

WELCOME TO THE PEAS PROJECT

WHAT IS PEAS?

Thank you for your interest in the PEAS (Pea Ecology and Adaptation Survey) project! Researchers know all about the importance of legumes as nitrogen-fixing species in an agricultural context, but we don't know much about Australian legumes as they grow in their native bush or the interactions and food webs they are part of. PEAS is an effort to redress this gap by looking at the interactions between Australian legume species, the insects that associate with them, and how these interactions might change over time.

OUR RESEARCH QUESTIONS

1. What effect will climate change have on the interactions between several genera of legumes, seed-eating insects, and parasitoid insects?
2. Are these interactions general (eg. a beetle can eat all legume seeds) or specific (eg. one species of beetle eats only *Acacia* seeds)? What factors contribute to specificity?
3. Are these interactions disrupted by events like fire, and if so, how long will it take for the interactions to return to equilibrium?

THE DESIGN OF PEAS

The PEAS study space is centered on the Blue Mountains, where we use the changing elevation of the mountain (and its accompanying change in temperature) as a surrogate for climate change. The space is divided into two independent transects — the North Transect along Bells Line of Road, and the South Transect along the Great Western Highway — which are themselves divided into three bands of High, Mid, and Low elevation. Meteorological monitoring hardware is deployed at key sites within these bands to monitor the major drivers of flowering and fruiting: rainfall, air temperature, species of interest temperature, and light intensity.

CITIZEN INVOLVEMENT IN PEAS

We need your help to cover more ground. A key element of the Survey is our ability to track the flux of plant species and insect groups over time and space. Every new field site improves the resolution of the Survey, giving us the ability to detect subtler changes in species distribution and abundance, and the turn-over of plant, herbivore, and parasitoid species.

HOW TO PARTICIPATE IN PEAS

1. GET A VOLUNTEER PACK

When you contact the PEAS researchers, you will receive a volunteer pack containing these items:

1. This information document.
2. The Pictorial Guide to the Common Legumes of the Blue Mountains, Australia.
3. A map of the study space.
4. Several copies of the Phenology and Abundance form.
5. Copies of the New Site Details form.

2. ADOPT OR ESTABLISH A NEW FIELD SITE

If you choose to adopt an established field site that has been surveyed by PEAS researchers, you can go out and begin collecting data immediately without having to register the field site.

Alternatively, you can set up your own field site in a new area like the bushland behind your house. To do this, you need to submit a New Site Details form. Instructions on how to fill one out are provided in the next section.

ATTRIBUTES OF AN IDEAL FIELD SITE

1. A 50 m² patch of undisturbed bushland.
2. Safe to traverse; away from cliff edges.
3. At least 6 different species of legumes.

3. SURVEY THE SITE FOR 10 MINUTES

It is important to standardise our efforts so that we can compare species abundance between sites. The guidelines for surveying are:

1. Surveys can be carried out at intervals between once a week, to once a month (PEAS researchers survey their key sites every two weeks and secondary sites every month). If you cannot survey within this time period please ask a friend or the PEAS researchers to survey for you.
2. Walk randomly through the field site, taking different routes in and out.
3. For your first visit, allow yourself 20 minutes so that you can find and identify all of the legume species in your field site.
4. On subsequent visits, spend no more than 10 minutes surveying the site.

5. New species can be recorded after the survey period is finished, but please do not add any further abundance counts.

You have been provided with copies of the Phenology and Abundance form to make it easier to record your observations. Instructions on how to fill one out are provided in the next section.

4. SUBMIT YOUR DATA

All data is submitted to the PEASTracker website from your Phenology and Abundance form. You can either enter the data yourself through our website, or send the Phenology and Abundance form back to us, and we will enter it for you.

The easiest way to send us your data is to scan the form, or take a clear digital photograph of the form, and email it to us at [TODO: Add submission email for PEAS project].

Alternatively, you can wait until you have several forms, and then send them to us by snail mail:

Attn: Desi Quintans (M14)
Locked Bag 1797
Penrith NSW 2751

Or if you let us know that you have several forms to submit, we can collect them from your postbox when we do our surveys.

HOW TO FILL OUT YOUR PHENOLOGY AND ABUNDANCE FORM

FOR EACH SHEET:

Add the site name, your name, and the date of sampling to all sampling sheets. This helps organise the data when the sheets are digitised.

There is a ruler along the bottom of each sheet that you can use to measure leaves and other plant traits in the field. This ruler is accurate when the sheet is printed at full size on a piece of A4 paper.

FOR EACH SPECIES:

SPECIES NAME

Write the name of the species you're observing (eg. *Acacia terminalis*). A shortened species name (eg. *A. term*) is fine, as long as it is unambiguous.

ABUNDANCE

Place a tally mark for each plant of the species of interest that you observe. Cross the tally at every fifth plant.

PLANT AGES SEEN

The different plant stages you have observed for the species of interest. You can circle multiple stages.

Age	Description
Seed	Seedlings.
Juv.	Juveniles, not yet able to flower.
Adult	Adult plants capable of flowering.

DOMINANT FLOWER STAGE

This is the most common stage of flowering for the species of interest. Circle one only (no in-between values, please).

Stage	Description
None	No flowers observed for the species of interest.
Bud	More buds are visible for the species of interest than opened flowers.
Open	More opened flowers are visible than buds.
Old	Most flowers are deteriorating.

DOMINANT POD STAGE

This is the most common stage of pod formation for the species of interest. Circle one only (no in-between values, please).

Stage	Description
None	No pods are observed for the species of interest.
Unripe	Most pods on the species of interest are immature.
Ripe	Most pods are matured, but have not yet dispersed their seed.
Open	Most pods have released their seed, but are still attached to the species of interest.

HEALTHY FLOWERS (%)

A rough percentage of the healthy flowers (opened flowers that show no signs of decay) presented by the species of interest. Circle one only (no in-between values, please).

%	Description
0	None observed.
25	0–25% of all buds have become opened flowers.
50	25–50% of all buds have become opened flowers.
More	50–100% of all buds have become opened flowers.

HEALTHY PODS (%)

A rough percentage of the healthy pods (both ripe and unripe pods that have not dispersed their seeds) presented by the species of interest. Circle one only (no in-between values, please).

%	Description
0	None observed.
25	0–25% of all flowers have become healthy pods.
50	25–50% of all flowers have become healthy pods.
More	50–100% of all flowers have become healthy pods.

INSECT COUNT

A rough count of the number of insects that you've observed interacting with different parts of the species of interest. For each group, circle one only (no in-between values, please).

Count	Description
0	None observed.
5	5 or fewer insects.
10	10 or fewer insects.
More	More than 10 insects.

DOMINANT ORDER

For each of the insect groups, write down the most common order you've observed (eg. 'beetle').

HOW TO FILL OUT A NEW SITE DETAILS FORM (ONLY NEEDED FOR NEW FIELD SITES)

SITE

Choose a name for your site (typically *Street, Suburb*).

SLOPE FACING

Which direction is downhill? (eg. W, NNE).

SLOPE (DEGREES)

An estimate of the steepness of the slope. An easy way to find this is to stand with your toes pointing uphill and decide what angle your feet and legs make.

ELEVATION AND GPS COORDINATES

You can find GPS coordinates using a smartphone, or by navigating to your field site in Google Maps (right-click a map location and select "What's Here?"). Elevation can be provided by a GPS unit, or you can leave it blank and we will find it for you.

DATE OF VISIT

The date when you recorded these site details. Site details may need to be revised at later dates (eg. after bushfires or development).

CANOPY COVER %

Canopy cover describes how much of the sky is obstructed by the tree canopy. 0% is a completely unobstructed sky, and 100% means that the canopy shades everything. Since the canopy cover can vary within your field site, indicate both the minimum and maximum that you observe.

GROUND COVER %

Ground cover describes how much of the ground is covered with shrubs, grasses, trees and weeds. 0% means that the ground is barren dirt, and 100% means that the ground is completely covered with plants (eg. a grass lawn). Since the ground cover can vary within your field site, indicate both the minimum and maximum that you observe.

OVERSTOREY HEIGHT RANGE (M)

The minimum and maximum heights of trees in your field site.

UNDERSTOREY HEIGHT RANGE (M)

The minimum and maximum heights of shrubs in your field site.

UNDERSTOREY DENSITY (% RANGE)

We estimate this by how much effort it takes to walk off the paths and through the bush. 10% is flat, unobstructed ground. 100% is near-impenetrable underbrush.

Enter the site name, your name, and the survey date.

Standard sampling form for altitudinal legume study, 2015-2018

Shortened names (eg. "A. term") are fine, as long as they're clear.

Site: Test St, Newville Surveyor: A. Jones Date: 2015 MM 05 DD 25

1	Species name	Plant ages seen			Dominant flower stage				Dominant pod stage			
	<u>A. terminalis</u>	<input checked="" type="radio"/> Seed	<input checked="" type="radio"/> Juv.	<input checked="" type="radio"/> Adult	<input type="radio"/> None	<input checked="" type="radio"/> Bud	<input type="radio"/> Open	<input type="radio"/> Old	<input type="radio"/> None	<input type="radio"/> Unripe	<input type="radio"/> Ripe	<input type="radio"/> Open
	<u> </u>	Abundance (tally)			Health				Insects on pods			
	<u>0</u>	5	10	More	<u>0</u>	0	<u>25</u>	50	More	0	<u>25</u>	50

Circle as many plant ages as you can see in your field site.

Keep a tally of how many adult plants you've seen.

2	Species name	Plant ages seen			Dominant flower stage				Dominant pod stage				
	<u>A. terminalis</u>	<input checked="" type="radio"/> Seed	<input checked="" type="radio"/> Juv.	<input checked="" type="radio"/> Adult	<input type="radio"/> None	<input checked="" type="radio"/> Bud	<input type="radio"/> Open	<input type="radio"/> Old	<input type="radio"/> None	<input type="radio"/> Unripe	<input type="radio"/> Ripe	<input type="radio"/> Open	
	<u> </u>	Abundance (tally)			Healthy flowers %				Healthy pods %				
	<u>0</u>	5	10	More	<u>0</u>	0	<u>25</u>	50	More	<u>0</u>	0	<u>25</u>	50

Circle the most common flowering stage you've seen.

Circle how many healthy and opened flowers you've seen.

3	Species name	Plant ages seen			Dominant flower stage				Dominant pod stage				
	<u>D. retorta</u>	<input type="radio"/> Seed	<input type="radio"/> Juv.	<input type="radio"/> Adult	<input type="radio"/> None	<input type="radio"/> Bud	<input type="radio"/> Open	<input checked="" type="radio"/> Old	<input type="radio"/> None	<input type="radio"/> Unripe	<input type="radio"/> Ripe	<input checked="" type="radio"/> Open	
	<u> </u>	Abundance (tally)			Healthy flowers %				Healthy pods %				
	<u>0</u>	5	10	More	<u>0</u>	0	<u>25</u>	50	More	<u>0</u>	0	<u>25</u>	50

Circle the most common podding/fruiting stage you've seen.

Circle how many healthy and unopened pods you've seen.

4	Species name	Plant ages seen			Dominant flower stage				Dominant pod stage				
	<u>D. retorta</u>	<input type="radio"/> Seed	<input type="radio"/> Juv.	<input checked="" type="radio"/> Adult	<input type="radio"/> None	<input type="radio"/> Bud	<input type="radio"/> Open	<input type="radio"/> Old	<input type="radio"/> None	<input type="radio"/> Unripe	<input type="radio"/> Ripe	<input type="radio"/> Open	
	<u> </u>	Abundance (tally)			Healthy flowers %				Healthy pods %				
	<u>0</u>	5	10	More	<u>0</u>	0	<u>25</u>	50	More	<u>0</u>	0	<u>25</u>	50

How many insects did you see on the flowers, and so on?

What kind of insect did you see the most of?

5	Species name	Plant ages seen			Dominant flower stage				Dominant pod stage				
	<u>M. rubrifolia</u>	<input checked="" type="radio"/> Seed	<input checked="" type="radio"/> Juv.	<input type="radio"/> Adult	<input type="radio"/> None	<input type="radio"/> Bud	<input type="radio"/> Open	<input type="radio"/> Old	<input type="radio"/> None	<input type="radio"/> Unripe	<input type="radio"/> Ripe	<input type="radio"/> Open	
	<u> </u>	Abundance (tally)			Healthy flowers %				Healthy pods %				
	<u>0</u>	5	10	More	<u>0</u>	0	<u>25</u>	50	More	<u>0</u>	0	<u>25</u>	50

6	Species name	Plant ages seen			Dominant flower stage				Dominant pod stage			
		<input type="radio"/> Seed	<input type="radio"/> Juv.	<input type="radio"/> Adult	<input type="radio"/> None	<input type="radio"/> Bud	<input type="radio"/> Open	<input type="radio"/> Old	<input type="radio"/> None	<input type="radio"/> Unripe	<input type="radio"/> Ripe	<input type="radio"/> Open
		Abundance (tally)			Healthy flowers %				Healthy pods %			
		0	5	10	More	0	5	10	More	0	5	10

