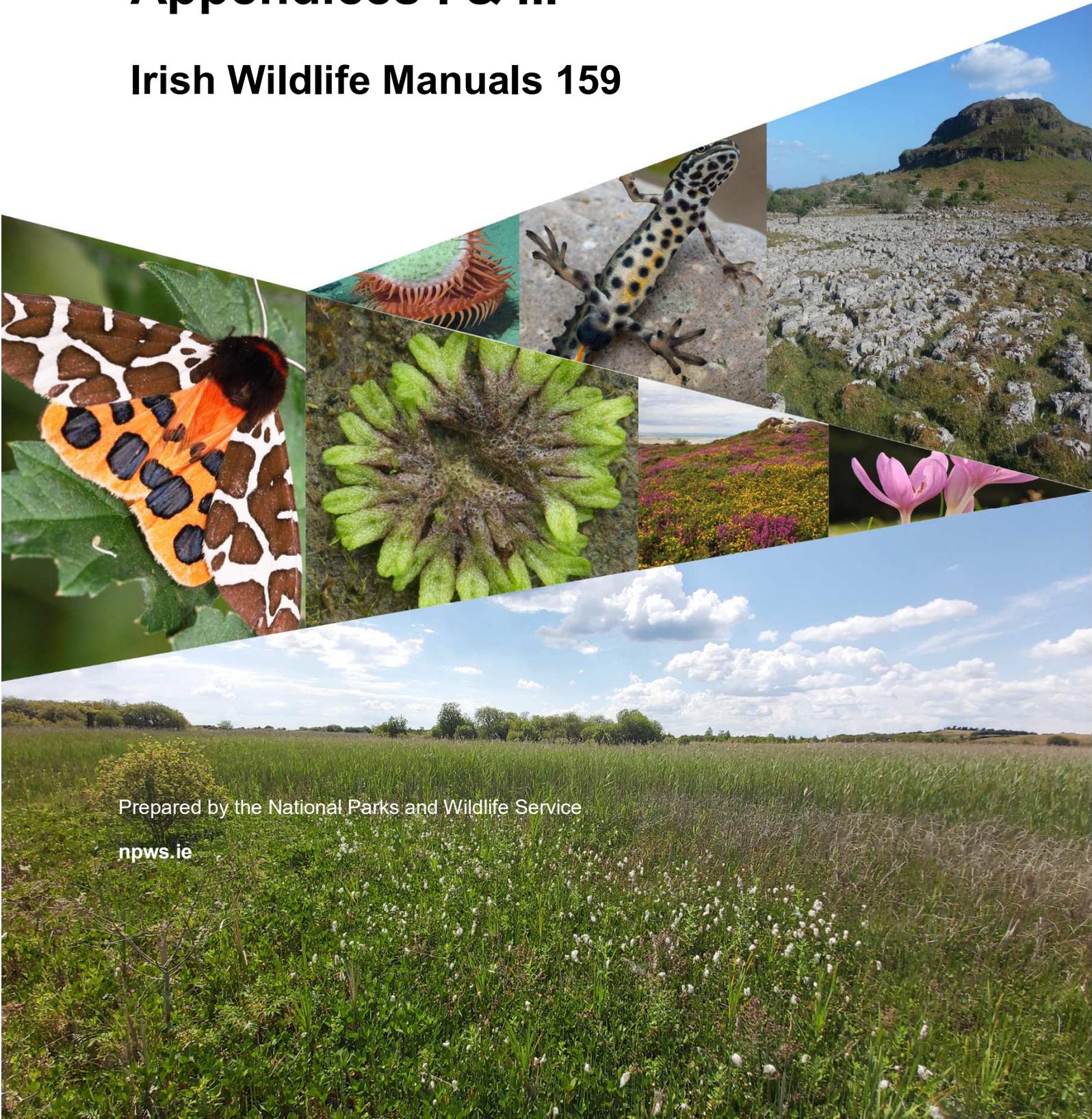




An tSeirbhís Páirceanna Náisiúnta
agus Fiadhúlra
National Parks and Wildlife Service

Monitoring of three Annex II species of *Vertigo* snail on Irish sites (2022–2024). Appendices I & II.

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Front cover, from left to right and top to bottom:

A deep water fly trap anemone *Phelliactis* sp., Yvonne Leahy; **Common Newt** *Lissotriton vulgaris*, Brian Nelson; **Limestone pavement**, Bricklieve Mountains, Co. Sligo, Andy Bleasdale; **Garden Tiger** *Arctia caja*, Brian Nelson; **Violet Crystalwort** *Riccia huebeneriana*, Robert Thompson; **Coastal heath**, Howth Head, Co. Dublin, Maurice Eakin; **Meadow Saffron** *Colchicum autumnale*, Lorcan Scott

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Monitoring of three Annex II species of *Vertigo* snail on Irish sites (2022-2024). Appendix I: Site summary paragraphs & Appendix II. *Vertigo angustior* site reports

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Appendix I: Site summary paragraphs

Full details of each site surveyed are presented in the relevant site report in Appendices II-IV; however, a brief overview and the Overall Conservation assessment summary for each site is presented here. Note that for some sites, reference to the maps included within the individual site reports will be necessary to gain a full understanding of the issues raised.

Vertigo angustior site summaries

VaCAM01 – Beal Point

Overall assessment

Vertigo angustior continues to occur mainly within the core area of the site, but is very limited elsewhere, resulting in a Population Assessment of Unfavourable-Bad (red). The impact of undergrazing and overgrazing has resulted in less-than-optimal habitat across most of the site, with a Habitat Assessment of Unfavourable-Inadequate (amber). The pressures acting on the site and the likely future trends for Population and Habitat result in a Future Prospects Assessment of Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Beal Point is Unfavourable-Bad (red).

Site Summary

The core habitat for *Vertigo angustior* at Beal Point continues to be the fixed dune habitat in the centre of the site within Polygon A. There do not appear to have been significant changes to the distribution of the snail within the site since the previous two monitoring periods, with the exception of its appearance at the western end of the site. The habitat within the site is quite affected by historical agriculture, with abundant grasses such as *Arrhenatherum elatius* and *Dactylis glomerata*, particularly in areas away from the transect in Polygon A and in Polygon B. Polygon B is very rank, with low-growing *Rubus fruticosus* agg. to be found through the sward. Polygon C has been heavily grazed and, being dominated by broadleaved herbs, has very little *Festuca rubra* thatch. Slurry spreading and supplementary feeding was reported in 2003 and the nutrients from these activities may still be affecting the system. Both undergrazing and overgrazing is currently affecting the site, illustrating the difficulty in maintaining a suitable grazing regime. Polygon A is now under a farm plan, which includes winter grazing by cattle at a level of 1 unit per hectare (Barry O'Donoghue, NPWS, pers. comm.). This is at odds with the recommendations of Moorkens & Killeen (2011) who suggested no more than 0.8 livestock units per hectare from spring to autumn, though there are other, potentially competing, objectives when it comes to the conservation management of this site. No supplementary feeding should be undertaken, as this would serve to introduce additional nutrients into the system. Close attention must be paid to the response of the vegetation to any changes to the management of the site.

VaCAM02 – Derrynane

Overall assessment

Both the Population Assessment and the Habitat Assessment for Derrynane have dropped from Unfavourable-Inadequate (amber) to Unfavourable-Bad (red), while the Future Prospects remain Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Derrynane is Unfavourable-Bad (red).

Site summary

The habitat polygon for *Vertigo angustior* at Derrynane was expanded significantly after the 2015 survey, which recorded suitable habitat and the target species much more widely than the 2008 survey, which only recorded *V. angustior* along the transect. The site should be

further expanded in the next round of monitoring due to work carried out by Mantell (2024), which extended the distribution of the snail at the site to the east and west of the current polygon. The site comprises an area of fixed dune fronted by Marram dunes along the back of Derrynane Beach, with two pools known to support Natterjack Toad (*Epidalea calamita*). While there are some minor pressures acting on the site, including trampling by recreational walkers, native and non-native scrub and tractor tracks, the most significant pressure is the rabbit population. It is clear that the rabbit population has grown significantly since the 2015 survey, with extensive burrows resulting in bare sand and most of the dunes have been virtually denuded of grasses (apart from the *Ammophila arenaria* along the back of the beach, though it has been lost from most of the fixed dune area). The dunes are, instead, dominated by bryophytes (mainly *Homalothecium lutescens* and *Pseudoscleropodium purum*) and broad-leaved herbs. While the reduced distribution of the species across the site and the habitat damage caused by the rabbit population is of concern, the recent implementation of rabbit control measures by the OPW may facilitate the recovery of the site for *V. angustior*.

VaCAM03 – Dooaghtry

Overall assessment

The current survey has seen a significant decrease in the extent of the *Vertigo angustior* population at Dooaghtry, with a Population Assessment of Unfavourable-Bad (red), while the Habitat Assessment returned a result of Unfavourable-Inadequate (amber). The likely future trends for the site and the pressures acting on the site result in a Future Prospects Assessment of Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Dooaghtry is Unfavourable-Bad (red).

Site summary

Between the monitoring periods 2007-2012 and 2013-2018, the primary grazing at Dooaghtry was changed from cattle to sheep, and sheep grazing has continued to occur across the site. This has resulted in a more tightly-grazed sward across much of the site, though this appearance was somewhat confounded by the fact that the current survey was carried out earlier in the growing season than previous surveys. What is clear is that the population of *Vertigo angustior* has declined, with only one positive sample returned for the current survey. The intensity of the sheep grazing is likely to be the main contributor to this decline, but inundation by seawater during storms is also likely to play a role. A reduction in the level of sheep grazing would benefit the snail and its habitat by allowing the development of the *Festuca rubra* thatch across more of the site.

VaCAM04 – Glencolmcille

Overall assessment

Despite an improvement in the habitat suitability of Glencolmcille, resulting in a Habitat Assessment of Favourable (green), the Population Assessment and Future Prospects are Unfavourable-Bad (red) due to the fact that the snail was not found, and a range of pressures continue to act on the site. Based on these assessments, the Overall Assessment for Glencolmcille is Unfavourable-Bad (red).

Site summary

Vertigo angustior was once again absent from the site at Glencolmcille. This is the third monitoring survey in which the snail has not been found. This is despite the fact that some of the habitat on the site is suitable for the snail and has shown improvement since the 2013-2018 monitoring period. Whether the issue now is that the snail was lost from the site due to historical pressures and has not become re-established due to the isolation of the site, or that the pressures acting on the sites are still negatively affecting the suitability of the habitat in a less visible way, is not clear. For example, while the footprint of the cultivated plots growing potatoes is not extensive, it is possible that pesticides are being applied to the crops that are impacting on the mollusc community of the wider area, as virtually no snails were recorded

from the samples taken for *V. angustior*. No grazing was occurring on the site at the time of survey; however, Moorkens & Killeen (2011) noted that there was winter grazing of sheep, and this is likely to be still occurring, as scattered wool was noted on the site. Given the length of time that has passed since the last record of *V. angustior* on the site, consideration may need to be given to implementing a reintroduction programme, should the habitat recover to a suitable state and appropriate long-term management enacted.

VaCAM05 – Kilshannig

Overall assessment

With the Population, Habitat and Future Prospects assessments all returning results of Unfavourable-Bad (red), the Overall Assessment for Kilshannig is Unfavourable-Bad (red).

Site summary

Vertigo angustior continues to be present at Kilshannig, but its distribution is becoming more restricted from monitoring period to monitoring period. In the current survey, only a single snail was found at one sample location. There does seem to be abundant suitable habitat on the site in terms of the vegetation, though *Festuca rubra* litter can be sparse. As indicated by the transect data, the site appears to be generally drier than is optimal and local information suggests that the dune slacks did not flood in the winter before the survey (*i.e.* winter 2021). This drying may be the result of climate change affecting the hydrological cycle in the area and/or increased evaporation due to wind. Other pressures acting on the site include cattle and rabbit grazing. A slight reduction in the grazing pressure would benefit the habitat of the snail at this site, by allowing the build-up of *Festuca rubra* thatch.

VaCAM06 – Kinlackagh Bay

Overall assessment

Vertigo angustior was not recorded during the current survey, which resulted in a Population Assessment of Unfavourable-Bad (red), while the Habitat Assessment was also Unfavourable-Bad (red), due to the increased sheep grazing in the vicinity of the transect. These assessments, combined with future trends and pressures acting on the site, resulted in a Future Prospects assessment of Unfavourable-Bad (red) also. Based on these assessments, the Overall Assessment for Kinlackagh Bay is Unfavourable-Bad (red).

Site summary

Vertigo angustior was not recorded at Kinlackagh Bay during the current survey, which is a significant decline from the previous rounds of monitoring. In 2013-2018, the snail was found widely across the site, though in low numbers, but had been lost from the Transect. The site does appear to have extensive areas that have some suitability for the snail, though much of this area (Polygon C, in particular) has developed more recently due to an apparent reduction in the grazing pressure. Increased grazing by sheep and cattle in Polygon A has reduced the suitability of the habitat in this area, and grazing is an issue across the entire site. The management of grazing is critical to the recovery of this site in order to allow any low-density population of *V. angustior* that may still be present on site to expand across the dunes one more. The control and removal of *Hippophae rhamnoides* before it spreads beyond its current patch is also extremely important for the dune habitat in general as well as for *V. angustior* and its habitat.

VaCAM07 – Maharees

Overall assessment

The reduction in the number of positive *Vertigo angustior* samples means the Population Assessment remains Unfavourable-Bad (red), as does the Habitat Assessment. Due to the current pressures acting on this site and the lack of any positive trend for these factors, the

Future Prospects are also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Maharees is Unfavourable-Bad (red).

Site summary

Vertigo angustior continues to occur at Maharees, but at very low density, with only a single individual recorded during the current survey. This is a decline from the low but reasonably stable population recorded across the previous two monitoring periods. The habitat of the site remains largely unchanged, with some minor improvements due to an apparent slight drop in grazing in places; however, while tufts of *Ammophila arenaria* have become more frequent in these areas, the *Festuca rubra* thatch remains underdeveloped. The main visible pressure acting on the site is cattle grazing, which is occurring across 90% of the site, with invasive species (*Hippophae rhamnoides*, *Acer pseudoplatanus* and *Phormium tenax*) and the golf course affecting a smaller area. The less evident, but possibly more important pressure acting on the site appears to be a reduction in rainfall, with local information suggesting that the dune slacks did not fill in the winter of 2021/22. This change in hydrology may be having negative effects on the habitat suitability across the site in terms of soil/litter moisture. As there is nothing that can be done to address this issue at the site level, the focus should be on managing the grazing levels across the site, which will mostly involve a reduction in the stocking level. Discussions should be had with the landowners with regard to this.

VaCAM08 – Dog's Bay

Overall assessment

The Population and Habitat assessments for Dog's Bay returned a result of Unfavourable-Bad (red). As a result of this, and the positive future trends assigned to the two parameters, the Future Prospects were assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Dog's Bay is Unfavourable-Bad (red).

Site summary

Vertigo angustior continues to hold out at Dog's Bay, with a single positive sample from the fixed dune habitat; the snail appears to have been lost from the grassy hollow at the northern end of the beach. The presence of the snail at the site is in spite of the continued decline in the habitat quality of the fixed dune habitat caused by a range of pressures, including grazing by cattle and sheep, erosion and the associated wind-blown sand, and trampling by walkers. If no action is taken, it is likely that the snail will be lost from the site. The Gurteen Bay & Dog's Bay Conservation Group has had a conservation management plan (Heffernan, 2022) prepared to address the damage to the fixed dune habitat from the various pressures and its implementation will be vital to the continued survival of *V. angustior* at the site. In relation to future monitoring, the habitat and population criteria may need to be altered to better reflect the wider site in the future, as the current criteria are limited to the grassy hollow with the freshwater upwelling, despite the snail occurring in the wider dunes.

VaCAM10 – Killanley Glebe

Overall assessment

The significant drop in the population of *Vertigo angustior* at Killanley Glebe compared to previous monitoring periods resulted in a Population Assessment of Unfavourable-Bad (red). Despite this, the Habitat Assessment returned a result of Favourable (green), as the habitat in Polygon A continues to appear suitable. Based on these assessments and their likely future trends, the Future Prospects for the site are assessed as being Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Killanley Glebe is Unfavourable-Bad (red).

Site summary

Vertigo angustior was not recorded at Killanley Glebe during the current survey. This is a dramatic drop in the population compared to the previous rounds of monitoring. Despite this drop, there is no clear cause. The habitat in Polygon A still appears to be optimal, comprising

flushed wet grassland and *Iris pseudacorus* marsh. The planted woodland in Polygon B continues to develop and so this area is Unsuitable. The only pressure noted for Polygon A was sheep grazing, but this does not appear to be at a level that is negatively affecting the habitat. It is recommended that discussions be had with the landowner to see if any change in management over the last 15 years can be found that would explain the population decline. The apparent removal of cattle from the site may be a factor, and their return (at low grazing level) may be an approach worth considering.

VaCAM11 – Lahinch

Overall assessment

As *Vertigo angustior* was not recorded during the current survey, the Population Assessment returned a result of Unfavourable-Bad (red). There continues to be a good area of suitable habitat for the snail, despite some decrease in suitability along the transect route, leading to a Habitat Assessment of Unfavourable-Inadequate (amber). In light of these assessments, and the pressures acting on the site the Future Prospects are considered to be Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Lahinch is Unfavourable-Bad (red).

Site summary

Vertigo angustior was not recorded from the site at Lahinch during the current survey, which is a further drop from the single positive sample recorded in 2013-2018. This contrasts starkly with the 17 positive samples recorded in 2009. Despite the site comprising two golf courses (the Old Course to the west and the Castle Course to the east), with the associated managed tees, greens, and fairways, the rough areas generally provide suitable habitat for the snail. However, the apparently suitable habitat does not appear to be capable of supporting the snail and it is unclear as to why this is the case. It is possible that there have been recent changes to the management of the golf courses, for example, in the application of pesticides. Discussions should be had with Lahinch Golf Club to ascertain if there have been any changes to the management of the site in the last 15 years.

VaCAM12 – Malin Dunes

Overall assessment

The Habitat Assessment for Malin Dunes remains Unfavourable-Bad (red), while the Population Assessment has also dropped to Unfavourable-Bad (red). The Future Prospects were assessed as Unfavourable-Bad (red), both Population and Habitat are Unfavourable-Bad (red) and neither has a positive future trend. Based on these assessments, the Overall Assessment for Malin Dunes is Unfavourable-Bad (red).

Site summary

Malin Dunes comprises an extensive sand dune system with large areas, across which the suitability for *Vertigo angustior* varies. The best of the habitat continues to occur along the section of the dunes closest to the shore, though coastal erosion has destroyed formerly suitable habitat and the associated increase in blown sand has further negatively impacted on the habitat more inland in proximity to the eroded stretch. The effect of erosion and blown sand has notably impacted on the result of the habitat and populations assessments of the site, as the area where the transect was located has been significantly altered by these factors.

The landward sections of the dunes are more subject to grazing pressure from cattle, sheep and rabbits, which has reduced the suitability of the habitat and resulted in areas with abundant *Ammophila arenaria* but limited associated *Festuca rubra* thatch, as it has been grazed away. The grazing and associated supplementary feeding has also increased the agricultural character of the site, with species such as *Trifolium repens*, *Cirsium arvense*, *Cirsium vulgare* and *Lolium perenne* found in patches throughout the site.

The site would benefit from a reduction in the grazing level and supplementary feeding. The rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and *Vertigo angustior* habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry.

Addressing the coastal erosion issue is likely to be particularly challenging into the future.

VaCAM13 – Pollardstown Fen

Overall assessment

Vertigo angustior was not recorded from the site and the area and quality of suitable habitat have reduced, resulting in Population and Habitat assessments of Unfavourable-Bad (red). Due to these assessments and the pressures acting on the site, the Future Prospects are also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Pollardstown Fen is Unfavourable-Bad (red).

Site summary

Vertigo angustior was not recorded from Pollardstown Fen during the current survey. The previous round of monitoring recorded the snail from a single sample, where only a single individual was found, which represented a significant decline from the 2007-2012 monitoring period. For this reason, the Population Assessment continues to be Unfavourable-Bad (red), as does the Habitat Assessment due to the habitat being either too rank where there is no grazing, or too impacted by grazing where horses have access to it. The areas grazed by horses would benefit from the temporary removal of access to allow the vegetation to become more developed and prevent poaching. If possible, some form of grazing should be introduced to Polygon A where the vegetation has become rank, with limited removal of trees also a possibility.

VaCAM14 – Streedagh Point Dunes

Overall assessment

The Population Assessment returned a result of Unfavourable-Inadequate (amber) due to the drop in the number of positive samples along the transect, while the Habitat Assessment similarly returned a result of Unfavourable-Inadequate (amber) due to drying along the transect. Based on these results and their future trends in light of the threats and pressures acting on the site, Future Prospects are considered to also be Unfavourable-Inadequate (amber). Therefore, the Overall Assessment for Streedagh Point Dunes is Unfavourable-Inadequate (amber).

Site summary

The site at Streedagh Point Dunes continues to support abundant suitable habitat for *Vertigo angustior*, with a good population distributed across the site. However, the site is not without its issues, with a drop in the number of positive samples since the 2013-2018 monitoring period noted during the current survey. The transect, in particular, saw a decline in the number of positive samples compared to the two previous rounds of monitoring, with drying out of the *Festuca rubra* thatch and underlying soil appearing to have had a negative effect on the suitability of the habitat despite the favourable vegetation. This drying out is assumed to be the result of changes to precipitation and/or wind patterns as a result of climate change. While grazing at the site is considered to be suitable overall, Conor's Island (Polygon A) is overgrazed by sheep and horses. Other more localised pressures include erosion, dumping, walking and trampling, and problematic native/invasive non-native species. With climate change and erosion largely beyond the scope of any site management measures, the main focus should be on addressing the issue of overgrazing in Polygon A and maintaining an appropriate level of grazing elsewhere. This measure may offset some of the issues caused by climate change by providing more *Festuca rubra* litter to retain some moisture close to the soil. Targeted control of problematic native/invasive non-native species would also be beneficial.

VaCAM15 – Bartraw

Overall assessment

The site at Bartraw supports a strong *Vertigo angustior* population, with abundant suitable habitat present, particularly on the island at the northern end of the site. This has resulted in Favourable (green) assessments for both of these elements. Future Prospects were also assessed as Favourable (green), thus giving an Overall Assessment for Bartraw of Favourable (green).

Site summary

The site at Bartraw comprises a former island and the sand and cobble spit connecting it to the mainland. The former island (Polygon A) supports abundant habitat suitable for *Vertigo angustior* in the form of fixed dune dominated by *Festuca rubra* grassland with *Ammophila arenaria*. The dune habitat along the spit has been heavily impacted by storm-related erosion and deposition of cobbles on former fixed dune habitat. As well as the impact of this pressure, paths trampled by human walkers and horse-riders have had an intense, if spatially limited, impact on the fixed dune habitat. Rabbit grazing was noted within Polygon A, albeit at a low level that is not currently having an impact on the *Vertigo angustior* habitat. However, the rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and *Vertigo angustior* habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry.

VaCAM16 – Inishmore Island

Overall assessment

Vertigo angustior was not recorded at Inishmore Island during the current survey, resulting in a Population Assessment of Unfavourable-Bad (red), while the Habitat Assessment and Future Prospects also returned Unfavourable-Bad (red) results. This results in an Overall Assessment for Inishmore Island of Unfavourable-Bad (red).

Site summary

The site at Inishmore Island comprises two widely separated areas; one at Cill Mhuirbhigh and the other around the Inishmore aerodrome. The habitat at Inishmore comprises fixed dune habitat and machair grassland. Most of this area is likely subject to grazing, particularly polygon B, which had a small number of cattle present at the time of survey, though there was no evidence of active grazing in the other polygons here. The cattle grazing has resulted in a reduction in the suitability of the area for *Vertigo angustior* via the removal of taller vegetation and the grassy thatch that provides the required microclimate for the species. Even where the classic *Ammophila arenaria*/*Festuca rubra* sward is well developed in Polygon A, the habitat is drier than would be optimal for the snail. Outside of the grazed areas (which are consequently more prone to drying out), the cause of this drying is not clear. It is assumed that this drying out is due to weather/climate changes that have reduced precipitation and/or increased drying conditions.

The habitat around Inishmore aerodrome is of lower potential suitability. While it also comprises fixed dune and maritime grassland, it generally has a well-developed bryophyte layer and limited *Festuca rubra* in the sward, resulting in only small areas that have suitability for *Vertigo angustior*. Part of the reason bryophyte cover is so high may be due to the presence of rabbits in this location, whereby they are preferentially grazing down the grasses and thus allowing the bryophytes to dominate.

The combination of pressures acting on the *Vertigo angustior* habitat at Inishmore Island has resulted in a decline in the population, with no *V. angustior* found during the current survey, continuing the trend that was evident from the prior monitoring periods. While the control of cattle grazing may restore some of the suitability to the habitat within Polygon B, the drying out

that is evident across the rest of the site is not likely to be something that can be managed at a local level.

VaCAM17 – Curragh Chase

Overall assessment

The Population Assessment returned a result of Unfavourable-Bad (red) due to the fact that the snail was not recorded during the current survey, while a reduction in the habitat suitability along the transect and across the site in general also resulted in a Habitat Assessment of Unfavourable-Bad (red). With no indication of any action to improve these assessments, the Future Prospects were assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Curragh Chase is Unfavourable-Bad (red).

Site summary

The *Vertigo angustior* site at Curragh Chase continues to deteriorate, with the snail not being recorded during the current survey. The areas that are defined as *Vertigo moulinsiana* habitat (southwest corner and a band running north across the middle of the site) are too wet for *V. angustior*. Other areas have become quite rank, usually with a dense grassy sward, and thick, wet *Juncus* spp. and grass litter in places. Vegetation that matches the description of optimal or suboptimal habitat for the species is limited or possibly absent. The site is subject to some low-level grazing by cattle and is also likely to be affected by nutrient inputs. The management required for *V. angustior* (some level of grazing to maintain a lighter thatch and for the development of a bryophyte layer) is at odds with that required for *V. moulinsiana* (virtually no grazing, in order to allow suitable tall vegetation to develop). Temporary electric fences seem to be partially in place to prevent cattle from entering the wetter fen areas, which may be for reasons of cattle husbandry or to reduce impacts on *V. moulinsiana* habitat. As *V. moulinsiana* is a Qualifying Interest for the Curraghchase Woods SAC, it is likely that this is the species that should be favoured by any management intervention. However, the *V. moulinsiana* population around the lakes of Curragh Chase Forest Park suggests that its continued presence within the SAC is not at risk.

VaCAM19 – Louisa Bridge

Overall assessment

The Population Assessment returned a result of Unfavourable-Bad (red) due to the fact that the snail was not recorded during the current survey, while a reduction in the habitat suitability across the site in general also resulted in a Habitat Assessment of Unfavourable-Bad (red). With no indication of any action to improve these assessments, the Future Prospects were assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Louisa Bridge is Unfavourable-Bad (red).

Site summary

Vertigo angustior was not recorded from Louisa Bridge during the current survey and has now not been recorded in 27 years (last recorded in 1997). The habitat has shown some decline in suitability, with the general loss of the *Iris pseudacorus* marsh with a bryophyte understorey and the spread of denser vegetation and litter, unsuitable for the snail. With succession in the form of encroaching *Salix* spp. the only pressure noted at the site, the sensitive manual removal of scrub is the only feasible management action that can be undertaken that may improve the site for the snail. Given the delicate nature of the tufa springs on the site, any such work would need to be approached in a manner that would prevent trampling or damage to the tufa slopes.

VaCAM20 – Ballysadare Bay

Overall assessment

Population Assessment for Ballysadare Bay is Unfavourable-Bad (red) due to the drop in the number of positive samples along the transect and across the site, while the Habitat Assessment is Unfavourable-Bad (red) due to reduction in the habitat suitability along the transect in terms of vegetation structure and soil moisture. Based on these results and their future trends in light of the threats and pressures acting on the site, the Future Prospects Assessment is also considered to be Unfavourable-Bad (Red). Therefore, the Overall Assessment for Ballysadare Bay is Unfavourable-Bad (red).

Site summary

Ballysadare Bay continues to support abundant habitat suitable for supporting *Vertigo angustior*, with the best of the habitat still in Polygon A. The number of positive samples has dropped compared to the previous two monitoring periods, and the habitat in Polygon A has shown some decline in suitability in terms of becoming more rank and drying out. This drying out is assumed to be the result of changes to precipitation and/or wind patterns as a result of climate change. Most of the other pressures acting on the site are minor and include erosion, camping, problematic native/invasive non-native species and dumping. The introduction of light grazing may be considered for Polygon A to open up the habitat slightly and prevent it becoming too rank; however, there should be no supplementary feeding. The chestnut fencing installed to attempt to restore the blowout in Polygon C does not appear to be having the desired effect, and additional measures may be required, such as planting *Ammophila arenaria*.

VaCAM21 – Strandhill Airport

Overall assessment

The drop in the number of positive samples and the largely unchanged status of the habitat at Strandhill Airport means that the Population and Habitat Assessments returned results of Unfavourable-Bad (red). In light of these results and the pressures acting on the site (scrubbing over, erosion and drying out due to climate change), the Future Prospects were also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Strandhill Airport is Unfavourable-Bad (red).

Site summary

The habitat for *Vertigo angustior* at Strandhill Airport has shown some decline in suitability and area since monitoring began. Though there has been some stabilisation of this decline, there are still pressures acting on the site including succession, erosion and drying out. The reduction in habitat quality appears to be having negative effects on the population of *V. angustior*, with only a single sample returning a positive result during the current survey, which continues the declining trend seen across the previous two monitoring periods. While the populations of species such as *V. angustior* can fluctuate year-to-year, the current decline does appear to be genuine, as it coincides with habitat issues and aligns with the pressures acting on the site. The site is largely unmanaged and was considered to be maintained mainly by natural elements; however, it had been noted over the previous monitoring rounds that grazing may need to be introduced to address the spread of bryophyte mounds and *Salix cinerea*. At this stage, it is recommended that this measure be implemented, with light cattle grazing (without supplementary feeding) introduced to the site. Grazing must be carefully monitored and set at a level that maintains the habitat for the snail and the site's other Qualifying Interests.

VaCAM22 – Waterstown Lough

Overall assessment

Vertigo angustior was not recorded from the site and the area and quality of suitable habitat has reduced, resulting in Population and Habitat assessments of Unfavourable-Bad (red). Due to these assessments and the pressures acting on the site, the Future Prospects are also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Waterstown Lough is Unfavourable-Bad (red).

Site summary

Vertigo angustior was not recorded from Waterstown Lough during the current survey. The previous round of monitoring recorded the snail from a single sample, where only a single individual was found, so the population appears to be sparse. The area of suitable habitat has contracted since the previous survey, with the lack of a well-developed litter and bryophyte layer noted. The main pressure acting on the site is grazing by 23 cattle that have access to the *V. angustior* habitat and the adjacent fen and grasslands. Two houses have been built, or are in the process of being built, above the site, though there is no sign of them having a negative effect on the habitat. It is recommended that the grazing level be reduced slightly by excluding animals from the area for a time, or reducing the numbers overall. This is required to allow the litter layer to develop. As all three Annex II *Vertigo* species have been recorded from this site, it is important that the requirements of all three species be considered in any changes to management.

Vertigo geyeri site summaries

VgCAM01 – Meenaphuil

Overall assessment

As in the previous two rounds of monitoring, the Population, Habitat, and Future Prospects assessments all returned a result of Favourable (green). For this reason, the Overall Assessment for Meenaphuil is Favourable (green).

Site summary

Meenaphuil continues to be an excellent, if small, site for *Vertigo geyeri*. The snail was recorded at both sample locations along the transect, as it was in the previous two rounds of monitoring. The site continues to support good habitat for the snail generally and along the transect. The fence that previously split the transect in two has been moved to the north and no longer bisects the transect, also resulting in the habitat polygon falling within a single habitat unit. The area is grazed non-intensively by sheep and the stocking density appears to be at or close to the optimal level required for the maintenance of the *V. geyeri* habitat, and so should be kept at this level. The Ben Bulbin, Gleniff and Glenade Complex SAC has numerous Qualifying Interests, some of which will have competing management requirements. For this reason, any changes to management practices for the purposes of improving the conservation status of the SAC will need to be cognisant of these contrasting requirements.

VgCAM02 – Tievebaun

Overall assessment

The Population Assessment returned a result of Favourable (green) once expert judgement was applied to address the limited habitat along the transect, as all samples were positive. The Habitat Assessment was Unfavourable-Inadequate (amber), after expert judgement was used to upgrade it from Unfavourable-Bad (red), as it was felt that the slight loss of suitable habitat along the transect would have a disproportionate effect on the result. The Future Prospects were assessed as Unfavourable-Inadequate (amber), in light of the above assessments and future trends. For this reason, the Overall Assessment for Tievebaun is Unfavourable-Inadequate (amber).

Site summary

Tievebaun continues to be an excellent site for *Vertigo geyeri*, with extensive suitable habitat spread along the slope of Tievebaun Mountain. The snail was recorded at both sample locations along the transect, similar to the previous two rounds of monitoring, when three samples along the transect were positive. The site continues to support good habitat for the snail generally and along the transect; however, the length of suitable habitat along the transect has declined since the previous round of monitoring. This is due to the drying out of some runnel areas and associated changes in vegetation. The site is grazed non-intensively by sheep and the stocking density appears to be at or close to the optimal level required for the maintenance of the *V. geyeri* habitat, and so should be kept at this level. The exception to this is the part of Polygon A where the transect is located, which is somewhat undergrazed. The Ben Bulbin, Gleniff and Glenade Complex SAC has numerous Qualifying Interests, some of which will have competing management requirements. For this reason, any changes to management practices for the purposes of improving the conservation status of the SAC will need to be cognisant of these contrasting requirements.

VgCAM03 –Brackloon

Overall assessment

The Population, Habitat, and Future Prospects assessments all returned a result of Unfavourable-Bad (red). For this reason, the Overall Assessment for Brackloon is Unfavourable-Bad (red).

Site summary

The site at Brackloon is located at the northwestern end of the infilled Brackloon Lough, and is set in a cutover bog landscape with calcareous flushing. No *Vertigo geyeri* were recorded during the current survey, despite the presence of suitable habitat in the southeastern part of the site. While the snail was not recorded from the transect in either of the previous monitoring periods, the flush habitat was positive in both. This suggests a real decline in the population of *V. geyeri* at Brackloon. Despite the apparent drop in the population, suitable habitat remains at the site and there were no pressures identified at the site that would explain this drop. There are signs of deer grazing and *Pinus contorta* saplings have grown up in places. Given the lack of any clear pressure acting on the site, no management recommendations can be made that would address the population loss at the site.

VgCAM04 – Clonaslee Eskers

Overall assessment

As in the previous round of monitoring, the Population, Habitat, and Future Prospects assessments all returned a result of Unfavourable-Bad (red). For this reason, the Overall Assessment for Clonaslee Eskers is Favourable (green).

Site summary

Vertigo geyeri was not recorded from Clonaslee Eskers during the current survey. This is a repeat of the results from the previous two rounds of monitoring, with the snail last recorded in 1998. The habitat suitability continues to decline, with the site being generally rank and the soil being either too dry or showing signs of fluctuating water levels, suggested alternating flooding/drying out events. Cattle have previously been known to graze the site, and there was a nose pump associated with the dry pool in Polygon A during the current survey; however, no livestock were noted on site during the current survey. It is understood that the landowner had recently passed away, which may be the cause of the removal of livestock. In Polygon D, *Schoenus nigricans* tussocks show signs of being topped by a digger, which may represent a conservation measure aimed at reducing the shading of *V. geyeri* habitat. In order to restore the site to a condition more suitable for the survival of *V. geyeri*, the hydrological situation needs to be investigated and remedied in a way that will result in consistently wet alkaline fen habitat.

VgCAM05 – Dooaghtry

Overall assessment

The Population Assessment returned a result of Unfavourable-Inadequate (amber) due to the fact that *Vertigo geyeri* was only recorded on the transect, while the Habitat Assessment was Favourable (green). Due to these results and the current pressures acting on the site, the Future Prospects are considered to be Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Dooaghtry is Unfavourable-Inadequate (amber).

Site summary

Dooaghtry continues to support suitable habitat for *Vertigo geyeri*, with the best of the habitat located around Dooaghtry Lough. Elsewhere in the site, the *V. geyeri* habitat comprises small flush areas in the hills above. During the current survey, the snail was only found along the transect beside the lough and not in other polygons, despite small patches of suitable habitat

being present across the site. This shows a decline in the number of positive samples as compared to the previous monitoring periods, though the cause of this decline is unclear. Away from the transect, the habitat is often tall and rank, which is unsuitable for the snail, but suitable habitat does continue to occur in patches among this taller vegetation. Sheep grazing is maintaining the good habitat where it occurs, though an appropriate increase in grazing pressure would be likely to benefit the snail by controlling the taller vegetation.

VgCAM06 – Drimmon Lough

Overall assessment

The Population, Habitat, and Future Prospects assessments all returned a result of Unfavourable-Bad (red), which shows a decline at the site across the three rounds of monitoring. For this reason, the Overall Assessment for Drimmon Lough is Unfavourable-Bad (red).

Site summary

The site at Drimmon Lough continues to decline in quality for *Vertigo geyeri*, as was noted by the previous round of monitoring. No *V. geyeri* were recorded from the site during the current survey. Despite the fen vegetation still being suitable for the snail, the soil moisture level was too low at the time of survey. Given the snapshot nature of the survey, it cannot be determined if this is a long-term situation; however, such fen habitat tends to have a stable water table, which is what makes it suitable for supporting *V. geyeri* in the first place. The cause of this drying out could not be identified and could be the result of climate change effects or more local pressures, such as abstraction from the lough or the local groundwater. The cattle grazing on the site is considered to be having an overall positive effect on the habitat by keeping the sward short and open. The drain bisecting the habitat polygon seems to be largely non-functional, with a high water table and heavily vegetated. Discussion with the landowner may help in identifying the cause of the site drying out.

VgCAM08 – Sheskinmore

Overall assessment

The Population, Habitat, and Future Prospects assessments all returned a result of Favourable (green), which shows an improvement since 2013-2018 when the Habitat Assessment was Unfavourable-Bad (red). For this reason, the Overall Assessment for Sheskinmore is Favourable (green).

Site summary

Sheskinmore continues to be an excellent site for *Vertigo geyeri* and is an important example of the positive effect of implementing the appropriate management measures. While seven of the eight samples were positive for the snail in 2013-2018, the site was assessed as being Unfavourable-Bad (red) due to issues around poaching and drying out along the transect, leading to a Habitat Assessment of Unfavourable-Bad (red). The management that has been implemented by the NPWS since then (light grazing by cattle and Polish Konik ponies, and the use of the sluice to maintain an appropriate water level) has seen the poaching and drying-out issues subside and resulted in the Habitat Assessment improving to Favourable (green). The current management regime should be continued, with the habitat checked occasionally to ensure that the current level of grazing is still appropriate to the needs of *Vertigo geyeri*.

VgCAM09 – Annaghmore Lough

Overall assessment

The Population, Habitat, and Future Prospects assessments all returned a result of Unfavourable-Bad (red). For this reason, the Overall Assessment for Annaghmore Lough is Unfavourable-Bad (red).

Site summary

The suitability of the site at Annaghmore Lough for *Vertigo geyeri* has declined over recent years. The snail was recorded from four transect samples in 2007-2012, but was absent during the 2013-2018 monitoring period survey and the current survey. This population decline is the result of a reduction in the habitat suitability, with all sample locations being too dry to support the snail. Even where the vegetation is still suitable, the soil moisture is just too dry. The cause of this drying out cannot be identified definitively, but is assumed to be the result of changes to precipitation caused by climate change. The only other pressures noted on the site were overgrazing of a small area by a horse and donkeys, and a small patch of the invasive species *Cotoneaster horizontalis*. No management can be implemented to address the effects of climate change at a local level, but discussions should be had with local landowners to see if any local activities can be identified that may be having an effect on the water levels of the lough and its surrounding fen.

An area of fen habitat southeast of the small lough in the southeastern lobe of the Annaghmore Lough (Roscommon) SAC was visited during the current survey, but no suitable habitat was found.

VgCAM10 – Ballyness Bay

Overall assessment

The Population Assessment returned a result of Unfavourable-Bad (red) due to the snail not being recorded during the current survey, while the Habitat Assessment is Unfavourable-Inadequate (amber). Due to these assessments and the lack of any positive trend for the site, the Future Prospects are assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Ballyness Bay is Unfavourable-Bad (red).

Site summary

Vertigo geyeri was not recorded from Ballyness Bay during the current survey, which indicates a continued decline since the 2007-2012 monitoring period. The site continues to maintain suitable habitat (within Polygon A), though it is patchy, and there has been some reduction in the cover of suitable habitat along the transect, resulting in a drop in the Habitat Assessment from Favourable (green) to Unfavourable-Inadequate (amber). The management of the site is by light cattle grazing, and this does not appear to be having a negative impact, but rather a positive one by keeping the vegetation from becoming rank. It is suggested that the grazing of the site should switch to sheep, as they are lighter and pose a lesser risk of trampling and poaching.

VgCAM13 – Easkey Valley

Overall assessment

The Population, Habitat, and Future Prospects assessments all returned a result of Unfavourable-Bad (red). For this reason, the Overall Assessment Easkey Valley is Unfavourable-Bad (red).

Site summary

The *Vertigo geyeri* site at Easkey Valley is spread across a large number of polygons and generally comprises small flushes creating a mosaic with other habitats. The snail was not

found during the current survey, which is a further decline since the last round of monitoring when the Population Assessment was still Unfavourable-Bad (red), but the snail was recorded from one sample location. This compares to 50% positive samples in 2007-2012, when the Population Assessment was Favourable (green). There does appear to have been a genuine reduction in the area of suitable habitat, which has led the Habitat Assessment to drop from Favourable (green) in the two previous monitoring rounds, to Unfavourable-Bad (red). Some of this is due to agricultural improvement, while elsewhere the habitat has become too dry or too wet. Grazing by sheep is the main management activity, which is appropriate for the maintenance of the snail's habitat, with cattle access possible to Polygon N (though the lack of grazing and better alternatives suggest it is rarely frequented). A small area of suitable habitat has been lost by drain clearance along the road verge in Polygon B. As the specific cause of the decline in the *Vertigo geyeri* population at Easkey Valley is difficult to identify, it is also difficult to propose appropriate management changes that could address the issue. Generally, the level of grazing by sheep is appropriate, keeping the flush vegetation open and low. If possible, sheep grazing could be attempted in Polygon N to control the rank vegetation without greatly damaging the underlying tufa slope. Supplementary feeding should be avoided within the *V. geyeri* habitat areas.

VgCAM14 – Polaguil Bay

Overall assessment

The Population Assessment, Habitat Assessment and Future Prospects are assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Polaguil Bay is Unfavourable-Inadequate (amber).

Site summary

The site at Polaguil Bay continues to support a good population of *Vertigo geyeri* and reasonably extensive areas of suitable habitat. The distribution of the species remains the same as 2013-2018, with four positive samples from Polygons A-C and no positive samples from Polygon E, where the transect is located. The best of the habitat continues to occur within the commonage area (polygons A-D), where sheep grazing keeps the vegetation generally short and open, though some areas have become dominated by *Schoenus nigricans* and *Molinia caerulea* tussocks, and *Juncus subnodulosus*. This contrasts somewhat with the privately-owned land, which is also sheep-grazed, but has seen the spread of *J. subnodulosus* in the flush area east of the fence-line through Polygon C, while Polygon E is largely unsuitable due to rank *S. nigricans* and *M. caerulea* tussocks shading out suitable habitat (it should be noted that suitable habitat here was always restricted to several runnels traversing the polygon). Sheep grazing is the main pressure acting on the site and it is currently at a level that is having a positive effect for the snail. The other aspect that is negatively affecting the suitability for the site for *V. geyeri* is that the water flowing down the runnels in Polygon E has eroded a narrow channel down to the stony substratum, thus increasing the flow rate and reducing the flushing effect to the surrounding habitat. While management should continue a similar level of sheep grazing, options for reducing the cover of *S. nigricans*, *M. caerulea* and *J. subnodulosus* should be investigated, though it may be difficult or impossible to achieve through sheep grazing alone.

VgCAM15 – Silver River

Overall assessment

The Population, Habitat, and Future Prospects assessments all returned a result of Unfavourable-Bad (red). For this reason, the Overall Assessment for Silver River is Unfavourable-Bad (red).

Site summary

Vertigo geyeri was not recorded at Silver River during the current survey. This compares with six positive samples from eight in 2007-2012 and four positive samples from eight in 2013-

2018, indicating a continued decline in population at the site. This decline has seen the Population Assessment drop from Favourable (green), in the previous two rounds of monitoring, to Unfavourable-Bad (red). The population decline reflects the decline in the habitat at the site, with the Habitat Assessment dropping from Favourable (green) in 2007-2012 to Unfavourable-Inadequate (amber) in 2013-2018, to Unfavourable-Bad (red) in the current survey. The site was expanded during the last round of monitoring due to the discovery of calcareous flush habitat upslope of the existing site and led to the creation of Polygon C. However, since the last round of monitoring, this area has been drained and the suitable habitat lost. The newly installed or cleared drains may also have affected the tufa slope that runs along the eastern boundary of Polygon A, which is now drying out. This has caused a dramatic reduction in brown mosses and the area is now dominated by more grassland-like vegetation. Grazing at the site by cattle, sheep, horses and deer is overall considered to be having a slightly positive effect by keeping the vegetation from becoming rank, though a slight reduction in the grazing level in Polygon B may reduce the effects of trampling and allow the bryophyte layer to become more developed.

VgCAM16 – Fermoyle

Overall assessment

The Population Assessment returned a result of Unfavourable-Inadequate (amber), while the Habitat Assessment was Unfavourable-Bad (red), with Future Prospects also Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Fermoyle is Unfavourable-Bad (red).

Site summary

The site at Fermoyle comprises a mosaic of habitats including transition mire (7140), rich fen (7230 and non-Annex PF1), active blanket bog (*7130) and degraded blanket bog supporting secondary wet heath (4010). The suitable habitat for *Vertigo geyeri* is sparsely interspersed throughout, typically confined to seepage zones and the edges of pools, but never forming large areas. Extensive areas of the site, particularly in Polygon B, are quaking and very wet. The site continues to support the snail in the northern section, though the habitat is becoming more limited, as *Schoenus nigricans* and *Molinia caerulea* tussocks develop and shade out the understorey of brown mosses and *Carex lepidocarpa*. The loss of habitat is likely due to the fact that the area is undergrazed. While evidence of cattle grazing was present in 2013-2018, only signs of deer grazing were evident during the current survey. This has allowed the development of taller vegetation, which impacts negatively on *V. geyeri* habitat. Scattered Lodgepole Pine (*Pinus contorta*) saplings and seedlings are present on the site, having spread from nearby plantations, but the effect is very limited. If possible, some extensive grazing should be reintroduced to the area, though due to its very wet nature, this may prove difficult and would need to be monitored closely to ensure poaching does not impact on the fragile flush habitats.

VgCAM18 – Fin Lough

Overall assessment

The Population Assessment returned a result of Unfavourable-Bad (red), while the Habitat Assessment was Favourable (green), with Future Prospects also Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Fin Lough (Offaly) is Unfavourable-Bad (red).

Site summary

There has been little apparent change at Fin Lough since the previous monitoring periods in terms of habitat and management; however, a decline has been noted in the Population of *Vertigo geyeri* at the site. In the current survey, the snail was only recorded from one of seven samples, resulting in a Population Assessment of Unfavourable-Bad (red), which contrasts with the Favourable (green) for the previous two monitoring periods. The result of the Habitat

Assessment was Favourable (green) in the current survey, as it was previously. Parts of the site are grazed by cattle and this has led to some poaching and loss of suitable vegetation. The ungrazed parts of the site depend on wetness to retain suitable vegetation for the snail, but this is not sufficient in some areas (particularly the *Schoenus* fen in Polygon C), where the vegetation is becoming too tall. Restoring areas that have seen the development of tall *Schoenus nigricans* tussocks is difficult, as grazers tend to work around them rather than graze them down. The overall management of the site is difficult due to its sensitivity to poaching, though access by livestock to polygons A and D should be restricted (though not necessarily prevented entirely). Some consideration may be given to the suggestion by Moorkens & Killeen (2011) that topping of *Schoenus nigricans* tussocks in Polygon C may benefit *Vertigo geyeri* and its habitat.

VgCAM20 – Lisduff Fen

Overall assessment

The Population and Habitat assessments returned a result of Unfavourable-Bad (red), as did the Future Prospects assessment. Based on these assessments, the Overall Assessment for Lisduff Fen is Unfavourable-Bad (red).

Site summary

Vertigo geyeri was not recorded from Lisduff Fen during the current survey, nor was it recorded during the previous monitoring period. This indicates a clear decline from the 2007-2012 monitoring period when it was recorded at more than half the sample locations. This decline in the snail's population is reflective of the changes to the habitat, with the site showing signs of drying out, or at least fluctuating water levels, both of which have negative repercussions for *V. geyeri*. The species requires a stable microhabitat with saturated soils; conditions that are no longer found at the site. The cause of the groundwater issues are uncertain and may include drainage or abstraction in the wider surrounding landscape or changes to the precipitation patterns caused by climate change. Another, likely related, pressure acting on the site is the encroachment of trees and scrub species, which is likely due to a lack of grazing pressure and drying out. Input of nutrients from the application of fertiliser to adjacent improved grassland is also likely to be affecting the site. A study of the hydrology of the site is required to elucidate the causes of the drying out/fluctuating water levels, while appropriate grazing and limited scrub removal is also required.

VgCAM21 – Ox Mountains

Overall assessment

The Population Assessment for Ox Mountains was Unfavourable-Inadequate (amber) due to the generally low numbers of snails recorded, while the Habitat Assessment was Favourable (green) due to the abundance of suitable habitat at the site. Future Prospects were assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Ox Mountains is Unfavourable-Inadequate (amber).

Site summary

The Ox Mountains *Vertigo geyeri* site continues to be a good site for the species, despite its small size. It has abundant suitable habitat within the runnel, with carpets of the brown mosses *Scorpidium cossonii*, *Scorpidium scorpioides* and *Campylium stellatum*, along with *Carex lepidocarpa* and *Schoenus nigricans*. While the habitat for the snail is good, there does appear to be an on-going decline in the population of the snail across the last three monitoring periods, with the current survey being the first time the snail was not recorded from every sample location. There is no clear reason for this decline, as the habitat remains very good for the snail at all sample locations. The only real pressure acting on the site is grazing by sheep. While there were none on site at the time of the survey, droppings were noted. A windfarm continues to operate on the lands around the site; however, there is no sign that this is having an effect

on the snail and its habitat. The only management recommendation put forward is to maintain, or slightly increase, the level of sheep grazing on the site.

VgCAM22 – Pollardstown Fen

Overall assessment

The Population and Habitat assessments returned a result of Unfavourable-Bad (red), as did the Future Prospects assessment. Based on these assessments, the Overall Assessment for Pollardstown Fen is Unfavourable-Bad (red).

Site summary

Pollardstown Fen is an important large fen site in which all three Annex II *Vertigo* species have been recorded in the past. However, *Vertigo geyeri* was not recorded during the current survey, which indicates a continuing decline since the 2007-2012 monitoring period when seven out of ten sample locations were positive for the snail. While the ground wetness, a critical factor for the survival of *V. geyeri*, was often suitable, the overall habitat tended to be tall and rank, which shades out the *Carex lepidocarpa* and brown moss sward required by the snail. This decline in habitat quality was noted along the transects and across the site in general. The lack of grazing is the main pressure acting on the site when it comes to the future survival of *V. geyeri*. The NPWS has introduced a programme of limited grazing by cattle in order to improve the conservation status of the site, but this has not yet been seen to benefit the snail. Sheep are considered to be the best grazer for *V. geyeri* habitat, as they maintain a low, open sward and cause lower poaching damage due to their small size. This is evidenced by the fact that the best habitat for the snail on the site is limited to a small sheep-grazed section of Polygon F in the east. Any expansion of grazing across the site will also have to take into account the other Annex II *Vertigo* species that are Qualifying Interests for the site, particularly *Vertigo moulinsiana* which is more dependent on tall, ungrazed vegetation. Changes to management at Pollardstown Fen will need to be closely monitored to ensure that they are achieving the desired outcome and to balance the needs of the various Qualifying Interests, both species and habitats.

VgCAM23 – Waterstown Lough

Overall assessment

The Overall Assessment for Waterstown Lough was assessed as Favourable (green) in the 2013-2018 monitoring period. Since then, the Population Assessment has dropped to Unfavourable-Inadequate (amber) and while the Habitat Assessment remains Favourable (green), in light of the population decrease and the pressures acting on the site, the Future Prospects are assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Waterstown Lough is Unfavourable-Inadequate (amber).

Site summary

Waterstown Lough is considered a particularly important site for *Vertigo* species, with all three Annex II species being recorded there during the 2013-2018 monitoring period. While *Vertigo angustior* was not recorded during the current survey, both *Vertigo geyeri* and *Vertigo moulinsiana* continue to be present on the site. The *V. geyeri* population has shown signs of decline, with only one sample being positive for the snail during the current survey, compared with three positive samples in 2013-2018. Suitable habitat continues to be found at the site; however, drying out appears to be an issue, with periodic flooding closer to the lake margins. The habitat is kept open by cattle grazing, though localised poaching is an issue and getting the balance between grazing levels and poaching is important when it comes to the future management. It may be possible to alter the timing of cattle access to the fen to alleviate the issue of poaching, while the infilling of the cattle drinking pond and the provision of water for cattle outside the fen would also be of benefit.

VgCAM24 – Duleek Commons

Overall assessment

The Population and Habitat assessments returned a result of Unfavourable-Bad (red), as did the Future Prospects assessment. Based on these assessments, the Overall Assessment for Duleek Commons is Unfavourable-Bad (red).

Site summary

During the 2013-2018 monitoring period, the site at Duleek Commons was noted to be drying out and *Vertigo geyeri* was only recorded from a single sample location, with one individual found. This drying out appears to have continued, with much of the previous fen/flush habitat drying out and converting to wet grassland. As a result, *V. geyeri* was not recorded from the site during the current survey. The cause of the drying out is unclear, but does not appear to be the result of pressures located within the site boundary, but rather a more regional issue. A drop in the groundwater level may be the result of agricultural abstraction on the surrounding farmland, or pumping from the five quarries located in reasonably close proximity to Duleek Commons. A detailed ecohydrological study would be required to find the cause of the drying out.

Vertigo moulinsiana site summaries

VmCAM01 – Borris

Overall assessment

Despite *Vertigo moulinsiana* being recorded at the site again during the current survey after an absence in 2013-2018, the Population Assessment remains Unfavourable-Bad (red) due to the low numbers and distribution. Vegetation and moisture levels are still good, but there has been some reduction in the extent of suitable vegetation along the transect, resulting in a Habitat Assessment of Unfavourable-Inadequate (amber), while current status of the site and its future trends based on the pressures acting on the site result in a Future Prospects Assessment of Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Borris is Unfavourable-Bad (red).

Site summary

Vertigo moulinsiana was once again recorded at Borris after an absence during the 2013-2018 monitoring period, lending weight to the suggestion that the site generally supports a low density population of the species. The best habitat is present along the back drain of the River Barrow towpath, tall swamp vegetation, particularly *Glyceria maxima*, providing good habitat for the snail. The site is affected by periodic flooding from the River Barrow with a 1-in-10 probability in any given year, though this is only likely to impact on *Vertigo moulinsiana* in exceptional years. Scrub encroachment in the form of *Salix cinerea* and *Alnus glutinosa* constitute the main pressure acting on the *Vertigo moulinsiana* habitat at the site and some sensitive active management is required to maintain the site for the species.

VmCAM02 – Fin Lough

Overall assessment

While *Vertigo moulinsiana* continues to be present in a number of locations at this site, its distribution and numbers have continued to drop since the 2007-2012 monitoring period resulting in a Population Assessment of Unfavourable-Bad (red). The wetness at the site remains good and, while there has been some localised loss of suitable vegetation, the habitat is generally still good for the species, giving a Favourable (green) Habitat Assessment. Based on the changes at the site and the identified pressures (clearly identified or otherwise), the Future Prospects have been classed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Fin Lough is Unfavourable-Bad (red).

Site summary

Fin Lough is an extensive site with a range of vegetation types capable of supporting *Vertigo moulinsiana* because it is an infilling lake offering a range of niches. Broadly, there is abundant suitable habitat for the snail in terms of the plant species present and the wetness, though there are localised impacts that have caused the virtual total loss of vegetation leaving only bare marl mud under shallow water. Despite the widespread suitable habitat, the *Vertigo moulinsiana* population at the site continues its decline from 75% positive in 2007-2012, to 53% positive in 2013-2018, to 38% in the current survey. It is possible that water quality has been impacted (which may also explain the vegetation loss), but there is limited evidence for this beyond some eutrophication in the adjacent pond. The continued presence of the snail at the site may depend on identifying the specific cause of the reduction in numbers and localised loss of vegetation. It may be that liaison with the adjacent landowners would shed some light on the situation.

VmCAM03 – Lough Owel

Overall assessment

Due to the Unfavourable-Bad (red) assessments for Population, Habitat, and Future Prospects the Overall Assessment for Lough Owel is Unfavourable-Bad (red).

Site summary

The *Vertigo moulinsiana* habitat at Lough Owel comprises fen areas on either side of the feeder canal, but has shown some signs of decline over the last two monitoring periods. Drying out has resulted in the loss of suitable habitat in the strip of land between the road and the canal (Polygon C) and has similarly reduced habitat suitability in the area to the northeast (Polygon A). This reduction in suitability is reflected in the population distribution, with the snail completely lost from Polygon C and reduced in Polygons A and B. While extensive cattle grazing continues across much of Polygon B, the habitat here is still suitable, with abundant *Carex* species. Grazing appears to have ceased in Polygon A, which may be contributing to the habitat change that has seen much of the potentially suitable habitat become grassier and drier. Addressing the drying out may prove a challenge, as the canal water levels are currently well below the ground level and Lough Owel is a water supply for Mullingar, thus putting pressure on the water levels.

VmCAM04 – Mountmellick

Overall assessment

While *Vertigo moulinsiana* continues to be recorded at Mountmellick, there is a clear deterioration at the site in terms of population and habitat suitability. The population has shown a decline across the last three monitoring periods, dropping to Unfavourable-Bad (red) in 2013-2018 and showing a further decline since. The cover of suitable vegetation is declining, as is the extent of suitable ground wetness, which has resulted in a Habitat Assessment of Unfavourable-Bad (red). The pressures acting on the site are significant, as evidenced by the decline in population and habitat, and the Future Prospects are also considered Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Mountmellick is Unfavourable-Bad (red).

Site summary

The *Vertigo moulinsiana* site at Mountmellick is in clear decline, with the extent of suitable vegetation and wetness within the disused canal bed reducing from monitoring period to monitoring period. Succession and drying out were pressures identified by Moorkens & Killeen (2011) and Long & Brophy (2019) and these processes are continuing, with horse grazing also having an effect, apparently replacing earlier cattle access to the site. Stretches that were previously dominated by *Glyceria maxima* are now dominated by *Agrostis stolonifera*, with sparse or no *Glyceria maxima* present. Vegetation has been completely lost from the first 15m of the transect due to shading and drying out. The canal bed is fed by a spring from the east bank at approximately 85m on the transect, but this does not seem to be supplying enough water to keep the soil wetness levels optimal for *Vertigo moulinsiana*. The artificial nature of the site means that the natural processes that maintain other wetland sites are not functioning in this case and the current decline is likely to continue, with management actions likely to have limited effects.

VmCAM05 – Louisa Bridge

Overall assessment

Vertigo moulinsiana continues to be recorded at Louisa Bridge, though with fewer positive locations and at a lower density, resulting in a Population Assessment of Unfavourable-Bad (red). The Habitat Assessment is also Unfavourable-Bad (red) due to the reduced extent of suitable vegetation and soil wetness. Due to the current status and likely future trend at the site, and the pressures acting upon it, Future Prospects are assessed as Unfavourable-Bad

(red). Based on these assessments, the Overall Assessment for Louisa Bridge is Unfavourable-Bad (red).

Site summary

Most of the Optimal habitat for *Vertigo moulinsiana* at Louisa Bridge can be found on the Rye Water flood plain at the base of the slope, though patches occur elsewhere in the site. The *V. moulinsiana* population appears to have reduced in extent within the site, with some areas dominated by unsuitable vegetation such as *Molinia caerulea* or too dry to provide suitable habitat for the snail. *Alnus glutinosa* saplings are springing up within some of the habitat polygons, while *Salix cinerea* is encroaching from the edges in places. The wetness is patchy across the site and slope-side springs continue to supply water to some areas. There is little needed in the way of management, beyond some sensitive removal of woody species spreading into the habitat, and protecting the site from external disturbance.

VmCAM06 – Ballybeg Lough

Overall assessment

The Population Assessment is Unfavourable-Bad (red), in contrast with the Habitat Assessment, which is Favourable (green). Considering these assessments, the trends and the existing threats and pressures, the Future Prospects were assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Ballybeg Lough is Unfavourable-Bad (red).

Site summary

Vertigo moulinsiana continues to occur across the site at Ballybeg Lough, though generally in low numbers. The numbers recorded along the transect do not approach those from the 2007-2012 monitoring survey, but are similar to those from 2013-2018. The habitat for the snail is still good, with a band of *Carex paniculata* tussocks running along the lake shore, with other *Carex* species also present along Transect 4. Most of Polygon B supports tall swamp vegetation dominated by *Cladium mariscus* and *Phragmites australis*, with the notable presence of *Typha angustifolia* (a species that is thinly distributed in Ireland). Threats and pressures relevant to the site include cattle and horse grazing, vehicle operation and a potential housing development. The site still supports the snail, albeit at reduced numbers, and there is abundant good habitat; however, careful management of the site is required to ensure its continued presence.

VmCAM08 – Cappankelly

Overall assessment

The Population Assessment for Cappankelly is Favourable (green) due to the number of positive samples and the density of *Vertigo moulinsiana*. The Habitat Assessment is also Favourable (green), with good vegetation and wetness. Due to the lack of significant threats or pressures, the Future Prospects are Favourable (green). Based on these assessments, the Overall Assessment for Cappankelly is Favourable (green).

Site summary

Despite its small size, Cappankelly continues to be an excellent site for *Vertigo moulinsiana* in terms of population and habitat. The snail is found in the fringing swamp vegetation around the western half of the small lake, which is regularly inundated by flooding from Lough Ree. The lake edge within Polygon A comprises floating scraw with swamp vegetation, which prevents this area from being completely flooded. Cattle have some access to the lake from the north and west, but this does not appear to be affecting the swamp vegetation. The transect habitat is protected by an electric fence, though there was no other evidence of cattle grazing in the adjacent fen habitat at the time of the current survey. There appears to be no need to alter the current management at the site in order to maintain its status.

VmCAM09 – Waterstown Lough

Overall assessment

Despite an improvement in the number of positive samples since the previous monitoring period, the Population Assessment remains Unfavourable-Bad (red). In contrast, the large extent of suitable vegetation with good soil wetness has resulted in a Habitat Assessment of Favourable (green). While the threats and pressures identified for the site do not appear to be having a significant impact on the snail's population, the distribution and density has not achieved 2007-2012 levels and the reason for this is unclear; however, the population has increased significantly since the last round of monitoring. For this reason, the Future Prospects were assessed as Favourable (green). Based on these assessments, the Overall Assessment for Waterstown Lough is Unfavourable-Bad (red).

Site summary

Historically, all three Annex II *Vertigo* species have been recorded from Waterstown Lough, with one positive location each recorded for *Vertigo geyeri* and *Vertigo angustior* in 2013-2018. For this reason, the site is important for the conservation of these species. *Vertigo moulinsiana* is quite widely distributed within the site. The snail is supported by tall fringing swamp vegetation and the adjacent fen area, with good wetness. The water levels of the lake were high at the time of survey, which likely helps to maintain the soil wetness for the species. The *Vertigo moulinsiana* population has improved slightly since 2013-2018, but it has not recovered to the numbers returned by the 2007-2012 survey, leading to a Population Assessment of Unfavourable-Bad (red). The cause of this reduction in the population is unclear, as extensive suitable habitat is present on the site, and the pressures identified would not appear to be sufficient to cause this decline. Cattle grazing is the main activity occurring within the site, though this is limited to the eastern section and no major change of management is required.

VmCAM10 – Ballynafagh Lake

Overall assessment

The Population Assessment, Habitat Assessment and Future Prospects for Ballynafagh Lake were all Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Ballynafagh Lake is Unfavourable-Bad (red).

Site summary

The *Vertigo moulinsiana* site at Ballynafagh Lake is spread across four polygons, namely the lake itself, adjacent wetland to the southwest, and two stretches of the Blackwood Feeder. While the lake supports abundant suitable vegetation and wetness, the three other polygons have continued to deteriorate since the 2013-2018 monitoring period, with a reduction in suitable vegetation and/or soil wetness. The population of *V. moulinsiana* within the site has declined in all four polygons, resulting in an assessment of Unfavourable-Bad (red), as in 2013-2018. Even within the lake polygon, there has been some loss of suitable habitat, with the area in which Transect 1 was located now completely scrubbed over, leading to the loss of suitable vegetation. The Habitat Assessment and Future Prospects for the site are also Unfavourable-Bad (red).

VmCAM11 – Charleville Lake

Overall assessment

The Population Assessment, Habitat Assessment and Future Prospects for this site are all Favourable (green). Based on these assessment results, the Overall Assessment for Charleville Lake is Favourable (green).

Site summary

Charleville Lake supports a good population of *Vertigo moulinsiana* in the tall fringing vegetation around the lake and in areas of tall sedge understorey within the wet woodland to the east. With regard to the snail's population, the situation has been largely stable for the last three monitoring periods and this is likely to continue into the future. Maintaining the water levels in the lake and consequently appropriate wetness within the *V. moulinsiana* habitat is vital, and for this reason, the sluice controlling the outflowing stream located near the northwest corner of the lake needs to be maintained. There is a second, uncontrolled outflow along the southern side of the lake, which also needs to be considered in any hydrological assessment of the lake. The centre of the lake is vegetating over and while it is still very wet and quaking, it does indicate that the site is progressing along a path of succession, which in the long term is likely to reduce the suitability of part of the site for *V. moulinsiana*. Long & Brophy (2019) suggested that this succession is being accelerated by peat sedimentation from nearby peat extraction, based on information from local NPWS staff.

VmCAM12 – Curragh Chase

Overall assessment

Due to the absence of *Vertigo moulinsiana* from the fen area to the south, the Population Assessment for Curragh Chase is Unfavourable-Inadequate (amber). The abundance of suitable habitat fringing the lakes and the patches of suitable habitat in the fen, along with the lack of significant pressures, result in an assessment of Favourable (green) for Habitat Assessment and Future Prospects. Based on these assessments, the Overall Assessment for Curragh Chase is Unfavourable-Inadequate (amber).

Site summary

The fringing swamp vegetation of the lakes at Curragh Chase provides good habitat for *Vertigo moulinsiana* and supports a good population of the snail. The population has improved since the previous round of monitoring, at least around the lake, while the snail remains absent from the fen area to the south. The site remains Unfavourable-Inadequate (amber) for *V. moulinsiana*, as it was in 2013-2018; however, this is now only due to the Population Assessment, as the Habitat Assessment and Future Prospects are Favourable (green). Cattle grazing in the fen area has reduced its suitability for the snail and liaison with the landowner would be required if this situation is to be improved. While there is no evidence of it affecting the *V. moulinsiana* population as yet, the increase in nutrient levels in the lake, illustrated by the presence of green algae, indicates that water quality is an issue and could have a negative effect in the future. Control of scrub around the lakes could also benefit the fringing swamp vegetation and, by association, *Vertigo moulinsiana*. Overall, Curragh Chase is a good site for *Vertigo moulinsiana* and the snail is likely to continue its presence here into the future.

VmCAM14 – Kildallan Bridge

Overall assessment

While the Habitat Assessment is Favourable (green), the limited distribution of *Vertigo moulinsiana* away from Transect 1 results in a Population Assessment of Unfavourable-Inadequate (amber), while the pressure cause by the maintenance of the canal results in a Future Prospects of Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Kildallan Bridge is Unfavourable-Inadequate (amber).

Sites summary

Kildallan Bridge supports a very good, if spatially limited, population of *Vertigo moulinsiana*. The Optimal habitat is limited to the swamp vegetation in the back-drain southeast of the canal bridge, while the wider site is Suboptimal-Unsuitable. The site would benefit from a reduction in the intensity of management of the vegetation fringing the Grand Canal, as this habitat is now low-growing and sparse, when it would be more suitable if it was allowed to grow tall,

dense and develop a litter layer. Infilling has occurred just west of Polygon A and it must be ensured that further infilling does not occur. Given the limited area of optimal habitat at Kildallan Bridge, it is important that more suitable habitat be allowed to develop in the area to ensure the continued presence of *V. moulinsiana* at this site.

VmCAM16 – Lisduff Fen

Overall assessment

The population of *Vertigo moulinsiana* at Lisduff Fen continues to decline, resulting in a current Population Assessment of Unfavourable-Bad (red). This is despite the apparent suitability of the habitat at this site, with a Habitat Assessment of Favourable (green). Taking into account the on-going decline in the population and the pressures, Future Prospects were assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Lisduff Fen is Unfavourable-Bad (red).

Site summary

The site at Lisduff Fen continues to support a population of *Vertigo moulinsiana* at low density; however, it does appear that the progressive loss of the species from the southern half of the site is occurring. There is no clear reason for this loss, as the habitat appears suitable in terms of vegetation (*Schoenus nigricans* tussocks) and wetness. The only noted activity occurring at the site is grazing by cattle and a donkey, but the level of grazing appears to be suitable for the habitat and prevents the spread of scrub across the *V. moulinsiana* habitat. It may be that something is occurring in relation to the groundwater supply to the site and the effect is spreading; however, detailed hydrological monitoring would be required to uncover any such change. As well as *Vertigo moulinsiana*, the site continues to support Marsh Fritillary (*Euphydryas aurinia*), with webs on some of the higher ground within the fen with abundant *Succisa pratensis*. As the site is subject to effects from agricultural activities in the vicinity, it is important that the landowners are contacted and the importance of the site stressed, with recommendations made for the future management of the site.

VmCAM17 – The Murrough

Overall assessment

Despite an improvement in the *Vertigo moulinsiana* population since 2013-2018, the Population Assessment remains Unfavourable-Inadequate (amber). The Habitat Assessment and Future Prospects also remain Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for The Murrough is Unfavourable-Inadequate (amber).

Site summary

The Murrough remains an important site for *Vertigo moulinsiana* in Ireland, as the most easterly site for the species. The extensive wetland habitat provides abundant opportunities for the snail in the face of changing conditions, while the active management being undertaken by Birdwatch Ireland in clearing scrub, carrying out conservation grazing with Kerry ponies, and drain blocking, should benefit *V. moulinsiana* in the long term. The lands extending to the south of the road at Five Mile Point have some of the best *V. moulinsiana* habitat within the site, with abundant *Phragmites australis* and *Cladium mariscus* swamp. For this reason, the snail is likely to persist at this site into the future.

VmCAM18 – Pollardstown Fen

Overall assessment

With Unfavourable-Bad (red) assessments for population, habitat and Future Prospects, the Overall Assessment for Pollardstown Fen is Unfavourable-Bad (red).

Site summary

Pollardstown Fen is an important site for *Vertigo*, as it is designated for all three Annex II *Vertigo* species. However, the situation is not positive for any of the species, with *Vertigo geyeri* and *Vertigo angustior* only found at one sample location each in 2013-2018. *Vertigo moulinsiana* is faring better, but was still assessed as Unfavourable-Bad (red) for population in the current survey. The pressures acting on the site include drying out and a change to less suitable vegetation in places, with *Juncus subnodulosus* spreading. Some of the particularly dry areas have seen encroachment by *Rubus fruticosus* agg.

Pollardstown Fen had largely been abandoned from an agricultural management point of view, with only occasional grazing occurring in places, particularly in the southeast; however, NPWS is instigating a conservation grazing programme to address the loss of suitable habitat for *Vertigo geyeri* and *Vertigo angustior*, as well as to improve the condition of Annex I fen habitats. The monitoring and maintenance of water levels is even more critical to the continued presence of *V. moulinsiana* within the site, as the species depends on water levels that are generally at or above ground level. Given that the water levels are dependent on the mid-Kildare aquifer, activities, such as water abstraction, in the wider area outside the fen could impact on the habitat within the fen.

The decline of the population and habitat assessments in Pollardstown Fen suggest that the future presence of *V. moulinsiana* is under threat in the long-term.

VmCAM19 – Portumna

Overall assessment

Vertigo moulinsiana and suitable habitat for the species occur widely at Portumna, resulting in Favourable (green) assessments for population and habitat. Taking into account the current status in light of threats and pressures, Future Prospects have also been assessed as Favourable (green). Based on these assessments, the Overall Assessment for Portumna is Favourable (green).

Site summary

Portumna is an important site for *Vertigo moulinsiana* due to the widespread suitable habitat for the species and the generally stable water levels provided by Lough Derg, as it is artificially controlled by the ESB. The snail is found in various locations within Portumna Forest Park and where suitable habitat occurs along the east shore of the lake, and the population appears to be reasonably stable when compared with the 2013-2018 monitoring survey. There are few pressures acting on the *V. moulinsiana* population at Portumna, with grazing by cattle, horses and deer the main ones. Grazing pressure can be addressed by reducing access or numbers in the appropriate areas. Some of the habitat polygons within the forest park are being shaded by trees and would benefit from opening up the canopy. A potential threat exists in the form of the Water Supply Project – Eastern and Midlands Region, which proposes to abstract water from Lough Derg, though the fact that the lake levels are artificially maintained means this risk should be low. Overall, the population and habitat for *V. moulinsiana* at Portumna are good and stable, and should remain so into the future.

VmCAM21 – Royal Canal Longford Branch

Overall assessment

While the Favourable (green) Habitat Assessment indicated that there is abundant suitable habitat for *Vertigo moulinsiana* at this site, the decline in the population due to the pressure of succession returned Unfavourable-Inadequate (amber) results for Population Assessment and Future Prospects. Based on these assessments, the Overall Assessment for the Royal Canal, Longford Branch is Unfavourable-Inadequate (amber).

Site summary

The *Vertigo moulinsiana* habitat along the Royal Canal, Longford Branch is located within the canal bed of the disused canal channel. Extensive tall swamp vegetation occurs along the

canal bed, with good wetness, with some stretches even supporting floating scraw over water depths >80cm. The population is still widespread along the site, but the species appears to have been lost from Polygon C. This is due to the main pressure acting on the site, which is shading out of swamp vegetation by the spread of *Salix cinerea* and *Alnus glutinosa* along the canal banks. This pressure is acting along other stretches of the canal, too, and management is required to reduce this pressure and restore the swamp vegetation. The Royal Canal, Longford Branch remains a good site for *V. moulinsiana* and could be returned to good condition reasonably easily with the introduction of the appropriate management works.

VmCAM23 – Castletown

Overall assessment

The Population Assessment for *Vertigo moulinsiana* at Castletown is Favourable (green), despite some notable decline. However, the Habitat Assessment returned a result of Unfavourable-Bad (red) due to drying out and loss of suitable vegetation, as did Future Prospects due to this loss of suitable habitat related to drainage of the area. Based on these assessments, the Overall Assessment of Castletown is Unfavourable-Bad (red).

Site summary

The *Vertigo moulinsiana* site at Castletown was first fully surveyed in 2012 by Long & Brophy (2013). At this time, the site had significant amounts of suitable vegetation, but was showing signs of decline due to drying out. During the 2013-2018 monitoring survey, this decline was clearly evident, with the loss of suitable vegetation underway and the cause being the major drains bordering the site. The drains have remained in place and so the drying out has continued into the current survey period. The decline in the site is evidenced by the gradual decline of the snail population along the transect and across most of Polygon B, though the habitat decline appears to be outpacing the population decline at the moment in terms of distribution, the abundance numbers are significantly down. Action will be required to re-wet the swamp area and attempt to re-establish the suitable vegetation, which used to include *Sparganium erectum*. This would entail the partial or complete blocking of the drains bordering the site.

VmCAM24 – Gollierstown

Overall assessment

As a new site, there are few data available on which to base the new assessment criteria. For this reason, and given the lack of apparent pressures, it is assumed that the site is in good condition. This has resulted in the Population Assessment, Habitat Assessment and Future Prospects being assigned Favourable (green) status. Based on these assessments, the Overall Assessment for Gollierstown is Favourable (green).

Site summary

Vertigo moulinsiana was first recorded at Gollierstown in 2018 (M. Long, pers. comm.) (though a historical record noted the species in the vicinity in 1945) and the current monitoring is the first time a full survey has been carried out at the site. The *V. moulinsiana* habitat comprises fringing vegetation, including *Sparganium erectum*, *Typha latifolia* and *Carex nigra*, around a flooded borrow pit. The pond is long-established and is visible on the 6-Inch map as part of a small quarry. Given the limited habitat available to the snail, the site is vulnerable to impacts including any significant change in water levels within the pond. No apparent pressures are acting on the site, though the future development of the Grand Canal Greenway poses a threat to *V. moulinsiana* and its habitat at Gollierstown.

VmCAM25 – Louisa Bridge (south)

Overall assessment

As a new site, there are few data available on which to base the new assessment criteria. Given the fact that the snail was recorded at all sample locations, it is assumed that the population is doing well, resulting in a Population Assessment of Favourable (green); however, the lack of soil wetness at most of the sample locations suggests the habitat is less than ideal, leading to a Habitat Assessment of Unfavourable-Inadequate (amber). Based on the current status of the site and the pressures acting on it, Future Prospects were also assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Louisa Bridge (South) is Unfavourable-Inadequate (amber).

Site summary

Vertigo moulinsiana was first recorded at Louisa Bridge (South) in 2018 (M. Long, pers. comm.) and the current monitoring is the first time a full survey has been carried out at the site. The snail has also been recorded north of Louisa Bridge in the Rye Water river valley. The *V. moulinsiana* habitat comprises bank-drain swamp vegetation, dominated by *Carex acutiformis* and *Glyceria maxima*. Given the limited habitat available to the snail, the site is vulnerable to pressures, including the encroachment of scrub from all sides and drying out. The site would benefit from the sensitive removal of some of the encroaching scrub. The future development of the Grand Canal Greenway poses a threat to *V. moulinsiana* and its habitat at Louisa Bridge (South).

VmCAM26 – Loughmerans

Overall assessment

As a new site, there are few data available on which to base the new assessment criteria. For this reason, and given the lack of significant pressures, it is assumed that the site is in good condition. This has resulted in the Population Assessment, Habitat Assessment and Future Prospects being assigned Favourable (green) status. Based on these assessments, the Overall Assessment for Loughmerans is Favourable (green).

Site summary

Vertigo moulinsiana was first recorded at Loughmerans in 2018 (M. Long, pers. comm.) and the current monitoring is the first time a full survey has been carried out at the site. The site is in a depression surrounded by steeply sloping woodland and bounded by a quarry to the north and cattle pasture on all other sides. The *V. moulinsiana* habitat polygons differ in character, with the Polygon A in the east dominated by *Carex paniculata* tussocks and some *Sparganium erectum*, while Polygon B in the west is dominated by *Phragmites australis*, with occasional *Sparganium erectum* and *Equisetum fluviatile* around the margin. The two areas are separated by wet woodland that conforms to the Annex I habitat 91E0 Alluvial forests. Water levels were very high in Polygon B at the time of survey, and it is unknown if this is the normal situation, though the presence of *Lemna minor* suggests that this may be the case. These water levels on flooded scraw made access to the wider polygon difficult.

Appendix II. *Vertigo angustior* site reports

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Introduction

This Appendix to the main report on the *Vertigo* habitat and site monitoring project contains the individual reports for *Vertigo angustior* sites. These were generated from the Microsoft Access database that was produced as part of the Vertigo National Monitoring Project, 2021. Each site report provides the results from the current monitoring survey (2022-2024) and the previous monitoring surveys (2008-2010 and 2014-2017). These reports should be read in conjunction with the main report. Note that the correction of errors or omissions from the data relating to the previous monitoring periods was not part of the current project and so may still be present within the site reports.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Beal Point

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM01 **County:** Kerry

SAC Site Code: 002165 Lower River Shannon **QI:** No

Location description (from baseline survey):

Vertigo angustior habitat is present throughout much of the fixed dune system but is most frequent in the central part of the site. Access is from the beach carpark at the western end of the site at Q895482 or from the minor farm road at Q904486.

Monitoring period	Date surveyed	Recorders
2019-2024	21-22 August 2023	John Brophy & Jessica Hamilton
2013-2018	22-23 July 2014	John Brophy & Maria Long
2007-2012	05 August 2008	E A Moorkens & I J Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and the dune slack at the south-eastern part of the site, and also within the ecotone of Potentilla anserina grassland between the fixed dunes and the estuary. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The core habitat for Vertigo angustior at Beal Point continues to be the fixed dune habitat in the centre of the site within Polygon A. There do not appear to have been significant changes to the distribution of the snail within the site since the previous two monitoring periods, with the exception of its appearance at the western end of the site. The habitat within the site is quite affected by historical agriculture, with abundant grasses such as Arrhenatherum elatius and Dactylis glomerata, particularly in areas away from the transect in Polygon A and in Polygon B. Polygon B is very rank, with low-growing Rubus fruticosus agg. to be found through the sward. Polygon C has been heavily grazed and, being dominated by broadleaved herbs, has very little Festuca rubra thatch. Slurry spreading and supplementary feeding was reported in 2003 and the nutrients from these activities may still be affecting the system. Both undergrazing and overgrazing is currently affecting the site, illustrating the difficulty in maintaining a suitable grazing regime. Polygon A is now under a farm plan, which includes winter grazing by cattle at a level of 1 unit per hectare (Barry O'Donoghue, NPWS, pers. comm.). This is at odds with the recommendations of Moorkens & Killeen (2011) who suggested no more than 0.8 livestock units per hectare from spring to autumn, though there are other, potentially competing, objectives when it comes to the conservation management of this site. No supplementary feeding should be undertaken, as this would serve to introduce additional nutrients into the system. Close attention must be paid to the response of the vegetation to any changes to the management of the site.

2013-2018:

The population of Vertigo angustior at Beal Point appears to be very limited geographically, with two recent surveys finding the snail only in the very central section of the site. This makes the population quite vulnerable. Lack of grazing is the most serious issue affecting the site, and all three polygons would benefit from an increase in grazing level. This change in management should be instigated immediately and in conjunction with the landowner/manager, and should be monitored regularly to ensure a successful outcome. This is particularly important given the fact that in the past (reported in Moorkens & Killeen, 2011) this site was damaged by grazing levels which were too high. This site is probably capable of good recovery, and also likely to be able to support a good population of Vertigo angustior, but this will only be the case with an appropriate grazing regime in place.

2007-2012:

A management programme needs to be introduced as a matter of priority. The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. Sacrificial areas for supplementary feeding outside the optimum V. angustior habitat could be considered, if appropriate to the objectives of the other features of the SAC. There should be no improvement with fertiliser or drainage of any of the habitat area. Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and

Vertigo angustior monitoring at Beal Point

abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management.

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 490296 648753	Top of dune crest. ITM from 2024.	
End point:	ITM 490456 648785	Gentle, east-facing slope. Fenceline from 2008 gone. ITM from 2024.	
Transect length:	163	Direction:	WSW-ENE
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, from a high dune crest through hollows and up slopes including east and west facing slopes.		
Sampling frequency:	7 samples were taken from zones with the most suitable habitat		
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TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	Q 90321 48704	Top of dune crest	
End point:	Q 90479 48741	Gentle, east-facing slope. Fenceline from 2008 gone.	
Transect length:	163	Direction:	As for 2008
Description:	As for 2008		
Sampling frequency:	As for 2008		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	Q 90319 48708	Top of dune crest	
End point:	Q 90478 48740	Fenceline	
Transect length:	163	Direction:	West to east
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, from a high dune crest through hollows and up slopes including east and west facing slopes.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	21.0826	Polygon A remains Optimal-Suboptimal, with the best habitat around the transect. Much of the polygon shows the effects of reduced grazing and relatively high nutrients, with rank swards of Arrhenatherum elatius and Dactylis glomerata common, especially in lower and flatter areas.
B	Suboptimal-Unsuitable	2.8513	Polygon B remains Suboptimal-Unsuitable, with most of the polygon consisting of rank swards of Arrhenatherum elatius and Dactylis glomerata, with low-growing Rubus fruticosus agg. common.
C	Suboptimal-Unsuitable	6.3651	Polygon C has dropped from Suboptimal to Suboptimal-Unsuitable. This is due to heavy overgrazing throughout with no Festuca rubra thatch, and a sward dominated by broadleaved herbs.
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Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	21.0821	Polygon A status remains Optimal-Suboptimal. It is the largest area, containing the best expanses of fixed dune habitat.
B	Suboptimal-Unsuitable	2.8519	Polygon B status remains Suboptimal-Unsuitable, but area at western end removed as unsuitable due agricultural nature.
C	Suboptimal	6.3651	Polygon C status upgraded from Suboptimal and Unsuitable to Suboptimal. Undergrazed, but good potential for Vertigo angustior. Small area of unsuitable land removed at east of polygon - bare sand & agricultural.
<hr/>			
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment

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Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	21.0941	The western polygon is not at its best potential due to rankness of vegetation through lack of grazing.
B	Sub-optimal with unsuitable areas	3.5462	xxxx
C	Sub-optimal with unsuitable areas	10.1403	

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	87.5m	64.5m	8.5m	2.5m	160.5m	0m	2.5m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		72.5m	20.5m	66m	4m	159m		4m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	48.5m	NA	54.5m	NA	59.8m	133.2m	26m	3.8m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (7 samples)								
2019-2024	1	1	17m	2	0	2	Count	Optimal-Suboptimal
2019-2024	1	2	23m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	3	35m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	4	53m	1	0	4	Count	Optimal-Suboptimal
2019-2024	1	5	76m	1	0	1	Count	Suboptimal
2019-2024	1	6	93m	0	0	1	Count	Optimal-Suboptimal
2019-2024	1	7	140m	2	0	2	Count	Optimal-Suboptimal
Monitoring period 2013-2018 Transect 1 (7 samples)								
2013-2018	1	1	13m	1	0	1		Optimal-Suboptimal
2013-2018	1	2	26 m	4	0	4		Suboptimal
2013-2018	1	3	40 m	2	0	2		Optimal-Suboptimal
2013-2018	1	4	50 m	1	1	2		Optimal-Suboptimal
2013-2018	1	5	78 m	0	0	0		Suboptimal
2013-2018	1	6	99 m	0	0	0		Optimal-Suboptimal
2013-2018	1	7	139 m	1	0	1		Suboptimal
Monitoring period 2007-2012 Transect 1 (7 samples)								
2007-2012	1	1	1m along transect	0	0	7		
2007-2012	1	2	20m along transect	0	0	7		
2007-2012	1	3	35m along transect	0	0	1		
2007-2012	1	4	52m along transect	0	0	5		
2007-2012	1	5	68m along transect	0	0	0		
2007-2012	1	6	96m along transect	0	0	3		
2007-2012	1	7	160m along transect	0	0	0		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (10 samples)							
2019-2024	01	ITM 489610 648391	4	1	5	Count	Suboptimal

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2019-2024	02	ITM 489671 648430	0	0	0	Count	Suboptimal
2019-2024	03	ITM 489756 648494	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	04	ITM 489914 648597	0	0	0	Count	Optimal-Suboptimal
2019-2024	05	ITM 490102 648718	0	0	0	Count	Optimal-Suboptimal
2019-2024	06	ITM 490276 648769	0	0	0	Count	Suboptimal
2019-2024	07	ITM 490864 648611	0	0	0	Count	Unsuitable
2019-2024	08	ITM 490781 648585	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	09	ITM 490588 648759	4	0	4	Count	Suboptimal
2019-2024	10	ITM 490481 648699	0	1	1	Count	Optimal-Suboptimal
Monitoring period 2013-2018 (10 samples)							
2013-2018	01	Q 89639 48345	0	0	0		Suboptimal-Unsuitable
2013-2018	02	Q 89694 48383	0	0	0		Suboptimal
2013-2018	03	Q 89788 48452	0	0	0		Suboptimal
2013-2018	04	Q 89939 48547	0	0	0		Optimal-Suboptimal
2013-2018	05	Q 90128 48671	0	0	0		Suboptimal
2013-2018	06	Q 90300 48726	1	0	1	Presence/absence	Suboptimal
2013-2018	07	Q 90905 48562	0	0	0		Optimal-Suboptimal
2013-2018	08	Q 90803 48534	0	0	0		Optimal-Suboptimal
2013-2018	09	Q 90611 48711	0	0	0		Suboptimal
2013-2018	10	Q 90503 48650	0	0	0		Optimal-Suboptimal
Monitoring period 2007-2012 (13 samples)							
2007-2012	01	Q 90315 48704	0	0	0		
2007-2012	02	Q 90246 48694	0	0	0		
2007-2012	03	Q 90300 48653	0	0	0		
2007-2012	04	Q 90326 48767	0	0	2		
2007-2012	05	Q 90372 48678	0	0	4		
2007-2012	06	Q 90428 48785	0	0	0		
2007-2012	07	Q 90556 48690	0	0	0		
2007-2012	08	Q 90467 48652	0	0	0		
2007-2012	09	Q 90127 48677	0	0	0		
2007-2012	10	Q 89741 48392	0	0	0		
2007-2012	11	Q 89687 48375	0	0	0		
2007-2012	12	Q 89641 48341	0	0	0		
2007-2012	13	Q 89587 48280	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2-3 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the 8 maritime grassland zones (from 0-107 m) with habitat Suboptimal or better	Present in 3 of the zones (and one zone after 107m)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the 8 maritime grassland zones (from 0-107 m) with habitat Suboptimal or better	Present in 5 of the zones	Pass

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2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the 8 maritime grassland zones (from 0-107m) with optimal or sub-optimal habitat	Present in all 4 zones	Pass
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Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Target 1: Adult or sub-adult snails are present in 4 of the 5 samples from Polygons A and C	Present in one spot sample (6 samples)	Fail
2019-2024	Presence/Absence	Target 2: Adult or sub-adult snails are present in at least 2 samples of the most suitable habitat in Polygon B (minimum 4 samples)	Present in one spot sample (4 samples)	Fail
2013-2018	Presence/Absence	Target 1: Adult or sub-adult snails are present in 4 of the 5 samples from Polygons A and C	Present in one spot sample (6 samples)	Fail
2013-2018	Presence/Absence	Target 2: Adult or sub-adult snails are present in at least 2 samples of the most suitable habitat in Polygon B (minimum 4 samples)	Absent (4 samples)	Fail
2007-2012	Presence/Absence	Target 1: Adult or sub-adult snails are present in 4 of the 5 samples of the optimal habitat	Present at 2 other locations	Fail
2007-2012	Presence/Absence	Target 2: Adult or sub-adult snails are present in at least 2 samples of the most suitable habitat in the western polygon (minimum 4 sample)	Absent	Fail

Mon. period	Population Notes
2019-2024	Along the transect, <i>Vertigo angustior</i> was recorded at four locations, compared to five in 2013-2018 and 2007-2012, with the location of one of the positives critical to the result of the Population Assessment. <i>V. angustior</i> was recorded at one spot location within Polygon B and one in Polygon A. In previous surveys the snail was not recorded outside Polygon A, and, overall, the percentage of positive samples is stable. However, based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	The snail was once again found in multiple samples along the transect, and in a sample nearby, but not from any other area of the site. This is remarkably similar to the findings in 2007-12, and suggests that the snail is largely limited to the central section of the dune system.
2007-2012	The snail is scattered in its distribution and present in low numbers.

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	45m of habitat along the first 107m of the Transect is classed as Optimal AND 125m of habitat along the Transect is classed as Suboptimal or better	0m Optimal and 152m Suboptimal or better	Fail
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 100 m of the first 107 m along the Transect	104.5m Optimal wetness	Pass
2013-2018	1	Habitat extent	45m of habitat along the first 107m of the Transect is classed as Optimal AND 125m of habitat along the Transect is classed as Suboptimal or better	0 m Optimal and 93 m Suboptimal or better	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 100 m of the first 107 m along the Transect	103 m Optimal wetness	Pass

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2007-2012	1	Habitat extent	45m of habitat along the first 107m of the Transect is classed as Optimal and 125m of habitat along the Transect is classed as Sub-Optimal or Optimal	48.5m is Optimal AND 133.2m is Sub-optimal or Opt	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 100m of the first 107m along the Transect	103.2m is Optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	23-25ha of the site sub-optimal with optimal areas	21.1ha Optimal-Suboptimal and 9.2ha Suboptimal-Unsuitable	Fail
2013-2018	Habitat extent	23-25ha of the site sub-optimal with optimal areas	21.08ha Optimal-Suboptimal and 6.37 ha Sub-optimal	Pass
2007-2012	Habitat extent	23-25 ha of the site sub-optimal with optimal areas	21.1 ha	Fail

Mon. period	Habitat Notes
2019-2024	The fixed dune habitat at Beal Point has been altered due to agricultural activity, which has reduced the suitability of the site. Polygon A remains Optimal-Suboptimal and supports the core habitat for the snail at the site. Polygon B remains Suboptimal-Unsuitable, while Polygon C drops from Suboptimal to Suboptimal-Unsuitable due to overgrazing. Along the transect, the wetness levels are mostly optimal, while the habitat is dominated by Optimal-Suboptimal habitat. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Inadequate (amber).
2013-2018	The upgrading of Polygon C from Sub-optimal and Unsuitable to Suboptimal means that there has been an increase in the area of potentially suitable habitat at the site. Management issues still remain throughout this site, however.
2007-2012	The western polygon is not as good as its best potential due to rankness of vegetation through lack of grazing. It has deteriorated since 2003.

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	High	Negative	21%	Polygon C is heavily overgrazed with virtually no Festuca rubra litter and dominated by broadleaved herbs.
2019-2024	PA08	Extensive grazing or undergrazing by livestock	Inside	Medium	Negative	60%	Polygons A and B show signs of undergrazing, particularly in relation to agricultural grasses (Arrhenatherum elatius and Dactylis glomerata) and Rubus fruticosus agg. in Polygon B and western part of Polygon A.
2019-2024	PA25	Agriculture activities not referred to above	Inside	Low	Negative	0.1%	Vehicle tracks
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	1.5%	Erosion along seaward edge of dunes in polygons A and B.
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	High	Negative	90%	

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2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Neutral	1%
2013-2018	G02.08	camping and caravans	Inside	Low	Neutral	<1%
2013-2018	K01.01	Erosion	Inside	Low	Negative	5%
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Low	Positive	3% Rabbits
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	77% Lack of grazing management, such that the vegetation is becoming taller and ranker, and encroached by scrub and bramble (especially at the western end, and in the more marginal areas). In 2003, there was some cattle grazing but no evidence in 2008.
2007-2012	A05.02	stock feeding	Inside	Low	Neutral	78% In 2003, there was damage through supplementary feeding but this was not evident in 2008.
2007-2012	A08	Fertilisation	Inside	Low	Negative	78% In 2003, there was damage through slurry spreading

Mon. period	Future Prospects	Notes
2019-2024		The snail continues to be present at the site in low numbers and across a similar area to previous monitoring surveys. The site is subject to both overgrazing (Polygon C) and undergrazing (most of Polygon B and parts of Polygon A). Lesser pressures include vehicle tracks and coastal erosion. The core area of the snail's habitat is now under a farm plan, though with a focus on the dune habitats themselves rather than <i>V. angustior</i> , which may lead to an improvement in the habitat; however, Polygon C has seen a loss of habitat suitability. Based on these factors, the Future Prospects are considered Unfavourable-Bad (red).
2013-2018		Lack of grazing management is the main issue facing this site, as it was in 2007-12, with some areas becoming rank and dominated by brambles. This site still holds areas of good quality habitat and has potential for recovery so has been assessed as Unfavourable Inadequate (amber).
2007-2012		The habitat quality should improve quickly if grazing management resumes, but would continue to deteriorate if the absence of sufficient grazing continues.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Amber	Red	Red
2013-2018	Amber	Amber	Amber	Amber
2007-2012	Amber	Amber	Amber	Amber

Mon. period	Overall Notes
2019-2024	Vertigo angustior continues to occur mainly within the core area of the site, but is very limited elsewhere, resulting in a Population Assessment of Unfavourable-Bad (red). The impact of undergrazing and overgrazing has resulted in less-than-optimal habitat across most of the site, with a Habitat Assessment of Unfavourable-Inadequate (amber). The pressures acting on the site and the likely future trends for Population and Habitat result in a Future Prospects Assessment of Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Beal Point is Unfavourable-Bad (red).
2013-2018	The site is quite undergrazed, and Vertigo angustior is concentrated in its distribution and present in rather low numbers. Due to these factors and the low area of optimal habitat, the overall assessment is Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period

Vertigo angustior monitoring at Beal Point

2019-2024

Discussion:

The core habitat for *Vertigo angustior* at Beal Point continues to be the fixed dune habitat in the centre of the site within Polygon A. There do not appear to have been significant changes to the distribution of the snail within the site since the previous two monitoring periods, with the exception of its appearance at the western end of the site. The habitat within the site is quite affected by historical agriculture, with abundant grasses such as *Arrhenatherum elatius* and *Dactylis glomerata*, particularly in areas away from the transect in Polygon A and in Polygon B. Polygon B is very rank, with low-growing *Rubus fruticosus* agg. to be found through the sward. Polygon C has been heavily grazed and, being dominated by broadleaved herbs, has very little *Festuca rubra* thatch. Slurry spreading and supplementary feeding was reported in 2003 and the nutrients from these activities may still be affecting the system. Both undergrazing and overgrazing is currently affecting the site, illustrating the difficulty in maintaining a suitable grazing regime. Polygon A is now under a farm plan, which includes winter grazing by cattle at a level of 1 unit per hectare (Barry O'Donoghue, NPWS, pers. comm.). This is at odds with the recommendations of Moorkens & Killeen (2011) who suggested no more than 0.8 livestock units per hectare from spring to autumn, though there are other, potentially competing, objectives when it comes to the conservation management of this site. No supplementary feeding should be undertaken, as this would serve to introduce additional nutrients into the system. Close attention must be paid to the response of the vegetation to any changes to the management of the site.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

With both overgrazing (Polygon C) and undergrazing (Polygons A & B) impacting the site, achieving an appropriate level of grazing across the site is important for the continued presence of *Vertigo angustior* at Beal Point. Moorkens & Killeen (2011) recommended winter grazing by young suckler or mixed-age cattle with no more than 0.8 livestock units per hectare from spring to autumn. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. There should also be no supplementary feeding of cattle within the site, as this would introduce additional nutrients. Currently, however, the core of the *V. angustior* habitat in Polygon A is under a farm plan with a winter-grazing regime of 1 livestock unit per hectare. Given there are likely to be conflicting aims with respect to the conservation objectives of the sand dunes of Beal Point as Qualifying Interests of the Lower River Shannon SAC, some balancing will be required to achieve the optimal outcome for the site.

Vertigo angustior monitoring at Beal Point

2013-2018

Discussion:

The population of *Vertigo angustior* at Beal Point appears to be very limited geographically, with two recent surveys finding the snail only in the very central section of the site. This makes the population quite vulnerable. Lack of grazing is the most serious issue affecting the site, and all three polygons would benefit from an increase in grazing level. This change in management should be instigated immediately and in conjunction with the landowner/manager, and should be monitored regularly to ensure a successful outcome. This is particularly important given the fact that in the past (reported in Moorkens & Killeen, 2011) this site was damaged by grazing levels which were too high. This site is probably capable of good recovery, and also likely to be able to support a good population of *Vertigo angustior*, but this will only be the case with an appropriate grazing regime in place.

Monitoring recommendations:

Monitor again, following the same protocol as for 2014, in three years time. If grazing is re-instated and site condition improves, then monitoring interval can be reviewed. However, moving to a longer interval (e.g. six years) would run the risk of missing deterioration if grazing were to cease again in the future.

Monitoring as follows:

Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too wet, Optimal wetness or Too dry, respectively
- Take at least 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (should include sites to west and east of the transect, and include Polygon B) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Lack of grazing is the most serious issue affecting this site. Moorkens & Killeen (2011) made detailed recommendations on grazing conditions to be implemented, and as these are still relevant and still needed, they are reproduced here: The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the *Vertigo angustior* habitat, with animals removed at the first signs of hunger. Sacrificial areas for supplementary feeding outside the optimum *Vertigo angustior* habitat could be considered, if appropriate to the objectives of the other features of the SAC. There should be no improvement with fertiliser or drainage of any of the habitat area.

Vertigo angustior monitoring at Beal Point

2007-2012

Discussion:

A management programme needs to be introduced as a matter of priority. The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. Sacrificial areas for supplementary feeding outside the optimum V. angustior habitat could be considered, if appropriate to the objectives of the other features of the SAC. There should be no improvement with fertiliser or drainage of any of the habitat area. Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management.

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations in the central polygon area and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 4 other locations in the western polygon area and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

There was no evidence of any grazing in 2008 and it did not appear that the site been grazed for some time (perhaps not since the 2003 survey). In 2003, there was some cattle grazing but also damage through supplementary feeding and slurry spreading.

Proposed management prescription for site

A management programme needs to be introduced as a matter of priority. The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. Sacrificial areas for supplementary feeding outside the optimum V. angustior habitat could be considered, if appropriate to the objectives of the other features of the SAC. There should be no improvement with fertiliser or drainage of any of the habitat area. A management agreement with the landowner should be implemented before the next monitoring scheduled for 2011.



1:3,500



Legend

Habitat Suitability

 Optimal-Suboptimal

 Suboptimal-Unsuitable

B

A

0 50 100 m



1:7,000



Legend

 Inset map



0 250 500 m

490000

491000

648000

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Derrynane

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM02 **County:** Kerry

SAC Site Code: 002158 Kenmare River **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed dune habitat across the peninsula. Access is from the National Historic Park car park across the dunes.

Monitoring period	Date surveyed	Recorders
2019-2024	23-24 August 2023	John Brophy & Jessica Hamilton
2013-2018	13-14 July 2015	John Brophy & Maria Long
2007-2012	11-12 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitats in which *Vertigo angustior* is present are the fixed grey dunes (Annex I 2130, CORINE 16.22) and the ecotone between the fixed dunes and the dune slack (Annex I 2190, CORINE 16.3) below (Romão, 1996; Devillers et al., 1991). Although the snails are not present in the dune slack and inundated lake, the presence of these wet areas is essential for the humid habitat the species lives in. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The dominant vegetation is *Festuca rubra*, with *Ammophila arenaria* higher up, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Plantago lanceolata*, *Trifolium repens*, *Galium verum* and *Viola tricolour* lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , <i>Euphrasia</i> sp. <i>Lotus corniculatus</i> and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The habitat polygon for *Vertigo angustior* at Derrynane was expanded significantly after the 2015 survey, which recorded suitable habitat and the target species much more widely than the 2008 survey, which only recorded *V. angustior* along the transect. The site should be further expanded in the next round of monitoring due to work carried out by Mantell (2024), which extended the distribution of the snail at the site to the east and west of the current polygon. The site comprises an area of fixed dune fronted by Marram dunes along the back of Derrynane Beach, with two pools known to support Natterjack Toad (*Epidalea calamita*). While there are some minor pressures acting on the site, including trampling by recreational walkers, native and non-native scrub and tractor tracks, the most significant pressure is the rabbit population. It is clear that the rabbit population has grown significantly since the 2015 survey, with extensive burrows resulting in bare sand and most of the dunes have been virtually denuded of grasses (apart from the *Ammophila arenaria* along the back of the beach, though it has been lost from most of the fixed dune area). The dunes are, instead, dominated by bryophytes (mainly *Homalothecium lutescens* and *Pseudoscleropodium purum*) and broad-leaved herbs. While the reduced distribution of the species across the site and the habitat damage caused by the rabbit population is of concern, the recent implementation of rabbit control measures by the OPW may facilitate the recovery of the site for *V. angustior*.

2013-2018:

The area mapped as having potential habitat for *Vertigo angustior* at Derrynane was expanded significantly. The species was found in two sample locations relatively distant from what had originally been understood to be its core area. Overall however, this site needs some changes in management to continue to provide suitable habitat for the species. This involves immediately relaxing the grazing regime across much of the area to allow the growth of grasses (particularly *Ammophila arenaria* and *Festuca rubra*) and also to allow the build-up of *Festuca rubra* thatch in places. In contrast, at the south-western end, grazers may need to be introduced as *Ammophila arenaria* is quite rank there.

2007-2012:

Although the transect is shorter than at many *Vertigo angustior* sites and only comprises one main habitat/vegetation type, the purpose of the transect is to ensure there is suitable *V. angustior* habitat within the zone between the marram dominated dune above the transition and the pond below the transition. The transition should retain a 2 metre wide zone dominated by *Festuca rubra*, and containing *Lotus corniculatus*, *Plantago lanceolata*, *Trifolium repens*, *Galium verum*, *Viola tricolour*, *Lotus corniculatus*. The habitat should retain a damp litter layer with some moss presence.

Insufficient sampling was carried out in 2006 to permit a retrospective Condition Assessment to be carried out. However, whilst the habitat along the transect remains unchanged from 2006, higher numbers of *Vertigo angustior* individuals were recorded in 2008. However, despite the apparent suitability of much of the adjacent dune grassland, the snail was not found and is thus, still restricted to this single dune face.

Vertigo angustior monitoring at Derrynane

Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change. For example, a pattern of long dry summers followed by stormy wet winters may mean that the conditions for *V. angustior* may become less favourable.

In the past a larger area of the site may have been occupied by the snail, but historical sheep and/or rabbit grazing may have restricted it to the groundwater dependant area where it is now confined.

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 453456 558499	Approximately 2.5 m up from base of the dune face. Grid ref in ITM	
End point:	ITM 453479 558498	Approximately 2.5 m up from base of the dune face. Grid ref in ITM	
Transect length:	21	Direction:	W-E
Description:	South-facing dune bank above pond. Data reassembled post-hoc due to data loss.		
Sampling frequency:	3 samples were taken at the start middle and end of the transect approximately 2.5m above the break in slope. Two further samples were taken half way along the transect, one 2m above the transect line and one 2m below the line.		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	V 53484 58430	Approximately 2.5 m up from base of the dune face	
End point:	V 53505 58435	Approximately 2.5 m up from base of the dune face	
Transect length:	21	Direction:	West to east
Description:	South-facing dune bank with marram, <i>Festuca rubra</i> , <i>Galium verum</i> , <i>Lotus corniculatus</i> , <i>Euphrasia</i> , <i>Viola tricolour</i>		
Sampling frequency:			
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	V 53484 58430	Approximately 2.5m up from the base of the dune face	
End point:	V 53505 58435	Approximately 2.5m up from the base of the dune face	
Transect length:	21	Direction:	West to east
Description:	South-facing dune bank with marram, <i>Festuca rubra</i> , <i>Galium verum</i> , <i>Lotus corniculatus</i> , <i>Euphrasia</i> , <i>Viola tricolour</i>		
Sampling frequency:	3 samples were taken at the start middle and end of the transect approximately 2.5m above the break in slope. Two further samples were taken half way along the transect, one 2m above the transect line and one 2m below the line.		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	7.686	Polygon A drops from Suboptimal to Suboptimal-Unsuitable. The polygon is fixed dune habitat heavily impacted by rabbit burrowing and grazing.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	7.686	Polygon A status remains Suboptimal. Boundary extended to include larger area of fixed dune grassland. Habitat consisted mostly of areas of short vegetation, which, while species-rich, are low in grass species, and low in thatch. The western strip, however, is too rank in places and gets much less grazing.
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal	1.94	The actual area of dune currently inhabited by <i>Vertigo angustior</i> is around 100m ² . However, there is 1.94ha of habitat with potentially suitable (sub-optimal) <i>V. angustior</i> habitat.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Vertigo angustior monitoring at Derrynane

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt./Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	0m	0m	0m	0m	0m	0m	21m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt./Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		5m	16m			13m		8m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt./Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	21m	NA		NA		21m		

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (5 samples)								
2019-2024	1	1	0m	1	0	1	Count	Suboptimal-Unsuitable
2019-2024	1	2	14m	0	0	0	Count	Unsuitable
2019-2024	1	3	18m	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	1	4	11m upslope 2m	0	0	0	Count	Unsuitable
2019-2024	1	5	11m downslope 2m	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	0m	0	0	0	Count	Suboptimal
2013-2018	1	2	14m	0	0	0		Suboptimal
2013-2018	1	3	21m	9	0	9	Count	Optimal-Suboptimal
2013-2018	1	4		0	0	0	Count	Suboptimal
2013-2018	1	5		0	0	0	Count	Suboptimal
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	0m	0	0	8		
2007-2012	1	2	11m	0	0	10		
2007-2012	1	3	21m	0	0	14		
2007-2012	1	4	11m and 2.5m upslope	0	0	4		
2007-2012	1	5	11m and 2.5m downslope	0	0	3		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (6 samples)							
2019-2024	01	ITM 453410 558426	6	2	8	Count	Suboptimal
2019-2024	02	ITM 453317 558609	0	0	0	Count	Suboptimal
2019-2024	03	ITM 453394 558570	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	04	ITM 453514 558444	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	05	ITM 453575 558445	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	06	ITM 453536 558271	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (6 samples)							
2013-2018	01	V 53434 58354	13	0	13	Count	Suboptimal
2013-2018	02	V 53337 58544	0	0	0	Count	Optimal
2013-2018	03	V 53413 58504	0	0	0	Count	Suboptimal
2013-2018	04	V 53523 58377	18	0	18	Count	Optimal-Suboptimal
2013-2018	05	V 53589 58380	0	0	0	Count	Optimal-Suboptimal

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2013-2018	06	V 53575 58214	4	0	4	Count	Optimal
Monitoring period 2007-2012 (6 samples)							
2007-2012	01	V 53298 58537	0	0	0		
2007-2012	02	V 53435 58477	0	0	0		
2007-2012	03	V 53512 58408	0	0	0		
2007-2012	04	V 53531 58381	0	0	0		
2007-2012	05	V 53577 58376	0	0	0		
2007-2012	06	V 53509 58401	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Density	At least 2 samples on the Transect should have >5 V. angustior individuals	No samples with >5 V. angustior individuals	Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 places on the transect with optimal or sub-optimal habitat (minimum 5 samples)	Present in 1 of 5 places sampled	Fail
2013-2018	1	Density	At least 2 samples on the Transect should have >5 V. angustior individuals	1 sample with >5 V. angustior individuals	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 places on the transect with optimal or sub-optimal habitat (minimum 5 samples)	Present in 1 of 5 places sampled	Fail
2007-2012	1	Density	At least 2 samples on the Transect should have >5 V. angustior individuals	3 samples with >5 individuals	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 places on the transect with optimal or sub-optimal habitat (minimum 5 samples)	Present in all 5	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	At least two positive samples (with adult or sub-adult snails) from a minimum of six samples taken from across the site	Adult or sub-adult snails present in 1 spot sample (from 6 samples)	Fail
2013-2018	Presence/Absence	At least two positive samples (with adult or sub-adult snails) from a minimum of six samples taken from across the site	Adult or sub-adult snails present in 3 spot samples (from 6 samples)	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was recorded in one location along the transect during the current survey, and at one spot sample. This represents a drop since the 2013-2018 monitoring survey, which recorded the snail from one sample along the transect and three spot samples. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, Vertigo angustior was recorded in five out of 11 locations across the site (taken both inside and outside the original polygon area), with the five positive samples all located on the transect taken in fixed dune habitat close to the Natterjack toad ponds. In the current survey, the species was recorded in four out of 11 locations, with only one positive sample on the transect and three positive samples outside the original polygon. In contrast to Moorkens & Killeen (2011), abundances were relatively high in the positive samples in 2015. Based on the current criteria, proposed by Moorkens & Killeen (2011), the Population Assessment would be Unfavourable Bad (red). However, their criteria take no account of samples off the transect, and so an additional criterion has been added. This means that the assessment is Unfavourable Inadequate (amber).
2007-2012	The abundance of the snail is relatively low

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

Vertigo angustior monitoring at Derrynane

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	20m of habitat along the Transect is classed as Optimal or Sub-Optimal	0m is Suboptimal or Optimal-Suboptimal habitat	Fail
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 20m along the Transect	0m of the transect has a layer of humid thatch	Fail
2013-2018	1	Habitat extent	20m of habitat along the Transect is classed as Optimal or Sub-Optimal	21m is Suboptimal or Optimal-Suboptimal habitat	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 20m along the Transect	<20 m is Optimal wetness	Fail
2007-2012	1	Habitat extent	20m of habitat along the Transect is classed as Optimal or Sub-Optimal	21m is Optimal habitat	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 20m along the Transect	21m is optimal	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	Over 1.5ha of the site sub-optimal with optimal areas	0ha Suboptimal with Optimal areas	Fail
2013-2018	Habitat extent	Over 1.5ha of the site sub-optimal with optimal areas	7.7ha Suboptimal with Optimal areas	Pass
2007-2012	Habitat extent	Over 1.5 ha of the site sub-optimal with optimal areas	1.94 ha	Pass

Mon. period	Habitat Notes
2019-2024	The habitat of Derrynane has been heavily damaged by rabbit grazing along the transect and across the whole site. This has resulted in most of the area being a carpet of bryophytes, with sparse, low-growing Festuca rubra. Where Ammophila arenaria tussocks dominate, Festuca rubra litter is limited to the tussocks, with the interstices grazed tightly. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	The boundary of the polygon at Derrynane was redrawn to reflect the wider distribution of suitable habitat at this site and also to conform better to identifiable boundary features, leading to a 300% increase in polygon area (from 1.95ha to 7.69ha). The suitability of the habitat in Derrynane for supporting Vertigo angustior remains Suboptimal overall, however. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Derrynane is Unfavourable Inadequate (amber).
2007-2012	The area of occupancy and habitat of Vertigo angustior is small but in relatively good condition

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA25	Agriculture activities not referred to above	Inside	Low	Negative	0.1%	Tractor tracks
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Low	Negative	100%	Trampling by walkers
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	Low	Negative	0.1%	Acer pseudoplatanus saplings
2019-2024	PI03	Problematic native species	Inside	High	Negative	100%	Number of rabbit burrows much higher than previous survey. Dunes almost denuded of grasses except areas of Marram. Bryophytes dominating.

Vertigo angustior monitoring at Derrynane

2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	Low	Negative	0.1%	Alnus glutinosa and Fraxinus excelsior saplings growing in dunes
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	80%	Approximately 10 cattle in winter over most of the site, but no access to dune at southwest
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	High	Negative	3%	Walking tracks
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Negative	1%	Horse riding (appears low impact/low intensity)
2007-2012	K02.01	species composition change (succession)	Inside	Medium	Neutral	1.9ha	

Mon. period	Future Prospects Notes
2019-2024	The single most significant pressure acting on the Vertigo angustior site at Derrynane is overgrazing and disturbance by rabbits. This has left most of the area virtually denuded of grasses, with the exception of large Ammophila arenaria tussocks, while burrows have caused a loss of habitat and the spread of sand. Other less important pressures include trampling from recreational walkers, non-native and native tree species spreading on the dunes, and tractor tracks. While rabbit grazing was erroneously not recorded as a pressure acting on the site in 2013-2018, the population level, as evidenced by the impact on the habitat, was significantly higher at the time of the current survey. For this reason, in 2024, the Office of Public Works (OPW) initiated a cull of the rabbit population at the site. While the population of V. angustior has declined at the site and the habitat has been badly damaged, the proposed rabbit cull should see the habitat of the site recover somewhat over the next few years. For this reason, the Future Prospects are assessed as being Unfavourable-Inadequate (amber).
2013-2018	The Future Prospects for Derrynane were considered Favourable (green) in the monitoring period 2007-2012. The main activity noted at this site that may impact on its suitability for Vertigo angustior is non-intensive cattle grazing across most of the site (80%). While the grazing is at non-intensive levels, and is for conservation reasons, it appears to be at too high a level for Vertigo angustior at the site. The vegetation is cropped very low, and grasses achieve only a very low cover. There is no thatch build up, a feature necessary for Vertigo angustior. Other more localised impacts are walking tracks and horse riding. Based on the current level of grazing, the Future Prospects are considered Unfavourable Inadequate (amber).
2007-2012	As the impact is neutral at present, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Amber	Red
2013-2018	Amber	Amber	Amber	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	Both the Population Assessment and the Habitat Assessment for this site have dropped from Unfavourable-Inadequate (amber) to Unfavourable-Bad (red), while the Future Prospects remain Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Derrynane is Unfavourable-Bad (red).
2013-2018	While the area of habitat considered suitable has been expanded and Vertigo angustior was found in a number of locations across the site, the drop in the number of positive samples along the transect, the habitat conditions and also the slight over-grazing noted all result in an Overall Assessment for Derrynane of Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period
2019-2024

Vertigo angustior monitoring at Derrynane

Discussion:

The habitat polygon for *Vertigo angustior* at Derrynane was expanded significantly after the 2015 survey, which recorded suitable habitat and the target species much more widely than the 2008 survey, which only recorded *V. angustior* along the transect. The site should be further expanded in the next round of monitoring due to work carried out by Mantell (2024), which extended the distribution of the snail at the site to the east and west of the current polygon. The site comprises an area of fixed dune fronted by Marram dunes along the back of Derrynane Beach, with two pools known to support Natterjack Toad (*Epidalea calamita*). While there are some minor pressures acting on the site, including trampling by recreational walkers, native and non-native scrub and tractor tracks, the most significant pressure is the rabbit population. It is clear that the rabbit population has grown significantly since the 2015 survey, with extensive burrows resulting in bare sand and most of the dunes have been virtually denuded of grasses (apart from the *Ammophila arenaria* along the back of the beach, though it has been lost from most of the fixed dune area). The dunes are, instead, dominated by bryophytes (mainly *Homalothecium lutescens* and *Pseudoscleropodium purum*) and broad-leaved herbs. While the reduced distribution of the species across the site and the habitat damage caused by the rabbit population is of concern, the recent implementation of rabbit control measures by the OPW may facilitate the recovery of the site for *V. angustior*.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

In 2015, it was noted that the site supported winter grazing by approximately 10 cattle in order to maintain the fixed dune habitat. At the time it was considered that this level of grazing was a bit high from a *V. angustior* perspective, given the species' need for a *Festuca rubra* thatch to develop. The cattle were removed in recent years in light of the significant damage caused by the explosion in the rabbit population at Derrynane from 2020, after a long period of relative stability (Chris O'Neill, OPW, pers. comm.). The cause of the population explosion is unknown; however, it is clear that management of the rabbit population is required at Derrynane in order to allow the fixed dune habitat, and the *V. angustior* habitat, to recover. Shortly after the current survey, it was reported that the OPW had begun to implement an annual cull of the rabbit population at Derrynane in 2024, so this may have a beneficial effect on the habitat for the snail. No other management recommendations are required until the response of the site to this cull can be assessed.

2013-2018

Discussion:

The area mapped as having potential habitat for *Vertigo angustior* at Derrynane was expanded significantly. The species was found in two sample locations relatively distant from what had originally been understood to be its core area. Overall however, this site needs some changes in management to continue to provide suitable habitat for the species. This involves immediately relaxing the grazing regime across much of the area to allow the growth of grasses (particularly *Ammophila arenaria* and *Festuca rubra*) and also to allow the build-up of *Festuca rubra* thatch in places. In contrast, at the south-western end, grazers may need to be introduced as *Ammophila arenaria* is quite rank there.

Monitoring recommendations:

Given the management issues relating to the habitat of *Vertigo angustior*, it is recommended that monitoring is carried out at a minimum of three-yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Monitoring should follow that of Moorkens & Killeen (2011):

- Repeat Transect 1, describe the plant community/habitats at each sample location zones, and assign the habitat and wetness at each as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too Wet, Optimal Wetness and Too Dry, respectively
- Take 1 sample each from at least 5 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations within the polygon of potentially suitable habitat (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygon and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

The site at Derrynane is currently being managed for the flora of the fixed dune habitat through winter grazing by 10 cattle (though cattle are excluded from the southwestern section, which has led this area to be dominated by *Ammophila arenaria* tussocks). The current level of grazing is slightly too high across most of the site resulting in a lack of suitable *Festuca rubra* thatch developing to support *Vertigo angustior*. Overall, the level of grazing (in terms of period or number of cattle) should be reduced to allow areas of *Ammophila arenaria* and *Festuca rubra* to develop where grazing is too high, while grazing should be introduced to the southwestern section to reduce the rankness of the *Ammophila arenaria* cover there. The management of the site is undertaken by the OPW as part of the Derrynane House National Historic Park and they may facilitate the necessary change in cattle grazing.

Vertigo angustior monitoring at Derrynane

2007-2012

Discussion:

Although the transect is shorter than at many *Vertigo angustior* sites and only comprises one main habitat/vegetation type, the purpose of the transect is to ensure there is suitable *V. angustior* habitat within the zone between the marram dominated dune above the transition and the pond below the transition. The transition should retain a 2 metre wide zone dominated by *Festuca rubra*, and containing *Lotus corniculatus*, *Plantago lanceolata*, *Trifolium repens*, *Galium verum*, *Viola tricolour*, *Lotus corniculatus*. The habitat should retain a damp litter layer with some moss presence.

Insufficient sampling was carried out in 2006 to permit a retrospective Condition Assessment to be carried out. However, whilst the habitat along the transect remains unchanged from 2006, higher numbers of *Vertigo angustior* individuals were recorded in 2008. However, despite the apparent suitability of much of the adjacent dune grassland, the snail was not found and is thus, still restricted to this single dune face.

Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change. For example, a pattern of long dry summers followed by stormy wet winters may mean that the conditions for *V. angustior* may become less favourable.

In the past a larger area of the site may have been occupied by the snail, but historical sheep and/or rabbit grazing may have restricted it to the groundwater dependant area where it is now confined.

Monitoring recommendations:

Given the small area of occupancy and habitat of *Vertigo angustior*, and the relatively low abundance of the snail, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, describe the plant community/habitats at each sample location zones, and assign the habitat and wetness at each as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations within the polygon of potentially suitable habitat (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygon and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The *V. angustior* habitat is not managed by grazing or mowing and is essentially managed by wind, trampling by visitors and hydrogeology.

Proposed management prescription for *Vertigo angustior*

The management at Derrynane should remain the same as the present, i.e. no grazing management with succession being prevented by the elements rather than active intervention. As with all low management regimes, this needs careful monitoring, particularly as weather patterns may change and occasional intervention such as strimming may be needed in the future.

The area between the dune and the pond should not be mowed or fertilized. Sheep grazing should not be allowed. No deepening or other changes to the pond should be undertaken. The area between the dune and the pond should not be part of any formal or informal walking route, but neither should it be fenced off. Irregular trampling is beneficial to the species, but compaction would have a negative affect on the habitat quality.



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Dooaghtry

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM03 **County:** Mayo
SAC Site Code: 001932 Mweelrea/Sheeffry/Erriff Complex **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the grassland and Iris along the river's edge to the north-east of the road entrance to Dooaghtry. Access is from the road to the beach, near the car park.

Monitoring period	Date surveyed	Recorders
2019-2024	22 April 2024	John Brophy & Orla Daly
2013-2018	9-10 June 2014	John Brophy & Maria Long
2007-2012	5-7 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitats in which *Vertigo angustior* is present are unimproved climax maritime grassland, humid tall herb communities (Iris) (CORINE 37.21) and the ecotone between marsh/riparian zone and maritime grassland (Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The dominant vegetation is *Festuca rubra*, with *Potentilla anserina* and *Iris pseudacorus*, corresponding to M27 of Rodwell (1991). The habitat falls between the more general habitats of wet grassland (GS4) and marsh (GM1) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Maritime grassland with <i>Festuca rubra</i> and <i>Potentilla anserina</i> , 10-25cm in height OR damp grassland dominated by <i>Iris pseudacorus</i> , <i>Potentilla anserina</i> and other grasses up to 0.9m high. Habitats growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but maritime grassland vegetation height is less than 5cm or greater than 15cm, or the <i>Iris</i> grassland is >0.9m high, or the water table is below 5cm or ground is flooded at the time of sampling.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Between the monitoring periods 2007-2012 and 2013-2018, the primary grazing at Dooaghtry was changed from cattle to sheep, and sheep grazing has continued to occur across the site. This has resulted in a more tightly-grazed sward across much of the site, though this appearance was somewhat confounded by the fact that the current survey was carried out earlier in the growing season than previous surveys. What is clear is that the population of *Vertigo angustior* has declined, with only one positive sample returned for the current survey. The intensity of the sheep grazing is likely to be the main contributor to this decline, but inundation by seawater during storms is also likely to play a role. A reduction in the level of sheep grazing would benefit the snail and its habitat by allowing the development of the *Festuca rubra* thatch across more of the site.

2013-2018:

The assessment of this site has changed from green in 2007-2012 to amber in 2013-2018. This is because of a change in land management (from cattle to sheep). This is a small site, with a small core area supporting the target species. This means that the species is vulnerable, but it also means that instigating changes in land management and subsequent monitoring are achievable. Contact needs to be made immediately with the land-owner and negotiations into changing land management begun. This site needs to be monitored carefully over the coming years.

2007-2012:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Favourable. The results obtained in 2008 are very similar to those from 2006 (Appendix 2, and Figure 1) with the vegetation and wetness levels virtually unchanged. There was some evidence of trampling in the *Iris* grassland. *Vertigo angustior* was found at each sample location and was present in either low or moderate numbers.

3. TRANSECT DETAILS

TRANSECT: 1	MONITORING PERIOD: 2019-2024
Start point:	ITM 474412 770538 Start point at edge of channel. ITM from 2024.
End point:	ITM 474456 770541 Ditch filled with sedge <i>Carex acutiformis</i> . ITM from 2024.
Transect length: 45	Direction: W-E
Description:	The transect covers a transition from <i>Festuca rubra</i> dominated maritime grassland, to damp <i>Iris</i> / <i>Festuca rubra</i> / <i>Potentilla anserina</i> grassland/ marsh.
Sampling frequency:	5 samples were taken from zones with the most suitable habitat

Vertigo angustior monitoring at Doaghtry

TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	L 74434 70520	Start point at edge of channel.	
End point:	L 74478 70521	Ditch filled with sedge <i>Carex acutiformis</i>	
Transect length:	45	Direction:	As for 2007-2012
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		

TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	L 74434 70525	Stream edge	
End point:	L 74475 70521	Ditch	
Transect length:	44.5	Direction:	West to east
Description:	The transect covers a transition from <i>Festuca rubra</i> dominated maritime grassland, to damp <i>Iris/Festuca rubra/Potentilla anserina</i> grassland/ marsh. Transect runs towards the south side of a white gable end of a farm.		
Sampling frequency:	Four samples were taken from 3 of the delineated zones along the transect.		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.2576	Polygon A remains Optimal with the best habitat of the site, comprising <i>Iris pseudacorus</i> marsh.
B	Optimal-Suboptimal	0.7512	Polygon B remains Optimal-Suboptimal, with several large patches of suitable habitat comprising <i>Iris pseudacorus</i> marsh.
D	Suboptimal-Unsuitable	1.8971	Polygon D remains Suboptimal-Unsuitable.
E	Suboptimal-Unsuitable	3.5913	Polygon E remains Suboptimal-Unsuitable, comprising a large, sheep-grazed field with patches of <i>Iris pseudacorus</i> marsh along a ditch.
F	Unsuitable	2.9155	Polygon F remains Unsuitable, comprising heavily sheep-grazed coastal grassland.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.2576	Polygon A status remains Optimal. This is a small polygon containing maritime wet grassland.
B	Optimal-Suboptimal	0.7512	Polygon B status was upgraded from Sub-optimal to Optimal-Suboptimal due to some redrawing of the boundary. The SE portion of E merged into Polygon B as is same management unit. The habitat is maritime grassland.
D	Suboptimal-Unsuitable	1.8971	Polygon D status was upgraded from Unsuitable to Suboptimal-Unsuitable as some potentially suitable habitat present. Area around shed and cattle crush removed as unsuitable.
E	Suboptimal-Unsuitable	3.5913	Polygon E status was upgraded from Unsuitable to Suboptimal-Unsuitable, as the boundary was amended at NE to include area within same fenced management unit. Also, vegetation similar. SW area removed as too sandy with short vegetation and separated by fence. SE area merged with Polygon B, as is same management unit. Polygon C appears to have been merged with E by Moorkens & Killeen, 2011.
F	Unsuitable	2.9155	Polygon F status remains Unsuitable. Slurry-spreading, very short sward
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.234	Polygon A
B	Sub-optimal	0.439	Polygon B
C	Unsuitable	0.366	Polygon C - V heavily grazed
D	Unsuitable	2.042	Polygon D very heavily grazed
E	Unsuitable	2.632	Polygon E very heavily grazed
F	Unsuitable	2.916	Polygon F very heavily grazed

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Vertigo angustior monitoring at Doaghtry

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	36m	5.5m	1.5m	2m	43m	2m	0m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	2.3m	38.2m	2m		2.5m	43 m		2m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	8.5m	NA	34.5	NA	2m	42.5m	2	

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (5 samples)								
2019-2024	1	1	2m	0	0	0	Count	Suboptimal
2019-2024	1	2	4m	1	0	1	Count	Suboptimal
2019-2024	1	3	13m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	4	20m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	5	33m	0	0	0	Count	Optimal-Suboptimal
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	2 m	0	0	0		Optimal-Suboptimal
2013-2018	1	2	4 m	3	0	3		Optimal
2013-2018	1	3	10 m	3	0	3		Optimal
2013-2018	1	4	20 m	1	0	1		Optimal-Suboptimal
2013-2018	1	5	28 m	1	0	1		Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (4 samples)								
2007-2012	1	1	5m	0	0	6		
2007-2012	1	2	11m	0	0	19		
2007-2012	1	3	28m	0	0	11		
2007-2012	1	4	38m	0	0	2		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (4 samples)							
2019-2024	01	ITM 474452 770725	0	0	0	Count	Suboptimal
2019-2024	02	ITM 474428 770596	0	0	0	Count	Optimal-Suboptimal
2019-2024	03	ITM 474398 770590	0	0	0	Count	Optimal-Suboptimal
2019-2024	04	ITM 474456 770585	0	0	0	Count	Optimal-Suboptimal
Monitoring period 2013-2018 (4 samples)							
2013-2018	01	L 74452 70698	0	0	0		Suboptimal-Unsuitable
2013-2018	02	L 74460 70566	0	0	0		Suboptimal
2013-2018	03	L 74422 70576	5	0	5		Optimal-Suboptimal
2013-2018	04	L 74417 70560	0	0	0		Suboptimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 1 of the 3 maritime grassland zones (0-8.5m) and in the 2 Iris grassland zones (8.5-	Adult or sub-adult snails are present in 1 of the maritime grassland zones and in the	Fail

Vertigo angustior monitoring at Doaghtry

2019-2024			28.3m, and 28.3-42.5m)	none of Iris grassland zones	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 1 of the 3 maritime grassland zones (0-8.5m) and in the 2 Iris grassland zones (8.5-28.3m, and 28.3-42.5m)	Present in all three zones	Pass
2013-2018	1	Species extent	Adult or sub-adult snails present in at least 1 out of 4 samples taken from across the site.	Present in 1 sample	Pass
2007-2012	1	Density	At least 2 samples on the Transect should have >6 <i>V. angustior</i> individuals	3 samples with 6 or more	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 1 of the 3 maritime grassland zones (0-8.5m) and in the 2 Iris grassland zones (8.5-28.3m, and 28.3-42.5m)	Present in all 3 zones (plus one other)	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Species extent	Adult or sub-adult snails present in at least 1 out of 4 samples taken from across the site.	Adult or sub-adult snails absent from 4 samples taken from across the site.	Fail

Mon. period	Population Notes
2019-2024	<i>Vertigo angustior</i> was present in one of five samples taken on the transect, and absent from the four spot samples elsewhere within the site. This is a significant reduction compared to the previous sampling period, which found the snails in four out of five samples on the transect and one spot sample from Polygon B. The assessment criteria of Moorkens & Killeen (2011), which looked at numbers of snails per sample on the transect, were replaced by one based on presence/absence across the site. Based on the revised criterion, the Population Assessment is Unfavourable-Bad (red).
2013-2018	<i>Vertigo angustior</i> was recorded in low numbers in four of five samples taken on the transect and one other spot sample (in Polygon B). This is similar to the previous sampling period, which found the snails in four of four samples (all taken on the transect). The assessment criteria of Moorkens & Killeen (2011), which looked at numbers of snails per sample on the transect was replaced by one based on presence/absence across the site. Based on the revised criteria, the Population Assessment is Favourable (green).
2007-2012	The snail is moderately common

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	40m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	41.5m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	Pass
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 40m along the Transect	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 36 m along the Transect	Fail
2013-2018	1	Habitat extent	40m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	43m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 40m along the Transect	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 43 m along the Transect	Pass
2007-2012	1	Habitat extent	40m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	42.5m	Pass

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2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 40m along the Transect	42.5m optimal	Pass
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5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	>0.2ha of the site classed as optimal and a further 0.4-0.6ha sub-optimal	0.26ha Optimal and 0.75ha Optimal-Suboptimal	Pass
2013-2018	Habitat extent	>0.2ha of the site classed as optimal and a further 0.4-0.6ha sub-optimal	0.26ha Optimal and 0.75 ha Optimal-Suboptimal	Pass
2007-2012	Habitat extent	>0.2 ha of the site classed as optimal and a further 0.4-0.6ha sub-optimal	0.26 ha optimal and 0.53 ha sub-optimal	Pass

Mon. period	Habitat Notes
2019-2024	Polygon A continues to support the most suitable habitat for <i>Vertigo angustior</i> , with <i>Iris pseudacorus</i> marsh and a <i>Festuca rubra</i> -dominated understorey. At the time of survey, the tall marsh vegetation was still low, as it was early in the season. The start of the transect is tightly grazed and lacking litter, with wetness optimal only due to recent rain. Patches of suitable habitat are present in polygons B, D and E, while Polygon F remains Unsuitable. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Dooaghtry is Unfavourable-Inadequate (amber).
2013-2018	The core area of habitat for <i>Vertigo angustior</i> at Dooaghtry (Polygon A) remains Optimal. While apparent slight upgrades have been made to the classification of polygons B, D and E, these are due in part to the use of a 5-point scale rather than a 3-point scale and some changes to the boundaries. However, Polygon E in particular was felt to have better potential for the species than previous assessments suggested. Polygon F remains Unsuitable, with polygons D and E being Suboptimal-Unsuitable. Thus, only Polygon B provides additional substantial areas of potentially optimal habitat.
2007-2012	The area of occupancy and habitat of <i>Vertigo angustior</i> is small but in good condition

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	High	Negative	100%	Polygons F, E and parts of B tightly grazed by sheep, with other areas grazed to a lesser extent.
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	Low	Negative	1%	<i>Phormium tenax</i> growing along the boundary between polygons B & E.
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	100%	Winter storms are causing saltwater inundation of the site, as evidenced by flotsam and jetsam.
2013-2018	A04.02.02	non intensive sheep grazing	Inside	Medium	Negative	100%	
2013-2018	K01.01	Erosion	Inside	Low	Negative	1%	
2013-2018	K01.04	Submersion	Inside	Medium	Negative	100%	Winter storms
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	0.67ha	As the grazing by cattle appears to be maintaining vegetation levels well without excessive trampling damage, its impact is positive.

Mon. period	Future Prospects Notes
2019-2024	Grazing by sheep and inundation by seawater during storms have been identified as the main pressures acting on the <i>Vertigo angustior</i> habitat at Dooaghtry. Polygons B, E and part of D are tightly grazed by sheep, which removed litter and exposes the substratum to drying out. Saltwater inundation, as evidenced by flotsam and jetsam within the habitat, can also impact on the snail's population. Of lesser importance is the presence of the invasive New Zealand Flax (<i>Phormium tenax</i>)

Vertigo angustior monitoring at Dooaghtry

Mon. period	Future Prospects Notes
2019-2024	on the site. Due to the current status of the snail at this site, the future trends and the pressures it is subject to, the Future Prospects are assessed as Unfavourable-Bad (red).
2013-2018	The Future Prospects for Vertigo angustior at Dooaghtry were considered to be Favourable (green) by Moorkens & Killeen (2011), as the only activity identified was a positive influence from cattle grazing, which maintained the vegetation without excessive trampling damage. In the current study, it was found that sheep are now grazing the site and this is having a moderate negative effect by producing a tight sward in places, unsuitable for V. angustior. Sheep grazing was identified by Moorkens & Killeen (2011) as one activity that should certainly not be undertaken at the site. While the habitat in the core area for Vertigo angustior remains Optimal, this may change in the future if sheep grazing continues. Winter sea flooding has occurred at the site in recent years and an increase in the frequency of such flood events may result in the loss of Vertigo angustior from the site. For these reasons, the Future Prospects of Vertigo angustior at Dooaghtry are assessed as Unfavourable Inadequate (amber).
2007-2012	The impact of cattle grazing impact is positive. Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Amber	Red	Red
2013-2018	Green	Green	Amber	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	The current survey has seen a significant decrease in the extent of the Vertigo angustior population at Dooaghtry, with a Population Assessment of Unfavourable-Bad (red), while the Habitat Assessment returned a result of Unfavourable-Inadequate (amber). The likely future trends for the site and the pressures acting on the site result in a Future Prospects Assessment of Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Dooaghtry is Unfavourable-Bad (red).
2013-2018	While the habitat for Vertigo angustior in Polygon A, the core of the suitable habitat, continues to be Optimal, with other suitable areas found, along with a positive record for the species in Polygon B, the change in management from grazing by cattle to grazing by sheep poses a serious threat to the species in the longer term.
2007-2012	

6. DISCUSSION

Monitoring period
<p>2019-2024</p> <p>Discussion:</p> <p>Between the monitoring periods 2007-2012 and 2013-2018, the primary grazing at Dooaghtry was changed from cattle to sheep, and sheep grazing has continued to occur across the site. This has resulted in a more tightly-grazed sward across much of the site, though this appearance was somewhat confounded by the fact that the current survey was carried out earlier in the growing season than previous surveys. What is clear is that the population of Vertigo angustior has declined, with only one positive sample returned for the current survey. The intensity of the sheep grazing is likely to be the main contributor to this decline, but inundation by seawater during storms is also likely to play a role. A reduction in the level of sheep grazing would benefit the snail and its habitat by allowing the development of the Festuca rubra thatch across more of the site.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>As noted in 2013-2018, the switch from cattle grazing to sheep grazing has had a negative impact on the Vertigo angustior habitat at Dooaghtry. While a switch back from sheep to cattle is unlikely, as that would depend on a significant change for the farmer(s), it may be possible to reduce the level of sheep grazing to one that allows a more suitable Festuca rubra thatch to develop. The removal of Phormium tenax from the site would be generally beneficial, but would have little to no impact on the snail at its current level.</p>

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2013-2018

Discussion:

The assessment of this site has changed from green in 2007-2012 to amber 2013-2018. This is because of a change in land management (from cattle to sheep). This is a small site, with a small core area supporting the target species. This means that the species is vulnerable, but it also means that instigating changes in land management and subsequent monitoring are achievable. Contact needs to be made immediately with the land-owner and negotiations into changing land management begun. This site needs to be monitored carefully over the coming years.

Monitoring recommendations:

In light of the sheep grazing, which is causing negative habitat impacts, monitoring should be carried out at three-yearly intervals for the target species. More frequent visits will be needed for landowner liaison and habitat condition monitoring. Monitoring largely to follow that of Moorkens & Killeen (2011), with the addition of some spot sampling:

Assessment of the transect and other locations with spot sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 2 samples from the maritime grassland zones (0-8.5m) on the transect and analyse for molluscan composition
- Take 3 samples from the Iris marsh zones (8.5m-42.5m) on the transect and analyse for molluscan composition
- Assign polygon habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Take 4 spot samples in the most suitable habitat areas from across the site outside Polygon A.
- Use results to determine overall condition assessment

Management recommendations:

When Moorkens & Killeen (2011) carried out their assessment based on the 2008 survey, it was determined that the low level of grazing by cattle was ideal for maintaining the habitat for *Vertigo angustior* at the site and that sheep should not be allowed to graze the area. As noted, sheep now appear to be the sole grazers of the site and this will lead to negative impacts on the *Vertigo angustior* habitat. In light of this, attempts should be made remove sheep from the site and return it to cattle grazing at a low level. Moorkens & Killeen (2011) recommended a level of no more than 0.6 livestock units per hectare and to be removed at the first sign of damage or if additional feeding is required. This should be the starting point of any future management, with on-going habitat monitoring to ensure no significant negative effects from the grazing. The large sedge *Carex acutiformis* was recorded in a large stand in Polygon D and, as it does not provide suitable habitat for *Vertigo angustior*, any spread of this species should be monitored and managed. No fertiliser should be applied to the site.

Vertigo angustior monitoring at Dooaghtry

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Favourable. The results obtained in 2008 are very similar to those from 2006 (Appendix 2, and Figure 1) with the vegetation and wetness levels virtually unchanged. There was some evidence of trampling in the Iris grassland. *Vertigo angustior* was found at each sample location and was present in either low or moderate numbers.

Monitoring recommendations:

The Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance is Favourable, and, therefore, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011

Methods (see Section 3 of main report for full details) Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from the 3 maritime grassland zones (0-8.5m) with the most suitable habitat on the transect and analyse for molluscan composition
- Take at least 1 sample each from the 2 Iris marsh zones (8.5m-42.5m) with the most suitable habitat on the transect and analyse for molluscan composition
- Re-determine boundary of the habitat polygons A and D and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2014

Methods (see Section 3 of main report for full details). Prescription as follows:

- Describe habitat and take 5 samples from the most suitable habitat in Polygon area D and analyse for molluscan composition

Management recommendations:

Existing Management

The *V. angustior* habitat has one management unit. Within this unit very light grazing by cattle was evident and these animals extensively roam over a wide area. This practice has resulted in excellent open vegetation, with a good build up of well thatched litter, resulting in a molluscan fauna of open ground, which are not suffering from competition from shade loving species. The field across the road was more heavily grazed, but also naturally drier in nature and not a suitable conservation area for this species.

Proposed management prescription for site

The management at Dooaghtry should remain the same as the present regime for the 2011-2014 period. The area should be grazed by up to six cattle or no more than 0.6 livestock units per hectare. The cattle grazing should be periodic and dependent upon the capacity of the site during the weather conditions of any particular year. The animals should be removed at the first sign of damage to the habitat or hunger. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the *Vertigo angustior* habitat. There should be no improvement with fertiliser or drainage of any of the habitat area. Under no circumstances should sheep be allowed to graze this area.



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Glencolmcille

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM04 **County:** Donegal

SAC Site Code: 000190 Slieve Tooley/Tormore Island/Loughr **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed dune habitat to the south of the Murlin River Estuary. Access is from the car park on the R263 at Glencolmcille.

Monitoring period	Date surveyed	Recorders
2019-2024	16-17 June 2022	John Brophy & Orla Daly
2013-2018	19-20 August 2014	John Brophy & Maria Long
2007-2012	5 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and the river valley below, in wet Iris flood plain but this was not suitable habitat during the time of the survey. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is *Festuca rubra*, with some *Ammophila arenaria* higher up, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Thymus praecox*, *Plantago lanceolata*, *Anthyllis vulneraria*, *Trifolium repens*, *Galium verum*, *Viola tricolour* and *Euphrasia* lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Lotus corniculatus</i> , <i>Thymus praecox</i> , <i>Plantago lanceolata</i> , <i>Anthyllis vulneraria</i> , <i>Trifolium repens</i> , <i>Galium verum</i> and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter, or the thatch has either a very dense structure, or the thatch is very sparse.
Unsuitable	Unfixed dune habitat, dominated by <i>Ammophila arenaria</i> and <i>Tussilago farfara</i> , very little thatch, or tall rank vegetation (>0.5m high) with <i>Cirsium</i> spp., umbellifers, tall grass species, thatch rather dense and wet.

2. SUMMARY:

2019-2024:

Vertigo angustior was once again absent from the site at Glencolmcille. This is the third monitoring survey in which the snail has not been found. This is despite the fact that some of the habitat on the site is suitable for the snail and has shown improvement since the 2013-2018 monitoring period. Whether the issue now is that the snail was lost from the site due to historical pressures and has not become re-established due to the isolation of the site, or that the pressures acting on the sites are still negatively affecting the suitability of the habitat in a less visible way, is not clear. For example, while the footprint of the cultivated plots growing potatoes is not extensive, it is possible that pesticides are being applied to the crops that are impacting on the mollusc community of the wider area, as virtually no snails were recorded from the samples taken for *V. angustior*. No grazing was occurring on the site at the time of survey; however, Moorkens & Killeen (2011) noted that there was winter grazing of sheep, and this is likely to be still occurring, as scattered wool was noted on the site. Given the length of time that has passed since the last record of *V. angustior* on the site, consideration may need to be given to implementing a reintroduction programme, should the habitat recover to a suitable state and appropriate long-term management enacted.

2013-2018:

Vertigo angustior has not been recorded at this site since 2006, in spite of dedicated surveys. The site sees significant human use - e.g. sports grounds (now excluded), arable plots, grazing and walkers. These activities occur piecemeal across the site, making management particularly challenging. *Vertigo angustior* may still occur at this site in low numbers and immediate changes in management are needed to increase the area of potentially suitable habitat for the species. Contact should be made immediately with local landowners to begin this process.

2007-2012:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable due to the decline in the condition of the habitat within the main polygon, and the absence of *Vertigo angustior* both on the transect and at other locations. Based upon changes observed since the corrected discovery in 2000 and since the last survey in 2006, it appears that there is a decline in habitat quality, along with a contraction in the distribution and abundance of *Vertigo angustior*, such that in 2008 the snail was not found in any of the samples despite that there are areas within the central part of the site, including the transect line which support apparently optimal habitat. Comparison of the transects between 2006 (Appendix 1) and 2008 shows a significant reduction in the proportion of optimal and sub-optimal habitat from 122m to 75m. At the start of the transect the vegetation has become taller and ranker, whereas the habitat towards the end of the transect has become less fixed. It is likely that the decline, particularly in habitat quality, results from changes in management.

However, whilst populations of *V. angustior* are known to fluctuate in abundance and small-scale distribution, the recent pattern of long wet summers followed by stormy wet winters may mean that the conditions for *V. angustior* are becoming less favourable. In general, *Vertigo*

Vertigo angustior monitoring at Glencolmille

angustior is not found on sites that have combined cattle and sheep grazing. In fact, Vertigo angustior rarely survives sheep grazing for any period. Sheep graze uniformly at the moss/root level that is the micro-habitat that the snail needs. The combination of low levels of cattle grazing followed by cropping by sheep gives the impression of an undergrazed landscape (which it is for part of the year) but the main damage may be done during overgrazing or unsuitable grazing by sheep in winter. Future prospects have been assessed as Unfavourable inadequate (amber). However, a repeat of the transect and spot sampling should be undertaken again as soon as possible, in order to assess whether the snail has recovered.

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 552708 885004	A fencepost by the pylon in the corner of the GAA training pitch. Grid ref in ITM	
End point:	ITM 552592 885094	N facing lower dune slope. End near-vertical drop to beach; More mobile. Bare sand visible. ITM from 2022.	
Transect length:	152	Direction:	SE-NW
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, up the slope towards the unfixed dune edge and down to the eroding foreshore.		
Sampling frequency:	6 samples were taken from zones with the most suitable habitat		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	G 52747 85011	A fencepost by the pylon in the corner of the GAA training pitch	
End point:	G 52630 85097	N facing lower dune slope. End near-vertical drop to beach; More mobile. Bare sand visible.	
Transect length:	153	Direction:	As for 2007-2012
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	G 52749 85010	A fencepost by the pylon in the corner of the GAA pitch	
End point:	G 52638 85107	The estuary shore at the base of the fore dune	
Transect length:	153	Direction:	SE to NW
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, up the slope towards the unfixed dune edge and down to the eroding foreshore. The transect runs towards a small, isolated sycamore near the dune crest.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	7.7752	Polygon A remains Suboptimal with the best habitat of the site, comprising fixed dune with some areas of disturbance.
B	Suboptimal-Unsuitable	8.4333	Polygon B increased from Unsuitable to Suboptimal-Unsuitable, as there are some areas with suitable habitat now present.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	7.7751	Polygon A status remains Suboptimal. The boundary has been altered to include area to north (formerly part of Polygon B), as some potentially suitable habitat and transect runs into this area.
B	Unsuitable	8.4331	Polygon B status remains Unsuitable. Area at NE removed as now football pitches, car park and clubhouse. Section at N merged with Polygon A (see above)
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment

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Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	7.16	Polygon A
B	Unsuitable	12.24	Polygon B

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	51m	87m	2m	12m	140m	0m	12m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		6 m	11m	36m	42m	128m		25m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	14m	NA	61m	NA	78m	120m		33m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (6 samples)								
2019-2024	1	1	45m	0	0	0	Count	Suboptimal
2019-2024	1	2	59m	0	0	0	Count	Optimal
2019-2024	1	3	64m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	4	78m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	5	112m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	6	72m	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 Transect 1 (6 samples)								
2013-2018	1	1	47 m	0	0	0		Optimal-Suboptimal
2013-2018	1	2	59 m	0	0	0		Optimal
2013-2018	1	3	65.5 m	0	0	0		Optimal-Suboptimal
2013-2018	1	4	79 m	0	0	0		Optimal-Suboptimal
2013-2018	1	5	99 m	0	0	0		Optimal-Suboptimal
2013-2018	1	6	111 m	0	0	0		Suboptimal-Unsuitable
Monitoring period 2007-2012 Transect 1 (6 samples)								
2007-2012	1	1	40m	0	0	0		
2007-2012	1	2	60m	0	0	0		
2007-2012	1	3	89m	0	0	0		
2007-2012	1	4	92m	0	0	0		
2007-2012	1	5	103m	0	0	0		
2007-2012	1	6	115m	0	0	0		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (6 samples)							
2019-2024	01	ITM 552584 885053	0	0	0	Count	Suboptimal
2019-2024	02	ITM 552503 885060	0	0	0	Count	Optimal
2019-2024	03	ITM 552369 885045	0	0	0	Count	Optimal
2019-2024	04	ITM 552361 884847	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	05	ITM 552543 884855	0	0	0	Count	Suboptimal

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2019-2024	06	ITM 552653 884875	0	0	0	Count	Optimal-Suboptimal
Monitoring period 2013-2018 (6 samples)							
2013-2018	01	G 52624 85060	0	0	0		Suboptimal-Unsuitable
2013-2018	02	G 52541 85072	0	0	0		Optimal-Suboptimal
2013-2018	03	G 52403 85060	0	0	0		Optimal-Suboptimal
2013-2018	04	G 52403 84875	0	0	0		Optimal-Suboptimal
2013-2018	05	G 52570 84900	0	0	0		Optimal-Suboptimal
2013-2018	06	G 52690 84877	0	0	0		Suboptimal
Monitoring period 2007-2012 (3 samples)							
2007-2012	01	G 52623 85052	0	0	0		
2007-2012	02	G 52585 85024	0	0	0		
2007-2012	03	G 52541 85031	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the grassland zones (0-104m) with habitat Suboptimal or better (minimum 6 samples)	Adult or sub-adult snails are absent from transect (6 samples)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the grassland zones (0-104m) with habitat Suboptimal or better (minimum 6 samples)	Adult or sub-adult snails are Absent from Transect (6 samples)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the grassland zones (0-104m) with optimal or sub-optimal habitat (minimum 6 samples)	Absent in all samples	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in at least one other location on the site (minimum 6 samples)	Adult or sub-adult snails are absent from the site (from 6 samples)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least one other location on the site (minimum 6 samples)	Adult or sub-adult snails are absent from the site (from 6 samples)	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least one other location on the site (minimum 6 samples)	Absent elsewhere in 2008	Fail

Mon. period	Population Notes
2019-2024	Vertigo angustior was not recorded during the current survey. The species was also not recorded at the site during the previous two monitoring periods, with surveys in 2008 and 2014, and so it appears that it has been lost from the site. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	Vertigo angustior was not found anywhere at this site in 2014. Given that it was not found in the 2008 survey, it must be presumed that the population is either currently very small, or has disappeared from the site.
2007-2012	The snail could not be found anywhere on the site

5.2 Habitat Assessment: 3 passes Favourable (green); 1-2 passes Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	90m of habitat along the Transect is classed as Suboptimal or better	138m of habitat along the Transect is classed as Suboptimal or better	Pass

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2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 90m along the	140m is Optimal wetness	Pass
2013-2018	1	Habitat extent	90m of habitat along the Transect is classed as Suboptimal or better	75m of habitat along the Transect is classed as Suboptimal or better	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 90m along the Transect	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 128m along the Transect	Pass
2007-2012	1	Habitat extent	90m of habitat along the Transect is classed as Optimal or Sub-Optimal	75m is Optimal or Sub-Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 90m along the Transect	120m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 6.5ha of the site sub-optimal with optimal areas	7.8ha Suboptimal	Pass
2013-2018	Habitat extent	At least 6.5ha of the site sub-optimal with optimal areas	7.78ha Sub-optimal	Pass
2007-2012	Habitat extent	At least 6.5 (ha) of the site sub-optimal with optimal areas	7.16 ha	Pass

Mon. period	Habitat Notes
2019-2024	The site at Glencolmcille includes some areas of suitable habitat, with Polygon B considered to have some suitability for the species now. The habitat along the transect is generally suitable for the species, albeit Suboptimal. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Favourable (green).
2013-2018	Habitat suitability classifications for polygons A and B have not changed since 2007-2012, though boundaries have been altered to remove a large area that is now sports grounds. The area of suitable habitat for Vertigo angustior at this site is limited.
2007-2012	The habitat at the site is not in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA01	Conversion into agricultural land (excluding drainage and burning)	Inside	High	Negative	0.5%	Cultivation of potatoes. Plots moved over years. At time of survey, c. 800m ² under cultivation, but much more in past, from aerial photography.
2019-2024	PA25	Agriculture activities not referred to above	Inside	Medium	Negative	0.5%	Vehicle tracks. Tractors & cars.
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Medium	Negative	0.1%	Trampling. Walking tracks through dunes.
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	High	Negative	0.1%	Acer pseudoplatanus & Polygonum wallichii

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2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	1%	Erosion of dune face along north & west. Final 2m of transect appears to have been lost.
2013-2018	A01	Cultivation	Inside	High	Negative	20%	Potato plots
2013-2018	A03.01	intensive mowing or intensification	Inside	High	Negative	10%	Some fields to south. Hay/silage
2013-2018	A04.02.05	non intensive mixed animal	Inside	Medium	Negative	25%	Sections of dune to west grazed heavily and some fields to south.
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	25%	Potentially most suitable areas rank.
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	7ha	Although there is grazing present, the grazing may be too low to maintain ideal vegetation height. In addition, in recent years sheep appear to have been introduced to the site for winter grazing as well as summer cattle grazing. The combination and timing of grazing may be the key to the problems at the site.
2007-2012	A04.02.02	non intensive sheep grazing	Inside	Medium	Negative	7ha	
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	7ha	

Mon. period	Future Prospects Notes
2019-2024	A range of pressures are acting on the site at Glencolmcille. These include the cultivation of potatoes in plots that have been moved around over the years, tracks from vehicles, the spread of non-native species (<i>Acer pseudoplatanus</i>) and recreational walking. Based on the fact that <i>Vertigo angustior</i> has not been recorded at the site for three monitoring periods, and there is a range of pressures acting on the site, the Future Prospects of Glencolmcille are assessed as being Unfavourable-Bad (red).
2013-2018	The Future Prospects for Glencolmcille, as assigned by Moorkens & Killeen (2011) following the 2008 survey, were Unfavourable Inadequate (amber), due to the negative impact on <i>Vertigo angustior</i> habitat from mixed grazing of cattle and sheep. The current survey identified mixed animal grazing, cultivation of potatoes and lack of grazing in places as having a negative impact on the suitability of the site for <i>Vertigo angustior</i> . The target species was last recorded at the site in 2006 and was not recorded in 2008 (Moorkens & Killeen, 2011) or 2014 (current study). Therefore, the Future Prospects of this site have been classified as Unfavourable Bad (red).
2007-2012	As the impact is not fully understood to date, Future prospects have been assessed as Unfavourable inadequate

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Green	Red	Red
2013-2018	Red	Amber	Red	Red
2007-2012	Red	Amber	Amber	Red

Mon. period	Overall Notes
2019-2024	Despite an improvement in the habitat suitability of Glencolmcille, resulting in a Habitat Assessment of Favourable (green), the Population Assessment and Future Prospects are Unfavourable-Bad (red) due to the fact that the snail was not found, and a range of pressures continue to act on the site. Based on these assessments, the Overall Assessment for Glencolmcille is Unfavourable-Bad (red).

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2013-2018	In light of the fact that <i>V. angustior</i> has not been recorded at this site since 2006 and the existing state of the site under its very mixed management regime, the overall assessment of Glencolmcille is considered Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2019-2024

Discussion:

Vertigo angustior was once again absent from the site at Glencolmcille. This is the third monitoring survey in which the snail has not been found. This is despite the fact that some of the habitat on the site is suitable for the snail and has shown improvement since the 2013-2018 monitoring period. Whether the issue now is that the snail was lost from the site due to historical pressures and has not become re-established due to the isolation of the site, or that the pressures acting on the sites are still negatively affecting the suitability of the habitat in a less visible way, is not clear. For example, while the footprint of the cultivated plots growing potatoes is not extensive, it is possible that pesticides are being applied to the crops that are impacting on the mollusc community of the wider area, as virtually no snails were recorded from the samples taken for *V. angustior*. No grazing was occurring on the site at the time of survey; however, Moorkens & Killeen (2011) noted that there was winter grazing of sheep, and this is likely to be still occurring, as scattered wool was noted on the site. Given the length of time that has passed since the last record of *V. angustior* on the site, consideration may need to be given to implementing a reintroduction programme, should the habitat recover to a suitable state and appropriate long-term management enacted.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

The management recommendations made in the previous two rounds of monitoring (Long & Brophy, 2019; Moorkens & Killeen, 2011) are still relevant and should form the basis of any future management of the site. Discussions should be had with the current land users to gain a detailed understanding of the current activities on the site that may be having an impact, including the use of chemicals on crops or livestock. Given that *Vertigo angustior* has not been recorded on the site for three monitoring periods, it is possible, if not likely, that the snail is extinct at the site and a reintroduction programme should be considered if the habitat is restored to a more suitable state and appropriate long-term management implemented.

2013-2018

Discussion:

Vertigo angustior has not been recorded at this site since 2006, in spite of dedicated surveys. The site sees significant human use - e.g. sports grounds (now excluded), arable plots, grazing and walkers. These activities occur piecemeal across the site, making management particularly challenging. *Vertigo angustior* may still occur at this site in low numbers and immediate changes in management are needed to increase the area of potentially suitable habitat for the species. Contact should be made immediately with local landowners to begin this process.

Monitoring recommendations:

This site needs management intervention if it is to have any chance of supporting a population of *Vertigo angustior*. Once this has been instigated, monitoring should be at three-yearly intervals until such time as the population has recovered and is deemed stable. Monitoring should follow that of Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too dry, Optimal wetness or Too dry, respectively
- Take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of at least 6 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Future management of the site at Glencolmcille should include the removal of sheep grazing from the site entirely and a return to an appropriate level of cattle grazing to prevent the vegetation becoming rank, while allowing a good *Festuca rubra* thatch to develop. Ideally, no additional agricultural activities should be carried on at the site (e.g. potato cultivation), and those potato plots that have been abandoned should be opened up for grazing. For levels and type of cattle grazing, refer to Moorkens & Killeen (2011) (see below)

Vertigo angustior monitoring at Glencolmcille

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable due to the decline in the condition of the habitat within the main polygon, and the absence of *Vertigo angustior* both on the transect and at other locations.

Based upon changes observed since the corrected discovery in 2000 and since the last survey in 2006, it appears that there is a decline in habitat quality, along with a contraction in the distribution and abundance of *Vertigo angustior*, such that in 2008 the snail was not found in any of the samples despite that there are areas within the central part of the site, including the transect line which support apparently optimal habitat. Comparison of the transects between 2006 (Appendix 1) and 2008 shows a significant reduction in the proportion of optimal and sub-optimal habitat from 122m to 75m. At the start of the transect the vegetation has become taller and ranker, whereas the habitat towards the end of the transect has become less fixed. It is likely that the decline, particularly in habitat quality, results from changes in management. However, whilst populations of *V. angustior* are known to fluctuate in abundance and small-scale distribution, the recent pattern of long wet summers followed by stormy wet winters may mean that the conditions for *V. angustior* are becoming less favourable.

In general, *Vertigo angustior* is not found on sites that have combined cattle and sheep grazing. In fact, *Vertigo angustior* rarely survives sheep grazing for any period. Sheep graze uniformly at the moss/root level that is the micro-habitat that the snail needs. The combination of low levels of cattle grazing followed by cropping by sheep gives the impression of an undergrazed landscape (which it is for part of the year) but the main damage may be done during overgrazing or unsuitable grazing by sheep in winter.

Future prospects have been assessed as Unfavourable inadequate (amber). However, a repeat of the transect and spot sampling should be undertaken again as soon as possible, in order to assess whether the snail has recovered.

Monitoring recommendations:

Given the evidence for an overall deterioration of the site both in terms of population and habitat for *Vertigo angustior*, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals.

Frequency: Next monitoring due 2011

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of at least 6 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

There are two distinct management units at the Glencolmcille site which comprise the 2 habitat polygons. Area A consists of the outer and lower dune habitat, with scrub in places and arable practices in others (potatoes). Most of this is not habitat for the snail, except for small patches of *Festuca* grassland in knolls, where the habitat is maintained by exposure. The best of the habitat is within Polygon B. This area is lightly grazed by cattle for periods of the Spring and Autumn. The local farmer told us that sheep are grazed in winter only, and this is likely to be having a negative effect.

Proposed management prescription for site

Habitat polygon B should remain grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the *Vertigo angustior* habitat, with animals removed at the first signs of hunger. There should be no improvement with fertiliser or drainage of any of the habitat area. The landowner should be encouraged not to graze sheep on this site at any time of the year.



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Kilshannig

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM05 **County:** Kerry

SAC Site Code: 002070 Tralee Bay and Magharees Peninsula **QI:** No

Location description (from baseline survey):

Fixed dune habitat in the northern part of the Maharees Peninsula at Kilshannig. Access is available from a number of tracks and roads.

Monitoring period	Date surveyed	Recorders
2019-2024	27-28 June 2022	John Brophy & Jessica Hamilton
2013-2018	26-30 May 2014	John Brophy & Maria Long
2007-2012	29 July 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is low, undulating fixed grey dunes and machair (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the living and decaying vegetation and moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is *Festuca rubra*, with some *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Pilosella officinarum*, *Trifolium repens*, *Galium verum*, and *Euphrasia* lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , <i>Euphrasia</i> sp. <i>Pilosella officinarum</i> , <i>Thymus polytrichus</i> , <i>Anthyllis vulneraria</i> and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure, or low willow scrub covers more than 10% of the habitat.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior continues to be present at Kilshannig, but its distribution is becoming more restricted from monitoring period to monitoring period. In the current survey, only a single snail was found at one sample location. There does seem to be abundant suitable habitat on the site in terms of the vegetation, though *Festuca rubra* litter can be sparse. As indicated by the transect data, the site appears to be generally drier than is optimal and local information suggests that the dune slacks did not flood in the winter before the survey (i.e. winter 2021). This drying may be the result of climate change affecting the hydrological cycle in the area and/or increased evaporation due to wind. Other pressures acting on the site include cattle and rabbit grazing. A slight reduction in the grazing pressure would benefit the habitat of the snail at this site, by allowing the build-up of *Festuca rubra* thatch.

2013-2018:

This site has considerable habitat which has good potential for *Vertigo angustior*. In their 2011 report, Moorkens & Killeen stated that it was being grazed by cattle, and at an optimal level to provide habitat for the snail. In 2014, much of the habitat was grazed too tightly - there was little *Festuca rubra* thatch build-up. Consequently, there needs to be a slight relaxation in grazing at the site. However, the change needed is small, and great care must be taken when organising this with the landowner/land manager - abandonment of grazing would also quickly become detrimental to the species' habitat. There is very good scope for the species at this site, pending slight management changes.

2007-2012:

This site has very high quality stable fixed dune habitat, which is being managed sustainably for *V. angustior*. Parts of the lower slopes are cropped quite low, where the cattle favour, but this seems to suit the lady's tresses *Spiranthes* at the site. There is some damage where cattle are moved in and out of the site, but this is an acceptable sacrificial area allowing sustainable grazing in an extensive site.

This site is worthy of SAC status, although *V. angustior* is not a qualifying interest in the cSAC.

3. TRANSECT DETAILS

TRANSECT: 1	MONITORING PERIOD: 2019-2024
Start point:	ITM 461585 617373 Fence post on mound. ITM from 2022.
End point:	ITM 461548 617299 Low mound. ITM from 2022.
Transect length: 82	Direction: NNE-SSW
Description:	The transect runs across gently undulating fixed dune grassland with a diversity of low growing herbs.
Sampling frequency:	5 samples were taken from zones with the most suitable habitat

Vertigo angustior monitoring at Kilshannig

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	24.7198	Polygon A status remains Optimal-Suboptimal. The habitat is grazed fixed dune with dune slack. (Note: Area difference from 2007-2012 appears to be due to original miscalculation)
B	Suboptimal	13.8338	Polygon B status is raised from Sub-optimal and Unsuitable to Suboptimal, as the polygon includes good areas of suitable fixed dune habitat, which is grazed.
C	Suboptimal-Unsuitable	7.3238	Polygon C status remains Suboptimal-Unsuitable. The habitat is grazed fixed dune, but is heavily grazed. The southern boundary has been altered to remove the caravan park from the polygon.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	24.23	Polygon A - Mostly fixed dune habitat and machair.
B	Sub-optimal with unsuitable areas	14.62	Polygon B - Dunes less fixed and with higher level of cattle grazing. Area also includes a small dune slack.
C	Sub-optimal with unsuitable areas	7.21	Polygon C - Mostly unfixed dunes near the road.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	41m	32m	9m	0m	52m	0m	30m
2								
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1			69.5m		12.5m	12.5m		69.5m
2	Transect 2 not done. Replaced by spot samples							
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	43.5m	NA	39.5m	NA		83m		
2		NA	288m is sub-optimal with some optimal patches	NA				

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (6 samples)								
2019-2024	1	1	6m	0	0	0	Count	Suboptimal
2019-2024	1	2	17m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	3	23m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	4	31m	0	0	0	Count	Suboptimal
2019-2024	1	5	62m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	6	69m	0	0	0	Count	Optimal-Suboptimal
Monitoring period 2013-2018 Transect 1 (6 samples)								
2013-2018	1	1	Q 61600 17317	0	0	0		Suboptimal
2013-2018	1	2	Q 61590 17297	1	0	1	Presence/Absence	Suboptimal
2013-2018	1	3	Q 61588 17289	0	0	0		Suboptimal
2013-2018	1	4	Q 61587 17273	0	0	0		Suboptimal
2013-2018	1	5	Q 61580 17261	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	6	Q 61575 17253	0	0	0		Suboptimal

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Monitoring period 2007-2012 Transect 1 (7 samples)						
2007-2012	1	1	4m	0	0	3
2007-2012	1	2	22m	0	0	0
2007-2012	1	3	31m	0	0	4
2007-2012	1	4	45m	0	0	0
2007-2012	1	5	54m	0	0	0
2007-2012	1	6	62m	0	0	18
2007-2012	1	7	71m	0	0	4
Monitoring period 2007-2012 Transect 2 (1 sample)						
2007-2012	2	8	250m	0	0	2

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (8 samples)							
2019-2024	01	ITM 461993 617335	0	0	0	Count	Optimal
2019-2024	02	ITM 461934 617129	0	0	0	Count	Suboptimal
2019-2024	03	ITM 461827 616952	1	0	1	Count	Suboptimal
2019-2024	04	ITM 461528 616609	0	0	0	Count	Optimal
2019-2024	05	ITM 461425 616644	0	0	0	Count	Optimal-Suboptimal
2019-2024	06	ITM 461310 616546	0	0	0	Count	Suboptimal
2019-2024	07	ITM 461608 616855	0	0	0	Count	Suboptimal
2019-2024	08	ITM 461688 616778	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	Q 62013 17284	1	0	1	Presence/absence	Suboptimal
2013-2018	02	Q 61954 17079	0	0	0		Optimal-Suboptimal
2013-2018	03	Q 61843 16900	0	0	0		Suboptimal
2013-2018	04	Q 61552 16552	0	0	0		Optimal
2013-2018	05	Q 61446 16596	0	0	0		Suboptimal
2013-2018	06	Q 61325 16489	0	0	0		Optimal-Suboptimal
2013-2018	07	Q 61629 16802	0	0	0		Optimal-Suboptimal
2013-2018	08	Q 61701 16722	0	0	0		Suboptimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 samples (minimum 6) of samples taken on Transect 1	Adult or sub-adult snails are absent from Transect 1 (6 samples)	Fail
2019-2024	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 location on Transect 2 (minimum 2 samples)	Transect 2 not sampled. Eight spot samples taken throughout the site instead	ND
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 samples (minimum 6) of samples taken on Transect 1	Adult or sub-adult snails are present in 2 of 6 samples taken on Transect 1	Fail
2013-2018	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 location on Transect 2 (minimum 2 samples)	Transect 2 not sampled. Eight spot samples taken throughout the site instead	ND

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2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 samples (minimum 6) of samples taken on Transect 1	Present in 4 of the 7 samples	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 location on Transect 2 (minimum 2 samples)	Present in 1 location	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in at least 2 spot samples (from a minimum of 6) taken from across the site	Adult or sub-adult snails present in 1 spot sample (from 8 spot samples)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 2 spot samples (from a minimum of 6) taken from across the site	Adult or sub-adult snails present in 1 spot sample (from 8 spot samples)	Fail

Mon. period	Population Notes
2019-2024	Vertigo angustior was absent from the transect and present at only one of eight spot samples across the site in the current survey. This is a reduction from two positive samples on the transect and one positive spot sample during the previous round of monitoring, indicating a continued decline at the site. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	Vertigo angustior was present in fewer samples along Transect 1 than in the 2007-2012 period (two of six, compared with four of seven), but was also found away from the transect at a sample location in Polygon B. A further eight spot samples were taken across the site (rather than 2 along Transect 2), and only one was positive. Based on the criteria of Moorkens & Killeen (2011) (amended to reflect the change from Transect 2 to spot sampling), the population assessment is Unfavourable Bad (red).
2007-2012	The snail is present throughout the transect in good numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	40m of habitat on Transect 1 should be classed as Optimal and 80m should be Optimal and sub-optimal	0 m of habitat on Transect 1 classed as Optimal and 73m as Suboptimal or better	Fail
2019-2024	1	Habitat quality	Soils should be optimal wetness for 80 m of Transect 1	52m is Optimal wetness	Fail
2019-2024	2	Habitat extent	At least 75% of the length of T2 is classed as Optimal-Suboptimal or better	Transect 2 not sampled. Eight spot samples taken throughout the site instead	ND
2013-2018	1	Habitat extent	40m of habitat on Transect 1 should be classed as Optimal and 80m should be Optimal and sub-optimal	0 m of habitat on Transect 1 classed as Optimal and 69.5 m as Sub-optimal	Fail
2013-2018	1	Habitat quality	Soils should be optimal wetness for 80 m of Transect 1	Soils have optimal wetness for 12.5 m of Transect 1	Fail
2013-2018	2	Habitat extent	At least 75% of the length of T2 is classed as Optimal-Suboptimal or better	Transect 2 not sampled. Eight spot samples taken throughout the site instead	ND
2007-2012	1	Habitat extent	40m of habitat on Transect 1 should be classed as Optimal and 80m should be Optimal and sub-optimal	3.5m optimal, 83m is optimal & sub-optimal	Pass
2007-2012	1	Habitat quality	Soils should be optimal wetness for 80m of Transect 1	83m optimal	Pass
2007-2012	2	Habitat extent	At least 75% of the length of T2 is classed as optimal and sub-optimal	100%	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
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Vertigo angustior monitoring at Kilshannig

2019-2024	Habitat extent	At least 12ha of the site sub-optimal with optimal areas	24.7ha Optimal-Suboptimal and 14.7ha Suboptimal	Pass
2013-2018	Habitat extent	At least 12ha of the site sub-optimal with optimal areas	24.7ha Optimal-Suboptimal and 13.8 ha Suboptimal	Pass
2007-2012	Habitat extent	At least 12 ha of the site sub-optimal with optimal areas	24.7 ha Optimal/Sub-optimal	Pass

Mon. period	Habitat Notes
2019-2024	The site at Kilshannig continues to support extensive areas of suitable habitat, with no changes to the polygon classification. The habitat along the transect has shown an increase in the cover of <i>Ammophila arenaria</i> , but the <i>Festuca rubra</i> thatch is still quite limited and much of the transect habitat is too dry. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	The habitat classification for polygons A and C remain unchanged from 2007-2012, while Polygon B is upgraded to Suboptimal. This upgrade is based on the quality of the habitat seen in 2014. Grazing has resulted in the habitat being less suitable for <i>Vertigo angustior</i> across much of the site, with short vegetation, little thatch and dry soils due to low vegetation cover. Based on the Moorkens & Killeen (2011) criteria, the habitat assessment is Unfavourable Bad (red).
2007-2012	The habitat at the site is in good condition for <i>V. angustior</i> ,

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Low	Negative	85%	Cattle grazing appears to have reduced, but litter build-up still limited
2019-2024	PA25	Agriculture activities not referred to above	Inside	Medium	Negative	0.5%	Tractor tracks
2019-2024	PJ03	Changes in precipitation regimes due to climate change	Inside	High	Negative	100%	<i>Acer pseudoplatanus</i> & <i>Polygonum wallichii</i>
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	Medium	Negative	1%	Western boundary of Polygon C subject to erosion. Adjacent habitat unsuitable due to sandy substratum caused by storm-blown sand.
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Low	Negative	95%	Cattle grazing levels are too high to allow good litter build up
2013-2018	K01.01	Erosion	Inside	High	Negative	1%	
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Low	Negative	5%	Rabbits
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Neutral	>43ha	The impacts are neutral, with sufficient cattle to maintain the habitat at a suitable vegetation height to suit the snail.

Mon. period	Future Prospects Notes
2019-2024	Cattle grazing was the main pressure acting on the site at the time of survey with at least 50 cattle/calves on site at the time of survey. Rabbit activity was also noted on site and this would contribute to the grazing level. Lesser pressures include vehicle tracks, and erosion along the western edge of Polygon C. The potential effects of climate change are difficult to identify at a site level, but local information suggests that the dune slacks did not flood in the winter of 2021. Given the decline in the population of the snail and the relatively stable nature of the habitat, combined with the pressures acting on it, including grazing and drying, the Future Prospects are assessed as Unfavourable-Bad (red).

Vertigo angustior monitoring at Kilshannig

Mon. period	Future Prospects Notes
2013-2018	Non-intensive cattle grazing is occurring across most of the site. This appears to be somewhat in excess of what is required to allow suitable habitat for <i>Vertigo angustior</i> (i.e. build up of <i>Festuca</i> thatch and/or moss at least in some places). Optimal habitat patches are limited. Changes in grazing regime are needed. Future Prospects are therefore considered to be Unfavourable Inadequate (amber).
2007-2012	As the impacts are neutral, with sufficient cattle to maintain the habitat at a suitable vegetation height to suit the snail, future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Red	Red	Amber	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	With the Population, Habitat and Future Prospects assessments all returning results of Unfavourable-Bad (red), the Overall Assessment for Kilshannig is Unfavourable-Bad (red).
2013-2018	In general, the <i>Vertigo angustior</i> habitat at Kilshannig is good, with large areas of Optimal-Suboptimal habitat, but at a finer scale, for example Transect 1, the habitat is not as suitable as it was in 2007-2012, showing the effects of grazing and the associated short sward. The number of positive samples on the transect was down on the previous sampling period, though the target species was also recorded away from the transect. The fact that grazing at the site is slightly too high to allow a good build-up of litter and <i>Festuca rubra</i> thatch has resulted Future Prospects being classified as Unfavourable Inadequate (amber). Therefore, the overall assessment is Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period
<p>2019-2024</p> <p>Discussion:</p> <p><i>Vertigo angustior</i> continues to be present at Kilshannig, but its distribution is becoming more restricted from monitoring period to monitoring period. In the current survey, only a single snail was found at one sample location. There does seem to be abundant suitable habitat on the site in terms of the vegetation, though <i>Festuca rubra</i> litter can be sparse. As indicated by the transect data, the site appears to be generally drier than is optimal and local information suggests that the dune slacks did not flood in the winter before the survey (i.e. winter 2021). This drying may be the result of climate change affecting the hydrological cycle in the area and/or increased evaporation due to wind. Other pressures acting on the site include cattle and rabbit grazing. A slight reduction in the grazing pressure would benefit the habitat of the snail at this site, by allowing the build-up of <i>Festuca rubra</i> thatch.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>Similar to 2013-2018, it is recommended that the grazing level be reduced slightly from the current levels. The general recommendation made by Moorkens & Killeen (2011) for grazing of fixed dune habitat for <i>V. angustior</i> is less than 0.8 livestock units (LU) per hectare in spring to autumn, with animals removed in winter. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Supplementary feeding should be avoided on site, as it brings in nutrients and unwanted species. The fact that rabbits are also present on the site may affect the capacity of the site to maintain a higher level of cattle grazing.</p>

Vertigo angustior monitoring at Kilshannig

2013-2018

Discussion:

This site has considerable habitat which has good potential for *Vertigo angustior*. In their 2011 report, Moorkens & Killeen stated that it was being grazed by cattle, and at an optimal level to provide habitat for the snail. In 2014, much of the habitat was grazed too tightly - there was little *Festuca rubra* thatch build-up. Consequently, there needs to be a slight relaxation in grazing at the site. However, the change needed is small, and great care must be taken when organising this with the landowner/land manager - abandonment of grazing would also quickly become detrimental to the species' habitat. There is very good scope for the species at this site, pending slight management changes.

Monitoring recommendations:

It is recommended that the site be monitored as per Moorkens & Killeen (2011) on a 3 yearly basis, owing to the apparent decrease *Vertigo angustior* population at the site. To increase the spread of samples it was decided to drop Transect 2 in the current sampling period. Instead a required to take spot samples is added. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too dry, Optimal wetness, Too wet, respectively
- Take 1 sample each from at least 6 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Take at least 6 samples from across the site, approximately 2 per polygon
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

The cattle grazing level at Kilshannig is slightly too high. A slight decrease in grazing could benefit *Vertigo angustior* by allowing more of a build-up of litter and *Festuca rubra* thatch in areas, though care must be taken to prevent the level of grazing dropping to a point that would allow areas to become more rank or scrub over. Liaison with the landowner/occupier will be required to achieve this.

Vertigo angustior monitoring at Kilshannig

2007-2012

Discussion:

This site has very high quality stable fixed dune habitat, which is being managed sustainably for *V. angustior*. Parts of the lower slopes are cropped quite low, where the cattle favour, but this seems to suit the lady's tresses *Spiranthes* at the site. There is some damage where cattle are moved in and out of the site, but this is an acceptable sacrificial area allowing sustainable grazing in an extensive site.

This site is worthy of SAC status, although *V. angustior* is not a qualifying interest in the cSAC.

Monitoring recommendations:

Although the Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance is favourable, it is still recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 6 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Take 1 sample each from at least 2 locations with the most suitable habitat on Transect 2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2014

Methods (see Section 3 of main report for full details). Prescription as follows:

- Describe habitat and take at least 3 samples from the most suitable habitat in each of Polygons A (away from transect), B and C and analyse for molluscan composition

Management recommendations:

Existing Management

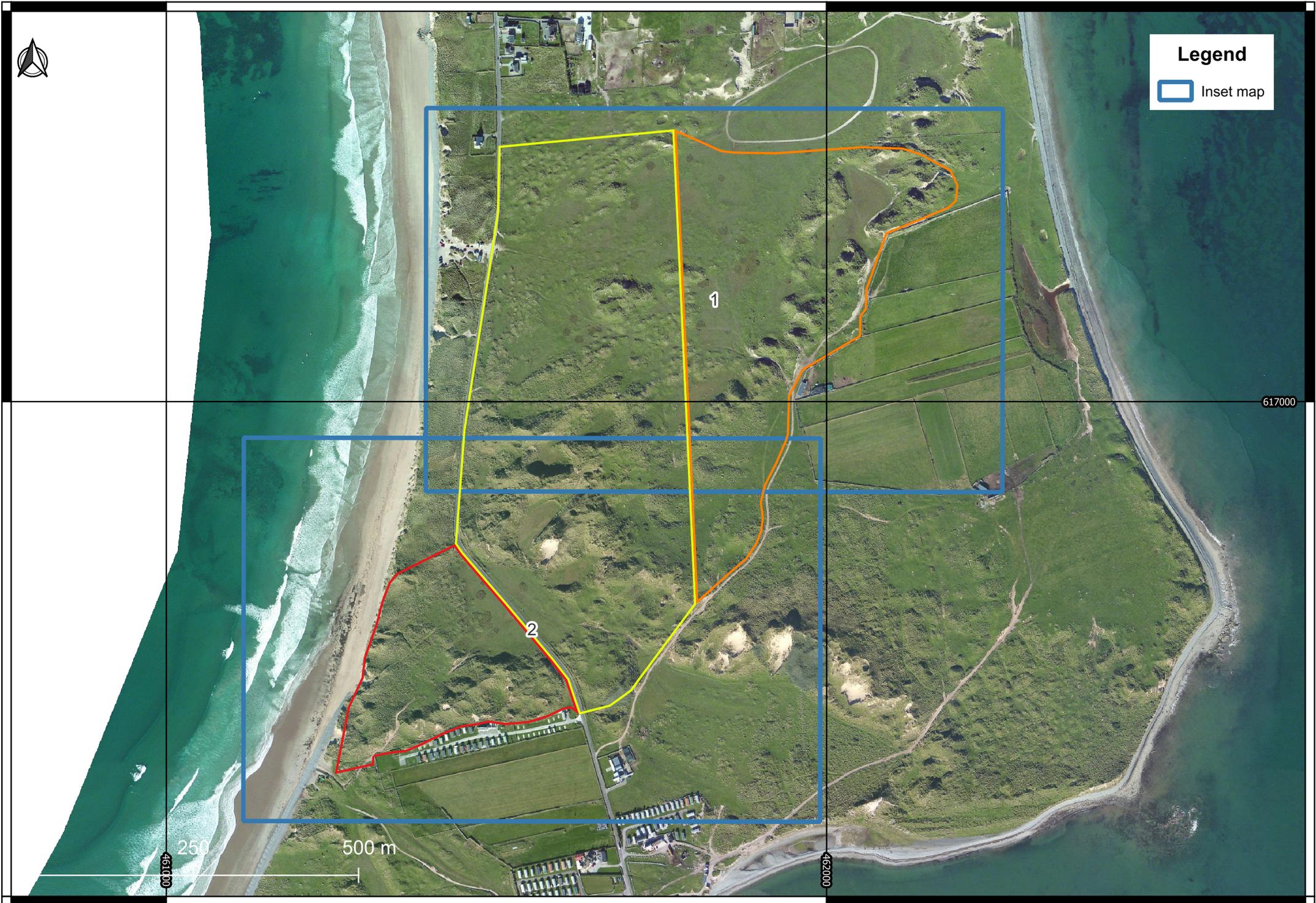
The site is currently seasonally grazed by moderate numbers of cattle, with less than a grazing unit per hectare.

Proposed management prescription for site

No changes are proposed to the current grazing regime at Kilshannig, which suits *V. angustior* very well.







Site report - Vertigo Monitoring

Vertigo angustior monitoring at Kinlackagh Bay

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM06 **County:** Donegal
SAC Site Code: 001975 Ballyhoorisky Point to Fanad Head **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed grey dune habitat at Kinlackagh, Ballyhieran Bay towards the north-west of the cSAC. Access is from the track from Eelburn Bridge.

Monitoring period	Date surveyed	Recorders
2019-2024	1-2 May 2024	John Brophy & Orla Daly
2013-2018	7-8 July 2014	Maria Long & Fionnuala O'Neill
2007-2012	5 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitats in which *Vertigo angustior* is present are the fixed grey dunes (Annex I 2130, CORINE 16.22) and the ecotone between the fixed dunes and the Eelburn Stream edge as it flows between the dunes (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The dominant vegetation is *Festuca rubra*, with *Ammophila arenaria* higher up, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Plantago lanceolata*, *Trifolium repens*, *Galium verum* and *Viola tricolour* lower down the slope, corresponding to SD8 of Rodwell (2000). Towards the river edge *Festuca rubra* and *Potentilla anserina* become co-dominant, corresponding to MG11 of Rodwell (1992). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , <i>Pilosella officinarum</i> , <i>Anacamptis pyramidalis</i> , <i>Plantago lanceolata</i> and other low growing herbs. Grassland with <i>Potentilla anserina</i> on the flatter zones. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior was not recorded at Kinlackagh Bay during the current survey, which is a significant decline from the previous rounds of monitoring. In 2013-2018, the snail was found widely across the site, though in low numbers, but had been lost from the Transect. The site does appear to have extensive areas that have some suitability for the snail, though much of this area (Polygon C, in particular) has developed more recently due to an apparent reduction in the grazing pressure. Increased grazing by sheep and cattle in Polygon A has reduced the suitability of the habitat in this area, and grazing is an issue across the entire site. The management of grazing is critical to the recovery of this site in order to allow any low-density population of *V. angustior* that may still be present on site to expand across the dunes one more. The control and removal of *Hippophae rhamnoides* before it spreads beyond its current patch is also extremely important for the dune habitat in general as well as for *V. angustior* and its habitat.

2013-2018:

There are large areas of habitat with good potential for *Vertigo angustior* at Kinlackagh, and the snail has been found in low to moderate numbers across Polygon A (2008 and 2014 surveys), as well as in low numbers in polygons B and C (2014 survey). Polygon A, the main and largest area, appears to have had varying management regimes, with no grazing apparent in 2006, very heavy usage and damage reported in 2008, and a mixed picture in 2014. In 2014, the after-effects of excessive grazing were apparent at the western end, with only scattered small plants of *Ammophila arenaria*, and little to no *Festuca rubra* thatch. Extensive, though localised, clumps of nettles pointed to past supplementary feeding sites, though no current supplementary feeding was noted. The only grazer noted was a single horse. At the eastern end things were quite different, with well-developed *Ammophila arenaria*, as well as *Festuca rubra* thatch. In fact, in places the vegetation was a little rank and under-grazed. Overall, however, there is good scope for the target species across this polygon, and small changes in management would be likely to yield good results for the species.

Polygon B is small and vulnerable, and being seriously damaged by human trampling. Fencing and the creation of a pathway to funnel human traffic is recommended immediately. The eastern section of Polygon C has good potential for *Vertigo angustior*, but management needs careful consideration here. Liaison with landowners/land managers is required to ensure the correct balance is met. Polygon D is likely to be too altered by agricultural use to hold much suitable habitat, either now or in the future.

2007-2012:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Bad. This represents the deterioration since 2006, when the site was assessed as Favourable.

Vertigo angustior monitoring at Kinlackagh Bay

This deterioration is considered to be a result of changes in grazing practice. The habitat and snail numbers in first 13m of the transect which runs down the dune slope are essentially unchanged, but the flatter areas have been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish.

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 618887 944482	Dune crest. ITM from 2024.	
End point:	ITM 618913 944536	Small dune ridge by stream. Infested by Hippophae rhamnoides. ITM from 2024.	
Transect length:	59	Direction:	SSW-NNE
Description:	The transect runs down a dune slope then across short turf into increasingly dense Hippophae rhamnoides on unfixed dune.		
Sampling frequency:	3 samples were taken from zones with the most suitable habitat		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	C 18943 44501	Dune crest	
End point:	C 18965 44554	Small dune ridge by stream	
Transect length:	59	Direction:	S-N
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	C 18945 44507	Top of a dune ridge	
End point:	C 18966 44552	The 1.5m drop down to the beach	
Transect length:	59	Direction:	S-N
Description:	The transect runs down a dune slope then across short turf into taller Festuca sward and then finally into unfixed dune with marram just before the beach. The transect runs towards a large white building on the headland across the bay.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	36.1403	Polygon A remains Suboptimal. The polygon has been subjected to cattle grazing in the east and sheep grazing in the west, which has greatly reduced the Festuca rubra litter, while supplementary feeding has introduced nutrients to the system in the east. The sheep-grazed area is generally dominated by bryophytes with limited Festuca rubra litter.
B	Suboptimal	0.8332	Polygon B is upgraded to Suboptimal. While part of the polygon is tightly grazed by sheep, the remainder is ungrazed and minimally impacted by people, with a Festuca rubra and Ammophila arenaria sward.
C	Suboptimal	16.6309	Polygon C is upgraded to Suboptimal, as the polygon contains a good amount of suitable habitat, likely as a result of reduced cattle grazing.
D	Unsuitable	60.6608	Polygon D remains Unsuitable. This area continues to be heavily impacted by agriculture, with grazing, trampling, compaction and supplementary feeding all having an effect.
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Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment

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Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	36.1403	Polygon A status unchanged. Largest area with best expanses of fixed dune habitat. Boundary changed slightly including removal of houses and curtilage and movement of eastern boundary to fenceline. (Area presented in 2007-2012 incorrect)
B	Suboptimal-Unsuitable	0.8342	Polygon B status dropped to Suboptimal-Unsuitable due to creation of car park and consequent excessive trampling. Boundary changed to remove car park and improved grassland to the west and the boundary between B and C changed to match fenceline
C	Suboptimal-Unsuitable	16.6328	Polygon C status upgraded to Suboptimal-Unsuitable due to discovery of potentially suitable habitat at eastern end along with finding of Vertigo angustior there. Boundary change between B and C to match fenceline.
D	Unsuitable	60.6608	Polygon D remains Unsuitable due to heavy agricultural use. Boundary change at border with A to match fenceline.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	16.438	Polygon A in central part of bay. In 2006, Area A had no evidence of grazing animals during the survey, and was managed by exposure and human trampling. However, in 2008, the flatter areas had been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish.
B	Sub-optimal with optimal areas	1.496	Polygon B western part of bay. Area B includes a car park area but has unmanaged dune grassland surrounding the tarmac area
C	Unsuitable	6.24	Polygon C towards western part of bay. Area C is heavily grazed by cattle including supplementary feeding.
D	Unsuitable	34.7	Polygon D at eastern end is managed by cattle grazing with the result that the habitat is compacted and has considerable bare areas, and also sheep grazing which results in a very tightly cropped sward with many bare areas.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	0m	16m	6.5m	36.5m	39.5m	0m	19.5m

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		10m	10.6m	9.2m	29.2m	39.8m		19.2m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		NA	29.2m	NA	29.8m	29.2m		29.8m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (3 samples)								
2019-2024	1	1	4m	0	0	0	Count	Suboptimal
2019-2024	1	2	8m	0	0	0	Count	Suboptimal
2019-2024	1	3	36m	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2013-2018 Transect 1 (3 samples)								
2013-2018	1	1	6.5m	0	0	0		Suboptimal-Unsuitable
2013-2018	1	2	12m	0	0	0		Suboptimal
2013-2018	1	3	44.5m	0	0	0		Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (6 samples)								
2007-2012	1	1	2m	0	0	0		
2007-2012	1	2	7m	0	0	4		

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2007-2012	1	3	13.5m	0	0	8
2007-2012	1	4	20m	0	0	0
2007-2012	1	5	34m	0	0	29
2007-2012	1	6	42m	0	0	1

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (6 samples)							
2019-2024	01	ITM 617339 944480	0	0	0	Count	Suboptimal
2019-2024	02	ITM 618356 944386	0	0	0	Count	Optimal
2019-2024	03	ITM 619402 944680	0	0	0	Count	Suboptimal
2019-2024	04	ITM 619477 944816	0	0	0	Count	Suboptimal
2019-2024	05	ITM 619129 944426	0	0	0	Count	Suboptimal
2019-2024	06	ITM 618665 944515	0	0	0	Count	Optimal
Monitoring period 2013-2018 (6 samples)							
2013-2018	01	C 17389 44504	1	0	1		Suboptimal
2013-2018	02	C 18412 44407	1	2	3		Optimal-Suboptimal
2013-2018	03	C 19451 44700	1	0	1		Optimal
2013-2018	04	C 19535 44827	1	0	1		Optimal
2013-2018	05	C 19185 44469	0	0	0		Optimal
2013-2018	06	C 18780 44463	0	0	0		Suboptimal
Monitoring period 2007-2012 (7 samples)							
2007-2012	01	C 18849 44475	0	0	17		
2007-2012	02	C 18776 44460	0	0	1		
2007-2012	03	C 18771 44519	0	0	1		
2007-2012	04	C 18758 44520	0	0	1		
2007-2012	05	C 19048 44562	0	0	1		
2007-2012	06	C 19141 44564	0	0	1		
2007-2012	07	C 19115 44580	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the grassland zones (0-45.7 m): on the dune slope (0-15.3 m), in the open central area (15.3-31.8 m), and the grassier zone near the fence (31.8-45.7 m)	Adult or sub-adult snails absent from the transect	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the grassland zones (0-45.7 m): on the dune slope (0-15.3 m), in the open central area (15.3-31.8 m), and the grassier zone near the fence (31.8-45.7 m)	Adult or sub-adult snails absent from the transect	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the grassland zones (0-45.7m): on the dune slope (0-15.3m), in the open central area (15.3-31.8m), and the grassier zone near the fence (31.8-45.7m)	Present in 2 zones	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
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2019-2024	Presence/Absence	Adult or sub-adult snails are present in 4 other locations with optimal habitat (should include sites to west and east of the transect) (minimum 6 samples)	Adult or sub-adult snails absent (from 6 samples)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in 4 other locations with optimal habitat (should include sites to west and east of the transect) (minimum 6 samples)	Adult or sub-adult snails are present in 4 other locations with optimal habitat (including sites to west and east of the transect) (6 samples)	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present in 4 other locations with optimal habitat (should include sites to west and east of the transect) (minimum 6 samples)	Present at 6 other locations	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was not recorded at Kinlackagh Bay during the current survey, which is a significant decline from 2007-2012 (ten positive out of thirteen) and 2013-2018 (four positive out of nine). Polygon A was once considered the core of the population, while the previous survey showed that the species was more widespread. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	Vertigo angustior is found across much of the site. The snail was found at five of thirteen sample locations in 2007-2012, including four samples on the transect, and four of nine in the current study, with none on the transect. This suggests a decline in the population in what was previously considered the core area, but also that the snail is more widely distributed at the site than previously known. Based on the criteria of Moorkens & Killeen (2011), the population assessment is Unfavourable Inadequate (amber).
2007-2012	The snail is very scattered in its distribution and there are few places where it is moderately frequent rather than present only in rather low numbers.

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	40m of habitat along the first 45m of the Transect is classed as Suboptimal or better	16m of habitat along the first 45m of the Transect is classed as Suboptimal or better	Fail
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 35-40 m of the first 45 m along the Transect	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 25.8 m of the first 45 m along the Transect	Fail
2013-2018	1	Habitat extent	40m of habitat along the first 45m of the Transect is classed as Suboptimal or better	20.6m of habitat along the first 45 m of the Transect is classed as Optimal or Sub-Optimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 35-40 m of the first 45 m along the Transect	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 25.8 m of the first 45 m along the Transect	Fail
2007-2012	1	Habitat extent	40m of habitat along the first 45m of the Transect is classed as Optimal or Sub-Optimal	28.5m is Sub-Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 35-40m of the first 45m along the Transect	28.5m is optimal wetness	Fail

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	More than 16ha of the site sub-optimal with optimal areas	53.6ha Suboptimal	Pass

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2013-2018	Habitat extent	More than 16ha of the site sub-optimal with optimal areas	36ha Suboptimal	Pass
2007-2012	Habitat extent	More than 16 ha of the site sub-optimal with optimal areas	36.4 ha Sub-optimal	Pass

Mon. period	Habitat Notes
2019-2024	Broadly the site has extensive areas of suitable habitat, and much of this appears to be due to a relaxation of cattle grazing in the western part of the site (Polygon C) since the previous round of monitoring. The sheep grazing in the vicinity of the transect has greatly reduced the habitat suitability here by grazing the sward tightly, with sparse <i>Ammophila arenaria</i> . Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	<p>Polygon A remains classified as Suboptimal. Some areas within this polygon are of excellent quality for <i>Vertigo angustior</i> (particularly to the east of the caravan park), but other areas appear to have been heavily grazed in the past (lots of dung evident and no thatch/litter layer).</p> <p>Polygon B was moved from Sub-optimal to Suboptimal-Unsuitable. This is because it is not grazed and is consequently quite rank, and most of it is too mobile (i.e. lots of loose sand) to be suitable for <i>Vertigo angustior</i>. Additionally, it is heavily trampled by humans.</p> <p>Polygon C has been upgraded from Unsuitable to Sub-optimal/Unsuitable due to the presence of a sizeable area of potentially good habitat (good <i>Festuca</i> thatch) at the eastern end. <i>Vertigo angustior</i> was found here in the current survey. Much of the polygon, however, remains less suitable, with an abundance of agricultural grasses.</p> <p>Polygon D remains Unsuitable and is tightly grazed by sheep in places. Based on the criteria of Moorkens & Killeen (2011), the habitat assessment is Unfavourable Bad (red) .</p>
2007-2012	There is a relatively large area which is potentially suitable for <i>V. angustior</i> , but most of it can only be classed as sub-optimal.

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Medium	Negative	99.6%	Grazing by cattle, sheep, rabbit and horses across the site, with supplementary feeding
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Low	Negative	12%	Caravan park with associated trampling
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	High	Negative	0.05%	<i>Hippophae rhamnoides</i> has invaded dunes at the public parking area west of Eelburn caravan park since previous monitoring
2013-2018	A04.01.01	intensive cattle grazing	Inside	High	Negative	20%	Presumed very heavy grazing in recent years (almost no litter, v high cover of old dung).
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	70%	Particularly optimal east of caravan park.
2013-2018	A04.02.03	non intensive horse grazing	Inside	Low	Positive	20%	One horse seen during survey.
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Low	Negative	5%	
2013-2018	A11	Agriculture activities not referred to above	Inside	Medium	Negative	25%	Grassy with <i>Holcus</i> , <i>Arrhenathrum</i> & <i>Dactylis</i> sward, cause unknown (reseeding/fertiliser?) Unsuitable habitat for <i>V. angustior</i> .
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Negative	0.5%	

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2013-2018	G02.08	camping and caravans	Inside	Low	Negative	3%	Caravan park. Long established but continued disturbance from residents.
2013-2018	I01	invasive non-native species	Inside	Low	Neutral	0.5%	About 4 small plants of Hippophae rhamnoides near
2013-2018	K01.01	Erosion	Outside	Low	Negative	3%	Erosion of soft cliff at site edge by sea.
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Low	Neutral	15%	Rabbit grazing.
2007-2012	A04.01.01	intensive cattle grazing	Inside	Medium	Negative	8ha	Prevalent throughout the best Vertigo angustior habitat and has increased since 2006.
2007-2012	A04.01.02	intensive sheep grazing	Inside	High	Negative	34.7ha	To the east of the site the 34.7 hectare block of habitat is unsuitable for V. angustior because it is very intensively cropped by grazing sheep, well short of the height of vegetation necessary for the species.
2007-2012	A05.02	stock feeding	Inside	Medium	Negative	2ha	
2007-2012	D01.01	paths, tracks, cycling tracks	Inside	High	Negative	2ha	Paths and desire lines from human trampling that concentrates in this area because of the caravans is also lowering the quality of the habitat.
2007-2012	D01.03	car parks and parking areas	Inside	Medium	Negative	1.5ha	The car park at the west of the site has destroyed some suitable habitat, and the human trampling that concentrates in this area due to the parking facility is exacerbating the negative effect in a wider area.
2007-2012	G02.08	camping and caravans	Inside	Medium	Negative	8ha	The caravan park in the centre of the site is located in some of the best natural habitat and thus has destroyed a considerable part of the habitat.

Mon. period Future Prospects Notes

- 2019-2024 The main pressure on the site is grazing by cattle, sheep, rabbits and horses, which extends across almost the entire site. A lesser impact in terms of scale is the recent invasion by Hippophae rhamnoides, which is having a high impact where it occurs but remains limited in extent for now. The Population of Vertigo angustior at this site has declined significantly since the 2007-2012 round of monitoring, to the point that it was not detected during the current survey and its future trend is considered to be Very Negative. The habitat appears to have improved in places due to reduced grazing, but declined in others due to increased grazing. For this reason, the future trend is considered Stable. Based on the current status of the site, the future trends and the pressures acting on the site, the Future Prospects are assessed as Unfavourable-Bad (red).
- 2013-2018 There are a diversity of management regimes and impacts across this site. Some areas receive optimal levels of grazing (for Vertigo angustior), while other areas are, or have been, overgrazed. This overgrazing removes the litter/thatch layer that Vertigo angustior requires. This problem of overgrazing seems to be lessening at this site, particularly in the western side of Polygon A. Human trampling is a big issue in Polygon B. The creation of a car park and the resulting trackways to the beach have rendered this small area less suitable for V. angustior. Overall, however, the habitat for the species at this site has probably marginally improved. This will only continue to be the case if appropriate grazing management is carefully applied. Based on the activities noted at the site, and their impacts on the habitat and species, the future prospects for Vertigo angustior at this site are classed as being Unfavourable Inadequate (amber). Should further and continued improvements be noted at the next assessment, this may be reviewed.

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Mon. period	Future Prospects Notes
2007-2012	As the major impacts (caravan park, car park) have been present for many years, the snail has survived in the remaining habitat, and therefore Future prospects have been assessed as Unfavourable inadequate (amber) rather than bad.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Amber	Red	Amber	Red
2007-2012	Amber	Red	Amber	Red

Mon. period	Overall Notes
2019-2024	Vertigo angustior was not recorded during the current survey, which resulted in a Population Assessment of Unfavourable-Bad (red), while the Habitat Assessment was also Unfavourable-Bad (red), due to the increased sheep grazing in the vicinity of the transect. These assessments, combined with future trends and pressures acting on the site, resulted in a Future Prospects assessment of Unfavourable-Bad (red) also. Based on these assessments, the Overall Assessment for Kinlackagh Bay is Unfavourable-Bad (red).
2013-2018	Based on the results of the population and habitat assessment (despite small signs of habitat improvement noted), along with the Future Prospects, the overall assessment for Kinlackagh Bay is Unfavourable Bad (red).
2007-2012	The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Bad. This represents the deterioration since 2006, when the site was assessed as Favourable

6. DISCUSSION

Monitoring period
2019-2024
<p>Discussion:</p> <p>Vertigo angustior was not recorded at Kinlackagh Bay during the current survey, which is a significant decline from the previous rounds of monitoring. In 2013-2018, the snail was found widely across the site, though in low numbers, but had been lost from the Transect. The site does appear to have extensive areas that have some suitability for the snail, though much of this area (Polygon C, in particular) has developed more recently due to an apparent reduction in the grazing pressure. Increased grazing by sheep and cattle in Polygon A has reduced the suitability of the habitat in this area, and grazing is an issue across the entire site. The management of grazing is critical to the recovery of this site in order to allow any low-density population of V. angustior that may still be present on site to expand across the dunes one more. The control and removal of Hippophae rhamnoides before it spreads beyond its current patch is also extremely important for the dune habitat in general as well as for V. angustior and its habitat.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>The management recommendations made in 2007-2012 and 2013-2018 should be reviewed to obtain an understanding of the historical management of the site. Grazing levels by sheep and cattle should be reduced in Polygon A, with sheep removed entirely, if possible. Supplementary feeding should also be ceased at the site, as it is bringing in nutrients and agricultural species. The general recommendation made by Moorkens & Killeen (2011) for grazing of fixed dune habitat for V. angustior is less than 0.8 livestock units (LU) per hectare in spring to autumn, with animals removed in winter. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. At the time of survey, Polygon C was being grazed at a level of within the range recommended by Chapman (2007), and this was seeing the habitat improve in suitability for V. angustior, and so should be maintained. The removal of the stand of Hippophae rhamnoides that has recently formed at the public car park to the west of Eelburn Caravan Park is vital to the protection of the dune habitat into the future, before the stand spreads even more. While sheep grazing is currently slowing its expansion further back into the dunes, it is still spreading further into the dunes from the seaward edge of the dune system.</p>

Vertigo angustior monitoring at Kinlackagh Bay

2013-2018

Discussion:

There are large areas of habitat with good potential for *Vertigo angustior* at Kinlackagh, and the snail has been found in low to moderate numbers across Polygon A (2008 and 2014 surveys), as well as in low numbers in polygons B and C (2014 survey). Polygon A, the main and largest area, appears to have had varying management regimes, with no grazing apparent in 2006, very heavy usage and damage reported in 2008, and a mixed picture in 2014. In 2014, the after-effects of excessive grazing were apparent at the western end, with only scattered small plants of *Ammophila arenaria*, and little to no *Festuca rubra* thatch. Extensive, though localised, clumps of nettles pointed to past supplementary feeding sites, though no current supplementary feeding was noted. The only grazer noted was a single horse. At the eastern end things were quite different, with well-developed *Ammophila arenaria*, as well as *Festuca rubra* thatch. In fact, in places the vegetation was a little rank and under-grazed. Overall, however, there is good scope for the target species across this polygon, and small changes in management would be likely to yield good results for the species.

Polygon B is small and vulnerable, and being seriously damaged by human trampling. Fencing and the creation of a pathway to funnel human traffic is recommended immediately. The eastern section of Polygon C has good potential for *Vertigo angustior*, but management needs careful consideration here. Liaison with landowners/land managers is required to ensure the correct balance is met. Polygon D is likely to be too altered by agricultural use to hold much suitable habitat, either now or in the future.

Monitoring recommendations:

This site should be monitored at a minimum of six-yearly intervals. Should management interventions be made, this should be increased to yearly or three-yearly so that changes can be assessed. The detailed monitoring protocol of Moorkens & Killeen (2011) should continue to be followed, but with the inclusion of Polygon C:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too dry, respectively
- Take at least 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (should include sites to west and east of the transect, and include polygons B and C) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

The western end of Polygon A had suffered from heavy management around 2007/2008 (see Moorkens and Killeen (2011) notes below), but in 2014 appeared to be recovering. Grazing by cattle, at low levels, is probably the optimal management for this polygon. Polygon B would greatly benefit from exclusion of humans, but this is likely to be difficult to implement given the building of a car park in this area. This polygon is very small in area and extremely vulnerable. The western half of the polygon does not currently contain any suitable *Vertigo angustior* habitat (tightly and heavily grazed) and appears to have been agriculturally improved. A small and sensitively designed and installed pathway should be created immediately to funnel human traffic from the car park to the beach and the remaining dune should be fenced off. The eastern end of Polygon C appears to receive close to optimal management for *Vertigo angustior* currently, and so no change is recommended here. The western section has an abundance of agricultural grasses and may not produce habitat suitable for the target species, even with changes to grazing management. However, no further intensification of agricultural management should be allowed.

Vertigo angustior monitoring at Kinlackagh Bay

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Bad. This represents the deterioration since 2006, when the site was assessed as Favourable.

This deterioration is considered to be a result of changes in grazing practice. The habitat and snail numbers in first 13m of the transect which runs down the dune slope are essentially unchanged, but the flatter areas have been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish.

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (should include sites to west and east of the transect, and include polygon B) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

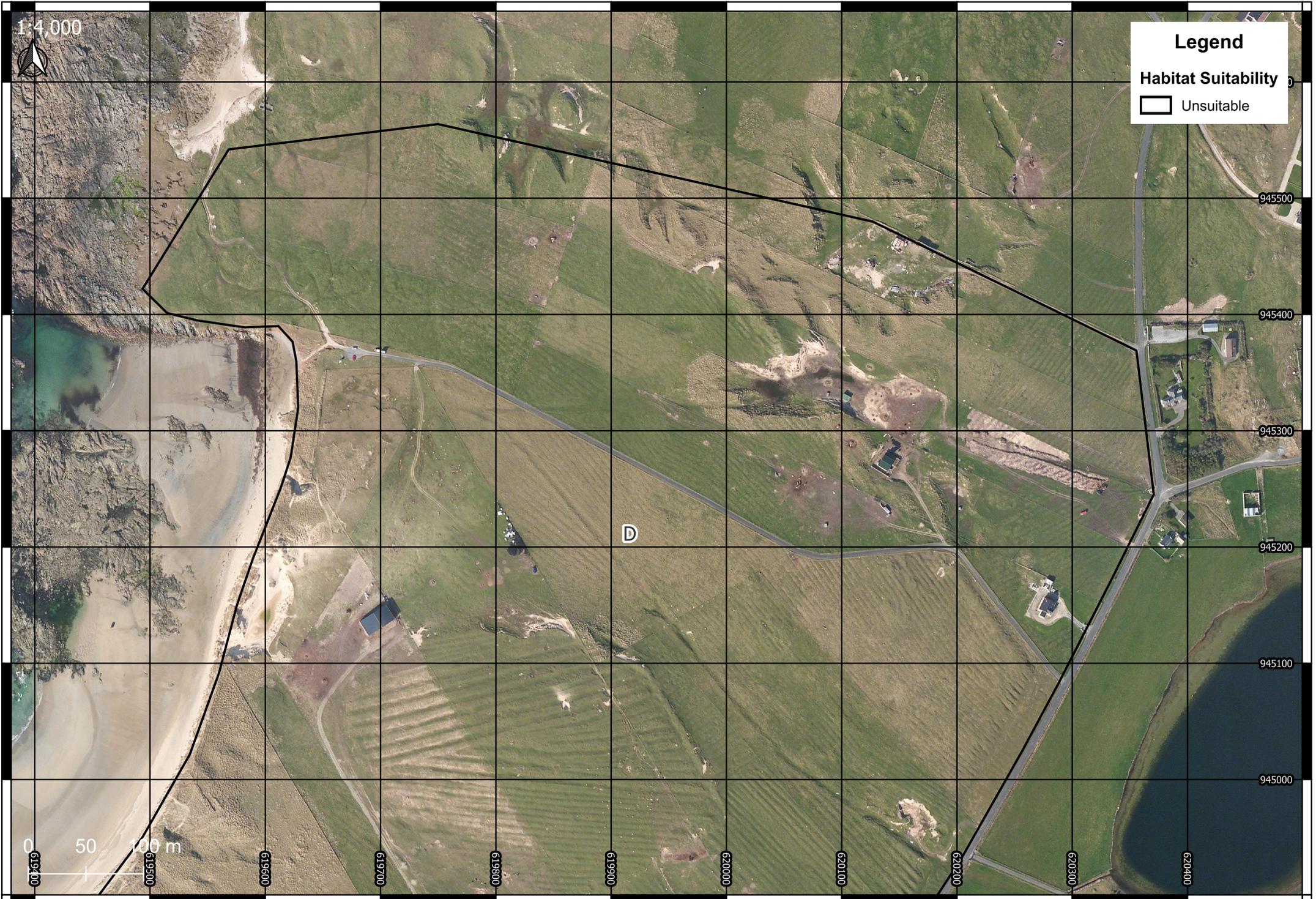
The site is divided into 4 polygon units A to D (Figure 1). The *V. angustior* habitat is largely restricted to A and B.

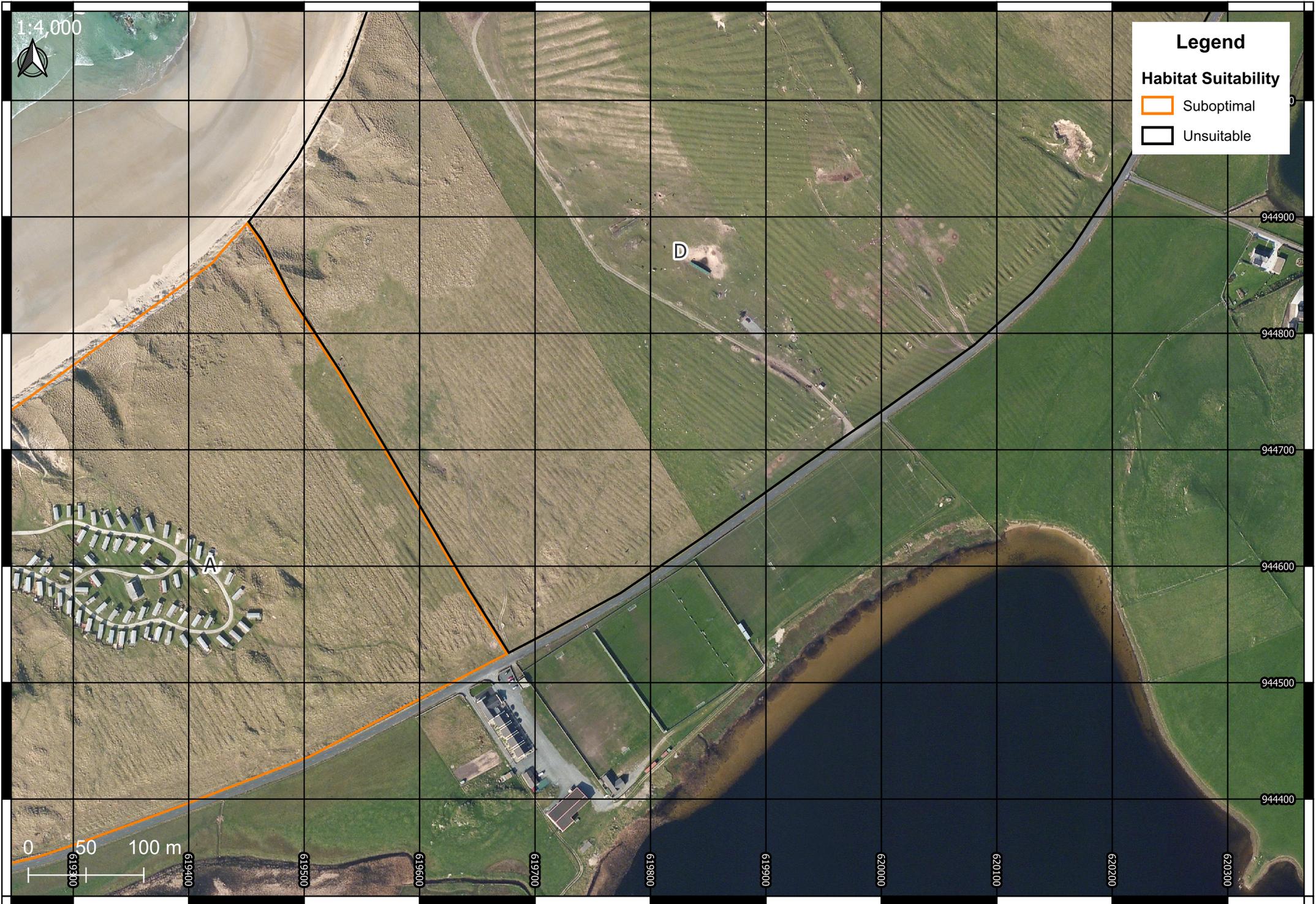
In 2006, Area A had no evidence of grazing animals during the survey, and was managed by exposure and human trampling. However, in 2008, the flatter areas had been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish. Area B includes a car park area but has unmanaged dune grassland surrounding the tarmac area. Area C is heavily grazed by cattle including supplementary feeding. Area D is managed by cattle grazing with the result that the habitat is compacted and has considerable bare areas, and also sheep grazing which results in a very tightly cropped sward with many bare areas.

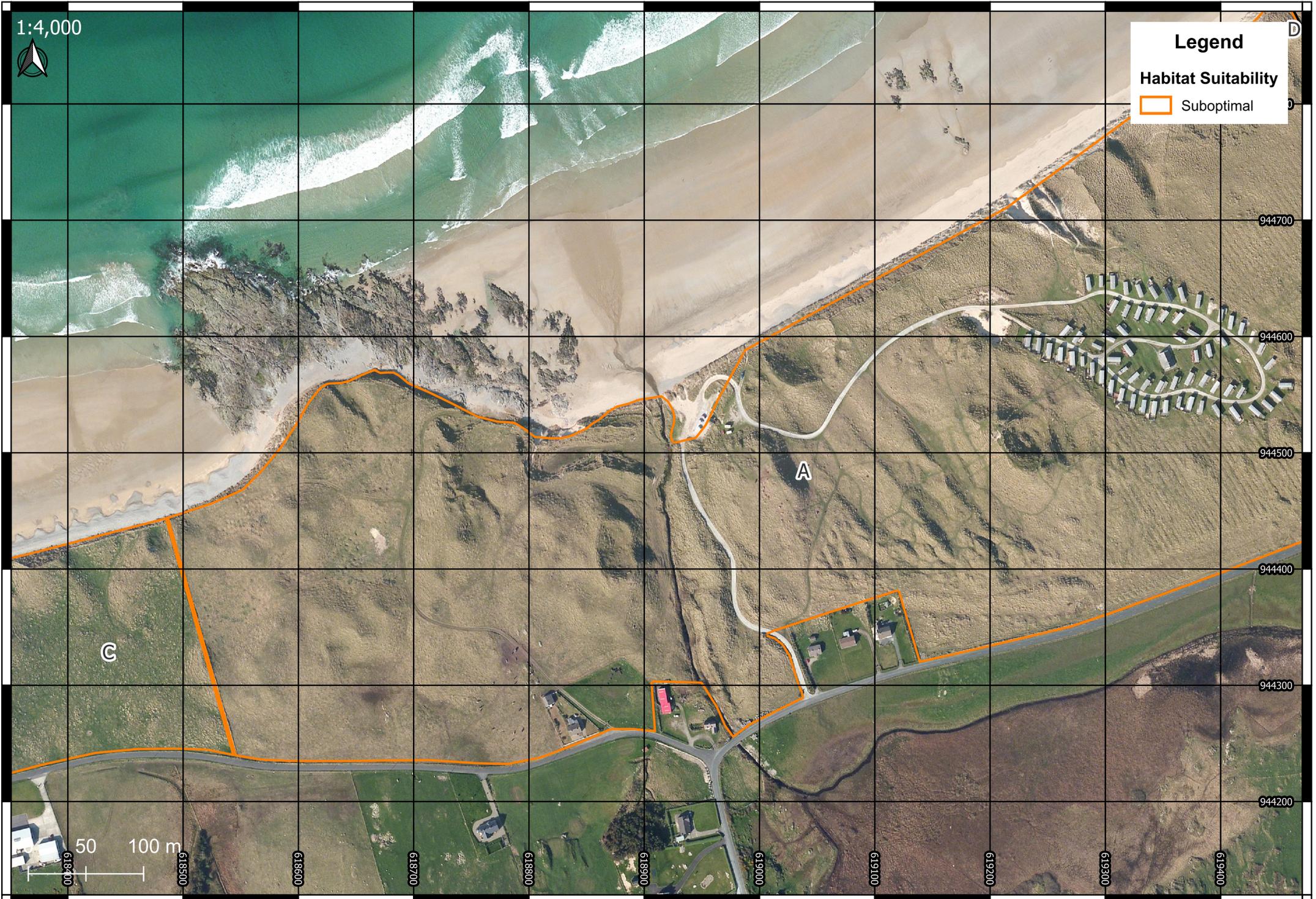
Proposed management prescription for site (from 2006 survey)

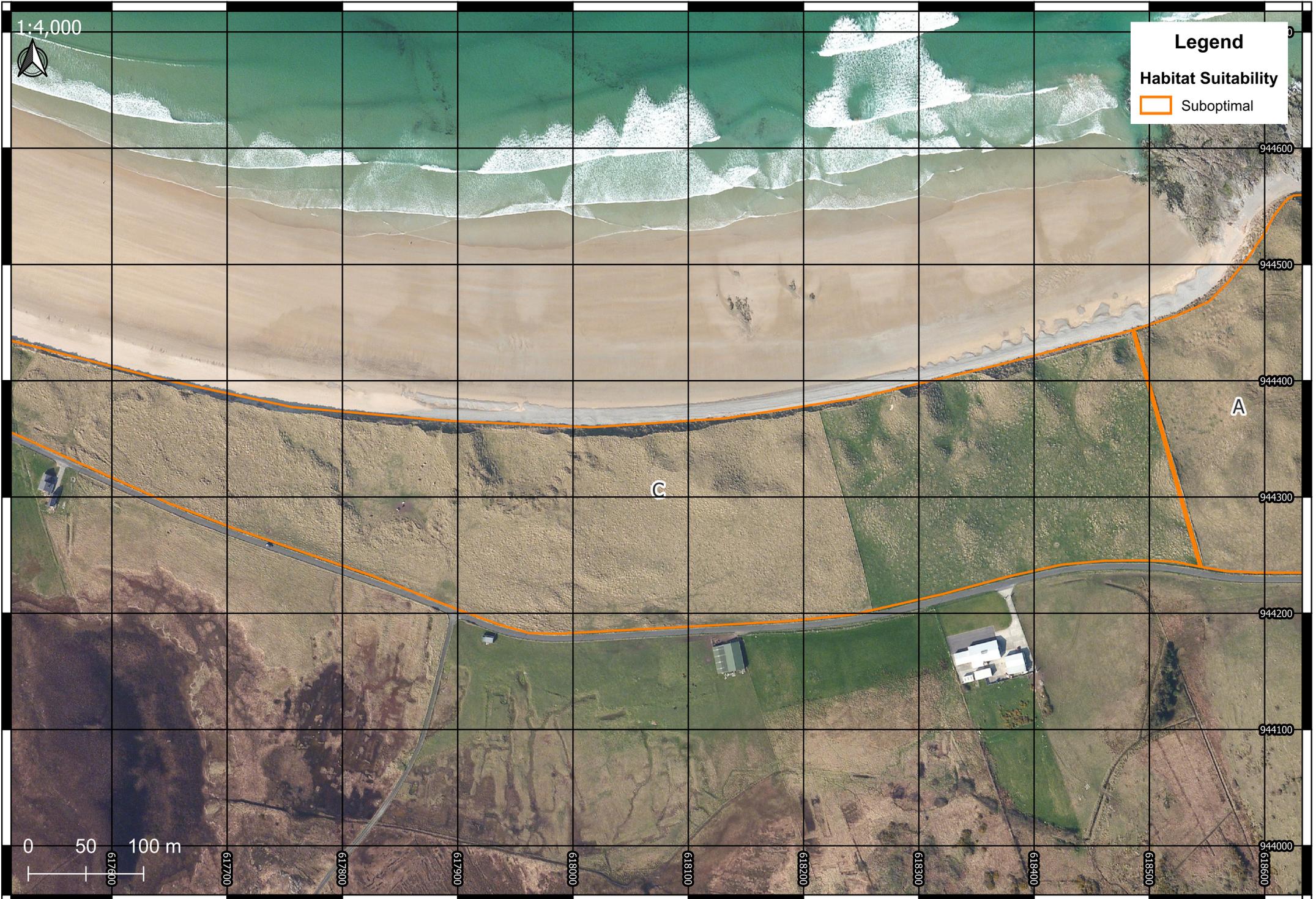
In 2006 it was considered that the management at Kinlackagh was only suitable for *V. angustior* in the recreational dune area to the east and west of the track at Eelburn Bridge, and at the car park area at the western part of the bay, and in both cases there is no grazing management but presumably some human trampling. It was recommended (Moorkens 2007) that this management (i.e. in polygon areas A and B) should continue during the 2007-2011 period. The results of the 2008 survey show that horses and cattle have been penned into the central fixed dune area and that they have caused considerable damage (see Section 6). It is strongly recommended that these grazing levels and associated activities are reduced.

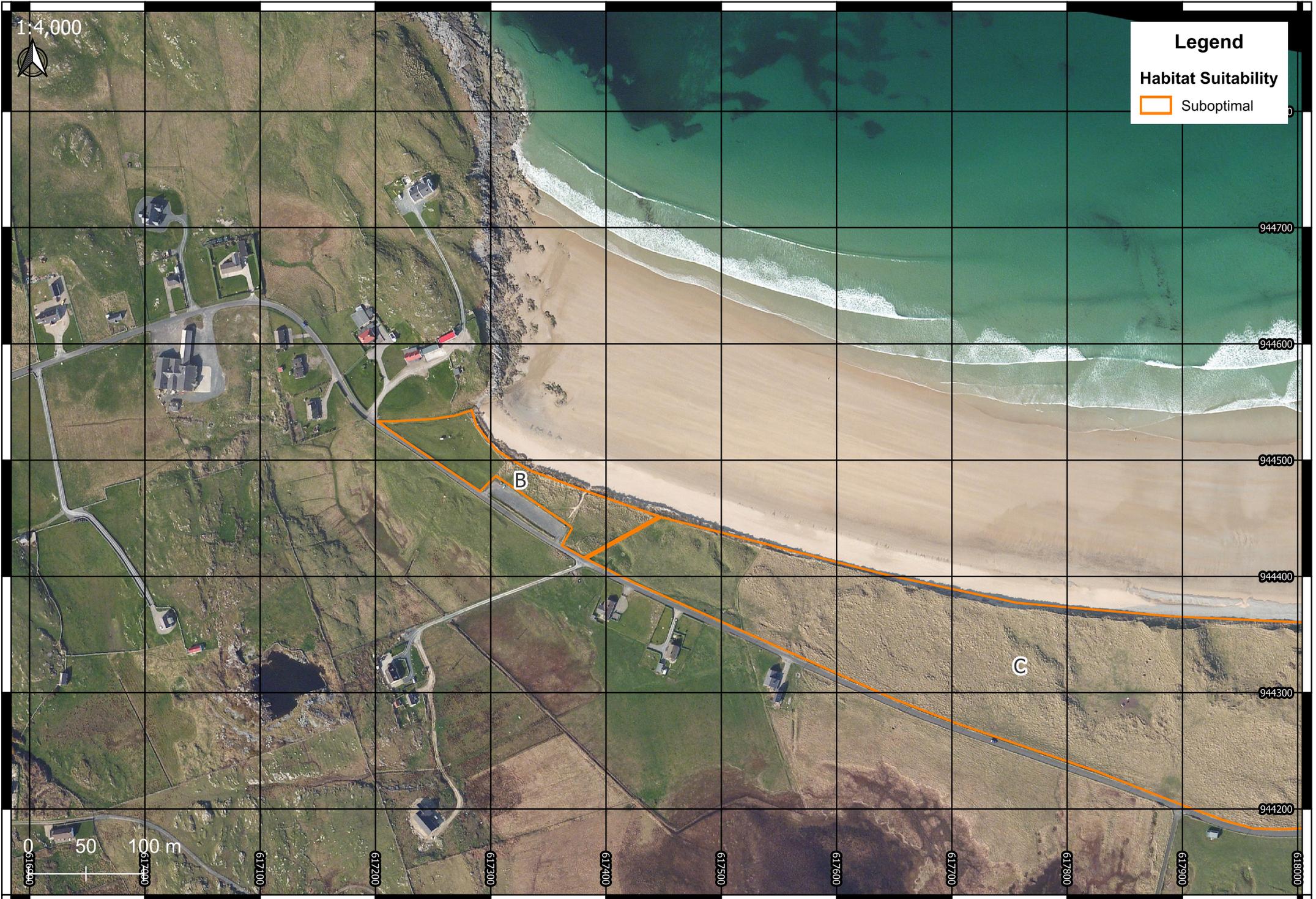
The habitats to the south of the main road have been fertilized and reseeded and are no longer natural habitats. While it was worth considering and surveying these areas because of the high water table nearby, the intensification of the land use there means that they should be excluded from *V. angustior* conservation effort. Similarly, an area within Area A has been degraded by use as a caravan park. The dune grassland of areas C and D areas have not been intensively destroyed by nutrient addition, but have been degraded by heavy grazing over time. As these areas are flatter and less mobile than the dune areas, it is not possible to say absolutely that it may be possible to increase *V. angustior* habitat, but there are pockets of potential habitat, and there is much nicer flora and vegetation structure in the less grazed areas, so a reduction in grazing would benefit the overall biodiversity. The intensity of grazing should be set to maximize the botanical potential as it is not naturally ideal habitat for the snail.

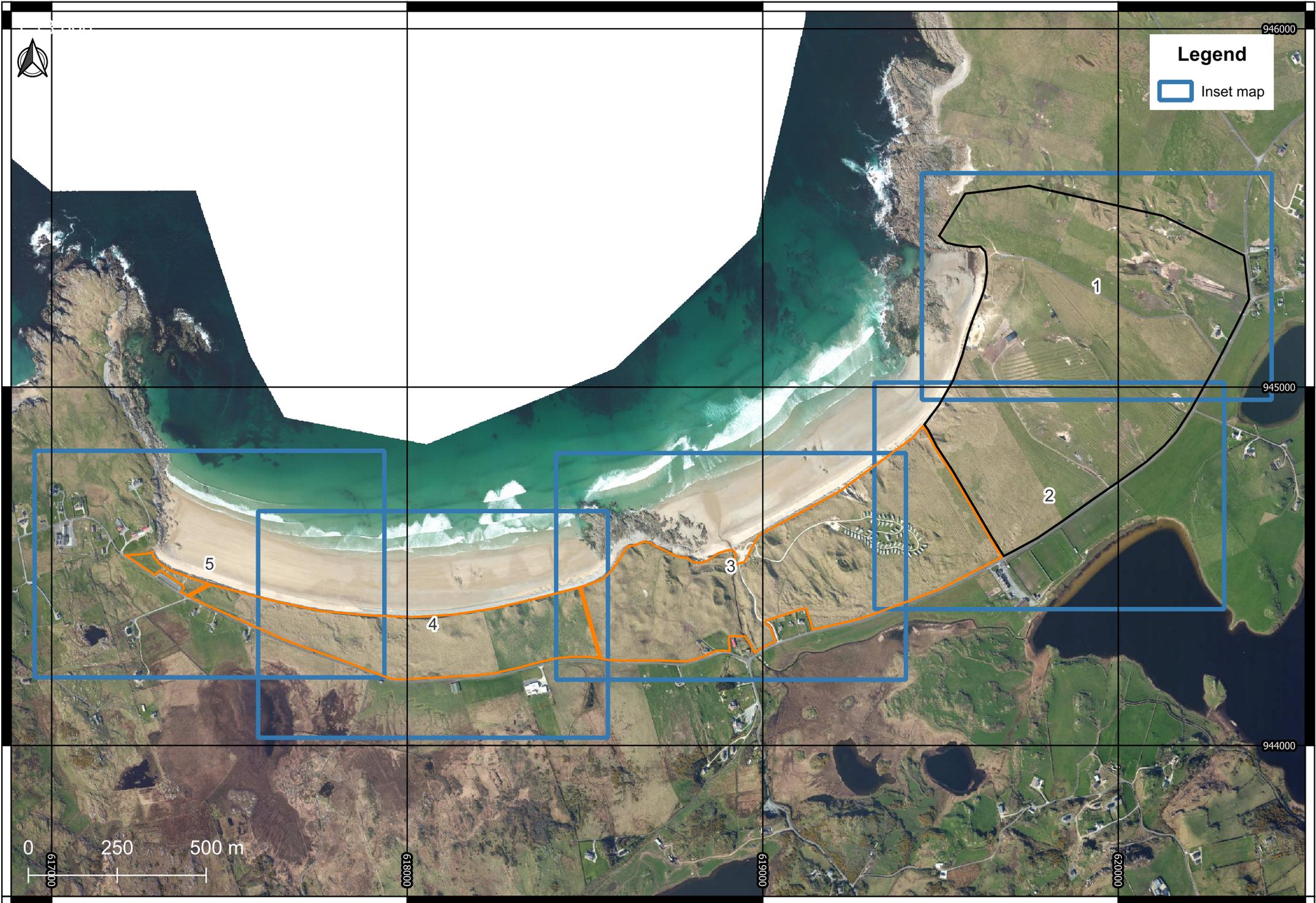












Site report - Vertigo Monitoring

Vertigo angustior monitoring at Maharees

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM07 **County:** Kerry

SAC Site Code: 002070 Tralee Bay and Magharees Peninsula **QI:** No

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed grey dune habitat. Note: the Kilshannig part of the SAC has been assessed separately.

Monitoring period	Date surveyed	Recorders
2019-2024	29 June - 1 July 2022	John Brophy & Jessica Hamilton
2013-2018	26-30 May 2014	John Brophy & Maria Long
2007-2012	29-31 July 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and dune. At Fermoyle there are areas of Transition marsh with *Iris*, *Caltha palustris*, *Lychnis flos-cuculi*, and *Mentha aquatica*. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is *Festuca rubra*, with some *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Pilosella officinarum*, *Trifolium repens*, *Galium verum*, and *Euphrasia* lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , <i>Euphrasia</i> sp. <i>Pilosella officinarum</i> and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. OR Ecotone between <i>Festuca</i> grassland and dune slack with <i>Potentilla anserina</i> OR Transition marsh with <i>Iris</i> , <i>Caltha palustris</i> , <i>Lychnis flos-cuculi</i> , <i>Mentha aquatica</i> (height 25-40cm). Under-storey of moss and litter
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior continues to occur at Maharees, but at very low density, with only a single individual recorded during the current survey. This is a decline from the low but reasonably stable population recorded across the previous two monitoring periods. The habitat of the site remains largely unchanged, with some minor improvements due to an apparent slight drop in grazing in places; however, while tufts of *Ammophila arenaria* have become more frequent in these areas, the *Festuca rubra* thatch remains underdeveloped. The main visible pressure acting on the site is cattle grazing, which is occurring across 90% of the site, with invasive species (*Hippophae rhamnoides*, *Acer pseudoplatanus* and *Phormium tenax*) and the golf course affecting a smaller area. The less evident, but possibly more important pressure acting on the site appears to be a reduction in rainfall, with local information suggesting that the dune slacks did not fill in the winter of 2021/22. This change in hydrology may be having negative effects on the habitat suitability across the site in terms of soil/litter moisture. As there is nothing that can be done to address this issue at the site level, the focus should be on managing the grazing levels across the site, which will mostly involve a reduction in the stocking level. Discussions should be had with the landowners with regard to this.

2013-2018:

This is a large site, with eight polygons, stretching over 9km. There are differing management regimes in almost all polygons, and this results in a mixed picture for *Vertigo angustior* across the site. The species was found in three polygons, F, G and H, all in the central portion of the site. The 2007-2012 survey found the species only in polygons E and F. Given that the species is also known from the adjacent site VaCAM05 (Kilshannig), it can be assumed that the species has a widespread, if sparse, distribution across suitable habitat in this area.

At this site, the main management issue is cattle grazing, and associated activities (e.g. supplementary feeding). Some polygons are under-grazed in places (e.g. western end of Polygon E), but more commonly, polygons are overgrazed (e.g. parts or all of E, G, H, I, J and K). In particular, the polygons at the west of the site (I, J, and K) are particularly heavily grazed, with K being so much so that there are extensive areas of bare ground. Clearly these areas are highly unsuitable for *Vertigo angustior* as it needs a build-up of moist thatch or moss. Within polygons D, E, G and H in particular, liaison is needed immediately with landowners/land managers to negotiate more appropriate management regimes.

Polygon F contains a golf course, and management here should remain as it is. The roughs are in excellent condition as *Vertigo angustior* habitat.

Vertigo angustior monitoring at Maharees

2007-2012:

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 460337 614548	Gatepost. ITM from 2022.	
End point:	ITM 459835 614562	ITM from 2022.	
Transect length:	509	Direction:	E-W
Description:	The transect runs across undulating fixed dune grassland, areas of unfixed dune, cattle-grazed grassland, and across the northern part of a slack. A range of vegetational habitats are present: Festuca-dominated, marram-dominated, and in places with a diversity of low-growing herbs.		
Sampling frequency:	6 samples were taken from zones with the most suitable habitat		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	Q 60357 14494	Gatepost.	
End point:	Q 59855 14485		
Transect length:	502	Direction:	W-E
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	Q 60357 14495	Old stone gate posts	
End point:	Q 59855 14484	Dune crest near coast	
Transect length:	506	Direction:	W-E
Description:	The transect runs across undulating fixed dune grassland, areas of unfixed dune, cattle-grazed grassland, and across the northern part of a slack. A range of vegetational habitats are present: Festuca-dominated, marram-dominated, and in places with a diversity of low growing herbs. Much of the habitat grazed by cattle and height ranges from 0.2m in height to over 0.5m.		
Sampling frequency:	Samples were taken at 13 locations approximately 40-50m apart along the transect principally from zones with the most suitable habitat (note: most of the first 250m was unsuitable with some sub-optimal areas, as was the c. 70m across the slack). At each location (Section 3.2), a brief description was made of the habitat and principal plant composition. Samples were either inspected in the field or analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
D	Suboptimal-Unsuitable	121.4264	Polygon D remains Suboptimal. This polygon contains large areas of dune slack, as well as unfixed dune habitat and Hippophae rhamnoides scrub.
E	Optimal-Suboptimal	31.3997	Polygon E has improved to Optimal-Suboptimal. Parts that were previously heavily grazed have remained ungrazed for 5+ years, allowing good habitat to develop.
F	Suboptimal	20.2577	Polygon F remains Suboptimal. The light rough around the golf course continues to provide good Vertigo angustior habitat. Storm-blown sand is affecting some areas closer to the coast.
G	Optimal-Suboptimal	9.3735	Polygon G has improved to Optimal-Suboptimal. Reduced grazing in some of the fields has resulted in a denser Festuca rubra sward with more Ammophila arenaria than before.
H	Suboptimal-Unsuitable	15.2513	Polygon H remains Suboptimal-Unsuitable. Areas nearest the coast have been heavily impacted by storm-blown sand, with suitable habitat limited to areas between dense Ammophila arenaria and more agricultural land further inland.
I	Suboptimal-Unsuitable	8.7476	Polygon I remains Suboptimal-Unsuitable, with only small patches of suitable Iris pseudacorus marsh habitat, with a bryophyte layer. There is substantial poaching by cattle.
J	Suboptimal-Unsuitable	9.4965	Polygon J remains Suboptimal-Unsuitable, with only small patches of suitable Iris pseudacorus marsh habitat, but with little to no bryophyte layer.

Vertigo angustior monitoring at Maharees

Monitoring Period: 2019-2024

Polygon	Habitat Type	Area (ha)	Comment
K	Unsuitable	5.8099	Polygon K remains Unsuitable due to heavy grazing, with abundant agricultural species and supplementary feeding.

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
D	Suboptimal-Unsuitable	115.2402	Polygon D status remains Suboptimal-Unsuitable. The polygon includes a large area of fixed dune and dune slacks.
E	Suboptimal	29.3513	Polygon E status is reduced from Optimal and Sub-optimal to Suboptimal. Fixed dune habitat has decreased in suitability in one fenced area due to overgrazing and one due to undergrazing, leading to rank vegetation.
F	Suboptimal	20.2577	Polygon F status remain Suboptimal. The polygon includes a links golf course, with suitable fixed dune habitat found in the rough, but lacking in fairways, greens and tracks.
G	Suboptimal	9.3735	Polygon G status is upgraded to Suboptimal due to presence of suitable fixed dune habitat within polygon, despite parts showing agricultural improvement.
H	Suboptimal-Unsuitable	15.2513	Polygon H status remains Suboptimal-Unsuitable. The polygon contains limited suitable fixed dune habitat and is mainly agriculturally improved, with areas affected by grass-specific herbicide.
I	Suboptimal-Unsuitable	8.7476	Polygon I status remains Suboptimal-Unsuitable. The habitat is more wet than other polygons, with marsh habitat dominating. Slight boundary change to reflect boundaries on the ground.
J	Suboptimal-Unsuitable	9.4965	Polygon J status remains Suboptimal-Unsuitable. The habitat is more wet than other polygons, with marsh habitat present. Slight boundary change to reflect boundaries on the ground.
K	Unsuitable	5.8099	Polygon K status downgraded to Unsuitable from Suboptimal and Unsuitable. Fixed dune habitat, but heavily overgrazed

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
D	Sub-optimal with unsuitable areas	121.4	Polygon D - Mosaic of Fixed and unfixed dunes, includes a large slack area (area 6.18 ha). Relatively heavily grazed by cattle.
E	Sub-optimal with unsuitable areas	31.47	Polygon E - Undulating fixed dune grassland, areas of unfixed dune, cattle-grazed grassland, and a large slack (area 2.05 ha)
F	Sub-optimal	20.26	Polygon F - area of fixed dunes and golf course
G	Sub-optimal with unsuitable areas	9.33	Polygon G - NE of Goulane - sub-optimal and unsuitable habitat, mostly unfixed coastal dunes
H	Sub-optimal with unsuitable areas	15.08	Polygon H - Goulane - sub-optimal and unsuitable habitat, mostly unfixed coastal dunes
I	Sub-optimal with unsuitable areas	9.01	Polygon I - Fermoye – sub-optimal and unsuitable habitat. Mostly Iris marsh with coastal strip of fixed dune habitat
J	Sub-optimal with unsuitable areas	9.81	Polygon J - Fermoye – sub-optimal and unsuitable habitat. Mostly Iris marsh with coastal strip of fixed dune habitat
K	Sub-optimal with unsuitable areas	5.81	Polygon K - Fermoye – sub-optimal and unsuitable habitat. Heavily grazed grassland

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	155m	156m	51m	147m	362m	65m	82m

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		97m	8m	100m	297m	105m	57m	340m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	see below	NA	approx 186m some of which is	NA	approx 320m			

Transect samples

Vertigo angustior monitoring at Maharees

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (6 samples)								
2019-2024	1	1	42m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	2	104m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	3	229m	0	0	0	Count	Suboptimal
2019-2024	1	4	323m	0	0	0	Count	Suboptimal
2019-2024	1	5	420m	0	0	0	Count	Suboptimal
2019-2024	1	6	460m	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 Transect 1 (6 samples)								
2013-2018	1	1	Q 60237 14488	0	0	0		Unsuitable
2013-2018	1	2	Q 60022 14482	0	0	0		Suboptimal-Unsuitable
2013-2018	1	3	Q 59958 14488	0	0	0		Suboptimal
2013-2018	1	4	Q 59933 14483	0	0	0		Optimal-Suboptimal
2013-2018	1	5	Q 59895 14478	0	0	0		Optimal-Suboptimal
2013-2018	1	6	Q 59865 14479	0	0	0		Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (13 samples)								
2007-2012	1	1	Q60357 14495 Heavily cattle-grazed grassland near gate posts with weeds	0	0	0		
2007-2012	1	2	Q60316 14493 Low fixed dune mound	0	0	0		
2007-2012	1	3	Q60291 14492 Mosaic of undulating mounds and cattle-trampled flats	0	0	0		
2007-2012	1	4	Q60240 14491 Mosaic of undulating mounds and cattle-trampled flats	0	0	0		
2007-2012	1	5	Q60198 14493 Generally unsuitable grassland habitat	0	0	0		
2007-2012	1	6	Q60166 14490 Generally unsuitable grassland habitat	0	0	0		
2007-2012	1	7	Q60103 14485 Good Festuca-dominated habitat	0	0	0		
2007-2012	1	8	Q60058 14487 Good Festuca-dominated habitat	0	0	0		
2007-2012	1	9	Q60018 14487 Boundary fence at edge of slack	0	0	0		
2007-2012	1	10	Q59984 14489 Boundary of slack	0	0	0		
2007-2012	1	11	Q59932 14484 Base of fixed dune	0	0	1		

Vertigo angustior monitoring at Maharees

2007-2012	1	12	Q59871 14475 Good fixed dune	0	0	1
2007-2012	1	13	Q59855 14484	0	0	0

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (11 samples)							
2019-2024	01	ITM 461692 615861	0	0	0	Count	Suboptimal
2019-2024	02	ITM 461597 615480	0	0	0	Count	Optimal-Suboptimal
2019-2024	03	ITM 460912 615380	0	0	0	Count	Suboptimal
2019-2024	04	ITM 459116 613902	0	0	0	Count	Optimal
2019-2024	05	ITM 459332 614065	0	0	0	Count	Optimal-Suboptimal
2019-2024	06	ITM 459345 613963	0	0	0	Count	Optimal
2019-2024	07	ITM 458786 613599	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	08	ITM 458803 613640	1	0	1	Count	Optimal-Suboptimal
2019-2024	09	ITM 458222 613062	0	0	0	Count	Suboptimal
2019-2024	11	ITM 454571 612294	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	12	ITM 454885 612254	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2013-2018 (12 samples)							
2013-2018	01	Q 61719 15805	0	0	0		Suboptimal
2013-2018	02	Q 61619 15427	0	0	0		Optimal-Suboptimal
2013-2018	03	Q 61019 15296	0	0	0		Suboptimal
2013-2018	04	Q 59137 13857	1	0	1		Optimal
2013-2018	05	Q 59448 14122	0	0	0		Optimal
2013-2018	06	Q 59366 13906	0	0	0		Optimal
2013-2018	07	Q 58736 13501	0	0	0		Suboptimal
2013-2018	08	Q 58830 13589	1	0	1		Optimal
2013-2018	09	Q 58247 13011	1	0	1		Optimal-Suboptimal
2013-2018	10	Q 53949 12384	0	0	0		Suboptimal-Unsuitable
2013-2018	11	Q 54588 12239	0	0	0		Suboptimal
2013-2018	12	Q 54916 12200	0	0	0		Suboptimal
Monitoring period 2007-2012 (13 samples)							
2007-2012	F1	Q 59448 11430	0	0	3		
2007-2012	F2	Q 59127 13858	0	0	4		
2007-2012	H1	Q 57613 12727	0	0	0		
2007-2012	H2	Q 57692 12771	0	0	0		
2007-2012	H3	Q 57777 12829	0	0	0		
2007-2012	H4	Q 57803 12835	0	0	0		
2007-2012	I1	Q 54844 12218	0	0	0		
2007-2012	I2	Q 54854 12273	0	0	0		
2007-2012	J1	Q 54302 12262	0	0	0		
2007-2012	J2	Q 54113 12311	0	0	0		
2007-2012	J3	Q 53924 12383	0	0	0		
2007-2012	J4	Q 53956 12377	0	0	0		

Vertigo angustior monitoring at Maharees

2007-2012	J5	Q 53958 12360	0	0	0
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5. CONDITION ASSESSMENT

5.1 Population Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in at least 4 locations on the Maharees transect with optimal and sub-optimal habitat (minimum 6 samples)	Adult or sub-adult snails absent from the Maharees transect (6 samples)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 4 locations on the Maharees transect with optimal and sub-optimal habitat (minimum 6 samples)	Adult or sub-adult snails absent from the Maharees transect (6 samples)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 4 locations on the Maharees transect with optimal and sub-optimal habitat (minimum 6 samples)	Present in 2 samples	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in at least 1 location in the fixed dune area of polygon F (golf course) (minimum 3 samples)	Adult or sub-adult snails absent from from the fixed dune area of polygon F (golf course) (3 samples)	Fail
2019-2024	Species extent	Adult or sub-adult snails are present in at least 1 location at Fermoyle (minimum 3 samples)	Adult or sub-adult snails are absent from Fermoyle (from 2 samples)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 1 location in the fixed dune area of polygon F (golf course) (minimum 3 samples)	Adult or sub-adult snails are present in 1 location in the fixed dune area of polygon F (golf course) (3 samples)	Pass
2013-2018	Species extent	Adult or sub-adult snails are present in at least 1 location at Fermoyle (minimum 3 samples)	Adult or sub-adult snails are absent from Fermoyle (from 3 samples)	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 1 location in the fixed dune area of polygon F (golf course) (minimum 3 samples)	Present in 2 samples	Pass
2007-2012	Species extent	Adult or sub-adult snails are present in at least 1 location at Fermoyle (minimum 3 samples)	Not found	Fail

Mon. period	Population Notes
2019-2024	Vertigo angustior was not recorded from the Transect in the current survey and was only recorded from a single spot sample across the site. While the snail was sparse across the site in the previous two rounds of monitoring, this represents an apparent decline in population. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	Fewer positive samples for Vertigo angustior were recorded in the current survey than in 2007-2012 (three compared to four). While the snail continues to be absent from Fermoyle (polygons I, J and K), it now also appears to be absent from the transect in Polygon E, and also Polygon D. The snail was present in polygons F (golf course), G and H. The snail was not recorded from polygons G and H in 2007-2012. Based on the criteria of Moorkens & Killeen (2011), the population assessment is Unfavourable Bad (red).
2007-2012	

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	At least 300m of the habitat along the transect should be classed as suboptimal or better	311m of the habitat along the transect classed as Suboptimal or better	Pass

Vertigo angustior monitoring at Maharees

2013-2018	1	Habitat extent	At least 300 m of the habitat along the transect should be classed as suboptimal or better	205 m of the habitat along the transect classed as Suboptimal or better	Fail
2007-2012	1	Habitat extent	At least 300m of the habitat along the transect should be classed as Optimal and sub-optimal	183m is optimal and sub-optimal	Fail

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 50% of the habitat in polygons D, E and F is classed as optimal and sub-optimal	49.7ha Optimal-Suboptimal and Suboptimal (30%)	Fail
2019-2024	Habitat quality	At least 50% of the habitat in polygons I and J (Fermoyle) is classed as optimal and/or sub-optimal	0.0ha Suboptimal or above	Fail
2013-2018	Habitat extent	At least 50% of the habitat in polygons D, E and F is classed as optimal and sub-optimal	49.7ha Optimal-Suboptimal and Suboptimal (30%)	Fail
2013-2018	Habitat quality	At least 50% of the habitat in polygons I and J (Fermoyle) is classed as optimal and/or sub-optimal	0.0ha Suboptimal or above	Fail
2007-2012	Habitat extent	At least 50% of the habitat in polygons D, E and F is classed as optimal and sub-optimal	Approx 16.5 ha, not including dune slacks	Fail
2007-2012	Habitat quality	At least 50% of the habitat in polygons I and J (Fermoyle) is classed as optimal and/or sub-optimal	100% is Unsuitable with sub-optimal areas	Fail

Mon. period	Habitat Notes
2019-2024	The period since the last round of monitoring has seen some improvement in the suitability of the habitat across parts of the site, including along the Transect, but generally the site remains similar to the last round. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	The habitat suitability classification remains unchanged from 2007-2012 in polygons D, F, H, I and J. Polygon E was dropped from Optimal and sub-optimal to Suboptimal due to changes caused by overgrazing by cattle in some areas and undergrazing in others. Polygon G was upgraded from Sub-optimal and unsuitable to Suboptimal due to an improvement in the habitat present, with more <i>Ammophila arenaria</i> with <i>Festuca rubra</i> thatch. Polygon K was dropped from Sub-optimal and unsuitable to Unsuitable due to the high level of grazing resulting in an extremely short sward unsuitable for <i>Vertigo angustior</i> . Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable Bad (red).
2007-2012	

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Medium	Negative	90%	Minimum 60 cattle in Polygon D, 12 in Polygon J and 23 in Polygon K at time of survey
2019-2024	PA25	Agriculture activities not referred to above	Inside	Medium	Negative	0.5%	Tractor tracks
2019-2024	PF03	Creation or development of sports, tourism and leisure infrastructure	Inside	Low	Neutral	10%	Golf Course

Vertigo angustior monitoring at Maharees

2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	High	Negative	5%	Hippophae rhamnoides, Acer pseudoplatanus, Phormium tenax
2019-2024	PI03	Problematic native species	Inside	High	Negative	1%	Pteridium aquilinum
2019-2024	PJ03	Changes in precipitation regimes due to climate change	Inside	High	Negative	100%	Low rainfall in 2021/22 resulted in slacks remaining dry. Vegetation often dry, even after rain due to wind.
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	Low	Negative	1%	Most of western boundary of site subject to erosion. Adjacent habitat often impacted by storm-blown sand.
2013-2018	A04.01.01	intensive cattle grazing	Inside	High	Negative	4%	Supplementary feeding and heavy grazing
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	90%	
2013-2018	A07	use of biocides, hormones and chemicals	Inside	High	Negative	5%	Grass-killing herbicide
2013-2018	C01.01	Sand and gravel extraction	Inside	High	Negative	1%	
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Medium	Negative	1%	
2013-2018	G02.01	golf course	Inside	Medium	Neutral	10%	V. angustior present on golf course since 2008
2013-2018	H05.01	garbage and solid waste	Inside	Low	Negative	1%	300 sq. m
2013-2018	I01	invasive non-native species	Inside	High	Negative	3%	Sea Buckthorn - Hippophae rhamnoides
2013-2018	I02	problematic native species	Inside	Medium	Negative	1%	Bracken - Pteridium aquilinum
2013-2018	K01.01	Erosion	Inside	High	Negative	1%	
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Medium	Negative	1%	Rabbits
2007-2012	A04.01.01	intensive cattle grazing	Inside	High	Negative	24ha	
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	160ha	While the cattle grazing regime cannot be classed as intensive in polygons D and E, the level of grazing is too intensive in its nature to meet conservation objectives for a large population of this species into the future.

Vertigo angustior monitoring at Maharees

2007-2012	G02.01	golf course	Inside	Low	Neutral	20.26ha	The grazing and damage in polygons I, J and K is severe. At present, only the higher dune areas of the cattle grazed areas and the golf course rough areas are supporting <i>V. angustior</i> .
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Mon. period	Future Prospects Notes
2019-2024	A range of pressures were identified as having a negative influence on the <i>Vertigo angustior</i> habitat at Maharees. The most important of these include grazing by cattle and drying out due to reduced rainfall. It was noted by locals that the dune slacks did not fill in the winter of 2021/22, which may be having negative effects on the habitat suitability across the site in terms of soil/litter moisture. The invasive species <i>Hippophae rhamnoides</i> has also covered a significant area of fixed dune (approx. 5% of the site), with <i>Acer pseudoplatanus</i> and <i>Phormium tenax</i> also present. The population of <i>V. angustior</i> has declined to the point that only a single snail was recorded in the current survey, so the Population Assessment is Unfavourable-Bad (red) with the future trend considered to be Negative. The Habitat Assessment is also Unfavourable-Bad (red), but is considered to be Stable. Based on these assessments and their future trends in light of the current pressures acting on the site, the Future Prospects for Maharees are assessed as being Unfavourable-Bad (red).
2013-2018	<p>The main activity affecting the <i>Vertigo angustior</i> habitat at the Maharees is grazing by cattle. The grazing level is too high across much of the habitat, in particular at Fermoy. Polygon E includes areas of undergrazing and overgrazing, separated by fencing. Other activities include a golf course, which is probably having a neutral effect by providing optimal areas within unsuitable ones, the use of biocides, which is having a high negative effect, and dumping.</p> <p>The management of cattle was identified as a serious concern by Moorkens & Killeen (2011), and it continues to be the dominant issue at the site. Based on the effect this is having on the <i>Vertigo angustior</i> habitat at the site, and the fact that these effects can be altered by changes in the management regime, the Future Prospects are considered to be Unfavourable Inadequate (amber).</p>
2007-2012	<p>Future Prospects have been assessed by examining how the impacts are affecting the other attributes (i.e. population and habitat for the species) and their impact if they continue unchecked.</p> <p>Future prospects should balance positives and negatives to determine whether the species will survive at this site for the foreseeable future. While the cattle grazing regime cannot be classed as intensive in polygons D and E, the level of grazing is too intensive in its nature to meet conservation objectives for a large population of this species into the future. The grazing and damage in polygons I, J and K is severe. At present, only the higher dune areas of the cattle grazed areas and the golf course rough areas are supporting <i>V. angustior</i>. The Future Prospects have been assessed as Unfavourable inadequate (amber)</p>

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Red	Red	Amber	Red
2007-2012	Red	Red	Amber	Red

Mon. period	Overall Notes
2019-2024	The reduction in the number of positive <i>Vertigo angustior</i> samples means the Population Assessment remains Unfavourable-Bad (red), as does the Habitat Assessment. Due to the current pressures acting on this site and the lack of any positive trend for these factors, the Future Prospects are also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Maharees is Unfavourable-Bad (red).
2013-2018	The reduction in the number of positive samples, combined with the overall deterioration in the suitability of the habitat at the site for <i>Vertigo angustior</i> and its unfavourable Future Prospects results in an overall assessment of Unfavourable Bad (red).
2007-2012	The baseline condition assessment in the Maharees part of the site can be determined by how well the site meets the key targets for the attributes associated with this species. Very little of the site is in good condition for <i>V. angustior</i> , and the snail is extremely locally distributed and present in very low numbers. It could not be found at Fermoy from where there were several previous records. The overall Condition is Unfavourable (red).

6. DISCUSSION

Monitoring period
2019-2024

Vertigo angustior monitoring at Maharees

Discussion:

Vertigo angustior continues to occur at Maharees, but at very low density, with only a single individual recorded during the current survey. This is a decline from the low but reasonably stable population recorded across the previous two monitoring periods. The habitat of the site remains largely unchanged, with some minor improvements due to an apparent slight drop in grazing in places; however, while tufts of Ammophila arenaria have become more frequent in these areas, the Festuca rubra thatch remains underdeveloped. The main visible pressure acting on the site is cattle grazing, which is occurring across 90% of the site, with invasive species (Hippophae rhamnoides, Acer pseudoplatanus and Phormium tenax) and the golf course affecting a smaller area. The less evident, but possibly more important pressure acting on the site appears to be a reduction in rainfall, with local information suggesting that the dune slacks did not fill in the winter of 2021/22. This change in hydrology may be having negative effects on the habitat suitability across the site in terms of soil/litter moisture. As there is nothing that can be done to address this issue at the site level, the focus should be on managing the grazing levels across the site, which will mostly involve a reduction in the stocking level. Discussions should be had with the landowners with regard to this.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

As noted in the reporting from 2007-2012 and 2013-2018, the livestock management across the whole site needs to be altered to benefit Vertigo angustior, where possible (though not at the expense of the Qualifying Interests of the SAC). Grazing levels by cattle should be reduced in Polygons A and supplementary feeding should also be ceased at the site, as it is bringing in nutrients and agricultural species. The general recommendation made by Moorkens & Killeen (2011) for grazing of fixed dune habitat for V. angustior is less than 0.8 livestock units (LU) per hectare in spring to autumn, with animals removed in winter. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. At the time of survey, Polygon D was being grazed at a level between the range recommended by Chapman (2007) and that of Moorkens & Killeen (2011), and this was seeing the habitat improve slightly in terms of suitability for V. angustior, though it is not known how this stocking level varies across the full year. The current stocking levels in polygons J and K appear to be far too high from a conservation perspective, both in terms of the situation on the ground and compared to recommended stocking levels. It is notable that the grazing level in Polygon G has reduced to a level that has seen the status of this polygon increase and also the only positive sample from the current survey was in this polygon. Discussions with landowners will be required to see if these stocking levels can be altered for the benefit of the habitat. The removal of Hippophae rhamnoides from this site would be a major undertaking given the area it covers and the risk of exposing the dunes to blow-outs; however, the threat that it will continue to expand and impact on the wider dune habitat, as well as the V. angustior habitat, means that its possible removal should be investigated.

Vertigo angustior monitoring at Maharees

2013-2018

Discussion:

This is a large site, with eight polygons, stretching over 9km. There are differing management regimes in almost all polygons, and this results in a mixed picture for *Vertigo angustior* across the site. The species was found in three polygons, F, G and H, all in the central portion of the site. The 2007-2012 survey found the species only in polygons E and F. Given that the species is also known from the adjacent site VaCAM05 (Kilshannig), it can be assumed that the species has a widespread, if sparse, distribution across suitable habitat in this area.

At this site, the main management issue is cattle grazing, and associated activities (e.g. supplementary feeding). Some polygons are under-grazed in places (e.g. western end of Polygon E), but more commonly, polygons are overgrazed (e.g. parts or all of E, G, H, I, J and K). In particular, the polygons at the west of the site (I, J, and K) are particularly heavily grazed, with K being so much so that there are extensive areas of bare ground. Clearly these areas are highly unsuitable for *Vertigo angustior* as it needs a build-up of moist thatch or moss. Within polygons D, E, G and H in particular, liaison is needed immediately with landowners/land managers to negotiate more appropriate management regimes.

Polygon F contains a golf course, and management here should remain as it is. The roughs are in excellent condition as *Vertigo angustior* habitat.

Monitoring recommendations:

The site should be monitored broadly following the recommendations of Moorkens & Killeen (2011) on a 3 yearly basis, but due the fact that it is a large site with complex management, extra spot samples are required and this requirement has been added below. Prescription as follows:

- Describe habitat and take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take at least 3 samples from areas with the most suitable habitat in Polygon F (golf course) and analyse for molluscan composition
- Describe habitat and take at least 6 samples from areas with the most suitable habitat in polygons D, G and H.
- Describe habitat and take at least 3 samples from areas with the most suitable habitat (dune and transition marsh) in polygons I and J at Fermoyle and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Different management actions are required for different areas/polygons at the Maharees. The level of grazing in polygons D and E should be reduced and supplementary feeding removed in order to allow the vegetation to recover to a more natural state for fixed-dune grassland. However, the area to the west of the fence in Polygon E needs to have grazing reintroduced. The management of the golf course (Polygon F) should continue as is, as the current situation provides *Vertigo angustior* with suitable habitat in areas off the greens and fairways. Polygons G and H have complex management, much of it detrimental, not only to *Vertigo angustior*, but to sand dune habitats in general. Immediate negotiation with the landowner/land manager is needed to stop the use of biocides, to remove excessive supplementary feeding and to generally bring land use practices back in line with those appropriate for sand dunes in a protected site. Polygons I, J and K at Fermoyle are suffering from overgrazing, particularly Polygon K, which is very tightly grazed with much bare ground and *Ammophila* limited to steep slopes down to the shore, and these areas are somewhat sandy and mobile. Animals should be removed from polygons I, J and K for a period to allow the recovery of the vegetation and an increase in the litter and *Festuca rubra* thatch .

Vertigo angustior monitoring at Maharees

2007-2012

Discussion:

The site at Maharees is very large with extensive undulating dune habitat that could support a large population of *V. angustior*. However, the agricultural management at the south of the site is very intensive, which is inimical to a species that requires a build up of damp litter in which to survive. The more extensive cattle grazing in the northern end of the site results in severe cropping in the flat areas that the cattle favour and thus the snail is being restricted to the more extreme high dunes, where the cattle are less likely to graze. The snails are thus reduced to a small area between the unfixed coastal habitat and the grazed coastal grassland. With less grazing, the snail should be able to spread to a much wider area.

Silage storage, supplementary feeding and widespread nutrient enriched weedy areas were a feature of the southern polygons.

The golf course area, although having many areas of intensively managed grassland, retains areas of rough that are maintained by exposure and trampling and remain suitable for *V. angustior*. The condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance, is unfavourable, therefore it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management.

Monitoring recommendations:

The Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance, is unfavourable, therefore it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 201. Methods (see Section 3 of main report for full details) Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Describe habitat and take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take at least 3 samples from areas with the most suitable habitat in Polygon F (golf course) and analyse for molluscan composition
- Describe habitat and take at least 3 samples from areas with the most suitable habitat (dune and transition marsh) at Fermoyle and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

The site is part of the Tralee Bay and Maharees Peninsula, west to Cloghane cSAC, but the snail is not a qualifying feature. The site should be reviewed with the current qualifying interests in mind to assess whether the management of the site is appropriate for these interests. If future management were to become less intensive, this could benefit the snails at the site.

Management recommendations:

Existing Management

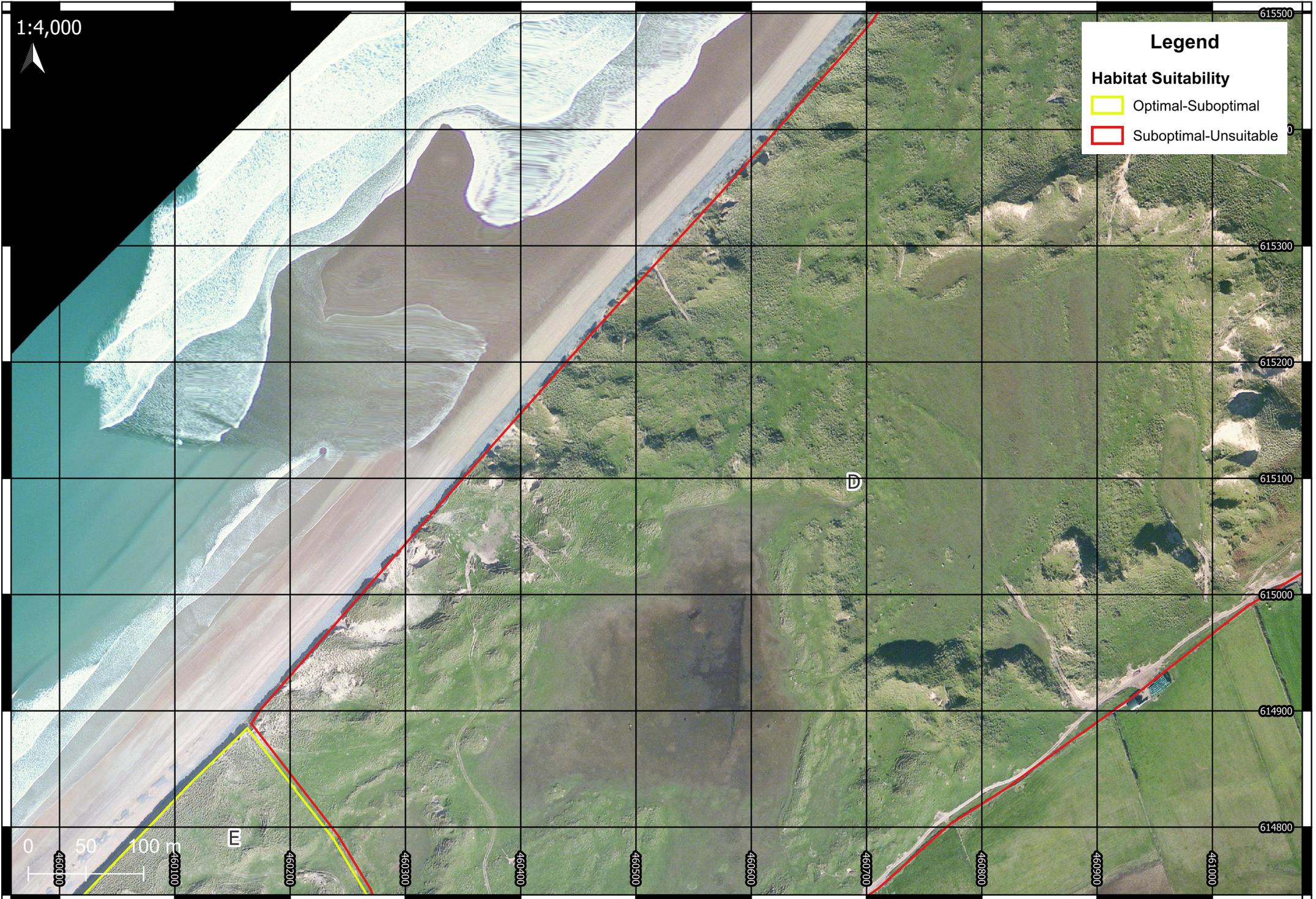
The existing management of areas of *V. angustior* at present is extensive cattle grazing (higher than the carrying capacity of *V. angustior* habitat) in Polygons D and E, golf course rough in Polygon F, unmanaged in Polygons G and H and intensive cattle grazing in Polygons I, J and K.

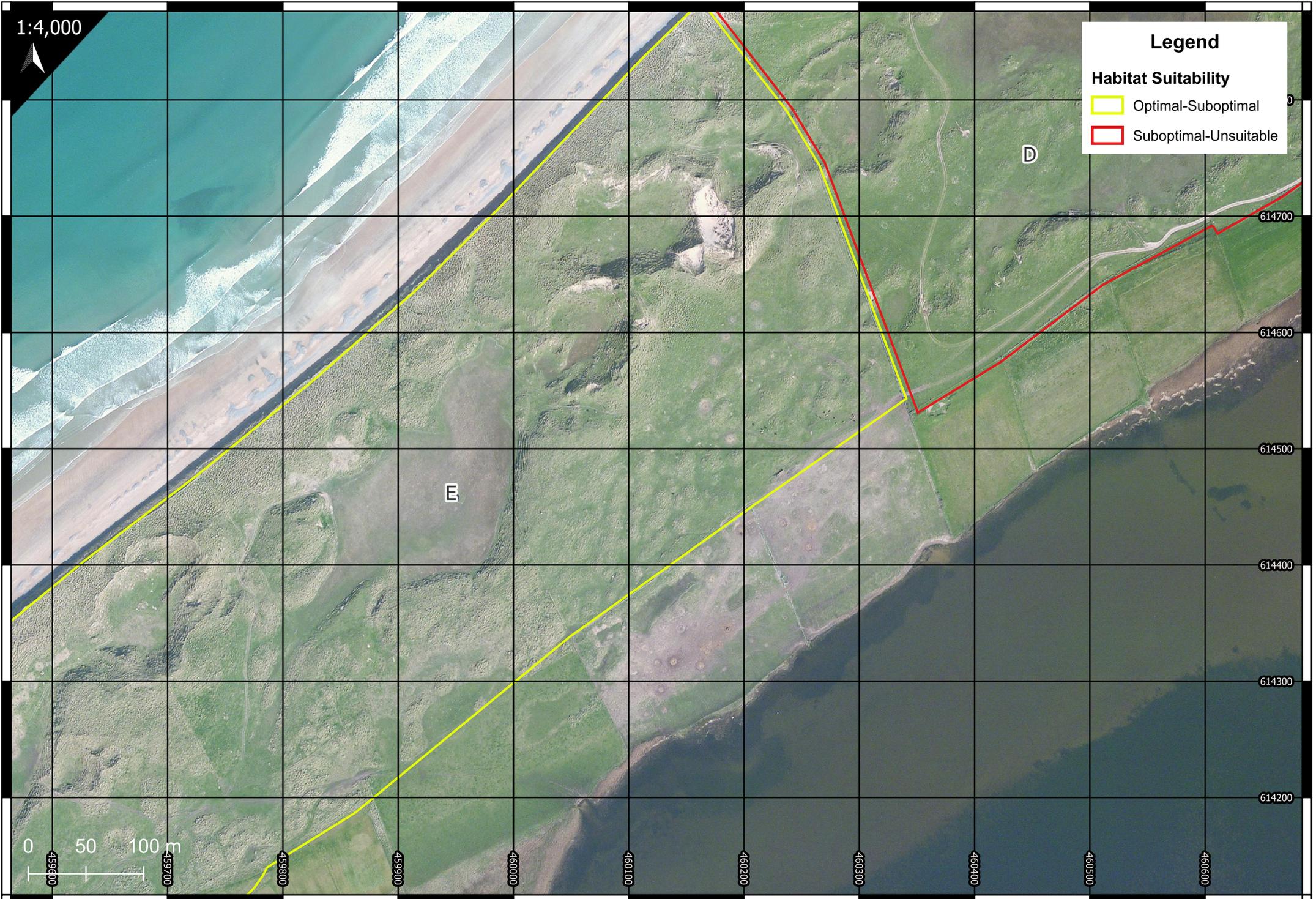
7.22 Proposed management prescription for site

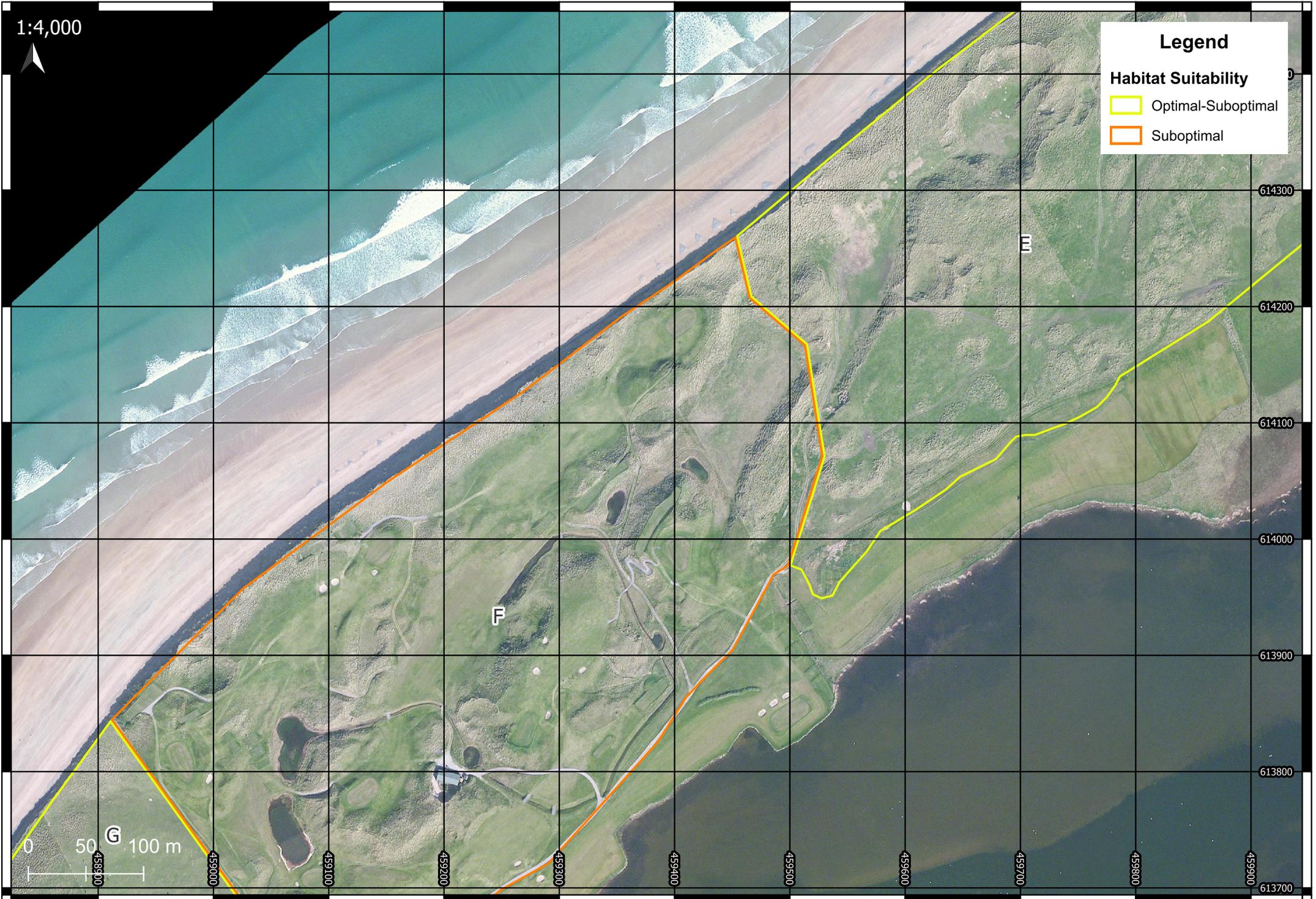
The management of the entire site needs to be reviewed with all qualifying interests of the cSAC in mind, considering that *V. angustior* is not a qualifying interest at present. The damage to the northern part of the site means that the nutrient levels incurred would be difficult to recover, but Polygons D and E would benefit from a reduction in grazing to seasonal autumn and spring grazing with no more than 0.8 livestock units per hectare, evenly spread.











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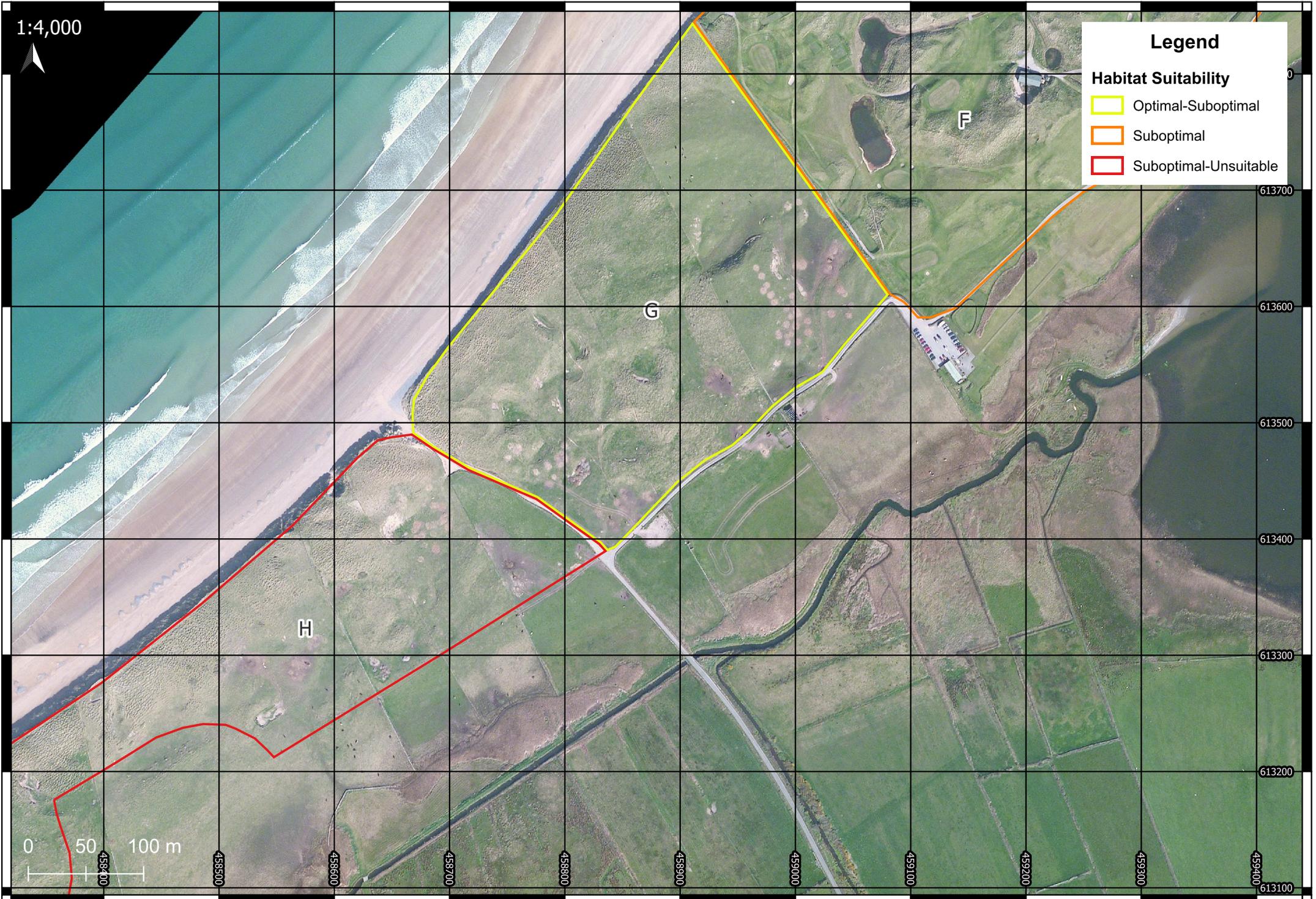


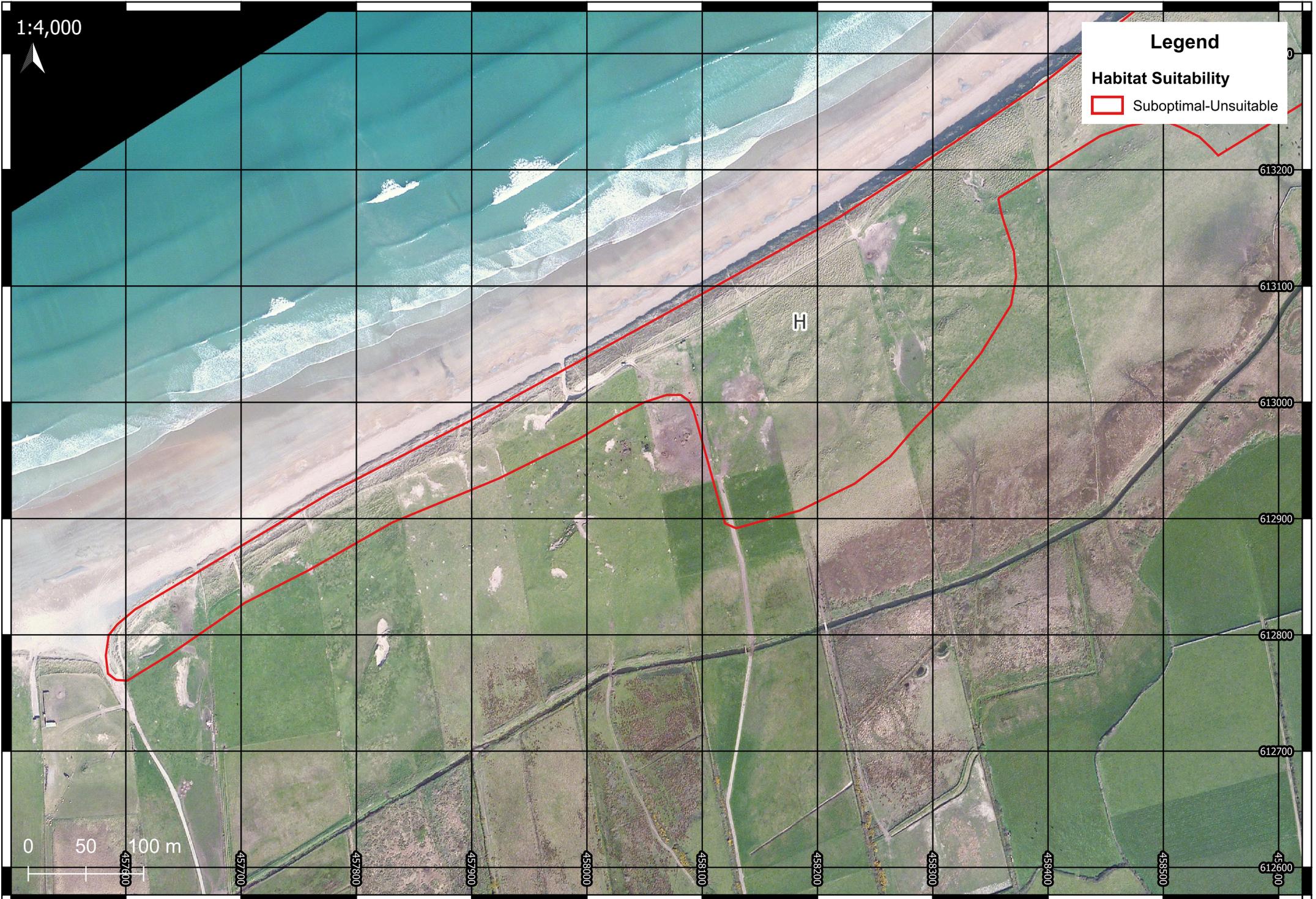
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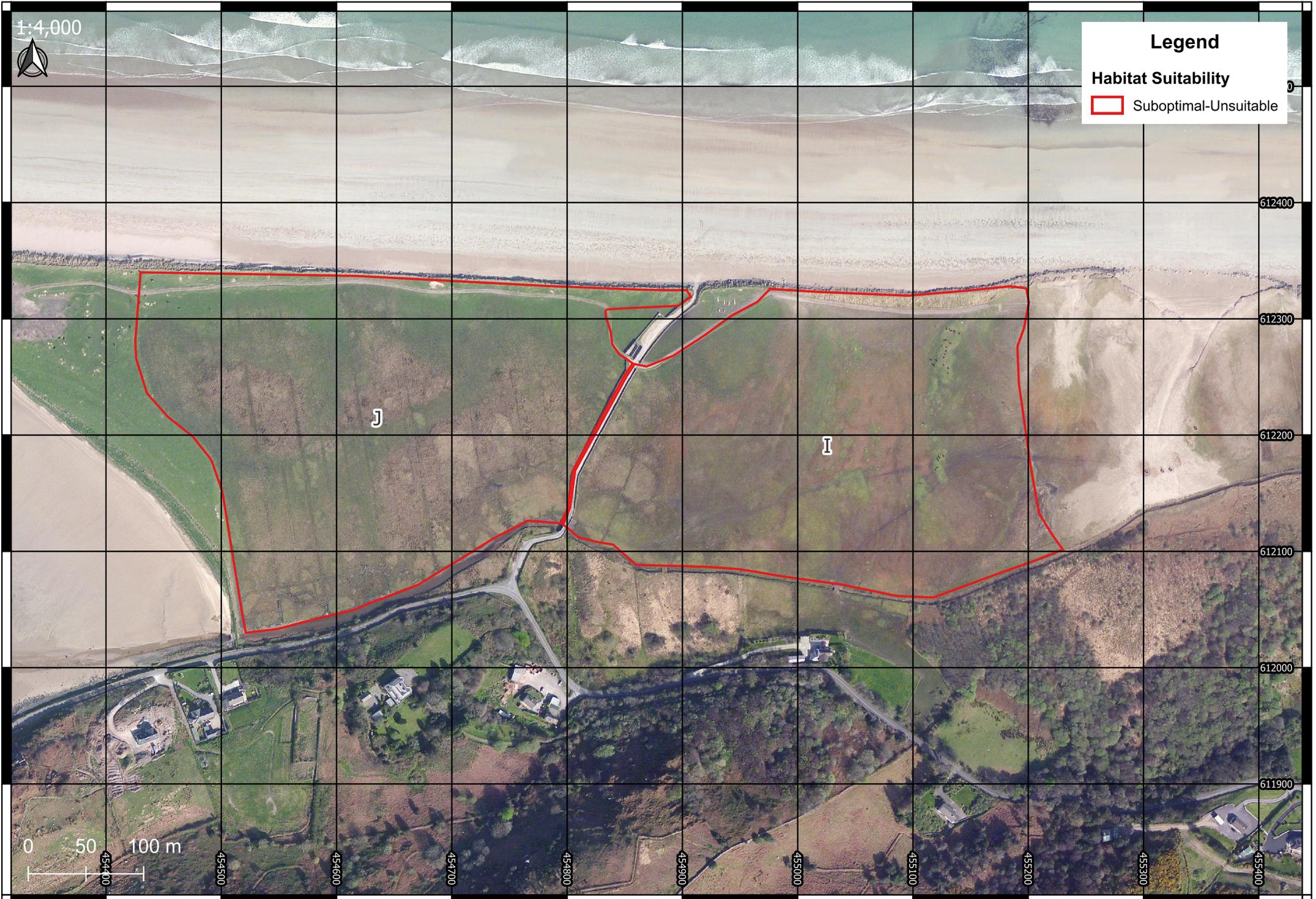
Habitat Suitability

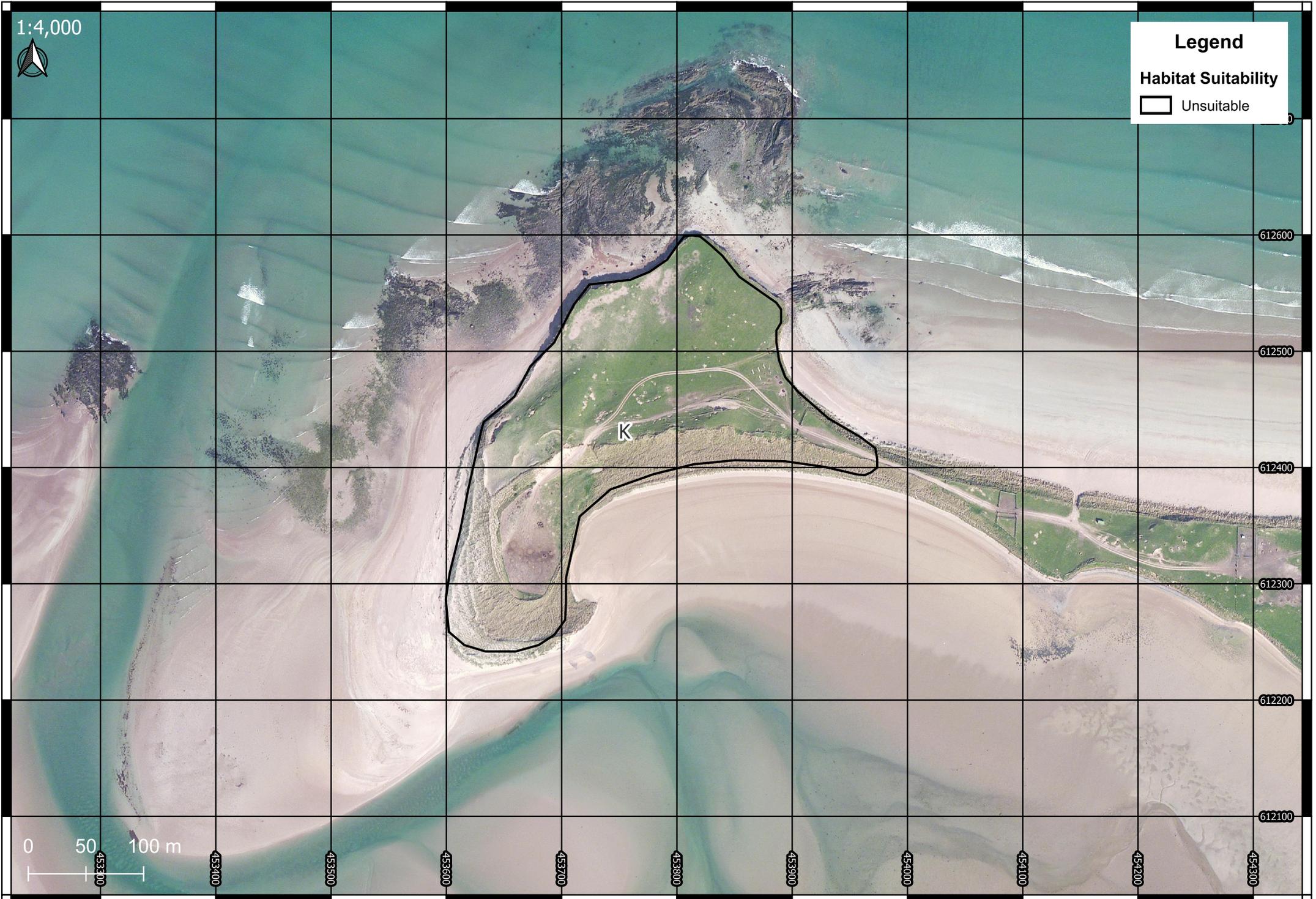
- Optimal-Suboptimal
- Suboptimal

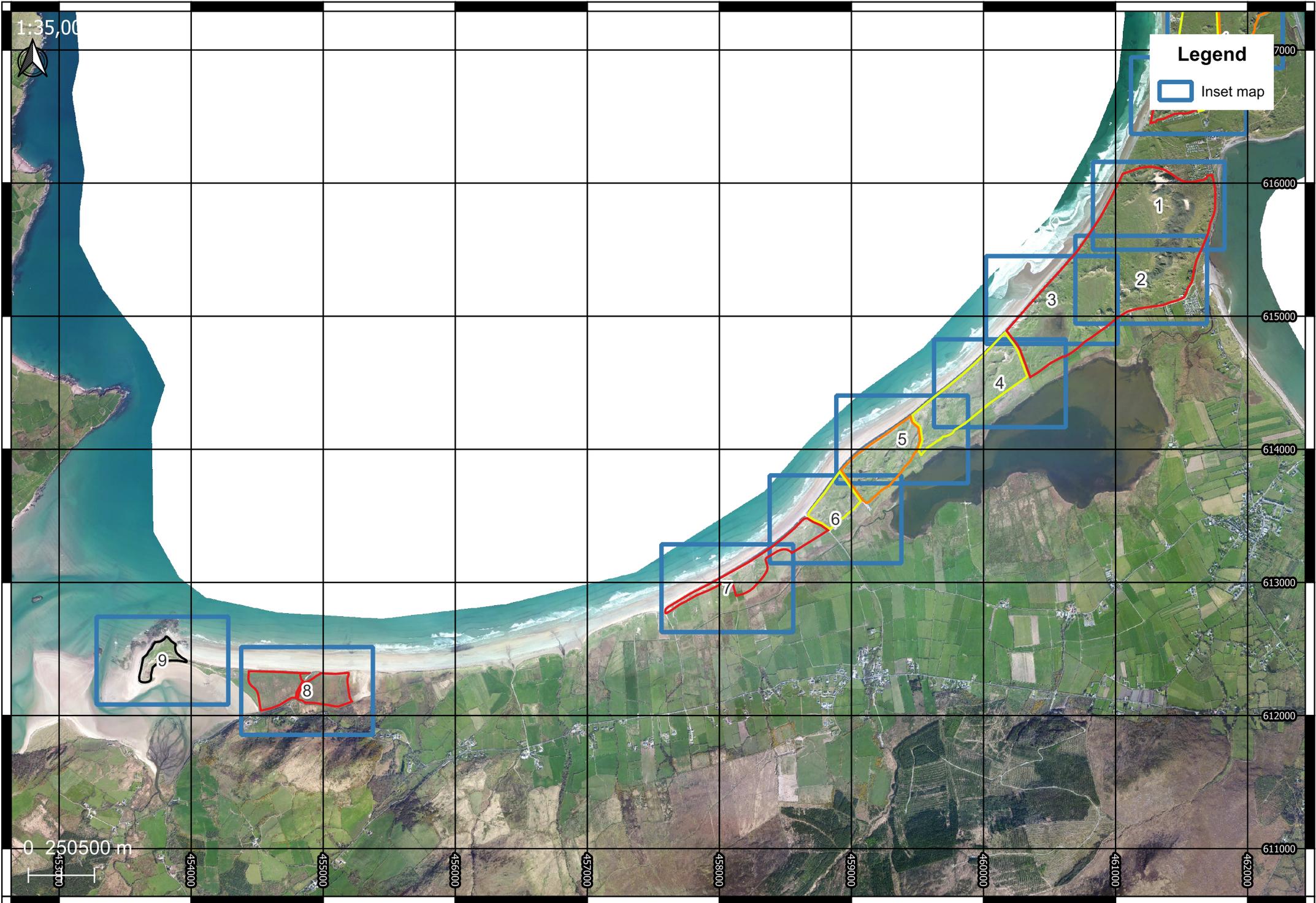
0 50 100 m











Site report - Vertigo Monitoring

Vertigo angustior monitoring at Dog's Bay

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM08 **County:** Galway

SAC Site Code: 001257 Dog's Bay **QI:** No

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this site is the fixed dune habitat along the eastern side of Dog's Bay. Access is from the car park at the north of the site.

Monitoring period	Date surveyed	Recorders
2019-2024	20-21 June 2022	John Brophy & Orla Daly
2013-2018	8-9 June 2015	John Brophy & Maria Long
2007-2012	11 April 2009	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

This general habitat in which *Vertigo angustior* is present corresponds to fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The dominant vegetation is *Festuca rubra* with *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000), and *Festuca rubra* dominated vegetation with *Galium verum*, *Campanula rotundifolia*, *Euphrasia*, *Holcus lanatus*, *Anacamptis pyramidalis*, and *Plantago lanceolata*, corresponding to SD8 of Rodwell (2000). Around a freshwater upwelling, there is an ecotone between *Festuca rubra* and *Potentilla anserina* wet grassland and the waterlogged marsh. These are not Annex I nor CORINE listed habitats, and are similar to the so called "marsh phase" or inland habitat of *Vertigo angustior*. The locations of suitable ecotone include *Festuca rubra*, *Potentilla anserina*, *Iris pseudacorus*, *Juncus acutiflorus*, *Carex disticha*, *Eleocharis palustris*, *Holcus lanatus*, and *Oenanthe* communities. This includes ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	1.Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , <i>Pilosella officinarum</i> , <i>Anacamptis pyramidalis</i> , <i>Plantago lanceolata</i> and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. 2.Transition marsh with <i>Iris</i> , <i>Potentilla anserina</i> , <i>Oenanthe</i> sp. (height 25-40cm). Under-storey of moss and litter
Sub-optimal	1.Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. 2.Vegetation composition as above but either vegetation height is less than 25cm or over 50cm, or the soil is very wet with pools of standing water, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior continues to hold out at Dog's Bay, with a single positive sample from the fixed dune habitat; the snail appears to have been lost from the grassy hollow at the northern end of the beach. The presence of the snail at the site is in spite of the continued decline in the habitat quality of the fixed dune habitat caused by a range of pressures, including grazing by cattle and sheep, erosion and the associated wind-blown sand, and trampling by walkers. If no action is taken, it is likely that the snail will be lost from the site. The Gurteen Bay & Dog's Bay Conservation Group has had a conservation management plan (Heffernan, 2022) prepared to address the damage to the fixed dune habitat from the various pressures and its implementation will be vital to the continued survival of *V. angustior* at the site. In relation to future monitoring, the habitat and population criteria may need to be altered to better reflect the wider site in the future, as the current criteria are limited to the grassy hollow with the freshwater upwelling, despite the snail occurring in the wider dunes.

2013-2018:

Although the habitat suitability status of the only polygon at this site remains unchanged at Suboptimal-Unsuitable, the site has decreased in quality since the 2007-2012 monitoring period. This is evident by a comparison with previous photographs taken at individual sample points. There is now very little *Ammophila arenaria* across the entire site, where previously large stands were present. The vegetation is very short throughout the site (i.e. ≈ 3 cm), with large areas with open sand/blown sand. There is little or no thatch anywhere. One small area (S06) is fenced and is the only place with *Ammophila arenaria* in fixed dune, indicating that overgrazing is a problem. The snail continues to survive in a small hollow, but this is showing signs of damage from erosion, putting the future survival of the species at this site at risk.

2007-2012:

Vertigo angustior is found in a very small area of habitat. As the Stelfox 1906 record for the species is noted from "Dog's Bay" and is not more specific with regard to habitat, it is difficult to tell if the snail was once more widespread in the grassland. However, Stelfox (1907) described *V. angustior* habitat as "coastal marshes" based on his knowledge of the few sites then known, so if he had found the snail in due grassland it was likely he would have included this as habitat for the species. It is likely that the coastal grassland in this area has been heavily cropped for a long time, and the snail has survived in the optimum and stable conditions of the marshy armchair. Any site this small is vulnerable to being lost from

Vertigo angustior monitoring at Dog's Bay

an extreme event or accident within such a small area. The site is a cSAC, but *V. angustior* is not a qualifying interest. This is appropriate due to its small habitat size. However, it is likely to survive if there are no significant changes to the landuse, vegetation management, hydrogeology and hydrology of the area.

3. TRANSECT DETAILS

TRANSECT:	0	MONITORING PERIOD:	2019-2024
	Start point:	NO TRANSECT RECORDED	
	End point:		
	Transect length:	Direction:	
	Description:		
	Sampling frequency:		
<hr/>			
TRANSECT:	0	MONITORING PERIOD:	2013-2018
	Start point:	NO TRANSECT RECORDED	
	End point:		
	Transect length:	Direction:	
	Description:		
	Sampling frequency:		
<hr/>			
TRANSECT:	0	MONITORING PERIOD:	2007-2012
	Start point:	NO TRANSECT RECORDED	
	End point:		
	Transect length:	0	Direction:
	Description:		
	Sampling frequency:		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	6.4655	Polygon A remains Suboptimal-Unsuitable. Despite notable habitat damage due to storms, sand blow, trampling and overgrazing, areas of suitable habitat remain.
<hr/>			
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	6.4655	Polygon A status unchanged at Suboptimal-Unsuitable. Area of fixed dune, which is grazed extremely tightly. Very little <i>Ammophila arenaria</i> , apart from isolated fenced patches, so little to no associated <i>Festuca rubra</i> thatch. Polygon expanded slightly to south to include small fenced area where S06 was taken. <i>Ammophila arenaria</i> was present and tall here.
<hr/>			
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with unsuitable areas	5.995	
	Optimal	0.04	small area of wetland in a hollow surrounded by <i>Festuca</i> slopes

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								
<hr/>								
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Vertigo angustior monitoring at Dog's Bay

Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 0 (1 sample)								
2019-2024	0	0	NO TRANSECT RECORDED					
Monitoring period 2013-2018 Transect 0 (1 sample)								
2013-2018	0	0	NO TRANSECT RECORDED					
Monitoring period 2007-2012 Transect 0 (1 sample)								
2007-2012	0	0	NO TRANSECT RECORDED					

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (7 samples)							
2019-2024	01	ITM 469449 738457	0	0	0	Count	Suboptimal
2019-2024	02	ITM 469455 738455	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	03	ITM 469088 738050	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	04	ITM 469327 738719	0	0	0	Count	Suboptimal
2019-2024	05	ITM 469371 738550	0	0	0	Count	Suboptimal
2019-2024	06	ITM 469278 737932	1	0	1	Count	Suboptimal
2019-2024	07	ITM 469266 738029	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2013-2018 (7 samples)							
2013-2018	01	L 69470 38436	0	0	0		Suboptimal-Unsuitable
2013-2018	02	L 69476 38428	1	0	1	Presence/absence	Suboptimal-Unsuitable
2013-2018	03	L 69103 38020	0	0	0		Suboptimal
2013-2018	04	L 69347 38693	0	0	0		Suboptimal
2013-2018	05	L 69387 38519	0	0	0		Suboptimal
2013-2018	06	L 69300 37908	0	0	0		Suboptimal
2013-2018	07	L 69297 38031	0	0	0		Suboptimal-Unsuitable
Monitoring period 2007-2012 (12 samples)							
2007-2012	01	L 69351 38694	0	0	0		
2007-2012	02	L 69361 38593	0	0	0		
2007-2012	03	L 69386 38555	0	0	0		
2007-2012	04	L 69447 38454	0	0	0		
2007-2012	05	L 69470 38425	0	0	1		
2007-2012	06	L 69470 38339	0	0	0		
2007-2012	07	L 69428 38204	0	0	0		
2007-2012	08	L 69330 38095	0	0	0		
2007-2012	09	L 69277 38058	0	0	0		
2007-2012	10	L 69217 38033	0	0	0		
2007-2012	11	L 69190 38020	0	0	0		

Vertigo angustior monitoring at Dog's Bay

2007-2012	12	L 69122 38063	0	0	0
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5. CONDITION ASSESSMENT

5.1 Population Assessment: 1 pass Favourable (green); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	0	N/A	NO TRANSECT RECORDED		NA
2013-2018	0	N/A	NO TRANSECT RECORDED		
2007-2012	0	N/A	NO TRANSECT RECORDED		

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in the grassy hollow with freshwater upwelling (site 5 of this survey)	Vertigo angustior absent the grassy hollow	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in the grassy hollow with freshwater upwelling (site 5 of this survey)	Vertigo angustior present in the grassy hollow	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present in the grassy hollow with freshwater upwelling (site 5 of this survey)	Present	Pass

Mon. period	Population Notes
2019-2024	As in 2007-2012 and 2013-2018, Vertigo angustior was recorded from only one sample location during the current survey. However, this was not in the grassy hollow with the freshwater upwelling, which is now badly damaged, but rather in a partially fenced-off depression within the fixed dunes. Based on the criterion of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	Vertigo angustior was found in only one out of seven samples taken as part of the current survey, which compares with one out of twelve in the 2007-2012 survey (Moorkens & Killeen, 2011). The positive samples from each survey came from the same location; a very small hollow with a freshwater upwelling. Based on the criterion of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2007-2012	Frequent but confined to one very small area

5.2 Habitat Assessment: 2 passes Favourable (green); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	0	N/A	NO TRANSECT RECORDED		NA
2013-2018	0	N/A	NO TRANSECT RECORDED		
2007-2012	0	N/A	NO TRANSECT RECORDED		

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Area of occupancy	The habitat area should be optimal or suboptimal at least 400m2 in the hollow at sample site 5, with at least some optimal habitat	Habitat area Suboptimal-Unsuitable, with no Optimal habitat present	Fail
2019-2024	Habitat type	The habitat in the hollow at Sample Site 5 should be classified as optimal	Habitat in the hollow is classified as Suboptimal, at	Fail
2013-2018	Area of occupancy	The habitat area should be optimal or suboptimal at least 400m2 in the hollow at sample site 5, with at least some optimal habitat	No Optimal habitat present	Fail
2013-2018	Habitat type	The habitat in the hollow at Sample Site 5 should be classified as optimal	Habitat in the hollow is classified as Unsuitable	Fail
2007-2012	Area of occupancy	The habitat area should be optimal or suboptimal at least 400m2 in the hollow at sample site 5, with at least some optimal habitat	400m2 is Optimal and sub-optimal	Pass

Vertigo angustior monitoring at Dog's Bay

2007-2012	Habitat type	The habitat in the hollow at Sample Site 5 should be classified as optimal	Habitat is Optimal	Pass
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Mon. period	Habitat Notes
2019-2024	The Vertigo angustior habitat at Dog's Bay continues to be considered Suboptimal-Unsuitable, as there are very small areas capable of supporting the snail. The grassy hollow with the freshwater upwelling contains no Optimal habitat, very sandy and short, with a low cover of Iris pseudacorus and an extensive area of Tussilago farfara. Very limited suitable habitat occurs across the broader site. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	Polygon A remains classed as Suboptimal-Unsuitable due to the effects of overgrazing and erosion on the dune grassland. The hollow in which the snail was found in both surveys is also now classified as Suboptimal-Unsuitable due to the effects of erosion, with no optimal habitat present. There are a handful of Iris pseudacorus plants, but relatively little Ammophila arenaria. Rubbish has also been dumped in this small hollow. The erosion is probably caused by storms and by the construction of a concrete ramp adjacent to the hollow. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Dog's Bay is Unfavourable Bad (red).
2007-2012	Vertigo angustior is found in a very small area of habitat

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	High	Negative	93%	Very heavy cattle grazing and trampling by cattle
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Medium	Negative	75%	Trampling by walkers
2019-2024	PI03	Problematic native species	Inside	Low	Negative	5%	Jacobaea vulgaris
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	20%	Erosion of dune face and associated sand blow
2013-2018	A04.02.01	non intensive cattle grazing	Inside	High	Negative	85%	Cattle grazing with many fallen fences
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	High	Negative	1%	
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Negative	5%	Human trampling
2013-2018	G05	Other human intrusions and disturbances	Inside	Low	Negative	1%	Campfires
2013-2018	H05.01	garbage and solid waste	Inside	Medium	Negative	1%	Plastic bottles, kids' toys
2013-2018	K01.01	Erosion	Inside	High	Negative	50%	
2007-2012	A04.02.02	non intensive sheep grazing	Inside	Low	Neutral	5.99ha	While the wider site is grazed by sheep, the grazers do not appear to spend significant time in the wetland area. The area is maintained due to its natural wetness, which prevents succession.
2007-2012	G05.01	Trampling, overuse,	Inside	Low	Neutral	5.99ha	

Vertigo angustior monitoring at Dog's Bay

Mon. period	Future Prospects Notes
2019-2024	There are a range of significant pressures acting on Dog's Bay. These are grazing by cattle and sheep, erosion and the associated wind-blown sand, and trampling by walkers. The combination of these pressures has greatly reduced the suitable habitat for the snail to virtually none, and threatens the continued presence of the snail at the site. The Population and Habitat assessments for the site are Unfavourable-Bad (red). A Conservation Management Plan was prepared for Gurteen Bay & Dog's Bay Conservation Group (Heffernan, 2022) and, assuming the implementation of some or all of the measures proposed (including those for which Planning Permission No. 2260606 has been granted), it is expected that these parameters will have a positive trend into the future. For this reason, the Future Prospects for Dog's Bay are assessed as being Unfavourable-Inadequate (amber).
2013-2018	The two main threats to the continued presence of Vertigo angustior at Dog's Bay is overgrazing by cattle (affected 85% of the site) and erosion (particularly within the hollow that supports the snail). Interestingly, Moorkens & Killeen (2011) note that sheep grazing was occurring, which is known to result in vegetation being too short to be suitable for Vertigo angustior. However, at this site, the change to cattle grazing has not resulted in a less over-grazed habitat. Erosion has caused the loss of dune habitat (e.g. the area containing samples points 2 and 3 of Moorkens & Killeen (2011) has been washed away) and resulted in the installation of rock armour. The construction of a concrete track adjacent to the positive sample site is also an important impact. Other relatively lesser impacts include trampling by humans, campfires and dumping of rubbish. Based on the above threats and impacts, the Future Prospects of the site are considered to be Unfavourable Inadequate (amber).
2007-2012	As the influence of current management is neutral, Future prospects have been assessed as Favourable . Although this is a very small area of habitat, if the quality is maintained the snail has a good chance of survival

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Amber	Red
2013-2018	Green	Red	Amber	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	The Population and Habitat assessments for Dog's Bay returned a result of Unfavourable-Bad (red). As a result of this, and the positive future trends assigned to the two parameters, the Future Prospects were assessed as Unfavourable-Inadequate (amber). Based on these assessments, the Overall Assessment for Dog's Bay is Unfavourable-Bad (red).
2013-2018	While the Population Assessment for the site remains Favourable, the Future Prospects are Unfavourable Inadequate and the Habitat Assessment is Unfavourable Bad due to the effects of overgrazing and erosion. This results in an Overall Assessment of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period
2019-2024
<p>Discussion:</p> <p>Vertigo angustior continues to hold out at Dog's Bay, with a single positive sample from the fixed dune habitat; the snail appears to have been lost from the grassy hollow at the northern end of the beach. The presence of the snail at the site is in spite of the continued decline in the habitat quality of the fixed dune habitat caused by a range of pressures, including grazing by cattle and sheep, erosion and the associated wind-blown sand, and trampling by walkers. If no action is taken, it is likely that the snail will be lost from the site. The Gurteen Bay & Dog's Bay Conservation Group has had a conservation management plan (Heffernan, 2022) prepared to address the damage to the fixed dune habitat from the various pressures and its implementation will be vital to the continued survival of V. angustior at the site. In relation to future monitoring, the habitat and population criteria may need to be altered to better reflect the wider site in the future, as the current criteria are limited to the grassy hollow with the freshwater upwelling, despite the snail occurring in the wider dunes.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>A Conservation Management Plan was prepared for Gurteen Bay & Dog's Bay Conservation Group (Heffernan, 2022), which involved installing chestnut fencing to address erosion at the dune front, the repair of livestock fencing across the site, the planting of Marram (Ammophila arenaria) to promote the recovery of the dunes, the control of Ragwort (Jacobaea vulgaris), and the management of grazing (in agreement with the commonage holders). All of these elements are important to the recovery of the site for the dune habitat itself and the Vertigo angustior habitat and should be implemented in full. Planning permission was granted for the chestnut</p>

Vertigo angustior monitoring at Dog's Bay

fencing and fence repair in 2023, though some chestnut fencing and signage was already present during the current survey. The general recommendation made by Moorkens & Killeen (2011) for grazing of fixed dune habitat for *V. angustior* is less than 0.8 livestock units (LU) per hectare in spring to autumn, with animals removed in winter. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Sheep are generally undesirable on fixed dune habitat for *V. angustior* due to their tight grazing of the habitat.

2013-2018

Discussion:

Although the habitat suitability status of the only polygon at this site remains unchanged at Suboptimal-Unsuitable, the site has decreased in quality since the 2007-2012 monitoring period. This is evident by a comparison with previous photographs taken at individual sample points. There is now very little *Ammophila arenaria* across the entire site, where previously large stands were present. The vegetation is very short throughout the site (i.e. ≤ 3 cm), with large areas with open sand/blown sand. There is little or no thatch anywhere. One small area (S06) is fenced and is the only place with *Ammophila arenaria* in fixed dune, indicating that overgrazing is a problem. The snail continues to survive in a small hollow, but this is showing signs of damage from erosion, putting the future survival of the species at this site at risk.

Monitoring recommendations:

Given the small area of occupancy and habitat of *Vertigo angustior*, and the low abundance of the snail, it is recommended that monitoring is carried out at a minimum of three-yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring should follow that of Moorkens & Killeen (2011):

- Describe habitat and take at least 2 samples from the most suitable habitat in the hollow (site 5 of 2009 survey) and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in the at least 5 other locations within the polygon and analyse for molluscan composition
- Re-determine boundary of the habitat polygon and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

NOTE: **Due to the very restricted area in which the snail is found, sampling should be carried out in a sensitive manner and snails should not be removed from the site unless strictly necessary.**

Management recommendations:

The fences on this site have collapsed in a number of places, allowing cattle free range across the *Vertigo angustior* habitat, which has resulted in overgrazing. These fences should be repaired, and the level of grazing reduced to one which allows the build-up of *Festuca rubra* litter, with sparse *Ammophila arenaria* tussocks. Of particular concern is the erosion and damage to the hollow that is known to support *Vertigo angustior*. This area should be protected immediately from further damage. This may include fencing off and also the planting of *Ammophila arenaria* along the seaward edge of the hollow in order to stabilise the substratum. It is understood that there had been management interventions at this site in the past. All efforts should be made to re-connect with the landowners/managers to ensure that a mutually agreeable management regime can be put in place immediately.

Vertigo angustior monitoring at Dog's Bay

2007-2012

Discussion:

Vertigo angustior is found in a very small area of habitat. As the Stelfox 1906 record for the species is noted from "Dog's Bay" and is not more specific with regard to habitat, it is difficult to tell if the snail was once more widespread in the grassland. However, Stelfox (1907) described V. angustior habitat as "coastal marshes" based on his knowledge of the few sites then known, so if he had found the snail in due grassland it was likely he would have included this as habitat for the species. It is likely that the coastal grassland in this area has been heavily cropped for a long time, and the snail has survived in the optimum and stable conditions of the marshy armchair. Any site this small is vulnerable to being lost from an extreme event or accident within such a small area. The site is a cSAC, but V. angustior is not a qualifying interest. This is appropriate due to its small habitat size. However, it is likely to survive if there are no significant changes to the landuse, vegetation management, hydrogeology and hydrology of the area.

Monitoring recommendations:

Given the small area of occupancy and habitat of Vertigo angustior, and the relatively low abundance of the snail, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012

Methods (see Section 3 of main report for full details) Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Describe habitat and take at least 2 samples from the most suitable habitat in the hollow (site 5 of this survey) and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in the at least 5 other locations within the polygon and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

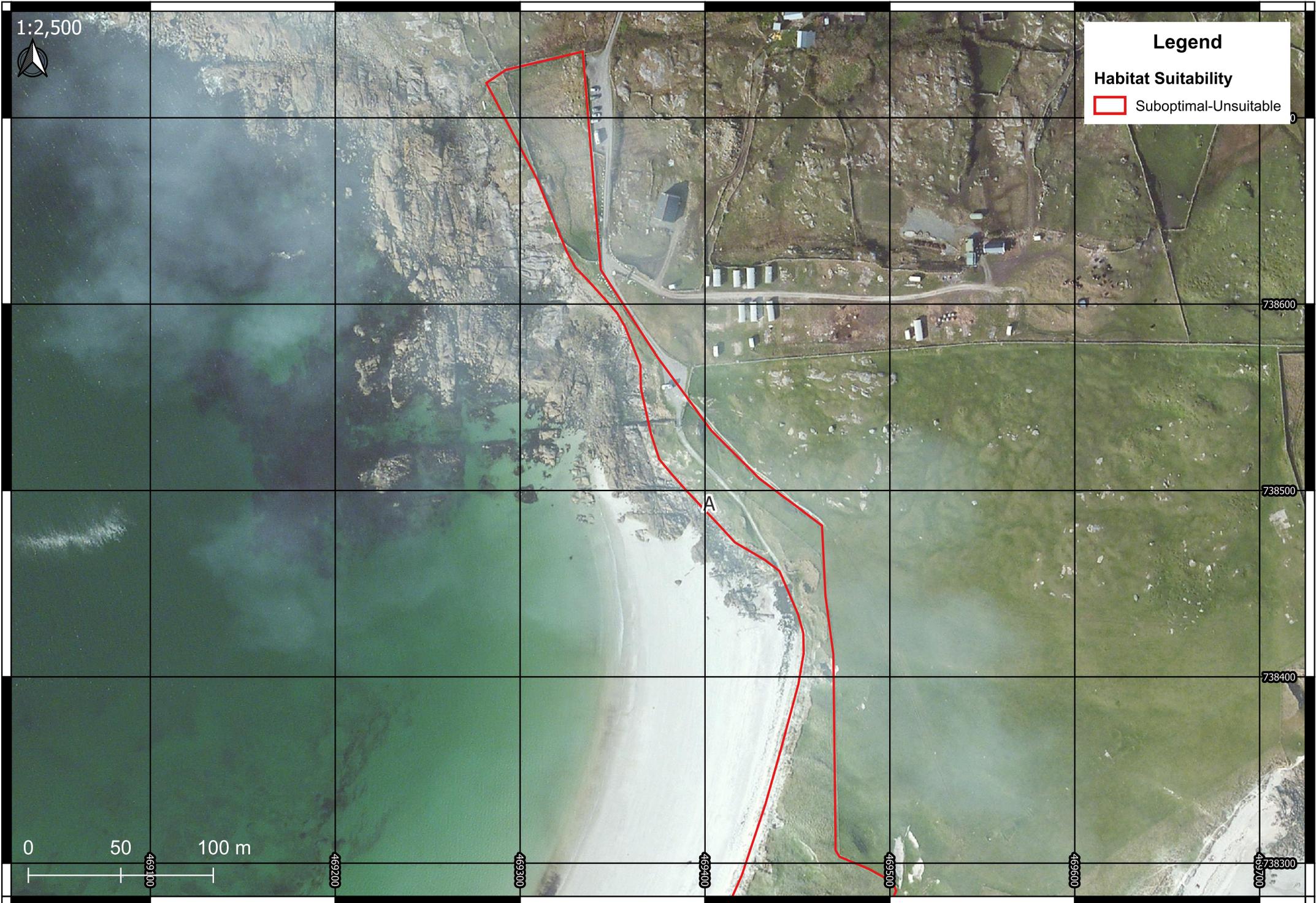
Management recommendations:

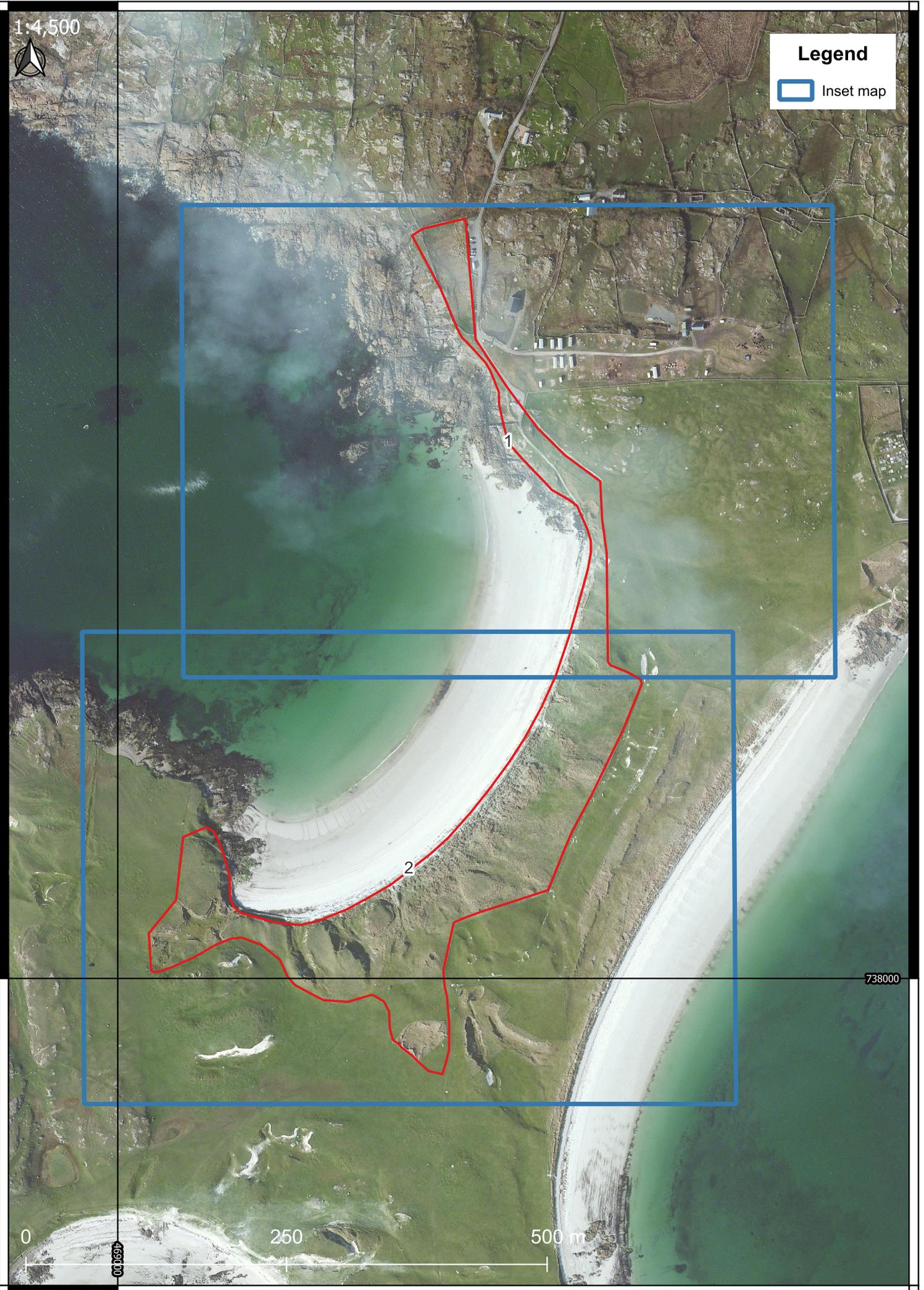
Existing Management

The V. angustior habitat is not significantly managed by grazing, is not mown and is essentially managed by wind, trampling by visitors and hydrogeology.

Proposed management prescription for site

The management at Dog's Bay should remain the same as the present, i.e. no grazing management, no mowing, with succession being prevented by the elements rather than active intervention. As with all low management regimes, this needs careful monitoring, particularly as weather patterns may change and occasional intervention such as strimming may be needed in the future.





Site report - Vertigo Monitoring

Vertigo angustior monitoring at Killanley Glebe

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM10 **County:** Sligo

SAC Site Code: 000458 Killala Bay/Moy Estuary **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this site is the wet *Iris pseudacorus* marsh habitat next to the old graveyard at Killanley Church, on the road between Ballina and Inishcrone.

Monitoring period	Date surveyed	Recorders
2019-2024	4 June 2024	John Brophy & Orla Daly
2013-2018	17 August 2015	John Brophy & Maria Long
2007-2012	3 June 2009	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present here is marsh, i.e. permanently waterlogged ground on mineral soil, and the ecotone between *Festuca rubra* and *Potentilla anserina* wet grassland and the waterlogged marsh. These are not Annex I nor CORINE listed habitats, but they are important in that they support the so called "marsh phase" or inland habitat of *Vertigo angustior*. The locations of suitable ecotone include *Festuca rubra*, *Potentilla anserina*, *Iris pseudacorus*, *Juncus acutiflorus*, *Carex disticha*, *Eleocharis palustris*, *Holcus lanatus*, and *Lathyrus pratensis* communities. This includes ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Marsh with transition of ecotone between <i>Festuca rubra</i> and <i>Potentilla anserina</i> wet grassland and waterlogged marsh dominated by <i>Iris pseudacorus</i> and low growing herbs. Vegetation height 20-40cm. Habitat growing on wet to saturated soil covered with a deep layer of mosses and humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 20cm or greater than 40-50cm, or the soil is dry or covered with standing water.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior was not recorded at Killanley Glebe during the current survey. This is a dramatic drop in the population compared to the previous rounds of monitoring. Despite this drop, there is no clear cause. The habitat in Polygon A still appears to be optimal, comprising flushed wet grassland and *Iris pseudacorus* marsh. The planted woodland in Polygon B continues to develop and so this area is Unsuitable. The only pressure noted for Polygon A was sheep grazing, but this does not appear to be at a level that is negatively affecting the habitat. It is recommended that discussions be had with the landowner to see if any change in management over the last 15 years can be found that would explain the population decline. The apparent removal of cattle from the site may be a factor, and their return (at low grazing level) may be an approach worth considering.

2013-2018:

The site at Killanley Glebe was assessed as Favourable (green) in 2007-2012, and maintains that classification in the 2013-2018 monitoring period. The site was split into two polygons after the current survey, due to the clear difference between the open habitat to the north and the wooded area to the south, with the northern polygon classed as Optimal and the southern as Unsuitable. The population and habitat in the northern polygon suggests that the current management regime is ideal for maintaining the site in favourable conservation status. The snail was not been recorded from the southern polygon during surveys in 2006 and 2009 by Moorkens & Killeen, nor in the current 2015 survey.

2007-2012:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable.

The marsh habitat at Killanley Glebe is of enormous interest as it has remained intact over a long period, and is an important historic site with records of *V. angustior* dating back to Warren (1879), where she describes finding the snail in the "marshy meadow" of the glebe. There are flushing seepages within the marsh habitat, thus while the saturated ground may receive a significant contribution from rainwater on occasions, the reason why the species is supported is due to the lack of flooding. There is an abundance of *Iris* marsh in Ireland resulting from pockets of low lying ground, but this marsh is continually flushing from a high spring area down slope, keeping the *V. angustior* habitat area saturated but not inundated. This is a rare occurrence in Ireland and should be carefully protected.

The groundwater profile in the site appears to be complex and has not been investigated in detail by a hydrogeologist. Therefore caution needs to be taken in local development that may occur outside the site to ensure it is appropriately assessed for potential influences on the Killanley Glebe site.

3. TRANSECT DETAILS

Vertigo angustior monitoring at Killanley Glebe

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.8843	Polygon A remains Optimal with extensive areas of flushed wet grassland and Iris pseudacorus marsh.
B	Unsuitable	0.4227	Polygon B remains Unsuitable, with some areas of Iris pseudacorus along the stream bank, and has mostly scrubbed over.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.8843	Polygon A - Original polygon split in two (due to southern section, Polygon B, never having supported the snail, and having been planted with trees). Polygon A is classed as Optimal.
B	Unsuitable	0.4227	Polygon B - Original polygon split in two (due to southern section, Polygon B, never having supported the snail, and having been planted with trees). Polygon B is classed as Unsuitable.
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with optimal areas	1.465	All of the potential (Optimal and sub-optimal) habitat was contained within one polygon area of 1.465 ha..

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024									
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry	
1									
2	53m	0m	15m	0m	4m	68m	0m	4m	
Monitoring period: 2013-2018									
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry	
1									
2	41m	8m	14m		9m	55m	13m	4m	
Monitoring period: 2007-2012									
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry	
1	3.7m	NA	16.8m	NA	11.5m	20.7m	8m	3.3m	
2	63.3m	NA		NA	10m	65m	3.4	4.9	

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 2 (4 samples)								
2019-2024	2	1	20m	0	0	0	Count	Optimal
2019-2024	2	2	33m	0	0	0	Count	Optimal
2019-2024	2	3	41m	0	0	0	Count	Optimal
2019-2024	2	4	60m	0	0	0	Count	Optimal
Monitoring period 2013-2018 Transect 2 (4 samples)								
2013-2018	2	1	21m	10	1	11	Count	Optimal
2013-2018	2	2	33m	21	0	21	Count	Optimal
2013-2018	2	3	41m	7	0	7	Count	Optimal-Suboptimal
2013-2018	2	4	57m	2	0	2	Count	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (3 samples)								
2007-2012	1	1	13m	0	0	0		
2007-2012	1	2	20m	0	0	0		
2007-2012	1	3	27m	0	0	0		
Monitoring period 2007-2012 Transect 2 (4 samples)								
2007-2012	2	1	26.5m	0	0	31		
2007-2012	2	2	35m	0	0	43		

Vertigo angustior monitoring at Killanley Glebe

2007-2012	2	3	43m	0	0	5
2007-2012	2	4	54m	0	0	0

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2013-2018 (1 sample)							
2013-2018	01	G 26515 24843	0	0	0		Unsuitable

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	2	Density	At least 2 samples on Transect 2 should have >10 V. angustior individuals	No samples with >10 V. angustior individuals	Fail
2019-2024	2	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones on Transect 2 with optimal or sub-optimal habitat	Adult or sub-adult snails are absent from Transect 2 (4 samples)	Fail
2013-2018	2	Density	At least 2 samples on Transect 2 should have >10 V. angustior individuals	2 samples with >10 individuals	Pass
2013-2018	2	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones on Transect 2 with optimal or sub-optimal habitat	Present in 4 zones	Pass
2007-2012	2	Density	At least 2 samples on Transect 2 should have >10 V. angustior individuals	2 samples with >10	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones on Transect 2 with optimal or sub-optimal habitat	Present in 3 zones	Pass

Mon. period	Population Notes
2019-2024	The Vertigo angustior population at Killanley Glebe has dropped precipitously since the 2013-2018 monitoring period to the point that it was not recorded during the current survey, which comprised four samples along the transect that were all positive in the previous monitoring period and had three out of four positive in 2007-2012. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, three out of eight samples taken across two transects were positive, with no positive samples recorded on Transect 1 (out of three taken). The current survey recorded Vertigo angustior at all four sample locations on Transect 2, with no snails recorded from one sample taken in the area of Transect 1. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Killanley Glebe is Favourable (green).
2007-2012	The main area of the habitat at the site appears to be in good condition for V. angustior

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	2	Habitat extent	>50m of habitat along the Transect is classed as Optimal	53m of habitat along the Transect is classed as Optimal	Pass
2019-2024	2	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >50m of the Transect	68m is Optimal wetness	Pass
2013-2018	2	Habitat extent	>50m of habitat along the Transect is classed as Optimal	48m Optimal or Optimal-Suboptimal (Pass awarded for this criterion, based on expert judgement and overall good quality of site)	Pass
2013-2018	2	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >50m of the Transect	55m is Optimal wetness	Pass
2007-2012	2	Habitat extent	>50m of habitat along the Transect is classed as Optimal	57.3m is Optimal	Pass

Vertigo angustior monitoring at Killanley Glebe

2007-2012	2	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >50m of the Transect	57.3m is optimal wetness	Pass
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5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 0.8ha of the site dominated by Suboptimal habitat or better	8.8ha Optimal	Pass
2013-2018	Habitat extent	At least 0.8ha of the site dominated by Suboptimal habitat or better (area reduced to take account of polygon split)	0.8843ha Optimal	Pass
2007-2012	Habitat extent	At least 1.4 ha of the site dominated by optimal and sub-optimal habitat	1.43 ha Opt/Sub-opt	Pass

Mon. period	Habitat Notes
2019-2024	Polygon A at Killanley Glebe continues to be Optimal, with good cover of suitable habitat. Much of the habitat along the Transect 2 within this polygon continues to support optimal habitat and wetness. Polygon B remains Unsuitable and no sampling was undertaken within this area. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Killanley Glebe is Favourable (green).
2013-2018	In the 2007-2012 monitoring period, one habitat polygon was drawn at Killanley Glebe and classed as Optimal and Sub-optimal. The snail has not been recorded in the part of the polygon which is south of the stream, and this area is now classed as unsuitable habitat as it has been planted with trees. For this reason, the polygon was divided following the current survey, with the southern polygon classed as Unsuitable and the northern polygon classed as Optimal. For a similar reason, Transect 1 has been dropped from the monitoring regime at this site. Note that a length of 50m along the transect needs to be classed as Optimal for one habitat criterion, yet 48m of Optimal habitat was measured in this survey. Given the good overall status and condition of this site, expert judgement was used to assess this particular criterion as a pass. Based on the criteria of Moorkens & Killeen (2011), and taking into account the above changes, the Habitat Assessment for Killanley Glebe is Favourable (green).
2007-2012	The snail is widespread in the wetland area and is locally common

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Low	Neutral	60%	No sheep grazing in Polygon A outside of the old graveyard at the time of survey, but small flock in an adjacent paddock to the southeast
2019-2024	PB01	Conversion to forest from other land uses, or afforestation (excluding drainage)	Inside	High	Negative	15%	Salix spp., Alnus glutinosa planted along stream to southwest continues to develop.
2013-2018	A04.02.01	non intensive cattle grazing	Inside	High	Positive	60%	Cattle grazing appears at optimal level
2013-2018	A04.02.02	non intensive sheep grazing	Inside	Medium	Neutral	60%	Unlikely that sheep graze much in wettest areas
2013-2018	B01	forest planting on open ground	Inside	High	Negative	15%	Willows, alders etc planted along river bank
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Low	Neutral	<1.4	The cattle grazing is, at present, having a neutral impact on the quality of the habitat

Vertigo angustior monitoring at Killanley Glebe

2007-2012	E01.03	dispersed habitation	Outside	Low	Negative	1ha	There has been a spread of one-off housing in the vicinity of the site, and although no changes in hydrogeology have been evident, some building work is still underway and future plans for housing should be investigated to ensure that any works does not impinge on the groundwater flow towards or out of the site.
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Mon. period	Future Prospects Notes
2019-2024	The Population Assessment for Killanley Glebe is Unfavourable-Bad (red) as no Vertigo angustior were recorded during the current survey. It is not clear why this is the case, as the habitat appears to still be suitable, as evidenced by the Habitat Assessment of Favourable (green). While the forestry continues to have its negative effect on Polygon B, the only pressure noted for Polygon A was sheep grazing. In 2007-2012, only cattle grazing was noted for the site, with sheep appearing in the 2013-2018 monitoring period, so it is possible the management of the sheep and the manner of their grazing is having a negative effect on the snail's habitat in a manner that is not visible in the field. Given the current status of the population at Killanley Glebe, with no reason to think there will be a positive trend into the future, the Future Prospects are assessed as being Unfavourable-Bad (red).
2013-2018	The Future Prospects for Killanley Glebe for the monitoring period 2007-2012 were classed as Favourable (green). Current activities affecting the site include tree planting (southern polygon), and non-intensive cattle and sheep grazing across 60% of the site. Given the extent of suitable habitat at the site, the grazing level appears to be appropriate to maintaining the habitat for the species. The Future Prospects for Killanley Glebe are classed as Favourable (green).
2007-2012	As the impact is low, Future prospects have been assessed as Favourable (green).

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Green	Amber	Red
2013-2018	Green	Green	Green	Green
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	The significant drop in the population of Vertigo angustior at Killanley Glebe compared to previous monitoring periods resulted in a Population Assessment of Unfavourable-Bad (red). Despite this, the Habitat Assessment returned a result of Favourable (green), as the habitat in Polygon A continues to appear suitable. Based on these assessments and their likely future trends, the Future Prospects for the site are assessed as being Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Killanley Glebe is Unfavourable-Bad (red).
2013-2018	Based on the results of the Population Assessment, Habitat Assessment and Future Prospects, the Overall Assessment for Killanley Glebe is Favourable (green).
2007-2012	

6. DISCUSSION

Monitoring period
2019-2024
<p>Discussion:</p> <p>Vertigo angustior was not recorded at Killanley Glebe during the current survey. This is a dramatic drop in the population compared to the previous rounds of monitoring. Despite this drop, there is no clear cause. The habitat in Polygon A still appears to be optimal, comprising flushed wet grassland and Iris pseudacorus marsh. The planted woodland in Polygon B continues to develop and so this area is Unsuitable. The only pressure noted for Polygon A was sheep grazing, but this does not appear to be at a level that is negatively affecting the habitat. It is recommended that discussions be had with the landowner to see if any change in management over the last 15 years can be found that would explain the population decline. The apparent removal of cattle from the site may be a factor, and their return (at low grazing level) may be an approach worth considering.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p>

Vertigo angustior monitoring at Killanley Glebe

Given that the cause of the decline in the population of *Vertigo angustior* at Killanley Glebe is not known, with the habitat appearing to be suitable, it is difficult to make any specific recommendation for the site. Discussions with the landowner are recommended to see if any changes to the management have been made over the last 15 years that may have influenced the suitability of the site in a manner that is not evident in the habitat. A return to only light cattle grazing, as was the case in 2007-2012, may be the best approach, if that is possible.

2013-2018

Discussion:

The site at Killanley Glebe was assessed as Favourable (green) in 2007-2012, and maintains that classification in the 2013-2018 monitoring period. The site was split into two polygons after the current survey, due to the clear difference between the open habitat to the north and the wooded area to the south, with the northern polygon classed as Optimal and the southern as Unsuitable. The population and habitat in the northern polygon suggests that the current management regime is ideal for maintaining the site in favourable conservation status. The snail was not been recorded from the southern polygon during surveys in 2006 and 2009 by Moorkens & Killeen, nor in the current 2015 survey.

Monitoring recommendations:

It is recommended that monitoring is carried out at a minimum of three-yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring is based on that of Moorkens & Killeen (2011):

- Repeat Transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable., and Too dry, Optimal wetness or Too wet, respectively (Note that Transect 1 has been dropped at this site)
- Take 1 sample each from each of the 4 main zones with the most suitable habitat on Transect 2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

The current management of the *Vertigo angustior* habitat in Polygon A at Killanley Glebe appears ideal for supporting the species and should continue unchanged. The snail has not been found in the southern polygon, in spite of surveys in 2006, 2009 and 2015. This fact, combined with the recent planting of trees in this polygon, means that no management recommendations are being made for this area as it is unlikely to result in the creation of habitat suitable for supporting *Vertigo angustior*.

Vertigo angustior monitoring at Killanley Glebe

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable.

The marsh habitat at Killanley Glebe is of enormous interest as it has remained intact over a long period, and is an important historic site with records of *V. angustior* dating back to Warren (1879), where she describes finding the snail in the "marshy meadow" of the glebe. There are flushing seepages within the marsh habitat, thus while the saturated ground may receive a significant contribution from rainwater on occasions, the reason why the species is supported is due to the lack of flooding. There is an abundance of Iris marsh in Ireland resulting from pockets of low lying ground, but this marsh is continually flushing from a high spring area down slope, keeping the *V. angustior* habitat area saturated but not inundated. This is a rare occurrence in Ireland and should be carefully protected.

The groundwater profile in the site appears to be complex and has not been investigated in detail by a hydrogeologist. Therefore caution needs to be taken in local development that may occur outside the site to ensure it is appropriately assessed for potential influences on the Killanley Glebe site.

Monitoring recommendations:

Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

It is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from each of the 4 main zones with the most suitable habitat on the transect T2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2015

Methods (see Section 3 of main report for full details). Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 1 sample each from each of the main zones with the most suitable habitat on the transect T1 and analyse for molluscan composition

Management recommendations:

The management discussed by Moorkens (2007b) based upon the 2006 survey is repeated below with minor modifications.

Existing Management

The *V. angustior* habitat has been divided for the purposes of this report into three management units. These are wall and fence divisions that separate the units on a permanent basis. Within these units are some smaller divisions but these have not been closed off in recent times. During the survey period (March and April 2006) there were 10 cattle in total seen in the main habit area Polygon A. The old graveyard and ruined church, supports some *V. angustior* habitat and it is not managed by grazing. The area to the south of the stream (location of Transect 1) is fenced off and had not had grazing prior to the 2006 survey.

Proposed management prescription for site

The management at Killanley should remain the same as the present regimes within each management unit for the 2009-2012 period. For the main area of habitat in polygon A, this works out a total of 10 cattle. This is somewhat higher density than normally recommended for *V. angustior*, but the reason is that the habitat for the snail is a small part of the large site, and the cattle do not appear to go into the wettest areas. It is important for this type of extensive grazing that the cattle are removed from the site at very dry times; as such conditions would encourage the cattle to congregate at the wet *V. angustior* habitat. It is better to restrict grazing to spring and autumn, but if there is a need for summer grazing a temporary electric fence could be placed beyond the sensitive area. The site on the south side of the stream should be monitored to ensure it is not being encroached by scrub in the absence of grazing, but it is likely to be maintained by wetness in the foreseeable future, indeed it is likely that its wet nature is the reason why it has been fenced off from cattle. The graveyard has some patches of suitable *V. angustior* habitat among the spaces around the old grave areas

Vertigo angustior monitoring at Killanley Glebe

and needs no management.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Lahinch

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM11 **County:** Clare

SAC Site Code: 000036 Inagh River Estuary **QI:** No

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this site is the fixed dune and semi-fixed dune habitat, mostly in the northern part of the old golf course, and in the saltmarsh-to-dune transition by the estuary. Access is from the main road.

Monitoring period	Date surveyed	Recorders
2019-2024	29-30 July 2024	John Brophy & Orla Daly
2013-2018	15-16 August 2016	John Brophy & Maria Long
2007-2012	2 July 2009	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also habitat within the ecotone of *Potentilla anserina* grassland between the fixed dunes and the estuary. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is *Festuca rubra*, with some *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Pilosella officinarum*, *Trifolium repens*, *Galium verum*, and *Euphrasia* lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> and <i>Galium verum</i> , <i>Anacamptis pyramidalis</i> and low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above or with a higher proportion of tall grasses, but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior was not recorded from the site at Lahinch during the current survey, which is a further drop from the single positive sample recorded in 2013-2018. This contrasts starkly with the 17 positive samples recorded in 2009. Despite the site comprising two golf courses (the Old Course to the west and the Castle Course to the east), with the associated managed tees, greens, and fairways, the rough areas generally provide suitable habitat for the snail. However, the apparently suitable habitat does not appear to be capable of supporting the snail and it is unclear as to why this is the case. It is possible that there have been recent changes to the management of the golf courses, for example, in the application of pesticides. Discussions should be had with Lahinch Golf Club to ascertain if there have been any changes to the management of the site in the last 15 years.

2013-2018:

This is a large site that, although consisting of two heavily used golf courses, has supported a population of *Vertigo angustior* for at least 100 years (and probably very much longer). Prior to the current survey, the species was found to be relatively widespread and common at the site. However, in 2016 a dramatic decrease was seen, with only 1 out of 15 samples positive. The reasons are unclear, as management does not appear to have changed. The site was inundated by the sea in 2010, but while it is difficult to be certain, the impact of this event on the population is unlikely to have been massive (due to relatively short inundation duration, and the height of many of the dune hills above the level of the inundation). A repeat survey is needed immediately to investigate the population further, and both the golf course managers and NPWS need to meet to discuss options for this large and important site.

2007-2012:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable. The targets have been passed for all performance indicators. *Vertigo angustior* was widespread and locally common in the fixed dune areas along the coastal and estuary margins of the old golf course (west side of the main road). The southern and eastern parts of the course support very little suitable *V. angustior* habitat. Most of the habitat on the new golf course (on the east side of the road) is unsuitable for *V. angustior* apart from the estuary margins and a more fixed mound at the north end of the site. The golf course management sacrifices some intensively managed areas in return for well managed rough areas, which are currently enough to sustain the snail. Major changes to the course should not be undertaken without consideration of the consequences for the habitat.

3. TRANSECT DETAILS

TRANSECT: 1	MONITORING PERIOD: 2019-2024
Start point:	ITM 509330 689332 Double fence post between course and saltmarsh. ITM from 2024.



Vertigo angustior monitoring at Lahinch

End point: ITM 509328 689312 Edge of green. ITM from 2024.
Transect length: 20 **Direction:** N-W
Description: The transect runs up a steep dune slope from the saltmarsh transition of the estuary to the light rough at the edge of the golf hole by the old castle tower.
Sampling frequency: 4 samples were taken from zones with the most suitable habitat

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018
Start point: R 09358 89294 Double fence post between course and saltmarsh. (Note correction of grid reference letter from 'M' to 'R').
End point: R 09356 89276 Edge of green
Transect length: 20 **Direction:** NE-SW
Description: As for 2009
Sampling frequency: As for 2009

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012
Start point: M 09369 89291 By double fence posts at base of slope in saltmarsh transition
End point: M 09355 89275 On edge of 7th green
Transect length: 19.7 **Direction:** NE-SW
Description: The transect runs up a relatively steep dune slope from the saltmarsh transition of the estuary to the golf hole by the old castle tower.
Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Five samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	19.0596	Polygon A remains Optimal-Suboptimal. This polygon has the most suitable habitat on the site, but much of the unmanaged dune grassland is rank, dominated by <i>Festuca rubra</i> , but with abundant <i>Arrhenatherum elatius</i> .
B	Suboptimal	0.7426	Polygon B remains Suboptimal. Some areas of suitable habitat remain, while much of the polygon is rank and grassy.
C	Suboptimal-Unsuitable	21.8201	Polygon C remains Suboptimal-Unsuitable and comprises a heavily-maintained golf course.
D	Suboptimal-Unsuitable	17.4477	Polygon D remains Suboptimal-Unsuitable and comprises a heavily-maintained golf course.
E	Suboptimal-Unsuitable	1.5829	Polygon E remains Suboptimal-Unsuitable, comprising an area of the Castle Course dominated by rough.
F	Suboptimal-Unsuitable	34.2666	Polygon F remains Suboptimal-Unsuitable and comprises a heavily-maintained golf course.

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	19.0596	Polygon A status remains Optimal-Suboptimal. Within this polygon there are large areas which are unsuitable (e.g. greens), large areas which are too rank, but also multiple smaller patches of good quality. These are scattered throughout the polygon.
B	Suboptimal	0.7426	Polygon B status drops from Optimal and Suboptimal, to Suboptimal. This is a small polygon, portions of which are fixed dune of moderate quality (though with quite a high proportion of rank grasses in places), and portions of which are unsuitable saltmarsh and embryonic dune. (There may have been mapping errors in the original survey resulting in the inclusion of the latter habitat types). The change in status reflects the existence of unsuitable habitat within the polygon, as well as a slight decline in habitat quality (picked up at and near the transect).

Vertigo angustior monitoring at Lahinch

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
C	Suboptimal-Unsuitable	22.454	Polygon C retains status of Suboptimal-Unsuitable. There are some areas with good habitat in larger and higher areas of 'rough' at the western end, but otherwise this is a heavily managed golf course.
D	Suboptimal-Unsuitable	18.3034	Polygon D status increased from Unsuitable to Suboptimal-Unsuitable. This polygon was increased in status as small areas of potential habitat were noted, mostly at the north near the depot. Otherwise, this area is heavily managed, with either very short grass or quite rank areas. This change is considered one of interpretation rather than ecological change.
E	Suboptimal-Unsuitable	1.5829	Polygon E status remains the same, at Suboptimal-Unsuitable. Small area of 'rough', with a good amount of Festuca rubra. However, there is only a low cover of thatch. Herb cover is high.
F	Suboptimal-Unsuitable	34.2666	Polygon F status increased from Unsuitable, to Suboptimal-Unsuitable. This consists of a large area of golf course, with some areas similar to Polygon E. However, there are small areas with better thatch. This change is considered one of interpretation rather than ecological change.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	19.06	Polygon A
B	Sub-optimal with optimal areas	0.743	Polygon B
C	Sub-optimal with unsuitable areas	22.454	Polygon C - golf course mostly fairways
D	Unsuitable	18.303	Polygon D - golf course mostly fairways
E	Sub-optimal with unsuitable areas	1.583	Polygon E
F	Unsuitable	35.85	Polygon F - new golf course

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	5m	0m	8.5m	3.5m	3m	20m	0m	0m

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	6 m	6.5m	2.5m	3 m	2 m	20m		

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	11.8m	NA	2.8m	NA	5.1m	19.7m		

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (4 samples)								
2019-2024	1	1	2m	0	0	0	Count	Optimal
2019-2024	1	2	14m	0	0	0	Count	Suboptimal
2019-2024	1	3	17m	0	0	0	Count	Suboptimal
2019-2024	1	4	19m	0	0	0	Count	Optimal
Monitoring period 2013-2018 Transect 1 (4 samples)								
2013-2018	1	1	1.5m	0	0	0		Optimal
2013-2018	1	2	12m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	16m	0	0	0		Optimal-Suboptimal
2013-2018	1	4	19m	0	0	0		Optimal
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	1.5m	0	0	14		
2007-2012	1	2	9m	0	0	2		
2007-2012	1	3	13.5m	0	0	2		

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2007-2012	1	4	16m	0	0	0
2007-2012	1	5	19m	0	0	1

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (10 samples)							
2019-2024	01	ITM 509354 688953	0	0	0	Count	Suboptimal
2019-2024	02	ITM 509532 688630	0	0	0	Count	Optimal
2019-2024	03	ITM 508865 688749	0	0	0	Count	Optimal
2019-2024	04	ITM 508772 688738	0	0	0	Count	Suboptimal
2019-2024	05	ITM 508778 688888	0	0	0	Count	Suboptimal
2019-2024	06	ITM 509112 689055	0	0	0	Count	Suboptimal
2019-2024	07	ITM 508905 688579	0	0	0	Count	Optimal
2019-2024	08	ITM 509085 688333	0	0	0	Count	Suboptimal
2019-2024	09	ITM 509206 688478	0	0	0	Count	Suboptimal
2019-2024	10	ITM 509234 688999	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (11 samples)							
2013-2018	01	R 09379 88935	0	0	0		Suboptimal
2013-2018	02	R 09603 88594	0	0	0		Optimal
2013-2018	03	R 08891 88711	0	0	0		Optimal
2013-2018	04	R 08786 88710	0	0	0		Optimal-Suboptimal
2013-2018	05	R 08800 88848	0	0	0		Optimal-Suboptimal
2013-2018	06	R 09137 89021	0	0	0		Optimal-Suboptimal
2013-2018	07	R 08943 88536	0	0	0		Optimal
2013-2018	08	R 09115 88283	0	0	0		Optimal-Suboptimal
2013-2018	09	R 09204 88449	0	0	0		Optimal-Suboptimal
2013-2018	10	R 09275 88915	0	0	0		Optimal-Suboptimal
2013-2018	11	R 09381 87936	0	0	0		Optimal
Monitoring period 2007-2012 (23 samples)							
2007-2012	01	M 09117 89000	0	0	1		
2007-2012	02	M 09116 88942	0	0	0		
2007-2012	03	M 09019 88856	0	0	4		
2007-2012	04	M 09020 88749	0	0	7		
2007-2012	05	M 08970 88705	0	0	3		
2007-2012	06	M 08992 88654	0	0	1		
2007-2012	07	M 09110 88550	0	0	0		
2007-2012	08	M 09113 88470	0	0	0		
2007-2012	09	M 09120 88459	0	0	0		
2007-2012	10	M 09140 88384	0	0	0		
2007-2012	11	M 09121 88300	0	0	0		
2007-2012	12	M 09029 88335	0	0	0		
2007-2012	13	M 08900 88446	0	0	12		
2007-2012	14	M 08792 88650	0	0	12		
2007-2012	15	M 08817 88694	0	0	2		

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2007-2012	16	M 08781 88758	0	0	13
2007-2012	17	M 08844 88860	0	0	1
2007-2012	18	M 09013 89018	0	0	1
2007-2012	19	M 09283 89001	0	0	0
2007-2012	20	M 09375 88920	0	0	2
2007-2012	21	M 09313 89223	0	0	0
2007-2012	22	M 09339 89198	0	0	0
2007-2012	23	M 09367 89286	0	0	1

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones with optimal or sub-optimal habitat (sample 4 zones)	Adult or sub-adult snails are absent from Transect (4 samples)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones with optimal or sub-optimal habitat (sample 4 zones)	Present in 1 zone	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones with optimal or sub-optimal habitat (sample 4 zones)	Present in 3 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in 5 or more other locations (50%, and minimum 10 samples) with optimal habitat at the northern and north-western part of the site	Vertigo angustior absent from all other locations	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in 5 or more other locations (50%, and minimum 10 samples) with optimal habitat at the northern and north-western part of the site	Vertigo angustior absent	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in 5 or more other locations (50%, and minimum 10 samples) with optimal habitat at the northern and north-western part of the site	Present at 13 of the other 23 locations	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was not recorded at Lahinch during the current survey. In the previous round of monitoring, it was only recorded from single location, which is a significant decline from the 2007-2012 monitoring period when it was recorded from 17 locations. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	In the 2007-2012 monitoring period, the Population Assessment was Favourable (green), with four out of five samples on the transect positive for Vertigo angustior, and 13 out of 23 spot samples positive. In the current survey, only one of the four samples on the transect was positive, and all eleven spot samples were negative. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Lahinch is Unfavourable Bad (red).
2007-2012	The snail is widespread in the northern part of the site and is locally common

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	At least 10m of habitat along the Transect is classed as Optimal AND At least 14m of habitat along the Transect is classed as Sub-Optimal or Optimal	5m along transect classed as Optimal and 13.5m classed as Suboptimal or Optimal	Fail

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2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 15m of the Transect	20m is optimal wetness	Pass
2013-2018	1	Habitat extent	At least 10m of habitat along the Transect is classed as Optimal AND At least 14m of habitat along the Transect is classed as Sub-Optimal or Optimal	12.5m Optimal or Optimal-Suboptimal AND 14m Suboptimal or above	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 15m of the Transect	20m is optimal wetness	Pass
2007-2012	1	Habitat extent	At least 10m of habitat along the Transect is classed as Optimal and At least 14m of habitat along the Transect is classed as Sub-Optimal or Optimal	11.8m is Optimal, 14.6m is Sub-Optimal or Optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 15m of the Transect	19.7m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 18ha of the site optimal and sub-optimal	19.1ha Optimal-Suboptimal	Pass
2013-2018	Habitat extent	At least 18ha of the site optimal and sub-optimal	19.8ha	Pass
2007-2012	Habitat extent	At least 18 ha of the site optimal and sub-optimal	19.8 ha	Pass

Mon. period	Habitat Notes
2019-2024	The broad habitat at Lahinch remains unchanged from 2013-2018, with Polygon A still containing the best of the habitat available. However, there was a decline in the quality of the habitat along the transect; now dominated by less suitable grasses such as <i>Arrhenatherum elatius</i> . Thatch and soil moisture across the site was good. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Inadequate (amber).
2013-2018	Suitable habitat is patchy due to almost the entire area of the site being managed as a golf course. Moorkens & Killeen (2011) mention that the site has been managed as a golf course since 1892, so clearly the snail is able to tolerate this and survive in some areas. The 2016 survey confirmed that there are suitable habitat patches throughout the site. Some are, however, a little rank, with high cover of grasses like <i>Dactylis glomerata</i> and <i>Arrhenatherum elatius</i> . Other areas are mown or trampled a little too much, so that <i>Festuca rubra</i> thatch build-up is inhibited. The largest areas with the most optimal habitat are found in areas with highest dune hills - at the north-west and west of the site. In the monitoring period 2007-2012, polygons A and B were classified as Optimal and Suboptimal. In the current survey, Polygon B drops in status to Suboptimal. This is based on ecological changes noted at and near the transect, but also because of the inclusion of areas of unsuitable saltmarsh (possibly due to a mapping error in the previous survey, but retained here nonetheless). Polygons C and E were previously classified as Suboptimal and Unsuitable, and retain this classification. Polygons D and F were classed by Moorkens & Killeen (2011) as Unsuitable, but in the current survey they have been recorded as Suboptimal-Unsuitable as potentially suitable, though small, areas of habitat were seen. In spite of the changes noted above, particularly in Polygon B, the conditions along the transect satisfy the assessment criteria of Moorkens & Killeen (2011), and there is enough potentially suitable habitat across the site as a whole, and so the Habitat Assessment results for Lahinch are Favourable (green).
2007-2012	Much of the habitat at the site appears to be in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Medium	Negative	99%	Golf course with heavily manicured greens and fairways, with associated management.

Vertigo angustior monitoring at Lahinch

2019-2024	PI03	Problematic native species	Inside	Low	Positive	25%	Occasional rabbit burrows noted at northern end of both courses, but no dropping and likely rabbit population maintained at a very low level
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Low	Negative	1%	Grazing level prevents thatch build up.
2013-2018	G02.01	golf course	Inside	Medium	Negative	65%	Presence of golf course (& associated maintenance) reduces habitat area for snail
2013-2018	H05.01	garbage and solid waste	Inside	Low	Negative	10%	Lots of small plastic rubbish at southwest end; the result of sea flooding
2013-2018	L08	inundation (natural processes)	Inside	High	Negative	20%	2010 sea floods covered areas of the golf course
2007-2012	G02.01	golf course	Inside	Medium	Neutral	97ha	Nearly all of the Vertigo angustior habitat lies within Lahinch Golf Club courses. At present, the snail is being maintained by wetness (salt marsh transition area polygon B), and by trampling and limited goat grazing in the golf course rough.

Mon. period	Future Prospects Notes
2019-2024	Vertigo angustior was not recorded during the current survey, despite the habitat being generally unchanged from the previous monitoring, resulting in a Population Assessment of Unfavourable-Bad (red) and a Habitat Assessment of Unfavourable-Inadequate (amber). The main pressure on the site is the fact that it is almost entirely spread across two golf courses, with the associated management. Given the decline in the population and no indication that the situation will improve, the Future Prospects are considered Unfavourable-Bad (red).
2013-2018	There are a number of factors affecting the Vertigo angustior habitat at Lahinch. In some areas, management is too intensive to allow the development of suitable habitat, and in others (mainly golf course 'roughs'), lack of management is resulting in rank vegetation. The site was inundated by the sea to a significant degree in storms in 2010. The impact of this event on the population is hard to ascertain, but is unlikely to have been massive (due to relatively short inundation duration, and height of many dune hills above inundation level). No sign of the previously recorded goat grazing was seen. Considering these impacts along with the severe decrease in the population of Vertigo angustior at the site, the Future Prospects for Lahinch are considered to be Unfavourable Inadequate (amber).
2007-2012	At present, the snail is being maintained by wetness (salt marsh transition area polygon B), and by trampling and limited goat grazing in the golf course rough. This should be sustainable for the population if the current amount of rough is maintained.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Amber	Red	Red
2013-2018	Red	Green	Amber	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	As Vertigo angustior was not recorded during the current survey, the Population Assessment returned a result of Unfavourable-Bad (red). There continues to be a good area of suitable habitat for the snail, despite some decrease in suitability along the transect, leading to a Habitat Assessment of Unfavourable-Inadequate (amber). In light of these assessments, and the pressures acting on the site the Future Prospects are considered to be Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Lahinch is Unfavourable-Bad (red).
2013-2018	In spite of a Habitat Assessment of Favourable (green), the Population Assessment of Unfavourable Bad (red) for this site results in an Overall Assessment of Unfavourable Bad (red).

2007-2012

6. DISCUSSION

Monitoring period

2019-2024

Discussion:

Vertigo angustior was not recorded from the site at Lahinch during the current survey, which is a further drop from the single positive sample recorded in 2013-2018. This contrasts starkly with the 17 positive samples recorded in 2009. Despite the site comprising two golf courses (the Old Course to the west and the Castle Course to the east), with the associated managed tees, greens, and fairways, the rough areas generally provide suitable habitat for the snail. However, the apparently suitable habitat does not appear to be capable of supporting the snail and it is unclear as to why this is the case. It is possible that there have been recent changes to the management of the golf courses, for example, in the application of pesticides. Discussions should be had with Lahinch Golf Club to ascertain if there have been any changes to the management of the site in the last 15 years.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

As the site at Lahinch comprises two golf courses, the management of the site is entirely within the purview of Lahinch Golf Club. There is no clear reason for the significant decline in the population of Vertigo angustior at the golf course, as there continues to be suitable habitat, particularly in northwest corner of the old golf course. It may be that there has been some change in the management of the site in terms of the use of pesticides, or some other activity that may not leave an obvious indicator. Discussions should be had with the landowners to ascertain if there have been any changes to the management of the site over the last 15 years.

Vertigo angustior monitoring at Lahinch

2013-2018

Discussion:

This is a large site that, although consisting of two heavily used golf courses, has supported a population of *Vertigo angustior* for at least 100 years (and probably very much longer). Prior to the current survey, the species was found to be relatively widespread and common at the site. However, in 2016 a dramatic decrease was seen, with only 1 out of 15 samples positive. The reasons are unclear, as management does not appear to have changed. The site was inundated by the sea in 2010, but while it is difficult to be certain, the impact of this event on the population is unlikely to have been massive (due to relatively short inundation duration, and the height of many of the dune hills above the level of the inundation). A repeat survey is needed immediately to investigate the population further, and both the golf course managers and NPWS need to meet to discuss options for this large and important site.

Monitoring recommendations:

This is a sizeable and important site for *Vertigo angustior*. It has been known to support a good population of the species for over a hundred years. It is not clear what has caused the apparent population crash, and so monitoring is recommended yearly until matters are more clear. The monitoring should follow that proposed by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too Wet, Optimal wetness or Too dry, respectively
- Take 1 sample each from each of the 4 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 10 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Some areas of 'rough' would benefit from increased trampling or introduction of grazing, as the vegetation is too rank for *Vertigo angustior*. These areas are particularly found in the 'old course', to the west of the road, and within this, mostly at the western fringe. The fact that the area is managed as a golf course may mean that this option is impractical, and so other methods of opening up the vegetation may need to be employed, such as cutting or purposeful disturbance. In areas that need to be opened up or would benefit from trampling, creative use of temporary fencing to funnel walkers/golfers through certain parts of the course could be employed. This should be monitored carefully to avoid unintentional damage to habitat, and designed with specialist advice and input. Other areas of rough, on the other hand, could be mowed less - both in frequency and height. This would allow an increase in thatch build-up.

The use of herbicides, fertiliser, etc. should be strictly limited to fairways/greens, and strong precautions taken to avoid drift (e.g. using covered machines).

Removal of sand; dumping/storage of earth, sand, grass, cuttings, etc.; - all such activities should be carried out away from habitat which is suitable for *Vertigo angustior*.

The presence of goats on the course was noted by Moorkens & Killeen (2011), but no signs of presence or activity were seen in the 2016 survey.

Given the sudden and large decrease in the population of the target species, the golf course managers and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on management actions.

Vertigo angustior monitoring at Lahinch

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable. The targets have been passed for all performance indicators.

Vertigo angustior was widespread and locally common in the fixed dune areas along the coastal and estuary margins of the old golf course (west side of the main road). The southern and eastern parts of the course support very little suitable V. angustior habitat. Most of the habitat on the new golf course (on the east side of the road) is unsuitable for V. angustior apart from the estuary margins and a more fixed mound at the north end of the site. The golf course management sacrifices some intensively managed areas in return for well managed rough areas, which are currently enough to sustain the snail. Major changes to the course should not be undertaken without consideration of the consequences for the habitat.

Monitoring recommendations:

Although the overall condition of the site is classed as Favourable, given that much of the good habitat lies within the golf club, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012

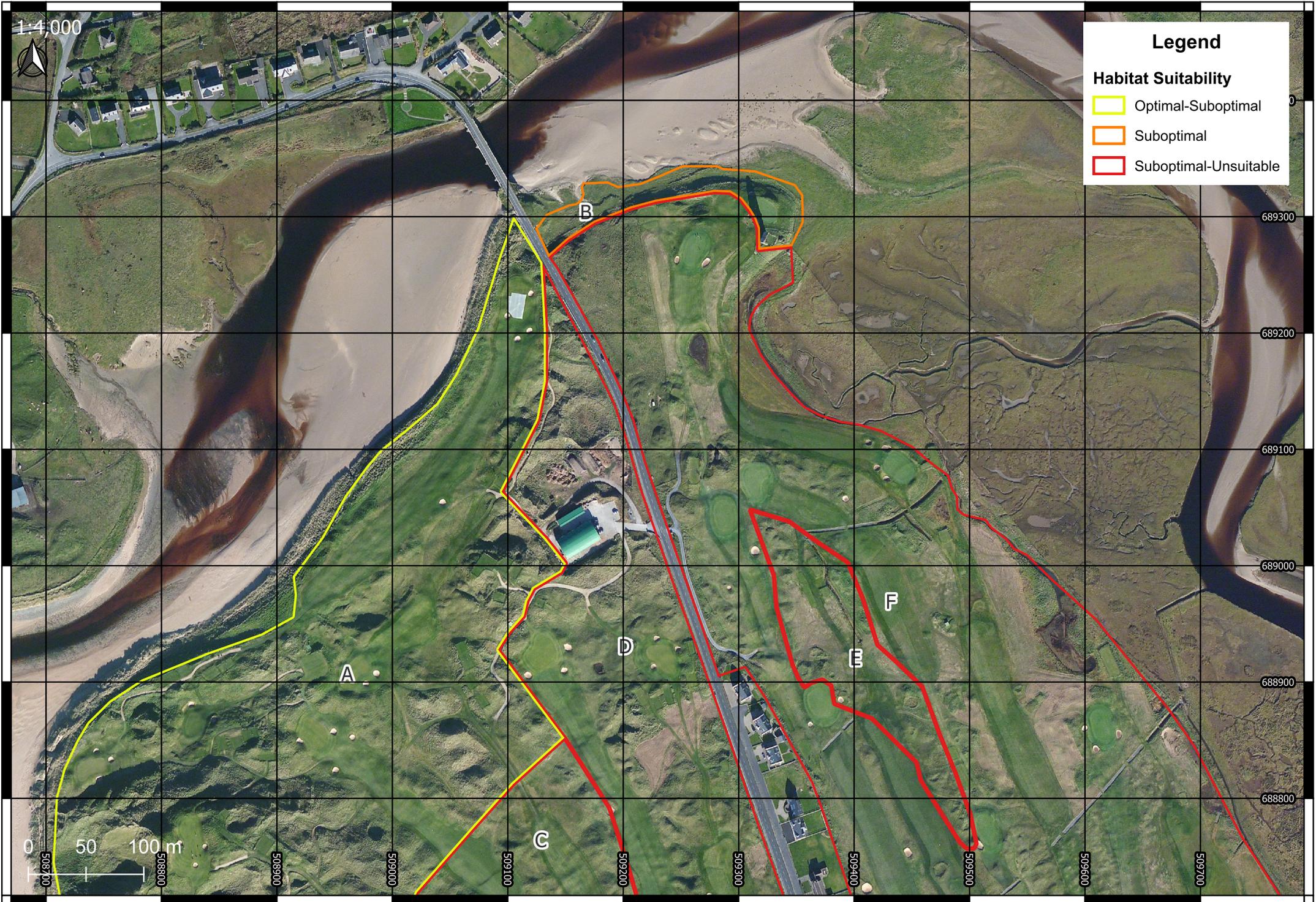
Management recommendations:

Existing Management

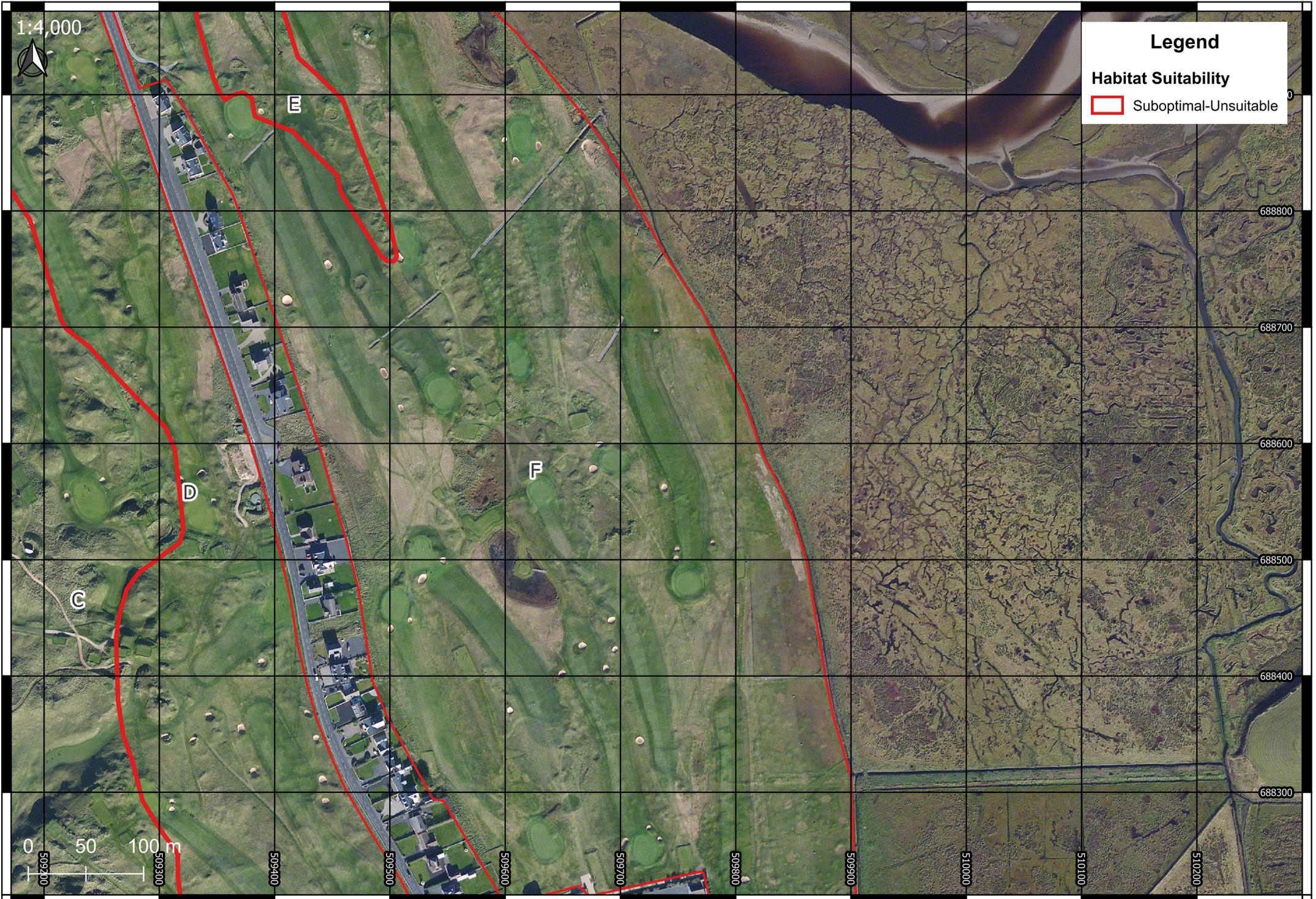
The site has been managed as a large links golf course since 1892 and the snail has had a sustainable population within the rough areas and salt marsh transition. The rough areas and the salt marsh are unmanaged apart from a small number of goats that wander extensively over the course.

Proposed management prescription for Vertigo angustior

The existing management is recommended to be continued with no further intensification of the current rough areas or salt marsh transition.







1:4,000



Legend

Habitat Suitability

 Suboptimal-Unsuitable

C

D

E

F

0 50 100 m

509200 509300 509400 509500 509600 509700 509800 509900 510000 510100 510200

688800
688700
688600
688500
688400
688300





Site report - Vertigo Monitoring

Vertigo angustior monitoring at Malin Dunes

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM12 **County:** Donegal
SAC Site Code: 002012 North Inishowen Coast **QI:** Yes

Location description (from baseline survey):

Vertigo angustior habitat is present throughout much of the fixed dune system known as the Back Strand or Lag. Access is from the minor road that turns off to the church at Lag at C 432 456.

Monitoring period	Date surveyed	Recorders
2019-2024	2-3 July 2024	John Brophy & Orla Daly
2013-2018	8-9 June 2016	John Brophy & Maria Long
2007-2012	6 July 2009	Evelyn Moorkens & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra and Ammophila arenaria, with sparse Galium aparine, Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above or with a higher proportion of Trifolium repens, but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Malin Dunes comprises an extensive sand dune system with large areas of variable suitability for supporting Vertigo angustior. The best of the habitat continues to occur along the section of the dunes closest to the shore, though coastal erosion has destroyed formerly suitable habitat and the associated increase in blown sand has further negatively impacted on the habitat more inland in proximity to the eroded stretch. The effect of erosion and blown sand has notably impacted on the result of the habitat and populations assessments of the site, as the area where the transect was located has been significantly altered by these factors. The landward sections of the dunes are more subject to grazing pressure from cattle, sheep and rabbits, which has reduced the suitability of the habit and resulted in areas with abundant Ammophila arenaria but limited associated Festuca rubra thatch, as it has been grazed away. The grazing and associated supplementary feeding has also increased the agricultural character of the site, with species such as Trifolium repens, Cirsium arvense, Cirsium vulgare and Lolium perenne found in patches throughout the site. The site would benefit from a reduction in the grazing level and supplementary feeding. The rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and Vertigo angustior habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry. Addressing the coastal erosion issue is likely to be particularly challenging into the future.

2013-2018:

This site represents an extensive area of Vertigo angustior habitat, most of which is in good condition and suitable for supporting the species. Monitoring criteria based heavily on the 60m transect have resulted in an Overall Assessment of Unfavourable Bad (red). However, this result should be interpreted in the context of the site as a whole, which is both in good condition more or less throughout, and likely to continue to be so (particularly following discussion with landowner who has no plans to change farming practices).

2007-2012: The future sustainability of V. angustior at Lag dunes depends on the continued vegetation height at Polygons A and B. These areas have widespread marram grass with a wide variety of other dune species, and are not encroached by the sheep grazing to the east of the site in spite of that fact that there are no boundary fences to prevent them moving over the entire site. The V. angustior habitat is less fixed and the marram grass dominating the area may be less tempting to sheep than the softer grass of the lower ground inland. The snail habitat is managed by exposure and this appears to be enough to prevent it getting more rank and unsuitable. Therefore, the likelihood of a sustainable population surviving in the future is high.

3. TRANSECT DETAILS

TRANSECT: 1	MONITORING PERIOD: 2019-2024
Start point:	ITM 642441 953014 First 13m of transect has been lost to marine erosion. ITM from 2024.
End point:	ITM 642467 953014

Vertigo angustior monitoring at Malin Dunes

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
C	Suboptimal-Unsuitable	14.8201	Polygon C was upgraded from Unsuitable to Suboptimal-Unsuitable. Large areas are unsuitable due to flooding (dune slack), tight grazing and species change due to agricultural use; however, one of the dune ridges is suitable for supporting <i>Vertigo angustior</i> and the species was found there. It is unknown whether this change in status is due to ecological change or interpretation.
D	Suboptimal	11.5052	Polygon D was upgraded from Unsuitable to Suboptimal due to the area of habitat present capable of supporting <i>Vertigo angustior</i> . While lower areas are unsuitable due to agriculture (grazed tight, with agricultural species or damaged by supplementary feeding), higher ground had more suitable habitat of <i>Ammophila arenaria</i> tussocks with <i>Festuca rubra</i> thatch. It is unknown whether this change in status is due to ecological change or interpretation. The area of the polygon was reduced, as the church and graveyard were excluded from the polygon.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	31.724	Polygon A
B	Sub-optimal with unsuitable areas	21.353	Polygon B
C	Unsuitable	14.82	Polygon C
D	Unsuitable	12.568	Polygon D

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	0m	7m	28m	25m	0m	0m	60m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	31.5m	22m	6.5m			43m		17m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	42m	NA	13	NA	5m	55m		5m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (5 samples)								
2019-2024	1	1	19m	1	0	1	Count	Suboptimal-Unsuitable
2019-2024	1	2	43m	1	0	1	Count	Suboptimal-Unsuitable
2019-2024	1	3	49m	0	0	0	Count	Suboptimal
2019-2024	1	4	55m	0	0	0	Count	Suboptimal
2019-2024	1	5	59m	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 Transect 1 (6 samples)								
2013-2018	1	1	1m	0	0	0		Optimal
2013-2018	1	2	20m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	25m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	4	35m	1	0	1	Presence/Absence	Optimal
2013-2018	1	5	45m	1	0	1	Presence/Absence	Optimal
2013-2018	1	6	52m	0	0	0		Optimal
Monitoring period 2007-2012 Transect 1 (7 samples)								
2007-2012	1	1	10m	0	0	0		
2007-2012	1	2	14.5m	0	0	1		
2007-2012	1	3	17.5m	0	0	0		

Vertigo angustior monitoring at Malin Dunes

2007-2012	1	4	22m	0	0	0
2007-2012	1	5	29.5m	0	0	1
2007-2012	1	6	41m	0	0	2
2007-2012	1	7	52m	0	0	0

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (8 samples)							
2019-2024	01	ITM 642485 952805	4	0	4	Count	Optimal-Suboptimal
2019-2024	02	ITM 642508 952525	22	3	25	Count	Optimal-Suboptimal
2019-2024	03	ITM 642679 953261	0	0	0	Count	Suboptimal
2019-2024	04	ITM 642852 953109	0	0	0	Count	Optimal
2019-2024	05	ITM 642940 952612	0	0	0	Count	Suboptimal
2019-2024	06	ITM 642850 952242	0	0	0	Count	Optimal-Suboptimal
2019-2024	07	ITM 642757 951958	0	0	0	Count	Suboptimal
2019-2024	08	ITM 642507 952124	0	0	0	Count	Optimal
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	C 42536 52818	0	0	0		Optimal
2013-2018	02	C 42566 52551	1	0	1	Presence/Absence	Optimal
2013-2018	03	C 42748 53298	0	0	0		Optimal-Suboptimal
2013-2018	04	C 42913 53132	1	0	1	Presence/Absence	Optimal
2013-2018	05	C 43005 52639	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	06	C 42923 52267	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	07	C 42849 51975	0	0	0		Optimal
2013-2018	08	C 42568 52145	1	0	1	Presence/Absence	Optimal
Monitoring period 2007-2012 (18 samples)							
2007-2012	01	C 42534 53188	0	0	0		
2007-2012	02	C 42538 53178	0	0	0		
2007-2012	03	C 42562 53155	0	0	0		
2007-2012	04	C 42572 53117	0	0	0		
2007-2012	05	C 42567 53082	0	0	0		
2007-2012	06	C 42591 53056	0	0	1		
2007-2012	07	C 42454 52471	0	0	0		
2007-2012	08	C 42654 52344	0	0	0		
2007-2012	09	C 42677 52391	0	0	0		
2007-2012	10	C 42722 52409	0	0	0		
2007-2012	11	C 42750 52487	0	0	0		
2007-2012	12	C 42740 52638	0	0	0		
2007-2012	13	C 42456 53205	0	0	0		
2007-2012	14	C 42498 53140	0	0	1		
2007-2012	15	C 42517 53068	0	0	1		
2007-2012	16	C 42541 53002	0	0	1		
2007-2012	17	C 42519 52359	0	0	1		
2007-2012	18	C 42572 52141	0	0	1		

Vertigo angustior monitoring at Malin Dunes

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-60m) with optimal or sub-optimal habitat	Present in 2 zones	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-60m) with optimal or sub-optimal habitat	Present in 5 zones	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-60m) with optimal or sub-optimal habitat	Present in 3 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present at 3 other locations (minimum 6 sites sampled) with optimal or sub-optimal habitat	Present at 2 other locations (8 sampled)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present at 3 other locations (minimum 6 sites sampled) with optimal or sub-optimal habitat	Present at 5 other locations (8 sampled)	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present at 3 other locations (minimum 6 sites sampled) with optimal or sub-optimal habitat	Present at 6 other locations (from 18 sampled)	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was recorded at two locations along the transect during the current survey, which is a decline from the previous two monitoring rounds. Fewer samples were taken, due to the limited amount of habitat present along the transect considered to have any suitability for the snail. Two of the eight spot samples taken across the site were positive for V. angustior, which is a decline from five of eight in 2013-2018. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, Vertigo angustior was recorded at five out of seven locations on the transect, and six out of 18 other locations around the site. This gave an overall result of 36% positive samples. In the current survey, five out of six locations on the transect were positive for Vertigo angustior, while five out of eight other locations across the site were positive. This gives an overall result of 71% positive samples. Among the 2016 samples were positive samples from both polygons C and D, which were previously deemed Unsuitable. All of this points to a healthy and widespread population of Vertigo angustior at this site. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2007-2012	The snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	At least 40m of habitat along the Transect is classed as Optimal AND At least 55m of habitat along the Transect is classed as Sub-Optimal or Optimal	0m is Optimal AND 7m is Suboptimal or Optimal	Fail
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 55m of the Transect	0m is Optimal wetness	Fail
2013-2018	1	Habitat extent	At least 40m of habitat along the Transect is classed as Optimal AND At least 55m of habitat along the Transect is classed as Sub-Optimal or Optimal	32m is Optimal AND 60m is Suboptimal or Optimal	Fail

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2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 55m of the Transect	43m is Optimal wetness	Fail
2007-2012	1	Habitat extent	At least 40m of habitat along the Transect is classed as Optimal and At least 55m of habitat along the Transect is classed as Sub-Optimal or Optimal	44m is Optimal, 55m is Sub-Optimal or Optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 55m of the Transect	55m is optimal	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 30-35ha of the site sub-optimal with optimal areas	64.6ha Suboptimal or above	Pass
2013-2018	Habitat extent	At least 30-35ha of the site sub-optimal with optimal areas	65.4ha Suboptimal or above	Pass
2007-2012	Habitat extent	At least 30-35 ha of the site sub-optimal with optimal areas	31.7 ha	Pass

Mon. period	Habitat Notes
2019-2024	Extensive areas of the site at Malin Dunes have some suitability for supporting <i>Vertigo angustior</i> , with the best habitat in Polygon A. The overall suitability of the site remains similar to the previous round of monitoring; however, there has been extensive erosion along the western edge of the dune system, particularly in the vicinity of the transect. This has resulted in a loss of fixed dune habitat for the first 13m of the transect and significant impacts from windblown sand along much of the remainder of the transect. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Malin Dunes is Unfavourable-Bad (red).
2013-2018	All habitat polygons at this site were upgraded in suitability status, with most areas being Suboptimal or better. This means that large areas across this site hold significant areas of land which provide good habitat for <i>Vertigo angustior</i> . In fact this site is likely to hold some of the largest expanses of <i>Vertigo angustior</i> habitat in the country. However, in spite of this, based on the criteria of Moorkens & Killeen (2011), the habitat assessment for Malin Dunes is Unfavourable Bad (red). This is because their assessment relies heavily on large proportions of the transect remaining optimal.
2007-2012	Much of the habitat at the site appears to be in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Medium	Negative	100%	Grazing mainly by cattle, but some sheep also present. Supplementary feeding resulting in localised poaching and spread of agricultural species, including <i>Lolium perenne</i> , <i>Trifolium repens</i> , <i>Cirsium arvense</i> and <i>Cirsium vulgare</i> .
2019-2024	PI03	Problematic native species	Inside	Low	Negative	100%	Rabbit grazing in all polygons. Patches of plant species such as <i>Lolium perenne</i> , <i>Cirsium arvense</i> and <i>Urtica dioica</i> .
2019-2024	PJ07	Cyclones, storms, or tornados due to climate change	Inside	High	Negative	5%	Extensive erosion of dune face and sand blown onto fixed dune habitat due to increased storminess related to climate change. 60m lost in vicinity of transect.
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Low	Positive	75%	Very low numbers of cattle

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2013-2018	A04.02.02	non intensive sheep grazing	Inside	Medium	Positive	100%	Levels of sheep grazing across site as whole are beneficial to habitat
2013-2018	A05.02	stock feeding	Inside	High	Negative	2%	Supplementary feeding only in Polygon D. Quite damaging in small areas.
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Negative	1%	Farmer access
2013-2018	I02	problematic native species	Inside	High	Negative	5%	Few areas at west (polygons B and C) affected by bracken
2013-2018	K01.01	Erosion	Inside	High	Negative	10%	Severe erosion in northern part of Polygon A. Much land lost.
2007-2012	A04.02.02	non intensive sheep grazing	Inside	Medium	Negative	27.39ha	The sheep grazing is cropping the vegetation to a level that is unsuitable for <i>V. angustior</i> , but it is not known whether the lack of habitat is solely due to grazing or whether the wetness levels are unsuitable also. Currently the sheep remain in the polygons that are unsuitable and are not affecting the quality of the habitat in polygons A and B. If they were to spread into A and B the result would be negative.

Mon. period	Future Prospects Notes
2019-2024	Grazing by cattle, sheep and rabbits, as well as the associated increase in the agricultural nature of the sward across extensive areas of Malin Dunes due to supplementary feeding appears to be having a negative impact on the suitability of the site for <i>Vertigo angustior</i> . This is causing the restriction in the extent of well-developed <i>Festuca rubra</i> thatch around <i>Ammophila arenaria</i> tussocks, and has also caused an increase in the cover of species more associated with agricultural land. Erosion along the western edge of Polygon A has resulted in the loss of tens of metres of fixed dune habitat and exposed more of the habitat to the effects of blown sand, and this has particularly affected the habitat in the vicinity of the transect. Based on the current status of the population and habitat, and in light of the pressures acting on the site, the Future Prospects are assessed as Unfavourable-Bad (red).
2013-2018	<p>The Future Prospects for <i>Vertigo angustior</i> at Malin Dunes were classed as Favourable (green) in the monitoring period 2007-2012, with non-intensive sheep grazing the only noted activity (which was deemed negative). The current survey noted non-intensive sheep and cattle grazing as positive, as it is maintaining a more open sward, preventing the site from becoming rank with <i>Ammophila arenaria</i> tussocks. It was noted that there is a good balance of grazing - some areas are grazed a little too tight, some are a little rank, but on balance, across the site as a whole, the grazing regime is well-suited to providing good habitat for <i>Vertigo angustior</i>.</p> <p>Considerable erosion is occurring around the seaward edge of the northern half of the site, which has resulted in loss of habitat. This is notable in particular at the start point of the transect, which is now much closer to the edge of the dune, as well as through the remnants of a former car park (concrete and tarmac), which are scattered at the end of the road to the beach. This will continue to be a concern into the future, with impacts probably increasing with continuing climate change. However, mitigating against this is the large size of the site. Other impacts include supplementary feeding, the spread of bracken, and some minor paths & tracks. Based on the generally positive (or if negative, then limited in extent) activities on-going at the site, the Future Prospects for Malin Dunes are assessed as Favourable (green).</p>
2007-2012	As the impact is not impinging on the areas needed to sustain the snail, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Green	Red	Green	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes

Vertigo angustior monitoring at Malin Dunes

2019-2024	The Habitat Assessment for Malin Dunes remains Unfavourable-Bad (red), while the Population Assessment has also dropped to Unfavourable-Bad (red). The Future Prospects were assessed as Unfavourable-Bad (red), both Population and Habitat are Unfavourable-Bad (red) and neither has a positive future trend. Based on these assessments, the Overall Assessment for Malin Dunes is Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, the overall assessment for Malin Dunes was Favourable (green). Despite favourable results for the Population Assessment and Future Prospects, and the improved classification of all four polygons, the Unfavourable Bad result for Habitat Assessment means an Overall Assessment of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2019-2024

Discussion:

Malin Dunes comprises an extensive sand dune system with large areas of variable suitability for supporting *Vertigo angustior*. The best of the habitat continues to occur along the section of the dunes closest to the shore, though coastal erosion has destroyed formerly suitable habitat and the associated increase in blown sand has further negatively impacted on the habitat more inland in proximity to the eroded stretch. The effect of erosion and blown sand has notably impacted on the result of the habitat and populations assessments of the site, as the area where the transect was located has been significantly altered by these factors. The landward sections of the dunes are more subject to grazing pressure from cattle, sheep and rabbits, which has reduced the suitability of the habitat and resulted in areas with abundant *Ammophila arenaria* but limited associated *Festuca rubra* thatch, as it has been grazed away. The grazing and associated supplementary feeding has also increased the agricultural character of the site, with species such as *Trifolium repens*, *Cirsium arvense*, *Cirsium vulgare* and *Lolium perenne* found in patches throughout the site. The site would benefit from a reduction in the grazing level and supplementary feeding. The rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and *Vertigo angustior* habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry. Addressing the coastal erosion issue is likely to be particularly challenging into the future.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

In 2009, there was no evidence of grazing in polygons A or B, but sheep were grazing in polygons C and D. In 2016, sheep were grazing the entire site and a small number of cattle were also present. During the current survey approximately 23 cattle and seven sheep were recorded where they would have access to polygons A, B and C, while one cow and 12 calves were recorded in Polygon D. Rabbits are also present at a low level across the site. Supplementary feeding has resulted in localised damage, but also, and more importantly, the spread of agricultural species such as *Cirsium arvense*, *Cirsium vulgare*, *Lolium perenne* and *Trifolium repens* throughout much of the dunes system, with Polygon A being the least impacted, but those species still present. The grazing level is considered to be slightly too high. While there are extensive areas of *Ammophila arenaria*, the *Festuca rubra* thatch that would be associated with *Ammophila* tussocks is very limited due to grazing by the various species. A relaxation in the grazing level is required to allow the *Festuca rubra* thatch to develop and therefore create more optimal habitat for *Vertigo angustior*. The general recommendation made by Moorkens & Killeen (2011) for grazing of fixed dune habitat for *V. angustior* is less than 0.8 livestock units (LU) per hectare in spring to autumn, with animals removed in winter. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Rabbit grazing was noted across the site, albeit at a low level that does not currently appear to be having a significant impact on the *Vertigo angustior* habitat. However, the rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and *Vertigo angustior* habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry. Coastal erosion, noted during the 2013-2018 monitoring period, continues to be an issue; however, the management of this pressure is extremely difficult given its nature and the challenge in installing any measures to prevent the continued erosion of the dune face. Similarly, the issue of drying out at the site, presumed to be the result of changes to precipitation and wind patterns at the site associated with climate change, is an extremely difficult one to address and one that cannot be solved at a local level.

Vertigo angustior monitoring at Malin Dunes

2013-2018

Discussion:

This site represents an extensive area of *Vertigo angustior* habitat, most of which is in good condition and suitable for supporting the species. Monitoring criteria based heavily on the 60m transect have resulted in an Overall Assessment of Unfavourable Bad (red). However, this result should be interpreted in the context of the site as a whole, which is both in good condition more or less throughout, and likely to continue to be so (particularly following discussion with landowner who has no plans to change farming practices).

Monitoring recommendations:

As this is such an important site for the species, monitoring should be carried out at three-yearly intervals to ensure that no major changes occur to the site, particularly in terms of the management activities or on-going (natural) erosion. The monitoring should follow that proposed by Moorkens & Killeen (2011), with only minor changes as suggested below:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 6 of the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of eight other locations (with a wide geographical spread, and including from all four polygons) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Generally, the grazing levels at the site are ideal (particularly within polygons A, B and C). Some areas are grazed tight, others to an ideal level and some are a little rank, but with a site this size the balance is as good as is likely to be achieved. Polygon D should be less heavily grazed, and the supplementary feeding should either be ceased, or moved to areas outside the *Vertigo angustior* habitat. Erosion rates at the site need to be monitored, and an assessment of coastal defence options may be needed in the future.

Vertigo angustior monitoring at Malin Dunes

2007-2012

Discussion:

The future sustainability of *V. angustior* at Lag dunes depends on the continued vegetation height at Polygons A and B. These areas have widespread marram grass with a wide variety of other dune species, and are not encroached by the sheep grazing to the east of the site in spite of that fact that there are no boundary fences to prevent them moving over the entire site. The *V. angustior* habitat is less fixed and the marram grass dominating the area may be less tempting to sheep than the softer grass of the lower ground inland. The snail habitat is managed by exposure and this appears to be enough to prevent it getting more rank and unsuitable. Therefore, the likelihood of a sustainable population surviving in the future is high.

Monitoring recommendations:

Although the Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance was Favourable, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 6 of the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

There was no evidence of any grazing in 2009 in polygons A and B, but sheep were grazing polygons C and D. The habitat where *V. angustior* is present has no active management, and thus is managed by exposure, i.e. the frequent high winds and rain.

Proposed management prescription for site

As the population of the snail is being maintained by the current regime, no change is proposed from the current management.



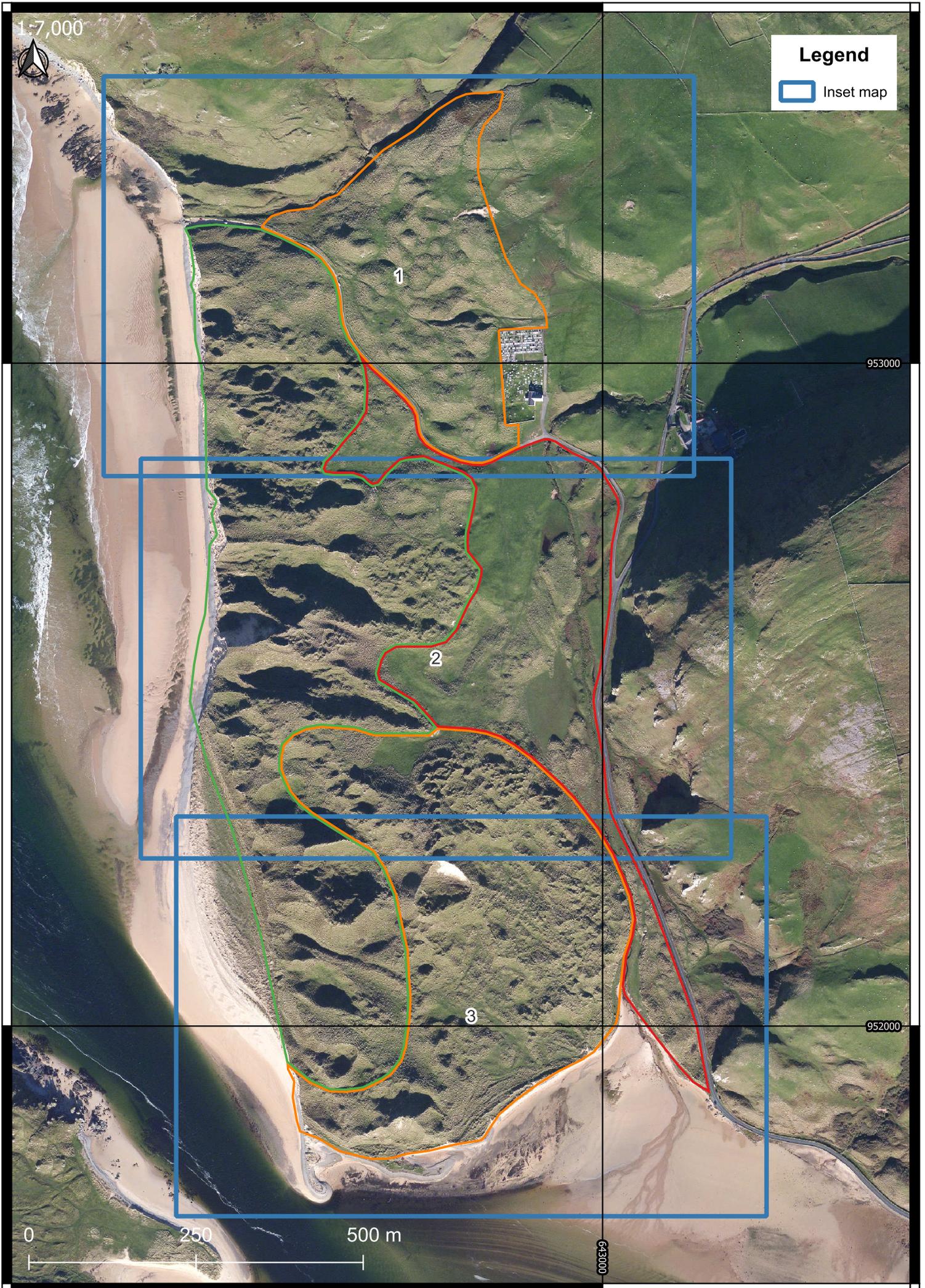


Legend

Habitat Suitability

- Optimal
- Suboptimal
- Suboptimal-Unsuitable





Site report - Vertigo Monitoring

Vertigo angustior monitoring at Pollardstown Fen

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM13 **County:** Kildare
SAC Site Code: 000396 Pollardstown Fen **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* is the ecotone above the fen margin below the esker ridge at the south-east of the fen, and the small mineral marsh in the centre south of the fen. Access is through private property or the public entrance.

Monitoring period	Date surveyed	Recorders
2019-2024	16 June 2024	John Brophy & Orla Daly
2013-2018	18-19 September 2014	John Brophy & Maria Long
2007-2012	12 May 2009	Evelyn Moorkens and Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present here in different areas is grassland marsh transition, grassland pond transition, or grassland marsh fen transition, but in each case permanently waterlogged but not inundated ground on mineral soil, mostly the ecotone between *Potentilla anserina* dominated wet grassland and the Iris marsh. These are not Annex I nor CORINE listed habitats, but they are important in that they support the so called "marsh phase" or inland habitat of *Vertigo angustior*. The habitat at the eastern site is more suitable for the snail than the site below the graveyard, and locations of suitable ecotone include combinations of *Potentilla anserina*, *Iris pseudacorus*, *Carex paniculata*, *Carex acutiformis*, *Trifolium pretense*, and *Ranunculus repens* communities. This comprises ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Iris marsh and wet grassland with <i>Potentilla anserina</i> , <i>Carex paniculata</i> , <i>Carex acutiformis</i> at the fen margin, with an open structured, damp, humid thatch of decaying vegetation with living and decaying moss in the litter layer of this unshaded habitat
Sub-optimal	As above but habitat is more shaded or with <i>Filipendula</i> , or thatch and moss layer is sparse, or there is pools of standing water
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior was not recorded from Pollardstown Fen during the current survey. The previous round of monitoring recorded the snail from a single sample, where only a single individual was found, which represented a significant decline from the 2007-2012 monitoring period. For this reason, the Population Assessment continues to be Unfavourable-Bad (red), as does the Habitat Assessment due to the habitat being either too rank where there is no grazing, or too impacted by grazing where horses have access to it. The areas grazed by horses would benefit from the temporary removal of access to allow the vegetation to become more developed and prevent poaching. If possible, some form of grazing should be introduced to Polygon A where the vegetation has become rank, with limited removal of trees also a possibility.

2013-2018:

This site has seen a considerable deterioration in terms of its suitability for *Vertigo angustior* in the period between 2009 and 2014. Polygon A has become rank and overgrown (not to mention overshadowed by growing trees), to such an extent that it is hard to imagine it ever having been suitable for *Vertigo angustior*. Polygons B and D are overgrazed, and for the most part lack areas with a suitable thatch/moss layer to host the species. The species was found in only one sample point, within Polygon C. Management intervention is urgently needed to attempt to reverse the deterioration. Polygon A needs some targeted tree removal and immediate instigation of grazing, whereas polygons B and D need a relaxation of grazing in general, and perhaps also some fencing out of animals from lower parts at wet times of year. Overall, the prospects for the species at this site are poor. The area of potentially suitable habitat at the site has always been very limited, and given the deterioration in quality across most of its area, for a variety of reasons, the species has been put under significant pressure.

2007-2012: *Vertigo angustior* was first discovered at Pollardstown Fen in 2002, and was the subject of a survey of the entire fen margin during that year. This showed that the snail was found only in the transition zone lying between the sloping grazed grassland with herbs, and the wetter fen dominated by *Filipendula ulmaria*, *Juncus* spp., and grasses. The transition zone was fragmented and discontinuous, and rarely more than 3-4 metres wide. The habitat within the zone was characterised principally by stands of *Iris pseudacorus* with grasses (e.g. *Holcus lanatus* and *Phleum pratense*), and low-growing herbs, particularly *Potentilla anserina* and *Ranunculus repens*. The survey demonstrated that the distribution of *Vertigo angustior* at Pollardstown Fen is very restricted, apparently only occurring at the south-eastern end of the site over a distance of approximately 800 metres, in a zone mostly less than 4 metres wide, and in a small clump of Iris dominated vegetation below the graveyard. Within the latter site, *V. angustior* is only occasionally found to be present, suggesting it is restricted to a very small areas of micro habitat for the majority of time, spreading more widely (a few metres square) during times of high humidity. The entire habitat for *V. angustior* at the fen equates to a maximum area of potential occupancy of 2.3 ha, whereas in reality, the area of suitable micro habitat is considerably less.

Vertigo angustior monitoring at Pollardstown Fen

Transition zone habitat comprising grassland with herbs occurs around most of the fen perimeter. However, the combination of suitable vegetation composition and ground moisture only occurs at a few locations. These are mainly on banks and mounds along the southern perimeter. Throughout most of the northern fen perimeter the transitional grassland is both tall and rank, or the land has been intensively managed up to the fen margin, such that the transition zone is too wet.

There are very few "marsh phase" or inland *V. angustior* habitat locations known in Ireland. While Iris marsh is very common in the country, this habitat is mainly subject to inundation in winter. Inundated habitat cannot support this species; it requires a wet but free-draining substrate. The combination of high water table and free draining esker ridge at Pollardstown accounts for its rare presence here.

This rare habitat needs to be carefully maintained into the future, especially in the light of its recent trampling damage. This site should therefore be monitored regularly, both for correct management maintenance and to assess other likely impacts caused by increased pressure on the greater Dublin area, and by the consequences of climate change.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2019-2024

Start point: ITM 676664 715850 Near base of fallen *Salix fragilis* that has continued to grow. ITM from 2024.

End point: ITM 676680 715875 End by *Salix cinerea*. ITM from 2024.

Transect length: 30 **Direction:** SSW-NNE

Description: The transect runs through a transition from wet grassland to Iris marsh to sedge fen, now rank.

Sampling frequency: 2 samples were taken from zones with the most suitable habitat

TRANSECT: 2 **MONITORING PERIOD:** 2019-2024

Start point: ITM 677728 715250 Just west of twin old fence posts. ITM from 2024.

End point: ITM 677722 715240 Spoil heap. ITM from 2024.

Transect length: 12 **Direction:** NE-SW

Description: The transect runs from the fence to the main fen across an Iris transition marsh and up a slope into rough horse pasture

Sampling frequency: 1 sample was taken from Zone 1

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point: N 76774 61571 Approx 1 m east of leaning *Salix fragilis*.

End point: N 76740 15856 *Carex paniculata* tussocks. Rank.

Transect length: 30 **Direction:** As for 2007-2012

Description: As for 2007-2012

Sampling frequency: As for 2007-2012

TRANSECT: 2 **MONITORING PERIOD:** 2013-2018

Start point: N 77795 15220 2nd fence post SE of gate. Broken off at base.

End point: N 77789 15208 Spoil heap. End point on slope down to SW.

Transect length: 12 **Direction:** As for 2007-2012

Description: As for 2007-2012

Sampling frequency: As for 2007-2012

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point: N 76729 15801 From a small willow tree

End point: N 76743 15847 The end of the sedge fen

Transect length: 30 **Direction:** S-N

Description: The transect runs through a transition from wet grassland to Iris marsh to sedge fen

Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Three samples were taken at various intervals along the transect from optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition

Vertigo angustior monitoring at Pollardstown Fen

TRANSECT:	2	MONITORING PERIOD:	2007-2012
Start point:	N 77794 15239	From the second fence post east of the gate	
End point:	N 77790 15218	A mound (spoil heap)	
Transect length:	12	Direction:	N-S
Description:	The transect runs from the fence to the main fen across an Iris transition marsh and up a slope into rough cattle pasture		
Sampling frequency:	As for Transect 1. Two samples were taken at various intervals along the transect from optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	0.6139	Polygon A remains Suboptimal-Unsuitable. It comprises FS2 Tall-herb swamp with encroaching woodland of <i>Salix</i> spp., <i>Fraxinus excelsior</i> and <i>Alnus glutinosa</i> . The polygon is dominated by <i>Carex acutiformis</i> swamp with dense, dry litter and <i>Rubus fruticosus</i> agg. spreading in the sward in places. Other areas have <i>Carex paniculata</i> , <i>Phragmites australis</i> , <i>Iris pseudacorus</i> , <i>Arrhenatherum elatius</i> , <i>Filipendula ulmaria</i> and <i>Eupatorium cannabinum</i> .
B	Suboptimal	0.1175	Polygon B remains Suboptimal. This polygon is a linear depression dominated by <i>Iris pseudacorus</i> with a carpet of <i>Calliergonella cuspidata</i> in damp parts. Vegetation upslope consists of tightly grazed GS1 Dry calcareous and neutral grassland.
C	Suboptimal-Unsuitable	0.7792	Polygon C remains Suboptimal-Unsuitable with <i>Holcus lanatus</i> sward on the field side, while fen side is dominated by <i>Carex acutiformis</i> , <i>Nasturtium officinale</i> patches, <i>Phragmites australis</i> with occasional <i>Iris pseudacorus</i> patches.
D	Suboptimal-Unsuitable	0.788	Polygon D remains Suboptimal-Unsuitable and comprises <i>Iris pseudacorus</i> marsh patches within a tightly grazed sward that is a mosaic of sedge-rich GS4 Wet grassland and GS1 Dry calcareous and neutral grassland.

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	0.6139	Polygon A status was downgraded from Sub-optimal to Suboptimal-Unsuitable. The boundary was tweaked slightly to ensure transect located within polygon.
B	Suboptimal	0.1175	Polygon B status remains Suboptimal. The boundary was refined to better delineate the habitat. Grassland to south excluded.
C	Suboptimal-Unsuitable	0.7792	Polygon C status was downgraded from Sub-optimal to Suboptimal-Unsuitable. The boundary was altered slightly to better delineate the habitat.
D	Suboptimal-Unsuitable	0.788	Polygon D status was downgraded from Sub-optimal to Suboptimal-Unsuitable.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	0.5911	Polygon A - transition from wet grassland to Iris marsh to sedge fen
B	Sub-optimal	0.1534	Polygon B - small area of Iris marsh between the fen and rough cattle grazed slope
C	Sub-optimal	0.7866	Polygon C - small area of Iris marsh between the fen and rough cattle grazed slope
D	Sub-optimal	0.788	Polygon D - small area of Iris marsh between the fen and rough cattle grazed slope

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	0m	0m	10m	20m	30m	0m	0m
2	0m	0m	5m	0m	7m	6.5m	0m	5.5m

Vertigo angustior monitoring at Pollardstown Fen

Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt./Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1				19.5 m	10.5m	19.5m		10.5m
2			4m	1.5 m	6.5m	4m		8m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt./Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	11m	NA	12.5m	NA	6.5m	30m		
2	3.6m	NA	3m	NA	5.4m	6.6m		5.4m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (2 samples)								
2019-2024	1	1	24m	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	1	2	29m	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2019-2024 Transect 2 (1 sample)								
2019-2024	2	1	2m	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2013-2018 Transect 1 (3 samples)								
2013-2018	1	1	14m	0	0	0		Suboptimal-Unsuitable
2013-2018	1	2	18.5m	0	0	0		Suboptimal-Unsuitable
2013-2018	1	3	26.5m	0	0	0		Suboptimal-Unsuitable
Monitoring period 2013-2018 Transect 2 (1 sample)								
2013-2018	2	1	2.5m	0	0	0		Suboptimal
Monitoring period 2007-2012 Transect 1 (3 samples)								
2007-2012	1	1	7.3m	0	0	0		
2007-2012	1	2	12.4m	0	0	1		
2007-2012	1	3	18.5m	0	0	5		
Monitoring period 2007-2012 Transect 2 (2 samples)								
2007-2012	2	1	2.8m	0	0	2		
2007-2012	2	2	5.4m	0	0	3		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (4 samples)							
2019-2024	01	ITM 677474 715342	0	0	0	Count	Suboptimal
2019-2024	02	ITM 677542 715318	0	0	0	Count	Suboptimal
2019-2024	03	ITM 677944 715099	0	0	0	Count	Suboptimal
2019-2024	04	ITM 677764 715244	0	0	0	Count	Suboptimal-Unsuitable
Monitoring period 2013-2018 (4 samples)							
2013-2018	01	N 77712 15262	0	0	0		Suboptimal-Unsuitable
2013-2018	02	N 77611 15287	0	0	0		Suboptimal-Unsuitable
2013-2018	03	N 78014 15061	0	0	0		Suboptimal-Unsuitable
2013-2018	04	N 77836 15208	1	0	1		Suboptimal-Unsuitable
Monitoring period 2007-2012 (1 sample)							
2007-2012	01	N 77782 15227	0	0	4		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Vertigo angustior monitoring at Pollardstown Fen

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 1 (minimum 3 samples)	Adult or sub-adult snails absent from Transect 1 (3 samples)	Fail
2019-2024	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 2 (minimum 2 samples)	Adult or sub-adult snails absent from Transect 2 (1 sample)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 1 (minimum 3 samples)	Adult or sub-adult snails absent from Transect 1 (3 samples)	Fail
2013-2018	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 2 (minimum 2 samples)	Adult or sub-adult snails absent from Transect 2 (1 sample only - disturbed by horses)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 1 (minimum 3 samples)	V. angustior found in 2 of the 3 samples	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 2 (minimum 2 samples)	Found in 2 samples	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was not recorded from any of the seven samples taken at Pollardstown Fen during the current survey. This compares with one positive sample from eight taken during the previous monitoring period, though the positive sample comprised a single individual, indicating the population was already sparse. In 2007-2012, there were five positives from six samples. In the current survey, only two samples were taken from Transect 1 due to a lack of suitable habitat. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	The population of Vertigo angustior at Pollardstown Fen appears to have deteriorated, as it was only found at one sample location as compared to five in 2007-2012. The species was not found on either transect in the current study. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable Bad (red).
2007-2012	The snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red))

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	At least 20m of habitat along Transect 1 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 20m of Transect 1	0 m of habitat along Transect 1 is classed as Suboptimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 30 m of Transect 1	Fail
2019-2024	2	Habitat extent	At least 6m of habitat along Transect 2 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 6m of Transect 2	5m of habitat along Transect 2 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 6.5m of Transect 2	Fail

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2013-2018	1	Habitat extent	At least 20 m of habitat along Transect 1 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 20 m of Transect 1	0 m of habitat along Transect 1 is classed as Suboptimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 19.5 m of Transect 1	Fail
2013-2018	2	Habitat extent	At least 6 m of habitat along Transect 2 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 6 m of Transect 2	4 m of habitat along Transect 2 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 4 m of Transect 2	Fail
2007-2012	1	Habitat extent	At least 20m of habitat along Transect 1 is classed as Sub-Optimal or Optimal and Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 20m of Transect 1	23.5m is Sub-Opti/Optimal and 30m optimal wetness	Pass
2007-2012	2	Habitat extent	At least 6m of habitat along Transect 2 is classed as Sub-Optimal or Optimal and Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 6m of Transect 2	6.6m is Sub-Opt/Optimal and 6m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 2ha of the site sub-optimal with optimal areas	0.01ha Suboptimal	Fail
2013-2018	Habitat extent	At least 2ha of the site sub-optimal with optimal areas	0.15ha Suboptimal	Fail
2007-2012	Habitat extent	At least 2 ha of the site sub-optimal with optimal areas	2.32 ha Sub-optimal	Pass

Mon. period	Habitat Notes
2019-2024	The Vertigo angustior habitat at Pollardstown Fen generally has declined, with the areas along the transects mostly becoming rank and overshadowed by encroaching trees, while other areas have been reduced to patches in a tightly horse-grazed sward. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	There is not sufficient suitable habitat present on the transects or in the site as a whole. Only Polygon B remains unchanged from 2007-2012, with polygons A, C and D all dropping from Sub-optimal to Suboptimal-Unsuitable. Polygon A is now rank with no suitable vegetation. Polygon C has limited Iris pseudacorus marsh, and this is very grassy. In Polygon D, the grassland is too dry, while the drain is too wet, leaving extremely limited areas of suitable moisture for Vertigo angustior.
2007-2012	The habitat at the site is extremely small in area and much of it is not in good condition for V. angustior due to grazing pressure

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA05	Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)	Inside	High	Negative	61%	Overgrown due to lack of grazing in polygons A and C.

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2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	High	Negative	39%	Overgrazed by horses in polygons B and D.
2013-2018	A04.02.03	non intensive horse grazing	Inside	Low	Negative	60%	
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	High	Negative	40%	Lack of grazing
2013-2018	A08	Fertilisation	Inside	Medium	Negative	15%	
2013-2018	H05.01	garbage and solid waste	Inside	Low	Negative	1%	
2013-2018	J02.02	Removal of sediments (mud...)	Inside	High	Negative	2%	Pool dug out around spring.
2007-2012	A04.02.01	non intensive cattle grazing	Inside	High	Negative	1.7ha	Although the number of cattle is relatively low, because the area of V. angustior habitat is extremely small, the intensity within the habitat is high.

Mon. period	Future Prospects Notes
2019-2024	The two pressures noted for the Vertigo angustior habitat in Pollardstown Fen are overgrazing (by horses) and areas becoming rank due to a lack of grazing. The Population and Habitat assessments are Unfavourable-Bad (red), and the current pressures are likely to continue into the future with no imminent management intervention. For this reason, the Future Prospects are considered to be Unfavourable-Bad (red).
2013-2018	<p>The two main activities impacting on Vertigo angustior habitat in Pollardstown Fen are lack of grazing (A04.03) and non-intensive horse grazing (A04.02.03). As the Vertigo angustior habitat is found in small areas across a number of management units, different activities can be limited to certain areas only. In the case of lack of grazing, this impact is most notable in polygons A and parts of C, the most westerly and easterly polygons, respectively. No grazing is evident in these areas and this is impacting negatively on the Vertigo angustior habitat.</p> <p>In contrast to the areas affected by lack of grazing, grazing by horses in polygons B and D is having the opposite effect, if less severe. While this grazing is acting to keep the vegetation open, as required by Vertigo angustior, the levels appear to be slightly too high, resulting in a lack of thatch and some poaching.</p> <p>Moorkens & Killeen (2011) assessed the Future Prospects as Unfavourable Inadequate (amber), with non-intensive cattle grazing (A04.02.01) posing a risk to the habitat in the longer term, which must be addressed to prevent the Future Prospects dropping to Unfavourable Bad (red). Whether as a direct result of the identification of this problem by Moorkens & Killeen (2011), or as a result of unrelated changes to management by the landowners, the threat is now from lack of grazing (polygons A and C) and overgrazing/trampling by horses (polygons B and D). Small areas of habitat capable of supporting Vertigo angustior continue to occur in Pollardstown Fen, but the quality of this habitat has declined since the 2009 survey. The only positive sample at the site was in Polygon C. The Future Prospects are assessed as Unfavourable Bad (red).</p>
2007-2012	Overall for the site the impact has been assessed as moderate rather than severe, therefore Future prospects have been assessed as Unfavourable inadequate (amber). However, unless the grazing is urgently addressed, the impact would have to be assessed as severe.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Red	Red	Red	Red
2007-2012	Green	Green	Amber	Amber

Mon. period	Overall Notes
2019-2024	Vertigo angustior was not recorded from the site and the area and quality of suitable habitat have reduced, resulting in Population and Habitat assessments of Unfavourable-Bad (red). Due to these assessments and the pressures acting on the site, the Future Prospects are also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall

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2019-2024	Assessment for Pollardstown Fen is Unfavourable-Bad (red).
2013-2018	Based on the limited distribution of Vertigo angustior at Pollardstown Fen, the deterioration of the habitat and the poor Future Prospects, the overall assessment for the site is Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2019-2024

Discussion:

Vertigo angustior was not recorded from Pollardstown Fen during the current survey. The previous round of monitoring recorded the snail from a single sample, where only a single individual was found, which represented a significant decline from the 2007-2012 monitoring period. For this reason, the Population Assessment continues to be Unfavourable-Bad (red), as does the Habitat Assessment due to the habitat being either too rank where there is no grazing, or too impacted by grazing where horses have access to it. The areas grazed by horses would benefit from the temporary removal of access to allow the vegetation to become more developed and prevent poaching. If possible, some form of grazing should be introduced to Polygon A where the vegetation has become rank, with limited removal of trees also a possibility.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

There has been little change to the management or condition of the site since the 2013-2018 monitoring period, so the management recommendations made then are still appropriate. The only change is that the overgrazing by horses noted from polygons B and D now also applies to Polygon C. The removal of trees that are overshadowing areas of Polygon A should also be considered.

Vertigo angustior monitoring at Pollardstown Fen

2013-2018

Discussion:

This site has seen a considerable deterioration in terms of its suitability for *Vertigo angustior* in the period between 2009 and 2014. Polygon A has become rank and overgrown (not to mention overshadowed by growing trees), to such an extent that it is hard to imagine it ever having been suitable for *Vertigo angustior*. Polygons B and D are overgrazed, and for the most part lack areas with a suitable thatch/moss layer to host the species. The species was found in only one sample point, within Polygon C. Management intervention is urgently needed to attempt to reverse the deterioration. Polygon A needs some targeted tree removal and immediate instigation of grazing, whereas polygons B and D need a relaxation of grazing in general, and perhaps also some fencing out of animals from lower parts at wet times of year. Overall, the prospects for the species at this site are poor. The area of potentially suitable habitat at the site has always been very limited, and given the deterioration in quality across most of its area, for a variety of reasons, the species has been put under significant pressure.

Monitoring recommendations:

Monitoring should be carried out largely following Moorken & Killeen (2011) and on a three-yearly basis. Due to the very limited distribution of the species at the site, it is recommended that the proposed inclusion of polygons C and D in the monitoring on a six-yearly basis be changed to three-yearly.

Assessment of the transect and other locations with spot sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too Dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Repeat Transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 2 of the main zones with the most suitable habitat on the Transect 2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Describe habitat and take 2 samples from the most suitable habitat in each of polygons C and D and analyse for molluscan composition
- Use results to determine overall condition assessment

Management recommendations:

The *Vertigo angustior* habitat in Pollardstown Fen is largely limited to the transition zone between drier and wetter habitats and, as such, is very limited in extent. For polygons B and D, the negative effect of grazing by cattle, identified by Moorkens & Killeen (2011), has been replaced by the negative effect of grazing by horses. A similar solution is recommended, namely that electric fences be used to temporarily exclude animals from the lower end of the fields and the ponds during dry periods when they may congregate in the wetter zone, which supports *Vertigo angustior*. The moss and litter layer is sensitive to poaching and grazing and a balance needs to be struck to maintain the habitat in a condition favourable to *Vertigo angustior*, particularly as the areas are very small. Given that the habitat is currently grazed extremely tightly, fencing off is needed immediately. However, it is important that the areas are not abandoned, as should the habitat become rank, this will also have a negative effect on its suitability for *Vertigo angustior*.

In Polygon C, a strip in the lower part of the field is currently being managed extensively (i.e. no overgrazing or poaching). The only positive sample at the site was found in a small area in the west of Polygon C. No change is recommended for the management of this polygon.

Polygon A is suffering from a lack of grazing, resulting in the vegetation becoming rank and too dense for *Vertigo angustior*. Growth of trees and shrubs has also resulted in levels of shading beyond the tolerance of *Vertigo angustior*. In order to bring this area back to good condition, an appropriate level of grazing is required and some targeted scrub/tree control or removal is also likely to be needed. Grazing by goats and cattle was noted by Moorkens & Killeen (2011) and local landowners suggested that feral goats used to occur, but are no longer present. The reintroduction of cattle and/or goats is required to maintain the habitat and the effect of this should be monitored to ensure that the right stocking/grazing level is achieved. The management of this small area will be difficult, as it is isolated and the surrounding managed lands are separated by a fence and treeline. Nonetheless, action is required immediately to attempt to restore the habitat quality.

Vertigo angustior monitoring at Pollardstown Fen

2007-2012

Discussion:

Vertigo angustior was first discovered at Pollardstown Fen in 2002, and was the subject of a survey of the entire fen margin during that year. This showed that the snail was found only in the transition zone lying between the sloping grazed grassland with herbs, and the wetter fen dominated by Filipendula ulmaria, Juncus spp., and grasses. The transition zone was fragmented and discontinuous, and rarely more than 3-4 metres wide. The habitat within the zone was characterised principally by stands of Iris pseudacorus with grasses (e.g. Holcus lanatus and Phleum pratense), and low-growing herbs, particularly Potentilla anserina and Ranunculus repens. The survey demonstrated that the distribution of Vertigo angustior at Pollardstown Fen is very restricted, apparently only occurring at the south-eastern end of the site over a distance of approximately 800 metres, in a zone mostly less than 4 metres wide, and in a small clump of Iris dominated vegetation below the graveyard. Within the latter site, V. angustior is only occasionally found to be present, suggesting it is restricted to a very small areas of micro habitat for the majority of time, spreading more widely (a few metres square) during times of high humidity. The entire habitat for V. angustior at the fen equates to a maximum area of potential occupancy of 2.3 ha, whereas in reality, the area of suitable micro habitat is considerably less.

Transition zone habitat comprising grassland with herbs occurs around most of the fen perimeter. However, the combination of suitable vegetation composition and ground moisture only occurs at a few locations. These are mainly on banks and mounds along the southern perimeter. Throughout most of the northern fen perimeter the transitional grassland is both tall and rank, or the land has been intensively managed up to the fen margin, such that the transition zone is too wet.

There are very few "marsh phase" or inland V. angustior habitat locations known in Ireland. While Iris marsh is very common in the country, this habitat is mainly subject to inundation in winter. Inundated habitat cannot support this species; it requires a wet but free-draining substrate. The combination of high water table and free draining esker ridge at Pollardstown accounts for its rare presence here.

This rare habitat needs to be carefully maintained into the future, especially in the light of its recent trampling damage. This site should therefore be monitored regularly, both for correct management maintenance and to assess other likely impacts caused by increased pressure on the greater Dublin area, and by the consequences of climate change.

Monitoring recommendations:

Given the overall assessment of the Condition of the habitat and the feature of the site as Unfavourable Inadequate, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Repeat transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 2 of the main zones with the most suitable habitat on the transect T2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional work at 6 yearly intervals:

Frequency: Next monitoring due 2015

Methods (see Section 3 of main report for full details). Prescription as follows:

- Describe habitat and take 2 samples from the most suitable habitat in each of Polygons C and D and analyse for molluscan composition

Management recommendations:

Existing Management

The V. angustior habitat below the graveyard has occasional grazing by cattle during times of movement, and low intensity grazing by goats. The eastern habitat is grazed by cattle, the intensity of grazing can be high at dry times when the animals congregate around the wettest area and nearby ponded water, and this has led to (sometimes severe) poaching of the habitat.

Proposed management prescription for site

The management of the western habitat area in the vicinity of Transect 1 should be maintained for the 2010-2013 period. The occasional grazing by goats and cattle is not poaching the habitat, which itself is maintained by the wetness and transition of mineral

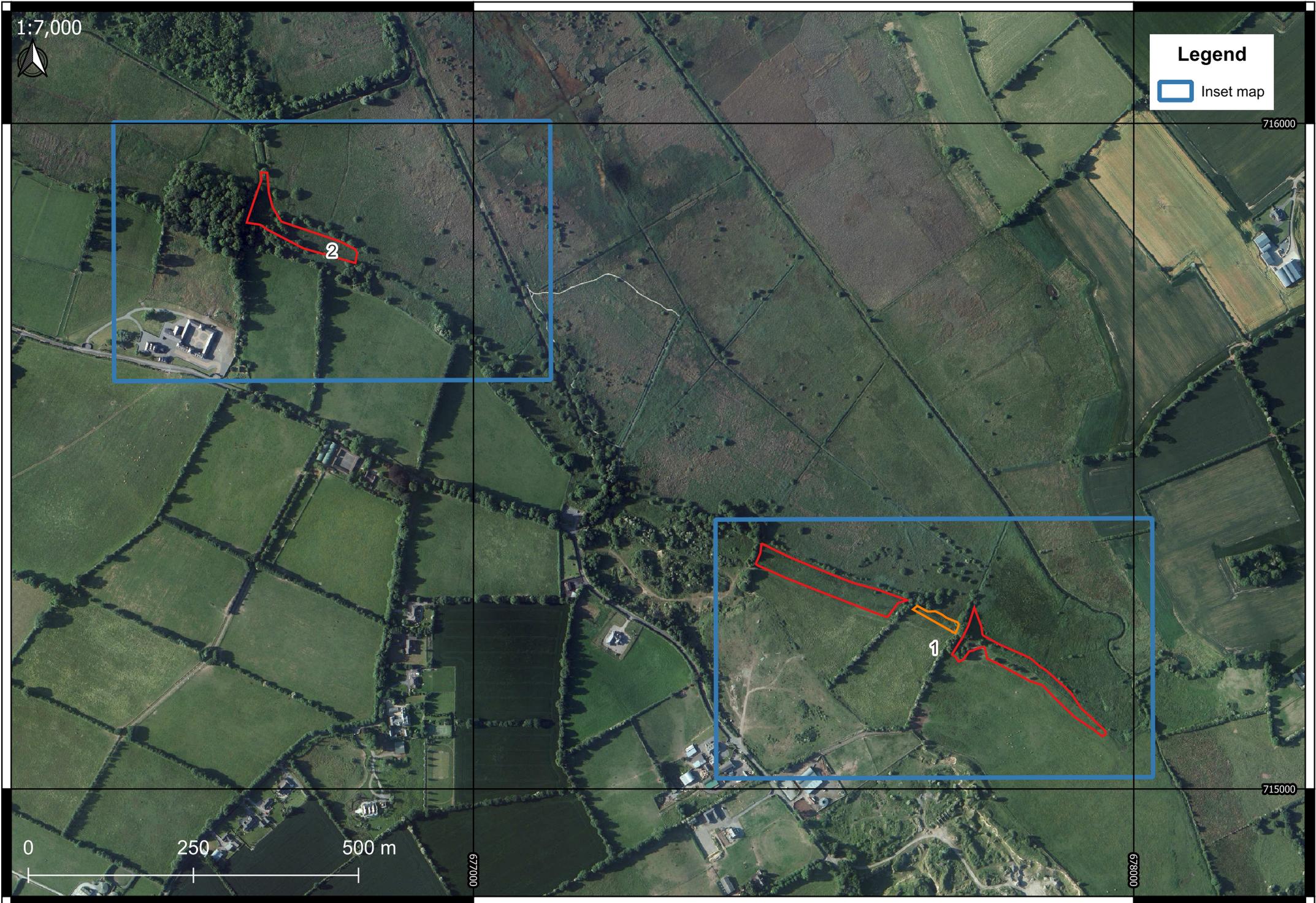
Vertigo angustior monitoring at Pollardstown Fen

to peat soils in the area.

The management of the eastern end in the vicinity of Transect 2 needs to be more carefully controlled. The habitat forms a narrow zone at the base of three large interconnected fields of improved grassland, where the interconnecting gates can be opened or closed. The improved grassland has a high carrying capacity for grazing cattle, and lowering the current intensity is not necessary most of the time. However, in dry periods, the cattle congregate in the important habitat area to gain moisture from the vegetation, and water from the ponds. In order to protect the habitat, the cattle should either be removed during dry periods, or else, more sensibly, the *V. angustior* habitat should be fenced off using temporary electric fencing during dry periods, leaving one approach to a drinking pond, or else by placing a drinking trough higher in the field. The electric fence should be removed at the end of the dry spell to allow for less intensive periods of grazing of the habitat, where the grazing pattern is more random and suitable for the maintenance of favourable condition.







Site report - Vertigo Monitoring

Vertigo angustior monitoring at Streedagh Point Dunes

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM14 **County:** Sligo

SAC Site Code: 001680 Streedagh Point Dunes **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed dune habitat along the tombolo and at the southern end of the dune system and the marsh in the southern section. Access is from the car park at the south of the site.

Monitoring period	Date surveyed	Recorders
2019-2024	13-15 June 2022	John Brophy & Orla Daly
2013-2018	18-19 August 2015	John Brophy & Maria Long
2007-2012	8 July 2009	Ian Killeen & Evelyn Moorkens

1.2 General Habitat Description (from baseline survey):

The *V. angustior* habitat at Streedagh is in sand dune habitat along the tombolo formation, the dunes on Conors Island to Streedagh Point, and the dunes at the southern end of the cSAC site. This general habitat in which *Vertigo angustior* is present corresponds to fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The dominant vegetation is *Festuca rubra* with *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000), and *Festuca rubra* dominated vegetation with *Galium verum*, *Campanula rotundifolia*, *Euphrasia*, *Holcus lanatus*, *Anacamptis pyramidalis*, and *Plantago lanceolata*, corresponding to SD8 of Rodwell (2000). Towards the salt marsh (CORINE 15.3) the snail is found within *Iris* and *Equisetum palustre* transition habitat, but not within the salt marsh itself. The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	1. Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , <i>Pilosella officinarum</i> , <i>Anacamptis pyramidalis</i> , <i>Plantago lanceolata</i> and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. 2. Transition marsh with <i>Iris</i> , <i>Equisetum palustre</i> , <i>Caltha palustris</i> , <i>Lychnis flos-cuculi</i> , <i>Mentha aquatica</i> (height 25-40cm). Under-storey of moss and litter
Sub-optimal	1. Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. 2. Vegetation composition as above but either vegetation height is less than 25cm or over 50cm, or the soil is very wet with pools of standing water, or the thatch is wetter with a denser structure
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The site at Streedagh Point Dunes continues to support abundant suitable habitat for *Vertigo angustior*, with a good population distributed across the site. However, the site is not without its issues, with a drop in the number of positive samples since the 2013-2018 monitoring period noted during the current survey. The transect, in particular, saw a decline in the number of positive samples compared to the two previous rounds of monitoring, with drying out of the *Festuca rubra* thatch and underlying soil appearing to have had a negative effect on the suitability of the habitat despite the favourable vegetation. This drying out is assumed to be the result of changes to precipitation and/or wind patterns as a result of climate change. While grazing at the site is considered to be suitable overall, Conors Island (Polygon A) is overgrazed by sheep and horses. Other more localised pressures include erosion, dumping, walking and trampling, and problematic native/invasive non-native species. With climate change and erosion largely beyond the scope of any site management measures, the main focus should be on addressing the issue of overgrazing in Polygon A and maintaining an appropriate level of grazing elsewhere. This measure may offset some of the issues caused by climate change by providing more *Festuca rubra* litter to retain some moisture close to the soil. Targeted control of problematic native/invasive non-native species would also be beneficial.

2013-2018:

The site at Streedagh Point supports extensive habitat suitable for supporting *Vertigo angustior* and the snail was found to be common and widespread. It was assessed as Favourable (green) in 2007-2012, but had an assessment of Unfavourable Inadequate (amber) in the current study due to a relatively small change in quality in the lower part of the transect (based on the habitat criteria set by Moorkens & Killeen (2011)). Given the fact that this is, overall, an excellent site for the species, and continues to support a large population over a large area, and does not suffer from serious negative impacts, it is likely that the assessment result is too negative, and too heavily weighted to conditions on the transect. In terms of the impacts, cattle-grazing is having a positive effect at the current levels, though horse grazing on Conors Island should be reduced.

2007-2012:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable. The targets have been passed for all performance indicators. The results obtained in 2009 are very similar to those from 2006 with the vegetation and wetness levels virtually unchanged.

Vertigo angustior monitoring at Streedagh Point Dunes

Vertigo angustior was present in moderate numbers to high numbers on the lower dune slopes and in the wetland area. The snail was either rare or absent in the samples from the upper dune slope. There was evidence of an increase in rabbit warrens and rabbit grazing on the dune slopes, and overgrazing by cattle remains a problem on the lower slopes and in the wetland transition.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2019-2024

Start point: ITM 563209 850366 High point on the dunes. ITM from 2022.

End point: ITM 563371 850428 Edge of the saltmarsh. ITM from 2022.

Transect length: 173 **Direction:** WSW-ENE

Description: The transect runs across Festuca rubra dominated fixed dune grassland, from a high dune crest down an undulating slope to transition grassland, into a Iris marsh and then into saltmarsh. The transect crosses a tarmacadam road at 117m distance.

Sampling frequency: 7 samples were taken from zones with the most suitable habitat

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point: G 63263 50371 High point on the dunes

End point: G 63423 50428 Edge of the saltmarsh

Transect length: 173 **Direction:** SW-NE

Description: The transect runs across Festuca rubra dominated fixed dune grassland, from a high dune crest down an undulating slope to transition grassland, into a Iris marsh and then into saltmarsh. The transect crosses a tarmacadam road at 117m distance and runs towards an isolated white post in the water.

Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect from dune and wetland zones with optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point: G 63256 50374 High point on the dunes

End point: G 63419 50424 Edge of the saltmarsh

Transect length: 173 **Direction:** SW-NE

Description: The transect runs across Festuca rubra dominated fixed dune grassland, from a high dune crest down an undulating slope to transition grassland, into a Iris marsh and then into saltmarsh. The transect crosses a tarmacadam road at 117m distance and runs towards an isolated white post in the water.

Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect from dune and wetland zones with optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	46.5367	Polygon A remains Suboptimal. Grazing may have increased slightly and knocked out Ammophila arenaria in places (e.g. S02).
B	Optimal	25.1517	Polygon B remains Optimal. Good fixed dune habitat.
C	Unsuitable	22.7387	Polygon C remains Unsuitable, due to the agricultural influence.
D	Optimal-Suboptimal	31.5039	Polygon D remains Optimal-Suboptimal. Southern section contains the most suitable habitat, with more northern areas either too stable (soil well-developed) or very short, forb-dominated sward. Litter thatch appears too dry in a lot of places, including along transect.
E	Optimal-Suboptimal	3.5784	Polygon E has improved to Optimal-Suboptimal, as sward is more open, with less dense, sodden thatch.

Vertigo angustior monitoring at Streedagh Point Dunes

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	46.5367	Polygon A status remains Suboptimal. Large areas not very suitable (grazed heavily by horses), but yet large areas of moderate quality also. Thatch relatively poor through-out, however.
B	Optimal	25.1517	Polygon B was upgraded from Sub-optimal and Unsuitable to Optimal, as large areas of this polygon represent excellent quality Vertigo angustior habitat.
C	Unsuitable	22.7387	Polygon C status remains Unsuitable - largely farmed.
D	Optimal-Suboptimal	31.5039	Polygon D status remains Optimal-Suboptimal. Most of transect is in this polygon. Good quality fixed dune habitat.
E	Suboptimal	3.5784	Polygon E status dropped from Optimal and Sub-optimal to Suboptimal. This was due to the fact that a large portion of this polygon is improved agricultural grassland, and parts of the marsh are very rank. It is unclear whether inclusion of the area of agricultural grassland originally was a mapping error. A small area was added into this polygon at the northern end in 2015, as it is a contiguous area of similar marsh habitat.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	45.637	Polygon A - unlikely to change
B	Sub-optimal with unsuitable areas	25.512	Polygon B - could improve if dunes became more fixed
C	Unsuitable	22.739	Polygon C - unlikely to improve because of development
D	Sub-optimal with optimal areas	31.504	Polygon D
E	Sub-optimal with optimal areas	3.041	Polygon E

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	36m	78m	0m	46m	13m	100m	13m	60m

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	71m	12.5m	45m	21.5m	23m	150m	23m	

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	63.5m	NA	85	NA	24.5m	149.5	19	4.5m (road)

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (7 samples)								
2019-2024	1	1	4m	3	0	3	Count	Optimal-Suboptimal
2019-2024	1	2	25.5m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	3	44m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	4	86m	0	0	0	Count	Suboptimal
2019-2024	1	5	98m	0	0	0	Count	Suboptimal
2019-2024	1	6	136m	17	0	17	Count	Optimal
2019-2024	1	7	145m	9	0	9	Count	Optimal
Monitoring period 2013-2018 Transect 1 (7 samples)								
2013-2018	1	1	4m	1	0	1	Presence/Absence	Optimal
2013-2018	1	2	24.5m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	37m	1	0	1	Presence/Absence	Optimal
2013-2018	1	4	81m	1	0	1	Presence/Absence	Optimal
2013-2018	1	5	96m	0	0	0		Optimal
2013-2018	1	6	132m	75	9	84	Count	Suboptimal-Unsuitable

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2013-2018	1	7	146m	22	0	22	Count	Suboptimal-Unsuitable
Monitoring period 2007-2012 Transect 1 (7 samples)								
2007-2012	1	1	8m	0	0	2		
2007-2012	1	2	17.5m	0	0	0		
2007-2012	1	3	32m	0	0	0		
2007-2012	1	4	61m	0	0	23		
2007-2012	1	5	85m	0	0	16		
2007-2012	1	6	130m	0	0	8		
2007-2012	1	7	150m	0	0	6		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (10 samples)							
2019-2024	01	ITM 565976 851986	2	0	2	Count	Optimal
2019-2024	02	ITM 566009 852161	5	0	5	Count	Suboptimal
2019-2024	03	ITM 565882 852257	0	0	0	Count	Suboptimal
2019-2024	04	ITM 565803 851756	3	0	3	Count	Optimal
2019-2024	05	ITM 565602 851537	18	0	18	Count	Optimal
2019-2024	06	ITM 565343 851371	0	0	0	Count	Optimal
2019-2024	07	ITM 565102 851175	2	0	2	Count	Optimal
2019-2024	08	ITM 564302 850823	1	0	1	Count	Optimal
2019-2024	09	ITM 564864 851092	6	0	6	Count	Optimal
2019-2024	10	ITM 562901 850437	0	0	0	Count	Optimal-Suboptimal
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	G 66022 51988	3	1	4	Count	Suboptimal
2013-2018	02	G 66059 52189	6	1	7	Count	Suboptimal
2013-2018	03	G 65981 52262	1	0	1	Presence/absence	Optimal
2013-2018	04	G 65846 51755	51	25	76	Count	Optimal
2013-2018	05	G 65644 51533	1	0	1	Presence/absence	Optimal
2013-2018	06	G 65383 51372	1	0	1	Presence/absence	Optimal
2013-2018	07	G 65142 51171	1	0	1	Presence/absence	Optimal
2013-2018	08	G 64344 50824	1	0	1	Presence/absence	Optimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 3 passes Favourable (green); 2 pass Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence1	Adult or sub-adult snails are present in 3 out of 5 samples taken on the dune slopes (0-117m)	Present in 1 of the 5 samples from dune habitat	Fail
2019-2024	1	Presence/Absence2	Adult or sub-adult snails are present in 2 samples taken in the wetland habitat from 121.5 to 154m on the transect	Present in both samples from the wetland	Pass
2013-2018	1	Presence/Absence1	Adult or sub-adult snails are present in 3 out of 5 samples taken on the dune slopes (0-117m)	Present in 4 of the 5 samples from dune habitat	Pass
2013-2018	1	Presence/Absence2	Adult or sub-adult snails are present in 2 samples taken in the wetland habitat from 121.5 to 154m on the transect	Present in both samples from the wetland	Pass

Vertigo angustior monitoring at Streedagh Point Dunes

2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 out of 5 samples taken on the dune slopes (0-117m) AND Adult or sub-adult snails are present in 2 samples taken in the wetland habitat from 121.5 to 154m on the transect	Present in 4/5 samples from dunes & both wetland	Pass
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Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails present in at least 2 samples from both Polygons A and B, minimum 3 samples in each.	Present in 2 of 3 from Polygon A and 5 of 6 from Polygon B	Pass
2013-2018	Presence/Absence	Adult or sub-adult snails present in at least 2 samples from both Polygons A and B, minimum 3 samples in each.	Present in 3 of 3 from Polygon A and 4 of 4 from Polygon B	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was recorded from three out seven samples along the transect, and seven out of ten samples across the site in general. This compares to six out of seven along the transect, and eight out of eight across the site in 2013-2018. In 2007-2012, only the transect was sampled, with five out seven samples returning a positive result. Based on the criteria of Moorkens & Killeen (2011), and the criterion added by Long & Brophy (2019), the Population Assessment is Unfavourable-Inadequate (amber).
2013-2018	Streedagh Point Dunes supports a good population of Vertigo angustior in terms of numbers and distribution. The 2007-2012 monitoring recorded positive samples for the species at five out of seven locations on the transect across polygons D and E. More widespread sampling in the current survey recorded the species at six out of seven locations on the transect and eight out of eight samples across polygons A and B. The highest abundance recorded was 84 adults and juveniles in sample T1_06 on the transect. The criteria of Moorkens & Killeen (2011) were limited to the transect and so an additional criterion has been added. The Population Assessment for the site is Favourable (green).
2007-2012	The snail is distributed throughout and present in good numbers

5.2 Habitat Assessment: 6-7 passes Favourable (green); 4-5 passes Unfavourable-Inadequate (amber); 0-3 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent1	35m of dune habitat along the first 117m of the Transect is classed as Optimal, 117m is classed as Optimal or Sub-Optimal	0m is Optimal, 78m Optimal-Suboptimal	Fail
2019-2024	1	Habitat extent2	30m of wetland habitat between 121.5m and 154m of the Transect is classed as Optimal or Sub-Optimal	36m is Optimal	Pass
2019-2024	1	Habitat quality1	Soils, are damp (optimal wetness) with a layer of humid thatch for > 95m of the first 117m of dune habitat	59m is Optimal wetness	Fail
2019-2024	1	Habitat quality2	Soils in the wetland (121.5 to 154m) are optimal wetness and covered with a layer of moss and litter, throughout the zone (32.5m)	61m is Optimal wetness	Pass
2013-2018	1	Habitat extent1	35m of dune habitat along the first 117m of the Transect is classed as Optimal, 117m is classed as Optimal or Sub-Optimal	71m is Optimal, 116m Optimal or Suboptimal	Pass
2013-2018	1	Habitat extent2	30m of wetland habitat between 121.5m and 154m of the Transect is classed as Optimal or Sub-Optimal	7m is Optimal/Suboptimal	Fail
2013-2018	1	Habitat quality1	Soils, are damp (optimal wetness) with a layer of humid thatch for > 95m of the first 117m of dune habitat	117m is Optimal wetness	Pass
2013-2018	1	Habitat quality2	Soils in the wetland (121.5 to 154m) are optimal wetness and covered with a layer of moss and litter, throughout the zone (32.5m)	28.5m is Optimal wetness	Fail

Vertigo angustior monitoring at Streedagh Point Dunes

2007-2012	1	Habitat extent	35m of dune habitat along the first 117m of the Transect is classed as Optimal, 117m is classed as Optimal or Sub-Optimal and 30m of wetland habitat between 121.5m and 154m of the Transect is classed as Optimal or Sub-Optimal	Pass on both	Pass
2007-2012	1	Habitat quality	Soils, are damp (optimal wetness) with a layer of humid thatch for > 95m of the first 117m of dune habitat and Soils in the wetland (121.5 to 154m) are optimal wetness and covered with a layer of moss and litter, throughout the zone (32.5m)	Pass on both	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent1	32-36ha of the habitat in areas D and E classed as optimal and sub-optimal	35.1ha Optimal-Suboptimal in D & E	Pass
2019-2024	Habitat extent2	44-46ha of the habitat in area A classed as optimal or sub-optimal	46.5ha in Polygon A is Suboptimal	Pass
2019-2024	Habitat extent3	20ha of Polygon B classed as Optimal-Suboptimal or better	25.2ha of Polygon B is Optimal	Pass
2013-2018	Habitat extent1	32-36ha of the habitat in areas D and E classed as optimal and sub-optimal	31.5ha Optimal-Suboptimal in D & E	Pass
2013-2018	Habitat extent2	44-46ha of the habitat in area A classed as optimal or sub-optimal	46.5ha Suboptimal	Pass
2013-2018	Habitat extent3	20ha of Polygon B classed as Optimal-Suboptimal or better	25.2ha Optimal	Pass
2007-2012	Habitat extent	32-36ha of the habitat in areas D and E classed as optimal and sub-optimal AND 44-46 ha of the habitat in area A classed as optimal or sub-optimal	34.56 ha in D and E and 46.5 ha in A	Pass

Mon. period	Habitat Notes
2019-2024	The site at Streedagh Point Dunes contains extensive suitable habitat for <i>Vertigo angustior</i> , particularly within polygons B and E. Sampling along the fixed dune stretch of the transect and some of the other sample spots across the site found that the soil was too dry to be suitable for the long-term survival of the snail, and this has negatively affected the result of the Habitat Assessment. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Inadequate (amber).
2013-2018	The habitat suitability of Polygon A remains Suboptimal despite tight grazing by horses. Polygon B is increased from Suboptimal and Unsuitable to Optimal due to the presence of extensive areas of very good quality <i>Vertigo angustior</i> habitat along the length of the polygon. This change is not thought to be ecological, but rather due to a misclassification in the previous monitoring period, as all 5 samples taken in this polygon in 2015 were positive. Polygon C remains Unsuitable, and includes houses and improved agricultural land. Polygon D remains Optimal-Suboptimal, while Polygon E has decreased from Optimal and Suboptimal to Suboptimal due to the presence of areas of improved grassland and to the vegetation here becoming more rank in places (i.e. end of transect), with dense areas of <i>Juncus subnodulosus</i> . Overall, the site contains large areas of suitable habitat. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Streedagh Point Dunes is Unfavourable Inadequate (amber). This is due largely to the final part of the transect being very wet and having vegetation not typical for the species, nor aligning with that defined by Moorkens & Killeen (2011) for the site (i.e. tall, dense and dominated by <i>Juncus subnodulosus</i> rather than fixed dune, or transition marsh with <i>Iris pseudacorus</i>).
2007-2012	Both the dune and wetland habitats at the site are in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Low	Positive	100%	Cattle grazing across most of site maintaining open <i>Festuca rubra</i> sward, but horse & sheep grazing keeping sward quite short away

Vertigo angustior monitoring at Streedagh Point Dunes

2019-2024	PA07		Inside	Low	Positive	100%	from NW edge of Conor's Island.
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Medium	Negative	5%	Trampling. Walking tracks through dunes. Still most severe at western end of Polygon B.
2019-2024	PH08	Other human intrusions and disturbance not mentioned above	Inside	High	Negative	0.1%	Round hay bales dumped in places within Polygon B
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	High	Negative	1%	Acer pseudoplatanus & Phormium tenax
2019-2024	PJ03	Changes in precipitation regimes due to climate change	Outside	Medium	Negative	100%	Climate change resulting in reduced rainfall and so drier vegetation. Likely to be associated with higher wind drying.
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	6%	Erosion along NW shore of Polygon B. Much of it protected by cobble bank, but more northern length exposed. Rubus fruticosus & Crataegus monogyna
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	70%	Moderate grazing necessary at site
2013-2018	A04.02.03	non intensive horse grazing	Inside	High	Negative	25%	In NE high level of horse grazing - bad
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Neutral	5%	Small tracks/trails = ok
2013-2018	D01.02	roads, motorways	Inside	Low	Negative	1%	Small roads - small issue
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	High	Negative	1%	Not much in dunes, but negative where occurs
2013-2018	G05.01	Trampling, overuse,	Inside	Medium	Negative	5%	Very severe at western end of Polygon B
2013-2018	I01	invasive non-native species	Inside	Low	Negative	1%	Sycamore - Isolated, low-growing trees
2013-2018	K01.01	Erosion	Inside	High	Negative	10%	Along edges of Polygon B in particular
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	80ha	Polygon A - Conor's Island 45.6ha ranked moderate to high; Polygons C and D 34.5ha ranked medium to low. Grazing has a greater impact at the eastern end of the site (Area A) but the habitat is naturally sub-optimal, whereas in the more optimal habitat in areas D and E the grazing impact is lower. However, the impact of an increase in grazing in either area would be

Vertigo angustior monitoring at Streedagh Point Dunes

2007-2012	G01.03	motorised vehicles	Inside	Medium	Negative	25ha	Polygon B - Driving vehicles on the beach and parking within the dunes in Area B is impacting the habitat but as the habitat is mostly unfixed dune, the impact on <i>V. angustior</i> is less severe.
2007-2012	M01.03	flooding and rising precipitations	Inside	Low	Negative	3-5ha	Rising sea levels are likely to have a major impact on the transition zone in Areas D and E, but in the foreseeable future, the impact is regarded as low.

Mon. period	Future Prospects Notes
2019-2024	Both the Population Assessment and Habitat Assessment returned results of Unfavourable-Inadequate (amber). The future trends for these elements are considered to be stable overall, due to the wide distribution of the snail at the site and the lack of a strong signal that the habitat is declining. There is a range of pressures acting on the site, with most comprising very localised high impacts due to dumping or problematic/non-native species, with erosion an issue along the seaward side of Polygon B. Overall, grazing at the site was considered to be a positive, as it maintained the habitat by preventing <i>Ammophila arenaria</i> from becoming rank; however, grazing by sheep and horses in Polygon A is having a negative effect there. Also of high concern is the apparent drying out of the <i>Festuca rubra</i> thatch and underlying soil in places, particularly along the fixed dune section of the transect. This is believed to be the result of altering precipitation and/or increased wind-drying due to climate change, and so may pose a long-term threat to the site. Based on these assessments and their future trends in light of the current pressures acting on the site, the Future Prospects for Streedagh Point Dunes are assessed as being Unfavourable-Inadequate (amber).
2013-2018	The Future Prospects for the site in 2007-2012 were classed as Favourable (green). A number of activities/impacts are occurring at the site which may have a bearing on its suitability for supporting <i>Vertigo angustior</i> . Much of the site is under grazing by cattle and, at the current levels, this is considered to be having a positive impact on the habitat by preventing the vegetation from becoming rank. Despite the continued occurrence of the snail on Conor's Island, horse grazing in this area is high and having a negative effect by creating a tight sward with little build-up of <i>Festuca rubra</i> litter. Erosion has impacted on the dune habitat, particularly on the seaward side of Polygon B. Other impacts mostly relate to recreational use of the site including trampling, tracks and vehicles. On the whole, however, the Future Prospects of Streedagh Point Dunes are considered to be Favourable (green).
2007-2012	Overall, as the impacts are moderate rather than severe, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Amber	Amber	Amber	Amber
2013-2018	Green	Amber	Green	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	The Population Assessment returned a result of Unfavourable-Inadequate (amber) due to the drop in the number of positive samples along the transect, while the Habitat Assessment similarly returned a result of Unfavourable-Inadequate (amber) due to drying along the transect. Based on these results and their future trends in light of the threats and pressures acting on the site, Future Prospects are considered to also be Unfavourable-Inadequate (amber). Therefore, the Overall Assessment for Streedagh Point Dunes is Unfavourable-Inadequate (amber).
2013-2018	Despite the favourable results for the Population Assessment and Future Prospects, the Unfavourable Inadequate (amber) result for the Habitat Assessment results in an Overall Assessment of Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period
2019-2024
Discussion:
The site at Streedagh Point Dunes continues to support abundant suitable habitat for <i>Vertigo angustior</i> , with a good population distributed across the site. However, the site is not without its issues, with a drop in the number of positive samples since the 2013-

Vertigo angustior monitoring at Streedagh Point Dunes

2018 monitoring period noted during the current survey. The transect, in particular, saw a decline in the number of positive samples compared to the two previous rounds of monitoring, with drying out of the *Festuca rubra* thatch and underlying soil appearing to have had a negative effect on the suitability of the habitat despite the favourable vegetation. This drying out is assumed to be the result of changes to precipitation and/or wind patterns as a result of climate change. While grazing at the site is considered to be suitable overall, Conor's Island (Polygon A) is overgrazed by sheep and horses. Other more localised pressures include erosion, dumping, walking and trampling, and problematic native/invasive non-native species. With climate change and erosion largely beyond the scope of any site management measures, the main focus should be on addressing the issue of overgrazing in Polygon A and maintaining an appropriate level of grazing elsewhere. This measure may offset some of the issues caused by climate change by providing more *Festuca rubra* litter to retain some moisture close to the soil. Targeted control of problematic native/invasive non-native species would also be beneficial.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

Similar to the monitoring periods 2007-2012 and 2013-2018, grazing is the main aspect of the management of Streedagh Point Dunes that must be addressed to maximise the suitable habitat for *Vertigo angustior* at the site. Cattle grazing in polygons D and E appear to be at a reasonably appropriate level to maintain suitable habitat for the snail. Polygon B does not appear to be subject to formal grazing, but a fallen fence separating polygons A and B appears to be allowing some grazing to occur, though not at a level that is causing issues for the snail's habitat. At the time of the current survey, Polygon A was heavily grazed by sheep and horses, both species that graze tightly, and the level of grazing appears higher than in 2013-2018 with *Ammophila arenaria* being knocked out in places. The general recommendation made by Moorkens & Killeen (2011) for grazing of fixed dune habitat for *V. angustior* is less than 0.8 livestock units (LU) per hectare in spring to autumn, with animals removed in winter. Lower grazing rates are recommended for sand dunes in other sources, as low as 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Supplementary feeding should be avoided on site, as it brings in nutrients and unwanted species. Coastal erosion, noted during the 2013-2018 monitoring period, continues to be an issue; however, the management of this pressure is extremely difficult given its nature and the challenge in installing any measures to prevent the continued erosion of the dune face. Similarly, the issue of drying out at the site, presumed to be the result of changes to precipitation and wind patterns at the site associated with climate change, is an extremely difficult one to address and one that cannot be solved at a local level. The removal of problematic native species (*Rubus fruticosus* agg. and *Crataegus monogyna*) and non-native invasive species (*Acer pseudoplatanus* and *Phormium tenax*) should be carried out as part of any management of the site.

Vertigo angustior monitoring at Streedagh Point Dunes

2013-2018

Discussion:

The site at Streedagh Point supports extensive habitat suitable for supporting *Vertigo angustior* and the snail was found to be common and widespread. It was assessed as Favourable (green) in 2007-2012, but had an assessment of Unfavourable Inadequate (amber) in the current study due to a relatively small change in quality in the lower part of the transect (based on the habitat criteria set by Moorkens & Killeen (2011)). Given the fact that this is, overall, an excellent site for the species, and continues to support a large population over a large area, and does not suffer from serious negative impacts, it is likely that the assessment result is too negative, and too heavily weighted to conditions on the transect. In terms of the impacts, cattle-grazing is having a positive effect at the current levels, though horse grazing on Conor's Island should be reduced.

Monitoring recommendations:

Due to the importance of Streedagh Point Dunes as an extensive site supporting *Vertigo angustior*, it is recommended that monitoring is carried out at three-yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring should follow that of Moorkens & Killeen (2011), with a minor alteration to the number of samples in polygons A and B:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from 5 of the main dune habitat zones (0-117m) with the most suitable habitat on the transect and analyse for molluscan composition
- Take 1 sample each from 2 of the main zones in the Iris marsh habitat (121.5-154m) on the transect and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Describe habitat and take at least 3 samples from the most suitable habitat (with a wide geographical spread) in each of polygon areas A and B, and analyse for molluscan composition
- Use results to determine overall condition assessment

Management recommendations:

It is recommended that cattle grazing at the site be maintained at current levels, as it is having a positive effect on the habitat for the snail. Horse grazing on Conor's Island should be reduced to a level that allows areas of *Ammophila arenaria*, with *Festuca rubra* thatch, to develop. Appropriate measures should be implemented to limit the impact of human activities at the site, in particular with regard to vehicles and trampling.

Vertigo angustior monitoring at Streedagh Point Dunes

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable. The targets have been passed for all performance indicators. The results obtained in 2009 are very similar to those from 2006 with the vegetation and wetness levels virtually unchanged.

Vertigo angustior was present in moderate numbers to high numbers on the lower dune slopes and in the wetland area. The snail was either rare or absent in the samples from the upper dune slope. There was evidence of an increase in rabbit warrens and rabbit grazing on the dune slopes, and overgrazing by cattle remains a problem on the lower slopes and in the wetland transition.

Monitoring recommendations:

Although the overall assessment of the Condition of the habitat and the feature of the site is Favourable, it is still recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from 5 of the main dune habitat zones (0-117m) with the most suitable habitat on the transect and analyse for molluscan composition
- Take 1 sample each from 2 of the main zones in the Iris marsh habitat (121.5-154m) on the transect and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2015

Methods (see Section 3 of main report for full details). Prescription as follows:

- Describe habitat and take at least 5 samples from the most suitable habitat (with a wide geographical spread) in each of Polygon areas A and B, and analyse for molluscan composition

Management recommendations:

7.2 Management

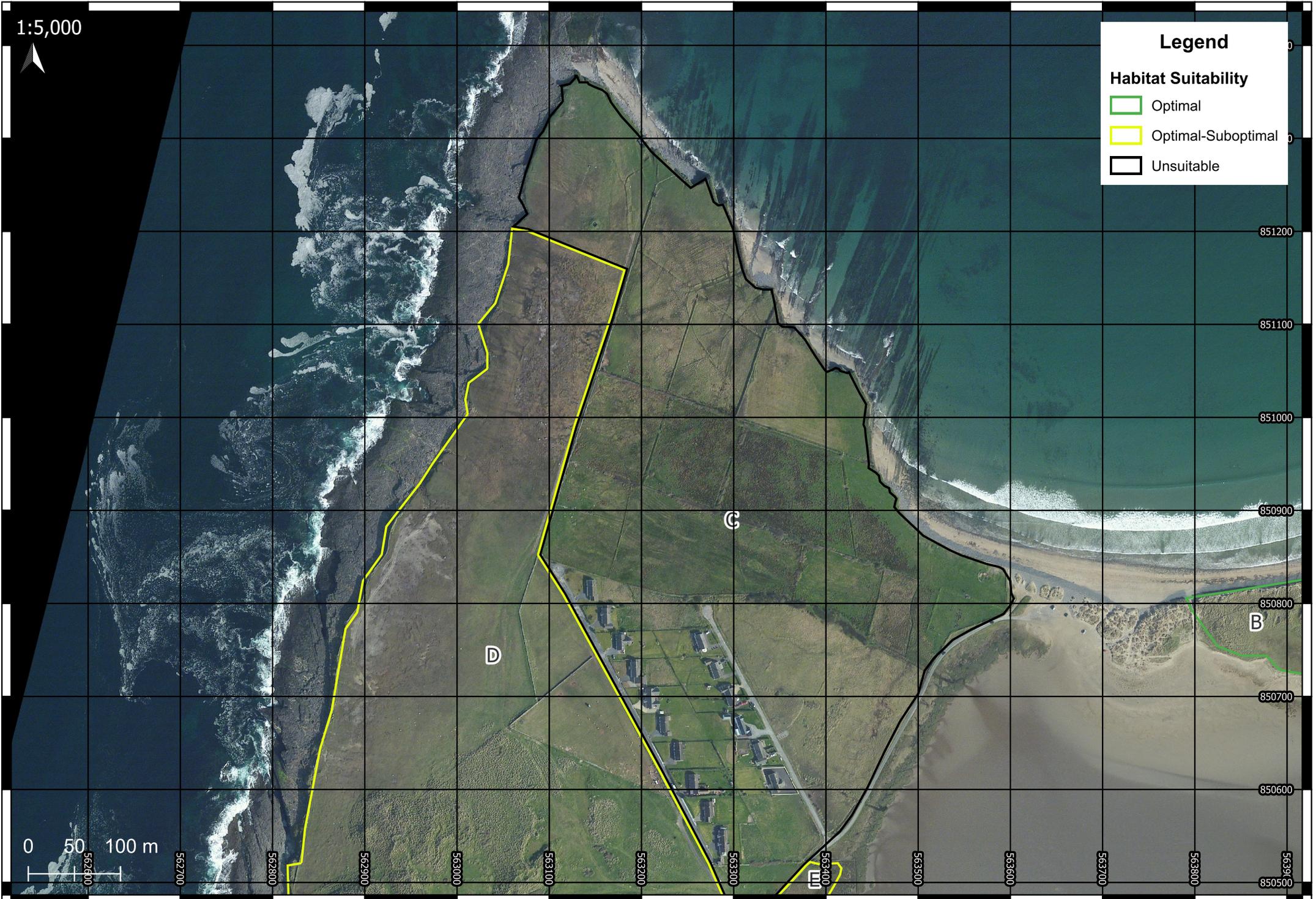
Existing Management

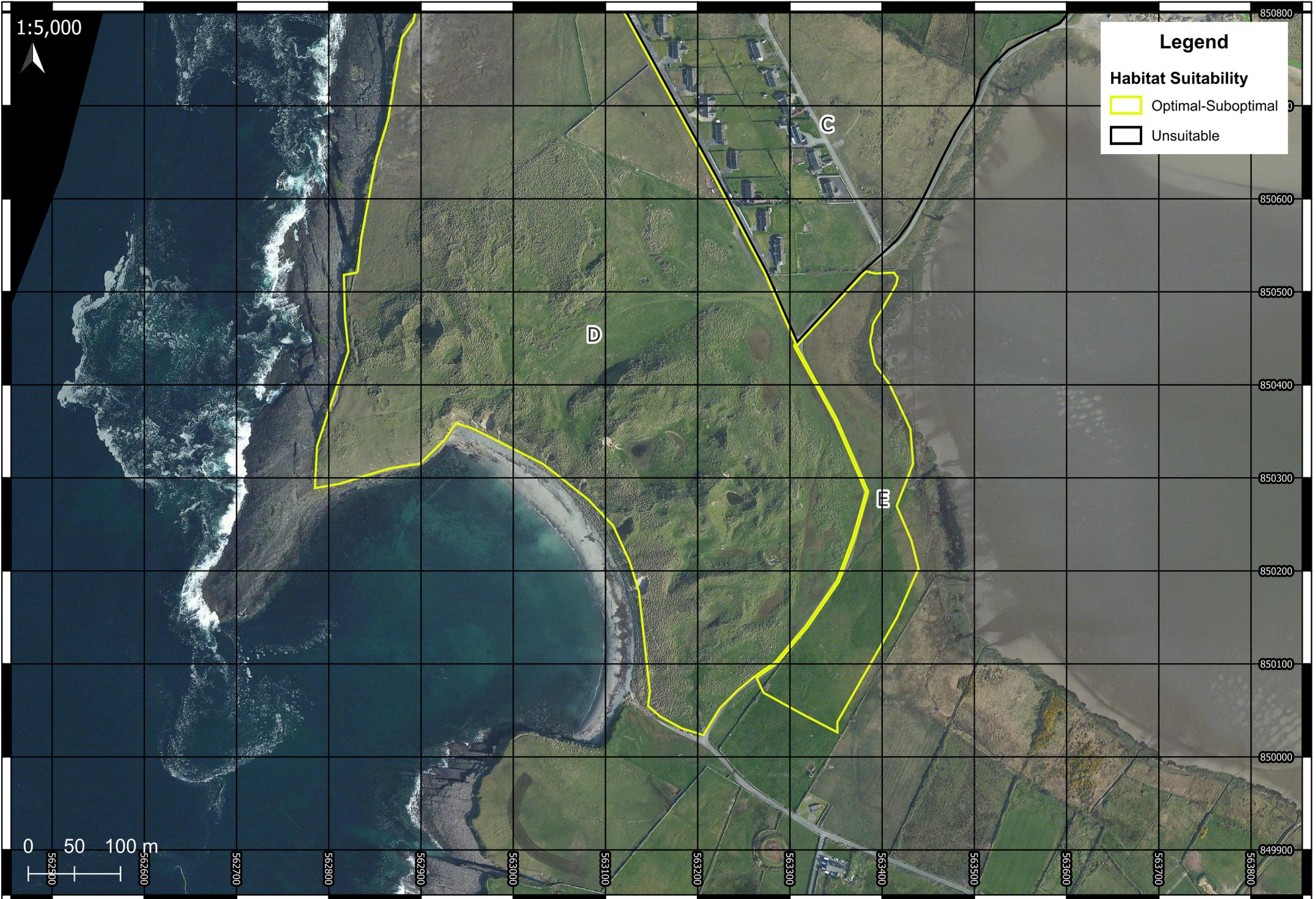
The management as described in 2006 is repeated below (with small modifications).

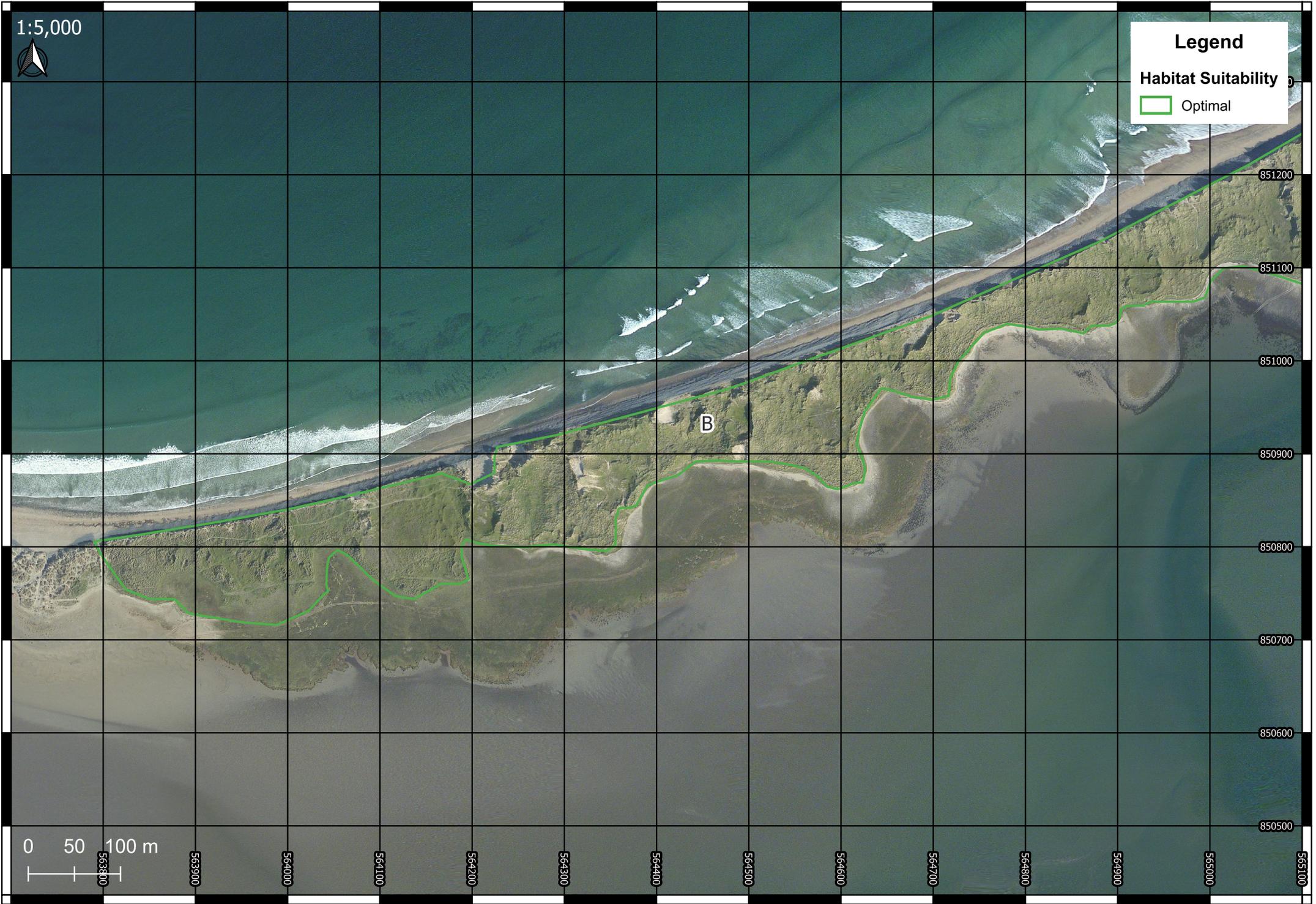
The area has been divided into 5 polygon areas A to E (Figure 1). Area A has been grazed heavily by cattle, and the sward has been tightly cropped and is bare in places. Area B is ungrazed, but heavily trampled and driven on by humans in places. The public car park is between B and C. Area C is not considered to be *V. angustior* habitat and has been developed for housing in the recent past. Area D is cattle grazed, quite heavily in places. A road separates D and E. There is no fence here, so cattle can graze on the other side of the road into Area E. The habitat of Area E is different from the rest of the site, with a transition zone between grassland and saltmarsh.

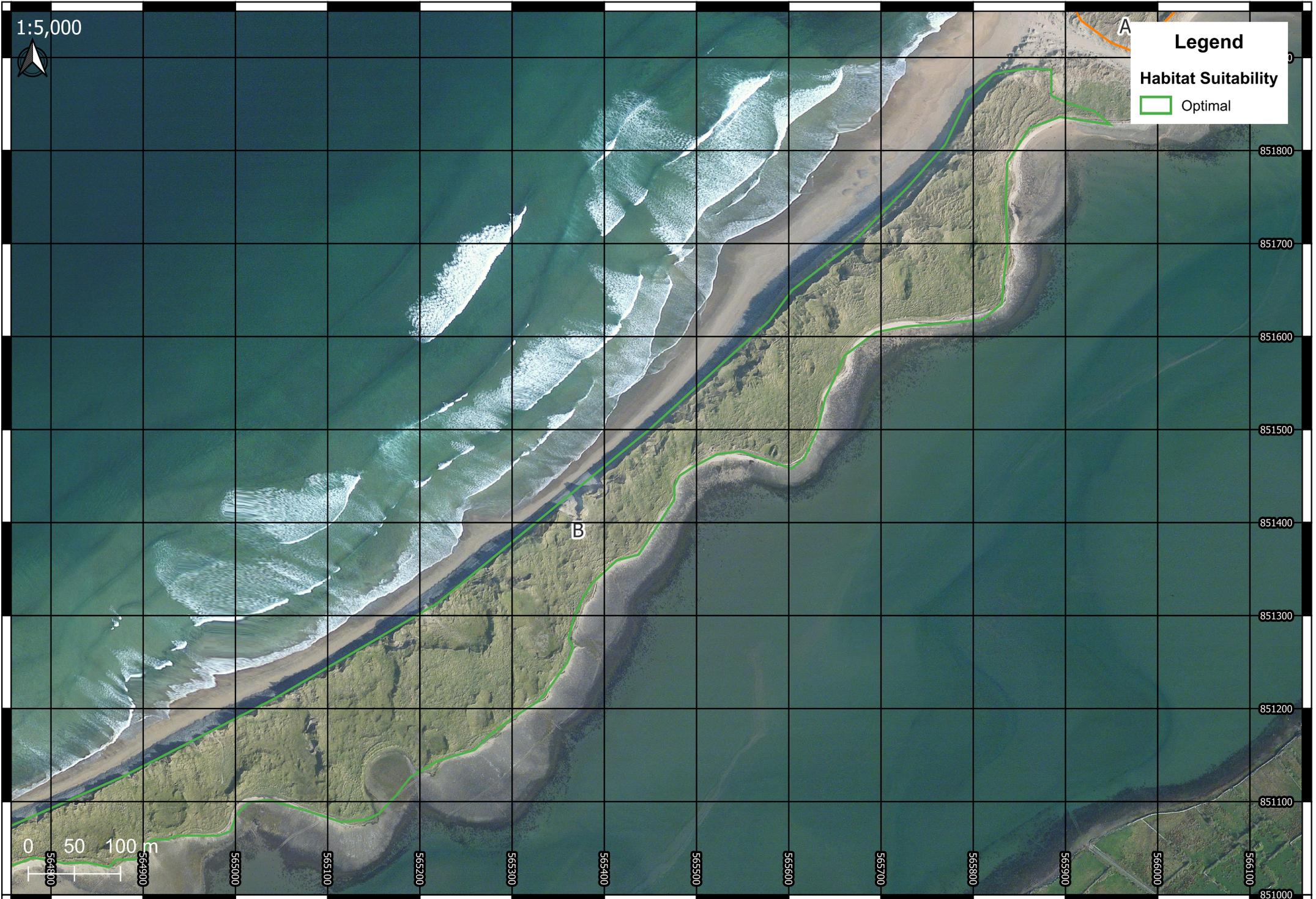
Proposed management prescription for site (from 2006 survey)

The management at Streedagh is not ideal for the maintenance of *V. angustior* in favourable condition. For areas A, D and E, there should be no more than 1 livestock unit per hectare, and grazing periods should typically be in the spring and autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the *Vertigo angustior* habitat. There should be no improvement with fertiliser or drainage of any of the habitat area. There should be no sheep introduced to the site. Area B should be maintained by light public trampling, but cars should be excluded from the area. These management changes should be monitored and maintained from 2009-2012 unless monitoring suggests a further change should take place.

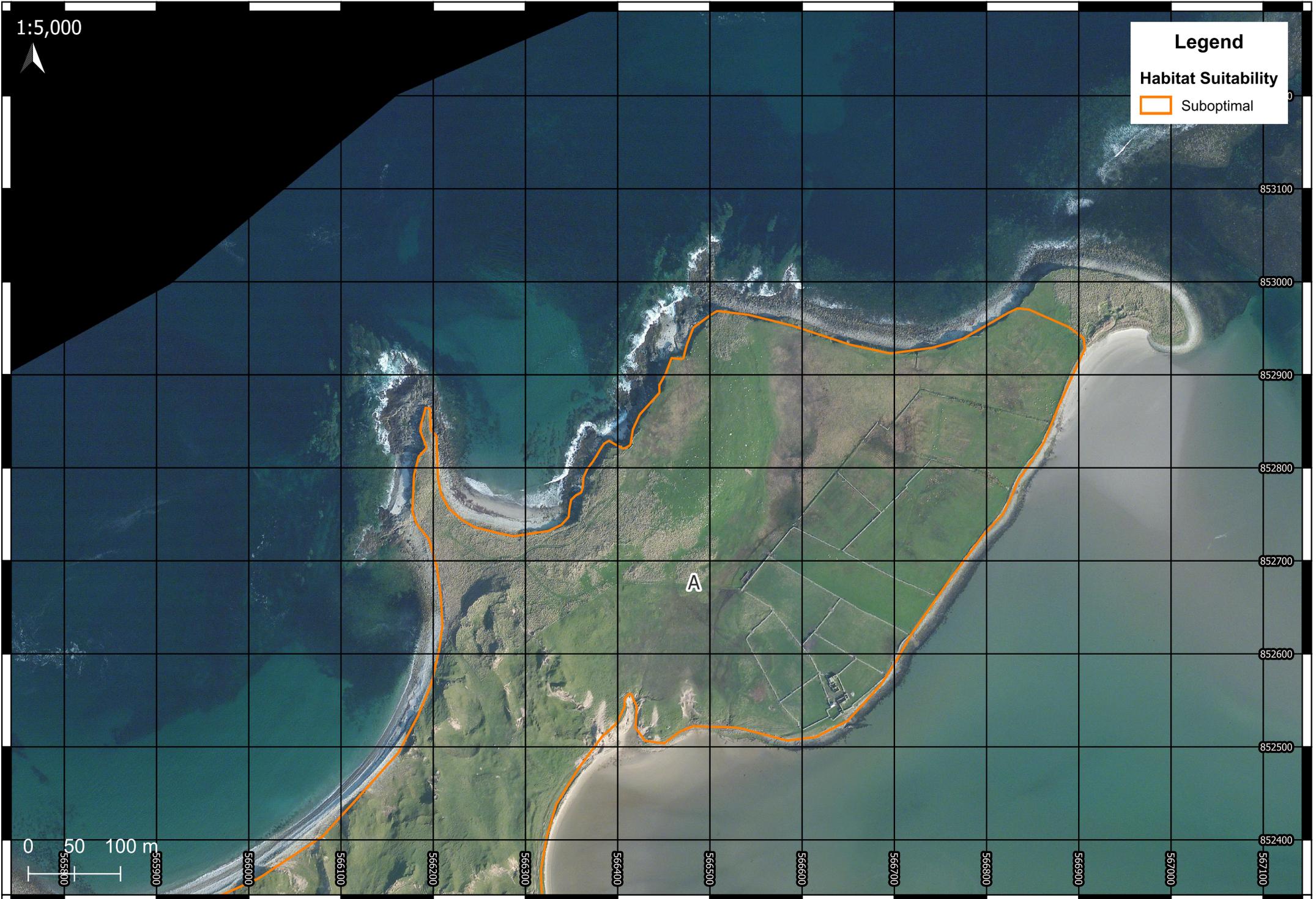








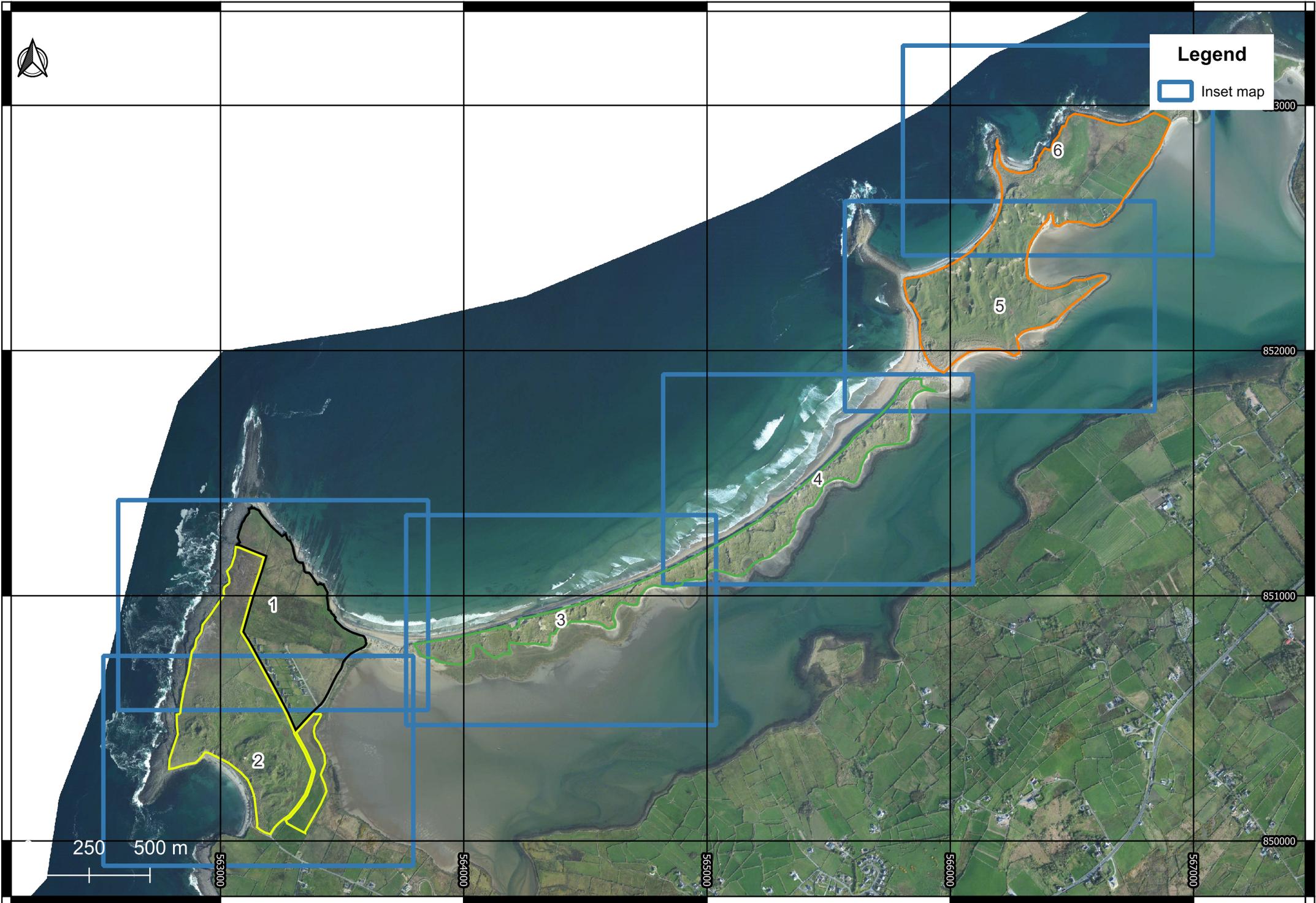




Legend

Habitat Suitability

- Suboptimal



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Bartraw

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM15 **County:** Mayo

SAC Site Code: 001482 Clew Bay Complex **QI:** No

Location description (from baseline survey):

As in 2013-2018, *Vertigo angustior* habitat is present throughout most of the fixed dune system at the northern part of the isthmus and on the island, but is absent from the unfixed, southern part of the isthmus. Access is from the beach car park.

Monitoring period	Date surveyed	Recorders
2019-2024	23-24 April 2024	John Brophy & Orla Daly
2013-2018	11 July 2017	John Brophy & Maria Long
2007-2012	21 May 2010	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is *Festuca rubra*, with some *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000), and *Lotus corniculatus*, *Pilosella officinarum*, *Trifolium repens*, *Galium verum*, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , with sparse <i>Ammophila arenaria</i> , <i>Geum verum</i> , and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The site at Bartraw comprises a former island and the sand and cobble spit connecting it to the mainland. The former island (Polygon A) supports abundant habitat suitable for *Vertigo angustior* in the form of fixed dune dominated by *Festuca rubra* grassland with *Ammophila arenaria*. The dune habitat along the spit has been heavily impacted by storm-related erosion and deposition of cobbles on former fixed dune habitat. As well as the impact of this pressure, paths trampled by human walkers and horse-riders have had an intense, if spatially limited, impact on the fixed dune habitat. Rabbit grazing was noted within Polygon A, albeit at a low level that is not currently having an impact on the *Vertigo angustior* habitat. However, the rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and *Vertigo angustior* habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry.

2013-2018:

The site at Bartraw consists of an isthmus, supporting a narrow strip of dune habitat, connecting to an island that supports abundant fixed dune habitat suitable for supporting *Vertigo angustior*. The snail was found across much of the island, as well as the northern part of the isthmus, but the dunes further south are too mobile to provide suitable habitat. Some pressures were identified for the site, but all are considered to be relatively small in scale. They include walking/trampling, horse-riding and storm-thrown shingle. Overall, *Vertigo angustior* is expected to continue to survive at the site. The site would benefit from the removal of horse-riding in the dunes, and a programme of dune restoration to repair damage caused along the isthmus by trampling and blow-outs.

2007-2012:

The Condition of the site and the feature based upon the 2010 survey has been assessed as Favourable. This is one of the few areas of fixed dune in Clew bay and indeed in County Mayo. Not only is it important for its location but also for its size and relatively intact nature, and the large area of good *Vertigo angustior* habitat

It is important to ensure that no adverse changes are allowed to occur in the area, and that the requirements of the snail habitat are not compromised for other conservation priorities. Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies, particularly in anticipation of potential effects of climate

3. TRANSECT DETAILS

TRANSECT: 1	MONITORING PERIOD: 2019-2024
Start point:	ITM 491182 784539 Narrow path along top of crest. ITM from 2024.
End point:	ITM 491268 784530 Shallow depression. ITM from 2024.

Vertigo angustior monitoring at Bartraw

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
B	Sub-optimal with unsuitable areas	0.83	Northern end of isthmus - polygon B - could improve
C	Unsuitable	2.157	Southern end of isthmus - polygon C - heavily damaged, unlikely to recover

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	72.5m	16.5m	0m	0m	1m	77.5m	0m	12.5m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	66m	21m			3m	87m		3m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	87m	NA	1.5m	NA	1.5m	88.5m		1.5m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (5 samples)								
2019-2024	1	1	6m	1	0	1	Count	Optimal-Suboptimal
2019-2024	1	2	25m	11	0	12	Count	Optimal
2019-2024	1	3	35m	4	0	6	Count	Optimal
2019-2024	1	4	54m	9	0	9	Count	Optimal-Suboptimal
2019-2024	1	5	72m	5	0	5	Count	Optimal-Suboptimal
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	6.5m	1	0	1	Presence/Absence	Optimal
2013-2018	1	2	26m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	39m	1	0	1	Presence/Absence	Optimal
2013-2018	1	4	66m	1	0	1	Presence/Absence	Optimal
2013-2018	1	5	57m	1	0	1	Presence/Absence	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	7m	9	2	11		
2007-2012	1	2	19m	18	0	18		
2007-2012	1	3	40m	40	34	74		
2007-2012	1	4	70m	6	1	7		
2007-2012	1	5	85m	5	1	6		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (7 samples)							
2019-2024	01	ITM 491101 784375	3	0	3	Count	Optimal
2019-2024	02	ITM 491158 784329	7	0	7	Count	Optimal
2019-2024	03	ITM 491367 784334	9	0	9	Count	Optimal-Suboptimal
2019-2024	04	ITM 491254 784464	6	0	6	Count	Optimal-Suboptimal
2019-2024	05	ITM 491339 784640	0	0	0	Count	Suboptimal
2019-2024	06	ITM 491238 784580	15	0	15	Count	Optimal
2019-2024	07	ITM 491031 784167	1	0	1	Count	Optimal
Monitoring period 2013-2018 (8 samples)							

Vertigo angustior monitoring at Bartraw

2013-2018	01	L 91126 84358	1	0	1	Presence/Absence	Optimal
2013-2018	02	L 91182 84311	1	0	1	Presence/Absence	Optimal
2013-2018	03	L 91369 84326	0	0	0		Optimal
2013-2018	04	L 91270 84449	1	0	1	Presence/Absence	Optimal
2013-2018	05	L 91371 84624	0	0	0		Optimal
2013-2018	06	L 91261 84573	1	0	1	Presence/Absence	Optimal
2013-2018	07	L 91054 84145	1	0	1	Presence/Absence	Optimal
2013-2018	08	L 90831 83625	0	0	0		Suboptimal
Monitoring period 2007-2012 (16 samples)							
2007-2012	01	L 91100 84332	0	0	1		
2007-2012	02	L 91121 84364	0	0	1		
2007-2012	03	L 91172 84454	0	0	1		
2007-2012	04	L 91264 84576	0	0	1		
2007-2012	05	L 91345 84630	0	0	1		
2007-2012	06	L 91286 84455	0	0	1		
2007-2012	07	L 91283 84364	0	0	1		
2007-2012	08	L 91265 84307	0	0	1		
2007-2012	09	L 91180 84315	0	0	1		
2007-2012	10	L 91058 84219	0	0	1		
2007-2012	11	L 91033 84133	0	0	1		
2007-2012	12	L 90926 83940	0	0	0		
2007-2012	13	L 90923 83927	0	0	0		
2007-2012	14	L 90915 83875	0	0	0		
2007-2012	15	L 90886 83764	0	0	0		
2007-2012	16	L 90774 83516	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 6 main grassland zones (from 0-90m) with optimal or sub-optimal habitat	Adult or sub-adult snails are present in 5 grassland zones	Pass
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 6 main grassland zones (from 0-90m) with optimal or sub-optimal habitat	Present in 5	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 6 main grassland zones (from 0-90m) with optimal or sub-optimal habitat	Present in all 5 of the zones sampled	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in at least 4 other locations on the island and in one site from the northern end of the isthmus, with Optimal habitat (minimum 6 samples)	Adult or sub-adult snails present at 5 other locations on the island and 1 on the isthmus (7 samples)	Pass
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 4 other locations on the island and in one site from the northern end of the isthmus, with Optimal habitat (minimum 6 samples)	Present at 4 other locations on the island and 1 on the isthmus	Pass

Vertigo angustior monitoring at Bartraw

2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 4 other locations on the island and in one site from the northern end of the isthmus, with Optimal habitat (minimum 6 samples)	Present at 9 other locations on the island and 2 on the isthmus	Pass
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Mon. period	Population Notes
2019-2024	Vertigo angustior was recorded at five locations along the transect during the current survey, which matches the results of the 2013-2018 monitoring period. In 2013-2018, the snail was present at four out of six locations on the island and one location at the northern end of the isthmus. The current survey has seen a slight improvement, with the snails present at five out of six locations on the island and one location at the northern end of the isthmus. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2013-2018	In the 2007-2012 monitoring period, the population assessment was Favourable (green), all five samples on the transect positive for Vertigo angustior, and 11 out of 16 spot samples were positive. In the current survey, all five samples on the transect were again positive, with five out of eight spot samples also positive. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Bartraw is Favourable (green).
2007-2012	The snail is widespread in its distribution and present in relatively high numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	75m of habitat along the Transect is classed as Optimal-Suboptimal or better	79m Optimal-Suboptimal or better	Pass
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 75m of the	77.5m Optimal wetness	Pass
2013-2018	1	Habitat extent	75m of habitat along the Transect is classed as Optimal-Suboptimal or better	87m Optimal-Suboptimal or better	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 75m of the	87m Optimal wetness	Pass
2007-2012	1	Habitat extent	75m of habitat along the Transect is classed as Optimal	87m is optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 75m of the Transect	87m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	8-10ha of the site Optimal-Suboptimal or better	8.9ha is Optimal	Pass
2013-2018	Habitat extent	8-10ha of the site Optimal-Suboptimal or better	8.81ha is Optimal-Suboptimal	Pass
2007-2012	Habitat extent	8-10ha of the site sub-optimal with optimal areas	8.88 ha	Pass

Mon. period	Habitat Notes
2019-2024	In the previous monitoring surveys, Polygon A at Bartraw was assessed as Optimal-Suboptimal. This has been upgraded to Optimal after the current survey, though this is not considered to be an ecological change, but rather one of interpretation. There is abundant good habitat for the snail along the transect within Polygon A. Polygon B remains Suboptimal-Unsuitable, with some reasonable V. angustior habitat present along the back/eastern side of the isthmus, while the western part has been impacted by deposited cobbles. Polygon C remains Unsuitable, with abundant bare sand, and the substratum beneath any Festuca rubra and Ammophila arenaria also dry sand. Based on the criteria of Moorkens & Killeen (2011) (with a minor change made in 2013-2018), the Habitat Assessment for Bartraw is Favourable (green).

Vertigo angustior monitoring at Bartraw

2013-2018	Based on the 2007-2012 monitoring survey, Polygon A was Optimal and Suboptimal, Polygon B was Suboptimal and Unsuitable, and Polygon C was Unsuitable. There has been no change to the suitability classifications of the three polygons, though there has been some habitat loss in Polygon B due to storm-thrown shingle covering some areas that were previously dune habitat. The habitat along the transect continues to be predominately Optimal, and a slight change has been made to the target criteria to take account of the application of the 5-point scale now used. Based on the criteria of Moorkens & Killeen (2011) (with the slight change noted), the Habitat Assessment for Bartraw is Favourable (green).
2007-2012	Most of the fixed dune habitat at the site appears to be in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Low	Negative	1%	Trampling by walkers. Polygons B & C most impacted due to limited size and more mobile nature. Worn track around Polygon A.
2019-2024	PI03	Problematic native species	Inside	Low	Neutral	75%	Small population of rabbits grazing in Polygon A. Not having a negative effect, but will require close monitoring
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	Low	Negative	1%	Erosion of sand dune habitat. Most notable along western edge of Polygon C. Deposition of cobbles on dune habitat in Polygon B.
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	High	Negative	2%	Damage caused by walking, and horse manure present
2013-2018	G05.01	Trampling, overuse,	Inside	High	Negative	2%	Tracks created by trampling in dunes
2013-2018	I01	invasive non-native species	Inside	Low	Negative	0.1%	Small sycamore trees in Polygon C
2013-2018	L07	storm, cyclone	Inside	High	Negative	2%	Shingle thrown up into Polygon B, covering dune habitat
2007-2012	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Neutral	9.6ha	If trampling pressures became more extreme and climatic changes resulted in inundations of the isthmus, then the situation could deteriorate.
2007-2012	J02.09.01	saltwater intrusion	Inside	Low	Neutral	9.6ha	If climatic changes resulted in inundations of the isthmus, then the situation could deteriorate.
2007-2012	M01.01	temperature changes (e.g. rise of temperature & extremes)	Inside	Low	Negative	9.6ha	If climatic changes resulted in inundations of the isthmus, then the situation could deteriorate.
2007-2012	M01.02	droughts and less precipitations	Inside	Low	Negative	9.6ha	
2007-2012	M01.03	flooding and rising precipitations	Inside	Low	Negative	9.6ha	

Mon. period Future Prospects Notes

2019-2024 There are no significant pressures acting on Bartraw. Most of the pressures acting on the site were recorded previously during the 2013-2018 monitoring survey, with the exception of rabbit grazing, which appears to be a recent occurrence. Storm damage includes the erosion of sand dune habitat, particularly along the western side of Polygon C, while cobbles

Vertigo angustior monitoring at Bartraw

Mon. period	Future Prospects Notes
2019-2024	have been thrown up on parts of Polygon B. There are walking tracks through Polygon C, which have resulted in extensive bare sand and blow-outs in these white dunes, while more limited walking and horse-riding impacts have created trails on Polygon A and B. While the rabbit grazing is not currently having a notable impact on Vertigo angustior habitat on the island, there is potential for major damage should the population expand dramatically. Such an event was seen Derrynane in Co. Kerry, where the V. angustior habitat was badly damaged through grazing and burrowing by an exploding rabbit population. For this reason, the rabbit population at Bartraw, and its effect on V. angustior habitat, needs to be closely monitored. Based on the threats and pressures acting on the site at Bartraw, the Future Prospects are assessed as
2013-2018	Damaging activities or threats to the Vertigo angustior population at Bartraw are limited. There is some walking and limited horse-riding taking place; storms have thrown shingle over potential Vertigo angustior habitat in Polygon B; and there is the occasional small sycamore (Acer pseudoplatanus) tree in Polygon C. Overall, the future of Vertigo angustior at Bartraw appears secure and so the Future Prospects are considered Favourable (green).
2007-2012	As the impacts are low, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Green	Green	Green	Green
2013-2018	Green	Green	Green	Green
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	The site at Bartraw supports a strong Vertigo angustior population, with abundant suitable habitat present, particularly on the island at the northern end of the site. This has resulted in Favourable (green) assessments for both of these elements. Future Prospects were also assessed as Favourable (green), thus giving an Overall Assessment for Bartraw of Favourable (green).
2013-2018	Based on the Favourable (green) results for habitat and population assessments and Future Prospects, the Overall Assessment for Bartraw is Favourable (green).
2007-2012	

6. DISCUSSION

Monitoring period
<p>2019-2024</p> <p>Discussion:</p> <p>The site at Bartraw comprises a former island and the sand and cobble spit connecting it to the mainland. The former island (Polygon A) supports abundant habitat suitable for Vertigo angustior in the form of fixed dune dominated by Festuca rubra grassland with Ammophila arenaria. The dune habitat along the spit has been heavily impacted by storm-related erosion and deposition of cobbles on former fixed dune habitat. As well as the impact of this pressure, paths trampled by human walkers and horse-riders have had an intense, if spatially limited, impact on the fixed dune habitat. Rabbit grazing was noted within Polygon A, albeit at a low level that is not currently having an impact on the Vertigo angustior habitat. However, the rabbit population and its impact on the fixed dune habitat must be closely monitored, as, if left unchecked, this could lead to major damage to fixed dune habitat in general and Vertigo angustior habitat in particular, as evidenced by the situation at Derrynane, Co. Kerry.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>At the moment, there is no urgent requirement for management at Bartraw. While the stabilisation of the dune habitat in Polygon C through the continuation of conservation measures (chestnut fencing) may provide more suitable habitat, its narrow form means that this is likely to result in limited gains. Walking in Polygon A is having a noticeable, but localised impact on the fixed dune habitat. Going forward, the most important management requirement for the fixed dune habitat in Polygon A is the monitoring of the rabbit population and its effect on the Vertigo angustior habitat. If the burrow-digging and grazing start to impact on the cover of Festuca rubra thatch and Ammophila arenaria, control measures will be required. Such a situation has developed at Derrynane, Co. Kerry, where suitable V. angustior habitat had been badly damaged due to the explosion in the rabbit population.</p>

Vertigo angustior monitoring at Bartraw

2013-2018

Discussion:

The site at Bartraw consists of an isthmus, supporting a narrow strip of dune habitat, connecting to an island that supports abundant fixed dune habitat suitable for supporting *Vertigo angustior*. The snail was found across much of the island, as well as the northern part of the isthmus, but the dunes further south are too mobile to provide suitable habitat. Some pressures were identified for the site, but all are considered to be relatively small in scale. They include walking/trampling, horse-riding and storm-thrown shingle. Overall, *Vertigo angustior* is expected to continue to survive at the site. The site would benefit from the removal of horse-riding in the dunes, and a programme of dune restoration to repair damage caused along the isthmus by trampling and blow-outs.

Monitoring recommendations:

It is recommended that monitoring is carried out at a minimum of 3 yearly intervals, due to the fact that the site continues to be a stronghold for *Vertigo angustior* and because there has been appreciable recent storm damage. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring should follow that set out by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable and wetness as Too wet, Optimal wetness or Too Dry
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (with a wide geographical spread, and including 1 on the northern end of the isthmus) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Little management is required for the *Vertigo angustior* habitat on the island at Bartraw; however, horse-riding should not be allowed in the dunes. A restoration plan should be implemented (fencing, appropriate signage, etc.) to encourage the recovery of the dunes in polygons B and C where human tracks and blow-outs have resulted in abundant bare sand, leaving the dunes more exposed to future erosion and loss of habitat.

Vertigo angustior monitoring at Bartraw

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2010 survey has been assessed as Favourable. This is one of the few areas of fixed dune in Clew bay and indeed in County Mayo. Not only is it important for its location but also for its size and relatively intact nature, and the large area of good Vertigo angustior habitat

It is important to ensure that no adverse changes are allowed to occur in the area, and that the requirements of the snail habitat are not compromised for other conservation priorities. Due to the importance of this site for Vertigo angustior, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies, particularly in anticipation of potential effects of climate change.

Monitoring recommendations:

It is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (with a wide geographical spread, and including 1 on the northern end of the isthmus) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

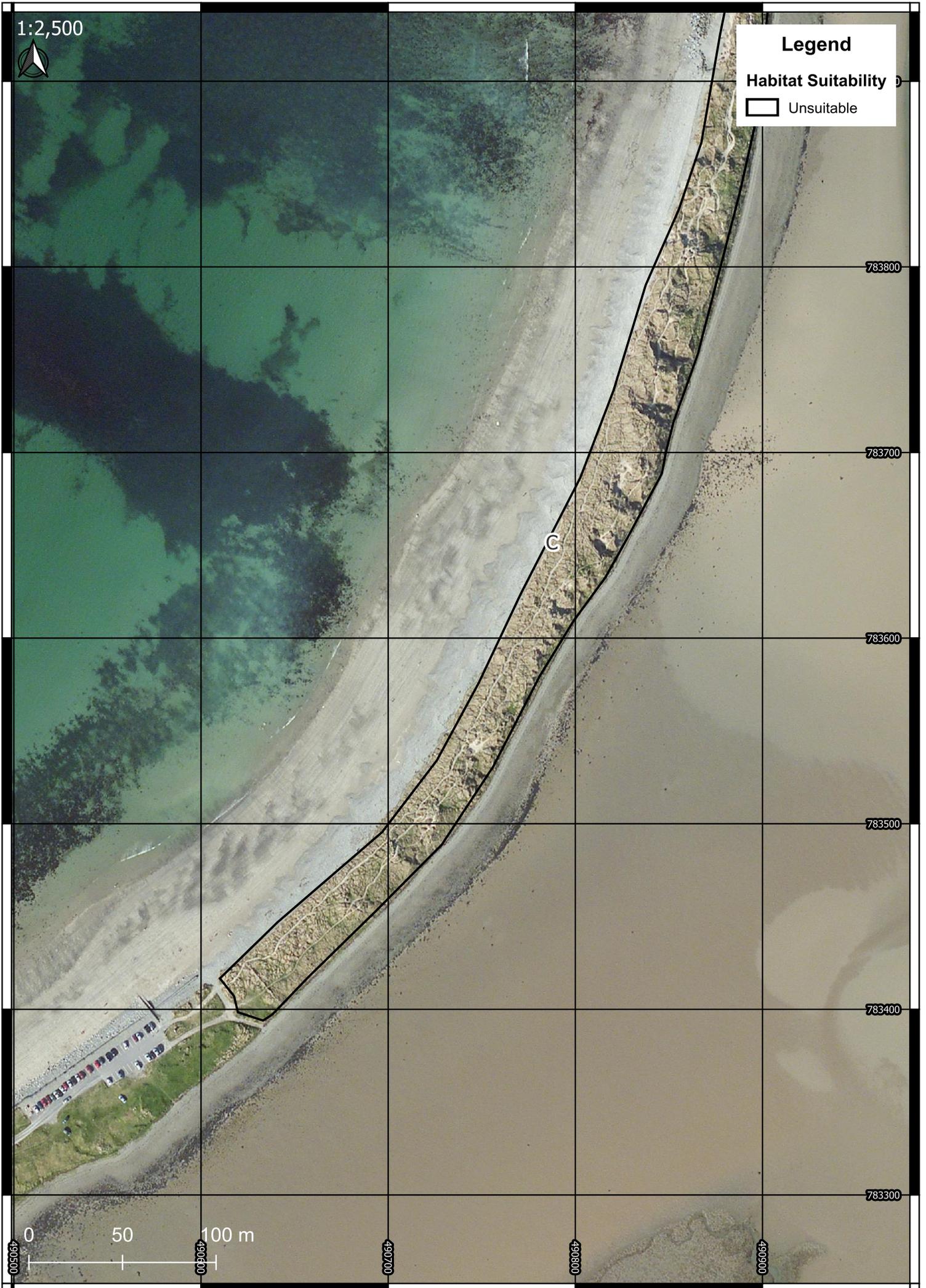
Management recommendations:

Existing Management

There was no evidence of any cattle or sheep grazing in 2010 and it did not appear that the site been grazed in the recent past.

Proposed management prescription for site

The site is currently in excellent condition for the snail, and no change of management is recommended between the periods 2010-2013. The high exposure of this windswept peninsula appears to be maintaining the ideal conditions for the snail.





1:2,500



Legend

Habitat Suitability

-  Suboptimal-Unsuitable
-  Unsuitable

784200

784100

784000

783900

783800

783700

490800

490900

491000

491100

0 50 100 m





Site report - Vertigo Monitoring

Vertigo angustior monitoring at Inishmore Island

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM16 **County:** Galway
SAC Site Code: 000213 Inishmore Island **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed dune and maritime grassland habitat at Inishmore in the southwest of the island and the fixed dune habitat within the airport complex to the northeast of the Island.

Monitoring period	Date surveyed	Recorders
2019-2024	25-26 June 2024	John Brophy & Orla Daly
2013-2018	12 July 2017	John Brophy & Maria Long
2007-2012	22-25 September 2006	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present at both sites is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The maritime grassland is species rich and also fits into this category. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is *Festuca rubra*, with *Plantago lanceolata*, *Trifolium pratense*, *Galium verum*, *Pilosella officinarum*, and *Euphrasia*, corresponding to SD8 of Rodwell (2000). The more undulating seaside dunes at Cill Mhuirbhig have *Festuca rubra*, with *Ammophila arenaria* higher up, corresponding to SD7 of Rodwell (2000). The habitats fall within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , and <i>Ammophila arenaria</i> , with sparse low growing herbs AND machair grassland with good botanical diversity. Vegetation height 10-40cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or above 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The site at Inishmore Island comprises two widely separated areas; one at Cill Mhuirbhig and the other around the Inishmore aerodrome. The habitat at Inishmore comprises fixed dune habitat and machair grassland. Most of this area is likely subject to grazing, particularly polygon B, which had a small number of cattle present at the time of survey, though there was no evidence of active grazing in the other polygons here. The cattle grazing has resulted in a reduction in the suitability of the area for *Vertigo angustior* via the removal of taller vegetation and the grassy thatch that provides the required microclimate for the species. Even where the classic *Ammophila arenaria*/*Festuca rubra* sward is well developed in Polygon A, the habitat is drier than would be optimal for the snail. Outside of the grazed areas (which are consequently more prone to drying out), the cause of this drying is not clear. It is assumed that this drying out is due to weather/climate changes that have reduced precipitation and/or increased drying conditions. The habitat around Inishmore aerodrome is of lower potential suitability. While it also comprises fixed dune and maritime grassland, it generally has a well-developed bryophyte layer and limited *Festuca rubra* in the sward, resulting in only small areas that have suitability for *Vertigo angustior*. Part of the reason bryophyte cover is so high may be due to the presence of rabbits in this location, whereby they are preferentially grazing down the grasses and thus allowing the bryophytes to dominate. The combination of pressures acting on the *Vertigo angustior* habitat at Inishmore Island has resulted in a decline in the population, with no *V. angustior* found during the current survey, continuing the trend that was evident from the prior monitoring periods. While the control of cattle grazing may restore some of the suitability to the habitat within Polygon B, the drying out that is evident across the rest of the site is not likely to be something that can be managed at a local level.

2013-2018:

The *Vertigo angustior* site of Inishmore Island comprises two well-separated areas: Cill Mhuirbhig and the airport. The Cill Mhuirbhig area includes fixed dune habitat close to the coast, while further inland it becomes machair grassland. The species was found frequently on the machair in the previous survey, but only a few of the most seaward sample locations were positive for the snail during the current survey. *Vertigo angustior* was only found in one sample from the large area of Polygon B, previously noted to be dominated by 'a dense, springy thatch of *Festuca rubra*', but now no longer supporting such a micro-habitat. No *Vertigo angustior* were recorded at the airport and much of the habitat there has either a dense moss layer in the understorey, or is too mobile. Overgrazing (at least from the point of view of the *Vertigo angustior* habitat) at Cill Mhuirbhig appears to have resulted in the loss of much of *Festuca rubra* litter, leading to a drop in the suitability of the habitat and so management of grazing levels is required to allow the habitat to improve.

2007-2012:

The two sites are important habitat areas for *V. angustior* in Inishmore. While there are pockets of the species in maritime grassland in other parts of the island, the large population at Cill Mhuirbhig in particular should be carefully conserved, along with the airport site which is an important population for the eastern part of the island.

Vertigo angustior monitoring at Inishmore Island

Along with protecting the current habitat from fertilizer and excessive grazing, it would be useful to ensure that similar protection occurs in the naturally flooding dune areas along the coastal strip, which are currently not suitable for *V. angustior* but may be in the future if climate change promotes more favourable conditions for the snail there.

As the area of *V. angustior* habitat is very fixed at both sites relative to other sites for this species, it is important to regularly monitor the habitat areas, particularly those that are not grazed. Any succession to scrub would be detrimental to *V. angustior* which requires open, unshaded habitat, but this does not appear to be an immediate threat.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2019-2024

Start point: ITM 482814 710314 Corner of two stone walls. ITM from 2024.
End point: ITM 482898 710330 Section of very dense *Ammophila arenaria* by sea wall. ITM from 2024.
Transect length: 87 **Direction:** W-E
Description: The transect runs across undulating *Festuca rubra*-dominated fixed dune grassland
Sampling frequency: 3 samples were taken from zones with the most suitable habitat

TRANSECT: 2 **MONITORING PERIOD:** 2019-2024

Start point: ITM 483111 710356 Wall by roadside. ITM from 2024.
End point: ITM 483114 710086 ITM from 2024.
Transect length: 276 **Direction:** N-S
Description: Linear sampling rather than transect, as in 2007-2012. Direction also reversed. Sloping machair grassland.
Sampling frequency: 5 samples taken in first 276m coinciding with previous sample locations

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point: L 82837 10285 Corner of two stone walls
End point: L 82922 10297 Section of very dense *Ammophila arenaria* by sea wall
Transect length: 87 **Direction:** SW-NE
Description: The transect runs across undulating *Festuca rubra*-dominated fixed dune grassland
Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Samples were taken at various intervals along the transect principally from zones with Optimal and Suboptimal habitat and analysed for their snail composition

TRANSECT: 2 **MONITORING PERIOD:** 2013-2018

Start point: L 83125 09973 Wall by roadside
End point: L 83133 10317
Transect length: 276 **Direction:** N-S with bend
Description: Linear sampling rather than transect, as in 2007-2012. Direction also reversed. Sloping machair grassland.
Sampling frequency: Five samples taken in first 276m coinciding with previous sample locations

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point: L 82837 10284 From the southwest corner of the field by the walls
End point: L 82921 10300 By a double telegraph pole at the high dune edge above the seawall
Transect length: 87.5 **Direction:** SW-NE
Description: The transect runs across undulating *Festuca rubra* dominated fixed dune grassland
Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition

Vertigo angustior monitoring at Inishmore Island

TRANSECT:	2	MONITORING PERIOD:	2007-2012
Start point:	L 83125 09973	South-east corner of the field by the walls	
End point:	L 83133 10317	Wall by the roadside	
Transect length:	351	Direction:	S-N with bend
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland		
Sampling frequency:	Eight samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat.		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	1.3186	Polygon A remains Optimal-Suboptimal; however, despite the habitat mainly comprising fixed dune dominated by Ammophila arenaria and Festuca rubra, it was quite dry at the time of survey.
B	Suboptimal-Unsuitable	16.5145	Polygon B drops from Suboptimal to Suboptimal-Unsuitable. This is due to the polygon being mostly tightly-grazed by cattle resulting in a short, dry sward with limited to no thatch.
C	Optimal-Suboptimal	0.2079	Polygon C remains Optimal-Suboptimal, as the maritime grassland supports a good thatch, but was quite dry at the time of survey.
D	Unsuitable	1.4566	Polygon D drops to Unsuitable. This change is due to interpretation, as the area was heavily disturbed by historical sand quarrying and is dominated by recolonising bare ground with Carex arenaria. Well-developed grassland only occurs around the margins and is quite dry as well as being invaded by Calystegia sepium.
E	Suboptimal-Unsuitable	12.4116	Polygon E remains Suboptimal-Unsuitable. This is an area of fixed dune with Ammophila arenaria and Festuca rubra, but with a bryophyte carpet across much of the polygon. Good thatch is limited and there are signs of historical disturbance and rabbit grazing.
F	Suboptimal-Unsuitable	1.2957	Polygon F drops to Suboptimal-Unsuitable. While Ammophila arenaria is common, Festuca rubra thatch is limited and there is an extensive bryophyte layer. Vehicle disturbance occurs in places.

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	1.3186	Polygon A status remains Optimal-Suboptimal and is a combination of machair grassland and Festuca rubra and Ammophila arenaria dominated fixed dune habitat.
B	Suboptimal	16.5145	Polygon B status drops from Optimal and Suboptimal to Suboptimal. This polygon supports machair grassland, which has seen a loss of the Festuca rubra thatch noted in the previous survey, so this change is ecological. The boundary of this polygon was adjusted to coincide with an appropriate field boundary.
C	Optimal-Suboptimal	0.2079	Polygon C status was raised from Suboptimal to Optimal-Suboptimal due to the presence of sufficient suitable habitat. This change is due to interpretation.
D	Suboptimal-Unsuitable	1.4566	Polygon D status was raised from Unsuitable to Suboptimal-Unsuitable. This change is presumed ecological, with the habitat recovering from previous sand quarrying activities.
E	Suboptimal-Unsuitable	12.4116	Polygon E status was raised from Unsuitable to Suboptimal-Unsuitable, to reflect the fact that some of the habitat has the potential to support Vertigo angustior, though the area which is potentially suitable is small. This change is due to interpretation as there is no evidence of actual ecological change. The boundary was also revised to better reflect the situation on the ground.
F	Suboptimal	1.2957	Polygon F status remains Suboptimal. The boundary of the polygon was revised to better reflect the situation on the ground.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	1.32	Polygon A - Cill Mhuirbhigh. Optimal and sub-optimal– fixed dune habitat
B	Sub-optimal with optimal areas	15.61	Polygon B - Cill Mhuirbhigh. Optimal and sub-optimal– mostly machair

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Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
C	Sub-optimal	0.22	Polygon C - Cill Mhuirbhigh. Sub-optimal – fixed and unfixed dune area and machair in old fields. Area C is a patch of fixed dune between the north road and the sea. It may be occasionally grazed, but very lightly, it is maintained by exposure.
D	Unsuitable	1.456	Polygon D - Cill Mhuirbhigh. Unsuitable – unfixed and damaged dunes. Area D consists of highly damaged dunes, parts of which were being excavated by JCB, as they were on a previous visit in 2003.
E	Unsuitable	15.19	Polygon E - Airport. Unsuitable – habitat includes the runways, service areas and less fixed dunes around the margins. Area E is within the runway zone and is lightly mown on a very infrequent basis. However, the sward is tight and cropped and has developed a very compacted mossy habitat over the years.
F	Sub-optimal	2.207	Polygon F - Airport. Sub-optimal – fixed dune area with good Festuca habitat. Area F is unmanaged except for light trampling and occasional parking of cars, and storage of equipment. It retains a fixed dune habitat with a springy, thatched litter layer in areas outside those that are regularly subjected to damage.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	46m	33m	8m	0m	0m	46m	0m	41m
2								
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	29m	49m	9m			87m		
2								
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	87.5m	NA		NA		87.5m		
2		NA	Mostly optimal and sub-optimal	NA				

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (3 samples)								
2019-2024	1	1	18m	0	0	0	Count	Optimal-Suboptimal
2019-2024	1	2	33m	0	0	0	Count	Optimal
2019-2024	1	3	26m	0	0	0	Count	Optimal-Suboptimal
Monitoring period 2013-2018 Transect 1 (3 samples)								
2013-2018	1	1	9m	0	0	0		Optimal
2013-2018	1	2	25m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	3	78m	1	0	1	Presence/Absence	Optimal
Monitoring period 2007-2012 Transect 1 (3 samples)								
2007-2012	1	1	30m	0	0	1		
2007-2012	1	2	45m	0	0	1		
2007-2012	1	3	70m	0	0	0		
Monitoring period 2007-2012 Transect 2 (8 samples)								

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2007-2012	2	1	L83125 09973 South-east corner of upper field. Rocky outcrops.	0	0	0
2007-2012	2	2	L83138 10052 Some rocky outcrops. Machair	0	0	1
2007-2012	2	3	L83141 10058	0	0	1
2007-2012	2	4	L83156 10123 Near bottom north-east corner of upper field.	0	0	1
2007-2012	2	5	Slopes in lower field. L83156 10203	0	0	1
2007-2012	2	6	L83158 10229 Damper area with Carex spp.	0	0	1
2007-2012	2	7	L83153 10260 Very similar to Sample site 5, orchid-rich.	0	0	1
2007-2012	2	8	L83133 10317 Machair grassland near roadside wall	0	0	1

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (11 samples)							
2019-2024	01	ITM 483117 710488	0	0	0	Count	Optimal-Suboptimal
2019-2024	02	ITM 483110 710357	0	0	0	Count	Suboptimal
2019-2024	03	ITM 483134 710294	0	0	0	Count	Suboptimal
2019-2024	04	ITM 483132 710234	0	0	0	Count	Suboptimal
2019-2024	05	ITM 483121 710158	0	0	0	Count	Suboptimal
2019-2024	06	ITM 483111 710095	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	07	ITM 489379 707580	0	0	0	Count	Suboptimal
2019-2024	08	ITM 489191 707730	0	0	0	Count	Suboptimal
2019-2024	09	ITM 489212 707257	0	0	0	Count	Suboptimal
2019-2024	10	ITM 489254 707255	0	0	0	Count	Suboptimal
2019-2024	11	ITM 489222 707215	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (12 samples)							
2013-2018	01	L 83150 10376	0	0	0		Suboptimal
2013-2018	02	L 83133 10441	1	0	1	Presence/Absence	Optimal
2013-2018	03	L 83132 10326	1	0	1	Presence/Absence	Optimal
2013-2018	04	L 83154 10259	0	0	0		Optimal-Suboptimal
2013-2018	05	L 83157 10202	0	0	0		Optimal-Suboptimal
2013-2018	06	L 83154 10117	0	0	0		Optimal-Suboptimal
2013-2018	07	L 83140 10055	0	0	0		Optimal-Suboptimal
2013-2018	08	L 89161 07734	0	0	0		Optimal-Suboptimal
2013-2018	09	L 89414 07485	0	0	0		Suboptimal
2013-2018	10	L 89217 07159	0	0	0		Optimal-Suboptimal
2013-2018	11	L 89217 07196	0	0	0		Optimal-Suboptimal

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2013-2018	12	L 89284 07218	0	0	0	Suboptimal
Monitoring period 2007-2012 (1 sample)						
2007-2012	Airp	L 89300 07300	0	0	1	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 4 passes Favourable (green); 2-3 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the habitat zones on Transect 1 (from at least 3 samples)	Not present on transect	Fail
2019-2024	2	Presence/Absence	Adult or sub-adults snails are present in 3 sample locations in Polygon B (from at least 5 samples)	Not present	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the habitat zones on Transect 1 (from at least 3 samples)	Present in 2 out of 3 samples	Pass
2013-2018	2	Presence/Absence	Adult or sub-adults snails are present in 3 sample locations in Polygon B (from at least 5 samples)	Present in 1 sample location	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the habitat zones on transect 1 (from at least 3 samples)	Present in 2 zones (from 3 samples)	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in 3 sample locations on transect 2 (from at least 5 samples)	Present in 7 locations (from 8 sampled)	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present within the Optimal and suboptimal habitat at the airport (minimum 5 samples)	Not present	Fail
2019-2024	Presence/Absence	Adult or sub-adult snails present in polygons C or D (minimum of one sample in each area)	Not present	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present within the Optimal and suboptimal habitat at the airport (minimum 5 samples)	Not present	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails present in polygons C or D (minimum of one sample in each area)	Present in Polygon C	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present within the optimal and sub-optimal habitat at the airport (minimum 5 samples)	Present	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was not found at any of the sample locations during the current survey. This compares to five positive samples in 2013-2018 and the positive samples in 2007-2012. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).

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2013-2018 In the 2007-2012 monitoring period, the population assessment was Favourable (green), with two out of three samples on Transect 1 and seven out of eight samples on "Transect 2" positive for *Vertigo angustior* (note that "Transect 2" of Moorkens & Killeen (2011) was in fact linear spot sampling, with no measures of habitat suitability or wetness along zones, as would be carried out in a typical transect). The snail was also present at the airport in the previous survey, but no details of numbers or locations of samples are given in the report of Moorkens & Killeen (2011). In the current survey, two out of three samples on Transect 1 were again positive, while only one out of five samples in Polygon B was positive. In addition, five further samples were carried out (but not presented here) in Polygon B in the current survey by an accompanying malacologist, all of which were negative. *Vertigo angustior* was found in one sample in Polygon C at Cill Mhuirbhigh, but not in Polygon D. The species was not found at the airport (Polygons E and F). Based on the criteria of Moorkens & Killeen (2011), with the addition of a new criterion to take into account polygons C and D, the Population Assessment for Inishmore is Unfavourable Inadequate (amber).

2007-2012 The snail is widespread in its distribution and frequently present in moderate to good numbers

5.2 Habitat Assessment: 4 passes Favourable (green); 2-3 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	At least 75m of habitat along Transect 1 is classed as Optimal AND Soils, at the time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for at least 75m of the transect	46m Optimal and 46m Optimal wetness	Fail
2013-2018	1	Habitat extent	At least 75m of habitat along Transect 1 is classed as Optimal AND Soils, at the time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for at least 75m of the transect	78m Optimal and 87m Optimal wetness	Pass
2007-2012	1	Habitat extent	At least 75m of habitat along Transect 1 is classed as Optimal and soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 75m of the Transect	87.5m is Optimal habitat and optimal wetness	Pass
2007-2012	2	Habitat extent	Optimal and sub-optimal habitat is present	Present at 7 locations	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Area of occupancy	At least 2ha of the habitat at the airport is classed as Optimal-Suboptimal or better	0ha Optimal-Suboptimal or better	Fail
2019-2024	Habitat extent	At least 1.5ha of the habitat in polygons A, C and D at Cill Mhuirbhigh is Suboptimal or better	1.5ha Optimal-Suboptimal	Pass
2019-2024	Habitat extent1	Polygon B contains large areas (>12ha) of habitat that is classified as Optimal-Suboptimal or better	16.5ha Suboptimal-Unsuitable	Fail
2013-2018	Area of occupancy	At least 2ha of the habitat at the airport is classed as Optimal-Suboptimal or better	0ha Optimal-Suboptimal or better	Fail
2013-2018	Habitat extent	At least 1.5ha of the habitat in polygons A, C and D at Cill Mhuirbhigh is Suboptimal or better	1.7ha Optimal-Suboptimal	Pass
2013-2018	Habitat extent1	Polygon B contains large areas (>12ha) of habitat that is classified as Optimal-Suboptimal or better	16.5ha Suboptimal	Fail
2007-2012	Area of occupancy	At least 2ha of the habitat at the airport is classed as optimal and sub-optimal	2.2 ha	Pass
2007-2012	Habitat extent	At least 15ha of the habitat at Cill Mhuirbhigh optimal and sub-optimal	17.13 ha	Pass

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Mon. period	Habitat Notes
2019-2024	While the vegetation in the vicinity of the transect at Inishmore Island is good, the area seems drier than in previous surveys. This drying was also evident at other sample locations, particularly those in Polygon B, though there it can be, at least partly, explained by the higher grazing pressure and associated limited thatch. Drops in habitat suitability were recorded for several polygons, with two being considered to reflect ecological change. Based on the criteria of Moorkens & Killeen (2011), as amended by Long & Brophy (2019), the Habitat Assessment for Inishmore Island is Unfavourable-Bad (red).
2013-2018	In the 2007-2012 monitoring period, polygons A and B were Optimal and Suboptimal, polygons C and F were Suboptimal, while polygons D and E were Unsuitable. In the current monitoring, Polygon A remained Optimal-Suboptimal. The status of Polygon B dropped to Suboptimal, and it had its boundary altered to better suit the boundaries on the ground. Polygon C status was increased to Optimal-Suboptimal, polygons D and E were increased to Suboptimal-Unsuitable, while Polygon F remained unchanged at Suboptimal. However, while some increases were made, these mostly related to interpretation of habitat quality, rather than to an observed ecological improvement. In fact, a distinct decline in a habitat quality (from the point of <i>Vertigo angustior</i> at least) was noted in the largest polygon, Polygon B. At the time of the last survey (2006) there was a dense layer of thatch, but in 2017, little to no such habitat (essential for the target species) was found in this area. Based on the criteria of Moorkens & Killeen (2011), with some changes to remove mention of Transect 2 (was not surveyed as a transect by Moorkens & Killeen) and to take account of habitat conditions across all polygons, the Habitat Assessment for Inishmore is Unfavourable Inadequate (amber).
2007-2012	Much of the habitat at the site appears to be in good condition for <i>V. angustior</i> ,

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Medium	Negative	50%	Generally tightly grazed machair grassland resulting in dry sward with little tall vegetation or thatch (Polygon B).
2019-2024	PI03	Problematic native species	Inside	Medium	Negative	37%	Rabbit grazing in Polygon E reducing cover of grass species
2019-2024	PJ03	Changes in precipitation regimes due to climate change	Inside	High	Negative	100%	No local cause evident (other than grazing in Polygon B reducing vegetation height and litter). Considered likely to be changing precipitation and wind patterns.
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	0.1%	<i>Rubus fruticosus</i> agg. in polygons A and E
2013-2018	A03.02	non intensive mowing	Inside	Medium	Negative	10%	Moderate mowing is fine, but tighter mowing near runway is too much
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	55%	Grazing important, but level currently too high.
2013-2018	D04.02	aerodrome, heliport	Inside	High	Negative	8%	Runway and associated hard surfaces
2013-2018	G05.01	Trampling, overuse,	Inside	Low	Negative	0.01%	Trampling around WC at Cill Mhuirbhig
2013-2018	K02.01	species composition change (succession)	Inside	High	Negative	20%	Dense moss layer in what are presumably old dunes around the airport (not ideal for <i>Vertigo angustior</i>)
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Low	Negative	17.1ha	(Cill Mhuirbhig)

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2007-2012	D04.01	airport	Inside	Medium	Neutral	17.4
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Mon. period	Future Prospects Notes
2019-2024	The significant pressures acting on Inishmore Island include cattle grazing (Polygon B), rabbit grazing (Polygon E) and drying out (entire site). While the grazing pressures have clear causes and effects, the cause of the drying out is less clear. The more tightly-grazed sward in Polygon B will retain less moisture than more suitable habitat with a well-developed thatch; however, even in places where taller vegetation occurs (e.g. Polygon A), the thatch and litter is generally dry and not what is to be expected for Optimal condition for <i>Vertigo angustior</i> . It is assumed that this drying out is due to weather/climate changes that have reduced precipitation and/or increased drying conditions. A lesser pressure acting on the site is the presence of <i>Rubus fruticosus</i> agg. in polygons A and E. Based on the threats and pressures acting on the site at Inishmore Island and the trends in relation to population, the Future Prospects are assessed as Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, cattle-grazing was identified as having a negative influence, while the airport was considered neutral. In the current monitoring, cattle-grazing continues to be having a negative influence in Polygon B in particular, while path trampling close to the toilet block at Cill Mhuirbhig affected a small area in a negative way. At the airport, the presence of the airport itself was considered to be a negative impact with its associated mowing, while succession of the dune vegetation to the north of the airport has resulted in the area developing a deep bryophyte layer, of low suitability for supporting <i>Vertigo angustior</i> . Balancing the various activities and their influence, and in particular the lack of thatch caused by slightly higher than suitable grazing levels in the large Polygon B, the Future Prospects for Inishmore are considered to be Unfavourable Inadequate (amber).
2007-2012	As the impacts are low to moderate rather than severe (see Section 7), Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red Red
2013-2018	Amber	Amber	Amber	Amber Amber
2007-2012	Green	Green	Green	Green Green

Mon. period	Overall Notes
2019-2024	<i>Vertigo angustior</i> was not recorded at Inishmore Island during the current survey, resulting in a Population Assessment of Unfavourable-Bad (red), while the Habitat Assessment and Future Prospects also returned Unfavourable-Bad (red) results. This results in an Overall Assessment for Inishmore Island of Unfavourable-Bad (red).
2013-2018	Based on the Unfavourable Inadequate (amber) result for the Population Assessment, Habitat Assessment and Future Prospects, the Overall Assessment for Inishmore is Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period
2019-2024
<p>Discussion:</p> <p>The site at Inishmore Island comprises two widely separated areas; one at Cill Mhuirbhig and the other around the Inishmore aerodrome. The habitat at Inishmore comprises fixed dune habitat and machair grassland. Most of this area is likely subject to grazing, particularly polygon B, which had a small number of cattle present at the time of survey, though there was no evidence of active grazing in the other polygons here. The cattle grazing has resulted in a reduction in the suitability of the area for <i>Vertigo angustior</i> via the removal of taller vegetation and the grassy thatch that provides the required microclimate for the species. Even where the classic <i>Ammophila arenaria</i>/<i>Festuca rubra</i> sward is well developed in Polygon A, the habitat is drier than would be optimal for the snail. Outside of the grazed areas (which are consequently more prone to drying out), the cause of this drying is not clear. It is assumed that this drying out is due to weather/climate changes that have reduced precipitation and/or increased drying conditions. The habitat around Inishmore aerodrome is of lower potential suitability. While it also comprises fixed dune and maritime grassland, it generally has a well-developed bryophyte layer and limited <i>Festuca rubra</i> in the sward, resulting in only small areas that have suitability for <i>Vertigo angustior</i>. Part of the reason bryophyte cover is so high may be due to the presence of rabbits in this location, whereby they are preferentially grazing down the grasses and thus allowing the bryophytes to dominate. The combination of pressures acting on the <i>Vertigo angustior</i> habitat at Inishmore Island has resulted in a decline in the population, with no <i>V. angustior</i> found during the current survey, continuing the trend that was evident from the prior monitoring periods. While the control of cattle grazing may restore some of the suitability to the habitat within Polygon B, the drying out that is evident across the rest of the site is not likely to be something that can be managed at a local level.</p> <p>Monitoring recommendations:</p>

Vertigo angustior monitoring at Inishmore Island

As per 2013-2018 recommendations

Management recommendations:

A reduction in the level of grazing within Polygon B is required to allow the vegetation to grow to a height to allow a *Festuca rubra* thatch to develop and, with it, the associated microclimate preferred by *Vertigo angustior*. Conversely, a slight increase or the introduction of light cattle grazing to Polygon A would likely benefit the snail by opening up the sward somewhat where it is currently *Ammophila arenaria*-dominated. Grazing rates recommended for sand dunes or coastal grasslands are in the range 0.1-0.3 LU/ha (Chapman, 2007). Any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Supplementary feeding should be avoided on site, as it brings in nutrients and unwanted species. Going forward, the most important management requirement for the fixed dune habitat in Polygon E is the monitoring of the rabbit population and its effect on the *Vertigo angustior* habitat. If the burrow-digging and grazing start to impact more heavily on the cover of *Festuca rubra* thatch and *Ammophila arenaria*, control measures will be required. Such a situation has developed at Derrynane, Co. Kerry, where suitable *V. angustior* habitat has been badly damaged due to the explosion in the rabbit population. Additional disturbance, caused by the future addition of occasional grazing by cattle to the fixed dunes at the aerodrome, may break up the bryophyte layer in places to allow the germination of more grasses and broad-leaved herbs. This would improve the habitat for *V. angustior*.

2013-2018

Discussion:

The *Vertigo angustior* site of Inishmore Island comprises two well-separated areas: Cill Mhuirbhig and the airport. The Cill Mhuirbhig area includes fixed dune habitat close to the coast, while further inland it becomes machair grassland. The species was found frequently on the machair in the previous survey, but only a few of the most seaward sample locations were positive for the snail during the current survey. *Vertigo angustior* was only found in one sample from the large area of Polygon B, previously noted to be dominated by 'a dense, springy thatch of *Festuca rubra*', but now no longer supporting such a micro-habitat. No *Vertigo angustior* were recorded at the airport and much of the habitat there has either a dense moss layer in the understorey, or is too mobile. Overgrazing (at least from the point of view of the *Vertigo angustior* habitat) at Cill Mhuirbhig appears to have resulted in the loss of much of *Festuca rubra* litter, leading to a drop in the suitability of the habitat and so management of grazing levels is required to allow the habitat to improve.

Monitoring recommendations:

Monitoring should be carried out on a 3-yearly basis, as set out by Moorkens & Killeen (2011) and with some modifications:

- Repeat Cill Mhuirbhig Transect 1, delineate the plant community/habitat zones, and assign the habitat in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take at least 5 samples in Polygon B and analyse for molluscan composition
- Describe habitat and take at least 1 sample in each of polygons C & D and analyse for molluscan composition
- Describe habitat and take at least 3 samples from the most suitable habitat at the airport and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

The machair grassland of Polygon B would benefit from a lower grazing level, in terms of duration or number of animals; however, care must be taken with any intervention to not allow the vegetation to become rank and thus unsuitable for supporting *Vertigo angustior*. The target would be to allow a build-up of *Festuca rubra* litter in a light, open thatch. It is thought that this change could be relatively easily implemented given good communication with the local landowner, and efforts to affect change should be taken immediately.

There are no management recommendations for the dunes in the vicinity of the airport, though the maintained grass areas could be made more suitable for supporting *Vertigo angustior* by reducing the mowing regime.

Vertigo angustior monitoring at Inishmore Island

2007-2012

Discussion:

The two sites are important habitat areas for *V. angustior* in Inishmore. While there are pockets of the species in maritime grassland in other parts of the island, the large population at Cill Mhuirbhigh in particular should be carefully conserved, along with the airport site which is an important population for the eastern part of the island.

Along with protecting the current habitat from fertilizer and excessive grazing, it would be useful to ensure that similar protection occurs in the naturally flooding dune areas along the coastal strip, which are currently not suitable for *V. angustior* but may be in the future if climate change promotes more favourable conditions for the snail there.

As the area of *V. angustior* habitat is very fixed at both sites relative to other sites for this species, it is important to regularly monitor the habitat areas, particularly those that are not grazed. Any succession to scrub would be detrimental to *V. angustior* which requires open, unshaded habitat, but this does not appear to be an immediate threat.

Monitoring recommendations:

Given the site is in excellent Condition, both in terms of habitat and *Vertigo angustior* distribution and abundance, it is recommended that monitoring is carried out at 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat Cill Mhuirbhigh transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Repeat Cill Mhuirbhigh transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in at least 5 locations at the airport site and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The Cill Mhuirbhigh Area A consists of a strip of land between the road and the seawall, east of the toilet block. This is lightly grazed by cattle. Area B consists of a block of fields rising from the road up to a rocky crest. The ground is always sloping and a dense, springy thatch of *Festuca rubra* dominates the vegetation. This area is lightly grazed by cattle. Area C is a patch of fixed dune between the north road and the sea. It may be occasionally grazed, but very lightly, it is maintained by exposure. Area D consists of highly damaged dunes, parts of which were being excavated by JCB, as they were on a previous visit in 2003.

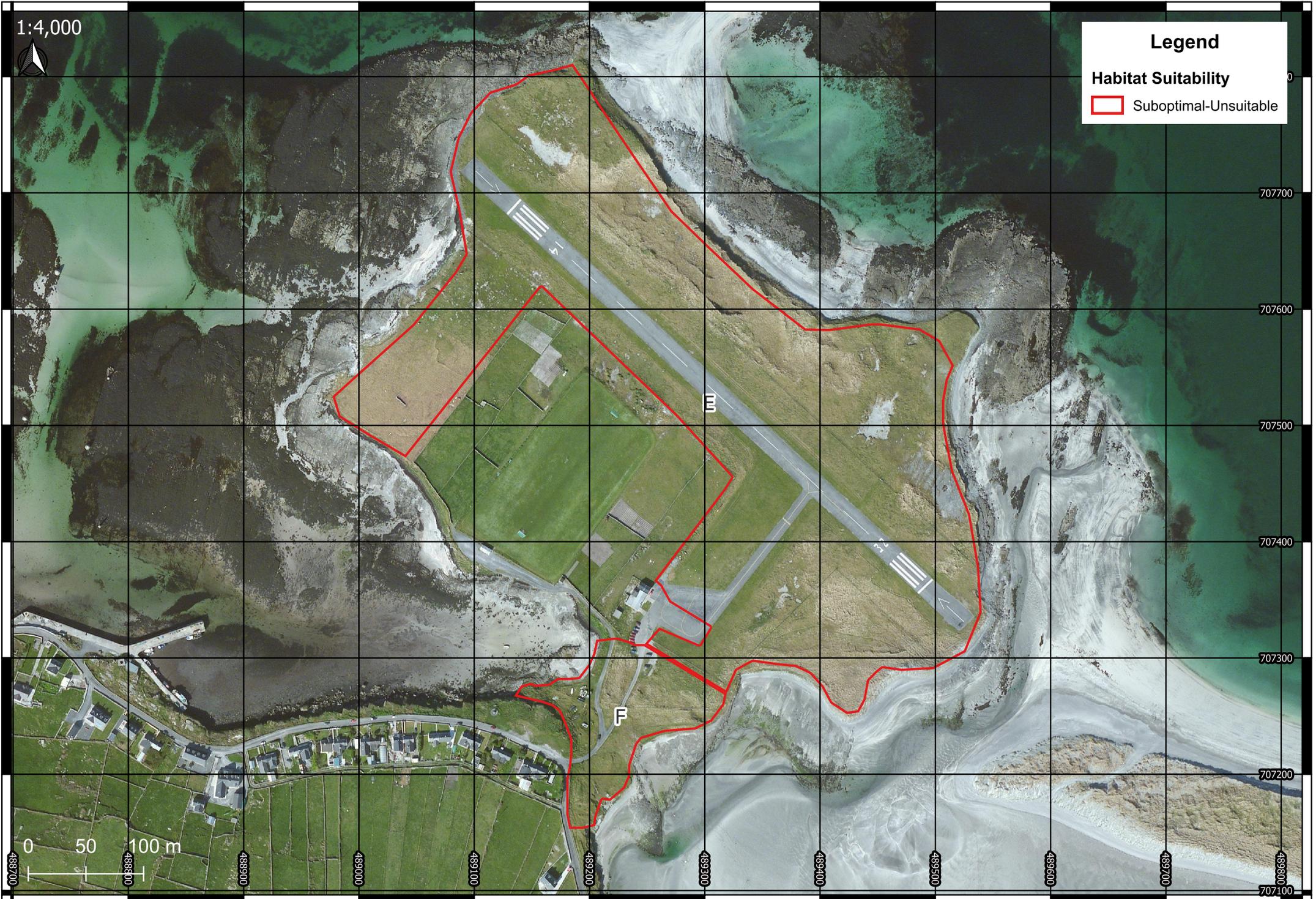
At the Airport site, two management units can be distinguished. Area E is within the runway zone and is lightly mown on a very infrequent basis. However, the sward is tight and cropped and has developed a very compacted mossy habitat over the years. Area F is unmanaged except for light trampling and occasional parking of cars, and storage of equipment. It retains a fixed dune habitat with a springy, thatched litter layer in areas outside those that are regularly subjected to damage.

Proposed management prescription for site

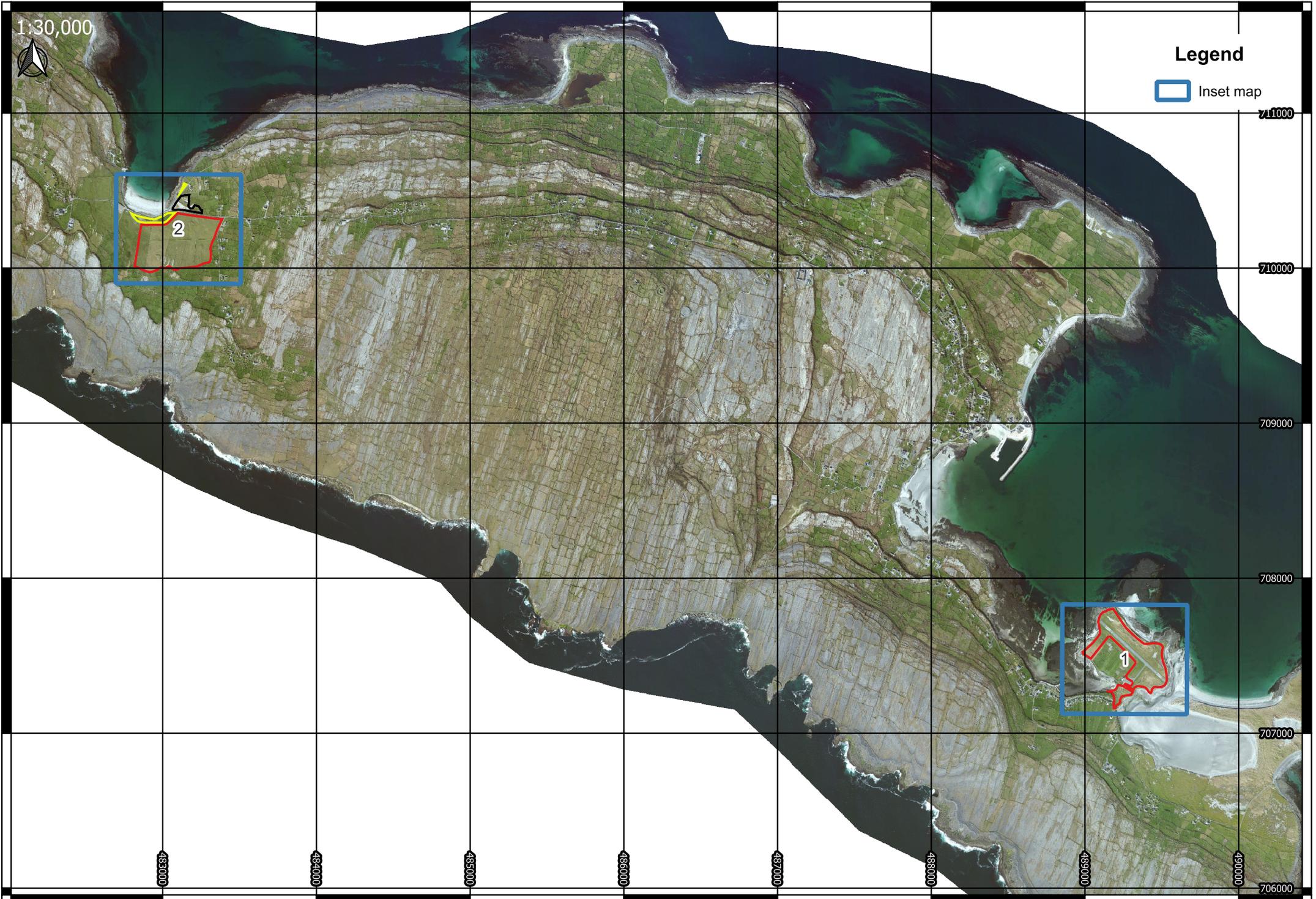
The management at Cill Mhuirbhigh should remain the same as the present regimes within each management unit for the 2011 - 2014 period. The machair areas (polygon B) should remain grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the *Vertigo angustior* habitat, with animals removed at the first signs of hunger. There should be no improvement with fertiliser or drainage of any of the habitat area. There should be no change to sheep grazing at any time of the year.

The management at the airport site is not required to be changed specifically – there are patches of suitable habitat within the runway area (at the edges which are not mowed or trampled as much as the main pathways), but care should be taken not to put any herbicides or paths at the edges where the habitat is best. The same precautions also need to be taken where parking and storage or placing of portacabins and other structures need to be reviewed in the light of the presence of this important habitat. No formal grazing or mowing management is recommended, this area is suitable for continued maintenance by exposure and light trampling, but must be kept clear of cars.

Vertigo angustior monitoring at Inishmore Island







Site report - Vertigo Monitoring

Vertigo angustior monitoring at Curragh Chase

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM17 **County:** Limerick

SAC Site Code: 000174 Curraghchase Woods **QI:** No

Location description (from baseline survey):

Vertigo angustior occurs in a marsh to the north-east of Curragh Chase Forest Park. Access is from a minor road across privately owned land at R409483.

Monitoring period	Date surveyed	Recorders
2019-2024	26 September 2023	John Brophy & Orla Daly
2013-2018	3-4 October 2016	John Brophy & Maria Long
2007-2012	5 May 2010	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The site supports different areas with grassland marsh transition, or grassland marsh fen transition, but in each case permanently waterlogged but not inundated ground on mineral soil, mostly the ecotone between *Potentilla anserina* dominated wet grassland and the Iris marsh lying upslope from the Schoenus fen. The general habitat in which *Vertigo angustior* is present here is marsh, i.e. permanently waterlogged ground on mineral soil, and the ecotone between *Festuca rubra* and *Potentilla anserina* wet grassland and the waterlogged marsh. These are not Annex I nor CORINE listed habitats, but they are important in that they support the so called "marsh phase" or inland habitat of *Vertigo angustior*. The locations of suitable ecotone include *Festuca rubra*, *Potentilla anserina*, *Iris pseudacorus*, *Juncus acutiflorus*, *Carex disticha*, *Eleocharis palustris*, *Holcus lanatus*, and *Lathyrus pratensis* communities. This includes ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Saturated transition marsh with <i>Juncus</i> , <i>Mentha aquatica</i> , occasional <i>Schoenus</i> tussock (height 25-40cm) with an understorey of moss and litter, going into grassland with <i>Festuca rubra</i> , <i>Potentilla anserina</i> , <i>Ranunculus repens</i> with a good thatch and/or moss layer.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between or > 50cm, or the ground has pools of standing water, or the thatch is wetter with a denser structure or has little moss.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The *Vertigo angustior* site at Curragh Chase continues to deteriorate, with the snail not being recorded during the current survey. The areas that are defined as *Vertigo moulinsiana* habitat (southwest corner and a band running north across the middle of the site) are too wet for *V. angustior*. Other areas have become quite rank, usually with a dense grassy sward, and thick, wet *Juncus* spp. and grass litter in places. Vegetation that matches the description of optimal or suboptimal habitat for the species is limited or possibly absent. The site is subject to some low-level grazing by cattle and is also likely to be affected by nutrient inputs. The management required for *V. angustior* (some level of grazing to maintain a lighter thatch and for the development of a bryophyte layer) is at odds with that required for *V. moulinsiana* (virtually no grazing, in order to allow suitable tall vegetation to develop). Temporary electric fences seem to be partially in place to prevent cattle from entering the wetter fen areas, which may be for reasons of cattle husbandry or to reduce impacts on *V. moulinsiana* habitat. As *V. moulinsiana* is a Qualifying Interest for the Curraghchase Woods SAC, it is likely that this is the species that should be favoured by any management intervention. However, the *V. moulinsiana* population around the lakes of Curragh Chase Forest Park suggests that its continued presence within the SAC is not at risk.

2013-2018:

The previous monitoring survey, in 2010, found that the site had deteriorated since the species was discovered there in 2005. This decline in quality was attributed to trampling and grazing by cattle. The current survey has shown that the site continues to decline in terms of habitat quality, and particularly in terms of population, with no *Vertigo angustior* found in the course of sampling in 2016. The failure to find the species does not mean that the population is extinct, but it does raise serious concerns, and repeat surveying is needed immediately.

A slightly higher-than-desirable level of grazing and trampling by cattle continues to have a negative effect on the site, and scrub clearance and dumping has also occurred (within the SAC boundary). The effects of the grazing is particularly notable along the transect, as a shift from fen to grassland can clearly be seen to have occurred since the last monitoring period. While grazing pressure, dunging, and associated agricultural effects are undoubtedly important in driving this change, it may be facilitated and/or accelerated by changes in hydrological regime (however studies are needed to confirm this).

As noted by Moorkens & Killeen (2011), the site is important as it is the only known *Vertigo angustior* site in County Limerick, and is one of only a handful of inland sites in Ireland. Furthermore, there are no known sites at all in the neighbouring counties of Cork, Tipperary, Waterford, nor further towards the south-east of Ireland. It is also vulnerable as it is partly outside the boundary of the Curraghchase Woods SAC (the western portion of the polygon, including the transect, is outside the SAC). Immediate contact needs to be made between local NPWS staff and the

Vertigo angustior monitoring at Curragh Chase

landowner/land manager about stock management and scrub removal and dumping, as small changes would be very beneficial. Extending the SAC boundary slightly should also be considered to afford this important site some added protection.

2007-2012:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Inadequate due to the condition of the habitat on the transect.

Based upon changes observed since the corrected discovery in 2003 and since the last survey in 2003, and the pilot survey in 2008, it appears that there is a decline in habitat quality, along with a contraction in the distribution and abundance of *Vertigo angustior*. It is likely that the decline results to some extent from trampling and poaching by cattle in the best area of marsh and transition grassland.

This is the only site in County Limerick known to support *Vertigo angustior*, and thus it is of high importance although it is just outside the boundary of the cSAC and it is not listed as a qualifying interest for the cSAC. Given the importance of the site, particularly in terms of range, it is worthy of inclusion as a cSAC.

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 541030 648514	Second fence post in from end. ITM from 2023.	
End point:	ITM 540983 648518	ITM from 2023.	
Transect length:	50	Direction:	E-W
Description:	The transect starts at a ditch and runs upslope through wet grassland into cattle pasture.		
Sampling frequency:	3 samples were taken from zones with the most suitable habitat		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	R 41066 48469	Second fence post in from end.	
End point:	R 41010 48474		
Transect length:	55	Direction:	As for 2010
Description:	As for 2010		
Sampling frequency:	As for 2010		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	R 41069 48479	Second fence post in by ditch	
End point:	R 41012 48474	Grassland under electric fenceline	
Transect length:	50	Direction:	E-W
Description:	The transect starts at a ditch and runs upslope through flushes with <i>Schoenus</i> and mosses, into wet fen and then into <i>Festuca</i> grassland		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Five samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	3.1883	Polygon A has dropped from Suboptimal to Suboptimal-Unsuitable. Most of the fen area of the site is too wet for <i>Vertigo angustior</i> , with pools of water present. <i>Juncus</i> spp. and grasses are rank, causing the loss of most of the bryophyte layer and also creating heavy, wet litter.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	3.1883	Polygon A status was dropped from Optimal and Suboptimal to Suboptimal due to ecological change - localised effects of grazing by cattle has led to the loss of fen habitat. No boundary change.
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment

Vertigo angustior monitoring at Curragh Chase

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with optimal areas	3.19	All of the potential <i>V. angustior</i> habitat lies within a single polygon, a field unit which comprises a mosaic of marsh, fen and grassland, and is classed overall as Optimal and sub-optimal.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	0m	0m	29m	0m	21m	29m	0m	21m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1			13m	18m	24m	18m	13m	24m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		NA	50m	NA		35m	15m	

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (3 samples)								
2019-2024	1	1	9m	0	0	0	Count	Suboptimal
2019-2024	1	2	20m	0	0	0	Count	Suboptimal
2019-2024	1	3	27m	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 Transect 1 (3 samples)								
2013-2018	1	1	6m	0	0	0		Suboptimal
2013-2018	1	2	16m	0	0	0		Suboptimal
2013-2018	1	3	25m	0	0	0		Suboptimal-Unsuitable
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	7m	0	0	2		
2007-2012	1	2	12m	0	0	5		
2007-2012	1	3	21m	0	0	2		
2007-2012	1	4	29.5m	0	0	0		
2007-2012	1	5	40.5m	0	0	0		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (3 samples)							
2019-2024	01	ITM 541042 648517	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	02	ITM 541046 648543	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	03	ITM 541099 648558	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (4 samples)							
2013-2018	01	R 41029 48544	0	0	0		Suboptimal
2013-2018	02	R 41088 48517	0	0	0		Suboptimal-Unsuitable
2013-2018	03	R 41155 48548	0	0	0		Suboptimal
2013-2018	04	R 41173 48519	0	0	0		Suboptimal
Monitoring period 2007-2012 (11 samples)							
2007-2012	01	R 41191 48556	0	0	0		
2007-2012	02	R 41171 48551	0	0	0		
2007-2012	03	R 41175 48521	0	0	1		

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2007-2012	04	R 41151 48544	0	0	1
2007-2012	05	R 41093 48499	0	0	0
2007-2012	06	R 41063 48490	0	0	0
2007-2012	07	R 41052 48529	0	0	6
2007-2012	08	R 41048 48467	0	0	12
2007-2012	09	R 41043 48451	0	0	7
2007-2012	10	R 41041 48546	0	0	1
2007-2012	11	R 41073 48558	0	0	0

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 2 zones with optimal or sub-optimal habitat on the transect (minimum 3 samples)	Adult or sub-adult snails absent from Transect 1 (3 samples)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 2 zones with optimal or sub-optimal habitat on the transect (minimum 3 samples)	Adult or sub-adult snails absent from Transect 1 (3 samples)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 2 zones with optimal or sub-optimal habitat on the transect (minimum 3 samples)	present in 2 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in one location with Iris habitat in the lower (eastern) part of the site (minimum 4 samples)	Absent from site	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in one location with Iris habitat in the lower (eastern) part of the site (minimum 4 samples)	Absent from site	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in one location with Iris habitat in the lower (eastern) part of the site (minimum 4 samples)	Present at 2 other locations	Pass

Mon. period	Population Notes
2019-2024	Despite being widespread at the site during the 2007-2012 monitoring period, <i>Vertigo angustior</i> was not recorded in the 2013-2018 monitoring period or during the current survey. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, <i>Vertigo angustior</i> was recorded at three out of five locations on Transect 1 and six out of eleven spot samples at other locations within the polygon. In the current monitoring period, all three samples on the transect and four spot samples from other locations were found to be negative for the species. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Curragh Chase is Unfavourable Bad (red).
2007-2012	The snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	At least one zone of the habitat along the Transect is classed as Optimal, and 40m of habitat along the Transect is classed as Sub-Optimal or Optimal	No zones are Optimal and 29m is Suboptimal	Fail

Vertigo angustior monitoring at Curragh Chase

2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch/moss for 40m of the Transect	29m is Optimal wetness	Fail
2013-2018	1	Habitat extent	At least one zone of the habitat along the Transect is classed as Optimal , and 40m of habitat along the Transect is classed as Sub-Optimal or Optimal	No zones are Optimal AND 13m is Suboptimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch/moss for 40m of the Transect	18m is Optimal wetness	Fail
2007-2012	1	Habitat extent	At least one zone of the habitat along the Transect is classed as Optimal and 40m of habitat along the Transect is classed as Sub-Optimal or Optimal	No zones are Optimal AND 55.5m is Sub-Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch/moss for 40m of the Transect	40.5m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 3ha of the site sub-optimal with optimal areas	0ha Suboptimal or better	Fail
2013-2018	Habitat extent	At least 3ha of the site sub-optimal with optimal areas	3.19ha Suboptimal	Fail
2007-2012	Habitat extent	At least 3ha of the site sub-optimal with optimal areas	3.19 ha	Pass

Mon. period	Habitat Notes
2019-2024	The habitat suitability for <i>Vertigo angustior</i> at Curragh Chase continues to decline. The habitat along the transect has dropped further, with limited bryophyte or litter layer. Most of the rest of the polygon is unsuitable, comprising <i>Dactylis glomerata</i> -dominated wet grassland and developing <i>Salix</i> spp. scrub, with some wet areas of fen. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	In the monitoring period 2007-2012, the habitat polygon (3.19ha) was classed as Optimal and Suboptimal, with the transect consisting entirely of Suboptimal habitat. In the current survey, the polygon was dropped to Suboptimal, and most of the habitat along the transect had also dropped in suitability. It is particularly clearly evident along the transect that parts of the site are transitioning from fen to grassland – this may be due to water regime changes in part, but grazing pressure is also playing a significant role. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Curragh Chase is Unfavourable Bad (red).
2007-2012	Much of the habitat at the site is not in optimal condition for <i>V. angustior</i> ,

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Low	Positive	100%	The <i>Vertigo angustior</i> habitat polygon appears to be subject to some low-intensity cattle grazing. Obtaining a balance that allows the development of a sward with open structured thatch and bryophyte layer, but prevents the build-up of denser, wet thatch i

Vertigo angustior monitoring at Curragh Chase

2019-2024	PA13	Application of natural or synthetic fertilisers on agricultural land	Inside	High	Negative	100%	Nutrients are likely to be affecting the Vertigo angustior habitat via run-off from the adjacent fertilised field and cattle dung deposited within the polygon. This increase in nutrients is promoting the strong growth of grasses less suited to the species
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	5%	Salix cinerea and Betula pubescens saplings developing within Polygon A
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	15%	Herd of 18 cattle with access to fen, but predominately graze grassland above. 15% relates to Transect area (Cattle grazing considered positive by preventing scrubbing over)
2013-2018	A10.01	removal of hedges and copses or scrub	Inside	Low	Negative	15%	Scrub removal, with associated dumping in fen
2013-2018	H05.01	garbage and solid waste	Inside	High	Negative	5%	Dumping of spoil and cleared scrub. Habitat lost.
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	3.19ha	Although the grazing is non-intensive, the numbers of cattle are too high for such a small site, and therefore the influence is negative and the intensity moderate.

Mon. period	Future Prospects Notes
2019-2024	Following the current survey, the Population Assessment for Curragh Chase has been Unfavourable-Bad (red) for two consecutive monitoring periods, with no Vertigo angustior recorded. This decline has reflected the decline in the habitat quality noted along the transect and the site in general. Pressures acting on the site include nutrient input from adjacent improved grassland for cattle pasture and succession in the form of Salix spp. saplings spreading. Given the decline in the population and habitat assessments, and the lack of any evidence of actions to reverse this decline, the Future Prospects for Curragh Chase are assessed as Unfavourable-Bad (red).
2013-2018	The Future Prospects for Vertigo angustior at Curragh Chase were classed as Unfavourable Inadequate (amber) in the monitoring period 2007-2012, with non-intensive cattle grazing the only activity recorded. In the current monitoring period, non-intensive cattle grazing continues to be a negative impact, but scrub removal and dumping of brush is also impacting the site. Based on this, along with the decline in the population and habitat assessments, the Future Prospects for Curragh Chase are considered to be Unfavourable Bad (red).
2007-2012	As the impact is moderate rather than severe, Future prospects have been assessed as Unfavourable inadequate

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Red	Red	Red	Red
2007-2012	Green	Amber	Amber	Amber

Mon. period	Overall Notes
2019-2024	The Population Assessment returned a result of Unfavourable-Bad (red) due to the fact that the snail was not recorded during the current survey, while a reduction in the habitat suitability along the transect and across the site in general also resulted in a Habitat Assessment of Unfavourable-Bad (red). With no indication of any action to improve these assessments, the Future Prospects were assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Curragh Chase is Unfavourable-Bad (red).

Vertigo angustior monitoring at Curragh Chase

2013-2018 As the Population Assessment, Habitat Assessment and Future Prospects all returned Unfavourable Bad (red) results, the Overall Assessment for Curragh Chase is Unfavourable Bad (red).

2007-2012

6. DISCUSSION

Monitoring period

2019-2024

Discussion:

The *Vertigo angustior* site at Curragh Chase continues to deteriorate, with the snail not being recorded during the current survey. The areas that are defined as *Vertigo moulinsiana* habitat (southwest corner and a band running north across the middle of the site) are too wet for *V. angustior*. Other areas have become quite rank, usually with a dense grassy sward, and thick, wet *Juncus* spp. and grass litter in places. Vegetation that matches the description of optimal or suboptimal habitat for the species is limited or possibly absent. The site is subject to some low-level grazing by cattle and is also likely to be affected by nutrient inputs. The management required for *V. angustior* (some level of grazing to maintain a lighter thatch and for the development of a bryophyte layer) is at odds with that required for *V. moulinsiana* (virtually no grazing, in order to allow suitable tall vegetation to develop). Temporary electric fences seem to be partially in place to prevent cattle from entering the wetter fen areas, which may be for reasons of cattle husbandry or to reduce impacts on *V. moulinsiana* habitat. As *V. moulinsiana* is a Qualifying Interest for the Curraghchase Woods SAC, it is likely that this is the species that should be favoured by any management intervention. However, the *V. moulinsiana* population around the lakes of Curragh Chase Forest Park suggests that its continued presence within the SAC is not at risk.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

The implementation of an appropriate grazing regime for the site at Curragh Chase is critical to return it to a condition capable of supporting *Vertigo angustior*. This need had been expressed after the previous two monitoring periods, but there is no evidence that it is being enacted. Moorkens & Killeen (2011) suggested that the ideal grazing regime would be suckler or mixed-age cattle with a stocking level of 10 livestock units across the period spring to summer, with the animals being removed during the winter. It is also recommended that there be no supplementary feeding and that the cattle be removed if this was deemed necessary. The application of fertiliser to the adjacent, upslope field should also be ceased. This would all need to be done in agreement with the landowner, who should be engaged with as soon as possible.

Vertigo angustior monitoring at Curragh Chase

2013-2018

Discussion:

The previous monitoring survey, in 2010, found that the site had deteriorated since the species was discovered there in 2005. This decline in quality was attributed to trampling and grazing by cattle. The current survey has shown that the site continues to decline in terms of habitat quality, and particularly in terms of population, with no *Vertigo angustior* found in the course of sampling in 2016. The failure to find the species does not mean that the population is extinct, but it does raise serious concerns, and repeat surveying is needed immediately.

A slightly higher-than-desirable level of grazing and trampling by cattle continues to have a negative effect on the site, and scrub clearance and dumping has also occurred (within the SAC boundary). The effects of the grazing is particularly notable along the transect, as a shift from fen to grassland can clearly be seen to have occurred since the last monitoring period. While grazing pressure, dunging, and associated agricultural effects are undoubtedly important in driving this change, it may be facilitated and/or accelerated by changes in hydrological regime (however studies are needed to confirm this).

As noted by Moorkens & Killeen (2011), the site is important as it is the only known *Vertigo angustior* site in County Limerick, and is one of only a handful of inland sites in Ireland. Furthermore, there are no known sites at all in the neighbouring counties of Cork, Tipperary, Waterford, nor further towards the south-east of Ireland. It is also vulnerable as it is partly outside the boundary of the Curraghchase Woods SAC (the western portion of the polygon, including the transect, is outside the SAC). Immediate contact needs to be made between local NPWS staff and the landowner/land manager about stock management and scrub removal and dumping, as small changes would be very beneficial. Extending the SAC boundary slightly should also be considered to afford this important site some added protection.

Monitoring recommendations:

Given that the site appears to be continuing to deteriorate, both in terms of habitat suitability and *Vertigo angustior* distribution and abundance, it is recommended that a repeat survey is carried out immediately (i.e. 2017 or 2018) and based on the findings, that monitoring needs are reviewed. It is likely that monitoring carried out at a minimum of three-yearly intervals will be needed. Monitoring should follow that proposed by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too dry, respectively
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 4 other locations and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

While cattle grazing is required at this site to prevent scrubbing over, it is clear from the transect results that the western edge of the fen is being lost to grassland due to grazing, trampling and nutrient level changes due to dunging. Cattle also have access to the wetter areas of marsh to the southeast of the habitat polygon. The level of grazing should be reduced in terms of duration and/or number of cattle, in order to allow the habitat to recover. Grazing in spring and autumn may be most suitable, thus avoiding both the wettest and the driest times of year. Temporarily fencing off of the most vulnerable parts of the fen may be a workable solution if cattle need to be grazed on other adjacent parts for longer periods. Careful monitoring will be required to assess the appropriateness of any changes to the management regime in this small and vulnerable site.

Vertigo angustior monitoring at Curragh Chase

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Inadequate due to the condition of the habitat on the transect.

Based upon changes observed since the corrected discovery in 2003 and since the last survey in 2003, and the pilot survey in 2008, it appears that there is a decline in habitat quality, along with a contraction in the distribution and abundance of *Vertigo angustior*. It is likely that the decline results to some extent from trampling and poaching by cattle in the best area of marsh and transition grassland.

This is the only site in County Limerick known to support *Vertigo angustior*, and thus it is of high importance although it is just outside the boundary of the cSAC and it is not listed as a qualifying interest for the cSAC. Given the importance of the site, particularly in terms

Monitoring recommendations:

Given the evidence for a possible deterioration in the Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013

Methods (see Section 3 of main report for full details) Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 4 other locations and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

Over 20 head of cattle had access to the *V. angustior* habitat at the time of the survey (early May 2010). It is not known whether cattle are excluded from the fen at certain times of the year, or if this number of cattle varies on a seasonal basis.

Proposed management prescription for site

A management programme needs to be introduced if the snail is to thrive at this site. The number of cattle or the length of grazing period needs to be reduced to a level that is not damaging to the habitat. The ideal grazing regime would be suckler or mixed age cattle, approximately 10 livestock units, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. There should be no introduction of supplementary feeding of animals within the *Vertigo angustior* habitat, with animals removed at the first signs of hunger. If it is not possible to exclude animals in winter and spring, in order to protect the habitat, the *V. angustior* habitat should be fenced off using temporary electric fencing to allow the habitat to recover.



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Louisa Bridge

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM19 **County:** Kildare
SAC Site Code: 001398 Rye Water Valley/Cartron **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this cSAC is the fixed dune habitat along the length of the peninsula. Access is from the beach at Strandhill, or through the golf club with permission.

Monitoring period	Date surveyed	Recorders
2019-2024	28 June 2023	John Brophy & Orla Daly
2013-2018	24-Jun-16	John Brophy & Maria Long
2007-2012	16 April 2010	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is the rich forb flood plain transition zone habitat on the banks of the river, with active springs on well drained mineral soil above. This is an ecotone between marsh and humid meadow, flushing with saturated water rather than inundated by flooding. There are no EU habitats that correspond to this habitat, the closest CORINE category would be Atlantic and sub-Atlantic humid meadows (37.21) (Devillers et al., 1991). *Iris pseudacorus*, *Glyceria maxima* and *Petasites fragrans* form the dominant vegetation with sub storey mosses in places. The habitat falls within the more general classification of freshwater marsh (GM1) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Wet grassland dominated by <i>Iris pseudacorus</i> , low herbs and mosses up to 0.9m high. Habitat growing on damp, friable soil covered with a layer of humid, open structured moss and litter.
Sub-optimal	The <i>Iris</i> grassland is >0.9m high, or the water table is below 5cm or ground is flooded at the time of sampling.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior was not recorded from Louisa Bridge during the current survey and has now not been recorded in 27 years (last recorded in 1997). The habitat has shown some decline in suitability, with the general loss of the *Iris pseudacorus* marsh with a bryophyte understorey and the spread of denser vegetation and litter, unsuitable for the snail. With succession in the form of encroaching *Salix* spp. the only pressure noted at the site, the sensitive manual removal of scrub is the only feasible management action that can be undertaken that may improve the site for the snail. Given the delicate nature of the tufa springs on the site, any such work would need to be approached in a manner that would prevent trampling or damage to the tufa slopes.

2013-2018:

The area which supported *Vertigo angustior* at this site in the past was always relatively small and marginal (i.e. at the interface between the swamp vegetation of the river floodplain and the tufaceous slopes above). Here the snail would have been found in unshaded vegetation consisting mostly of *Iris pseudacorus*, with a mossy understorey. This vegetation type is now largely lost, being limited to a shaded strip adjacent to willow trees. This may be due mostly to natural changes taking place in the absence of management - i.e. a build-up of tall dense vegetation, and a development of a line of willows leading to shading, but alterations along the Rye River catchment may also have had an influence on the hydrological regime at the site. Even with management, it would likely have been difficult to have retained suitable habitat at this site for *Vertigo angustior*. Experimental cutting of vegetation at the site was carried out by Kildare County Council in the past, but does not appear to have had long-term benefits (Moorkens & Killeen, 2011).

Given that the species has not been found here since the late 1990s, in spite of repeated surveys, the continued occurrence of *Vertigo angustior* at this site is far from certain. Given the importance of this site (the most eastern site in Ireland, also one of only a handful of inland sites, and the fact that *Vertigo moulinsiana* is also found here), and the fact that the species is difficult to detect, particularly in small populations, short surveys should be continued for at least another two rounds.

2007-2012:

The river margin flood plain and sloping flushing spring seepages above it are very rare habitats in Ireland and unusual also in lying so close to an intensively built up location within the greater Dublin area. Along with the *V. moulinsiana* habitat and the tufa spring and fen habitats above, this area requires strict protection from dumping, spraying, drainage of the complex hydrogeological area that drive the springs, and also from well meaning schemes that could inadvertently change the habitat such as tree planting or amenity pathways.

Due to the importance and location of this site for *Vertigo angustior* and *V. moulinsiana*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change and intensification of regional land use.

Vertigo angustior monitoring at Louisa Bridge

The most likely reasons for the decline of *V. angustior* at the flood plain habitat are changes that have taken place in the long term. It is likely that the snail was present at this site for hundreds and possibly thousands of years. Up to 100 years ago it was likely to have been part of a low intensity grazing regime. However, with the development of the spa and the transfer to public land, grazing at some stage was removed and natural succession has occurred in the upper part of the *V. angustior* habitat. In addition, there have been modifications in the more recent past to the Rye Water River, evident from spoil heaps close to the river bank. The changed profile of the river channel appears to have resulted in part of the habitat being drier than in previous times, and other parts becoming regularly flooded in high flow periods. This is evident by visiting the site in winter and seeing the line of vegetation that has been pushed over where the water overflows at the slight bend. All of these changes in management have resulted in a loss of quality to both the upper and lower parts of the habitat, which is unsustainable for a long term population of this sensitive snail.

3. TRANSECT DETAILS

TRANSECT:	0	MONITORING PERIOD:	2007-2012
Start point:	NO TRANSECT RECORDED		
End point:			
Transect length:		Direction:	
Description:			
Sampling frequency:			

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	0.5296	Polygon A remains Suboptimal-Unsuitable. The moss layer is very sparse and much of the litter is dense, including <i>Phalaris arundinacea</i> stalks. <i>Petasites hybridus</i> dominates the western half of the polygon and closer to the Rye Water.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	0.5296	Polygon A status remains Suboptimal-Unsuitable.
Monitoring Period: 2007-2012			
Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with unsuitable areas	0.61	All of the potentially suitable <i>V. angustior</i> habitat at Louisa Bridge lies within one polygon area of approximately 0.606 ha

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2007-2012 Transect 0 (1 sample)								
2007-2012	0	0	NO TRANSECT RECORDED					

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (3 samples)							
2019-2024	01	ITM 699365 736901	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	02	ITM 699393 736886	0	0	0	Count	Suboptimal
2019-2024	03	ITM 699444 736873	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (3 samples)							
2013-2018	01	N 99435 36872	0	0	0		Suboptimal-Unsuitable
2013-2018	02	N 99465 36855	0	0	0		Suboptimal

Vertigo angustior monitoring at Louisa Bridge

2013-2018	03	N 99515 36846	0	0	0	Suboptimal-Unsuitable
Monitoring period 2007-2012 (5 samples)						
2007-2012	01	N 99431 36876	0	0	0	
2007-2012	02	N 99448 36860	0	0	0	
2007-2012	03	N 99463 36849	0	0	0	
2007-2012	04	N 99511 36827	0	0	0	
2007-2012	05	N 99544 36838	0	0	0	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 1 pass Favourable (green); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2007-2012	0	N/A	NO TRANSECT RECORDED		

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Vertigo angustior is present at the site	Vertigo angustior not found	Fail
2013-2018	Presence/Absence	Vertigo angustior is present at the site	Not found	Fail
2007-2012	Presence/Absence	Vertigo angustior is present at the site	Not found	Fail

Mon. period	Population Notes
2019-2024	As was the case for the previous two rounds of monitoring, Vertigo angustior was not recorded from Louisa Bridge during the current survey. It has now not been recorded at the site for 27 years (last recorded in 1997). Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	Vertigo angustior was last recorded at Louisa Bridge in 1997, despite several surveys in the intervening period. In the monitoring period 2007-2012, all five locations sampled returned negative results. In the current monitoring period, the species was again not found at the site, with four locations sampled. While not impossible that the species survives at the site, it becomes increasingly unlikely given multiple negative surveys over a 20 year period. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Louisa Bridge is Unfavourable Bad (red).
2007-2012	Snail could not be found

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2007-2012	0	N/A	NO TRANSECT RECORDED		

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 0.2ha of the site should support habitat which is classed as optimal and sub-optimal	0.53ha Suboptimal-Unsuitable	Fail
2013-2018	Habitat extent	At least 0.2ha of the site should support habitat which is classed as optimal and sub-optimal	0.53ha Suboptimal-Unsuitable	Fail
2007-2012	Habitat extent	At least 0.2ha of the site should support habitat which is classed as optimal and sub-optimal	0.61 ha classed as sub-optimal and unsuitable	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	The habitat at all sample sites is classed as Optimal or Suboptimal (minimum 3 samples)	Habitat at 2 sample sites classed as Suboptimal	Fail
2019-2024	Habitat quality	Soils, at time of sampling, at all sample sites are damp (optimal wetness)	Soils of Optimal wetness at 3 sample sites	Pass

Vertigo angustior monitoring at Louisa Bridge

2013-2018	Habitat extent	The habitat at all sample sites is classed as Optimal or Suboptimal (minimum 3 samples)	Habitat at 1 sample site Suboptimal	Fail
2013-2018	Habitat quality	Soils, at time of sampling, at all sample sites are damp (optimal wetness)	Soils of Optimal wetness at 3 sample sites	Pass
2007-2012	Habitat extent	The habitat at all 5 sample sites is classed as Optimal or sub-optimal	All 5 sites are sub-optimal	Pass
2007-2012	Habitat quality	Soils, at time of sampling, at all 5 sample sites are damp (optimal wetness)	All 5 sites are optimal wetness	Pass

Mon. period	Habitat Notes
2019-2024	As was the case in the previous round of monitoring, the only habitat parameter that passed was the ground moisture, while the habitat suitability at the spot sample level and the polygon level were below target. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	The habitat polygon was classed as Suboptimal and Unsuitable in the previous monitoring period and remains Suboptimal-Unsuitable in the current monitoring. Overall, only a small area running roughly parallel to the river, near the line of willow trees, has potential to support <i>Vertigo angustior</i> , and even here the vegetation is mostly too tall and dense. The litter is also too dense in places, and there is too much shade. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Louisa Bridge is Unfavourable Bad (red).
2007-2012	Very little of the habitat at the site is in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	Medium	Negative	50%	Encroachment by <i>Salix</i> spp. is causing shading within the site
2013-2018	K02.01	species composition change (succession)	Inside	Medium	Negative	100%	Spread of willow and other tree species
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	0.6ha	The impacts are likely to have been long term and although minor in the short term, they have been in a negative direction for a long time.
2007-2012	J02.04.01	flooding	Inside	Medium	Negative	0.6ha	
2007-2012	J02.05.02	modifying structures of inland water courses	Outside	Medium	Negative	0.6ha	

Mon. period	Future Prospects Notes
2019-2024	Following the current survey, the Population Assessment for Louisa Bridge has been Unfavourable-Bad (red) for three consecutive monitoring periods, with no <i>Vertigo angustior</i> recorded. The habitat has also declined in suitability, with a Habitat Assessment of Unfavourable-Bad (red). Succession appears to be the only pressure acting on the site that may be having a negative effect on the snail and its habitat. As there are no measures being enacted to improve the suitability of the site for <i>Vertigo angustior</i> , this negative trend is likely to continue. For this reason, the Future Prospects are assessed as being Unfavourable-Bad (red).
2013-2018	There is currently no active management within the <i>Vertigo angustior</i> polygon at this site. As the vegetation continues to develop via succession, shading and dense litter will continue to become more of a problem, and the suitability of the site for supporting <i>Vertigo angustior</i> is likely to continue to decrease. There are few obvious other discernible impacts on the site (e.g. unclear whether the hydrological regime has changed). Thus the Future Prospects for the site are considered to be Unfavourable Bad (red).
2007-2012	As the impacts are likely to have been long term and although minor in the short term, they have been in a negative direction for a long time and thus, Future prospects have been assessed as Unfavourable bad

Vertigo angustior monitoring at Louisa Bridge

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Red	Red	Red	Red
2007-2012	Red	Amber	Red	Red

Mon. period	Overall Notes
2019-2024	The Population Assessment returned a result of Unfavourable-Bad (red) due to the fact that the snail was not recorded during the current survey, while a reduction in the habitat suitability across the site in general also resulted in a Habitat Assessment of Unfavourable-Bad (red). With no indication of any action to improve these assessments, the Future Prospects were assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Louisa Bridge is Unfavourable-Bad (red).
2013-2018	The Habitat Assessment, Population Assessment and Future Prospects were all Unfavourable Bad (red), resulting in an Overall Assessment for Louisa Bridge of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period
<p>2019-2024</p> <p>Discussion:</p> <p>Vertigo angustior was not recorded from Louisa Bridge during the current survey and has now not been recorded in 27 years (last recorded in 1997). The habitat has shown some decline in suitability, with the general loss of the Iris pseudacorus marsh with a bryophyte understorey and the spread of denser vegetation and litter, unsuitable for the snail. With succession in the form of encroaching Salix spp. the only pressure noted at the site, the sensitive manual removal of scrub is the only feasible management action that can be undertaken that may improve the site for the snail. Given the delicate nature of the tufa springs on the site, any such work would need to be approached in a manner that would prevent trampling or damage to the tufa slopes.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>As there has been no material change to the site since the 2013-2018 monitoring period, the management recommendations made by Brophy & Long (2019) remain valid.</p>

2013-2018

Discussion:

The area which supported *Vertigo angustior* at this site in the past was always relatively small and marginal (i.e. at the interface between the swamp vegetation of the river floodplain and the tufaceous slopes above). Here the snail would have been found in unshaded vegetation consisting mostly of *Iris pseudacorus*, with a mossy understorey. This vegetation type is now largely lost, being limited to a shaded strip adjacent to willow trees. This may be due mostly to natural changes taking place in the absence of management - i.e. a build-up of tall dense vegetation, and a development of a line of willows leading to shading, but alterations along the Rye River catchment may also have had an influence on the hydrological regime at the site. Even with management, it would likely have been difficult to have retained suitable habitat at this site for *Vertigo angustior*. Experimental cutting of vegetation at the site was carried out by Kildare County Council in the past, but does not appear to have had long-term benefits (Moorkens & Killeen, 2011).

Given that the species has not been found here since the late 1990s, in spite of repeated surveys, the continued occurrence of *Vertigo angustior* at this site is far from certain. Given the importance of this site (the most eastern site in Ireland, also one of only a handful of inland sites, and the fact that *Vertigo moulinsiana* is also found here), and the fact that the species is difficult to detect, particularly in small populations, short surveys should be continued for at least another two rounds.

Monitoring recommendations:

In light of the apparent disappearance of *Vertigo angustior* from the site, Moorkens & Killeen (2011) recommend that a brief presence/absence survey should be carried out at 2-yearly intervals. If the species is re-found then this should be re-assessed and monitoring effort and detail increased. Thus, for now, the monitoring should consist of the following:

- Describe habitat and take at least 1 sample from the most suitable habitat in each of at least 3 locations and analyse for molluscan composition

Management recommendations:

Given that apart from succession there are few obvious discernible impacts on the site, it is difficult to propose management changes that might improve the situation. Manual cutting of vegetation to try to encourage a more open structure was carried out in the past, but vegetation had re-grown to its original extent within six months. This means that it may be considered too labour intensive to maintain. Also, the required frequency of works could lead to trampling and other damage. Overall, therefore, management intervention is currently not recommended. However, if the species is re-found, a regime of cutting (manually, not with machines) an approximate 5m strip along the edge of the willows (following the line where the samples are taken) twice per year should be instigated immediately and maintained. This would aim to reduce the overall height of vegetation, density of vegetation and density of litter. Cuttings should be removed from the site, and great care must be taken to avoid inadvertent damage by trampling.

The area upslope at Louisa Bridge should continue to be managed as it is - i.e. no increase in recreational use, no ornamental planting, no use of fertiliser/herbicide/etc. and no attempt to alter the hydrology of the springs.

Vertigo angustior monitoring at Louisa Bridge

2007-2012

Discussion:

The river margin flood plain and sloping flushing spring seepages above it are very rare habitats in Ireland and unusual also in lying so close to an intensively built up location within the greater Dublin area. Along with the *V. moulinsiana* habitat and the tufa spring and fen habitats above, this area requires strict protection from dumping, spraying, drainage of the complex hydrogeological area that drive the springs, and also from well meaning schemes that could inadvertently change the habitat such as tree planting or amenity pathways.

Due to the importance and location of this site for *Vertigo angustior* and *V. moulinsiana*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change and intensification of regional land use.

The most likely reasons for the decline of *V. angustior* at the flood plain habitat are changes that have taken place in the long term. It is likely that the snail was present at this site for hundreds and possibly thousands of years. Up to 100 years ago it was likely to have been part of a low intensity grazing regime. However, with the development of the spa and the transfer to public land, grazing at some stage was removed and natural succession has occurred in the upper part of the *V. angustior* habitat. In addition, there have been modifications in the more recent past to the Rye Water River, evident from spoil heaps close to the river bank. The changed profile of the river channel appears to have resulted in part of the habitat being drier than in previous times, and other parts becoming regularly flooded in high flow periods. This is evident by visiting the site in winter and seeing the line of vegetation that has been pushed over where the water overflows at the slight bend. All of these changes in management have resulted in a loss of quality to both the upper and lower parts of the habitat, which is unsustainable for a long term population of this sensitive snail.

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the habitat at the site, and the apparent disappearance of *Vertigo angustior*, it is recommended that a brief presence/absence survey is carried out at 2 yearly intervals. This should be re-assessed if the snail is refound:

Frequency: Next monitoring due 2012

Methods (see Section 3 of main report for full details). Prescription as follows:

- Describe habitat and take at least 1 sample from the most suitable habitat in each of at least 3 locations and analyse for molluscan composition

Management recommendations:

Existing Management

The potential *V. angustior* habitat at this site comprises a single management unit. There is currently no grazing or other active management within the area of the *V. angustior* habitat.

Proposed management prescription for site

An experimental cutting of the upper habitat vegetation was carried out by Kildare County Council as part of the attempt to understand the reason for the loss of the snail at this site. Within 6 months, the vegetation had grown to previous levels, and was not maintained for an extended period by wetness as would be expected in a functioning *V. angustior* habitat. A hydrogeological study at the site did not relate any changes in the wider catchment hydrogeology to changes in the flood plain, so there does not appear to be much that can be done to improve the habitat at this flood plain area. As a consequence, there is no recommendation for active management at the flood plain at present. As habitat changes in the upper terraces, potential *V. angustior* habitat may expand away from the flood plain and any small numbers of *V. angustior* remaining in refugia could spread, or be re-introduced. As the levels of calcium at the site are ideal for *V. angustior*, it would be unfortunate to lose it from this historical site.



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Ballysadare Bay

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM20 **County:** Sligo

SAC Site Code: 000622 Ballysadare Bay **QI:** Yes

Location description (from baseline survey):

The habitat that supports *Vertigo angustior* within this SAC is the fixed dune habitat in the area surrounding Sligo Airport. Access is from the pedestrian path to the south of the airport.

Monitoring period	Date surveyed	Recorders
2019-2024	22-23 May 2023	John Brophy & Orla Daly
2013-2018	27 June 2016	John Brophy & Maria Long
2007-2012	20 May 2010	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which *Vertigo angustior* is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and the dune slack (Annex I 2190, CORINE 16.3) to the south west of the large bare dune (Shelly Valley) valley. However, the main area of distribution of the snail is on the barely fixed dunes of the majority of the peninsula to the south west of this. The dominant vegetation is *Festuca rubra* with *Ammophila arenaria*, corresponding to SD7 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by <i>Festuca rubra</i> , and <i>Ammophila arenaria</i> , with sparse <i>Leucanthemum vulgare</i> , <i>Taraxacum</i> , <i>Plantago lanceolata</i> and other low growing herbs. Vegetation height 20-50cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or above 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Ballysadare Bay continues to support abundant habitat suitable for supporting *Vertigo angustior*, with the best of the habitat still in Polygon A. The number of positive samples has dropped compared to the previous two monitoring periods, and the habitat in Polygon A has shown some decline in suitability in terms of becoming more rank and drying out. This drying out is assumed to be the result of changes to precipitation and/or wind patterns as a result of climate change. Most of the other pressures acting on the site are minor and include erosion, camping, problematic native/invasive non-native species and dumping. The introduction of light grazing may be considered for Polygon A to open up the habitat slightly and prevent it becoming too rank; however, there should be no supplementary feeding. The chestnut fencing installed to attempt to restore the blowout in Polygon C does not appear to be having the desired effect, and additional measures may be required, such as planting *Ammophila arenaria*.

2013-2018:

The site at Ballysadare Bay supports extensive *Vertigo angustior* habitat and a good population of the snail, with adult snails found at all but one of the twelve sample locations (and a juvenile *Vertigo angustior* was found at this sample location within the golf course). The habitat comprises extensive fixed dune, with a good *Festuca rubra* thatch in places under *Ammophila arenaria*. While the habitat is good for the snail, there is some indication that it may be becoming rank, particularly in Polygon A. Some areas have been affected by trampling and blowouts (polygons B and C), while the maintenance of the golf course has limited suitable habitat to areas of rough within its footprint (Polygon E). Management actions are necessary to address some of the issues at the site including potentially introducing light cattle grazing to Polygon A, a more sensitive mowing regime for roughs on the golf course, and measures to address the negative effects of trampling and to allow the revegetation of blowout areas.

2007-2012:

The highly attractive site is one of the most undisturbed dune sites in the country. Although important more for its size and intact nature than for its botanical diversity, and as was stated after the 2006 survey (Moorkens 2007) the very large area of the habitat that is present makes it probably the largest single uninterrupted area of *V. angustior* in Ireland, and probably in Europe.

It is important to ensure that no adverse changes are allowed to occur in the area, and that the requirements of the snail habitat are not compromised for other conservation priorities. Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

3. TRANSECT DETAILS

TRANSECT: 1	MONITORING PERIOD: 2019-2024
Start point:	ITM 559638 835073 Top of dune crest with immediate drop to beach. ITM from 2023.

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End point: ITM 559631 835012 ITM from 2023.
Transect length: 60 **Direction:** N-S
Description: The transect runs across undulating *Ammophila arenaria* dominated fixed dune grassland, from a high dune crest.
Sampling frequency: 4 samples were taken from zones with the most suitable habitat

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018
Start point: G 59677 35072 Stone at top of dune crest.
End point: G 59679 35006
Transect length: 60 **Direction:** As for 2010
Description: As for 2010
Sampling frequency: As for 2010

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012
Start point: G 59677 35071 Top of dune crest
End point: G 59680 35014 Grassland
Transect length: 60 **Direction:** N-S
Description: The transect runs across undulating *Festuca rubra* dominated fixed dune grassland, from a high dune crest.
Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Four samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	39.07	Polygon A remains Optimal-Suboptimal; however there is evidence of drying out along the western part, where the soil is now sandier. This could be due to windblown sand from the adjacent beach. Sward consists of rank <i>Ammophila arenaria</i> and <i>Arrhenatherum elatius</i> with <i>Festuca rubra</i> .
B	Suboptimal	15.494	Polygon B remains Suboptimal. The polygon seems largely unchanged, with areas dominated by <i>Ammophila arenaria</i> and <i>Festuca rubra</i> interspersed by areas of more floristically diverse low-growing vegetation and cushion mosses.
C	Unsuitable	13.4116	Polygon C remains Unsuitable. The polygon consists mainly of a very large, blown-out dune, with extensive areas of bare sand. While some management has been implemented to attempt to stabilise the dune (chestnut fencing), this has yet to yield real results in terms of revegetation.
E	Suboptimal-Unsuitable	42.7537	Polygon E remains Suboptimal-Unsuitable. This polygon comprises the Strandhill Golf Club, and suitable <i>Vertigo angustior</i> habitat is limited to some areas of rough around tees, greens and between fairways.

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	38.8842	Polygon A status drops from Optimal to Optimal-Suboptimal - Based on notes from Moorkens & Killeen (2011) relating to the transect and other areas (where they mention bare ground and bryophyte cover, for example), it would appear that the polygon has become a little more rank overall, and so this change is ecological. This is a large expanse of fixed dune habitat, with <i>Ammophila arenaria</i> , <i>Festuca rubra</i> and <i>Arrhenatherum elatius</i> the main species throughout. Cover of <i>A. elatius</i> is probably higher than would be ideal.

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Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
B	Suboptimal	15.4198	Polygon B was merged with Polygon D, but its status remains Suboptimal. There is more diversity of habitat type here compared to Polygon A, with areas of low-growing vegetation, mossy areas, some areas of bare ground and dune slack. Areas with <i>Ammophila arenaria</i> and associated <i>Festuca rubra</i> thatch are more limited to higher parts of dunes. Botanical diversity is much greater in this area than in Polygon A. Some parts of the eastern boundary of this polygon were re-mapped - see notes on Polygons C and E for explanation.
C	Unsuitable	15.8093	Polygon C status remains Unsuitable - Large area of blow-out, consisting of either bare sand, or very mobile dune. Judging by aerial photographs, this area may be re-vegetating, and so its status should be re-assessed at the next monitoring survey. Two areas from within Polygon C were reassigned to be part of Polygon B due to having habitat and vegetation which is similar, and being contiguous.
E	Suboptimal-Unsuitable	38.4549	Polygon E status remains Suboptimal-Unsuitable and consists largely of the golf course. The polygon boundary was re-mapped in two places to better delineate the area which is managed as golf course. The course contains areas of rough, which are under a variety of management regimes. In some of these areas, habitat suitable for <i>Vertigo angustior</i> exists.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	38.994	Polygon A - fixed dune habitat
B	Sub-optimal	15.419	Polygon B - fixed and unfixed dune area
C	Unsuitable	15.821	Polygon C - area known as shelly valley, mostly bare, high dunes
D	Unsuitable	2.051	Polygon D - small dune slack
E	Sub-optimal with unsuitable areas	38.455	Polygon E - Most of this area is within Strandhill Golf course where there are areas of rough where the habitat is sub-optimal for <i>V. angustior</i>

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024									
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry	
1	0m	34m	26m	0m	0m	34m	0m	26m	
Monitoring period: 2013-2018									
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry	
1		60m				60m			
Monitoring period: 2007-2012									
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry	
1	60m	NA		NA		60m			

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (4 samples)								
2019-2024	1	1	5m	1	0	1	Count	Suboptimal
2019-2024	1	2	17m	0	0	1	Count	Suboptimal
2019-2024	1	3	34m	0	0	0	Count	Suboptimal
2019-2024	1	4	57m	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 Transect 1 (4 samples)								
2013-2018	1	1	6.5m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	2	15m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	3	25m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	4	47m	1	0	1	Presence/Absence	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (4 samples)								
2007-2012	1	1	2m	120	25	145		

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2007-2012	1	2	13m	20	2	22
2007-2012	1	3	26m	18	10	28
2007-2012	1	4	40m	35	5	40

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (8 samples)							
2019-2024	01	ITM 559509 834808	1	0	1	Count	Optimal-Suboptimal
2019-2024	02	ITM 559501 834427	12	0	12	Count	Optimal-Suboptimal
2019-2024	03	ITM 559499 834220	4	0	4	Count	Optimal-Suboptimal
2019-2024	04	ITM 559733 834782	2	0	2	Count	Optimal-Suboptimal
2019-2024	05	ITM 560137 835004	0	0	0	Count	Optimal-Suboptimal
2019-2024	06	ITM 559945 835052	0	0	0	Count	Suboptimal
2019-2024	07	ITM 560360 834959	2	1	3	Count	Optimal-Suboptimal
2019-2024	08	ITM 560606 835501	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	G 59559 34801	1	0	1	Presence/Absence	Optimal
2013-2018	02	G 59545 34421	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	03	G 59539 34220	1	0	1	Presence/Absence	Optimal
2013-2018	04	G 59774 34778	1	0	1	Presence/Absence	Optimal
2013-2018	05	G 60179 34998	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	06	G 59986 35047	1	0	1	Presence/Absence	Optimal
2013-2018	07	G 60408 34953	0	0	0		Optimal
2013-2018	08	G 60654 35489	1	0	1	Presence/Absence	Optimal
Monitoring period 2007-2012 (24 samples)							
2007-2012	01	G 59387 34514	0	0	1		
2007-2012	02	G 59351 34349	0	0	1		
2007-2012	03	G 59355 34203	0	0	1		
2007-2012	04	G 59440 34126	0	0	1		
2007-2012	05	G 59539 34074	0	0	1		
2007-2012	06	G 59589 34072	0	0	1		
2007-2012	07	G 59580 34147	0	0	1		
2007-2012	08	G 59561 34217	0	0	1		
2007-2012	09	G 59553 34280	0	0	1		
2007-2012	10	G 59617 34350	0	0	1		
2007-2012	11	G 59520 34381	0	0	1		
2007-2012	12	G 59467 34442	0	0	1		
2007-2012	13	G 59487 34555	0	0	1		
2007-2012	14	G 59594 34535	0	0	1		
2007-2012	15	G 59699 34545	0	0	1		
2007-2012	16	G 59771 34691	0	0	1		
2007-2012	17	G 59674 34729	0	0	1		
2007-2012	18	G 59562 34693	0	0	1		
2007-2012	19	G 59557 34793	0	0	1		

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2007-2012	20	G 59564 34892	0	0	1
2007-2012	21	G 59625 35006	0	0	1
2007-2012	22	G 59717 34948	0	0	1
2007-2012	23	G 59776 34929	0	0	1
2007-2012	24	G 59846 34859	0	0	1

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in all 3 of the habitat zones on the transect (from at least 4 samples)	Present in all 1 zone (4 sampled)	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in all 3 of the habitat zones on the transect (from at least 4 samples)	Present in all 3 zones (4 sampled)	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in all 3 of the habitat zones on the transect (from at least 4 samples)	Present in all 3 zones (4 samples)	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites sampled)	Present at 5 other locations (8 sampled)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites sampled)	Present at 7 other locations (8 sampled)	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites sampled)	Present in 24 (from 24 samples)	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was recorded at six out of twelve sample locations across Ballysadare Bay, with only one positive sample on the transect. This compares with 11 out of 12 positive in the monitoring period 2013-2018 and all 28 positive in 2007-2012. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	The 2007-2012 monitoring survey recorded Vertigo angustior at four out of four locations on the transect, and 24 out of 24 locations across Polygon A. The current survey had positive samples for the target species at four out of four locations on the transect, and seven out of eight samples across polygons A, B and E. The only negative sample was one of two samples taken within the golf course itself (Polygon E), and in fact here a juvenile Vertigo angustior was recorded. However, to count as a positive sample point according to Moorkens & Killeen (2011), the shell must be from an adult or sub-adult. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2007-2012	The snail is widespread in its distribution and frequently present in moderate to good numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	50m of habitat along the Transect is classed as Optimal-Suboptimal or better AND 10m of habitat along the Transect is classed as Sub-optimal or better	34m is Optimal-Suboptimal and 26m is Suboptimal	Fail
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 50m of the Transect	34m is Optimal wetness	Fail

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2013-2018	1	Habitat extent	50m of habitat along the Transect is classed as Optimal-Suboptimal or better AND 10m of habitat along the Transect is classed as Sub-optimal or better	60m is Optimal-Suboptimal	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 50m of the Transect	60m is Optimal wetness	Pass
2007-2012	1	Habitat extent	50m of habitat along the Transect is classed as Optimal and 10m of habitat along the Transect is classed as Sub-Optimal or Optimal	60m is Optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 50m of the Transect	60m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	45-55ha of the site optimal and sub-optimal	54.6ha Optimal-Suboptimal and Suboptimal	Pass
2013-2018	Habitat extent	45-55ha of the site optimal and sub-optimal	54.6ha Optimal and Suboptimal	Pass
2007-2012	Habitat extent	45-55 ha of the site optimal and sub-optimal	54.4 ha suitable	Pass

Mon. period	Habitat Notes
2019-2024	The site at Ballysadare Bay continues to support extensive areas of fixed dune habitat suitable for <i>Vertigo angustior</i> . Habitat suitability and soil/thatch moisture have both declined along the transect. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	Of the five polygons (A-E) delineated in the 2007-2012 monitoring period, the current monitoring survey saw Polygon A drop slightly from Optimal to Optimal-Suboptimal due to vegetation becoming slightly more rank. All other polygons remained at the same status. The full length of the transect (60m) was classed as Optimal in 2010, and Optimal-Suboptimal in the current monitoring period, reflecting the use of a five-point scale in this survey (rather than three-point scale used by Moorkens & Killeen). Therefore, based on the criteria of Moorkens & Killeen (2011), along with a small amendment to take account of the use of the five-point scale, the Habitat Assessment for Ballysadare Bay is Favourable (Green).
2007-2012	Much of the habitat at the site appears to be in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Medium	Negative	40%	Golf course. Greens and fairways unsuitable. Plan to plant more Marram to replace non-dune grasses. Damage from plans to create new hole. Also, camping and campfires, and walking/trampling.
2019-2024	PF06	Deposition and treatment of waste/rubbish from built-up areas	Inside	High	Negative	0.1%	Dumping of astroturf and other debris and cuttings on golf course
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	Medium	Negative	0.1%	<i>Acer pseudoplatanus</i> scattered in Polygons A & B

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2019-2024	PJ03	Changes in precipitation regimes due to climate change	Outside	High	Negative	100%	Climate change resulting in reduced rainfall and so drier vegetation. Likely to be associated with higher wind drying.
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	High	Negative	0.2%	Erosion of dunes along western edge resulting in loss of habitat, and spread of Hedera helix and Crataegus monogyna
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Negative	5%	In some areas, trampling and blow-outs caused by excessive walking or large tracks
2013-2018	G02.01	golf course	Inside	Medium	Negative	36%	Tight mowing, reseeding & fertiliser are all unsuitable management for Vertigo angustior
2013-2018	G02.08	camping and caravans	Inside	Low	Negative	2%	Fires and trampling
2013-2018	I02	problematic native species	Inside	High	Negative	1%	Some areas covered in thick blanket of Ivy, shading out habitat for Vertigo angustior
2013-2018	K01.01	Erosion	Inside	Low	Negative	2%	Loss of habitat, but natural process
2007-2012	K02.01	species composition change (succession)	Inside	Medium	Neutral	24ha	The lack of grazing management is having a neutral affect at present, as the habitat is mainly managed by exposure, and is on the less fixed end of the spectrum of fixed dune habitat. Over a long period of time succession may result in the vegetation becoming too rank for the snail, with vegetation litter and ultimately soil building up future vegetation litter decay taking place in a higher and drier micro-habitat. This should be monitored and if the spread and density of V. angustior reduces, active management could then be considered.

Mon. period	Future Prospects Notes
2019-2024	Both the Population Assessment and Habitat Assessment for Ballysadare Bay returned results of Unfavourable-Bad (red). While there are numerous minor pressures acting on the site, the two main ones are the golf course and drying out. The site appears drier than during the previous survey, based on the assessment of the soil and thatch moisture levels at the sample locations. This is believed to be the result of changing precipitation and/or increased wind-drying due to climate change, and so may pose a long-term threat to the site. Lesser pressures include erosion, camping, problematic native/invasive non-native species and dumping. Based on these assessments and their future trends in light of the current pressures acting on the site, the Future Prospects for Streedagh Point Dunes are assessed as being Unfavourable-Bad (red).
2013-2018	Future prospects for Vertigo angustior at this site are deemed to be good, though if there is any further rank/dense vegetation growth, in Polygon A in particular, this may become an issue in the future. Other threats to the snail's continued survival at the site include the negative effects of trampling and blowouts, but all other impacts are on a very small scale in this large site. For this reason, the future prospects of the site are considered to be Favourable (green).
2007-2012	As the impact is unlikely to be negative for the foreseeable future and could be remedied before damage through careful monitoring, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment

Vertigo angustior monitoring at Ballysadare Bay

2019-2024	Red	Red	Red	Red
2013-2018	Green	Green	Green	Green
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	Population Assessment for Ballysadare Bay is Unfavourable-Bad (red) due to the drop in the number of positive samples along the transect and across the site, while the Habitat Assessment is Unfavourable-Bad (red) due to reduction in the habitat suitability along the transect in terms of vegetation structure and soil moisture. Based on these results and their future trends in light of the threats and pressures acting on the site, the Future Prospects Assessment is also considered to be Unfavourable-Bad (Red). Therefore, the Overall Assessment for Ballysadare Bay is Unfavourable-Bad (red).
2013-2018	Given that the Population and Habitat Assessments, as well as the Future Prospects, are all Favourable (green), the Overall Assessment is Favourable (green).
2007-2012	The Condition of the site and the feature based upon the 2010 survey has been assessed as Favourable, and has not changed since the last (2006) survey

6. DISCUSSION

Monitoring period

2019-2024

Discussion:

Ballysadare Bay continues to support abundant habitat suitable for supporting *Vertigo angustior*, with the best of the habitat still in Polygon A. The number of positive samples has dropped compared to the previous two monitoring periods, and the habitat in Polygon A has shown some decline in suitability in terms of becoming more rank and drying out. This drying out is assumed to be the result of changes to precipitation and/or wind patterns as a result of climate change. Most of the other pressures acting on the site are minor and include erosion, camping, problematic native/invasive non-native species and dumping. The introduction of light grazing may be considered for Polygon A to open up the habitat slightly and prevent it becoming too rank; however, there should be no supplementary feeding. The chestnut fencing installed to attempt to restore the blowout in Polygon C does not appear to be having the desired effect, and additional measures may be required, such as planting *Ammophila arenaria*.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

In terms of management recommendations, there is little change from the 2013-2018 monitoring period. Polygon A would benefit from some light cattle grazing to address the fact that it is becoming rank *Ammophila arenaria*, with *Arrhenatherum elatius*. Grazing rates recommended for sand dunes can be as low as 0.1-0.3 LU/ha (Chapman, 2007) and any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Supplementary feeding should be avoided on site, as it brings in nutrients and unwanted species. The large blowout in Polygon C has not shown any signs of revegetating, despite some management to attempt to stabilise the dune (chestnut fencing). More intensive restoration works may be required, including planting up with *Ammophila arenaria* plugs. Control of problematic native/non-native invasive species (*Hedera helix*, *Crataegus monogyna*, *Acer pseudoplatanus*) should be undertaken. Some areas of the golf course are dominated by non-dune grasses and, according to staff, it is proposed that these areas are to be replaced with *Ammophila arenaria* and *Festuca rubra*, which would benefit the snail. Coastal erosion, noted during the 2013-2018 monitoring period, continues to be an issue; however, the management of this pressure is extremely difficult given its nature and the challenge in installing any measures to prevent the continued erosion of the dune face. Similarly, the issue of drying out at the site, presumed to be the result of changes to precipitation and wind patterns at the site associated with climate change, is an extremely difficult one to address and one that cannot be solved at a local level.

2013-2018

Discussion:

The site at Ballysadare Bay supports extensive *Vertigo angustior* habitat and a good population of the snail, with adult snails found at all but one of the twelve sample locations (and a juvenile *Vertigo angustior* was found at this sample location within the golf course). The habitat comprises extensive fixed dune, with a good *Festuca rubra* thatch in places under *Ammophila arenaria*. While the habitat is good for the snail, there is some indication that it may be becoming rank, particularly in Polygon A. Some areas have been affected by trampling and blowouts (polygons B and C), while the maintenance of the golf course has limited suitable habitat to areas of rough within its footprint (Polygon E). Management actions are necessary to address some of the issues at the site including potentially introducing light cattle grazing to Polygon A, a more sensitive mowing regime for roughs on the golf course, and measures to address the negative effects of trampling and to allow the revegetation of blowout areas.

Monitoring recommendations:

Monitoring should be carried out at three-yearly intervals to ensure that no major changes occur to the site, particularly in terms of the management activities. The monitoring should follow that proposed by Moorkens & Killeen (2011), as outlined below:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take at least 4 samples from the 3 zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 8 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Due to its large area and the habitat present, the management of Polygon A is particularly important. Light cattle grazing could be considered as it is likely to be beneficial in terms of opening up the vegetation, which is developing into a tall, rather dense *Ammophila arenaria*/*Arrhenatherum elatius* sward. There should be no supplementary feeding if animals are introduced, and regular monitoring is required to ensure that grazing is having the desired effect. Should this management intervention be considered, then it should be implemented with caution, with full advice from a *Vertigo angustior* expert, and effects should be monitored twice per year.

Polygons B and C, in the middle of the site, require some action to reduce the effects of walkers on the vegetation. This trampling may have contributed to the blowout that makes up most of Polygon C. Action should also be taken to stabilise the sand within the blowout and allow the re-establishment of fixed dune vegetation to provide suitable habitat for *Vertigo angustior*. The erection of fences to funnel walkers and protect the most vulnerable areas is recommended.

The management of the golf course (Polygon E) could be altered to create habitat more suitable for *Vertigo angustior* in the roughs. The effect of mowing in the various grades of rough could be made more positive by raising the mower height setting and by reducing the frequency of mowing to allow a good *Festuca rubra* thatch to develop. The golf course managers are amenable to suggestions as to how to better manage their course for nature conservation.

Vertigo angustior monitoring at Ballysadare Bay

2007-2012

Discussion:

The highly attractive site is one of the most undisturbed dune sites in the country. Although important more for its size and intact nature than for its botanical diversity, and as was stated after the 2006 survey (Moorkens 2007) the very large area of the habitat that is present makes it probably the largest single uninterrupted area of *V. angustior* in Ireland, and probably in Europe.

It is important to ensure that no adverse changes are allowed to occur in the area, and that the requirements of the snail habitat are not compromised for other conservation priorities. Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

Monitoring recommendations:

Given the site is in excellent Condition, both in terms of habitat and *Vertigo angustior* distribution and abundance, it is recommended that monitoring is carried out at 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 4 samples from the 3 zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 8 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Management recommendations:

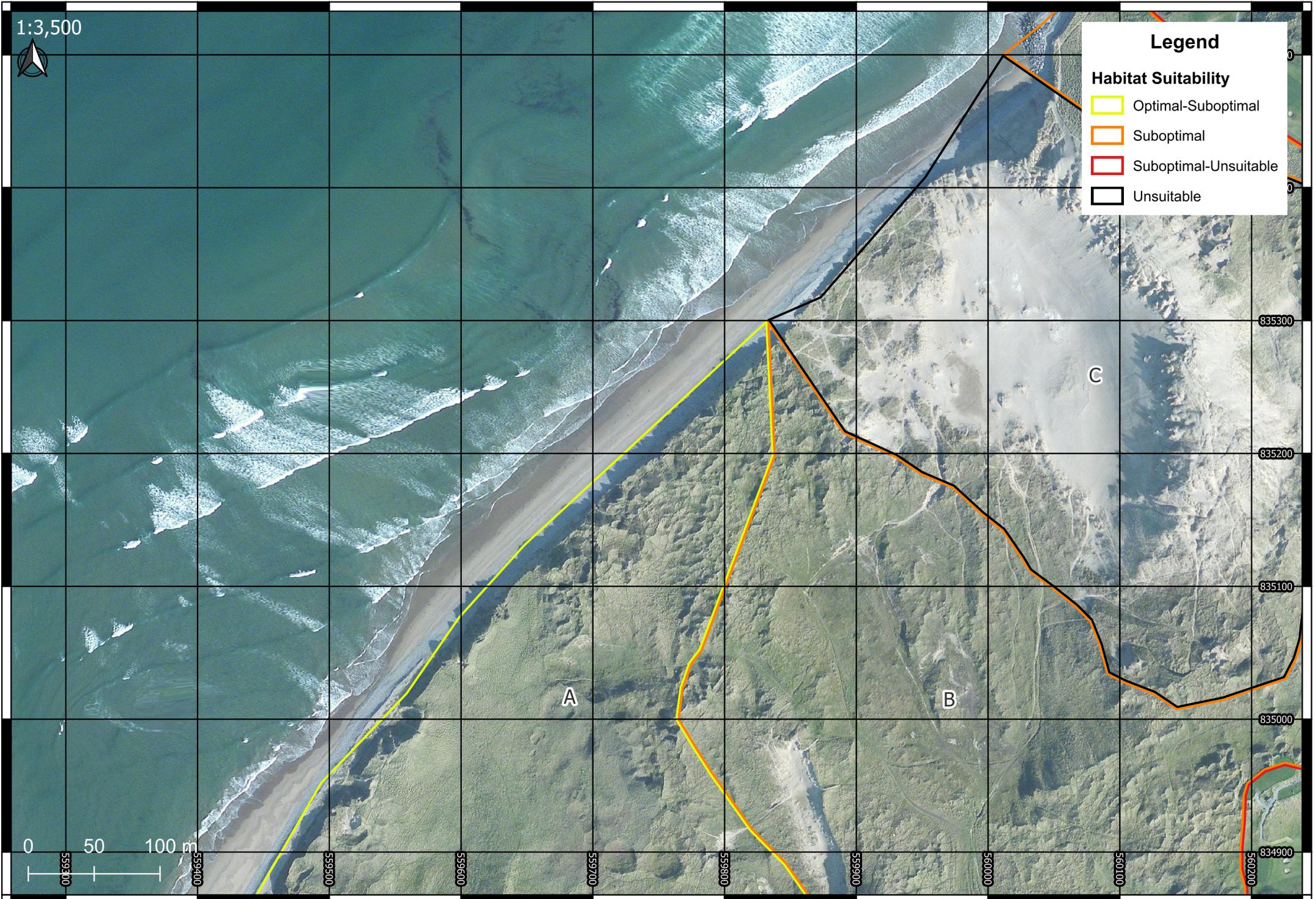
Existing Management

The *V. angustior* habitat has been divided into 5 polygon areas. Areas A-D are all unmanaged at present, while E is managed as a golf course (and is outside the cSAC area). The snail is present in unmanaged parts of the golf course (roughs). In areas A to D, management is natural, through exposure to wind and water spray and low levels of public trampling.

Proposed management prescription for site

The site is currently in excellent condition for the snail, and no change of management is recommended between the periods 2010-2013. The high exposure of this windswept peninsula appears to be maintaining the ideal conditions for the snail. The site should be monitored to ensure that the situation remains like this in the medium to long term, and any management introduced for other purposes, such as maintenance of the Annex I habitats should only be considered if it does not interfere with the favourable condition of the snail.





1:3,500



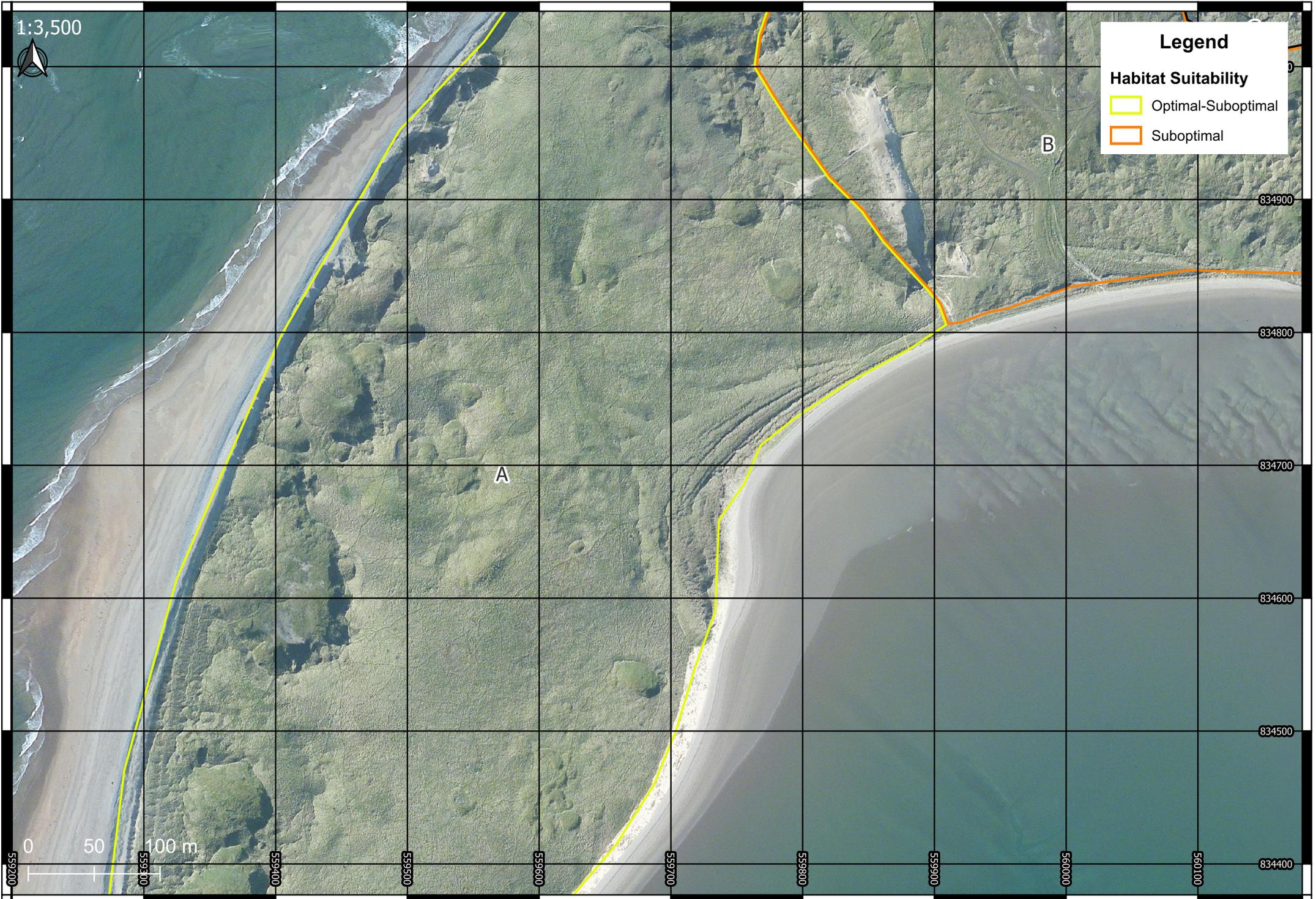
Legend

Habitat Suitability

- Optimal-Suboptimal
- Suboptimal
- Suboptimal-Unsuitable
- Unsuitable

0 50 100 m





1:3,500



Legend

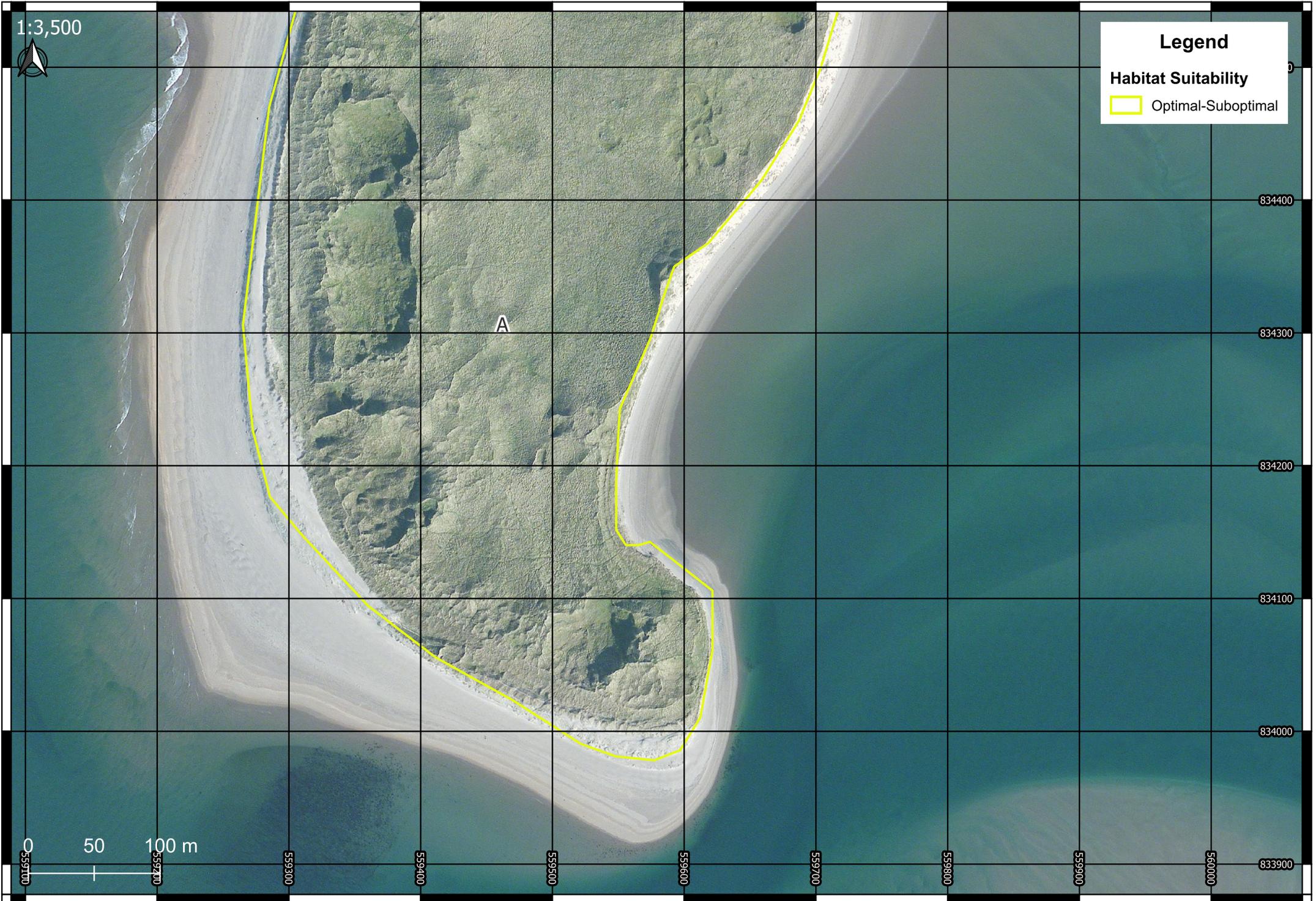
Habitat Suitability

-  Optimal-Suboptimal
-  Suboptimal

A

B





1:11,000



Legend

 Inset map



Site report - Vertigo Monitoring

Vertigo angustior monitoring at Strandhill Airport

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM21 **County:** Sligo
SAC Site Code: 000627 Cummeen Strand/Drumcliff Bay (Slig **QI:** Yes

Location description (from baseline survey):

The Vertigo angustior habitat is limited to a band along the north-eastern side of the site. Access is via a private track accessed from the local road north of Glassan on the N55 Athlone - Ballymahon Road.

Monitoring period	Date surveyed	Recorders
2019-2024	24-25 May 2023	John Brophy & Orla Daly
2013-2018	12-15 July 2016	John Brophy & Maria Long
2007-2012	18 May 2010	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria higher up, corresponding to SD7 of Rodwell (2000), and Galium verum, Pilosella officinarum, Plantago lanceolata, Poa sp, Holcus lanatus, Thymus polytrichus, Carex arenaria, and coastal mosses, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the vegetation contains mounds of moss or willow scrub, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

The habitat for Vertigo angustior at Strandhill Airport has shown some decline in suitability and area since monitoring began. Though there has been some stabilisation of this decline, there are still pressures acting on the site including succession, erosion and drying out. The reduction in habitat quality appears to be having negative effects on the population of V. angustior, with only a single sample returning a positive result during the current survey, which continues the declining trend seen across the previous two monitoring periods. While the populations of species such as V. angustior can fluctuate year-to-year, the current decline does appear to be genuine, as it coincides with habitat issues and aligns with the pressures acting on the site. The site is largely unmanaged and was considered to be maintained mainly by natural elements; however, it had been noted over the previous monitoring rounds that grazing may need to be introduced to address the spread of bryophyte mounds and Salix cinerea. At this stage, it is recommended that this measure be implemented, with light cattle grazing (without supplementary feeding) introduced to the site. Grazing must be carefully monitored and set at a level that maintains the habitat for the snail and the site's other Qualifying Interests.

2013-2018: The Vertigo angustior population at Strandhill Airport appears to have declined since the 2007-2012 monitoring period, with some decline in habitat quality evident along the transect and in Polygon C. The high cover of Arrhenatherum elatius, particularly polygons B and E, suggest the habitat has become rank through lack of grazing (by rabbits or livestock), and therefore is less suitable for supporting the target species. Natural succession to a more stable fixed dune habitat is also occurring. Lack of grazing has been identified as the main threat to the site, with coastal erosion also of concern. Historical conifer planting along the eastern boundary of the site has led to the loss of potentially suitable habitat, as has construction of the airport and the sewage treatment works.

Management of the site should include the introduction of grazing to counter the transition to rank vegetation, and to encourage a return to a more Ammophila arenaria-Festuca rubra dominated sward. Monitoring of the grazing level would be required to ensure a positive effect.

Site managers, site users and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on the relative priorities. This site is important for a suite of other uncommon plants, animals and habitats, any actions taken must bear this in mind.

2007-2012:

The Condition of the site and the feature based upon the 2010 survey has been assessed as Unfavourable Inadequate. This represents deterioration since 2006, when the site was assessed as Favourable (see Appendix). However, this is still a very good site for V. angustior, which in parts includes a densely thatched litter layer in a naturally calcareous stable environment that is managed well by the elements rather than by active grazing. The wider habitat areas, dune and slack, are botanically rich and thus the overall importance of this cSAC in international terms is high.

Vertigo angustior monitoring at Strandhill Airport

Results and observations from the present survey in addition to results from other surveys undertaken for NPWS indicate that there is a contraction in the area of good *V. angustior* habitat and also in the range and abundance of the snail. The best *V. angustior* habitat is present mostly along the fixed dune coastal strip, particularly towards the northern end of the site. On the landward side of the dunes much of the habitat is becoming dominated luxuriant mounds of moss (*Rhytidiadelphus* spp.) and willow scrub, suggesting parts of the site may be becoming drier and/or less calcareous. The numbers of *V. angustior* in 2010 on the transect are much lower than recorded in 2006. Whilst populations of *V. angustior* are known to fluctuate in abundance and small-scale distribution, the recent pattern of long wet summers followed by stormy wet winters may mean that the conditions for *V. angustior* at the site are becoming less favourable. This site needs careful monitoring with a view to possibly needing conservation management (strimming or grazing) in the future, but a further round of monitoring is recommended in order to ascertain how fluctuating the numbers of snails are from year to year.

3. TRANSECT DETAILS

TRANSECT:	1	MONITORING PERIOD:	2019-2024
Start point:	ITM 560497 836330	Eroded away, former start point and zone 1 no longer present. ITM from 2023.	
End point:	ITM 560682 836442	ITM from 2023.	
Transect length:	220	Direction:	SW-NE
Description:	The transect runs down an undulating dune slope through a dryish slack and back into dune grassland with dense mosses and willow scrub. The transect is crossed by several paths.		
Sampling frequency:	5 samples were taken from zones with the most suitable habitat		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2013-2018
Start point:	G 60561 36432	Eroded away, former start point and zone 1 no longer present	
End point:	G 60724 36440		
Transect length:	170	Direction:	As for 2010
Description:	As for 2010		
Sampling frequency:	As for 2010		
<hr/>			
TRANSECT:	1	MONITORING PERIOD:	2007-2012
Start point:	G 60557 36326	The transect runs from a high point on the dunes at the cliff edge path	
End point:	G 60725 36444	Fencepost	
Transect length:	170.5	Direction:	SW-NE
Description:	The transect runs down an undulating dune slope through a dryish slack and back into dune grassland with dense mosses and willow scrub. The transect is crossed by several paths.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	11.2291	Polygon A continues to be Optimal. Sward is dominated by <i>Ammophila arenaria</i> , <i>Festuca rubra</i> and <i>Arrhenatherum elatius</i> , with some <i>Salix repens</i> and more grassy habitat (i.e. less suitable) towards the north.
B	Suboptimal	6.733	Polygon B remains Suboptimal. Sward consists of rank <i>Ammophila arenaria</i> and <i>Arrhenatherum elatius</i> with <i>Festuca rubra</i> . Abundant mossy hummocks, with <i>Salix repens</i> apparently spreading.
C	Suboptimal	2.5141	Polygon C remains Suboptimal. The polygon remains largely rank <i>Ammophila arenaria</i> tussocks with mossy hummocks. <i>Festuca rubra</i> thatch, where developed, was dry at the time of the survey.
D	Suboptimal	5.8464	Polygon D remains Suboptimal. Some suitable vegetation occurs on small dunes, but much of the area consists of short vegetation and there are areas of trampling from walkers.

Vertigo angustior monitoring at Strandhill Airport

Monitoring Period: 2019-2024

Polygon	Habitat Type	Area (ha)	Comment
E	Suboptimal	9.4511	Polygon E remains Suboptimal. While there are areas with <i>Ammophila arenaria</i> further north, <i>Arrhenatherum elatius</i> is often co-dominant. <i>Festuca rubra</i> is throughout much of sward, but never dominant. At the southern end, the sward is rank, with non-dune specialist species <i>Dactylis glomerata</i> and <i>Arrhenatherum elatius</i> dominant.
F	Unsuitable	21.388	Polygon F remains Unsuitable. The airport includes runway and strips of grassland either side mown short.
G	Suboptimal-Unsuitable	3.4397	Polygon G remains Suboptimal-Unsuitable. While the vegetation has recovered from previous cattle grazing/trampling, and the sward has <i>Ammophila arenaria</i> and <i>Festuca rubra</i> , the habitat is very rank and shows signs of disturbance by the presence of <i>Arrhenatherum elatius</i> , which is common throughout, as well as <i>Poa pratensis</i> and <i>Dactylis glomerata</i> .
H	Unsuitable	9.9856	Polygon H remains Unsuitable, as it continues to support a plantation of <i>Pinus contorta</i> .

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	11.2291	Polygon A status remains Optimal. This area consists of fixed dune habitat with <i>Ammophila arenaria</i> and <i>Festuca rubra</i> throughout, though variable in density and thatch quality.
B	Suboptimal	6.733	Polygon B status remains Suboptimal. While the western portion is mainly <i>Arrhenatherum elatius</i> , with no <i>Ammophila arenaria</i> or <i>Festuca rubra</i> , the eastern part is more similar to Polygon E with some parts rank and others with reasonable <i>Festuca rubra</i> thatch, but with a dense moss layer throughout.
C	Suboptimal	2.5141	Polygon C status dropped to Suboptimal as large areas of the polygon are rank with dense tussocks of <i>Ammophila arenaria</i> and others with mounds of deep, dense moss. <i>Festuca rubra</i> thatch is very patchy. It is not clear if this change in ecological or down to interpretation.
D	Suboptimal	5.8464	Polygon D status remains Suboptimal. The habitat is good quality in places, but some areas have very short vegetation and some with dense moss cover. <i>Festuca rubra</i> thatch is patchy. Some areas with <i>Salix repens</i> .
E	Suboptimal	9.4511	Polygon E status increases to Suboptimal. It is unclear whether this increase is due to interpretation or actual ecological change. The polygon is somewhat rank and mossy, but with good cover of <i>Festuca rubra</i> thatch in places.
F	Unsuitable	21.388	Polygon F remains unsuitable. This is the within boundary of the airport, where the grass is tightly mown.
G	Suboptimal-Unsuitable	4.0074	Polygon G increases to Suboptimal-Unsuitable. This is considered to be ecological change due to the vegetation recovering from overgrazing by cattle. The habitat supports good quality <i>Festuca rubra</i> thatch, with scattered <i>Ammophila arenaria</i> . Some areas are unsuitable due to dense <i>Arrhenatherum elatius</i> , <i>Dactylis glomerata</i> and <i>Agrostis stolonifera</i> .
H	Unsuitable	9.9856	Polygon H remains Unsuitable. This polygon consists mostly of conifer plantation.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	11.224	Polygon A - fixed dune grassland
B	Sub-optimal	6.732	Polygon B - fixed dune grassland but much of it becoming vegetated with dense moss and some willow scrub, also includes an area of slack
C	Optimal	2.51	Polygon C - fixed dune grassland
D	Sub-optimal	5.846	Polygon D - mostly fixed dune grassland
E	Sub-optimal with unsuitable areas	9.45	Polygon E - taller denser grassland with some woodland
F	Unsuitable	21.387	Polygon F - main airport runway and surrounds
G	Unsuitable	4.007	Polygon G - much of the grassland heavily grazed and damaged, also includes STW compound
H	Unsuitable	9.986	Polygon H - mostly conifer forest, occasional small patches of sub-optimal habitat

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024

Vertigo angustior monitoring at Strandhill Airport

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	58m	26m	105m	24m	7m	213m	0m	7m
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	55m		41.5m	60m	13.5m	155m		15m
Monitoring period: 2007-2012								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	48.5m	NA	90m	NA	32m	143.7m	20m	6.8m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 1 (5 samples)								
2019-2024	1	1	18m	0	0	0	Count	Optimal
2019-2024	1	2	52m	0	0	0	Count	Optimal
2019-2024	1	3	85m	0	0	0	Count	Optimal
2019-2024	1	4	106m	0	0	0	Count	Suboptimal
2019-2024	1	5	196m	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	16m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	2	26m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	46m	0	0	0		Optimal
2013-2018	1	4	83m	0	0	0		Optimal-Suboptimal
2013-2018	1	5	156.5m	0	0	0		Suboptimal
Monitoring period 2007-2012 Transect 1 (6 samples)								
2007-2012	1	1	6.5m	3	3	6		
2007-2012	1	2	24m	2	3	5		
2007-2012	1	3	67m	0	0	0		
2007-2012	1	4	83m	1	0	1		
2007-2012	1	5	120m	0	0	0		
2007-2012	1	6	157m	1	1	2		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (9 samples)							
2019-2024	01	ITM 560806 836199	0	0	0	Count	Suboptimal
2019-2024	02	ITM 560692 836531	0	0	0	Count	Suboptimal
2019-2024	03	ITM 560488 836920	0	0	0	Count	Optimal
2019-2024	04	ITM 560527 836773	2	0	2	Count	Optimal
2019-2024	05	ITM 560603 836520	0	0	0	Count	Optimal-Suboptimal
2019-2024	06	ITM 560758 836875	0	0	0	Count	Suboptimal
2019-2024	07	ITM 560379 837175	0	0	0	Count	Suboptimal
2019-2024	08	ITM 560578 837218	0	0	0	Count	Suboptimal
2019-2024	09	ITM 561187 837215	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (9 samples)							
2013-2018	01	G 60839 36172	0	0	0		Optimal
2013-2018	02	G 60739 36532	0	0	0		Optimal-Suboptimal
2013-2018	03	G 60531 36912	1	0	1	Presence/Absence	Optimal

Vertigo angustior monitoring at Strandhill Airport

2013-2018	04	G 60563 36768	0	0	0	Optimal
2013-2018	05	G 60644 36521	0	0	0	Optimal-Suboptimal
2013-2018	06	G 60820 36832	0	0	0	Suboptimal
2013-2018	07	G 60423 37166	0	0	0	Optimal
2013-2018	08	G 60581 37215	0	0	0	Optimal
2013-2018	09	G 61226 37205	0	0	0	Optimal-Suboptimal
Monitoring period 2007-2012 (19 samples)						
2007-2012	01	G 60666 36495	0	0	1	
2007-2012	02	G 60639 36515	0	0	1	
2007-2012	03	G 60627 36535	0	0	1	
2007-2012	04	G 60649 36600	0	0	0	
2007-2012	05	G 60644 36651	0	0	0	
2007-2012	06	G 60610 36767	0	0	1	
2007-2012	07	G 60650 36820	0	0	1	
2007-2012	08	G 60497 36923	0	0	1	
2007-2012	09	G 60482 36941	0	0	0	
2007-2012	10	G 60458 36952	0	0	1	
2007-2012	11	G 60530 36858	0	0	1	
2007-2012	12	G 60565 36765	0	0	1	
2007-2012	13	G 60592 36721	0	0	1	
2007-2012	14	G 60587 36540	0	0	0	
2007-2012	15	G 60572 36392	0	0	1	
2007-2012	16	G 60581 36336	0	0	0	
2007-2012	17	G 60648 36297	0	0	0	
2007-2012	18	G 60710 36198	0	0	0	
2007-2012	19	G 60710 36157	0	0	0	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the grassland zones with optimal or sub-optimal habitat (minimum 5 samples)	Vertigo angustior absent from Transect 1	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the grassland zones with optimal or sub-optimal habitat (minimum 5 samples)	Present in 2 zones	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the grassland zones with optimal or sub-optimal habitat (minimum 5 samples)	Present in 4 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites or 75% of sites sampled)	Present in 1 other location (9 samples)	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites or 75% of sites sampled)	Present in 1 other location (9 samples)	Fail

Vertigo angustior monitoring at Strandhill Airport

2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites or 75% of sites sampled)	at 10 other locations (from 19 samples)	Pass
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Mon. period	Population Notes
2019-2024	Vertigo angustior was recorded at only a single location out of 14 samples at Strandhill Airport during the current survey. This compares with three positive out of 14 in 2013-2018 and 15 out of 25 in 2007-2012. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable-Bad (red).
2013-2018	In the 2007-2012 monitoring period, the population assessment was Favourable (green), with four out of six samples on the transect positive for Vertigo angustior, and 10 out of 19 spot samples positive. In the current survey, two out of five samples on the transect were positive, while one out of nine spot samples were positive. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Strandhill Airport is Unfavourable Bad (red).
2007-2012	The snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable-Inadequate (amber); 0-1 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	1	Habitat extent	75m of habitat along the Transect is classed as Optimal and 150m of habitat along the Transect is classed as Sub-Optimal or Optimal	56m is Optimal and 187m is Suboptimal or better	Fail
2019-2024	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >130m along the Transect	213m is Optimal wetness	Pass
2013-2018	1	Habitat extent	75m of habitat along the Transect is classed as Optimal and 150m of habitat along the Transect is classed as Sub-Optimal or Optimal	55m is Optimal AND 96.5m is Suboptimal or Optimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >130m along the Transect	155m is Optimal wetness	Pass
2007-2012	1	Habitat extent	75m of habitat along the Transect is classed as Optimal and 150m of habitat along the Transect is classed as Sub-Optimal or Optimal	48.5m is Opt & 138.5m is Sub-Opt or Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >130m along the Transect	143.7m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	12-15ha of the site optimal and a further 11-14 ha sub-optimal	11.2ha Optimal and 24.5ha Suboptimal	Fail
2013-2018	Habitat extent	12-15ha of the site optimal and a further 11-14 ha sub-optimal	11.2ha Optimal and 24.6ha Suboptimal	Fail
2007-2012	Habitat extent	12-15 ha of the site optimal and a further 11-14 ha sub-optimal	13.7 ha optimal and 6.7 sub-optimal	Pass

Mon. period	Habitat Notes
2019-2024	The habitat suitability along the transect and across the site in general has remained largely unchanged, though at a finer scale, many sample locations were drier than Optimal. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable-Bad (red).

Vertigo angustior monitoring at Strandhill Airport

2013-2018	In the monitoring period 2007-2012, polygons A and C were classified as Optimal, B and D as Suboptimal, E as Suboptimal-Unsuitable and F, G and H as Unsuitable. Following the current survey, Polygon C was downgraded to Suboptimal due to the rank tussocks of <i>Ammophila arenaria</i> and dense moss, with little <i>Festuca rubra</i> thatch. It is not known whether this due to ecological change or interpretation. Polygon E was upgraded to Suboptimal due to the presence of good thatch in places, and this change is likely to be due to interpretation. Polygon G was upgraded to Suboptimal-Unsuitable due to ecological change as the vegetation has recovered from heavy cattle grazing. The start of the transect has been lost through coastal erosion. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Strandhill Airport is Unfavourable Bad (red).
2007-2012	Much of the habitat at the site appears to be in good condition for <i>V. angustior</i>

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA05	Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g. cessation of grazing, mowing or traditional farming)	Inside	Medium	Negative	75%	Sward becoming rank and unsuitable
2019-2024	PF05	Sports, tourism and leisure activities	Inside	Medium	Negative	1%	Walking tracks, trampling
2019-2024	PI02	Other invasive alien species (other than species of Union concern)	Inside	High	Negative	1.5%	<i>Pinus contorta</i> , <i>Petasites pyrenaicus</i> , <i>Montbretia</i>
2019-2024	PJ03	Changes in precipitation regimes due to climate change	Outside	High	Negative	100%	Climate change resulting in reduced rainfall and so drier vegetation. Likely to be associated with higher wind drying.
2019-2024	PM07	Natural processes without direct or indirect influence from human activities or climate change	Inside	Medium	Negative	40%	Erosion and spread of <i>Salix repens</i> and bryophyte hummocks
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	75%	Grazing needed in some areas
2013-2018	B01.02	artificial planting on open ground (non-native trees)	Inside	High	Negative	3%	Conifers planted to restrict sand blowing
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Medium	Negative	1%	Walking trail/tracks.
2013-2018	D04.01	airport	Inside	High	Negative	1%	Sligo airport. Only impacting slightly into polygons with potentially suitable habitat.
2013-2018	G02.07	sports pitch	Outside	Low	Negative	5%	Increased human activity due to campsite
2013-2018	K01.01	Erosion	Inside	High	Negative	2%	Loss of fixed dune habitat
2013-2018	K02.01	species composition change (succession)	Inside	Medium	Negative	40%	Succession to more stable fixed dune with deep mossy layer occurring in polygons B & E

Vertigo angustior monitoring at Strandhill Airport

2007-2012	A04.01.01	intensive cattle grazing	Inside	High	Negative	3ha	Refers to Polygon G, where cattle numbers are so great at times that the ground is poached to bare sandy mud.
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	24ha	Refers to the public dunes, which were probably grazed in the past, but are now being managed by trampling and exposure, and are being encroached by scrub in places.
2007-2012	B01	forest planting on open ground	Inside	High	Negative	10ha	The artificial planting refers to the conifer plantation on fixed dune habitat that still retains crumbs of <i>V. angustior</i> habitat. This habitat area is likely to be restorable.
2007-2012	B06	grazing in forests/ woodland	Inside	Medium	Negative	2ha	The northern part of the plantation is grazed by cattle and badly poached and in consequence is less restorable.
2007-2012	D04.01	airport	Inside	Medium	Negative	21ha	The airport was built on fixed dune habitat in 1974, so much of the 21 hectares of its footprint is now unsuitable for <i>V. angustior</i> , but the fringe vegetation that is suitable is maintained by trampling.
2007-2012	E06	Other urbanisation, industrial and similar activities	Inside	Medium	Negative	1ha	Refers to the Strandhill Waste Water Treatment Plant, which sits on further former habitat, and there is considerable disturbance to the vegetation in its vicinity.
2007-2012	G02.08	camping and caravans	Outside	Medium	Negative	3ha	Refers to the caravan site on former fixed dune habitat. Although this site has a long history, the fixed dunes to the north of the caravans are heavily trampled and have higher human pressure than would be desirable at a prime dune site.
2007-2012	M01.01	temperature changes (e.g. rise of temperature & extremes)	Inside	Low	Negative	70ha	deal with the potential for climate change impacts, in a site which relies on a dominance of very damp conditions and high rainfall rather than groundwater sources to keep the habitat and particularly the litter layer moist
2007-2012	M01.02	droughts and less precipitations	Inside	Low	Negative	70ha	

Mon. period	Future Prospects Notes
2019-2024	<p>There are several important threats or pressures acting on the site at Strandhill Airport. The spread of <i>Salix repens</i> and bryophyte tussocks, with other areas of <i>Ammophila arenaria</i> becoming rank, suggests that succession and overgrazing are affecting the snail's habitat. Erosion along the seaward edge of Polygon A has resulted in the loss of approximately 1ha, resulting in the dune front retreating by approximately 20m. Many of the sample sites were found to be too dry in terms of the <i>Festuca</i> thatch and underlying soil; this is considered to be the result of changing precipitation patterns and/or increased wind-drying due to climate change, and so may pose a long-term threat to the site. Other lesser pressures include non-native invasive species (<i>Pinus contorta</i>, <i>Petasites hybridus</i> and <i>Crocospia x crocosmiiflora</i>) and recreational walking/trampling. Based on these Unfavourable-Bad (red) assessments for Population and Habitat, and their future trends in light of the pressures acting on the site, the Future Prospects for Strandhill Airport are assessed as being Unfavourable-Bad (red).</p>

Vertigo angustior monitoring at Strandhill Airport

Mon. period	Future Prospects Notes
2013-2018	There are a number of factors affecting the Vertigo angustior habitat at Strandhill Airport. A lack of grazing is considered the main negative impact, resulting in the site becoming rank. Other impacts include coastal erosion, conifer plantations, paths & tracks, and buildings/activities such as the airport and the sewage treatment works. Considering these impacts along with the apparent reduction in the population of Vertigo angustior at the site, the Future Prospects for Strandhill Airport are considered to be Unfavourable Inadequate (amber).
2007-2012	Due to the combination of the retention of a large habitat area, but with a variety of pressures acting on the site, Future prospects have been assessed as Unfavourable inadequate

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Red	Red	Amber	Red
2007-2012	Green	Amber	Amber	Amber

Mon. period	Overall Notes
2019-2024	The drop in the number of positive samples and the largely unchanged status of the habitat at Strandhill Airport means that the Population and Habitat Assessments returned results of Unfavourable-Bad (red). In light of these results and the pressures acting on the site (scrubbing over, erosion and drying out due to climate change), the Future Prospects were also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Strandhill Airport is Unfavourable-Bad (red).
2013-2018	While the Future Prospects for the site are Unfavourable Inadequate (amber), the results of the population and habitat assessments result in an Overall Assessment for Strandhill Airport of Unfavourable Bad (red).
2007-2012	The Condition of the site and the feature based upon the 2010 survey has been assessed as Unfavourable Inadequate. This represents deterioration since 2006, when the site was assessed as Favourable. However, this is still a very good site for <i>V. angustior</i>

6. DISCUSSION

Monitoring period
<p>2019-2024</p> <p>Discussion:</p> <p>The habitat for <i>Vertigo angustior</i> at Strandhill Airport has shown some decline in suitability and area since monitoring began. Though there has been some stabilisation of this decline, there are still pressures acting on the site including succession, erosion and drying out. The reduction in habitat quality appears to be having negative effects on the population of <i>V. angustior</i>, with only a single sample returning a positive result during the current survey, which continues the declining trend seen across the previous two monitoring periods. While the populations of species such as <i>V. angustior</i> can fluctuate year-to-year, the current decline does appear to be genuine, as it coincides with habitat issues and aligns with the pressures acting on the site. The site is largely unmanaged and was considered to be maintained mainly by natural elements; however, it had been noted over the previous monitoring rounds that grazing may need to be introduced to address the spread of bryophyte mounds and <i>Salix cinerea</i>. At this stage, it is recommended that this measure be implemented, with light cattle grazing (without supplementary feeding) introduced to the site. Grazing must be carefully monitored and set at a level that maintains the habitat for the snail and the site's other Qualifying Interests.</p> <p>Monitoring recommendations:</p> <p>As per 2013-2018 recommendations</p> <p>Management recommendations:</p> <p>As was noted in the two previous rounds of monitoring, there has been a decline in the suitability of the habitat for <i>Vertigo angustior</i> at Strandhill Airport. Since monitoring began, very little of the site has received any kind of management beyond the mowing within the boundary of the airport and some livestock in polygons E and G. While the site was previously considered to be maintained by the elements, it had been noted that the spread of dense bryophyte mounds and <i>Salix repens</i>, as well as rank <i>Ammophila arenaria</i>, suggests that some light grazing may be required to maintain the habitat for the snail. Sheep grazing should be avoided, due to the fact that they graze too selectively and tightly. Grazing rates recommended for sand dunes in some sources can be as low as 0.1-0.3 LU/ha (Chapman, 2007) and any grazing management plan should consider these stocking rates at the outset, with grazing adjusted to attain the desired result. Supplementary feeding should be avoided on site, as it brings in nutrients and unwanted species. Control of non-native invasive species (<i>Pinus contorta</i>, <i>Petasites hybridus</i> and <i>Crocsmia x crocsmiiflora</i>) should be undertaken. Coastal erosion, noted during the 2013-2018 monitoring period, continues to be an issue; however, the management of this pressure is extremely difficult given its nature and the challenge in installing any measures to prevent the continued erosion of the dune face. Similarly, the issue of drying out at the site, presumed to be the result of changes to precipitation and wind patterns at the site associated with climate change, is an extremely difficult one to address and one that cannot be solved at a local level.</p>

Vertigo angustior monitoring at Strandhill Airport

2013-2018

Discussion:

The *Vertigo angustior* population at Strandhill Airport appears to have declined since the 2007-2012 monitoring period, with some decline in habitat quality evident along the transect and in Polygon C. The high cover of *Arrhenatherum elatius*, particularly polygons B and E, suggest the habitat has become rank through lack of grazing (by rabbits or livestock), and therefore is less suitable for supporting the target species. Natural succession to a more stable fixed dune habitat is also occurring. Lack of grazing has been identified as the main threat to the site, with coastal erosion also of concern. Historical conifer planting along the eastern boundary of the site has led to the loss of potentially suitable habitat, as has construction of the airport and the sewage treatment works.

Management of the site should include the introduction of grazing to counter the transition to rank vegetation, and to encourage a return to a more *Ammophila arenaria*-*Festuca rubra* dominated sward. Monitoring of the grazing level would be required to ensure a positive effect.

Site managers, site users and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on the relative priorities. This site is important for a suite of other uncommon plants, animals and habitats, any actions taken must bear this in mind.

Monitoring recommendations:

This is an important site and the population of *Vertigo angustior* appears to be decreasing, so monitoring should be carried out at three-yearly intervals. This should be increased to yearly, for at least three years, if grazing or other management changes are made. The monitoring should follow that proposed by Moorkens & Killeen (2011), with some alterations as shown below:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of nine other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *Vertigo angustior*
- Use results to determine overall condition assessment

Management recommendations:

Some light grazing by cattle would benefit *Vertigo angustior* in a number of areas at this site, as the vegetation is becoming rank and unsuitable for supporting the snail. Grazing would be likely to reduce the size and cover of large *Ammophila arenaria* tussocks and allow the cover of *Festuca rubra* to increase. The grazing level would need to be closely monitored to ensure overgrazing does not occur, with cattle numbers or the period of grazing adjusted accordingly. The main areas to focus on are Polygon C and D, and perhaps the northern portion of Polygon A - it is here that the snail appears to have been lost from. Polygons B and E may also benefit from grazing, but processes of succession to more stable fixed dune habitat, with dense moss layer, may be harder to slow/reverse in these areas.

The main part of this site that continues to support the target species is the coastal strip of Polygon A. Here, no management intervention is needed. The main threat is habitat loss through erosion, but coastal defence works are not recommended as part of this survey.

Site managers, site users and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on the relative priorities. This site is important for a suite of other uncommon plants, animals and habitats, and any actions taken must bear this in mind.

Vertigo angustior monitoring at Strandhill Airport

2007-2012

Discussion:

The Condition of the site and the feature based upon the 2010 survey has been assessed as Unfavourable Inadequate. This represents deterioration since 2006, when the site was assessed as Favourable (see Appendix). However, this is still a very good site for *V. angustior*, which in parts includes a densely thatched litter layer in a naturally calcareous stable environment that is managed well by the elements rather than by active grazing. The wider habitat areas, dune and slack, are botanically rich and thus the overall importance of this cSAC in international terms is high.

Results and observations from the present survey in addition to results from other surveys undertaken for NPWS indicate that there is a contraction in the area of good *V. angustior* habitat and also in the range and abundance of the snail. The best *V. angustior* habitat is present mostly along the fixed dune coastal strip, particularly towards the northern end of the site. On the landward side of the dunes much of the habitat is becoming dominated luxuriant mounds of moss (*Rhytidiadelphus* spp.) and willow scrub, suggesting parts of the site may be becoming drier and/or less calcareous. The numbers of *V. angustior* in 2010 on the transect are much lower than recorded in 2006. Whilst populations of *V. angustior* are known to fluctuate in abundance and small-scale distribution, the recent pattern of long wet summers followed by stormy wet winters may mean that the conditions for *V. angustior* at the site are becoming less favourable. This site needs careful monitoring with a view to possibly needing conservation management (strimming or grazing) in the future, but a further round of monitoring is recommended in order to ascertain how fluctuating the numbers of snails are from year to

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and *Vertigo angustior* distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013

Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 8 other locations (with a wide geographical spread, in Polygon area A) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for *V. angustior*
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2016

Methods (see Section 3 of main report for full details). Prescription as follows:

- Describe habitat and take at least 2 samples from the most suitable habitat in each of Polygon areas B, C, D and E, and analyse for molluscan composition

Management recommendations:

Existing Management

There is no active management by grazing at the publicly owned land at this site. There is some irregular mowing close to the airport runway. *Vertigo angustior* is maintained at the habitat by light trampling and by exposure and dampness. There are areas of low pockets and dry slack habitat that have some willow, but this is not part of the area of occupancy of *V. angustior*.

Proposed management prescription for site

The management at this site should remain the same as the present regime without active management outside the airport runway area for the 2011-2014 period. If management is recommended to be introduced for habitat or vegetation purposes, e.g. in the dry slack areas, it should not be such that would interfere with the favourable condition of *V. angustior*, for example any introduction of sheep grazing would be very detrimental to the snail.

Any recommendations for a change in management should be habitat based. However, any introduced management should not interfere with the *V. angustior* habitat elsewhere. Light cattle grazing would not interfere with the current favourable condition of the species, but sheep should not be introduced. More notices for the public could help to discourage littering, which is common in places. A site meeting of NPWS staff including all the habitat and species experts is recommended to assess if there are active conservation management measures required, but this could wait until after another round of monitoring.

Due to the importance of this site for *Vertigo angustior*, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the medium to long term. This site should also form part of a suite of important flora & fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

Vertigo angustior monitoring at Strandhill Airport

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1:3,500

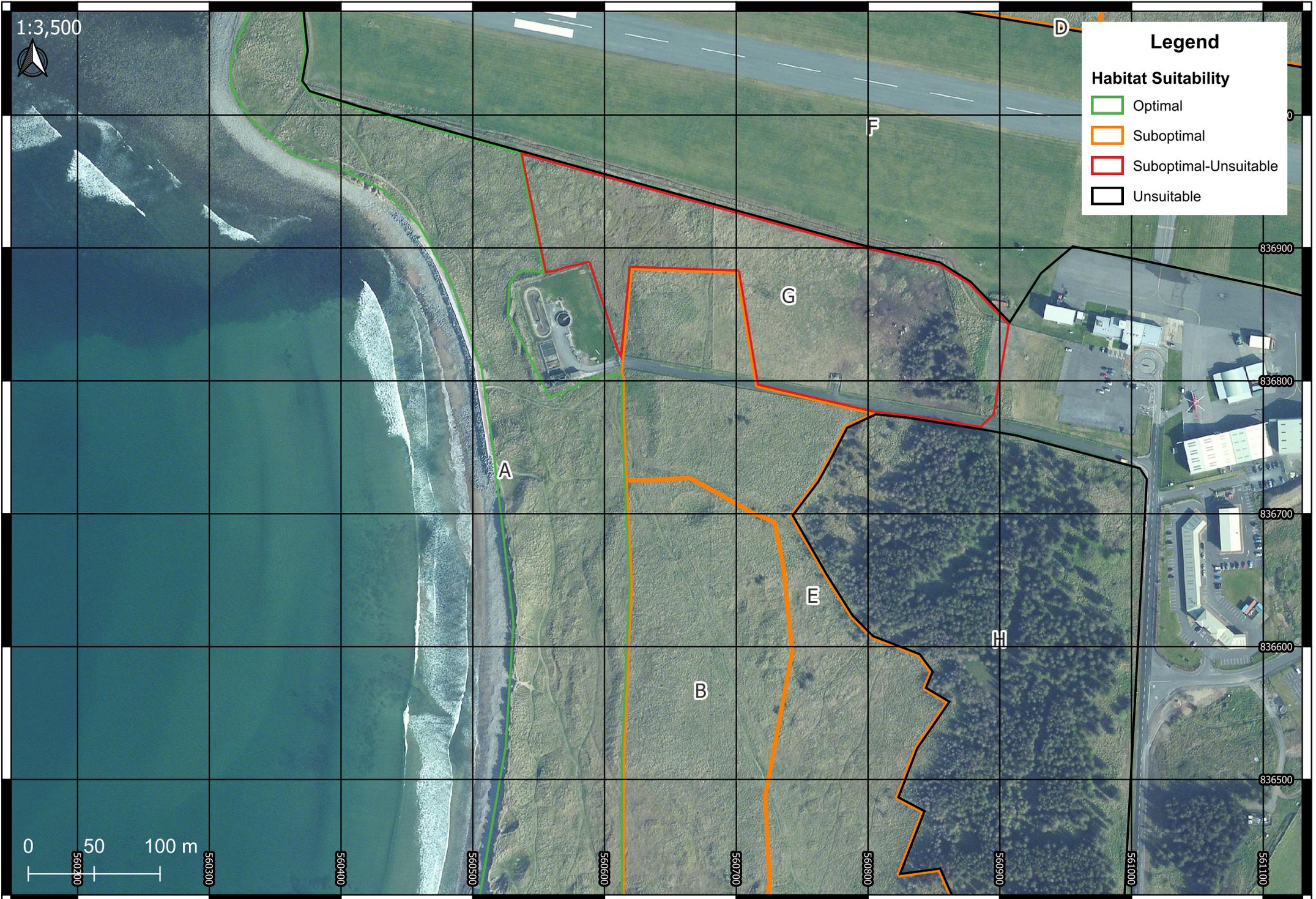


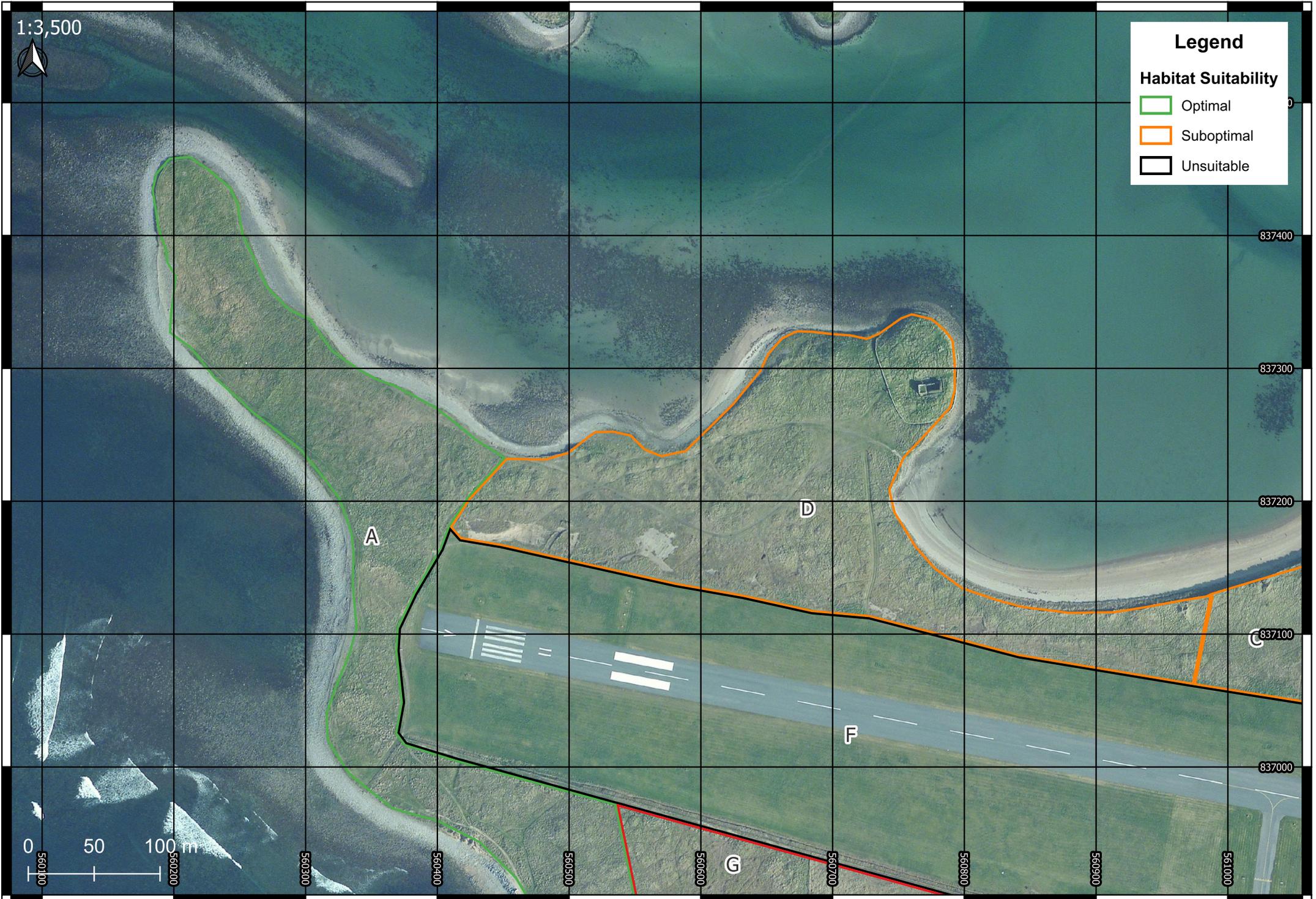
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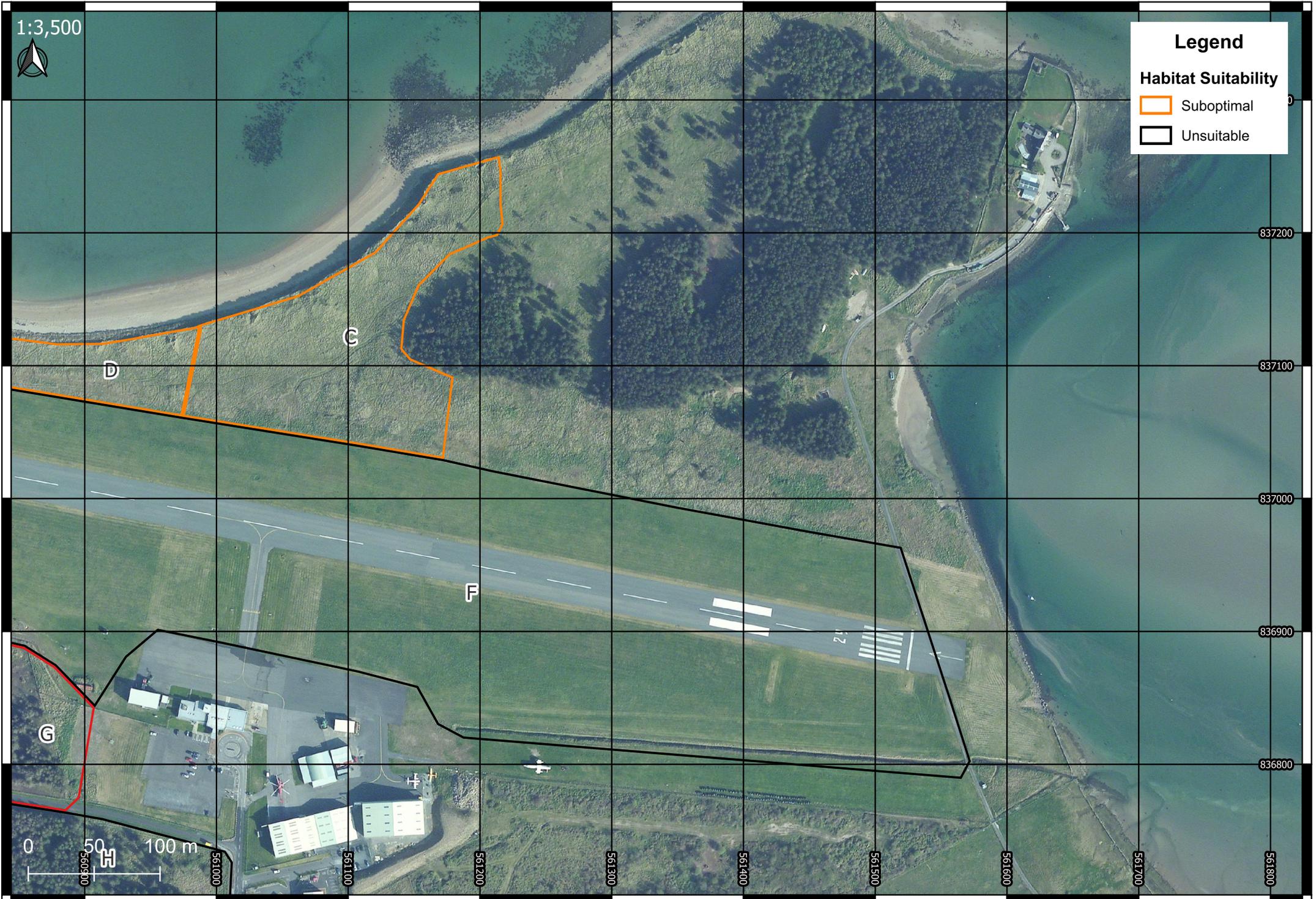
Habitat Suitability

- Optimal
- Suboptimal
- Unsuitable











Site report - Vertigo Monitoring

Vertigo angustior monitoring at Waterstown Lough

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM22 **County:** Westmeath
SAC Site Code: n/a Not in SAC **QI:** n/a

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2019-2024	22 September 2023	John Brophy & Orla Daly
2013-2018	24 September 2015	John Brophy & Maria Long

1.2 General Habitat Description (from baseline survey):

(Habitat description written as part of 2014-17 survey) The lake and its surrounding wetland communities are arranged in distinct zones across a hydrological transition. They include open water, reed swamp, tall sedge/alkaline fen mosaic, fen-grassland transition and wet grassland. The area of habitat in which *Vertigo angustior* is present at this site consists of wet grassland, and more specifically, occurs along the transition zone between this habitat and the rich calcareous fen downslope of it. It is found in a band along the upper slopes of the fen at the north-east of the site and there are saturated soils throughout. Wet grassland is not an Annex I nor CORINE listed habitat, but it is important in that it supports the so called "marsh phase" or inland habitat of *Vertigo angustior*. This habitat matches most closely with the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). Commonly occurring species at this site include *Festuca rubra*, *Iris pseudacorus*, *Juncus inflexus*, *Filipendula ulmaria* and *Carex acutiformis*. The microhabitat of the snail is the decaying vegetation at the base of taller plants (especially *Festuca rubra* thatch, where present), and living and decaying moss in the litter layer. The habitat falls within the general habitat of wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Transition zone between fen and wet grassland, with saturated soils. Vegetation typically 15 to 60 cm tall. Good cover of <i>Festuca rubra</i> , with build-up of open thatch in places, and/or good bryophyte cover. Other tall species present include <i>Iris pseudacorus</i> , <i>Juncus inflexus</i> and <i>Carex acutiformis</i>
Sub-optimal	Vegetation either taller or shorter than above. Soils not saturated, or area under water. Thatch/moss layer absent, or thatch layer thick, heavy and choking
Unsuitable	Not defined

2. SUMMARY:

2019-2024:

Vertigo angustior was not recorded from Waterstown Lough during the current survey. The previous round of monitoring recorded the snail from a single sample, where only a single individual was found, so the population appears to be sparse. The area of suitable habitat has contracted since the previous survey, with the lack of a well-developed litter and bryophyte layer noted. The main pressure acting on the site is grazing by 23 cattle that have access to the *V. angustior* habitat and the adjacent fen and grasslands. Two houses have been built, or are in the process of being built, above the site, though there is no sign of them having a negative effect on the habitat. It is recommended that the grazing level be reduced slightly by excluding animals from the area for a time, or reducing the numbers overall. This is required to allow the litter layer to develop. As all three Annex II *Vertigo* species have been recorded from this site, it is important that the requirements of all three species be considered in any changes to management.

2013-2018:

Waterstown Lough is a very important site, as it supports all three Annex II *Vertigo* species (*Vertigo angustior*, *Vertigo geyeri* and *Vertigo moulinsiana*); one of only two sites to do so in Ireland, the other being Pollardstown Fen. The *Vertigo angustior* population is limited in size and distribution, with the habitat restricted to the transition zone between wet grassland and fen along the north-eastern side of the site. Cattle currently have access to the habitat, which helps to maintain an open sward suitable for *Vertigo angustior*. Negative impacts are thought to be small in scale, but it should be noted that slow-paced hydrological change (i.e. the site drying out) cannot be ruled out. Therefore, monitoring of this site on a regular basis is important.

2007-2012:

No summary

3. TRANSECT DETAILS

TRANSECT: 0	MONITORING PERIOD: 2019-2024
Start point:	NO TRANSECT RECORDED
End point:	
Transect length:	Direction:
Description:	
Sampling frequency:	

Vertigo angustior monitoring at Waterstown Lough

TRANSECT:	0	MONITORING PERIOD:	2013-2018
Start point:	NO TRANSECT RECORDED		
End point:			
Transect length:	Direction:		
Description:			
Sampling frequency:			

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2019-2024			
Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	2.6359	Polygon A drops to Suboptimal. The habitat comprises a band of wet grassland along the mid-slope above the fen habitat below. The polygon has limited suitable habitat due to the lack of light Festuca rubra litter and a limited bryophyte layer.
Monitoring Period: 2013-2018			
Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	2.6359	Polygon A is classified as Optimal-Suboptimal, and consists of an area of habitat transitional between calcareous fen and wet grassland with Iris pseudacorus.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2019-2024								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								
Monitoring period: 2013-2018								
Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 Transect 0 (1 sample)								
2019-2024	0	0	NO TRANSECT RECORDED					
Monitoring period 2013-2018 Transect 0 (1 sample)								
2013-2018	0	0	NO TRANSECT RECORDED					

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Count type	Habitat suitability
Monitoring period 2019-2024 (4 samples)							
2019-2024	01	ITM 610226 745922	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	02	ITM 610297 745924	0	0	0	Count	Suboptimal-Unsuitable
2019-2024	03	ITM 610100 746058	0	0	0	Count	Suboptimal
2019-2024	04	ITM 610038 746147	0	0	0	Count	Suboptimal
Monitoring period 2013-2018 (4 samples)							
2013-2018	01	N 10276 45899	0	0	0		Suboptimal
2013-2018	02	N 10335 45897	0	0	0		Suboptimal
2013-2018	03	N 10153 46031	0	0	0		Suboptimal
2013-2018	04	N 10086 46123	1	0	1	Count	Suboptimal

5. CONDITION ASSESSMENT

Vertigo angustior monitoring at Waterstown Lough

5.1 Population Assessment: 1 pass Favourable (green); 0 passes Unfavourable-Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	0	N/A	NO TRANSECT RECORDED		ND
2013-2018	0	N/A	NO TRANSECT RECORDED		

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Presence/Absence	At least one adult or sub-adult snail found from a minimum of four samples, taken from across the site	Vertigo angustior absent from all four sample locations	Fail
2013-2018	Presence/Absence	At least one adult or sub-adult snail found from a minimum of four samples, taken from across the site	1 adult in S04	Pass

Mon. period	Population Notes
2019-2024	Vertigo angustior was not recorded from Waterstown Lough during the current survey based on four samples taken. This compares with one positive sample from four taken during the previous monitoring period, though the positive sample comprised a single individual, indicating the population was already sparse. Based on the criterion of Long & Brophy (2019), the Population Assessment is Unfavourable-Bad (red).
2013-2018	The population of Vertigo angustior at Waterstown Lough is limited in distribution and abundance. Four samples were taken across the site and only a single individual was recorded. Note that the grid reference given for the single positive sample in Moorkens & Killeen (2011) is likely to be an error, based on observation in the field and the description they provide in the site report. Based on the criteria developed in this survey the Population Assessment is Favourable (green).

5.2 Habitat Assessment: 2 passes Favourable (green); 1 pass Unfavourable-Inadequate (amber); 0 passes Unfavourable-Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2019-2024	0	N/A	NO TRANSECT RECORDED		ND
2013-2018	0	N/A	NO TRANSECT RECORDED		

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat extent	At least 2.4ha of the site should support habitat that is classed as Optimal-Suboptimal or better	2.64ha is Suboptimal	Fail
2013-2018	Habitat extent	At least 2.4ha of the site should support habitat that is classed as Optimal-Suboptimal or better	2.64ha is Optimal-Suboptimal	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2019-2024	Habitat quality	Soils, at time of sampling, classed as being of Optimal wetness and possessing a layer of humid thatch at all sample locations (minimum 4 samples)	Soils of Optimal wetness at all four sample points, but lacking a well-developed layer of humid thatch	Fail
2013-2018	Habitat quality	Soils, at time of sampling, classed as being of Optimal wetness and possessing a layer of humid thatch at all sample locations (minimum 4 samples)	Soils of Optimal wetness at all four sample points	Pass

Mon. period	Habitat Notes
2019-2024	While broadly the habitat at Waterstown Lough contains areas suitable for Vertigo angustior, with appropriately damp soil, there is a general lack of a litter or bryophyte layer beneath. Overall the polygon has dropped from Optimal-Suboptimal to Suboptimal. Based on the criteria of Long & Brophy (2019), the Habitat Assessment is Unfavourable-Bad (red).
2013-2018	The area of Vertigo angustior habitat runs along the length of the north-eastern section of the site. The most suitable area is limited to a narrow band of transitional habitat between the wet grassland with Iris pseudacorus and the fen below. The polygon is classified as Optimal/Suboptimal, and wetness levels were judged to be optimal at all four sample points. Based on the criteria developed in this survey, the Habitat Assessment result is Favourable (green).

5.3 Future Prospects Assessment

Vertigo angustior monitoring at Waterstown Lough

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2019-2024	PA07	Intensive grazing or overgrazing by livestock	Inside	Low	Negative	100%	At the time of survey, 23 cattle had access to the Vertigo angustior habitat as they move between fields across the day. Likely to be causing the limited build-up of a humid litter layer.
2019-2024	PF01	Conversion from other land uses to built-up areas	Outside	Low	Neutral	30%	One house has been built immediately above the site since 2005 and another was under construction at the time of the current survey.
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	100%	Cattle grazing helps keep vegetation relatively open
2013-2018	F06.01	game/ bird breeding station	Inside	Low	Negative	1%	Pheasantry at north end of site
2013-2018	J02.07	Water abstractions from groundwater	Inside	Low	Negative	5%	Very difficult to assess what effect, if any, this water abstraction is having on the site. Site appears sufficiently wet.
2013-2018	K01.03	Drying out	Inside	Low	Negative	50%	Site may be drying as lake fills with reeds.

Mon. period	Future Prospects Notes
2019-2024	The main pressure identified for the site is grazing by cattle. Twenty-three cows were recorded during the current survey that had access to the Vertigo angustior habitat, as well as a number of other connected fields. The level of grazing may be the cause of the limited litter and bryophyte layer within the V. angustior habitat. One house has been built immediately above the site since 2005 with another under construction at the time of the current survey. Given the Unfavourable-Bad (red) assessments for Population and Habitat, and the lack of any active conservation measures, the future trend is assumed to be stable or negative. This results in the Future Prospects being assessed as Unfavourable-Bad (red).
2013-2018	Activities and impacts occurring at the site include non-intensive cattle-grazing, which is considered to be having a positive effect across the whole site by keeping the vegetation reasonably open. There is a pheasant breeding enclosure at the northern end, but this is unlikely to be having an impact, apart from the small amount of land it stands on. In terms of the hydrology, which is critical at this site as with other wetlands, the site may be drying out as the lake infills and reeds extend their range into the lake (for example, the six-inch map from the early 1900s shows a much larger area of open water than that which occurs today). Water abstraction is occurring from a spring at the northern end of the site, which may have a localised negative effect on ground moisture levels. Overall, however, the Future Prospects for Waterstown Lough are currently considered to be Favourable (green).

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2019-2024	Red	Red	Red	Red
2013-2018	Green	Green	Green	Green

Mon. period	Overall Notes
2019-2024	Vertigo angustior was not recorded from the site and the area and quality of suitable habitat has reduced, resulting in Population and Habitat assessments of Unfavourable-Bad (red). Due to these assessments and the pressures acting on the site, the Future Prospects are also assessed as Unfavourable-Bad (red). Based on these assessments, the Overall Assessment for Waterstown Lough is Unfavourable-Bad (red).
2013-2018	Based on the fact that population, habitat and future prospects assessments were all considered to be Favourable (green), Overall Assessment is also Favourable (green).

6. DISCUSSION

Monitoring period
2019-2024

Vertigo angustior monitoring at Waterstown Lough

Discussion:

Vertigo angustior was not recorded from Waterstown Lough during the current survey. The previous round of monitoring recorded the snail from a single sample, where only a single individual was found, so the population appears to be sparse. The area of suitable habitat has contracted since the previous survey, with the lack of a well-developed litter and bryophyte layer noted. The main pressure acting on the site is grazing by 23 cattle that have access to the V. angustior habitat and the adjacent fen and grasslands. Two houses have been built, or are in the process of being built, above the site, though there is no sign of them having a negative effect on the habitat. It is recommended that the grazing level be reduced slightly by excluding animals from the area for a time, or reducing the numbers overall. This is required to allow the litter layer to develop. As all three Annex II Vertigo species have been recorded from this site, it is important that the requirements of all three species be considered in any changes to management.

Monitoring recommendations:

As per 2013-2018 recommendations

Management recommendations:

The current level of cattle grazing appears to be slightly too high for the site to support good Vertigo angustior habitat. A reduction in stocking level, in either time or numbers, is recommended. Cattle could be temporarily excluded using electric fences. It is important that cattle not be completely excluded from the Vertigo angustior habitat (and the overlapping/adjacent Vertigo geyeri and Vertigo moulinsiana habitat), as that would likely lead to scrubbing over or rank vegetation developing.

2013-2018

Discussion:

Waterstown Lough is a very important site, as it supports all three Annex II Vertigo species (Vertigo angustior, Vertigo geyeri and Vertigo moulinsiana); one of only two sites to do so in Ireland, the other being Pollardstown Fen. The Vertigo angustior population is limited in size and distribution, with the habitat restricted to the transition zone between wet grassland and fen along the north-eastern side of the site. Cattle currently have access to the habitat, which helps to maintain an open sward suitable for Vertigo angustior. Negative impacts are thought to be small in scale, but it should be noted that slow-paced hydrological change (i.e. the site drying out) cannot be ruled out. Therefore, monitoring of this site on a regular basis is important.

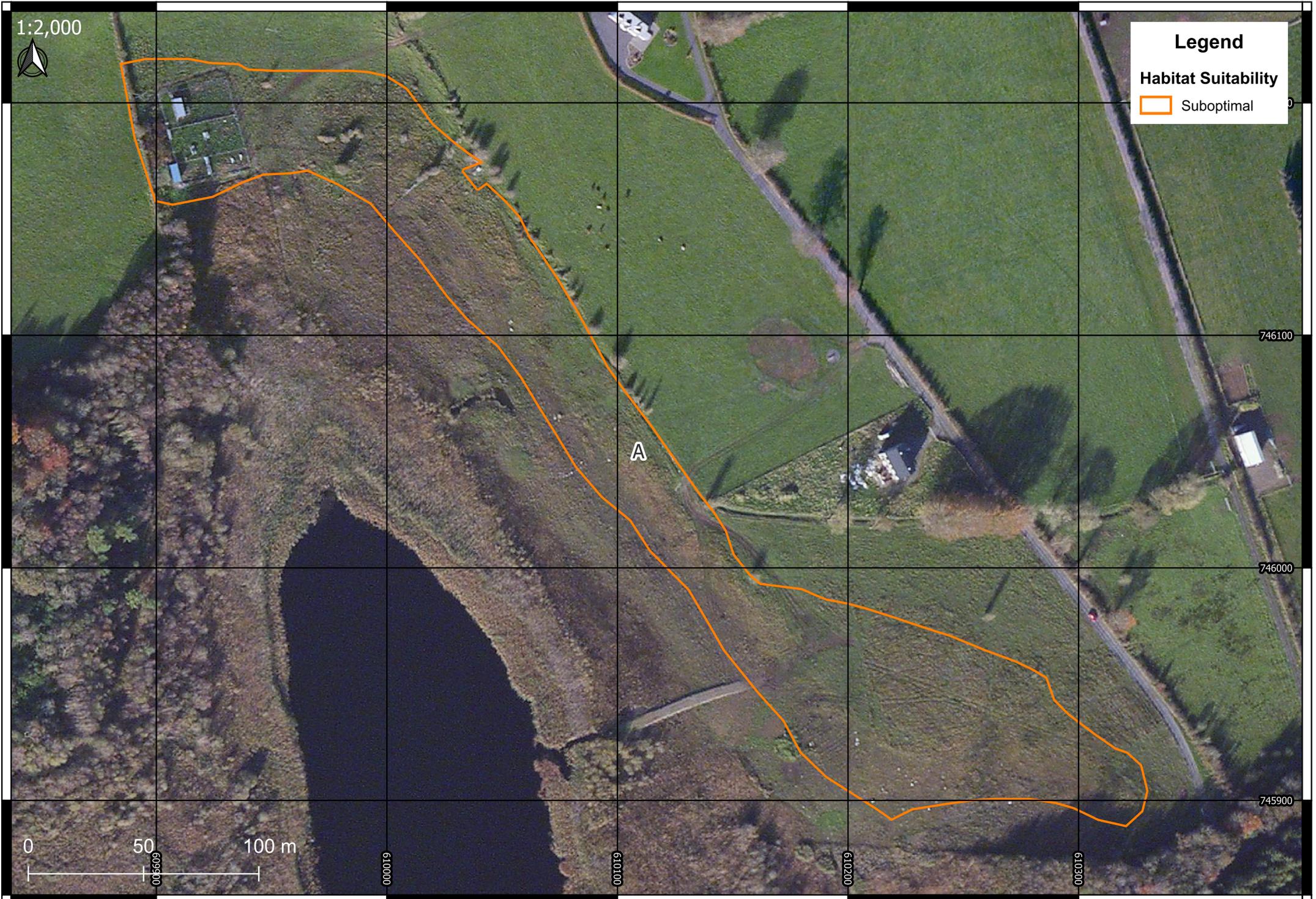
Monitoring recommendations:

Given the limited information available on the status of Vertigo angustior at this site, its importance for supporting all three Annex II Vertigo species, and the question about potential slow-paced hydrological change, it is recommended that a minimum of three-yearly monitoring be undertaken. The following actions should be undertaken:

- Take 4 samples spread across Polygon A and analyse for presence of Vertigo angustior
- Re-determine boundary of the habitat polygon and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The current management of the site through cattle grazing is appropriate to maintaining suitable habitat for Vertigo angustior. As the site also supports Vertigo moulinsiana and Vertigo geyeri, any changes to the management regime must be sensitive to the needs of all three species. Should the site be found to be drying out following future surveys, measures may need to be taken to quickly halt or reverse this.



1:2,000



Legend

Habitat Suitability

- Suboptimal

0 50 100 m

610000

610100

610200

610300

746100

746000

745900