Restoring eroded peat soils on Dyke Island

WINTER 2022

Giselle Hazell | Antarctic Research Trust Planting Report | August 1, 2022

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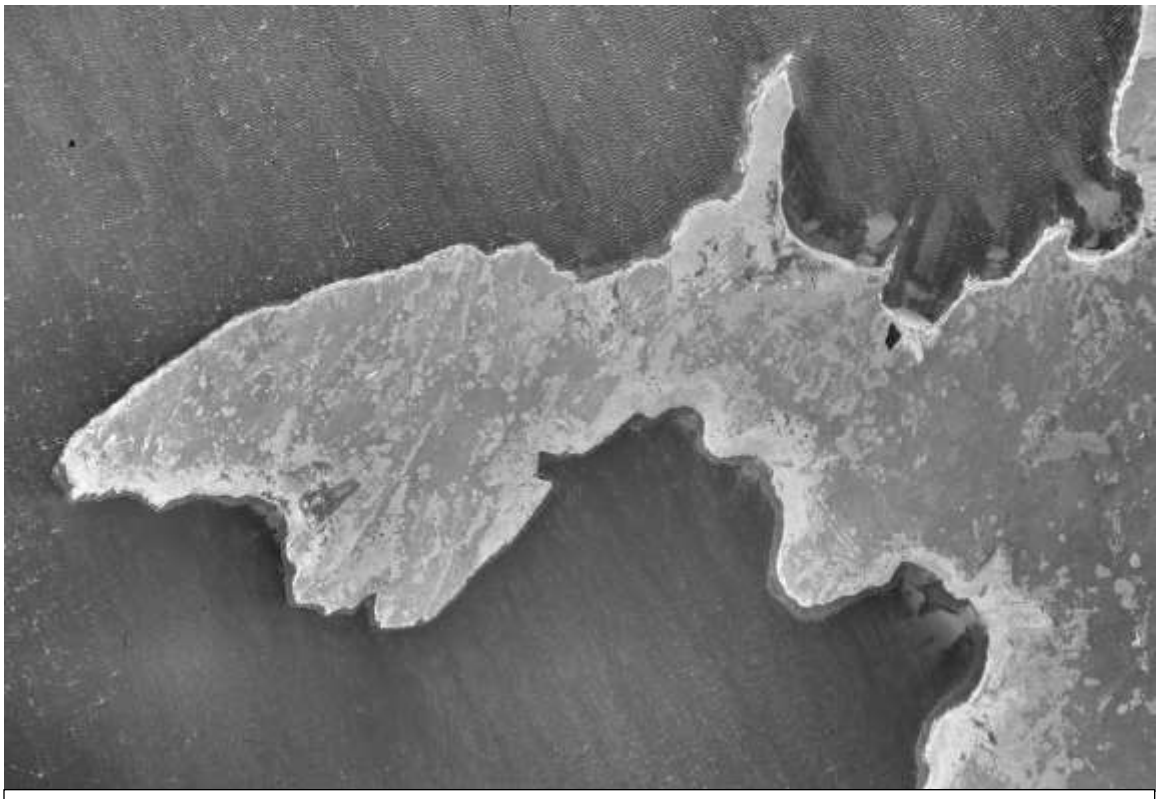


1954 Aerial Survey Photograph of South West Point showing intact coastal tussac belts (standing water) and very little bare ground. Image use with permission of the FIG Natural Resources Department and sourced with thanks to SAERI.

Summary of Project

Planting tussac from pulled tillers on sites of eroding peat soils on the South West Peninsula of Dyke Island.

The South West Peninsula of Dyke Island has undergone both fire damage and overgrazing of its coastal tussac belt. This has left areas of bare and blowing peat soils. On the western extent of the peninsula these blowing soils are smothering inland diddle dee and white grass communities and accelerating habitat loss- whilst on the lee side theses soils are blowing into the sea and smothering aquatic environments.

Dyke island was purchased by us (Giselle and Alec Hazell) in December 2019 and has had around 20 years without stock. We currently have a small herd of cattle for our subsistence use under electric rotational grazing. We would like to keep the South West peninsula unstocked - to facilitate habitat rehabilitation and ensure an established nursery stock for future restoration projects on the island.

Through multi- year plantings we hope to restore this part of the island within 5-10 years. The restoration aims are:

1. Protect the existing tussac belts and bluegrass communities.
2. Stop the blowing soil to create suitable habitat for coastal tussac belts. (This provides habitat for other plants to colonise, habitat for seabirds and sea mammals, water traps to improve soil water retention, and potential long term carbon sinks)
3. Use the re-established plant communities as nursery and seed stock to implement the next phase of rehabilitation on Dyke (total extent of eroded and blowing soils which require remedial intervention on the entire island is 140 hectares).

Aims of the Project

Phase 1: 2021-2022 Season

- 2.5 km of fencing erected and 3-6 hectares of Tussac grass planted from tillers.

Phase 2:

- Tussac planting 10-20 hectares 2022/23 seasons
- Establish a 10 000-root trained tiller nursery programme for planting out seed grown tillers

Phase 3:

- Tussac planting 10-20 hectares 2023/24 seasons
- Increase production of tiller stock in nursery and add new species to the growing mix.

Expected conservation benefit of project:

1. Protect existing Tussac and other native grass communities
2. Reduce loss of soil
3. Improve water retention and reduce water run off

4. Reduce further loss of habitat through creeping/wind-blown erosion
5. Aid in carbon sequestration
6. Reduce impact on the micro and macro algae communities offshore
7. Restore biodiversity to the site
8. Provide habitat and protect existing habitat for seabirds and their predator species such as Skuas and Striated Caracara
9. Protect the breeding ground of 15 pairs of breeding Skuas
10. Create long term nursery stock to further restoration projects on the rest of Dyke Island in the medium term and facilitate plant stocks for other projects in the Falkland long term.
11. Protect our natural environment for the generations of Falklanders.

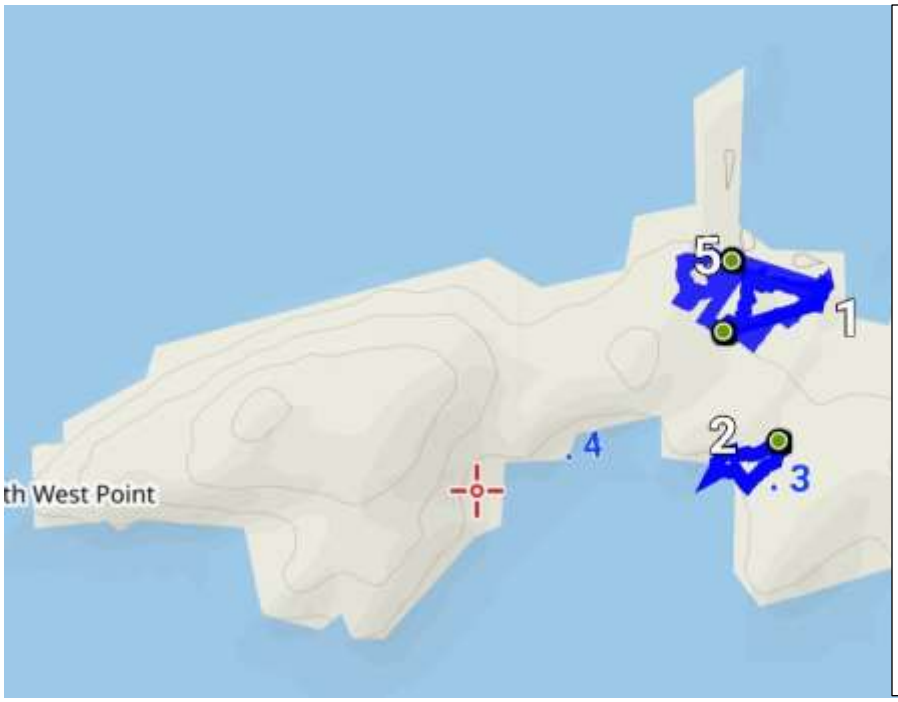
Project Work Undertaken

Year 1 of the project was completed on the 29 July 2022. This was somewhat later then anticipated due to having taken on other work over the summer season and fencing only began in February 2022.

Summary of work.

1.In February and March 2022 fencing commenced with Alec and Giselle building a 2.5km fence consisting of a 5-strand wire fence with a top hot wire. It averaged as a 10m star post spacing with 2.5m dropper spacings. Strainer posts where spaced at 250m intervals with 1 wire gate in the central position. The top electrified wire is powered by a Speedrite S1000 Portable Solar Energizer with an average output voltage of 5,600 V. The fence terminated on the SW and N coasts on steep rock slabs- with a crate and a swing riser fence. On either side of the fence termination points, the geological features of deep dykes of the island were employed as further fail -safe barriers preceding the crates to further prevent cattle crossing. This phase of the project was funded by the Falklands Conservation/Spring creek conservations ecological restoration grant.

2. The first round of planting took place between April and May 2022 over a 30-day period. With the dry conditions over summer, we decided to delay planting until there had been some rain. A total of 9762 tillers were planted in just over 2.54 hectares over 4 locations over 30 days. This part of the project was funded by the Falkland Islands Environmental Studies Budget.



ESB Plantings 1-4
Total Tiller/Ha:9762/2.55ha

1. 3 Beach Bay *:7024tillers/1.63ha
2. Old Bones:2205tillers/0.92 ha
3. Cormorant Corner:213 tillers(very small infill)
4. Nursery/Explore Site 1: 320 tillers/very small site

ART Planting 5

5. 3 Beach Bay*: 13680 tillers/2.87 hectares

*3 Beach Bay planting is one continuous planting of the ESB plot 1 and ART plot 5 and measures 4.5ha in total.

4. The final phase of planting took place over June and July 2022. A total of 13 680 tillers were planted in the 3 Bay Beach plantation adjacent to the ESB plantings over 40 days or 248.08-man hours. An estimated 2.87 hectares were covered in this session making the total plantation size of 3 bay beach plantation of 4.5 hectares. This part of the project was funded by the Antarctic Research Trust.

Plantation Name	***Funded***	***Tillers***	***Hectares***
1. 3 Bay Beach	*ESB*	*7024*	*1.63*
2. Old Bones	*ESB*	*2205*	*.92*
3. Cormorant Corner	*ESB*	*213*	*(METERS)*
4. Nursery 1	*ESB*	*320*	*(Meters)*
5. 3 Bay Beach	*ART*	*13680*	*2.87*
Totals		*23442*	*5.42*

4. Total tillers planted this winter 2022: 23 442 covering an estimated 5.42 hectares across all plantations on South West Point.

Entrance to South West Point plantations

Summary of Field Work

The second planting session commenced on the 07 June 2022 in the 3 Beach Bay area. This area lies adjacent to the stork point stand of tussac with mature and denser formation on the seaward point and areas beginning to degrade on its perimeter. There was no evidence of rust or weevil infestations in the stand and plenty of micro and macro arthropods and healthy fungal communities. Tussac tillers were predominantly old and long tough fibrous examples-making for very hard pulling. Where possible bogs were harvested of 50% of growing tillers on the lee side of the plant. Areas were harvested and marked to provide a rest so that ideally, they are not harvested on subsequent years. The density of the stand means that there are longer walking distances to move the bundles out- and utilizing the low tides to access the northern sections of stork point. Each planting consists of 2 or three tiller bulbs-so whilst a daily planting may be for e.g., 300 tillers in the ground -actual tillers pulled would be around 750-800.

The bare peat ground comprises of areas which were once tussac soils and then peat soils which have eroded and blown onto diddle dee and cinnamon grass. This smothering and encroachment causes die off of the vegetation and then further create more blowing soils. It verges the coast and consists of burnt peat soils and smothered cinnamon and diddle dee ground. There is small stand of marram grass on the coastal section in sandy soil. The ground has burn pockets which are hollows that are often unknown until broken through- this makes planting tricky in getting the

quad and trailer close to the planting site without bogging's. Whilst proximity to the Stork Point stand was closer -the transport of the stock to the site was harder -relying on more carrying big bundles over long distances. The central section has eroded down to clay. Whilst it would be wonderful to try to restore this the priority is the peat soils that are more likely to take plants. The hope is that stabilization of the areas may promote colonization by liverworts and juncus (as witnessed on Hummock Island) and eventual tussac or some other native grass.

Shaded sections are the 2 main plantation sites known as Old Bones (bottom) and 3 beach Bay (Top)

Image from track off Locus Map App

Photograph of the 3 Beach Bay plantation. With thanks to Marilou Delignieres- note the clay bare patch in the middle. Stork Point Tussac stands on the right.

At the conclusion of the planting 4.5ha of bare ground was planted (combined ESB and ART Tussac sessions) with 20774 tillers in the 3 Beach Bay Plantation. Tiller spacings decreased significantly from the first planting. (This decision was made after joining the Hummock Island planting session in April 2022 and discussing methodology with Sally Poncet and Ken Passfield.(Antarctic Research Trust) We determined that closer spacings may give the tillers a better chance of success and seedling establishment due to tighter proximity. Denser spacings cover the ground with leafy shade which brings the surface temperatures down -black peat soils can reach temperatures of 40 degrees Celsius in Summer (*pers. comm* Sally Poncet from temperature measurements photographs taken by Jeromy Poncet)-these scorching temperatures may account for a lack of seedling success in plantations with a larger interplanting spacing- i.e., up to 2 meters. We further hope this denser planting space will increase overall water retention and soil stabilization. It may also reduce the need of follow up plantings and infillings in the future. This change in method during planting may offer some insight into the success of said spacings as these can be used for comparative analysis in the future. (I.e., similar soils-same location- same planting times- same tiller stock and fairly homogenous tiller type)

It was desirous to use this session to create more nursery stocks on other bare parts of the peninsula- but getting such a large continuous band of planting in one area was just too tempting to pass up.

The second planting session saw many more wet days -with several cold snaps bringing snow and heavy frosts. This planter found that planting after snow did not alter the pace of planting as the ground was insulated but days after hard frosts was very hard going and in one or two instances the ground did not thaw at all for the days digging. The less sunlight during the day do take a toll on getting out and putting in full 8 hours- as well as the cold wet conditions-as evidenced by the work log hours. It certainly felt like a harder effort-but it did answer my question of -can planting carry on throughout winter. In essence a resounding yes- however this timing may not work if it were applied for a large workforce with time constraints.

One possible issue to be considered is the benefit/cost of planting over frost days. Often due to weather a half day meant it was better to pull and transport bundles to the site and then plant the next day. But on one occasion is frosted heavily overnight-whilst obvious damage to the pulled roots of the tillers wasn't obvious it is probably prudent to avoid this situation in future.

Frustratingly the upland geese were delighted by this easy source of snacks and have made a fairly big dent in the plantations already- only surveying will establish how damaging their grazing impact has been.

In terms of effort the heaviest physical burden is the actual harvesting of the tillers. This may be due in part to the type of tiller available-big tough long old plants. And the transporting out of dense stands. The first 4 bogs in from the high tide line where left unharvested to try and maintain a barrier to the wind -to help the bogs that have been harvested some protection.

Cost of the Total Project

Description	Funding Body	Cost
Fencing Materials	Falklands Conservation/Spring Creek	£4462.40
Fencing Labour, Travel, Freight, Misc	Dyke Island	£3952.69
Planting Labour	FIG Environmental Studies Budget	£3000
Planting Labour	Antarctic Research Trust	£3000
Quad (Fuel and wear and Tear)667.8 mils @40p	Dyke Island	£267.14
Total:		£14682.23

Total Tillers Planted: 23 442

Total Hectares Planted: 5.42 ha

Google Earth Image of the 4.5ha bare ground(3BB) now planted with tussac.

Lessons Learnt

This first planting session offered many lessons and new thoughts on long term progression of the project. Planting days are best staggered over a 5/6 day working week-this allows the planter a rest and a chance to clean and service work gear. (This can work well in the early parts of winter but it was found that during this June and July it was a case of watching the forecast and working when conditions were best and not fighting the spells of inclement weather)

Due to the distance from the settlement -days with inclement weather are not as productive due to lack of shelter. Often a day of sunshine and showers could be more productive if the planter could shelter in the worst of the squalls and continue when they pass. Ideally a tea hut would be a good investment but a field hut that can accommodate 4 planters would expedite the projects aims of covering the bare ground.

In phase 2 of our initial plan, we envisioned creating a nursery program for root trained seedlings under shade house conditions. We have revised that idea as a poor capital investment at this time and feel better yields and production would be to create nursery areas in situ that can be harvested in 2-3 years. This we will concentrate on in year 2 (2023).

Mapping and recording were a frustrating aspect of the project but the plan is to have a few lessons with the SAERI GIS Mapping department this winter in Stanley and create multilayer maps for the plantations which can be updated daily with more information regarding site aspect; effort etc.

Phase II Projected Aims

Post planting surveys will hope to determine growth rate, mortality rates, species present both flora and fauna. Analysis of soil improvement on sites though sampling (DOA). Analysis of water retention in soil through sampling (DOA) and determine best methods for increasing planting productivity on Dyke.

Completed island wide surveys to ground proof the google maps and SAERI soil maps against the actual soil composition have earmarked the areas that have a cost benefit for rehabilitating ground. Coastal bird and mammal surveys have been completed in November 2020 to set a data point for future comparisons of habitat utilization post rehabilitation. Coastal vegetative surveys were completed in December earmarking key species and areas of high biodiversity for native plants. These will all be used for future comparisons on the site.

This year's planting efforts have encouraged us to increase planting days from 60 to 100 days. This could be achieved throughout the winter season extending until such time as the ground begins to dry-estimated by September or October (depending on the years actual rainfall).

The tussac stand on Stork Point will not be harvested for 2 growing seasons to allow it to recover from this years harvesting. Instead, we will harvest from the area marked in red and transport to the area marked in green. This will increase the travel distances and decrease the days planting efforts. Currently the little trailer we welded up can carry around 700 tillers(planted) over uneven terrain-however to maximize effort we feel a larger trailer will become necessary. This will mean that the planting effort will be divided into a pulling/transporting day followed by a planting day. A larger trailer should provide planters with a 1000-1500 tiller stock to get in the ground in a day. The increased distances will have a knock-on effect on both cost of transport and productivity but the hope is that these plantings will become the main body of nursery stock for year 4 and 5. We are

researching the availability of such a trailer both locally and abroad and hope to secure a grant for this equipment.

Acknowledgments

We are incredibly grateful to the generous support of the Antarctic Research Trust for investing in our project of saving our soils by providing the funds to cover labour costs. Watching the bare ground transform into textured and green plantation had been so encouraging. Special thanks to Sally Poncet who had been so supportive throughout the process with advice, proofing and encouragement. The entire project would not have been viable without support of the Falklands Conservation Spring creek grant for the fencing materials and the FIG Environmental studies Budget grant for labour costs.