

Summary of information on collecting, growing and planting spinifex and pingao

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Introduction

Many staff and coastal groups they advise are actively involved in the propagation and planting of native sand binders. People are often new to these roles, and have several questions about the growing and planting of sand binders.

The aim of this note is to raise awareness of some of the fundamental issues that need to be considered before planting, and to provide advice to guide seed collecting, propagating and planting activities.

Do you really need to plant? Is planting appropriate?

Planting is a last resort after other avenues have been explored; it's not a guaranteed solution to your problems. Some factors that may be preventing natural regeneration or causing erosion will need to be fixed before you plant anyway, so identify what these key factors are and address them first (e.g. control of rabbits, management of beach users, etc.). Before embarking on a planting programme that may have a high risk of failure there are several issues that need to be considered:

- Does planting meet the stated objectives for the site?
- Is the site degraded? Does it need stabilisation, or is it naturally sparsely vegetated?
- What impact will stabilisation have on the site and surroundings?
- Is the site receiving fresh sand? Sand binders need fresh sand, so if they're not receiving it they will die off within a year or two and not fulfil their function.
- Will other planned activities interfere with this sand supply? I've seen dying pingao behind a sand fence built on a foredune, because it was starved of a fresh sand supply.
- What else is interfering with the sand supply? I've visited a spit where marram is controlled in front of a reserve. Sand is transported horizontally along the beach, marram windward of the reserve land is trapping the sand, and the foredune in front of the reserve is eroding. In this instance the sand transport processes need to be

reinstated before any restoration planting can occur. On the other hand will reinstating the natural processes be all that is needed?



Dead pingao likely due to lack of sand deposition. The most vigorous spinifex and pingao appear to be thriving where fresh sand is deposited, e.g. bottom right.

- Does the sand need to be stabilised, or will stable sand interfere with other wildlife values, e.g. katipo spiders, seabird and wader nesting requirements?
- Is the substrate suitable? Do you have a clay cap or rubble dumped on site? You'll need to remove this unnatural consolidated material from the sand to ensure that plantings take place in sand only.
- Does the sand have the right profile? Spinifex and pingao prefer gentler-sloped dunes, so avoid planting on a steep marram dune.
- Are there vehicle problems at the site? They can cause a lot of damage, so you may be wasting your efforts until vehicles are properly managed.
- Have you got rabbits or hares? Don't plant until you've managed them. This may see natural spread or regeneration of sand binders happen that may obviate the need to plant.



Downwind treated area with eroding dune.



Dense marram upwind preventing sand movement down the spit.

- Are you trying to protect infrastructure, a campsite etc.? Get a professional to devise a management plan for the site, because infrastructure and developments often restrict the width of dunes you have to work with, and specialist skills are required. A zone of sand binders requires space to function properly, to allow the natural 'cut and fill' cycle of sand dune form and function. Also, as a government official or community group have you ever been successful in telling somebody that their house or campsite is too close to the sea? I'm aware of instances where houses and campsites have been moved back on the advice of independent dune management experts.
- Are you in a position to manage the site into the future and to monitor to determine if you are achieving your objectives? If not, you should reconsider the planting.
- Do you have a nursery lined up for growing high quality plants?
- Have you sorted out permission to collect seed?

These are some of the issues that commonly arise. The main thing is to understand what's happening at your site, and to think critically about whether planting of sandbinders is appropriate. Would managing weeds, browsers and human pressures serve your needs to allow nature to do it for you?

Seed collection, propagation and establishment

The Dune Restoration Trust of NZ has published a technical handbook on restoration of coastal sand dunes using native plants. Links to the spinifex and pingao chapters of seed collecting, propagation and planting are included. Other local council and national guidelines exist, and I encourage you to read widely, but I find these are a good basis for guiding work. These guidelines include sections on alternative methods of establishing plants, but for the purposes of this summary I'm going to restrict advice to the most successful strategy, i.e. planting nursery-raised seedlings.

Products such as the Planting Calculator on the Dunes Trust website will guide you through the process of deciding on how many plants you will need.

<http://www.dunestrust.org.nz/resources/planting-calculator/>

Spinifex, kowhangatara (*Spinifex sericeus*)

<http://www.dunestrust.org.nz/uploads/7.2%20Spinifex%20Establishment.pdf>

Photos of spinifex and pingao seed are taken from Dune Restoration Trust of New Zealand publications, with their compliments.

Where to plant

Spinifex is the major indigenous sandbinder that occurs in foredunes throughout most of the North Island and the upper part of South Island. It's most suited to the seaward face of the foredunes.

Ecosourcing

Beach managers and planting advisers have taken a pragmatic view to ecosourcing spinifex, so our general rule is to use material from the same stretch of coastline, e.g. Manawatu, Whanganui, rather than to focus on material from a specific beach. If material isn't available from a stretch of coast try to get material from within the Ecological District. It's important to avoid buying material from a nursery just because it's available, even though the nursery owner may say it's okay to plant east coast material on the west coast or in the South Island. However, sometimes nurseries will have leftover stock from a neighbouring beach, so it's always worth asking.

When, where and how to collect seed

Spinifex seed can be collected in mid- to late-summer, when the straw-coloured seedheads are beginning to detach from parent plants.

Spinifex has separate male and female plants. Females close to males have a higher proportion of viable seed, so only collect seed from within 2 m or so of a male plant. If you don't have many males collect from a cross-section of the dune, but check a few seedheads to make sure you're not wasting your time (details below).

Do not collect seed that is infected by floral smut, as it won't contain viable seed. Infected seedheads are easily recognised by the swelling partway along the spines within the seedhead.



Spinifex male flowers (left) and female flowers (right) are borne on separate plants.



Both male flowers and female seedheads of spinifex can be infected by a floral smut. The presence of smut is easily recognised in female seedheads by the presence of a swelling containing black spore masses midway along each spine. Smut-infected seedheads do not contain viable seed and should not be collected.

Collect the seedheads, not the individual seeds. Before collecting a bagful check a few for viability. The technique is described in the link above and on pg 8, but the general idea is to break the seedhead in two, remove the main chaff to reveal the swollen base of each spine where the seed is still covered in scales, then press the swollen base between your thumb and forefinger. You'll be able to feel if a firm formed seed is present.

Seedheads vary in size, comprising 40-160 spikelets. The proportion of spikelets containing sound seed can be up to 40% per seedhead, but more often it is much less. If you have around only 5 sound seed per seedhead it's not worth collecting from that site, so move onto adjacent populations hopefully where more males may be present.

Don't collect the pileup of rolling seedheads at the base of a dune along the high tide mark. Experience has shown that they seldom contain viable seed. Rather collect seedheads that are still attached to plants.

Store seed in hessian or paper bags, e.g. rubbish bags, until sorted. And keep them away from rodents and sparrows. Mice have been known to clean out a collection of seedheads.

You don't need to remove the seed from the spikelets.

A nursery I spoke to get around 500 plants from a tightly packed paper rubbish bag.

They collect around 10% of the available seedheads, and tend to pick the largest ones. If a site is badly degraded you may need to collect more than the 10% guideline.

Propagation

Spinifex is usually produced in high numbers, into the thousands, so is generally done by a nursery. The cost is roughly \$2 per plant, but will vary depending on containers used etc.

If you are doing your own propagation, there are some tips that'll make it cheaper and more productive for you:

- Separate seed with spikelets attached from the seedhead, sorting out the viable ones as described above.
- Direct sow seed by hand into the final container using standard free draining potting mixes - they don't need to be raised in sand.
- Insert 3 spikelets per container, using a dibble (or pencil) to make a hole so that the seed end of the spikelet is at least 2 cm below the surface of the potting mix – this caters for the approximately 30% of non-viable seed that inevitably still occurs within your carefully sorted seed. Sowing several seed reduces the percentage of empty containers at the end of the growing period (if more than one grows in a container, you don't need to thin them out - spinifex roots do not like being disturbed, hence direct sowing into final containers).

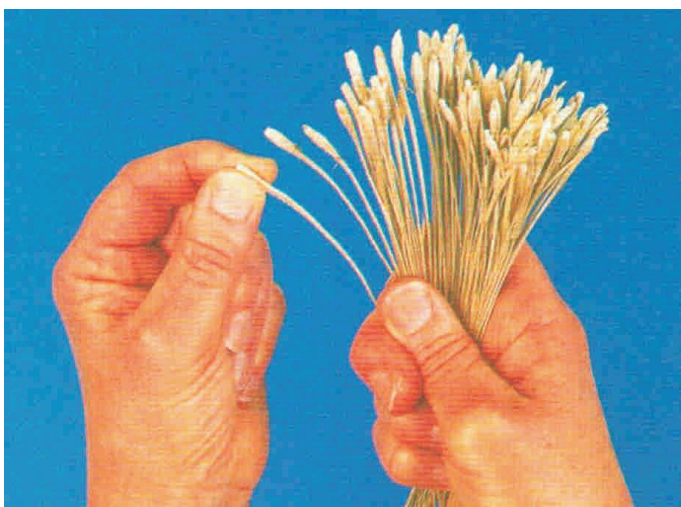
Sorting formed seed from spinifex seedheads



First break the seedhead in two.



Remove the large chaff to reveal the swollen base of each spine where the seed is still covered in scales.



Pressing the base of each spine between the thumb and forefinger will reveal whether a firm formed seed is present.

- Tinus root trainers or similar size plugs or growing cells that allow free drainage work well, and they make the planting process a lot easier, e.g. cheaper and easier to transport to and on site, less nursery space needed, and cheaper containers.
- In the Bay of Plenty spinifex can reach 80 cm high within 9 months of sowing. This will vary between regions and between plant stocks.
- Watch you do not overwater.

Planting

Plant in autumn or spring, and unless previously tested on your site, spread your risk and plant some in autumn and some in spring. There doesn't seem to be much difference in survival and growth between the seasons but there can be differences between sites and years of planting. Autumn plantings may be vulnerable to sand accretion or scouring during winter storms; and spring plantings will fail if root systems have not developed and extended into lower sand levels before early summer. Avoid summer planting because of the hot dry conditions.

Plant deep, with the top of the potting mix about 10 cm below the sand surface. Plants of at least 60 cm will allow this deep burial.

Slow release fertiliser (about 10-30g per plant) is highly recommended, using either tablets or pellets. Fertiliser will substantially boost initial growth of a plant on site. Add it to the planting hole. Slow release fertiliser at the recommended level will not kill your plants.

Fast-release fertiliser (e.g. Urea) will kill plants if incorporated in the planting hole.

Don't forget to control vehicles, pedestrians, rabbits and hares.

Pingao *Ficinia spiralis*

<http://www.dunestrust.org.nz/uploads/7.4%20Pingao%20-%20Establishment.pdf>

Where to plant

Pingao is present throughout the country, but is the dominant sand binder from Canterbury southwards. It is, however, popular amongst community groups throughout the country as something that is easy for them to grow in small numbers and plant out.

When, where and how to collect seed

Pingao seed can be collected from established stands during December to early January in northern districts, and through to February in the south. You have a window of two to four weeks.

Collect seed when it begins to fall and appears along with golden brown seed husks in sand hollows in the vicinity of plants. During this period seeds are easily dislodged from seed heads by rubbing with the fingers. Mature seeds are shiny brown-black nuts. Immature seedheads are greenish and seeds are difficult to dislodge. If you need a lot of seed you can collect the seed heads. When dried out over a few days the seed often dislodges easily.

As with spinifex, try to collect around 10% of what's available, and collect from a range of plants.

Store in hessian or paper bags.

Although you need to remove seed from the seedhead, it's not necessary to get rid of the chaff, mainly husks.

Pingao shows small differences in plant form between regions, so it's important to ecosource from local stocks.

Propagation

Pingao seed is easily germinated and does not need any pre-treatment. Nurseries have their own way of doing things, but the general procedures are similar:

- Seed with the remaining chaff is scattered onto a firm bed of seed raising mix (1:1 peat to pumice) in seed trays.
- Cover with sieved potting mix to depth of 3-5 mm

- Invert an empty seed tray over the germination tray, and cover with a sheet of plastic to maintain high humidity.
- Place in a glasshouse if possible.
- Regular light watering is needed.
- Once the seeds start germinating remove the top tray.
- Watch out for birds and rodents.

Seeds sown in summer germinate in 10-20 days; in winter it can take up to 30 days.

Within four to eight weeks after germination seedlings will be big enough to be transplanted. Seedlings of 7-10 cm can be transferred from seedling trays to containers. Root trainers can be used to save costs, and the smaller Hillson root trainers are suitable.

Plants need to be hardened off before planting. Don't let them become waterlogged. Placing the containers on a gravel bed will help with drainage.

Planting

The main rule about pingao is to avoid planting in summer. One trial on the Coromandel Peninsula had better survival with spring than with autumn plantings, but this is not applicable across the country. There seems to be little difference in survival and growth at other sites.

As for spinifex, plant deep (root collar 10 cm below surface) and use a slow-release fertiliser.

Pingao is highly palatable to rabbits so you need to control them before planting.

The dark brown seedhead of pingao containing ripe seed.

