

SEAWILDING

Community-led Marine Habitat Restoration

Scottish Charity No: SC050126

Seagrass Report 2024



Seagrass Restoration in Loch Craignish

Seagrass restoration continues to present challenges for Seawilding and other practitioners across the UK, but over the last year, through a combination of science and trial and error, we've refined our methodologies and learned a great deal. Sharing outcomes with collaborative partners around the UK, notably Project Seagrass and Ocean Conservation Trust, has helped feed into the national knowledge pool and partnering with the Scottish Association for Marine Science and a number of other academic institutions has given us access to scientific research methods that are beyond our in-house capabilities. We are looking forward to seeing the results of 2024's restoration trials over the coming growing season and we hope that this marks the beginning of a transition from the research phase to scaling up.

Background

Seagrasses have been described as one of the most valuable coastal and marine ecosystems on the planet and play a role in human well-being in many different ways:

- They enhance food security by providing shelter for juvenile commercially important fish species, helping to restore depleted fish stocks and support our coastal communities;
- They lock away carbon in the sediment preventing it from being released into the atmosphere, often referred to as 'blue carbon';
- They stabilise sediments which act as coastal defences, mitigating some of the effects of extreme weather events caused by climate change and provide an important coastal habitat.

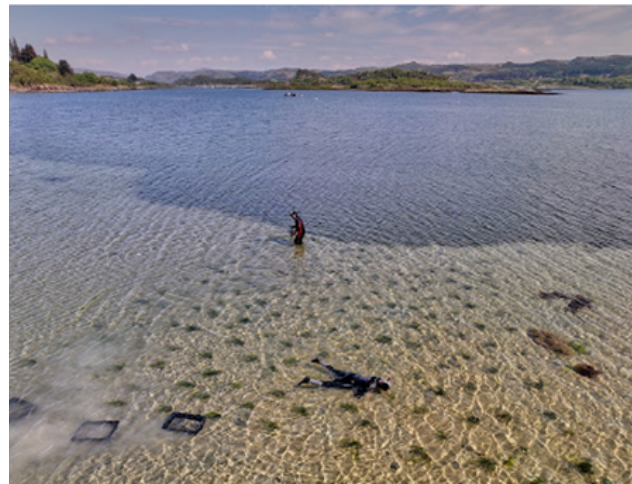
Furthermore, seagrass meadows are amongst the richest habitats for bio-diversity with over 50 species of fish having been recorded in a single meadow, along with hundreds of species of invertebrates such as molluscs, shrimp and marine worms.

Despite their benefits, seagrass habitats are under threat from a variety of factors. It is estimated that beds have declined by a staggering 92% from their historic extent around the UK due to decreasing water quality, physical disturbance of the seabed, coastal development, disease, and increasing siltation. Around the world an area the size of a football pitch of seagrass is lost every 30 minutes. The need for marine habitat restoration is clear on the west coast of Scotland where white fish stocks are commercially extinct, many fishing jobs have been lost, and destructive bottom trawling and dredging has destroyed fragile seabed habitats. Scotland is an important location for seagrass globally, holding 20% of the seagrass beds in north-west Europe, yet as of 2020 no seagrass restoration had been undertaken in Scottish waters. The lack of restoration activities meant that not only was the habitat not being improved, but also that no data was available on the feasibility of seagrass restoration in Scotland. In an attempt to address this situation, in 2021 the Scottish charity Seawilding began the first seagrass restoration

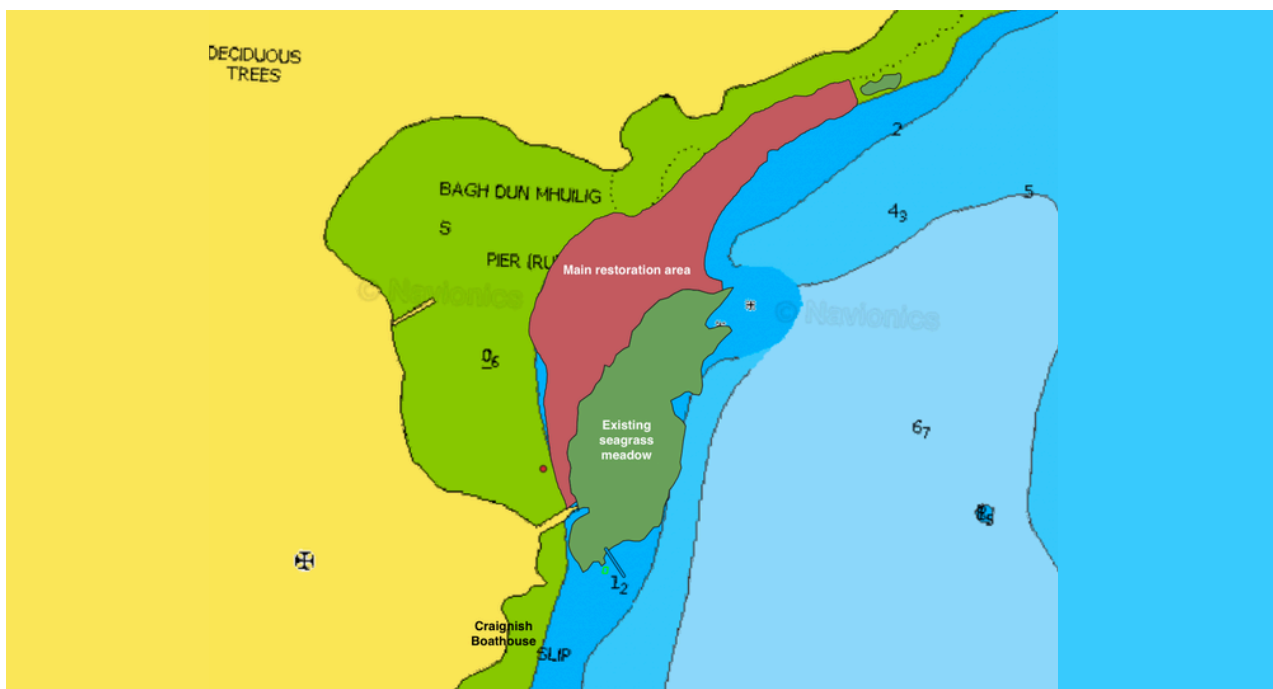
Restoration activities in 2024

To date, the project has been experiencing high failure rates with both seed and shoot (sections of rhizome with leaves attached) in the lagoonal areas of Loch Craignish. In 2023, we trialed transplanting seagrass shoots from a donor meadow into the soft lagoonal sediments, and while these grew well for the first few months, in the autumn they were failing and by the following spring they had died. In the spring of 2024, approximately 100,000 seagrass seeds were planted in high densities (800 to 1200 seeds per m²) near an existing meadow in Loch Craignish. However, once again, we observed germination of seedlings which grew to approximately 10 cm before failing.

In 2024, we have been working with the Scottish Association for Marine Science (SAMS) to investigate the cause of these high failure rates by measuring the oxygen content of seabed sediments in the restoration areas. This research has revealed the muddy sediments of the lagoon in Loch Craignish are anoxic with high levels of sulphides which are toxic to seagrass. This has encouraged us to identify and select more oxygenated areas and in 2024, we focused our attention on an area around Dun Mhullaig Bay which is adjacent to an existing seagrass meadow.



2024 seagrass shoot transplanting area



Map of Dun Mhullaig Bay showing main restoration area (in red) measuring 2.1 hectares, determined by a combination of depth and sediment oxygen levels.

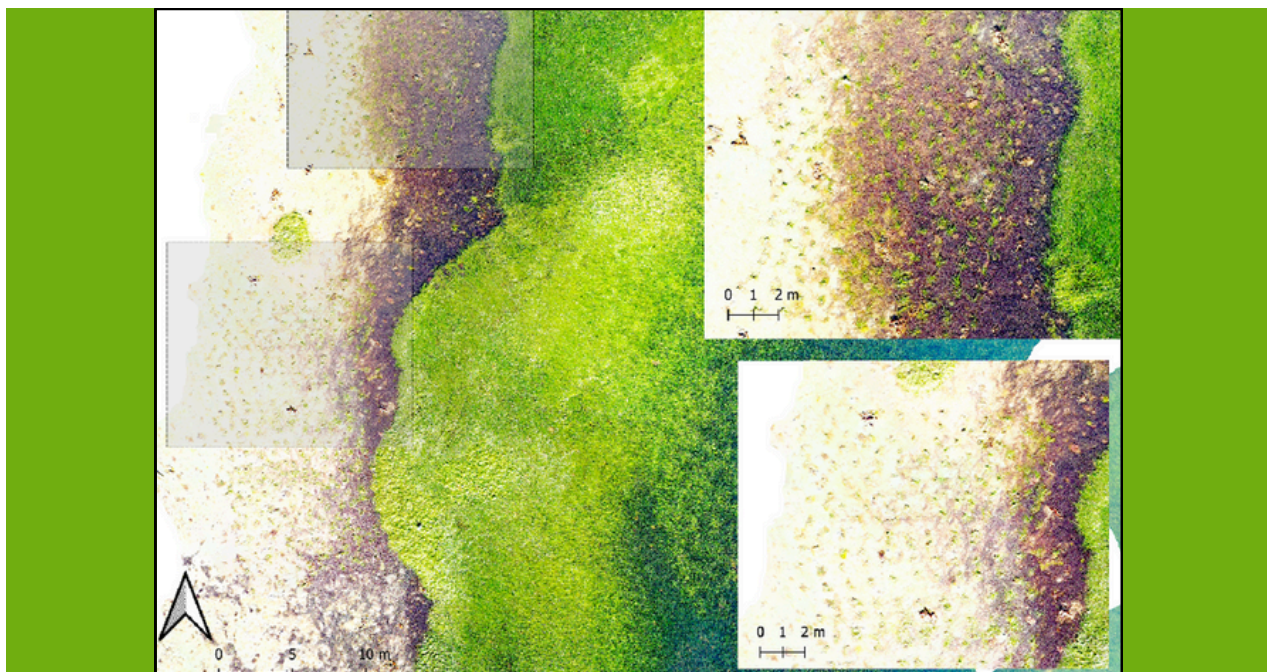
Restoration with seagrass shoots (Rhizomes)

Between May and July, with the help of over 40 volunteers, we harvested, processed and transplanted over 8,000 seagrass shoots from a donor meadow in Loch Craignish to a restoration area measuring approximately 0.12 of an acre.



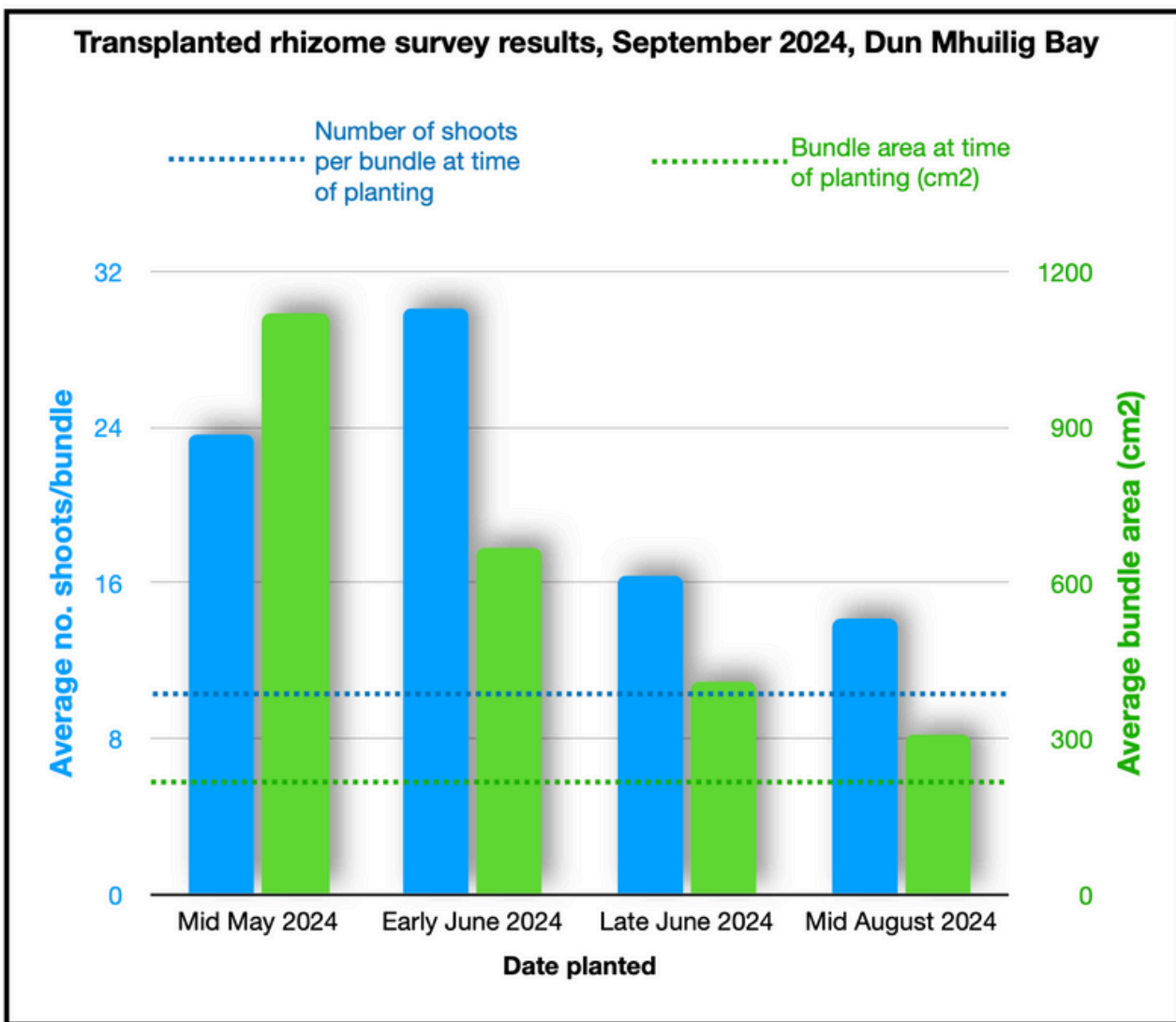
The shoots were harvested by snorkelers and brought to our boathouse. Here a team of volunteers separated the plants, attached steel washers using biodegradable ties, then tied the plants into bundles of 10 using hessian string. These were then planted out below the low water tide mark at a density of 2 bundles per m². The steel washers anchor the bundles on the seabed until the root systems have developed. Research has shown the iron washers may help improve growing conditions by reducing the rate of reduction of sulphates to sulphides which are toxic to seagrass.

With some team members now qualified to BSAC Dive Leader level, in 2024, we were able to trial transplanting seagrass using divers for the first time. This has increased our efficiency significantly, as it allows the harvesting/planting team to stay under water for longer, and reduces our dependency on tide and weather conditions.



Aerial shot of section of 2024 rhizome restoration area (left of main image, with close-ups or areas highlighted in grey as insets)

In September, we surveyed the restoration area planted in the spring and found the translocated plants to be healthy, growing, and showing a good increase in the number of shoots and spread of shoots across the seabed. The shoots planted in May 2024 showed the most growth, with up to a three-fold increase in the number per bundle and up to a five-fold increase in the area of seabed covered by each bundle (see graph below).



It's still too early to say whether this planting success represents a break-through – we need to get through the winter season and survey again in the spring – but nonetheless these are the most exciting results to be seen in the short history of the Loch Craignish seagrass project so far.

It's important that our translocation of plants does not affect the health of our donor seagrass meadows so monitoring the impact of rhizome harvesting is a key part of our scientific work. Currently we harvest just 1 to 2 shoots per m². Following an initial baseline survey to establish average percentage seagrass cover across the meadow, surveys are carried out twice a year: once shortly before harvesting begins to assess recovery from the previous year's activities, and again immediately after harvesting to record impact. We have observed no change in the areas where we are harvesting over time, with seagrass cover remaining above 80% - in the superabundant category on the SACFOR scale for turf. In the future, we may consider small-scale trials to establish the maximum number of shoots that can be harvested from an area while still allowing full recovery within a specified time period - important information to enable scaling up of restoration efforts.

Seagrass restoration using seed

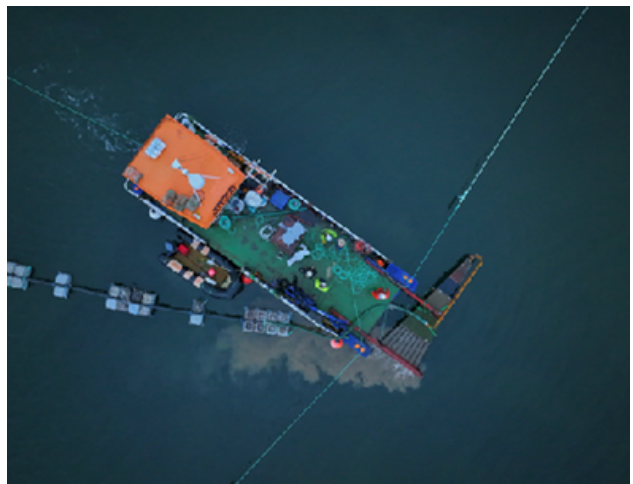
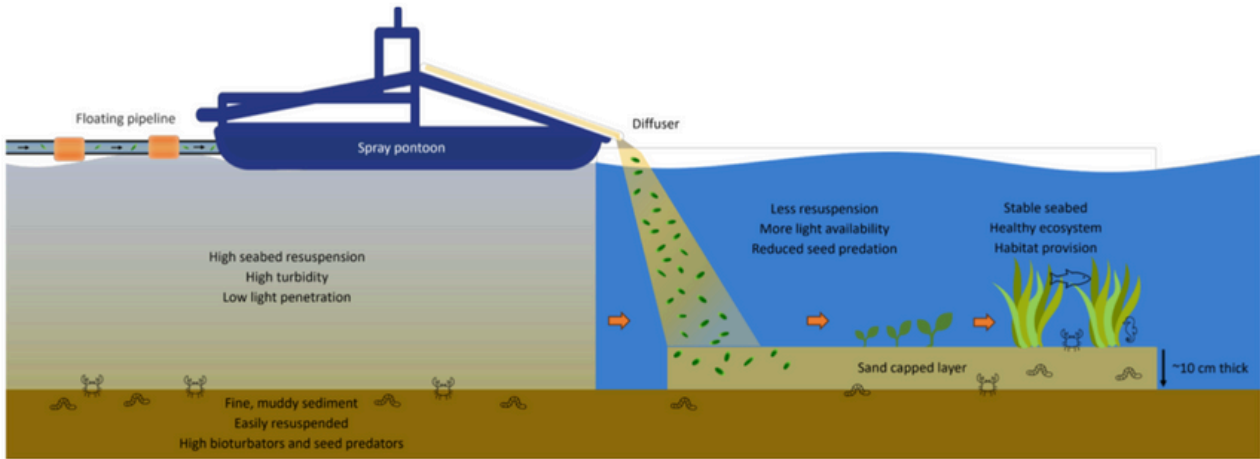
In spring 2024, approximately 100,000 seagrass seeds were planted in high densities (800 to 1200 seeds per m²) near an existing meadow in Loch Craignish. In line with our previous attempts to restore seagrass in the wild using seeds in other parts of the loch, we observed germination of seedlings which grew to approximately 10 cm before failing. In 2025 we will run further trials, planting seeds in various densities between seagrass shoots that were transplanted in 2024 to determine whether the close proximity of established plants helps seedling survival.



Volunteers assisting with the seagrass seed harvest



With the help of thirty-two snorkel volunteers and nine volunteers from the Dutch marine construction company, Van Oord, the team harvested 200,000 seagrass seeds in August 2024 which were placed in a specialised chiller unit for winter storage. One hundred thousand of these will be used in the aforementioned trials and the remainder in a "sand-capping" experiment run by our partners at the Dutch marine construction company Van Oord and the University of Groningen. Sand capping involves spreading a 10cm layer of sand-seed mixture on soft anoxic muddy sediments, which would otherwise be ill-suited for seagrass restoration, in order to improve growing conditions. In autumn 2024, Van Oord successfully laid a 100m² area of sand and "proxy" seeds in the lagoon area of Loch Craignish to test methods and equipment and in early 2025, it plans to lay a further 1000m², this time incorporating seagrass seeds. Previous attempts to transplant seagrass seeds and shoots into these anoxic sediments have been unsuccessful so the Seawilding team will also use the 100m² test area to trial transplanting seagrass shoots from a donor meadow into the sand cap.



Van Oord sand capping methodology

Seawilding - SAMS Partnership

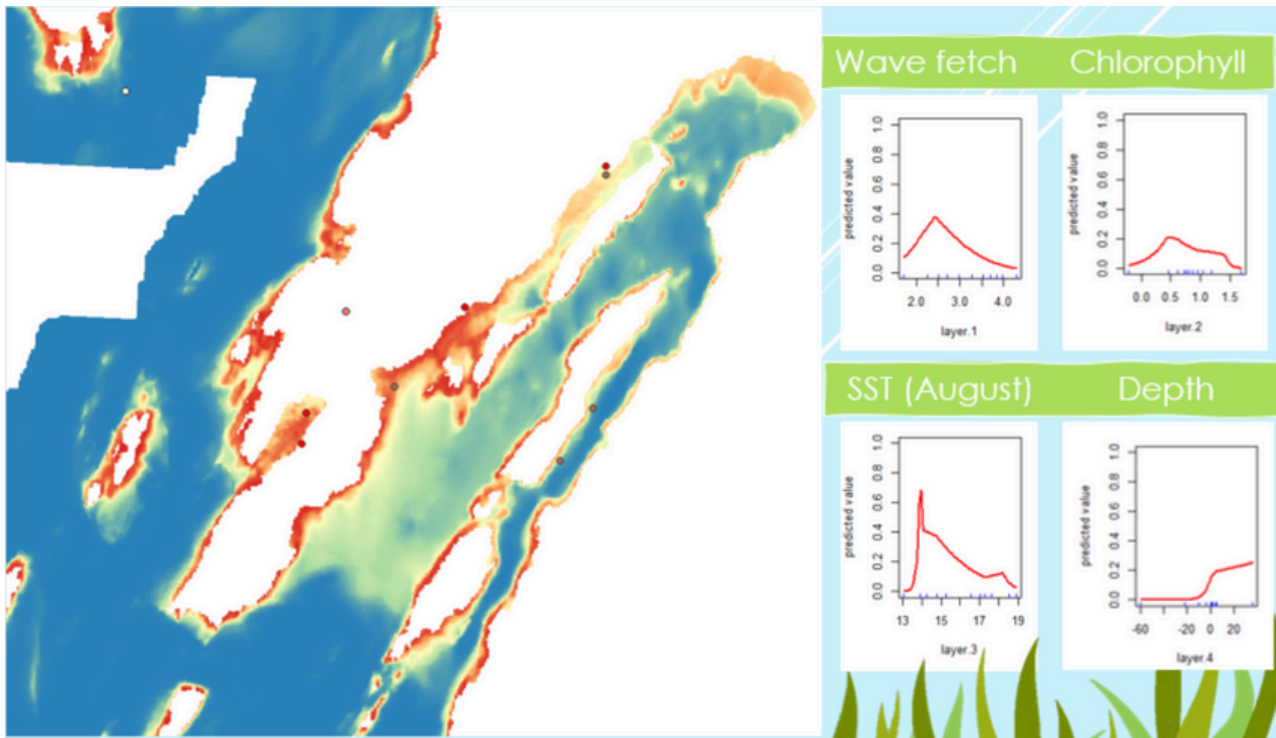
The Scottish Association for Marine Science (SAMS) has been a key partner since the beginning of the seagrass restoration project in 2021, offering analytical capabilities and scientific expertise beyond our in-house resources and helping to establish a reliable baseline for seagrass restoration in Loch Craginich. SAMS has continued to deliver this support throughout 2024, specifically:

- State-of-the-art biodiversity assessments (eDNA metabarcoding and benthic infauna analysis);
- Physical sediment characterisation (C and N and isotope values);
- Detailed drone surveys to assess environmental impacts and changes in the target restoration areas.

Additionally, SAMS has been piloting the use of eDNA and habitat modelling techniques to identify suitable sites for restoration as well as testing for the historic presence of seagrass habitats in proposed restoration sites.

Summary of findings

- The combination of drone mapping, sediment sampling, and eDNA biodiversity surveys proved effective in assessing baseline environmental conditions, though there remains room for refinement. Implementing longer-term monitoring, with sampling every five years, would be recommended for a more informative understanding of environmental changes.
- eDNA analysis highlighted the unique biological communities supported by seagrass habitats within Loch Craginich, underscoring the habitat's role in contributing to landscape-scale gamma diversity.
- Infaunal community analysis highlighted the importance of seagrass patches for diversity of smaller organisms from several genera.
- Habitat modelling within the Loch identified key regions of suitable habitat for seagrass, (including Loch Beag) and highlighted the importance of grid resolution and wave fetch as a key environmental factor and influencing distribution.
- Sediment core analysis from both Loch Craginich and Loch Beag provided initial evidence of historic seagrass presence, demonstrating the potential of this method for tracking historical habitat changes.



High resolution (20 x 20 m) habitat suitability model applied to Loch Craignish. Red areas indicate a score closer to 1 which indicates the areas is more likely to be suitable as habitat for *Zostera marina*.

The work that SAMS has been carrying out is essential if seagrass restoration is to be rolled out at scale around Scotland. Identifying restoration opportunity - factors such as sediment characteristics and historical presence of seagrass - and developing efficient ways of monitoring restoration success are key for moving forward.

The Great Seagrass Survey

In May, in conjunction with BSAC (British Sub-Aqua Club), we held the second year of the Great Seagrass Survey whereby snorkellers and divers around the UK survey seagrass meadows around the coastline. The data is entered into national databases, the hope being that by recording the whereabouts of these endangered species we can afford them better protection. This has been a fantastic way to engage members of the public far and wide and, so far, 1118 hectares of different types of seagrass has been mapped by the project around the UK.

Seagrass restoration plans 2025

We are eager to get in the water in 2025 to assess how the shoots we transplanted in 2024 recover after a particularly stormy winter. All being well we will begin scaling up, increasing from 8000 shoots transplanted in 2024 to a target of 20,000 in 2025, covering an area of 2800m². This will be made possible by the increased efficiency of using divers over a four week period during the transplanting season. We will also run a small-scale trial transplanting shoots into the test sand-cap laid by Van Oord in Autumn 2024 to investigate the possibility of using this as a method to extend the area available for seagrass restoration in Loch Craignish, and beyond.

We will, again, trial seed planting with 100,000 seeds sowed in varying densities within last year's transplanted shoots and between 2025's new transplants, and a further 100,000 sown in Van Oord's sand-capping trials in the lagoon.

We look forward to welcoming a new member of staff to the Seawilding team on a part-time basis. A marine scientist currently based at SAMS, Alex Thomson is perfectly suited to lead the charge with our ongoing surveying and monitoring work throughout the summer of 2025, along with a team of seven well-qualified newly-recruited interns.

We are very excited to have partnered up with Musa Landscape Architecture to create a show garden for the RHS Chelsea Flower Show in May 2025. Funded by Project Giving Back and supported by the William Grant Foundation, it will be the first time that seagrass has featured in the show's 111 year history. Although this is a departure from our usual hands-on restoration activities, it will give us a fantastic platform from which to broadcast our message to a wider audience and hopefully open avenues to new resources.



The Seawilding Garden, RHS Chelsea Flower Show

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