

Coastal Peppercross

Lepidium banksii Kirk

Against all odds



Coastal peppercross. Simon Walls, DOC

Quickfacts

A tough coastal herb

Faces a wide range of threats from pests and diseases

Almost extinct in the wild

Needs constant support from people to survive

The battle of the coastal peppercross

It is unusual, and very disturbing, that the coastal peppercross – a hardy plant adapted to inhabiting the tough north-west Nelson coastal environment – has proved to be so vulnerable to a large number of exotic pests and diseases. Pests known to attack coastal peppercross include:

Diamond Back Moth: Infestations skeletonise the plant.

Pigs: Uproot and eat the plants.

Weeds: Competition for space and light with a number of weeds.

White rust (*Albugo candida*): Infection by this fungus causes sickening plants.

White cabbage butterfly caterpillars: Infestations strip the plant of leaves.

Grey aphids: Dense infestations drain the plant's sap.

Rabbits: Kill plants by nibbling them down to the ground.

Hares: Kill plants by nibbling them down to the ground.

Rats: Eat the seeds and leaves, and kill plants by nibbling the stems.



Mice: Eating the seeds before they are spread and can germinate.

Possums: Kill plants by nibbling them down to the ground and breaking the stems.

Deer: Kill plants by nibbling them down to the ground.

Snails: Infestations strip the plant of leaves.

Slugs: Infestations strip the plant of leaves.

White Fly: Dense infestations drain the sap and kill cultivated plants.

Turnip mosaic virus: Causes ill health of cultivated plants.

Inhabiting the tough coastal environment, coastal peppergrass also has to cope with storms, large waves, saltwater inundation, flood debris, landslips and droughts. The decline in seabird and seal colonies, primarily due to predation by people and exotic mammals, has dramatically reduced the bare high-nutrient habitat of the coastal peppergrass.

And these are just the problems we know about!

Conservationists have battled against these threats since the early 1990's by searching for the last of the wild populations, collecting and scattering thousands of seeds and planting hundreds of nursery-grown plants at more than 21 sites in Golden Bay.

The coastal peppergrass world

Coastal peppergrass has a stubborn lifestyle. As it grows it develops a swollen tap root which probably helps the plants survive both the regular dry weather of Nelson and frequent bashings by passing wildlife. It is thought to prefer open sites with lots of light and bare soils that have high fertility: places like those created in seal and seabird colonies where the animals moving around crush the vegetation and create bare ground, and their droppings enrich the soil. Other sites known to have been occupied by coastal peppergrass include bare ground left after landslips, crevices in coastal rocks, and sandy beaches. When conditions are good, it produces masses of seed which when wet develops a sticky outer layer that 'glues' itself to passing birds and seals, who drop the seed at new sites when they preen their feathers or brush against rocks. Some seabirds would also have gathered coastal peppergrass for nesting material and spread the seeds that way. While coastal peppergrass can grow into a 1 metre tall bush, it is often much smaller – especially where it is being regularly squashed by seals and seabirds! Its small white flowers are pollinated by a range of small insects and develop into a capsule which splits to release the small brown seed. The leaves are peppery to taste, and this is why many members of its brassica family (the Brassicaceae) like cabbage, cauliflower, broccoli and swedes are cultivated by people. Some of New Zealand's peppergrasses were eaten by Maori and early European explorers as their leaves are high in vitamins – this led to them being named "scurvy grasses" as they helped prevent the development of scurvy (a deficiency in Vitamin C which causes teeth

to fall out and other unpleasant things) in exploring sailors. However, peppercreesses are herbs and not grasses at all.

There are 21 native cress (*Lepidium*) species in New Zealand, and all apart from three occur in coastal environments similar to that inhabited by coastal peppercress (the other three occur inland in the drylands of the eastern South Island). All but one of New Zealand's peppercress species are endangered (mainly for some of the same reasons as for coastal peppercress) and two species are extinct.

Coastal peppercress was probably already uncommon by the time Europeans discovered New Zealand. It was possibly first discovered in 1770 by the botanist Joseph Banks when travelling with Captain Cook, who collected boatloads of what they called "scurvy grass" (possibly a mixture of *Lepidium oleraceum* and coastal peppercress, both of which were present in the area) in the Marlborough Sounds. A scientific specimen of coastal peppercress was collected from Tasman Bay in 1827 by the French botanist Rene Lesson when travelling with the explorer Dumont d'Urville. Since then it was discovered at a few sites between the Marlborough Sounds and Tasman Bay in the early 1900's. In recent times no plants were known until it was discovered by Alan Esler at Totaranui and by DOC's Shannel Courtney at the Waimea Estuary in 1961. This discovery sparked a search for coastal peppercress and it was found at a further 5 sites. The largest population ever known was 300 plants, discovered on a beach at Mutton Cove in the Abel Tasman National Park. All these plants were lost 1 year later when pigs (possibly just one pig) ate them all. It has now been recorded from 10 sites, but the last of these was destroyed in a storm during Easter 2015. Only two naturally wild plants are known, but it is not known if these plants survived the 2016 Nelson storms.

Coastal peppercress conservation

In 2004, the coastal peppercress was classified as Nationally Critical (with the current qualifiers of being range restricted, extreme fluctuation, conservation dependent and extinct in the wild) and in imminent danger of becoming extinct.

A plan for the conservation of New Zealand's endemic coastal cress species was published in 1999. This Recovery Plan set out 10 Objectives with the Goal: to ensure that viable populations of all extant coastal cress species are restored and self-sustaining in the wild throughout the natural range of these species. The objectives of this plan included promoting the plight of coastal cress, researching the taxonomy, habitat requirements and threats to coastal cresses, searching for coastal cress sites, managing coastal cress populations so that they persist and preferably flourish, establishing cultivated populations and establishing coastal cresses at new locations.

This plan has largely been successful for many of the coastal cresses, and many people and organisations have devoted considerable time and money to the conservation of these charismatic plants. This effort has resulted in slowing their decline, but unfortunately most (if not all) species are still declining in numbers and range, and conservation of coastal cresses has proved to be difficult because of the range of threats they face.

The coastal peppergrass has proved to be the most difficult of the coastal cresses to save. The number of wild plants has decreased from over 500 in 1994, to 113 in 2008 and to 2 (possibly) in 2015. Recent conservation efforts by a team from DOC have centred on trying to establish new wild populations through sowing seed and planting nursery-grown plants in over 21 sites that were thought to be potentially suitable, including around seabird and seal colonies on islands. Mice were recently eradicated from Tonga, Adele and Fisherman's islands in Abel Tasman National Park, to raise their value for conservation of endangered species and re-establishment of coastal peppergrass has been attempted here and at other sites along the coastline in the Abel Tasman National Park, on Maud Island in the Marlborough Sounds, and at Waimea Inlet. The technique of establishing plants on dry rock walls constructed behind beaches shows some promise, but the plants are often damaged in storms. With the support and knowledge of Tasman Bay Herbs ([Link](#)), cultivation of coastal peppergrass was undertaken hydroponically, but unfortunately the plants attracted too many pests which threatened their commercial operation. Cultivated populations of coastal peppergrass are being managed at the Auckland Regional Botanic Gardens and at the DOC office in Motueka, and by the Waimea Coastal Garden Group and it is the seed from these plants that is being used to try and reintroduce coastal peppergrass to other wild sites. In 2015, plants were brought into cultivation at the Dunedin Botanic Garden and a Dunedin plant specialist to test whether this species would not be as susceptible to pests, and therefore easier to manage as a seed-orchard, in the cooler Dunedin climate. So far plants at these sites have survived their first winter which involved frosts down to -5°C , something they are unlikely to have experienced in their natural range!

The struggle continues and the future of the coastal peppergrass depends mainly on two things: finding ways to manage pests and diseases, and finding suitable sites to re-establish wild coastal peppergrass.

What next?

The threats to the survival of coastal peppergrass are:

1. Its vulnerability to fungal infestations.
2. Its vulnerability to viral infestations.
3. Its vulnerability to insect pests.
4. Its vulnerability to slugs and snails.
5. Its vulnerability to exotic herbivores.
6. Competition for light and space with weeds.
7. Loss of seabird colonies.

It is possible that coastal peppergrass is also showing the effects of inbreeding and loss of genetic diversity. It is also possible (though less likely) that the effects of pest insects and diseases are increased by changes in the local climate.

Successfully protecting coastal peppergrass from these threats must be achieved in order for the existing conservation programme to succeed. Ideally, this should be done by:

1. Expanding the cultivated population.

Currently, coastal peppergrass is cultivated by DOC in Motueka and at the Auckland Regional Botanic Gardens, and this should continue. As both places are in warm climates where pests and diseases tend to thrive, a third place from the southern South Island (where there should be less impact of pests and diseases on the plants) should be added to the cultivation project.

It is not known how much it will cost to look after this southern cultivated population. In 2015, the Dunedin Botanic Garden and a specialist grower started to cultivate this plant.

2. Selectively breeding pest and disease resistant plants.

Many species of plants have been selectively bred over centuries to produce desirable characteristics (which is why our cultivated crops are now so different from their ancestors) and strains that are more resistant to particular diseases and insects. It may be possible for a dedicated group of plant breeders to selectively breed coastal peppergrass to produce a more resistant plant. This could be done by using the network of people who already keep rare native plants in their gardens, by asking them to grow coastal peppergrass, collect seed from the healthiest-looking plants and send it to a subgroup of people who breed the best of that season with the best from the previous season.

Selectively breeding coastal peppergrass for ten years is likely to cost \$691,000 of which \$680,000 is the cost of labour which would likely be donated by the plant breeders. The \$11,000 remainder is for cultivation materials and sending seed between breeders.

3. Concentrating the reintroduction programme.

Reintroducing coastal peppergrass has been tried at over 21 different sites, so far without notable success. There have been many reasons for this lack of success, but it is likely that the severity of many of the causes differ from year to year. What is needed is for reintroduction efforts to continue for multiple years at the same sites. These sites should be:

- 1) A large seal haulout site on a predator-free offshore island.
- 2) A dense burrowing seabird nesting site on a predator-free offshore island.
- 3) A sandy strip beach which backs onto native forest with little weed presence.
- 4) A coastal area of steep, unstable soils which regularly slip and create fresh bare ground.
- 5) A cobble beach.
- 6) Several artificial coastal seawalls.
- 7) The inner margin of a coastal estuary mouth where debris accumulates.
- 8) The inner margin of a coastal estuary mouth where regular flooding keeps an area clear of weeds.
- 9) In the estuary saltmarsh meadow transition zone to taller grasses.

Reintroductions should consist of annually broadcasting as much seed as possible into these sites. Post-broadcast care of the plants (including weed control, fungal or insecticide treatments) should occur at all sites, except where this is not possible (see 4.). Seed used in the reintroduction must be from a known, disease-free source. Confirmation is needed on whether Turnip Mosaic Virus can be transmitted via seed or not.

This reintroduction programme is likely to cost \$93,000 over ten years.

4. Involving local communities in the reintroduction programme.

The plants grown from the broadcast seed will be vulnerable to a range of pests and diseases. The aid of the local community should be enlisted at three easily accessible sites in order to provide:

- 1) Caging of selected plants to prevent browsing by rodents, rabbits, hares and possums.
- 2) Ongoing possum control using traps.
- 3) Ongoing rat and mouse control using traps.
- 4) Monthly broadcasting of snail bait over spring and summer.

- 5) Monthly applications of a systematic fungicide to all plants over spring and summer.
- 6) Monthly spraying of an insecticide of all plants over spring and summer.
- 7) Monthly applications of derris dust to all plants over spring and summer.

Community support at three sites over ten years is likely to cost \$1,043,400 of which \$1,020,000 is the cost of labour which would likely be donated by the community. The \$23,400 remainder is for traps, insecticides, fungicides and snail bait over the ten year project.

More information

Website: NZ Plant Conservation Network. [Link](#)

Scientific paper: New *Lepidium* (Brassicaceae) from New Zealand. By P. J. de Lange, P. B. Heenan, G. J. Houlston, J. R. Rolfe, A. D. Mitchell. *PhytoKeys* Vol. 24, pages 1-147, 2013. [PDF](#)

Book: *Threatened Plants of New Zealand*. By Peter de Lange, Peter Heenan, David Norton, Jeremy Rolfe, John Sawyer. Canterbury University Press, Christchurch, 2010.

News article: Defying a 'death wish'. By Vanessa Phillips. *Nelson Mail*, 20 March 2009. [Link](#)

Scientific paper: First record of Turnip mosaic virus in Cook's scurvy grass (*Lepidium oleraceum* agg.) – an endangered native plant in New Zealand. By J.D. Fletcher, S. Bulman, P. J. Fletcher and G. J. Houlston. *Australian Plant Disease Notes* Vol. 4, pages 9-11, 2009.

Report: Molecular detection and pathology of the oomycete *Albugo candida* (white rust) in threatened coastal cresses. By T. Armstrong. DOC Science and Development Series No. 274. Department of Conservation, Wellington, 2007. [PDF](#)

News article: Unsung heroes. by Peter de Lange with Peter Heenan. *New Zealand Geographic*, Sep-Oct 2006. [Link](#)

Scientific paper: The role of seabirds and seals in the survival of coastal plants: lessons from New Zealand *Lepidium* (Brassicaceae). By D. A. Norton, P. J. de Lange, P. J. Garnock-Jones, D. R. Given. *Biodiversity and Conservation* Vol. 6, pages 765-785, 1997.

Plan: Coastal cresses (nau) Recovery Plan. By David A. Norton & Peter J. de Lange. *Threatened Species Recovery Plan* No. 26. Department of Conservation, Wellington, 1999.



Photos



Deer damaged coastal peppergrass. Shannel Courtney, DOC



Planting coastal peppergrass. Shannel Courtney, DOC



Spreading coastal peppergrass seed. Shannel Courtney, DOC



Weeding around coastal peppergrass plant. Shannel Courtney, DOC



Grey aphids infesting cultivated coastal peppergrass.



Cabbage white butterfly caterpillars defoliating cultivated coastal peppergrass. Mike Thorsen

This webpage represents the views of the Endangered Species Foundation of New Zealand and not necessarily those of other individuals or organisations involved in the conservation of this species.

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