ENVIRONMENTAL MONITORING METHOD:

Collecting Plant Samples for Identification

About This Method

This document helps you to collect plant samples that can be used to create a field herbarium, lodged at a Herbarium, and/or used to identify plant samples. This method has been developed by the Monitoring Country staff. You can find more information on the Monitoring Country website: monitoringcountry.org.au or scan the QR code.

This method has three parts: **1. Get Ready**, **2. Out on Country** and **3. Back in the Office.** Each part can be undertaken separately but you must complete all three parts to finish the method. At the end of the document, you will find guidance for all the gear you need - **Gather Your Gear – Complete List**.

We recommend you read the whole document before you start.

Part 1: Get Ready

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Tablets/phones with:
  - ability to take photos
  - data collection and navigation apps
- ☐ Laptop/computer with software for:
  - mapping
- ☐ GPS device (recommended)
- ☐ Items to make a plant press
  - Plywood (8-10mm thick) and/or lightweight material like corflute or thick cardboard
  - Corrugated cardboard
  - Clean, dry and flat newspaper
  - Nylon rope, quick release straps, Velcro straps or belts

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KEEP IN MIND

Why?

Make sure there is a clear monitoring question and that the method you have selected will answer the monitoring question.

If this is the first time you are monitoring, you will need to design the survey: what are you monitoring, where will you survey, and when and how often you will survey?

When?

Prepare well before heading out on Country so that you have time to gather gear or train staff, if needed.

Who?

1 ranger/staff to plan and prepare

Training and skills

Staff involved in planning are trained and competent in:

- ☐ Mapping software (like QGIS or Google Earth) and/or monitoring point generator
- ☐ Navigation systems (like Avenza app or GPS device)
- ☐ Data collection systems (like Fulcrum app or paper datasheets)

Check permissions

Consult with Traditional Owners, landholders and relevant government agencies and authorities, to determine appropriate access and approvals for environmental monitoring:

1. Where you can go – consult with the owners/managers of the land.
2. What you can do – check if you need scientific licences or ethics permits
3. What or who can you take photos of
4. What can be done with data and photos – who owns them, where will they be stored and how will data be interpreted and communicated.

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ACTIONS

Make a plan and prepare

If you have done this monitoring before, it is best to do the surveys at the same time and same sites so that you can compare the data to previous surveys and see if there have been changes.

1. Plan which dates you will collect plant samples:
   - Plant samples usually need the flowers or the fruit. You may need to collect samples at several times throughout the year depending on the species you have on Country
2. Gather plant species of interest records in your area and identify where potential plant species of interest habitat is.
   - Such as from Traditional Owners, Atlas of Living Australia (ALA) or government databases.
3. Decide on which plants you want to collect and what parts of the plants need to be collected for the sample:
   - Types of plants can include particular Families (grasses, Eucalypts), native plants, threatened or rare plants, weeds, culturally significant plants
   - If you are interested in threatened or rare plants, you need to make sure you have the correct licences and consider whether you can identify them in a different way (like photographs or inviting an expert) rather than collecting samples.
   - Decide on a system for numbering/ naming each sample so that each one is unique numbered.
4. Use the monitoring point generator or mapping software to select your sites
   - If you are searching for threatened or rare flora, ensure that the sites you choose are the correct habitat type for those plants
5. Give each site a unique name, and export and save the location data in your data management system
6. Prepare maps of sites and load sites onto navigation devices
7. Plan how you will record information on Country (electronic data forms or paper datasheets)
8. Plan your data management system (how you will store plant records and images)
9. Check **GATHER YOUR GEAR** lists for **Get Ready**, **Out on Country** and **Back in the Office** (complete list on last page) and get any equipment you don't have.
   - See buying guide(s) for advice
10. Charge electronic devices (tablets/phones, power banks, GPS) and batteries

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Train

1. Check the **Training and skills** requirements for **Get Ready, Out on Country** and **Back in the Office** steps and arrange any training or expertise that you need.
2. Run everyone involved in the survey through the plan.
   - Be clear on how many people will be involved, what everyone will be doing, and what they will need to do the survey.
3. Prepare guides for identifying species of interest (if required)
   - ID books or apps can be used instead, but a short guide that is specific to your area/species makes it quicker and easier to check when out on Country.
   - Guides can be loaded onto tablets/phones or printed and laminated.
4. Run a training session for all rangers involved in the survey to learn or refresh:
   a. How to use the devices (like tablets/phones and GPS)
   b. How to use data collections apps and record data
   c. How to identify species of interest and their habitat

Make a plant press

1. Cut the plywood and/or lightweight material like corflute into two pieces that are 45 cm x 30 cm
   - The plywood is used for the main plant press, the lightweight material can be used to create a temporary field press if you will be walking long distances.
2. Cut pieces of cardboard down into the same size as the plywood.
3. Sandwich folded sheets of newspaper between the cardboard, and the place the plywood on either side of the newspaper/cardboard stack.
4. Tie the stack up tightly with either two nylon ropes tied with a trucker's hitch, quick release straps, Velcro straps or belts.

Next Section – Part 2: Out on Country

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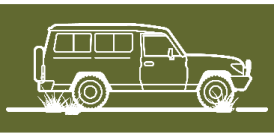
Part 2: Out on Country



GATHER YOUR GEAR

<u>One set</u> of this equipment for <u>each team</u>:

- ☐ Tablets/phones
- ☐ Power bank (optional)
- ☐ GPS device and spare batteries (recommended)
- ☐ Reference documents or field guides:
  - Plant species of interest (if required)
- ☐ Jewellers' tags (small paper tags with string that are tied to the samples)
- ☐ Large paper envelopes and ziplock bags (when collecting weed samples)
- ☐ Plant press including extra sheets of corrugated carboard and newspaper
- ☐ Gardening gloves for collecting plants that are prickly, poisonous or have corrosive sap (recommended)
- ☐ Vehicle wash down facility (when working in areas with weed infestations)
- ☐ Secateurs
- ☐ Hand trowel
- ☐ Pencils
- ☐ Permanent marker

KEEP IN MIND

Who?

at least 2 rangers per team

Training and skills

Make sure everyone knows the plan.

Field staff are trained and competent in:

- ☐ Navigation systems (like Avenza app or GPS device)
- ☐ Data collection systems (like Fulcrum app or paper datasheets)
- ☐ Identifying species of interest (if required)
- ☐ How to make a plant press and mount samples

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Collecting Plant Samples for Identification

ACTIONS

Check that your electronic devices (tablets/phones, power banks, GPS) are charged before you head out.

Collect plant samples

1. Once you arrive, look for the correct habitat type for the plant/s you are trying to find.
2. Once you are in the correct habitat, find a healthy and typical plant that has different sizes of leaves, flowers and fruits.
    - Avoid plants that are insect damaged
    - It is best to look for several of the same plants in the area and compare them before picking the healthiest specimen with the most flowers and/or fruit.
3. Take photos of the plant and surrounding habitat
4. Record the plant location on the GPS and/or map and give it a unique name
5. Using the secateurs, cut your sample off the plant so that it:
    a. Includes stems, leaves and several flowers and/or fruit.
    b. Is 25-40 cm long and up to 26 cm wide (so that it will fit onto a standard herbarium mounting sheet which is 42 cm x 27 cm)
    - Collect a second sample if you are planning to send a sample to the state/territory herbarium and keep a sample to create a field herbarium.
    - The sample can be made up of a single branch or several smaller branches. For small annuals or perennials like herbs, the sample should consist of several individual plants.
    - For some herbaceous plants like grasses, use a hand trowel to dig out a complete or partial plant and its underground structure (roots, bulbs).
    - For plants that are dioecious, meaning they have male and female flowers on different plants, collect a sample from each sex.
6. If your sample is prickly or tough, use the secateurs to trim off some of the branches from the “back” and “front” of the sample so that it will lay flat.
    - Leave enough leaves, flowers and fruit to show their arrangement
    - Leave a short stub to show that a branch/stem was present.
    - For weed samples, collect any trimmings, especially seeds, spores, flowers and roots, and place them in a ziplock bag to dispose of later so that you don’t help to spread weeds across the landscape.
7. In pencil, write the following information onto a jewellers tag and tie it securely onto the sample

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a. Name or initials
b. Sample number
c. Date
d. Site name/number

8. Open the plant press to a new piece of newspaper with a piece of cardboard underneath it and open the newspaper sheet.
   - You can also write the sample number and date on the newspaper with permanent marker.
9. Spread the sample out as flat as possible onto one side of the newspaper sheet.
   - If the sample is too big, bend or fold the stems in a zig zag.
   - Flowers can be easily damaged. Carefully place them so that the petals will spread out when the plant press is closed.
10. Close the newspaper, placing a carboard sheet on top.
    - For weed samples, place the sample and closed sheet of newspaper inside a large paper envelope. This will prevent seeds, spores, flowers, roots or other plant cuttings from falling out, so that you don't help the weed spread across the landscape. Seeds heads can also be put into separate sealed paper envelopes and any other dry material into ziplock bags.
11. Record **plant sample data**
12. Add any other samples collected from the survey in the same way, making sure each sample is between newspaper and cardboard.
13. Close the press and carefully pull the straps tight.
    - This should create a "sandwich" of the samples: plywood/corflute, sample 1 (cardboard, newspaper, sample, newspaper, cardboard), sample 2 (cardboard, newspaper, sample, newspaper, etc)
14. Before heading to your next survey area, if you collected weed samples and/or there are weeds in the area, make sure you won't be spreading weeds by:
    a. Checking that weed samples, especially seeds, spores, flowers or roots, can't fall out of the press.
    b. Place the plant press and any collected trimmings into a plastic storage box. Keep it in the car during travel unless the container is properly sealed.
    c. Removing seeds or plant pants from boots, clothing and equipment
    d. Cleaning vehicles including mud, soil or plant parts on tyres, wheel arches and chassis, inside the car, engine bay, ute trays and storage areas.

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RECORD DATA

Data to record when collecting a plant sample

What to record	Required?	Notes
Information to record about each plant sample collected		
Project name	Yes	Make it clear which project this data belongs to and its purpose
Date	Yes	Record the date the sample was collected
Personnel	Yes	Record the name of the people who collected the sample - this is helpful if any questions come up about the data
Survey area	Optional	If you are collecting plant samples from different areas on Country, consider recording the name or general description of the area.
Location coordinates	Yes	Record an accurate location of the plant (using a handheld GPS if possible) (latitude and longitude or eastings and northings)
Unique collection number (sample number)	Yes	This is the unique number associated with each sample. It is also written on the jewellers tag and the newspaper.
Name of plant	Optional	Record the name of the plant if you already know what it is. If you don't know the name, you can give it a temporary name that is descriptive (e.g. tiny white flower)
Plant description	Yes	Describe features of the plant like: Plant type (e.g. shrub, herb, grass, tree etc.), Flower colour (colour often changes once dried), Height, Tree form, Bark type, colour and texture
Photo of plant and habitat	Yes	Take a photo of the plant and site and make a note of which camera/tablet/phone it was taken on, and the filename of the photo (usually ends in .JPG)
Habitat description	Yes	Describe the habitat of the area including vegetation type, other major plant species, soil and geology, fire age, and signs of disturbance (e.g. goats, weeds, vegetation clearing).
Abundance	Optional	Estimate how many plants of the same species are in the area. This is especially useful for rare or threatened species and weeds.
Stories and notes	Optional	Record information or stories from Elders, and anything else worth noting about the area or animals.
Video	Optional	Record videos of information or stories from Elders, and rangers performing or describing the work they are doing.

Next section – Part 3: Back in the Office

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Part 3: Back in the Office

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Tablets/phones (or paper datasheets) that you used to record data
- ☐ Data management system
- ☐ Laptop or computer with software for:
  - Spreadsheets
  - Mapping
- ☐ Plant press with samples
- ☐ Newspaper
- ☐ Waterproof plastic tubs
- ☐ Materials for sending plant samples and/or making a field herbarium:
  - Tissue paper, tissues or toilet paper
  - Envelopes or small ziplock bags
  - Paper/card for labels
  - Ziplock bags
  - White A4 card or herbarium mounting paper
  - Sticky tape
  - Ring binder folder(s)
  - A4 clear plastic sleeves

KEEP IN MIND

When?

Always try to complete this work as soon as you can after returning from your time on Country so that what you did and what you saw is fresh in your memory.

Cars and equipment should be cleaned immediately on return from the field to prevent the spread of weeds.

It is good practice to check all the samples on the same day they were collected.

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Collecting Plant Samples for Identification

Where

Store the samples somewhere dry and out of the wind (like an office or shed).

Who?

At least 1 person to manage the data, clean survey equipment, and clean the vehicle

Training and skills

Staff managing data are trained and competent in:

- ☐ Mapping software (like QGIS or Google Earth)
- ☐ Spreadsheet software (like Microsoft Excel)
- ☐ Data collection systems (like Fulcrum app or paper datasheets)
- ☐ Data management systems (like databases, cloud storage and external hard drives)

Field staff are trained and competent in:

- Managing the spread of weeds including vehicle washdown procedures

ACTIONS

Manage weeds

1. On return to the office, make sure you won't be spreading weeds by:
    a. removing seeds or plant pants from boots, clothing and equipment,
    b. cleaning vehicles including mud, soil or plant parts on tyres, wheel arches and chassis, inside the car, engine bay, ute trays and storage areas.

Take care of samples

1. Check each specimen on the day that it was collected and straighten or unfold any leaves and flowers before they are completely dry.
    - This is also a good time to change the newspaper out for a fresh piece.
    - Collect any loose bits of weed samples and place them into a sealed ziplock bag.
2. If the samples are in a field plant press, carefully transfer them into the main plant press made from plywood.
    - Kneel on the press while tightening the ropes or straps.
3. Dry the specimens by leaving the press in a warm, dry place that has some airflow
    - During sunny weather put the plant press in direct sunlight during the day.
    - In wet, cold or humid environments/seasons, keep plant presses indoors with air-conditioner, fan or heater (at lowest heat setting).

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- Make sure seeds, flowers or other plant plants from weed samples are secure/can't be blown into the environment.

4. Replace any damp newspaper in the plant press daily in humid environments/seasons or every 2-3 days in dry environments/seasons.
   - The newspaper between each plant can become wet from the moisture inside the plant, and the sample can become mouldy and unusable.
   - Keep delicate plants and petals between tissue paper to avoid losing or damaging them, and things like seeds and bark in an envelope to avoid losing them. Make sure to store it with the rest of the sample and label the envelope with the sample number.
   - Collect any loose bits of weed samples and place them into a sealed ziplock bag.
5. Once the samples are completely dry, store them inside a large plastic tub.
   - It usually takes 3-4 days for samples to dry completely but it depends on the environment/season and the type of plants.
   - Plants with fleshy leaves and flowers like succulents will take longer to dry.
   - If they aren't completely dry before storing, the specimens will become mouldy and unusable.
   - Weed samples should be double sealed inside two ziplock bags.
6. Correctly dispose of any of the collected trimmings/loose bits of weed samples to avoid spreading weeds

Send samples to Herbarium (optional)

Send your samples to your state/territory herbarium if you want them to identify the samples for you and/or add them to their plant collection.

1. If you aren't already familiar with your state/territory herbarium's process, contact them or visit their website to find specific instructions.
   - They will most likely have a form that you will need to fill out.
   - Check how much it will cost as there is sometimes a fee for the herbarium to process and identify the samples.
2. Print or write out a final label to attach to each sample. The herbarium will usually tell you what to include on the label, but it should generally include:
   a. Collector's name
   b. Sample number
   c. Date of collection
   d. Species name (if known)

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e. Location/site description and coordinates
f. Habitat description
g. Plant description
h. Plant abundance

- The herbarium also might ask you to enter the data into a spreadsheet.

3. Drop off or send the samples to the herbarium.
   - Make sure the plant samples are completely dry before you do this.
   - Make sure to include the final label and/or spreadsheet and the herbarium form.
   - Your herbarium will usually have instructions on how they should be packaged for sending, but generally they should be double bagged (put inside two plastic bags) and sent in a carboard box to protect them.
4. Wait to find out the sample identifications.
   - This can take several months.
5. Update your plant sample data in your data management system and any field herbarium samples with the confirmed sample identifications.

Make a field herbarium (optional)

Make a field herbarium if you want to store samples on Country as a plant identification resource and/or training tool.

1. Wash and dry your hands so they are free of dirt, moisturiser etc.
2. Take your fully dried plant sample out of the plant press and lay it neatly on the A4 card/herbarium mounting paper.
3. Use small pieces of sticky tape to stick the samples onto the card
   - Any seeds etc. that can't be stuck onto the card/paper, should be kept in an envelope or small ziplock bag. Label the envelope/ziplock and tape it to the card
   - Make sure the jewellers tag is still attached and visible.
4. Print or write out a label including:
   a. Collector's name
   b. Sample number
   c. Date of collection
   d. Family, Genus, Species, language and common name (if known)
   e. Location/site description and coordinates
   f. Habitat description
   g. Plant description
   h. Plant abundance

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5. Stick the label onto the bottom right corner of the card.
6. Slip the card into a plastic sleeve and place it in the ring binder folder.
7. Decide what order to keep your samples in.
    - They are usually kept in alphabetical order by botanical name (genus and species) and separate ring binder folders are used to separate plant type or family.
    - It is a good idea to label each ring binder folder to keep track of what is inside.
8. Store the ring binder folders in waterproof plastic tubs in the office.
9. Burn or compost any leftover plant material.

Data entry, analysis and reporting

1. Record a summary of what you did and why, any observations (like weather conditions, fire history and site condition), anything that went wrong or didn't work and things that worked well.
2. Upload the **plant sample** data to your data management system.
    - Recommended: get someone else to proof the data to check for mistakes.
    - Update the plant ID of the samples after they have been identified by the herbarium
3. Upload any photos or videos taken during the survey to your data management system.
4. Use the mapping software to create a map of plant species of interest like rare or threatened flora
5. Discuss with the ranger team or community the results of the monitoring, any reasons for the presence or absence of flora species], and if there have been any changes to previous years.
    - Consider whether trends might be related to your management (like weed control, fire programs, or feral herbivore control) to check how well management is working, or if you need to make adjustments.
6. Share the data according to any data sharing or funding agreements you have made

Next section – Full Equipment List

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Gather Your Gear – Complete List

The complete **GATHER YOUR GEAR** list for **Get Ready**, **Out on Country** and **Back in the Office**.

Gear List	Required?	Get Ready	On Country	In Office
Tablets/phones: • Ability to take photos • Apps for data collection (like Fulcrum) and navigation (like Avenza)	✓	✓	✓	✓
Laptop or computer with software for: • Mapping (like QGIS or Google Earth) • Spreadsheets (like Microsoft Excel)	✓	✓		✓
GPS device & spare batteries	**Recommended**	✓	✓	
Power bank	**Recommended**		✓	
Plant press: • Plywood (8-10mm thick) and/or lightweight material like corflute or thick cardboard • Corrugated cardboard • Newspaper • Rope or straps	✓	✓	✓	✓
Secateurs	✓		✓	✓
Hand trowel	✓		✓	
Gardening gloves	Recommended		✓	
Pencil and permanent marker	✓		✓	✓
Jewellers tags	✓		✓	
Waterproof plastic tub(s)	✓			✓
Materials for sending plant samples and/or making a field herbarium: • Tissue paper, tissues or toilet paper • Envelopes or small ziplock bags • Paper/card • Plastic bags • White A4 card or herbarium mounting paper • Sticky tape • Ringer binder folder A4 clear plastic sleeves	✓			✓
Data management system (like databases, cloud storage and external hard drives)	✓			✓

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