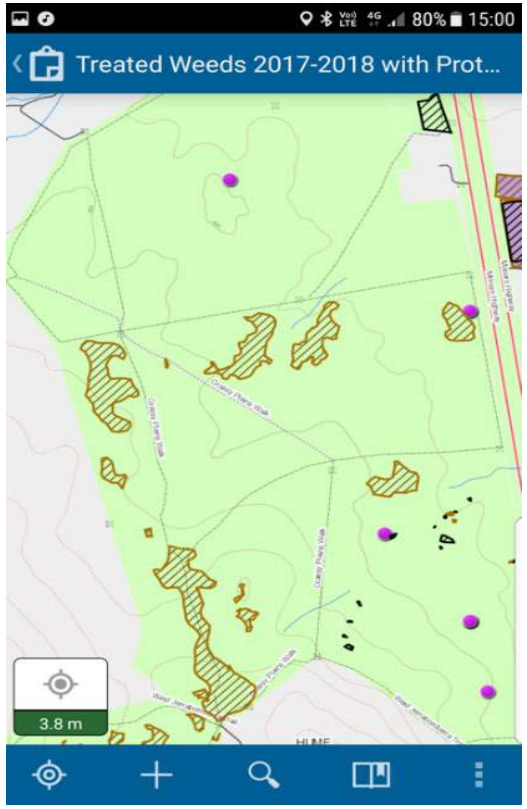


Invasive Grass Control & Mapping in Native Grasslands

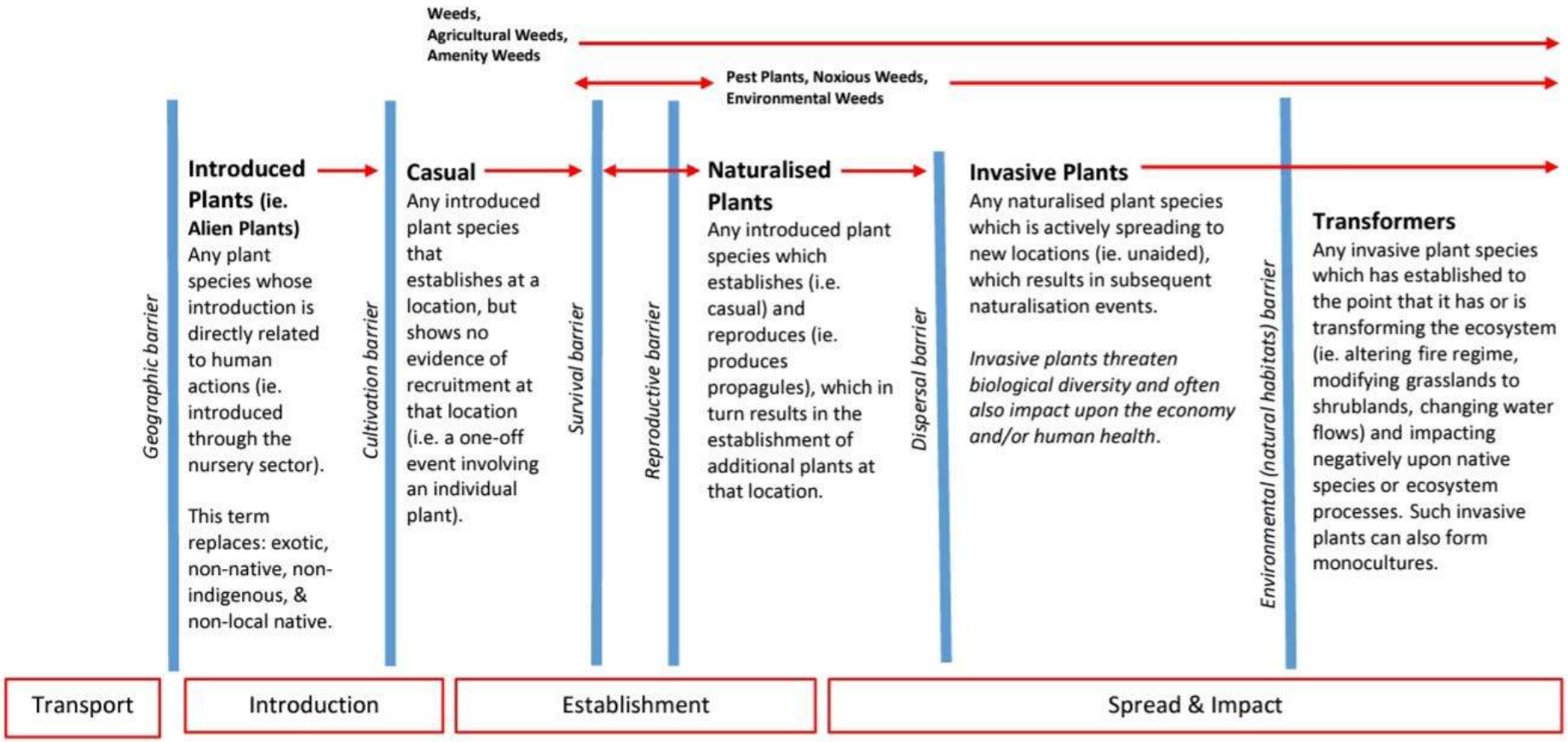
If you can't measure it - you can't manage it

Steve Taylor
Invasive Plants Coordinator

ACT Government

Invasive Plant Terminology

and barriers introduced plants must overcome to become invasive



Definitions are based on these references:

C. Hui & D.M. Richardson (2017) Invasion Dynamics, Oxford University Press

Blackburn, T.M., Pysek, P., Bacher, S., Carlton J.T., Duncan, R.P., Jarosik, V., Wilson, J.R., Richardson D.M. (2011) A proposed unified framework for biological invasions. Trends in Ecology & Evolution, 26, 333-9.

D.M. Richardson, P.Pysek, M. Rejmánek, M.G. Barbour, F.D Panetta & C.J. West (2000) Naturalization and Invasion of Alien Plants: Concepts and Definitions. Journal of Diversity & Distributions, 6. 93-107.

United Nations (UN) Convention on Biological Diversity (2018) What are invasive alien species? https://www.cbd.int/invasive/WhatareIAS.shtml

US Dept. Agriculture (USDA) National Invasive Species Information Centre (2018) What is an invasive species? https://www.invasivespeciesinfo.gov/whatis.shtml

Adjunct Assoc. Professor Paul Downey, Institute for Applied Ecology, University of Canberra, pers. commun. 2018

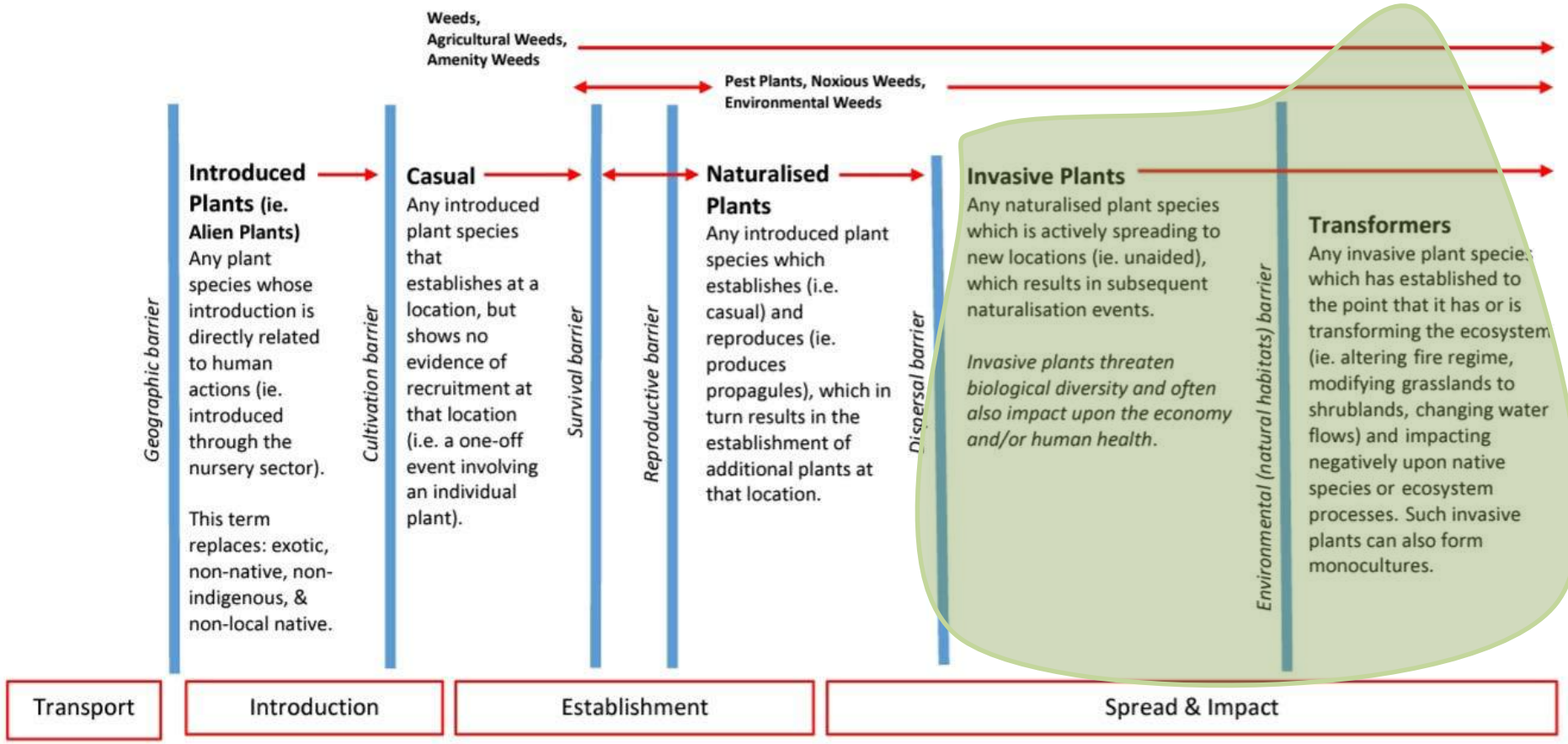
Notes: Questionably Naturalised (syn. Doubtfully Naturalised) and Sparingly Naturalised, are terms used with respect to the barriers between Casual and Naturalised Plants (i.e. Establishment phase). Other terms used include: New Incursions and Sleeper Weeds. New Incursions are recently Introduced Plants that are in the early stages of establishment. Sleeper Weeds are Introduced Plants that are currently not spreading but evidence elsewhere indicates they have invasive potential.

Highest impact invasive grasses are transformers eg. serrated tussock, African lovegrass, Chilean needle grass.

ACT Government

Invasive Plant Terminology

and barriers introduced plants must overcome to become invasive



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ACT Government

Landscape impact…

Invasive introduced grasses are regarded as an increasing landscape threat*

- Impact upon landscape connectivity, biodiversity and productivity
- Serrated tussock (syn. nassella tussock)#, African lovegrass, Chilean needle grass#, Coolatai grass, buffel grass#

*Godfree R., Firn J., Johnson, S, Knerr. N, Stohl, J. , Doerr V. (2017) Why non-native grasses pose a critical emerging threat to biodiversity conservation, habitat connectivity and agricultural production in multifunctional rural landscapes, Landscape Ecology, doi:10.1007/s10980-017-0516-9

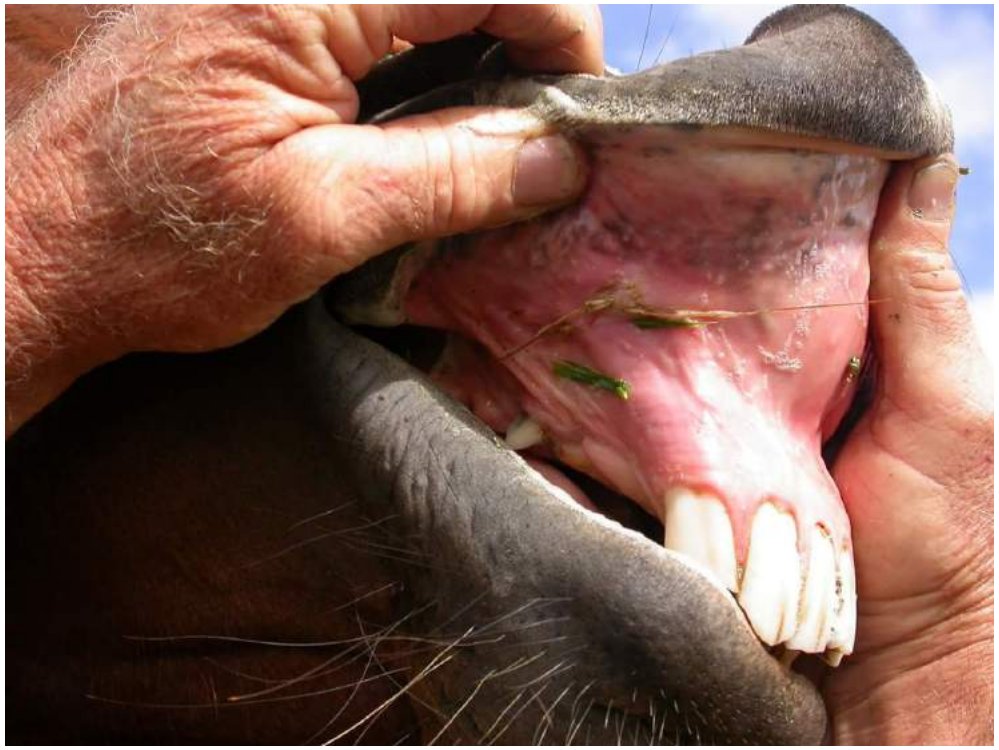
#Weed of National Significance

Serrated tussock, aka Nassella tussock, seed heads (top R) and a mono-culture of serrated tussock that has smothered a native grassland (Bottom R)

Even high quality native grasslands are susceptible to invasion by higher risk invasive plants

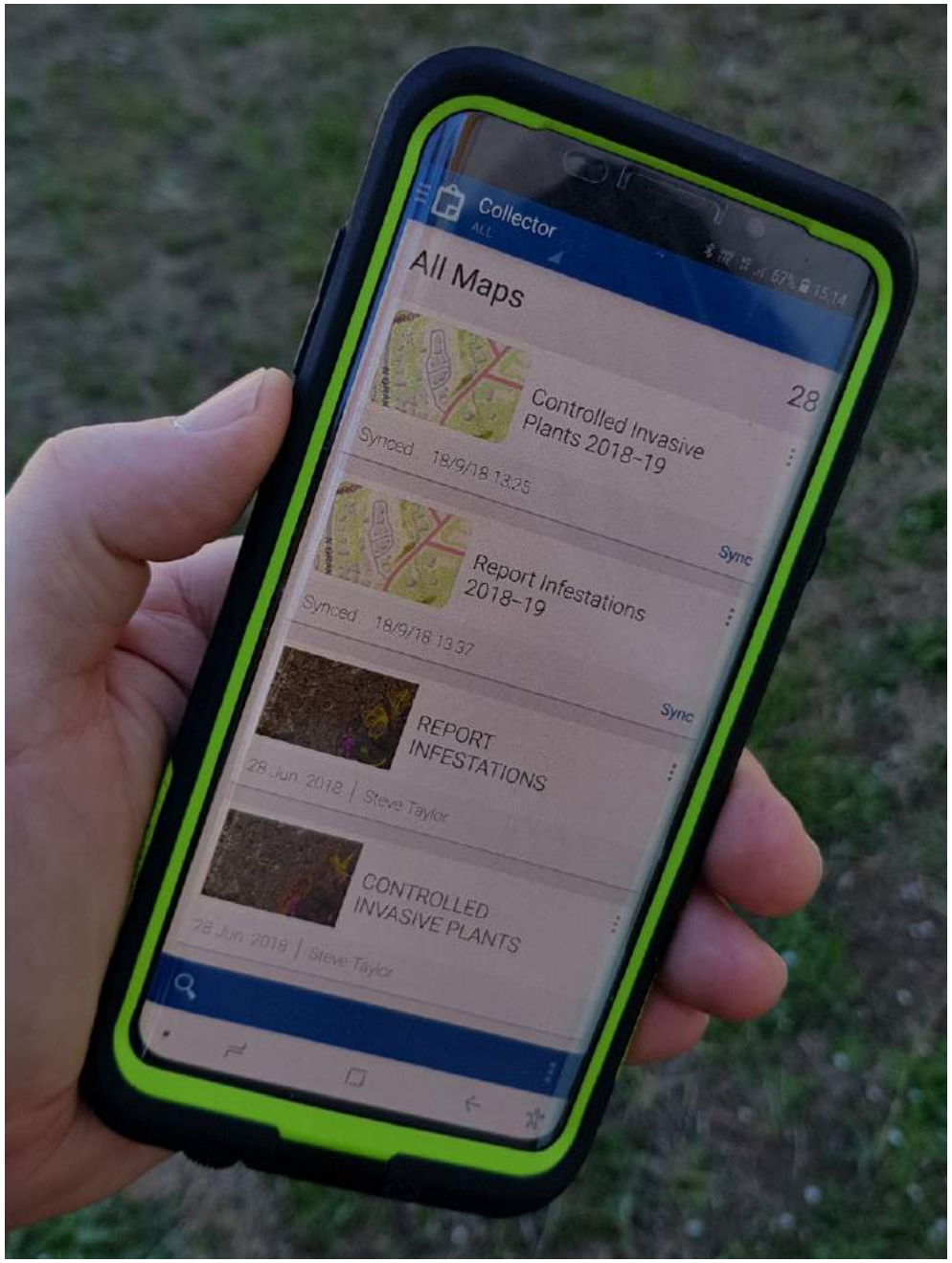
Early stage of Chilean needle grass invasion (bright green grasses) in a kangaroo grass (reddish-brown grasses) native grassland at Barton, ACT
Photo taken in winter when kangaroo grass is dormant

Impacts on livestock from Chilean needle grass seed…



Mapping infestations & control work on Collector app…

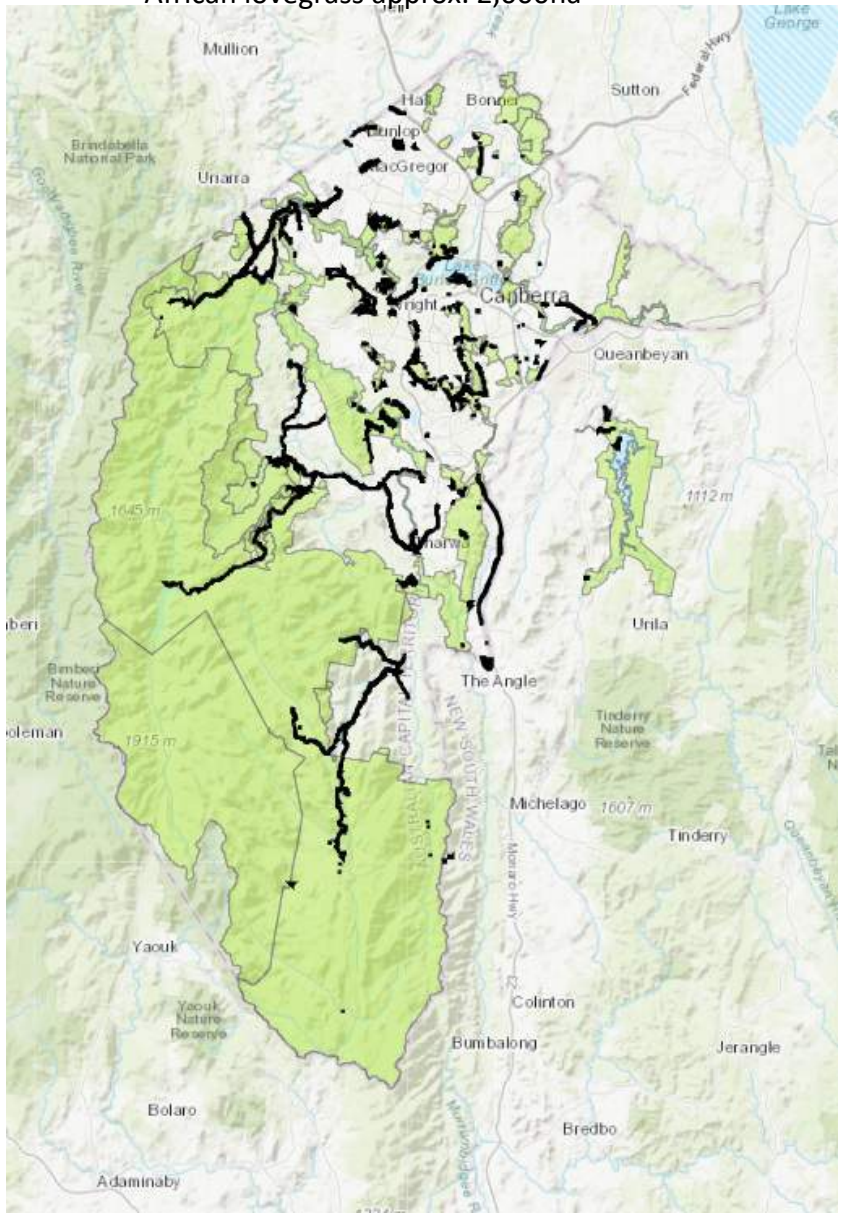
- 27,500 polygons collected each financial year
- 128 users in the Invasive Plants Group
- Feature layer is based around 70 unique invasive plant species values
- 4 pick lists (density, control method, herbicide type, operator) and one free field for iNaturalist hyperlinks to photo-points or other comments for each polygon
- Mostly on device or off-line using our own 3.8GB land use base map



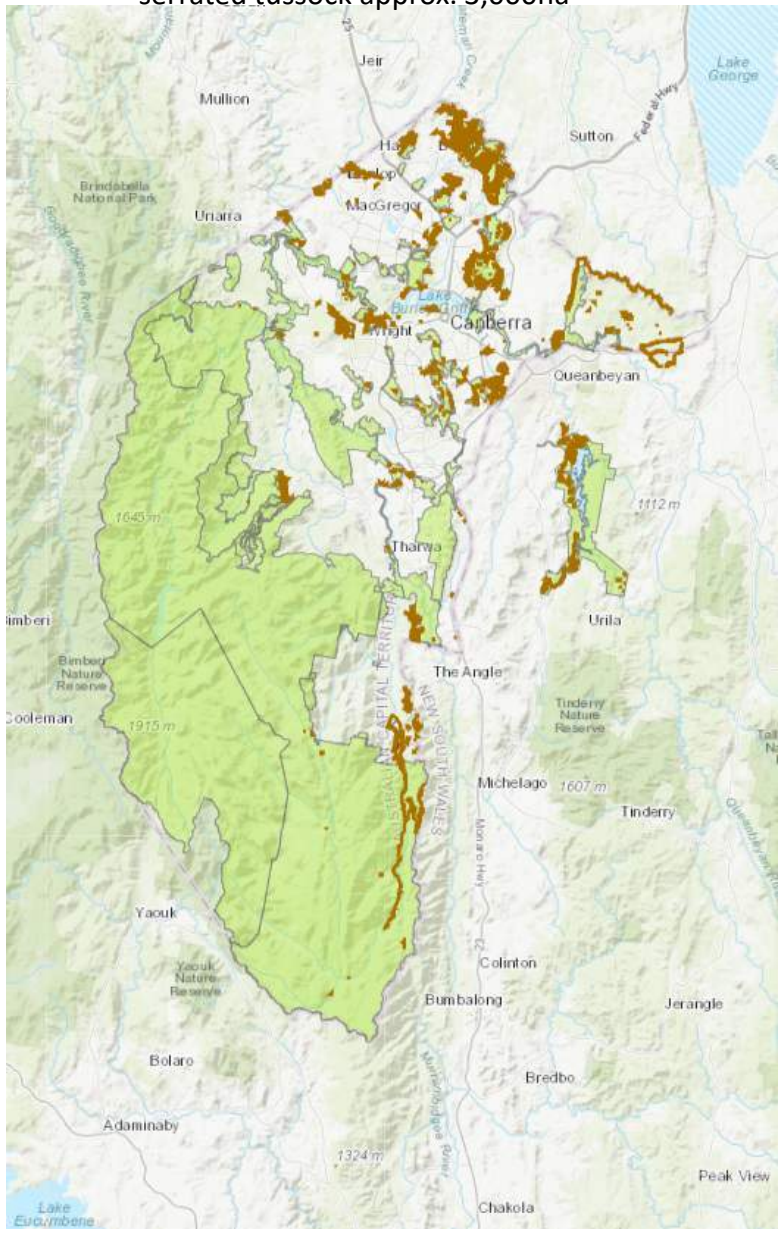
Snapshots of invasive grass control in 2017-18

Source: Collector app – ArcGIS On-line

African lovegrass approx. 2,000ha



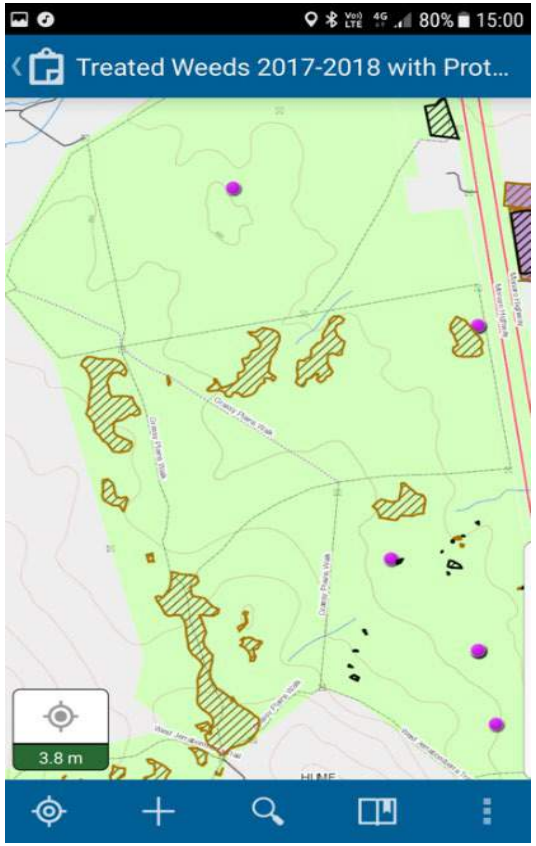
serrated tussock approx. 3,000ha

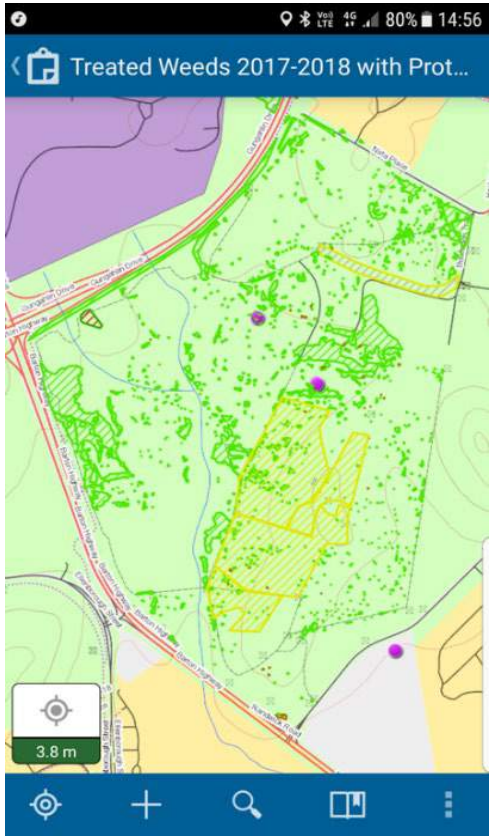


Invasive grass control effort in native grasslands

measuring successful control 2014-2017

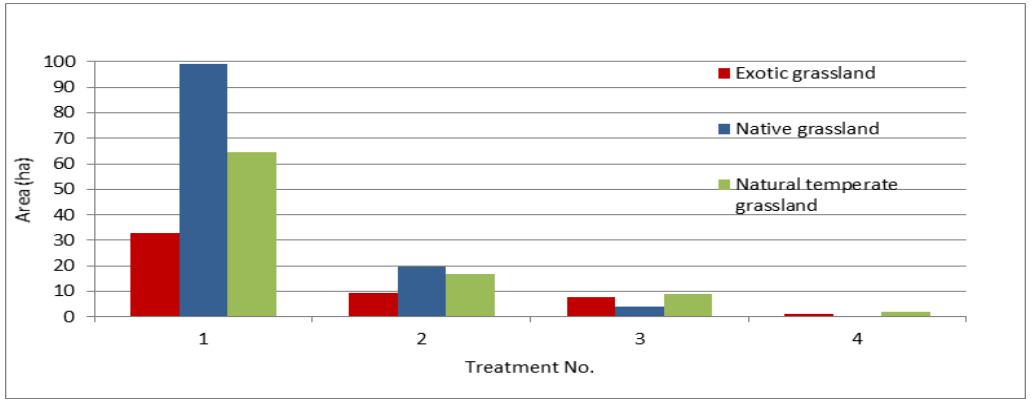
- Approx. 182 ha of Chilean needle grass, 266 ha of African lovegrass and 699 ha of serrated tussock were controlled multiple times in the lowlands grasslands*.
- Collector app was used to map control work:
  - A density rating for the target species was assigned to each polygon: <1% cover (density 1), 1-10% cover (density 2), 11-25% cover (density 3), 26-50% cover (density 4), > 50% cover (density 5)
  - For each target species the number of sites (polygons) in each density category was shown by treatment number. Treatments were mainly spot spraying with herbicides (glyphosate, flupropanate).



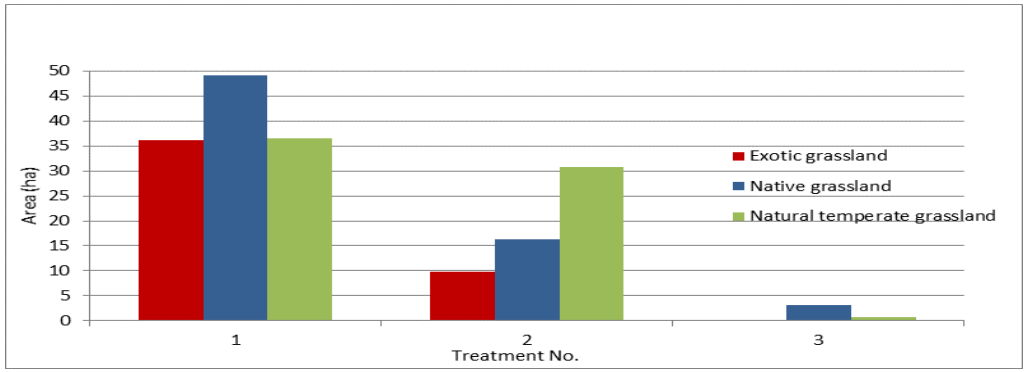


*Brawata, R., Stevenson, B., and Seddon, J. (2017) Conservation Effectiveness Monitoring Program: ACT Lowland Native Grasslands Ecosystem Condition Monitoring Plan. Technical Report. Environment, Planning and Sustainable Development Directorate, ACT Government, Canberra.

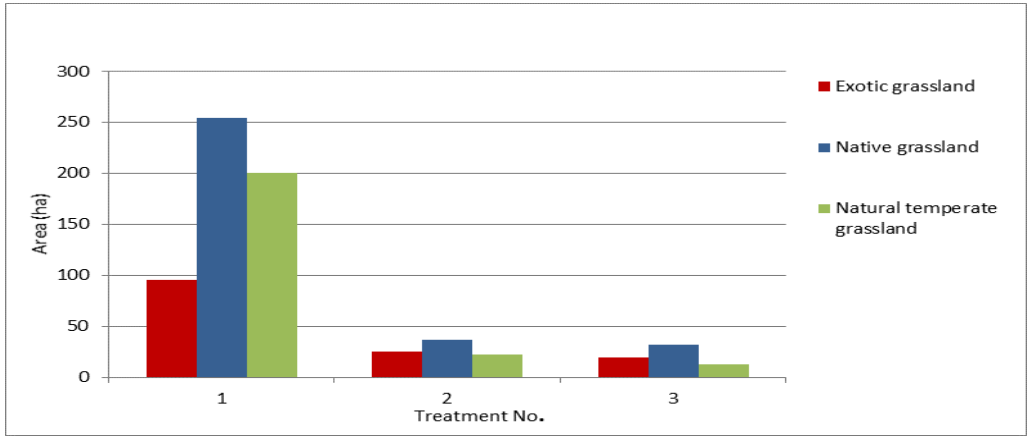
Results: reduced area of infestations



African lovegrass controlled & treatment number



Chilean needle grass controlled & treatment number



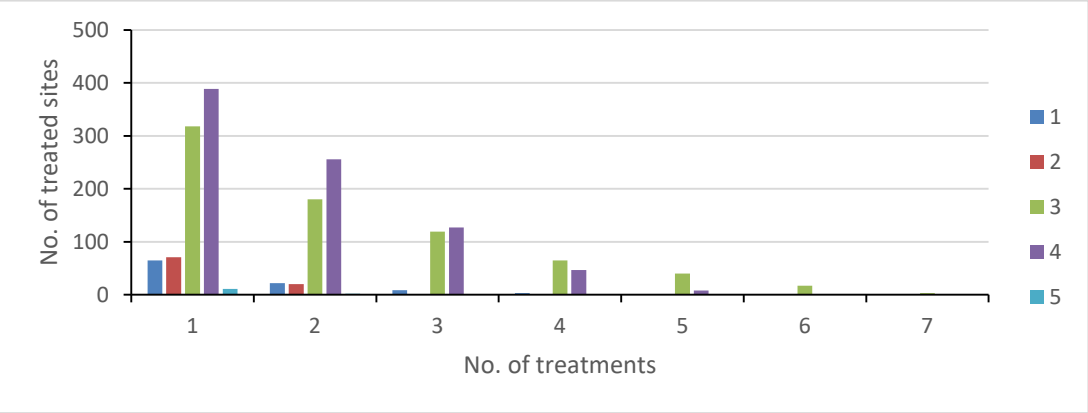
Serrated tussock controlled & treatment number

Native grasslands prioritized over exotic grasslands.

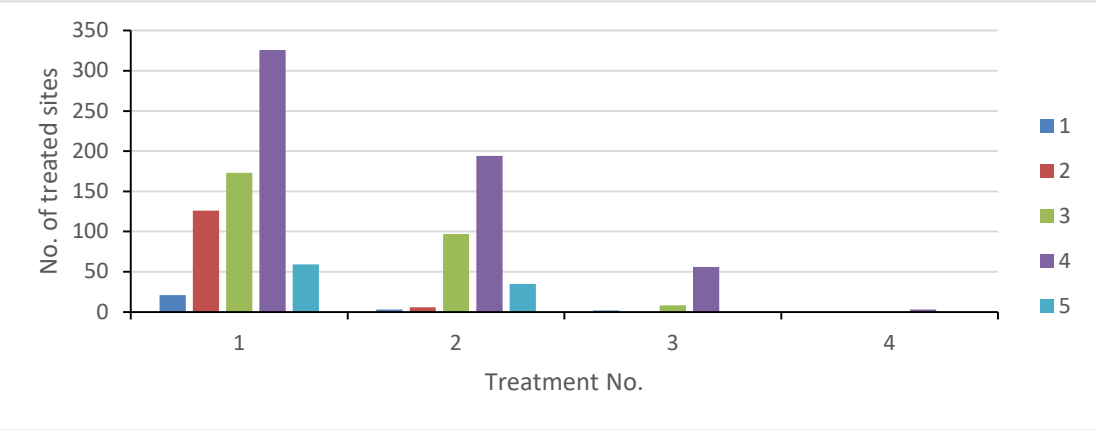
Once the infestations start being broken down then polygons reduce in size.

There are often more polygons mapped after the first treatment but the cumulative area is less than the large initial polygons.

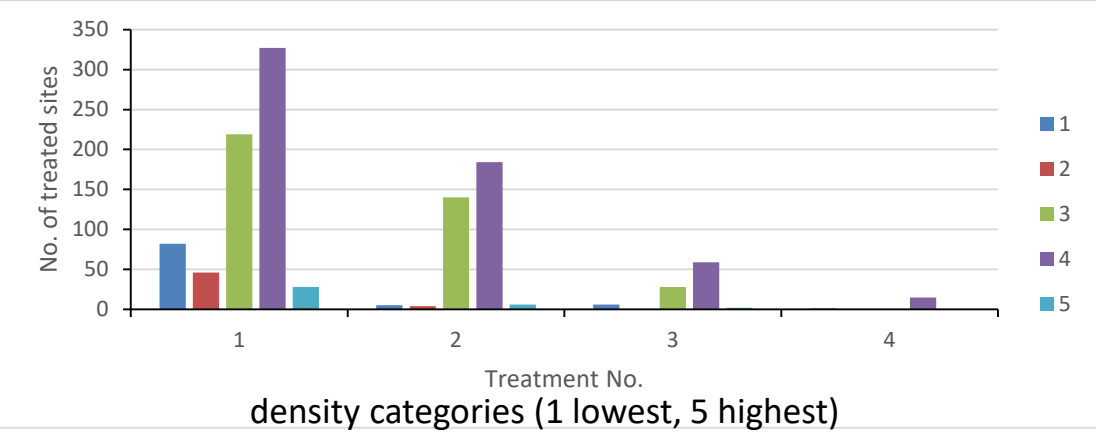
Using Mapping Data to Determine Threshold Cover



African lovegrass controlled & treatment number



Chilean needle grass controlled & treatment number



Serrated tussock controlled & treatment number

density categories (1 lowest, 5 highest)

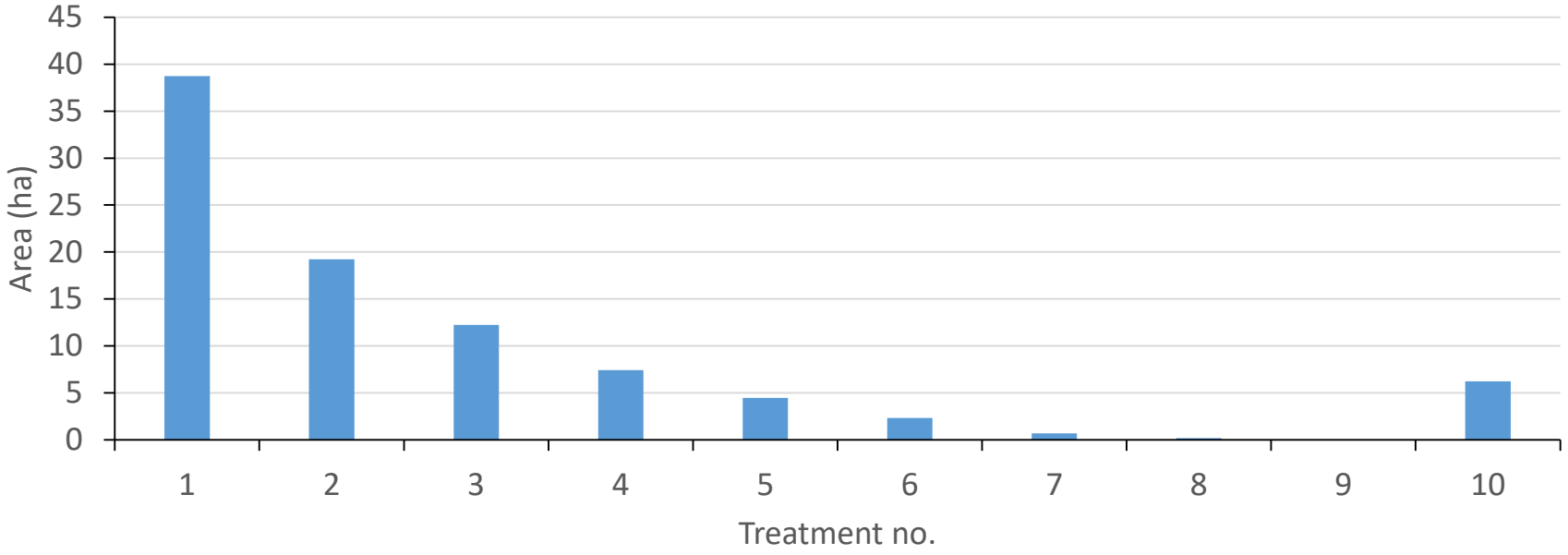
Source: Collector app/ArcGIS

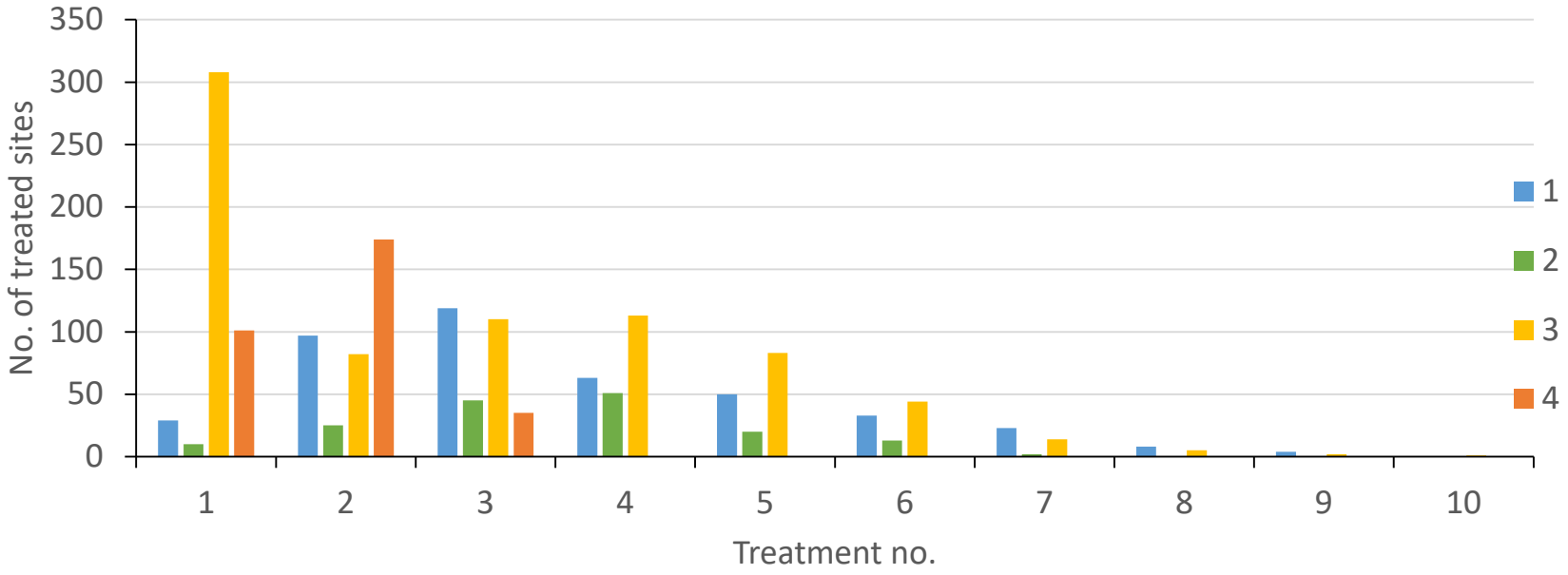
Follow-up control is essential to deal with re-infestation.

Denser infestations require more follow-up control

Relatively more control effort is required for African lovegrass

Treatment effort for African lovegrass in Namadgi NP grasslands





6 years of data

1 – lowest density
4 - highest density

Control Thresholds

What should be the target level of cover or acceptable threshold cover at high conservation sites for widespread high risk invasive plants?

The invasive grass control charts can help answer. Density charts showed:

- At the lowest densities only 2 to 3 treatments were required before there was no need for follow-up control (over the study period)

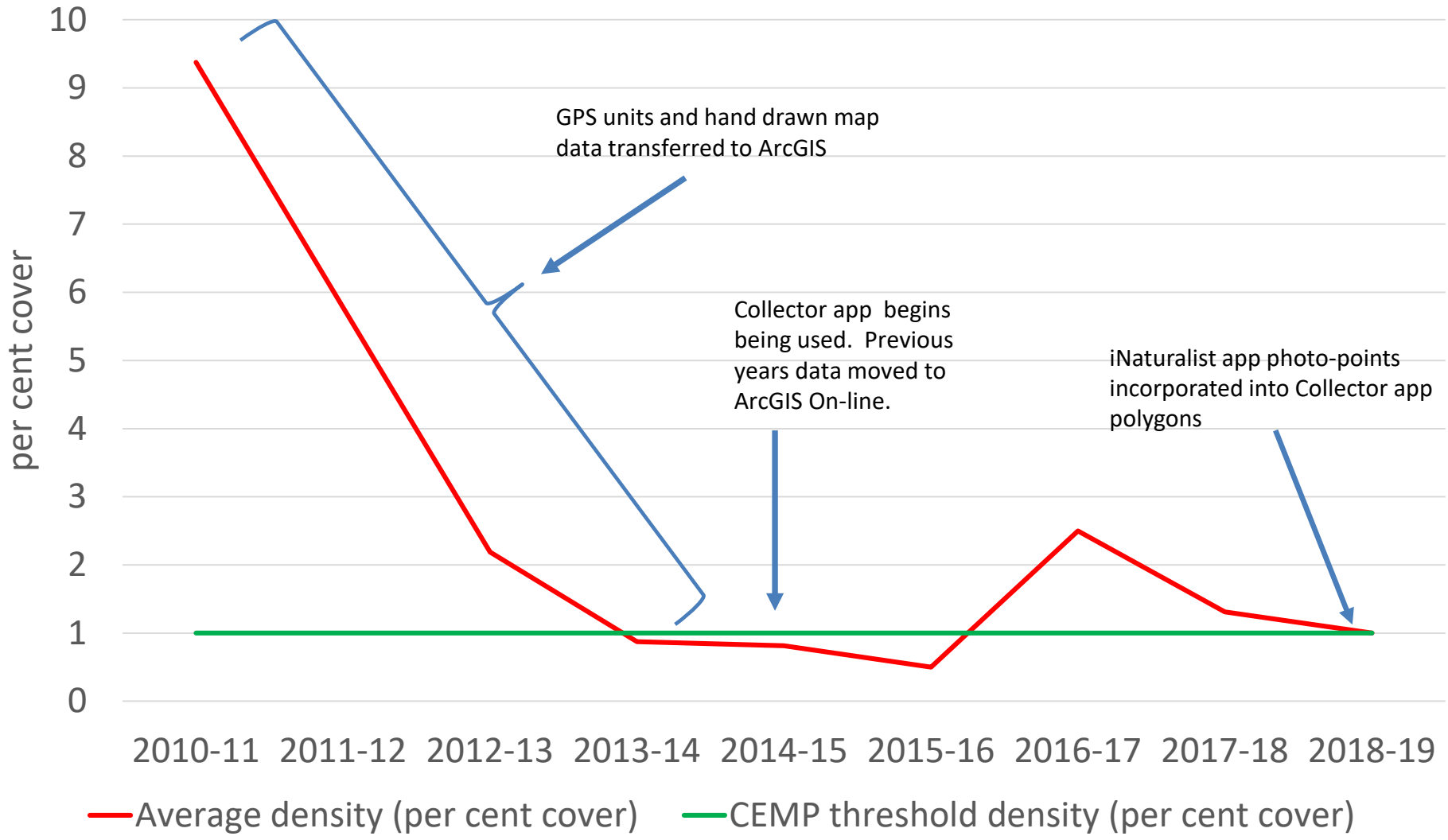
- At higher densities between 4 to 7 treatments were required before there was no need for follow-up control (over the study period)

Impact increases with density. Use of restoration techniques such as prescribed burns spread 'fire increaser' species such as African lovegrass.

So…..a low target threshold of less than 1% cover for high risk invasive plants seems like a sensible precaution.

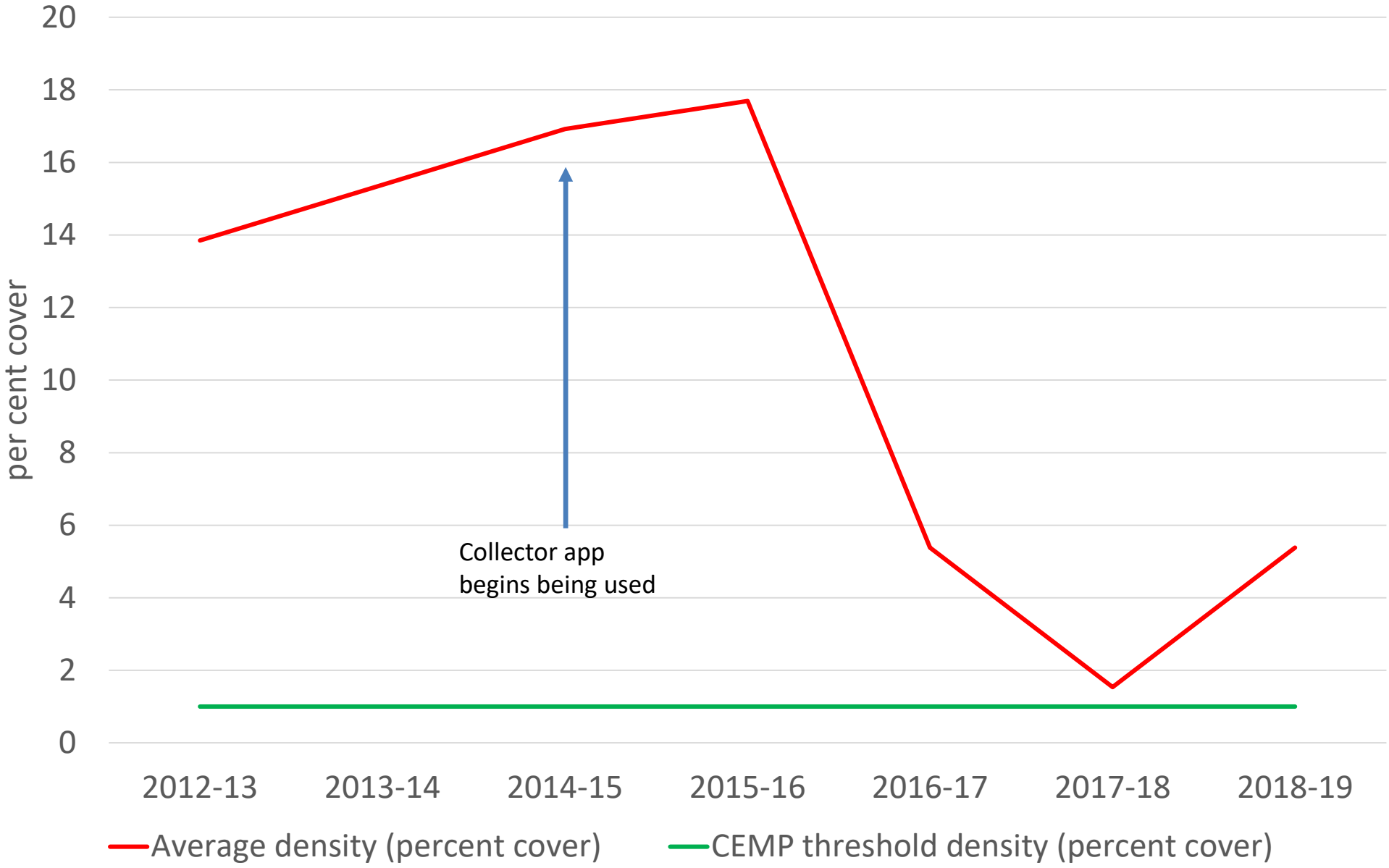
Results from Red Hill Nature Reserve for Chilean needle grass control

Data downloaded to Excel/CSV using ArcGIS On-line Analysis-Perform Analysis-Summarize Data-Summarize Within



Results from Crace Nature Reserve for Chilean needle grass control

Data downloaded to Excel/CSV using ArcGIS On-line Analysis-Perform Analysis-Summarize Data-Summarize Within



Results from Namadgi National Park for African lovegrass control

Data downloaded to Excel/CSV using ArcGIS On-line Analysis-Perform Analysis-Summarize Data-Summarize Within

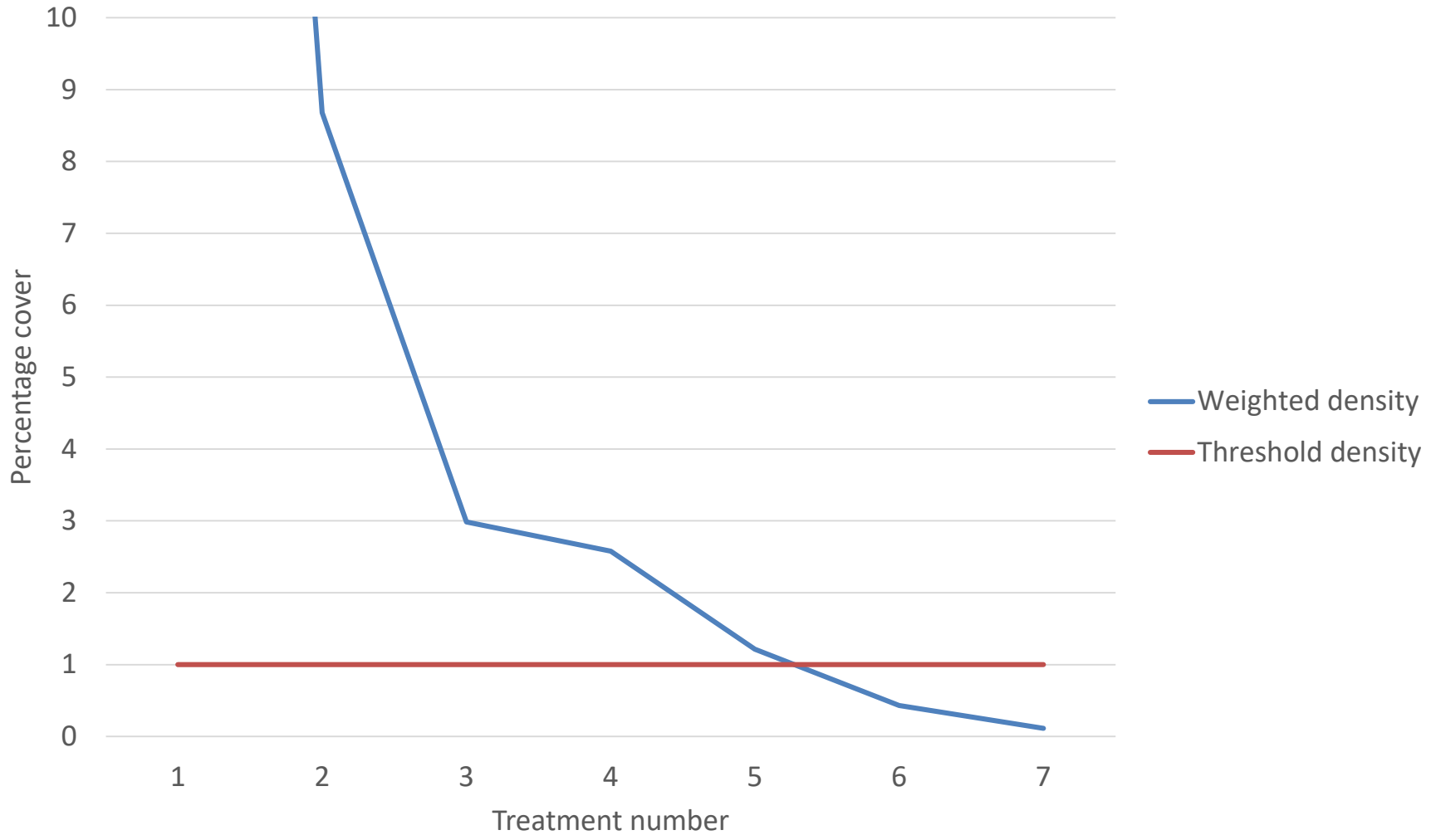


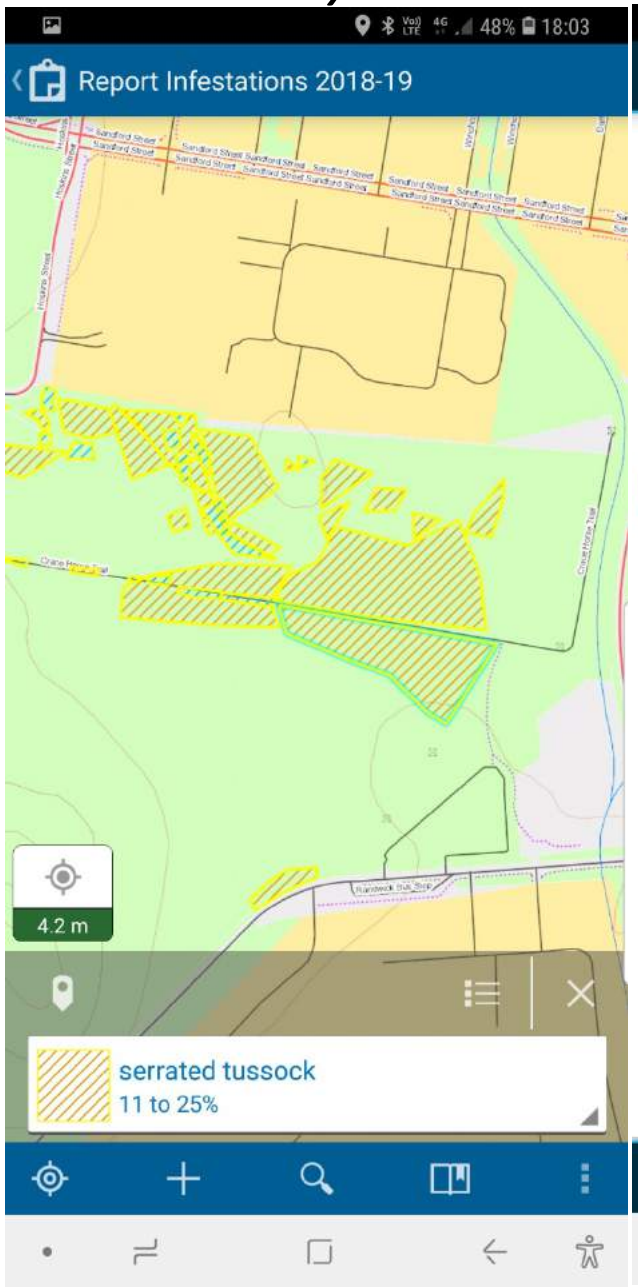
Photo points of control work

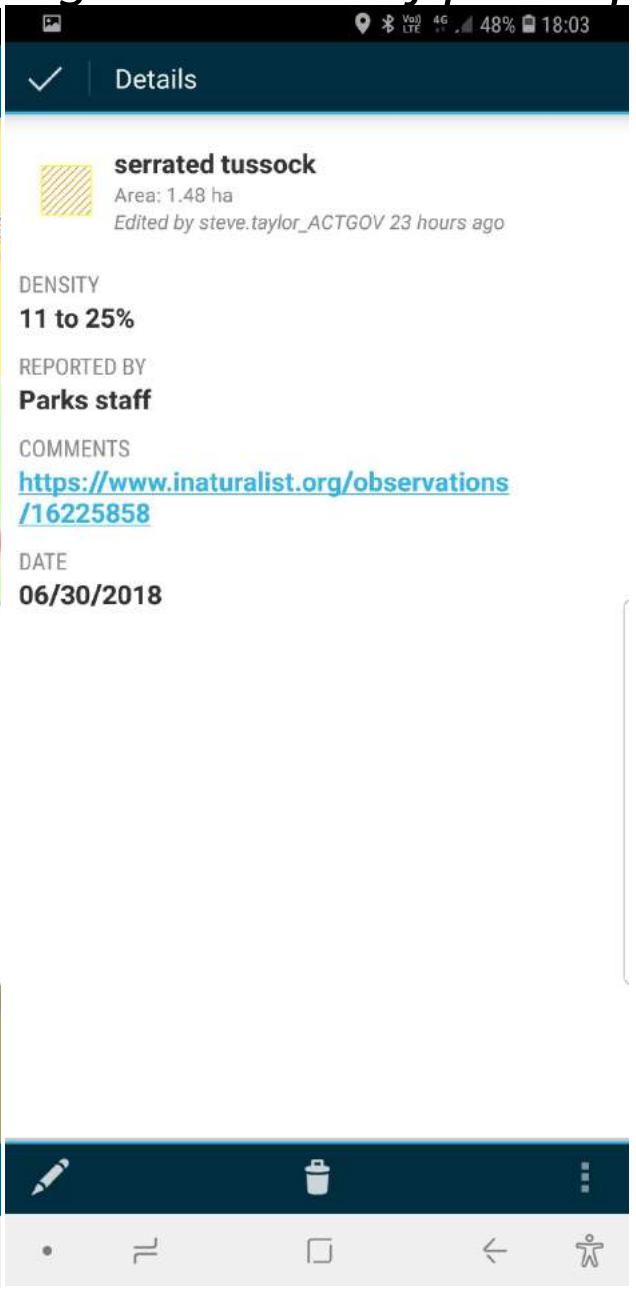
Primary spot spraying control of serrated tussock at Jerrabomberra Grasslands Nature Reserve, 2005

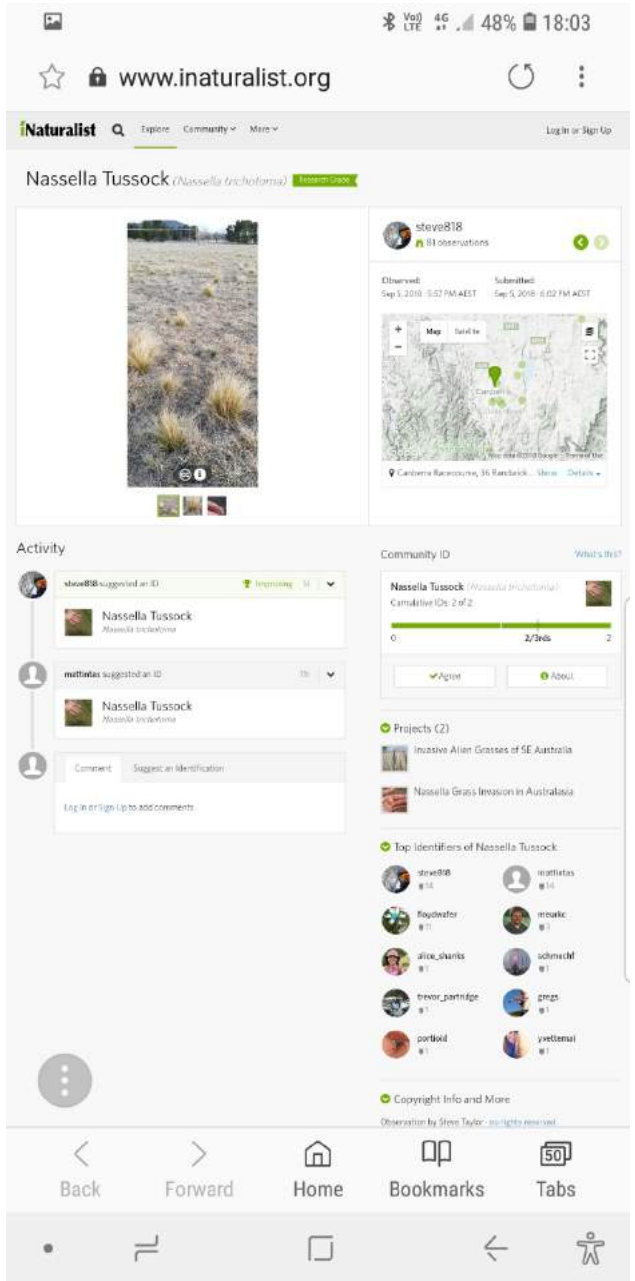
After 4 years of control work. The site was dominated by native tall spear grass

Integrating Collector app & iNaturalist app – photo-points

A better way to create large numbers of photo points







Integrating Collector app & iNaturalist app cont.

View video content

Conclusions

Collector app simple to use system - good uptake by staff, contractors & volunteers

Data showed good performance against KPIs or environmental thresholds

Asset protection works: follow-up control has brought invasive grasses under control at priority sites

Collector app bugs less common than early days but important quick turn around with updates to the app. Issue of ArcGIS on-line updates affecting existing on-device maps.

Where next ? Enterprise accounts, drones, hyperspectral imagery…