Updated Changes in Extent of Bay of Plenty Frost Flats: 2020 Summary

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Nicholas Singers
Ecological Solutions
Innovation in conservation

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Author(s): Alana Delich for Nicholas Singers Ecological Solutions Ltd
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Note: This report is a brief summary of the change in extent of Bay of Plenty frost flats between 2016/17 and January 2020 only. The full methodology and background to this report can be found in Delich, A. (2020). Changes in Extent of Bay of Plenty Frost Flats: 2003 – 2017. April 2020 Update. NSES Ltd report 5:2019/20. Prepared for: Bay of Plenty Regional Council. 25 p.

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1. Introduction

This report is a brief summary of the change in extent of Bay of Plenty frost flats between 2016/17 and January 2020 only. The full methodology and background to this report can be found in Delich, A. (2020). Changes in Extent of Bay of Plenty Frost Flats: 2003 – 2017, April 2020 Update. NSES Ltd report 5:2019/20. Prepared for: Bay of Plenty Regional Council. 25 p.

1.1. Background:

BOP frost flat extents and wilding pine cover were mapped in 2019/2020 using 2015-2017 aerial imagery (*Delich, A. 2020).* Bay of Plenty Regional Council (BOPRC) requested that the GIS file produced in that work to be updated based on high resolution (0.1m) aerial imagery captured in January 2020*.* BOPRC also requested additional data on wilding pine locations, and tree size in the areas of the 'Rangitāiki River bog pine reserve' (Priority Biodiversity Site 325) with <5% wilding pine cover, in order to guide upcoming pine control work and help cost future control work.

1.2. Project Outline:

a) Update previous mapping (GIS files) of wilding pine densities within Bay of Plenty frost flats from 2020 imagery - including additional attributes for wilding pine type.

b) Provide an additional GIS file showing locations and size classes of wilding pine trees in polygons with less than 5% cover in the Rangitāiki River bog pine reserve (hereafter referred to as the 'bog pine reserve'.

1.3. Methods:

a) Follow methods outlined in *Delich, A. 2020. Changes in Extent of Bay of Plenty Frost Flats: 2003-2017 Prepared for Bay of Plenty Regional Council by Nicholas Singers Ecological Solutions Limited April 2020. NSES Ltd report 5:2019/20;* with the following exceptions:

- Map areas that are/were frost flats but which are now occupied by felled pines/pine slash as 'degraded' frost flat rather than 'cleared'.
- Include additional cover classes for Zero Density, 6-15%, and 16-25% wilding pine cover.
- Include an attribute for 'wilding type' so that polygons containing Douglas fir can be easily identified.

b) Map individual pine trees (points) in the 'bog pine reserve' in polygons with <5% pine cover – allocate each tree to a size class to roughly correspond to wilding pine size classes in the WCIS inventory system (extra small : <1m diameter, small: 1-2m diameter, medium: 2-8m diameter, large: 8m diameter).

1.4. Deliverables:

a) Updated GIS file (ESRI file geodatabase) with metadata and updated Table 1 and 2 from previous report (Delich 2020). No contract report required. But this brief summary report has been compiled to present these tables.

b) New GIS file with points for pines in the 'bog pine reserve' in polygons with < 5% pine cover.

Methodology

2.1 GIS

The frost flat ecosystems within the Bay of Plenty Region, as mapped in the report Delich, A. 2020 were re-assessed using January 2020 high-resolution frost flat aerial photography layer (0.1m). Frost flats were divided into areas of contiguous wilding pine cover, and assigned a wilding pine cover score based on the modified braun-blanquet scale (Zero density, <1%, 1-5%, 6-15%, 16-25%, 26-50%, 51-75%, >75%). This

method is as described in Delich 2020, with the addition of the zero density cover score, and the splitting of the 6-25% cover class into 6-15% and 16-25%.

Each polygon was also assigned a landcover (TI3 frostflat, TI4 frostflat, degraded TI3 frostflat, Degraded TI4 frostflat, wilding pine forest, developed forestry, developed pasture). This is method is as described in Delich & Singers 2019, with the addition of the degraded frost flat landcover classes (to replace the "cleared" cover class in the 2016/17 dataset).

2.2 Analysis

2.2.1 Canopy Cover

A modified Braun-Blanquet scale was used to assign canopy cover of wilding pines within each polygon. In the 2020 dataset this scale included the cover categories of Zero Density, <1%, 1-5%, 6-15%, 16-25%, 26-50%, 51-75%, >75%, NA.

This scale differs somewhat from that used in the2003 and 2016-17 datasets. The cover score of Zero Density has been added, and the 6-25% cover score used in 2003 and 16/17 has been split into 6-15% and 16-25%.

The cover class of NA was used for areas that had been developed into forestry or pasture.

2.2.2 Landcover

Each polygon was also assigned a landcover (TI3 - Monoao scrub/lichenfield, TI4 - Grey scrub, degraded TI3 frostflat, degraded TI4 frostflat, wilding pine forest, developed forestry, developed pasture, cleared). This method is as described in Delich & Singers 2019, with the addition of the degraded frost flat landcover classes (to replace the "cleared" cover class in 2016/17, though "cleared" was still used for a few very recently cleared polygons where it was not certain if the area was going to be developed or restored).

Following completion of the GIS datasets the changes in canopy cover of wilding pines, and overall landcover were analysed using pivot tables in Microsoft Excel.

2.3 Limitations

The 2020 aerial imagery was very high resolution (0.1m/pixel) so the determination of wilding pines was much more accurate than in the 2016/17 imagery (0.3m/pixel). With the high-resolution images determining the difference between *Pinus contorta*, Douglas fir, bog pine and kanuka was very straightforward.

However mapping individual pines in separate cover classes was more difficult for the smaller pines, particularly within mingimingi shrubland frost flat ecosystems. For this dataset a level of confidence has been assigned for the accuracy of the identification of wilding pines classed as extra-small (<1m diameter - 70% confident), small (1-2m diameter - 80% confident) and medium (2-8m diameter – 95% confident). The 95% confidence for medium pines is largely for smaller medium sized pines growing within mingimingi scrub communities.

3. Results

3.1 Changes in Landcover

Table 1 shows that the extent of TI3 - Monoao scrub/ lichenfield frost flats decreased by 184.8 ha. However this was largely due to redefining the landcover to Degraded TI3 frost flat, or to TI4-grey scrub, due to better resolution the aerial photographs increasing the accuracy of the landcover class assigned to each polygon.

No new areas of frost flat were developed for pasture. There was a 19.7 ha increase in areas developed into forestry, of this 13.1 ha were genuine new developments, and the remaining 6.6 ha were made up of adjustments to boundaries as areas were better defined with the better imagery.

The extent of wilding pine forest actually decreased by 10.4 ha. This was largely due to some very intensive wilding pine control in areas of privately owned land near Otamatea River Marginal Strip. Much of this area is currently defined as "cleared".

Table 1: Changes in landcover extent of BOP Frost flats from 2003 – 2020.

Landcover	**Sum of Area (Ha) 2003**	**Sum of Area (Ha) 2016/17**	**Sum of Area (Ha) 2020**	**Change** (negative value indicates a decline in extent)
TI3 - Monoao scrub/ lichenfield	5038.6	4325.9	4141.3	-184.6
TI4 - Grey scrub	67.9	113.5	147.4	33.9
VS8 - Successional frost flat	84.3	89.6	74.5	-15.1
Cleared	87.3	216.4	90.2	-126.2
Degraded TI3 Frostflat			278.8	278.8
Degraded TI4 Frostflat			3.2	3.2
Degraded VS8 - Successional Monoao/ Grey scrub			0.8	0.8
Developed- Forestry	0.0	308.9	328.7	19.7
Developed- Pasture	0.0	17.3	17.3	0.0
Wilding Pine Forest	261.2	467.6	457.2	-10.4
Grand Total	**5539.1**	**5539.1**	**5539.5**	**0.3**

3.2 Changes in Wilding Pine Cover

Table 2 reports changes in extent for all the areas, and landcovers reported in Table 1. In 2016/17 there were 3,485 Ha of indigenous frost flat ecosystems (TI3, TI4 or VS8 ecosystems, included degraded ecosystems) with less than 1% wildling pine cover. Between 2016/17 and 2020 the area of indigenous frost flat ecosystems with <1% wilding pine cover has declined to 3310 Ha, a decline 178.9 ha, a further 5.1%. This is an accelerated rate of loss, as between 2003 and 2016/17 (a period of 14 years) there was an 8.3% loss in indigenous frost flat ecosystems with <1% cover.

This decline is likely to be largely due to increasing density of wilding pines along the western edge of the Rangitaiki frost flat (an area of 253 ha, all of which was classified as <1% cover in 2016.17). This is Rangitaiki Zone 1, the densest areas of which were treated by ground control this year between March and August (Jo

Mendonca, DoC, Pers comm). This control was after the aerial imagery (Jan 2020). Much of this area is likely to be back to a low percentage cover following this control.

Table 2: Changes in wilding pine cover of BOP Frost flats from 2003 - 2016/17 (all landcovers listed in table 1).

Wilding Pine Cover	Sum of Area (Ha) 2003	Sum of Area (Ha) 2016/17	Sum of Area (Ha) 2020	Change (Ha) (from 2016/2017 to 2020 (negative value indicates a decline in extent)
Zero Density			888.8	
<1%	3798.7	3484.6	2421.4	-178.9*
1-5%	261.2	478.8	440.8	-38.0
6-15%			386.6	
16-25%			152.4	
6-25%	593.1	319.5		219.5**
26-50%	162.1	213.0	241.4	28.4
51-75%	168.5	155.5	119.1	-36.4
>75%	468.3	467.6	457.2	-10.4
NA	87.3	420.1	436.2	16.1
Total	**5539.2**	**5539.2**	**5539.5**	**-0.3**

*Change from <1% in 2016/17, to combined Zero Density and <1% in 2020, as these cover classes were not separate in 2016/17.

**Change from 6-25% in 2016/17, to combined 6-15% and 16-25% in 2020, as these cover classes were not separate in 2016/17.

4. References

Delich, A. (2020). Changes in Extent of Bay of Plenty Frost Flats: 2003 – 2017. April 2020 update. NSES Ltd report 5:2019/20. Prepared for: Bay of Plenty Regional Council. 25 p.