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Weed Control Trials on Coastal Sand Dunes, Taipa, Northland

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Background

- Invasion of exotics especially kikuyu and buffalo grass is a major issue for dune restoration programmes throughout Northland where native species are being planted on both foredunes and backdunes.
- Northland Regional Council (NRC) commissioned a review, and funded nursery and field-based trials to determine optimum methods for weed control.
- Trials established at two Northland sand dune sites including Taipa in mid-2011 in collaboration with the local Coast Care groups.

Work undertaken

- A review of weed control practices nationwide on sand dunes and other relevant information collated with input from the Dune Restoration Trust provided the basis for selection of weed control treatments for trials.
- Trials focused on knapsack application of the 2 most commonly used herbicides:
 - broad spectrum herbicide glyphosate (e.g. Roundup); and
 - grass selective herbicide haloxyfop (e.g. Gallant).
- Other treatments were considered impractical on a large scale or required further investigation such as:
 - organic spray-on formulation (e.g. Hitman);
 - saltwater or concentrated saline;
 - timing of applications;
 - use of penetrants to aid uptake of chemical;
 - other herbicide application methods (e.g. weed wipe)
 - hand-pulling.
- Nursery-based herbicide trials evaluating tolerance of herbicide at different rates sprayed on spinifex indicate less effect with low rates of chemical but glyphosate and haloxyfop kill spinifex at label rates.
- Field-based weed control trials established at Taipa and Waipu Cove, Northland, has quantified the effectiveness of a limited number of herbicide control options for foredunes and backdunes.

Sites

- Two site types use for setting up of weed control trials:
 - Backdune dominated by pohuehue and exotic grasses
 - Foredune dominated by spinifex and transitions to backdune species range of exotic grass and herbaceous species.

Treatments

- Two herbicides – glyphosate (Roundup); haloxyfop (Gallant)
- Three rates of herbicide concentration:
 - label rate for each herbicide;
 - $\frac{3}{4}$ label rate; and
 - $\frac{1}{2}$ label rate;
- Control – no application of herbicide.

Trial design

- All trials were laid out using a fully replicated Randomized Complete Block design (RCD) with up to three replicates to account for inevitable variation in site factors.
- Each plot comprises a minimum 3 m wide band running across the dune from seaward to landward.
- A single treatment combination was applied to each plot with treatments allocated randomly within each replicate.

Application method

- Standard knapsack sprayer with a fan nozzle at low pressure was used to apply chemical.
- A non-toxic coloured marker dye was incorporated into the mix to reduce overlaps and ensure all weeds were sprayed.
- No surfactants were mixed with herbicides.
- Spraying was carried out to avoid spinifex and other native plants.
- Herbicide applied August 2011.

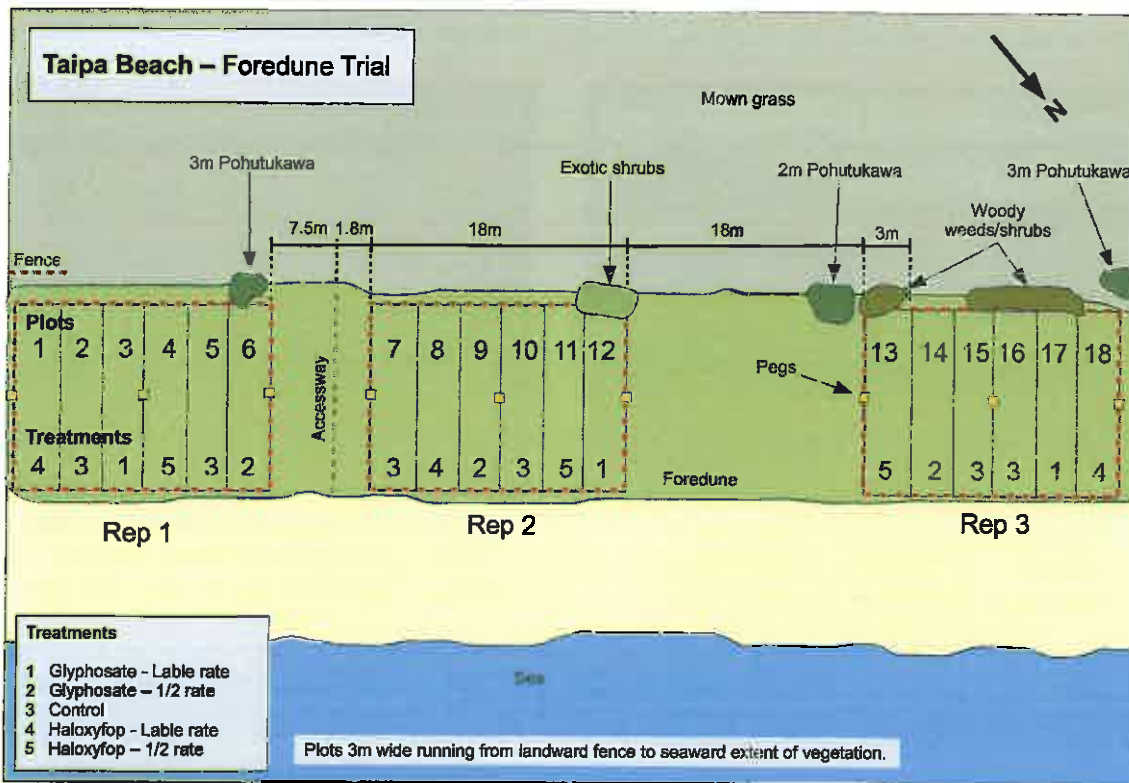
Monitoring

- Vegetation cover was assessed before spraying to provide a baseline of species composition, stature and vigour.
- Sites were inspected regularly once trials were established.
- Post-weed control monitoring involved a repeat assessment of the percentage vegetation cover approximately 3 months after herbicide application.



Foredune and backdune weed control trial sites, Taipa, Northland.

Taipa Foredune Trial



Results

- Glyphosate (Roundup) was just as effective at $\frac{1}{2}$ recommended label rate at controlling both exotic grasses and herbaceous species as the higher concentrations of $\frac{3}{4}$ label rate and full label rates.
- Haloxyfop at lower rates proved less effective at controlling exotic grasses.
- Where both exotic grass and dicot weed species are present, haloxyfop as expected only controlled the grass species.
- Careful spraying using knapsack with marker dye to avoid spraying native species was effective in the application of either herbicide glyphosate and haloxyfop with virtually no losses of natives.

Recommendations for foredune sites

- Use glyphosate for effective control of both exotic grasses and herbaceous weeds.
- Lower rates of chemical than recommended on the label are likely to give effective weed control – test on a small area first to confirm for new sites and weed species before committing to larger areas.
- Careful use of knapsack sprayer with a fan jet at low pressure will allow spraying weeds around established native plants and help avoid overspray.
- Use a marker dye in the herbicide mix to avoid overlaps during spraying and to avoid spray drift onto native plants.
- Regular inspections are required to ensure timely weed control is carried out before weeds overtop natives.

Taipa Foredune Trial



Foredune trial site before application of herbicide – dominated by wiwi and exotic grasses on semi stable site immediately landward of the spinifex zone.



Spraying of herbicide using a knapsack with fan nozzle and marker dye to reduce overspray and to help avoid spray drift onto natives.

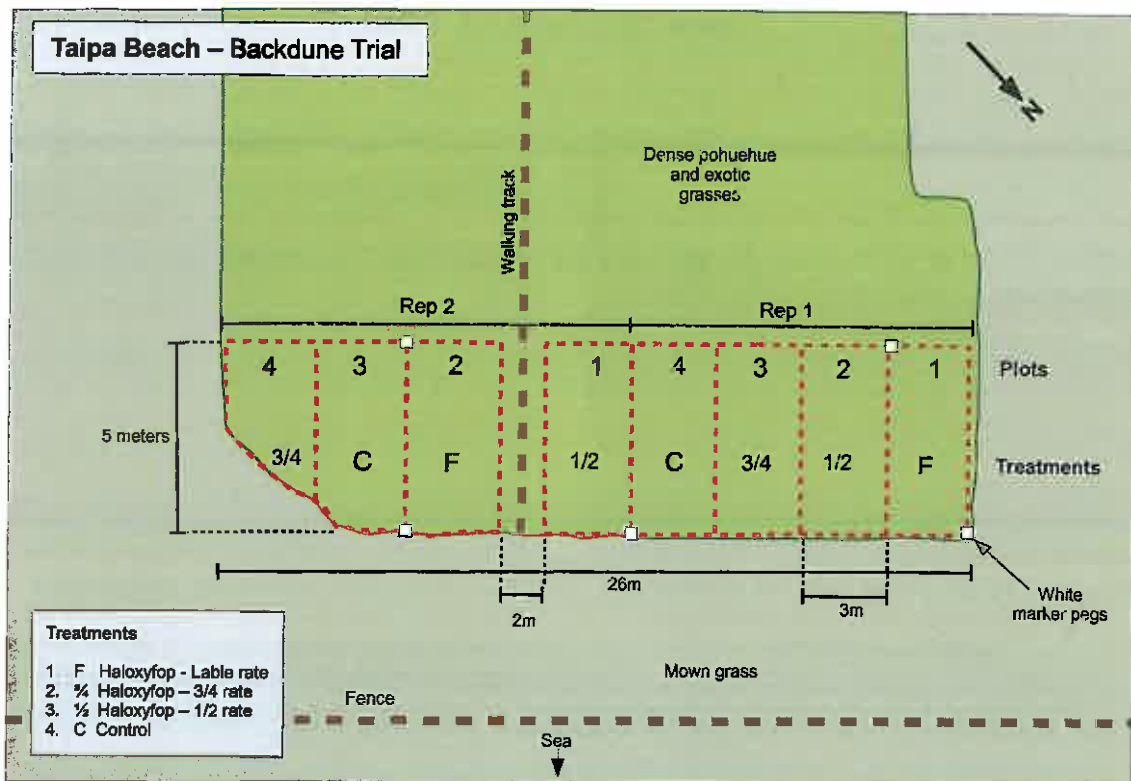


Foredune trial 3 months after herbicide application. Glyphosate ½ rate (left); haloxyfop full rate (centre); control (right). Glyphosate (Roundup) even at half label rate very effective in killing exotics; Haloxyfop (Gallant) partially effective as it only control grass.



Three months after spraying – control plot with no application of herbicide (left); glyphosate with effective control of exotics (right). Careful spraying around natives including these wiwi has resulted in no dieback.

Taipa Backdune Trial



Results

- Haloxyfop (Gallant) applied at $\frac{3}{4}$ label rate for exotic grasses was as effective as full label rate at killing kikuyu and buffalo grass.
- Half label rate of haloxyfop was not as effective so dilution of knapsack applications to this level is not recommended. However, no surfactants were used to aid uptake of chemical and should be evaluated to determine if low rates of herbicide can be effective in grass control.
- As haloxyfop only kills grasses, native woody and herbaceous species were not affected by overspray. Pohuehue and nihinihi (sand convulvolus) thrived after plots sprayed.

Recommendations for backdunes, particularly pohuehue sites

- Use haloxyfop at or near label rates for control of exotic grasses that overtop pohuehue.
- Spray does not affect pohuehue so application is fast and effective.
- Within 3 months followup spot spraying with haloxyfop will be required for occasional exotic grass plants missed during initial treatment.
- Haloxyfop will not control herbaceous/dicot weeds so these will require spot spraying by glyphosate or hand pulling.
- Regular inspections will be required to monitor any reinvasion of exotic grasses and scheduling further herbicide applications.

Taipa Backdune Trial



Backdune trial site before herbicide application – dense pohuehue with overtopping kikuyu grass up to 1 m high.



Backdune site 3 months after application of haloxyfop (Gallant) – note pohuehue with lack of exotic grass (left) compared to landward site (right) dominated by kikuyu and buffalo grass.



Exotic grass in non-sprayed control (left); dead exotic grass 3 months after application of Gallant (right).



Gallant sprayed over the top of mixed pohuehue and exotic grass (left) vs. control with no herbicide treatment (right). Application rates lower than label rate provided only partial control of grasses.