



How to collect Flora
Connections data

A STEP BY STEP GUIDE



Community scientists have a wealth of on-ground knowledge about plants. Flora Connections wants to connect community plant knowledge to people working on plant conservation. Photos: Seamus Doherty (top) and Australian Citizen Science Association (below)




The Flora Connections project

The Flora Connections project aims to connect community plant knowledge to conservation decision making. Community scientists and botany groups have a wealth of on-ground plant knowledge. Government committees making decisions about native plants across Australia need on-ground plant data. Flora Connections will connect community to government to improve outcomes for Australian plants. Flora Connections is a collaborative research project between Western Sydney University and the Atlas of Living Australia, funded by the Australian Government's Bushfire Recovery Program for Wildlife and their Habitats.



Australian Government
Department of Agriculture,
Water and the Environment



A vertical photograph on the left side of the page shows a person's legs and feet in a field of red flowers. The person is wearing dark pants and shoes. The field is filled with low-growing plants with bright red flowers. In the background, there are green trees and a blue sky with some clouds.

We want to know what is happening to native plants in your area.

Where are native plants growing?
How many plants are there?
Is the plant species reproducing?
How does it respond to fire?
Are there any threats to the plant?

To answer these questions and more we've made a data sheet and portal to collect data on plants in your area.

This guide will explain how to choose a plant to survey, what to do when you find a plant, and how to fill out the data sheet.

INSIDE THIS GUIDE

- | | | | |
|-----------|-----------------------------------|-----------|--|
| 4 | AUSTRALIAN PLANTS AND FIRE | 13 | SPECIES INFORMATION |
| 5 | FLORA CONNECTIONS PROCESS | 15 | DISTURBANCE AND THREATS |
| 7 | GETTING STARTED | 17 | POPULATION NUMBERS |
| 11 | SITE INFORMATION | 19 | WHAT TO DO WITH DATA ONCE YOU'VE COLLECTED IT |
| 12 | SPECIES HABITAT | 20 | FLORA CONNECTIONS GLOSSARY |



Many Australian plants are adapted to fire and regrow from seed or by resprouting.

Australian plants and fire

The Black Summer 2019-20 bushfires burnt across millions of hectares of Australian plants. Many Australian plants are adapted to fire: some plants are killed by fire but regrow from seeds in the ash bed. Some plants have thick bark to protect them from the worst of the fire, resprouting afterwards. Some plants need fire as part of their life cycle, and can only be seen after fire has burnt an area.

But some Australian plants and ecosystems are not well adapted to fires. Fires that are too frequent, too intense or too severe can badly impact plant populations. And plants that are already threatened by habitat loss, drought or disease may have a harder time recovering from fire.

Whether fire has harmed a plant population depends a lot on local conditions. How severe was the fire? Did it burn the whole population or only part of it? We need local knowledge to answer these questions and more. On-ground observations help us better understand which Australian plants are under threat. And that's where Flora Connections can help!



These Eucalypts survived an intense fire in Warrumbungle National Park in 2013 but died in the subsequent drought in 2019.

Flora Connections- connecting
community plant knowledge to
government and researchers.

1

Find a native plant in your area

Page 7



2

Identify the plant species

Page 8



3

Record site and habitat data

Page 11 & 12



4

Assess threats to the population

Page 15 & 16



5

Conduct species population survey

Page 17 & 18



6

Upload data to Flora Connections website

Page 19



Flora Connections wants information
on priority plants from across Australia.
Pictured: Tjoritja/ West MacDonnell
National Park, Northern Territory.



Getting Started

How to choose a plant to survey

Flora Connections wants information on native plants in your area. We need detailed information on each plant species.

So how do you choose a plant to survey?

Local knowledge is important here. Are there plants in your area that have been affected by recent fires or floods? Plants threatened by drought, clearing or disease? Plants that have disappeared from the area recently?

After the 2019-20 bushfires researchers put together a list of "Priority plants". Priority plants may be at risk because of bushfires and other threats, such as drought, disease and herbivory. Surveys of priority plants will help government and researchers understand how plants are responding to threats.



Priority plants for Flora Connections surveys can be found at: floraconnections.com/priority-plants

You can check if species occur in your local area via the Australasian Virtual Herbarium (avh.ala.org.au). Search for a species, and the map will show you where botanists have collected that plant in the past.

A note about site hygiene

If you are looking for native plants it is important not to bring new diseases or threats to the area. Make sure you clean your shoes before your visit (scrub and wash with methylated spirits).

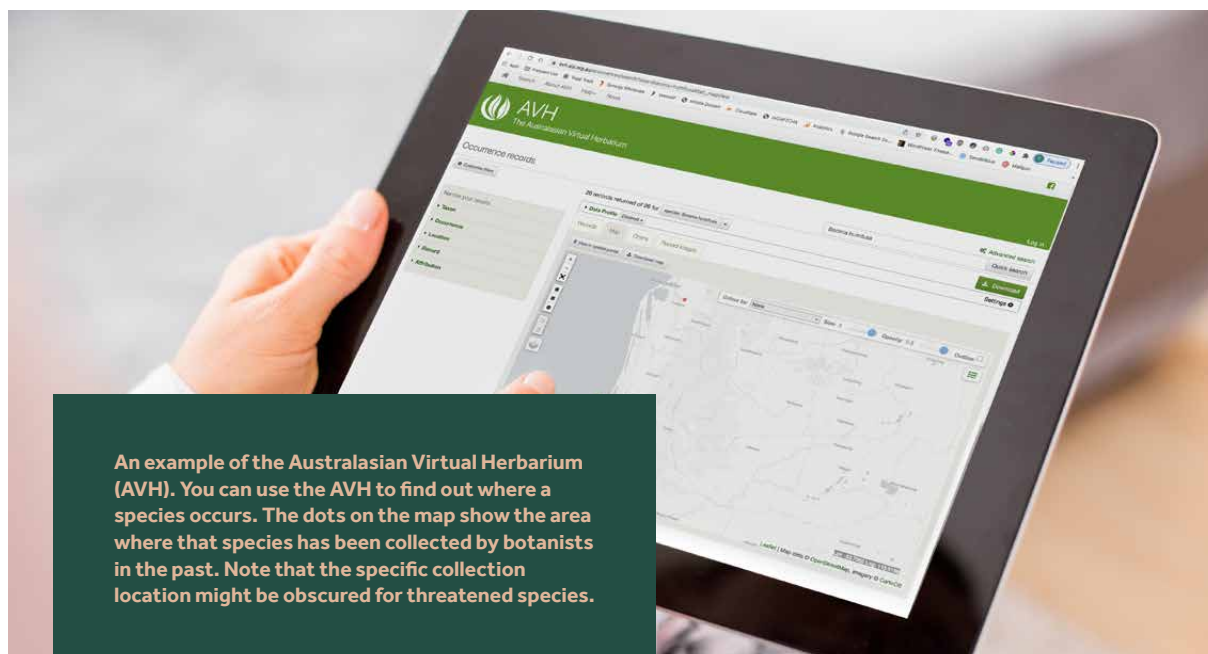


Follow "Leave No Trace" principles in the bush <https://parks.tas.gov.au/explore-our-parks/know-before-you-go/leave-no-trace>

Be careful where you step, and try not to damage any plants while surveying.



For advice on equipment for Flora Connections surveys please visit floraconnections.com/guide



An example of the Australasian Virtual Herbarium (AVH). You can use the AVH to find out where a species occurs. The dots on the map show the area where that species has been collected by botanists in the past. Note that the specific collection location might be obscured for threatened species.

What to do when you find a plant

Time to get some data down! When you find a plant you want to survey in the field it's time to fill out the Flora Connections data sheet.

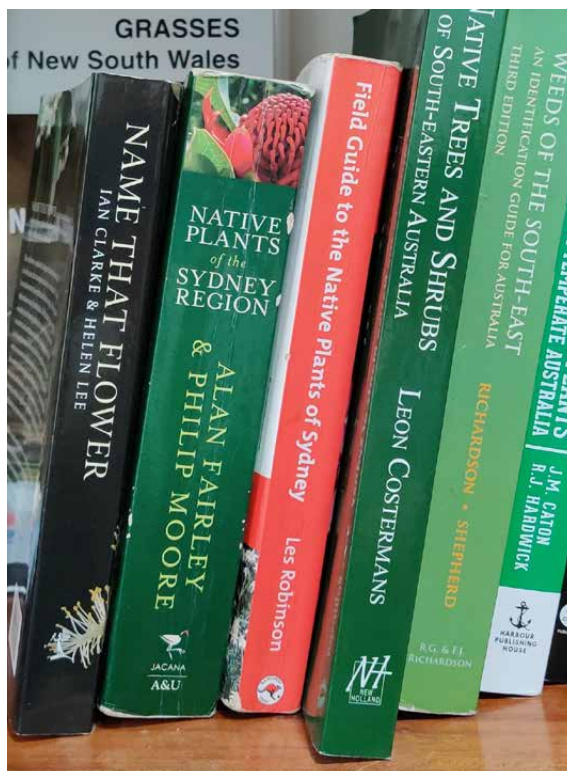


You can print data sheets from floraconnections.com/data-sheet to fill out in the field.

The first thing is to double check what species you're looking at. You don't want to collect all this data for the wrong species!

Under "Species Information" we ask for the plant's scientific name - no common names please. The scientific name is important to make sure we know what species you're collecting data on. We also ask how you identified the species: using a published key, a field guide or something else. Please note here which key or field guide you used. We also ask for identification notes: what features helped you identify this plant? Does it have a particular type of hair or leaf colour? What makes you sure it's not a similar lookalike plant?

If you have a smartphone you can use the iNaturalist app (inaturalist.org) to log a sighting. This will record the location and photos of the plant - take as many detailed photos as you can. If you have a current scientific licence you can also collect a herbarium specimen.



Field guides and floras for your region can help you to check a plant's identity. And a hand lens helps for those hard-to-see characters in the field!

Online resources for identifying Australian plants


You can find many floras and species identification keys online. Keys are the most reliable way to identify a plant species. Below are a few online resources to help with Australian plant identification:

Flora of Australia	ausflora.org.au
NSW PlantNet	plantnet.rbgsyd.nsw.gov.au
VicFlora	vicflora.rbg.vic.gov.au
WA FloraBase	florabase.dpaw.wa.gov.au
eFlora SA	flora.sa.gov.au
eFlora NT	eflora.nt.gov.au
Australian Tropical Rainforest Plants	apps.lucidcentral.org/rainforest
Eucalypts of Australia	apps.lucidcentral.org/euclid

What if I can't find the species in the field?

If you have thoroughly looked for a plant species but haven't found it, this is still very useful data. Sometimes a plant can't be found at a location where it used to grow. This can be because of fire, clearing, disease or other threats. If you've looked for a plant but haven't found it, please still fill out the Flora Connections data sheet. We want to

know the site information; species habitat; what species you were looking for; how long you spent searching; and any disturbances or potential threats to the species you see in the area. You can also make notes about when the species was last seen in this area in the "Survey notes" section.



Are there understudied plants in your area? Pictured: *Grevillea acanthifolia* subsp. *acanthifolia*, a priority plant in the Blue Mountains, NSW.



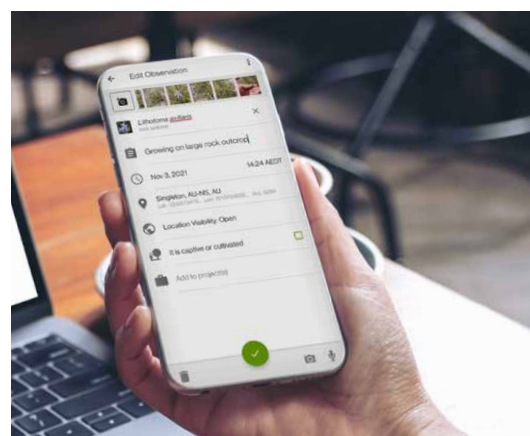
It's important to pay attention to detail when identifying a plant species. Keys such as the Flora of Australia can help you work out which characters are important for your species.

Site information

Once you're sure you're looking at the right species, it's time to get down important information about where you are. This starts with basic information: the date of survey and the names of the people recording the data. In case you are monitoring the species over time write what number visit this is (first, second, fifth etc).

We then need you to describe where you are. Start with country, state and general area (e.g. north-west slopes, south coast). Add the tenure of the land (e.g. if it's owned by National Parks, local government or private property holders) if you know it.

An example of the Site information section of the Flora Connections data sheet. Be as detailed as you can with your location description- this will help if anyone has to survey your plant population again!



Uploading an observation to iNaturalist is a good way to keep track of your photos of different plants, and share them with Flora Connections.

Site information		
Date: 15/02/2022	Visit #: 1	Recorders: Ruby Stephens
Country, state and district: Aus, NSW, Blue Mountains		Tenure (e.g. National Park, private): Blue Mountains City Council land
Location description: On foot trail 30 metres west from Yondell Ave fire trail, 460 metres south along Yondell Ave fire trail from intersection between Yondell Ave and Bee Farm Rd, Springwood		
Latitude/longitude: -33.7155 / 150.559	Datum: WGS84	Location accuracy: ± 5 m
Site photo notes: photos uploaded to iNaturalist, ID 95936545		

Sensitive species

It's important to be careful with location data for native species. Illegal collectors can target rare plants, especially orchids and succulents. **Don't share rare species locations publicly or with people you don't know.**

Be especially careful with data for plants that are:

- very rare, growing in limited locations
- old or slow growing
- difficult to grow from seed or cuttings
- easy to smuggle or transport
- able to be stored for some time

In "Location description" put a detailed description of exactly where the plant is. If you have a GPS or maps app you can use these to work out how far it is to the nearest road or town.

Using a GPS, map or app you can work out the latitude and longitude (in decimal degrees and datum WGS84) for your location. Please record how accurate your coordinates are - you can find this in GPS settings.

We encourage you to take as many photos of the species and site as you can. You can upload these photos with a sighting on iNaturalist or include them with your data. We've left a space in site information for you to make notes on what photos you've taken and where they are.

Species habitat



Habitat describes where a plant grows. This Coastal Sandstone Heath-Mallee is habitat to many different plant species.

Habitat is very useful as it helps ecologists predict where else this plant might grow.

- **Start by looking at the soil.**
What sort of habitat does the plant grow in? What colour is it: red, dark brown, grey? What texture: sand, clay, loam or sandy loam?
- **How steep is the slope,** and what compass direction does the slope face (aspect)?
- **How high above sea level is the location in metres?** You can work this out using contour lines on a map or a GPS.

Landform describes the landscape features around the plant. Examples are depressions, rises, slopes, flats, waterways, waterbodies or coastal. You can be more specific than this, e.g. flats can be deserts, roadsides, clay pans, floodplains or creek flats. Summarise the vegetation around the plant in vegetation type. For example, this could be low woodland, closed heath, shrubby forest or open grassland.

You can use this habitat information and more to write a site description. Try to include the most distinctive features of the habitat in this description. For example, if the plant is growing only between rock outcrops or in waterlogged soil write this here.

Species habitat	
Soil colour: <i>Pale yellow</i>	Soil texture: <i>Sandy</i>
Slope: Flat / <i>Gentle</i> / Steep / Very steep / _____	Aspect: N / NE / E / SE / <i>S</i> / SW / W / NW
Elevation (m): <i>340 metres</i>	Landform: <i>Ridge top</i>
Vegetation type: <i>low heath regrowth dominated by Grevillea phylloides</i>	
Site description: <i>regrowing shrubby heath in previously cleared area on sandstone ridgetop, below electricity lines and beside intact Red Bloodwood – Eucalyptus sparsifolia woodland with Banksia serrata</i>	

An example of the Flora Connections data sheet habitat section.

Species information

We want to know as much as we can about this plant. Under species description give a brief description of the plants you see. For height range you'll need to measure the shortest and the tallest plant you can find in the area. Measure from the ground to the highest point on the plant. If the plant is very tall you can estimate the height: ask several people to estimate and take the average.

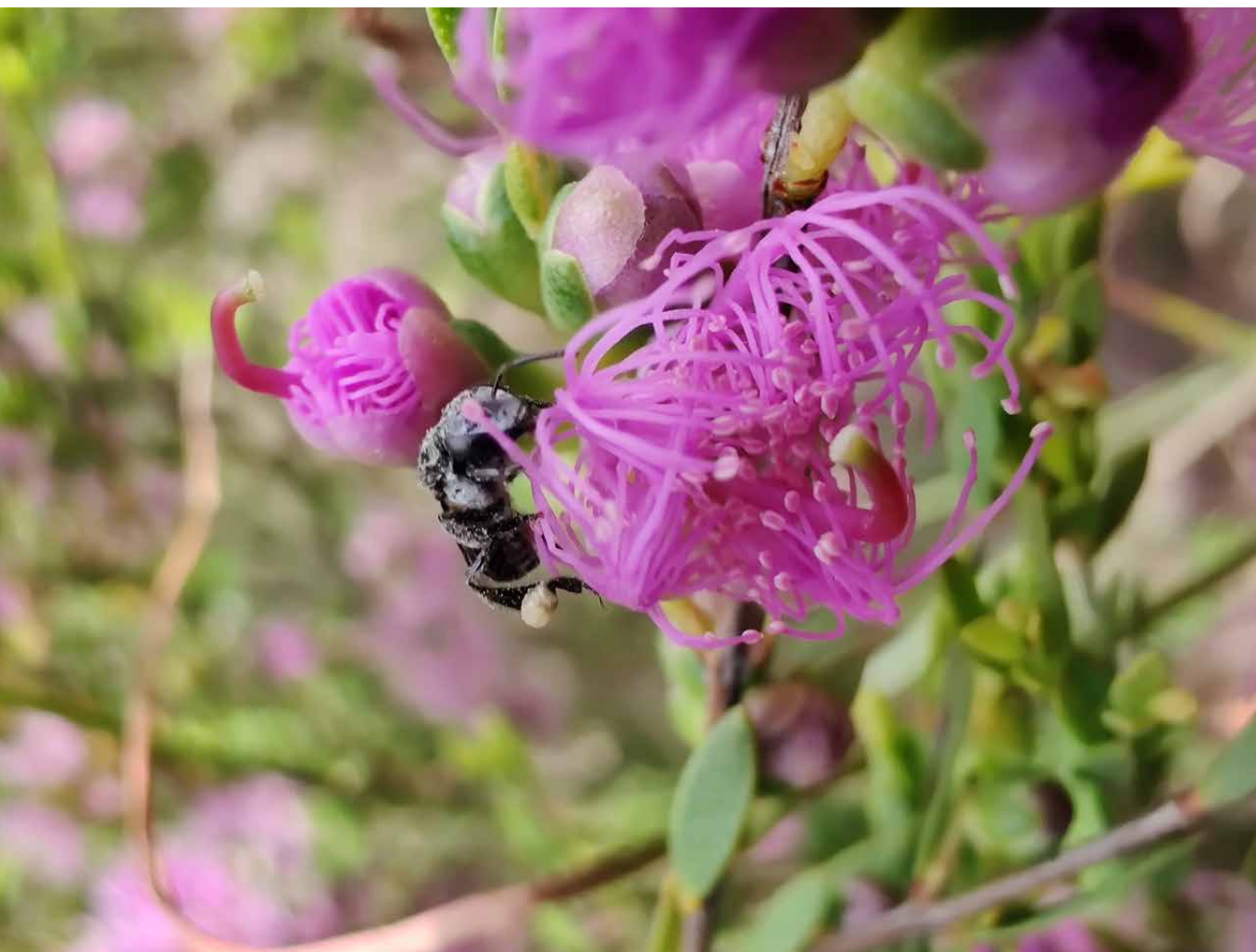
To understand the threats to a plant it's important to know how it is reproducing.

If you can see seedlings the plant might be reproducing from seed. If you see that the plant is spreading by underground stems, runners or suckers this is vegetative reproduction. If you can't see any evidence of reproduction this is also important to note.

An example of the Flora Connections data sheet
Species information section. Include as much detail as
you can about how you identified the species.

Species information	
Species scientific name: <i>Grevillea phyllioides</i> (Grey Spider Flower)	
Was the species found at this site? <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No	Time spent searching: ____ hours <u>15</u> minutes
Identified by: Published key <u>NSW PlantNet</u> Field guide <u>Fairley and Moore</u> Other _____	
Identification notes: <i>Worked out most likely Grevillea from photos in field guide then used NSW PlantNet key to separate from similar species.</i>	
Species description (flower colour, distinguishing characters, tree / shrub / herb / climber): <i>Flowers grey-orange, hairy. Shrub. Pollen presenter is narrow elliptic and 1mm wide, narrow at tip</i>	
Height range: <u>0.2</u> - <u>1.5</u> metres	
Reproduction: None / <input checked="" type="checkbox"/> Seedlings / Vegetative / Other: _____	
Fire response: <input checked="" type="checkbox"/> NA / Killed / Resprouting / Regrowth from seed / Other: _____	
Interaction notes (herbivores, pollinators etc): <i>Honey bees and peacock carpenter bee visiting flowers (possible pollinators)</i>	





Note any insect visitors to the plant, or interactions with other species. This stingless bee (*Tetragonula carbonaria*) is a potential pollinator of this Thyme Honey-Myrtle (*Melaleuca thymifolia*) flower.

Many Australian plants have particular responses to fire. Some plants are killed by fire. Some plants resprout, from buds along their trunk or from the base of the plant. Some plants regrow from seed after fire, making lots of new seedlings in areas recently burnt. If you see any of these or other responses to fire in your plant please record it.

Last but not least, if you see any other species interacting with this plant we want to know about it. Pollinators visit open flowers and make contact with the stigma or anthers in the flower. Herbivores are animals or insects that eat any part of the plant. Note any interactions on the data sheet. You don't need to identify the exact species interacting with the plant to record what you've seen. Just give as much detail as possible.



Native plants resprouting from the base after being burnt in a bushfire.

Disturbance and threats

In this section we want to know about anything that might affect the plant species. We list some of the most common threats to plant species on the left. In the first column we ask whether this threat has affected the plant in the past, present or might do so in the future. If you see no evidence for the threat please write "NA" here. In the second column we ask whether this threat is an actual or potential threat. Actual threats are certain to affect the species. Potential threats may or may not affect the species.

In the last column we ask for details about the threat. This is very important. What evidence have you seen for this threat in the area of the plant? For example, digging by feral pigs near the plant or leaf damage from disease. Please take as many photos of threats or disturbances as you can.



Note any evidence of feral animals near your plant population. This could include diggings, hoof prints or dung. Photo: CSIRO

Disturbance and threats			
Threat	Past / Current / Future	Actual / Potential	Details and supporting evidence
Disease	None seen		
Herbivory	None seen		
Human impacts	Past, current and future	Actual	Past clearing, current and future trampling and track forming
Feral animals	Current	Potential	Pig diggings found nearby but none affecting Grevillea
Erosion	Current / Future	Actual	Erosion at track edges limiting seedling growth
Weeds	Current	Actual	African Love Grass growing on track edges
Climate	Future	Potential	Area exposed, may be affected by future droughts under climate change
Other: <u>Parasite</u>	Current	Actual	Parasitic plant (<i>Cassytha</i> sp.) smothering some adult species
Fire	Past	Actual	Many years since fire – no burnt logs, only mild charring on bloodwood trunks
Fire severity	<u>Unburnt</u> / Low / Moderate / High / Extreme / Burnt grassland		
Date of last fire (if known): <u>unknown</u> Fire interval (if known): <u>unknown</u> years			

An example of the Disturbance and threats section of the Flora Connections data sheet.



Extreme fire consumes more than 50% of the canopy.

We especially want to know whether fire has affected the plant. If you know the date of last fire or how many years are usually between fires in this area please fill this in.

Measure fire severity as:

Fire severity	Description	% leaves burnt
Unburnt	Canopy and understorey both unburnt	0%
Burnt grassland	Burnt grassland or open grassy woodland, if present tree canopy unburnt	100% grassland burnt 0% canopy burnt (if present)
Low	Burnt understorey with unburnt canopy	>10% understorey burnt <10% canopy burnt
Moderate	Partial canopy scorch (burnt but not consumed)	20-90% canopy scorched
High	Complete canopy scorch (with or without partial canopy consumption)	>90% canopy scorched <50% canopy consumed
Extreme	Complete canopy consumption	>50% canopy consumed

Population numbers

In the final section of the data sheet we ask for data on how many plants there are in this population. The number of plants in a population is very important information. It can help us estimate how many plants are growing in the wild in total. It can also help us estimate whether the plant's numbers are increasing or decreasing. This information is vital to deciding if the species is under threat.

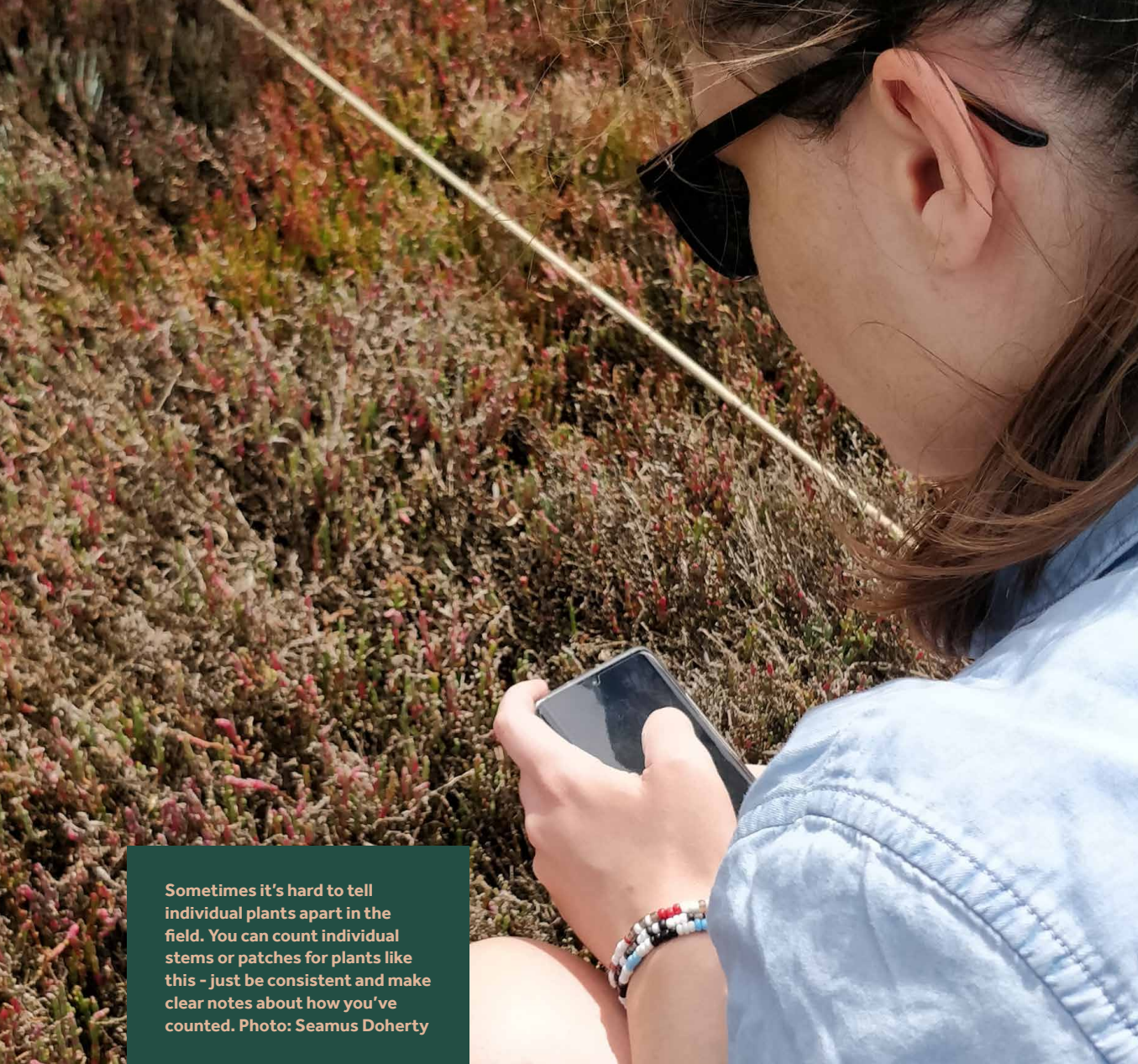
Before you start counting, work out where the plant population begins and ends. Walk around the edges of the population if you can. Are the plants only growing in the area where you have recorded this site information? Or are they also growing in different vegetation nearby? Are they more dense in some areas and less dense in others? Make as many notes on this as you can. If you can, draw a rough sketch map of the area. Include key site features, where the plants are and are not growing, scale and north arrow.

An example of the Population numbers section of the Flora Connections data sheet.

Population numbers					
Abundance live plants	Rare / Occasional / Common / <u>Abundant</u> / Dominant				
Unit of measure	<u>Individual plants</u> / Stems / Ramets / Other: _____				
Approx. # of individuals	1 / 80-100	<5 / <u>100-200</u>	5-10 / 200-500	10-20 / 500-1,000	20-50 / >1,000
Survey method	<u>Direct count</u> / Plots (__ x __ m, along __ m transect) / Other: _____				
Number of individuals:	Seedlings	Adults with buds	Adults with flowers	Adults with fruit	Adults <u>no</u> buds, flowers or fruit
Total <u>115</u>	### ## /	### ## ## /	### ## ## /	### ## ## /	### ## ## /
Population survey notes / sketch	Directly counted individuals in each category, using GPS to mark each individual. Seedlings more common along track edge.				



Plant populations can be easy to count when there are only a few plants. It can be difficult when there are many plants. For this section we start by asking if the plant is rare, occasional, common, abundant or dominant in the area.




Sometimes it's hard to tell individual plants apart in the field. You can count individual stems or patches for plants like this - just be consistent and make clear notes about how you've counted. Photo: Seamus Doherty

Then we ask how you will count the plants, or the unit of measure. Some plants have obvious separate individuals. Other plants are connected by underground roots or stems and are difficult to separate into individuals. For these plants it is important to be consistent in how you count them. You can decide to count each separate stem, or define your own unit of measure. For example, each patch with more than 10cm of bare ground around it could be a separate unit. Choose what you think is most appropriate for the plant. Just be consistent about what you are counting, and make clear notes.

Next we ask you to estimate the approximate number of individuals in this population. Make sure you have worked out where the population begins and ends first. Then tell us how you will

count plants. If there are less than 50 you could count plants directly. If this is not practical, you could count a subsample of plants. If you have a measuring tape you could measure a plot or transect and count within this. If you don't have a measuring tape you could set a time limit, and count as many plants as you can in this time limit. Please note what method you have used.

When you count individuals please separate seedlings and adults. Seedlings are young plants that do not have buds, flowers or fruit. Adult plants are larger and have or have had buds, flowers or fruit. If a plant has buds and flowers, count it as an adult with flowers. If a plant has fruit and flowers or fruit and buds, count it as an adult with fruit. When you have finished counting, add up your tally and write down the total number on the left.



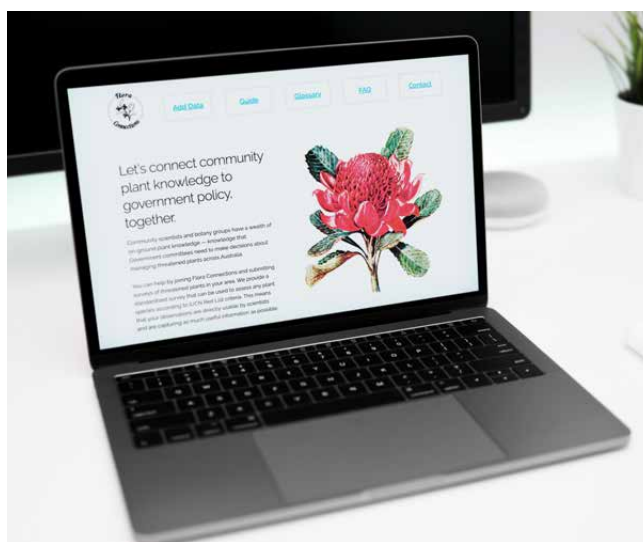
This *Grevillea acanthifolia* subsp. *acanthifolia* has both buds and open flowers. It is an adult, and would be counted as an adult with flowers as this is the most advanced reproductive stage on the plant.

What to do with data once you've collected it

Once you have finished filling out the data sheet it's time to upload the data. Make sure you keep your completed data sheet in a safe place when you finish. You can take photos of the sheet as a backup just in case!



Upload your data via the form at
floraconnections.com/submit



More questions?

Check out our Frequently Asked Questions at floraconnections.com/faq, or get in touch with us at floraconnections.com/contact

Flora Connections Glossary

Abundance:	The number of individual plants, plant stems or ramets.
Australasian Virtual Herbarium:	An online record of plant specimen data from Australian and New Zealand herbaria, https://avh.chah.org.au
Canopy:	The tallest layer of vegetation, the tree layer.
Climate:	Climate events such as droughts and floods can disturb or threaten plant populations.
Datum:	The geodetic reference system for geographic data. Flora Connections uses WGS84, which is commonly used around the world.
Disease:	Many different diseases affect plant populations. Some diseases affect many plants in an area, e.g. root rot from the soil-borne water mould <i>Phytophthora cinnamomi</i> . Other diseases only affect particular plant groups, e.g. the fungus Myrtle Rust only affects plants in the Myrtaceae family.
Disturbance:	Any change in environment that causes a change in an ecosystem, positive or negative.
Elevation:	Metres above sea level. Can be measured using a GPS or by looking at the contour lines on a map for your location.
Erosion:	Large movements of soil or sediment. Erosion can threaten plants by removing soil from beneath plants or by depositing soil on top of plants.
Feral animal:	In Australia deer, goats, horses, pigs, water buffalo, rabbits, foxes, camels, cats and cane toads are feral animals. Feral animals threaten plants by eating, trampling or digging them up.
Fire interval:	How many years are usually between fires.
Fire severity:	How much vegetation was burnt in the last fire. Defined by how much of the understorey and canopy was burnt or scorched.
Fruit:	The part of the plant that holds the seed, may be fleshy or woody.
Habitat:	The environment in which a plant grows.
Herbarium:	A collection of preserved plant specimens and associated data.
Herbivory:	Feeding on living plant parts by animals including insects. Herbivory is a natural ecosystem process but can threaten plant populations when it is excessive.
Human impacts:	Humans can threaten plant populations in many ways. Direct human impacts include clearing vegetation, building tracks, trampling or collecting plants.
iNaturalist:	A mobile app and website (www.inaturalist.org) for recording species sightings. Upload photos of an organism with location data and the community will help you to identify it. Researchers use iNaturalist data and sightings go to the Atlas of Living Australia.
Key:	The most reliable way to identify a species. Keys focus on the important features to separate one species from another. Keys can use technical language and take practice to use, but are the best way to be sure what species you're looking at.

Landform:	Natural features of the land surface, e.g. ridge, river flat, rise, depression.
Latitude/ Longitude:	The geographic coordinates of a location measured in angles. In Australia latitude ranges from -10 in far north Queensland to -43 in south Tasmania. Longitude ranges from 113 in Western Australia to 154 in eastern Australia. Flora Connections data is collected in decimal latitude/longitude.
Leave No Trace:	There are seven principles to Leave No Trace in natural areas. Read more about them at https://parks.tas.gov.au/explore-our-parks/know-before-you-go/leave-no-trace
Lookalike:	Some plants can look very similar when in fact they are not related. It always pays to double check your plant identification to avoid mistaking lookalikes.
Pollinator:	Any animal that moves pollen from one flower to another flower of the same plant. Common pollinators include bees, flies, beetles and birds. Pollinators must make contact with the reproductive parts of the flower (anthers and stigma) to pollinate.
Population:	A group of individuals of the same species growing in the same area.
Priority plant:	A plant identified as potentially at risk after the 2019-20 bushfire season. Priority plants may be threatened by bushfires and other interacting threats, such as drought, disease and herbivory. Australian plant scientists collaborated to prioritise those plant species most at risk following the 2019-20 bushfires. Priority plants for Flora Connections surveys can be found at: floraconnections.com/priority-plants
Ramet:	An individual of a clone.
Recorders:	The people recording survey data.
Resprout:	To grow or shoot again after fire or other injury has damaged the plant. Plants can resprout from underground, basal, stem (epicormic) or apical parts.
Scientific name:	The name used by scientists for a species, written <i>Genus species</i> . Check what scientific plant names are currently accepted in Australia via the Australian Plant Census (APC). https://biodiversity.org.au/nsi/services/search/taxonomy
Seedling:	A young plant grown from seed.
Scorched:	Discoloured or damaged from fire but not consumed.
Tenure:	The land holder or manager. Can include National Parks, local council, private landholders.
Threatened species:	Any species which is Vulnerable, Endangered or Critically Endangered. State and federal scientific committees determine whether a species is threatened.
Understorey:	Any vegetation growing beneath the canopy. Includes the ground layer, shrubs and small trees.
Vegetative reproduction:	Spreading clonally, for example by underground stems, runners or suckers.
Weeds:	Exotic plants that spread in the environment and negatively impact native plants or animals. Weeds threaten native plants by outcompeting them or changing their habitat.

