

Getting started with seagrass restoration – Webinar Q&A responses

Webinar held on 25 July 2024.

Watch the webinar recording here: <https://vimeo.com/989859700>

Contact: seagrass@cawthron.org.nz

Visit: www.cawthron.org.nz/seagrass

- 1. Just within the consideration piece on translocating, if you are working closely with mana whenua, you don't need to discuss this with iwi, you would surely have iwi at the forefront to lead not to be led?**

Cawthron's relationships with mana whenua partners and clients are central to how we operate. Our goal is always to empower them to achieve their aspirations by providing technical expertise.

Some iwi/hapū may want to lead a restoration project, while others may not have the capacity to be involved to that degree but would like to be kept informed on progress and/or have discussions at critical decision points.

- 2. Would you say that seagrasses are more vulnerable to sedimentation and other stressors/effects during their flowering season?**

We are unsure whether seagrass would be more vulnerable to sedimentation during the flowering period. If the seagrass was completely smothered with sediment, as it was after the August 2022 floods in Whakatū/Nelson, then this could potentially hinder the release of pollen and therefore the pollination of the flowers. It is thought that seagrass may allocate more resources to sexual reproduction (flowering) when under stress as this increases the potential for the plant to move to a site with more favourable environmental conditions.

- 3. Are there are some examples of how you have engaged, collaborated with mana whenua? And how successful have they been in sharing their mātauranga? Do you have indigenous knowledge stand side by side with Western science when restoring the nana?**

When we first started our research programme, we carried out interviews with individuals from a local hapū to understand environmental changes in our case study estuaries, mātauranga Māori associated with seagrass (such as pūrākau, tohu, rongoā, whakapapa) and views on seagrass restoration. This was informative and provided a good foundation for our research. Depending on how our research progresses, we would seek mana whenua views on translocating seagrass between estuaries. We believe in the inclusion of mātauranga Māori in developing unique seagrass restoration techniques. We recently held an event where rangatahi/tamariki from Te Kura Kaupapa Māori o Tuia te Matangi came out to the seagrass meadow and visited our laboratory to learn all about seagrass restoration and they also shared knowledge from a Te Ao Māori perspective.

4. Who are the mana whenua iwi?

In short, who holds mana whenua depends on the area of interest for restoration. For our case study estuary, we have been engaging with six iwi local to Whakatū / Nelson.

5. Congratulations on a great resource! Your presentation was super informative and practical. You mentioned you'll share the recording. Will it be in a form that is able to be shared this on social media to spread the seagrass intel?

Thank you for your positive feedback. You will have seen in the follow-up email that the webinar has been uploaded onto Vimeo ([Getting started with seagrass restoration on Vimeo](#)). You will be able to share a link to this on social media. Cawthron has also shared the webinar on its social channels so you could share one of these posts on your channels.

6. Are you aware of any organisations/individuals who have already started some seagrass restoration work in NZ, and utilised the work you've done? (excluding yourselves). Or is it too early?

It's still early days for seed-based seagrass restoration and we are confident no one has tried it here in Aotearoa New Zealand yet. However, several projects have attempted to translocate clumps of seagrass and individual seagrass plants. We can think of at least four estuaries/harbours where seagrass restoration has been trialled in Aotearoa New Zealand. The most successful example was a project carried out in 2008 and 2012 that was led by the National Institute of Water and Atmospheric Research (NIWA, Fleur Matheson and others). By 2017, seagrass in Whangarei Harbour had increased by 600 ha to occupy 40% of its previous range. However, it is likely that seagrass extent would have increased without intervention following improvements in environmental conditions, making it difficult to assess the contribution of active transplantation to this expansion. Nevertheless, it demonstrates that it is possible to successfully transplant seagrass in Aotearoa New Zealand if the environmental conditions are suitable. Here in Nelson, we've also been investigating transplantation using intact seagrass clogs. In our study, we saw blade length double and 8 x the number of blades from August 2023 to April 2024. Further information on seagrass translocation projects in Aotearoa New can be found in our report: Review of the potential for low impact seagrass restoration in Aotearoa New Zealand (https://www.researchgate.net/publication/355356605_Review_of_the_potential_for_low_impact_seagrass_restoration_in_Aotearoa_New_Zealand).

7. Is there a nationwide communication plan to help inform the general public? Our Snells Beach community has people vocally opposed to seagrass for many reasons, including the belief it has caused the demise of scallops.

No, we do not have a nationwide communication plan to help inform the public about the importance of seagrass, but we can see that this would be useful. Hopefully our seagrass restoration blueprint and summary document provide information that you can use to convince people of how important this habitat is. The Department of Conservation also has some good links to articles about the importance of seagrass (<https://www.doc.govt.nz/nature/habitats/estuaries/our-estuaries/seagrass-and-mangrove-extent/>).

Seagrass and scallops can happily co-exist together. However, in general they do not occupy the same coastal areas in Aotearoa New Zealand. This is because scallops are subtidal so must live in places that are permanently covered with seawater. Most seagrass meadows in Aotearoa New Zealand are found in intertidal areas, which are exposed to the air at low tide. Although seagrass can live subtidally, such meadows are rare along our coastline as the water quality is not sufficient for them to photosynthesize. Where subtidal meadows do exist, their maximum depth is around 10 m and scallops are able to live much deeper.

8. Will there be a blueprint to assessing habitat suitability at a local scale prior to starting a restoration experiment? Something to help practitioners know if they have a spot that may work as a successful site.

The Blueprint contains information on choosing a restoration site (see Section 3.3). This includes a table of information on what environmental conditions seagrass in Aotearoa New Zealand prefers.

9. How do you store your seed after flushing with freshwater prior to planting in the field?

It depends on what you want to do with the seeds. You could either flush them with freshwater and then sow directly at the restoration site or you could germinate and grow them in sediment in the laboratory until they become seedlings and then outplant the seedlings at your restoration site. Prior to the freshwater flush, we store our seeds in sterile seawater in the fridge in the dark (refer to Section 4.5 of the Blueprint for more information on this).

10. Do we happen to know how fast seagrass grows?

At small scales (i.e., < 0.25 m²), seagrass can grow relatively fast. Aotearoa New Zealand studies that have tracked the recovery of seagrass after harvesting seagrass for transplantation found that the disturbed areas (10-20 cm², 10-15 cm deep) recovered within 3-9 months. Here in Nelson, we've also investigated small scale transplantation using 200 mm intact seagrass clogs. In this study, we saw blade length double (~45 mm to ~90 mm) and 8 x the number of blades (~30 to as many as 334) from August 2023 to April 2024. However, if we are thinking about larger scales (e.g., from a few to 1000s of hectares) it's generally longer than five years and often more than a decade for seagrass to recolonise after disturbance. In Aotearoa New Zealand, seagrass in Whangarei Harbour increased (from 1000 m² to 4600 m²) over

two years after transplantation. This expansion largely took place over a relatively short period (from mid-spring to mid-summer). While some of it could be attributed to active transplantation (up to 4.5 m²), much of it occurred beyond the original transplant site. In Tauranga Harbour, damage (presumably at scales less than 1000 m in distance; more likely to be 10s or 100s) to a seagrass bed caused by laying a pipeline was evident two decades later. So, it can vary. Further information on timeframes for natural recovery of seagrass can be found in our report: Review of the potential for low impact seagrass restoration in Aotearoa New Zealand (https://www.researchgate.net/publication/355356605_Review_of_the_potential_for_low_impact_seagrass_restoration_in_Aotearoa_New_Zealand).

11. Are the monitoring tools available for feasibility studies, i.e where its unknown if sea grass was historically located there? and conditons are favourable or suited?

A good starting point to assess the feasibility of a site for seagrass restoration is to speak with a coastal scientist from your local council to see what information they hold on seagrass in that area. Many councils have current and historical maps of seagrass meadows in their region. You can also look at the Department of Conservation's interactive seagrass map, which shows the current and historical extent of seagrass in Aotearoa New Zealand (<https://www.doc.govt.nz/nature/habitats/estuaries/our-estuaries/seagrass-and-mangrove-extent/>). It should be noted that while this website has made every effort to catalogue all the seagrass extent information from around Aotearoa New Zealand, there could be additional information available.

Table 1 in the Blueprint contains information on the optimal environmental conditions for seagrass in Aotearoa New Zealand. Your local council may hold information on the environmental conditions (e.g., light, sediment mud content, temperature) at your potential restoration site. You can check these against the information in the table to get an idea of the suitability of your site. However, as environmental conditions can vary over small spatial scales, and over time, we would recommend collecting your own information at the potential restoration site if possible. This might involve collecting some sediment samples and putting out some light loggers as a starting point. You can also refer to Sections 3.3, 5.1 or 5.2 in our Blueprint on gathering monitoring information to inform restoration site selection, setting up baseline monitoring or monitoring for restoration success.

12. What key points are you emphasising in terms of the importance of restoration, to try and convince private investors to invest?

We mainly focus on the suite of ecosystem services (i.e. benefits to humans) that seagrass provides. These are covered in the Blueprint in Section 1.2 and include supporting biodiversity and fisheries, regulating water quality and mitigating climate change. By restoring these important ecosystems, you can help boost biodiversity, enhance fisheries, improve water quality and mitigate climate change effects. There are also a range of social outcomes that occur when restoring seagrass meadows. These are discussed in Section 5.3 of the Blueprint and include things such as the

development of new partnerships and collaborations, environmental education, building trust between industry and the public, innovations resulting from project activities and wellbeing benefits (amongst others).

13. The recent report on seagrass die-off in Whanganui inlet has implicated increased water temperature due to climate change as the main cause. What do we know about temperature effects on seagrass germination and growth? And are there ecotypes with greater heat tolerance that could make a difference?

This is an active area of research internationally. A rapid rise in temperature has been found to increase germination in some cases, but the long-term survival of those plants under those increased temperatures is unknown. Over long, hot summers you'll often see the die-off of intertidal seagrass. We are not sure how much is desiccation stress vs. stress from the warm water. This is something which would be interesting to study further.

In Aotearoa New Zealand, northern seagrass populations could be adapted to warmer conditions. As you suggest, you could potentially translocate these plants to places affected by marine heatwaves as a mitigation measure. However, translocation of seagrass does come with some genetic, social/cultural and biosecurity considerations (see Section 3.4 of the Blueprint) so would need to be done carefully. A good first step would be to grow seagrass from Northland and seagrass from Whanganui Inlet in a laboratory under a range of conditions to see if the Northland plants cope with the heat better. It's something we would like to do here at Cawthron if we had the funding. Long-term, there is also the potential to selectively breed seagrass for traits such as heat tolerance or disease resistance. But this is a long way down the track as it would require a large-scale seagrass nursery that had families of different plants as source stock for selective breeding.

Our planning chapter in the Blueprint (Section 3.1) refers to a study that has a useful framework (not seagrass specific) for enhancing the resilience of ecological restoration projects to future climate change (Simonson et al. 2021).

14. How much more successful is the survival rate of seed-based restoration compared to the natural process of germination?

We do not have the answer to this question but it's something that would be good to quantify in the future. Theoretically, we should be able to optimise environmental conditions so that we obtain greater germination rates under our controlled laboratory conditions than would be possible in the wild.

15. Do these meadows trap sediment or are they damaged by sediment?

Both. One of the beneficial ecosystems services that seagrasses provide is their ability to trap and stabilise sediment, thereby helping to keep our coastal waters nice

and clear. They do this by creating turbulence and slowing down the flow of water, which causes the sediment particles to drop out and become trapped by the roots and blades. However, seagrass is also susceptible to sedimentation. Large volumes of sediment arising from floods etc. can smother seagrass meadows, covering the seagrass blades and preventing them from photosynthesizing. Sediment resuspended in the water can make the water too murky for light to be able to penetrate, also restricting the ability of seagrass to photosynthesize. One of the things that makes seagrass restoration difficult is this feedback between sediment, light and seagrass. Once the seagrass is lost, the water tends to become more turbid and darker from resuspended sediment and this in turn hinders the reestablishment of seagrass.

16. Awesome work! Are there any long-term aspirations to have a centralised seed bank available for restoration? Or are the genetics considerations too significant to make this happen? Thanks

Our long-term aspiration would be to have a centralised seagrass nursery (or regional nurseries) that could provide seagrass seeds or plants for restoration projects. However, we are a long way from that right now! In addition to the genetic considerations that you mention there is still work that needs to be done to optimise seed storage, germination and seedling growth.

17. From the optimal condition chart, it shows no impact on temperature difference for seagrass except for frost; is there any temperature impacts at different stages?

Off the top of our heads, we do not know of any research that looks at temperature effects on seagrass at different life stages. However, there is likely to be an upper temperature limit for seagrass and further work is needed to determine what this is for seagrass in Aotearoa New Zealand.

18. Is there seed banking for the different populations? And/or a national collection of material

There is currently no seed banking or national collection of seagrass material. See our response to Question 16 for more information on what this might look like in the future.

19. Fantastic work guys! Really inspiring to see this come together. We're working on the seaweed equivalent here at Love Rimurimu - and this kind of sharing is so important with others in the space. Developing restoration techniques & sharing these in complex and ever-changing environmental conditions is challenging - so congratulations on all of your work bringing this together.

Thank you. We are huge fans of Love Rimurimu!

20. Off topic a bit but do you have any idea why seagrass is increasing around Auckland? eg. Inner Waitemata and Pine Harbour

It's not uncommon for seagrass to expand if environmental conditions are favourable. Usually, this would indicate that the water quality has improved. We are not familiar with these two examples but potentially the water there is clearer than it was in the past. There are a range of other factors that may limit seagrass growth, so it depends on what the original stressors were at those sites. Seagrass can also contract and expand seasonally, so it's important to compare seagrass extent at the same time of the year to get a true picture of changes. We do hear of examples from around Aotearoa New Zealand where seagrass is naturally expanding. This is what is referred to as 'passive restoration', where the reduction or removal of a stressor allows the system to naturally recover. Passive restoration is preferable to active restoration where humans intervene and re-establish seagrass through reseedling or transplantation. However, removal of a stressor is sometimes not enough to facilitate recovery (e.g., no source population of seagrass nearby for recolonisation) and active restoration is then required.

21. When reestablishing seagrass beds, do you find pest birds such as swans graze and strip your beds? Note we've got a large population of swans in and around a site in Napier Hawke's Bay that we're looking at re-establishing seagrass within?

Swans and geese have been demonstrated to consume large amounts of seagrass in Aotearoa New Zealand, so they have potential to hinder the establishment of a seagrass meadow. It might be possible to construct a cage structure to exclude the birds while the plants are getting established, but this would only be possible on a small scale.

22. Do you know of any examples of projects that have used seagrass restoration as a form of offsetting or mitigation to the marine environment?

There are a couple of examples in Aotearoa New Zealand that we have heard of, but we don't have details on whether these went ahead nor what the outcomes were. Both were related to the construction of coastal roads that displaced or impacted nearby seagrass meadows. Overseas, we know of a large project in Central Queensland that is attempting to re-establish a seagrass meadow to offset the displacement of a meadow that is going to be used as a disposal ground for sediment dredged from shipping channels. Our understanding is that the port company is establishing a seagrass nursery to provide the source material for the restoration project. With offsetting, mitigation and compensation becoming more common in Aotearoa New Zealand, we think regulatory authorities would use seagrass restoration as a management tool if we had robust restoration approaches available.

23. What about plague numbers of swans and geese. Is it worthwhile trying to establish seagrass in these situations?

We think it would be difficult as they have been shown to consume large amounts of seagrass in Aotearoa New Zealand. As we said in response to the similar question above (Q21), perhaps it would be possible to construct a cage structure to exclude the birds while the plants are getting established, but this would only be possible on a small scale.

24. Thanks for your amazing work 😊

Thank you for coming to the webinar.

Answered during the webinar:

These questions were answered during the webinar so please see the recording [here](#) for those responses. Summaries of those answers are below, with additional information for some questions.

1. Hi Anna - What sort of permit do you need for seagrass restoration project?

Hi Cat, nice to hear from you:)

Section 3.6 of the Blueprint provides details on government permits required for a seagrass restoration project.

These include:

- The Ministry of Primary Industries (MPI) for biosecurity permits and any research involved in sampling, moving and studying marine resources.
- Fisheries New Zealand (FNZ; part of MPI) for special permits for any type of plant extraction (e.g. seeds) and translocation.
- The Department of Conservation (DOC) for permits for work within conservation areas and marine reserves, or on species protected by the Wildlife Act 1953.
- A resource consent from the local council may be required if they decide that the restoration activity might affect the environment, and that is not allowed 'as of right' in the district or regional plan.

Permits for community-led projects may be different to those required for projects led by scientific research organisations. It is best to talk to these four government authorities to determine what is required for your project. It is also important to engage with local iwi and hapū who have a connection with the potential restoration area (if they are not already leading the project themselves).

2. **Wondering what the benefit of a stand-alone app is over using one of the many apps already out there eg creating a project in iNaturalist. There may be resistance to another app and also having a project in iNaturalist might reach a wider audience and increase the engagement.**

The apps mentioned in the webinar were just examples of the types of apps you could use to share your project with a wider audience. iNaturalist is a great app and we would encourage people to use it.

3. **What is the freshwater flush mimicking? What is the natural germination version?**

It is thought that the freshwater flush mimics the large rain events that tend to occur during unsettled spring weather.

4. **When a seagrass meadow does flower, is there a "catch-limit" so to say of how many flowers should be collected to assure the ongoing health of the donor site?**

Collection of seagrass material (including limits) will need to be approved by the Ministry for Primary Industries (MPI) (and potentially DOC if relevant) on an individual basis for each restoration project. As an example, our permit from MPI stipulates a wet weight limit of flowers that we can collect from a given estuary.

We would encourage you to survey the flowers in your meadow before starting your project to get an idea of how dense and widespread the flowering is and when flowering peaks. To avoid placing additional pressure on stressed seagrass meadows, we recommend finding donor meadows that are healthy and have good numbers of flowers.

5. **Greetings from the Habitat Restoration Program at Biscayne National Park in Homestead Florida USA, where Dan Crossett first worked with seagrass restoration many years ago. HI DAN!!! Thank you for sharing this exciting new work from New Zealand. A few questions: Do you have an understanding of clonal diversity in these meadows, that might inform spatial aspects of flower collection? Do you have guidelines on density of flower collection - is there a concern of "robbing Peter to pay Paul"? Are you concerned with trampling the meadow while working in these meadows? THANK YOU!**

Thanks for tuning in Amanda! Great to have international viewership here and kia ora to everyone at Biscayne!

We have not yet carried out any genetic work on these meadows, but it is something we would like to do to answer your question about clonal diversity and inform where it is appropriate to source seagrass seeds from. We do notice 'patchiness' of seagrass flowers within a meadow and likely there is a link here to clonal diversity.

As mentioned in response to Question 4 above, we have a permit from the Ministry for Primary Industries that stipulates a limit to the amount of flowers that we can collect from a given estuary. Flowering in our case study estuary is widespread and relatively dense, and our method of handpicking means it would be very difficult to overharvest. We also aim to move to another flower patch within the meadow regularly to avoid picking too many flowers from (or heavily trampling) one area. That said, if the numbers of flower picked in the future significantly increased through higher effort or technological innovations, there could be a risk of overharvesting. In terms of robbing Peter to pay Paul, we expect to have better germination success under controlled conditions in the laboratory and field than you would get in the wild. Many of the seagrass seeds released in the wild may not end up in an appropriate location or could be outcompeted by adult plants.

Trampling is not a concern at the scale of which we are collecting flowers at the moment. The sediment beneath the meadow is pretty stable so walking over the meadow causes little damage and we cover a tiny fraction of the extent of the meadow. But as with flower picking, this could become an issue in the future if effort increases or the flower picking approach changes (e.g., becomes mechanised).

- 6. On the topic of temperature around the seagrass. I guess you saw this news about the large seagrass loss at Whanganui Inlet, put down to heat waves from climate change. What do you think of how this risk affects investment to restore seagrass? Once you have the nurseries and seed collection set up will it be easy to “simply” repeat reseedling if heatwaves cause a big die-off? Any thoughts? <https://www.stuff.co.nz/climate-change/350347433/nearly-all-dense-seagrass-gone-protected-inlet>.**

We think the example at Whanganui Inlet highlights the role that active restoration could play in helping our coastal ecosystems become more resilient to climate change. If we had a large source of seagrass seeds available, we could re-seed the meadows after these events to speed up their recovery and make them more resilient to the next heatwave. Similar efforts have been taking place in Australia in response to large storm events. Facilitating seagrass meadow recovery is a much better option than trying to re-establish a meadow once it has been lost because the ecological feedback between sediment, light and seagrass is still functioning (see response to Question 15).

As mentioned in response to Question 13, you could also translocate seagrass from northern parts of Aotearoa New Zealand that may be better adapted to cope with warm temperatures. And further down the track it may be possible to selectively breed seagrass for traits such as heat tolerance.

Resources:

Learn more about Cawthron's Restore the Meadows seagrass restoration here:

<https://www.cawthron.org.nz/seagrass>

Download 'A blueprint for seed-based seagrass restoration in Aotearoa New Zealand'



summary here: <https://www.researchgate.net/publication/380264132> [A blueprint for seed-based seagrass restoration in Aotearoa New Zealand Summary](#)

Download 'A blueprint for seed-based seagrass restoration in Aotearoa New Zealand' full technical report here:

<https://www.researchgate.net/publication/380263874> [A blueprint for seed-based seagrass restoration in Aotearoa New Zealand](#)

Download 'Review of the potential for low impact seagrass restoration in Aotearoa New Zealand' here:

<https://www.researchgate.net/publication/355356605> [Review of the potential for low impact seagrass restoration in Aotearoa New Zealand](#)