ENVIRONMENTAL MONITORING METHOD:

Collecting Plant Samples for Identification

Each section can be completed separately but you should read all three parts before starting. You need to complete all three parts to finish the monitoring method.

Part 1: Getting Ready

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Electronic device(s) – charge ready for use and check that it has:
  - ability to take photos
  - data collection systems (app and form) (e.g. Fulcrum)
  - navigation system (e.g. Avenza) and site maps
- ☐ Laptop or computer with software for mapping (e.g. QGIS, ArcGIS, Google Earth)
- ☐ 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

Remember to check **GATHER YOUR GEAR** lists for **Out on Country** and **Back in the Office**. See the full list of equipment needed to complete this monitoring method on the last page.

KEEP IN MIND

Why?

Make sure there is a clear aim for your monitoring project and that the method you have selected will give you the answers you need.

When?

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

Who?

At least one ranger/staff to plan and prepare.

Training and skills

Staff involved in planning are trained and competent in:

- ☐ Mapping software (e.g. QGIS, ArcGIS, Google Earth)

- ☐ Navigation systems (e.g. Avenza, GPS)
- ☐ Data collection systems (e.g. Fulcrum, 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 licencing, approvals or ethics.
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.

ACTIONS

Make a plan and prepare

1. If this is the first year you are monitoring, gather plant records in your area and identify where potential habitat is. Such as from Traditional Custodians , Atlas of Living Australia (ALA) or government databases.
2. Decide which plants you want to collect and what parts of the plant need to be collected for the sample
   - Some examples of what type of plants you want to collect:
     - Plants from a type of family, like grasses or Eucalypts
     - Native plants from a particular area
     - Weeds
     - Threated or rare plants
     - Plants that are an important food source for a threatened animal
     - Bush tucker plants
   - Keep in mind what plants you are likely to find on Country and the aim of your monitoring project
   - 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.
3. Plan which dates you will collect plant samples
   - Plant samples usually need the flowers or fruit. You may need to collect samples at several times throughout the year depending on the species you have on Country.
4. Decide on a system for numbering/naming each sample so that each one is unique numbered.

5. Choose where you will collect plant samples based on plant records, potential habitat and/or area of interest.
6. Prepare maps of sites/load sites onto navigation devices
7. Plan how you will record information on Country e.g. Fulcrum electronic data forms.
8. Plan your data management system e.g. 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 of equipment on last page) and get any equipment you don't have. Seebuying guide(s) for advice on which plant ID books may be suitable to buy.
10. Be clear on how many people will be involved and what everyone needs to do the work.
11. Check the training requirements for **Get Ready, Out on Country** and **Back in the Office** steps to ensure that rangers know how to use the devices, data collection apps, navigation systems etc. and how to identify potential 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

Part 2: Out on Country

GATHER YOUR GEAR

One set of this equipment for each team:

- ☐ Electronic device(s) – charged and ready to record data, take photos and navigate to sites
- ☐ Power bank – charged and ready to charge devices (optional)
- ☐ GPS device and spare batteries (recommended)
- ☐ Reference documents or field guides: plant ID books
- ☐ Secateurs
- ☐ Hand trowel
- ☐ Pencil
- ☐ Permanent marker
- ☐ 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)

KEEP IN MIND

Who?

At least two people per team

Training and skills

Make sure everyone knows the plan.

Field staff are trained and competent in:

- ☐ Navigation systems (e.g. Avenza, GPS)
- ☐ Data collection systems (e.g. Fulcrum, paper datasheets)
- ☐ Collecting plant samples, including what parts of different plants need to be collected
- ☐ Identifying habitats, plant species and plant parts
- ☐ Managing spread of weeds including vehicle wash down

Collecting Plants Samples for Identification

ACTIONS

Collect plant samples

1. Once you are at your survey area, look for the correct habitat type for the plant 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, based on the naming/numbering system you decided on during "Getting Ready."
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 (e.g. roots, bulbs).
    - For some plants like Acacias, you might find last season's seed pods that are either still on the plant or on the ground immediately beneath it.
    - 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 has lots of branches that are prickly and/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

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 up 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, cardboard)... plywood/corflute.
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.

Collecting Plants Samples for Identification

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

Part 3: Back in the Office

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Electronic device(s) that you used to record your data
- ☐ Data management system, e.g. cloud storage
- ☐ Laptop or computer with software for spreadsheets (e.g. Microsoft Excel) and mapping (e.g. QGIS, ArcGIS, Google Earth)
- ☐ Reference documents or field guides: plant ID books
- ☐ Plant press with samples
- ☐ Newspaper
- ☐ 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 for labels
  - Ziplock bags
  - White A4 card or herbarium mounting paper
  - Sticky tape
  - Ring binder folder(s)
  - A4 clear plastic sleeves
- ☐ Vehicle wash down area

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.

Where

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

ENVIRONMENTAL MONITORING METHOD:

Collecting Plants Samples for Identification

To prevent weeds from spreading, any work with weed samples should preferably be done inside a building.

Who?

At least one person per team to clean vehicles and survey equipment

At least one person to manage the data

All field staff to clean boots, clothing and personal equipment.

Training and skills

Field staff trained and competent in:

- ☐ Managing spread of weeds including vehicle wash down

Staff managing data are trained and competent in:

- ☐ Mapping software (e.g. QGIS, ArcGIS, Google Earth)
- ☐ Spreadsheet software (e.g. Microsoft Excel)
- ☐ Data collection systems (e.g. Fulcrum, datasheets)
- ☐ Data management systems (e.g. databases, cloud storage, external hard drives)

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

2. 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.
3. 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.
4. 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).
- Make sure seeds, flowers or other plant plants from weed samples are secure/can't be blown into the environment.

5. 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.
6. 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.
7. 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)

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
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 (e.g. weather conditions, fire history, 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, including updating the plant ID of the samples after they have been identified by the herbarium.
    - Recommended: get someone else to proof the data to check for mistakes.
3. Upload any photos or videos taken during the survey to your data management system.
4. [include any other relevant steps e.g. analysis]
5. Discuss with the ranger team or community the results of the monitoring, any reasons for the presence or absence and location of plant species, and if there have been any changes to previous years.
    - Consider whether trends might be related to your management (e.g. feral herbivore or weed 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

Gather Your Gear – Complete List

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

Gear List	Required?	Get Ready	On Country	In Office
Electronic device(s): • Charged • Ability to take photos • App for data collection (e.g. Fulcrum) • App for navigation (e.g. Avenza)	✓	✓	✓	✓
Power bank • Charged	**Recommended**		✓	
Laptop or computer with software for: • Mapping (e.g. QGIS, ArcGIS, Google Earth) • Spreadsheets (e.g. Microsoft Excel)	✓	✓		✓
GPS (e.g. Garmin handheld device) & spare batteries	**Recommended**	✓	✓	
Plant ID reference documents and/or field guides	✓		✓	✓
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 (e.g. cloud storage)	✓			✓