

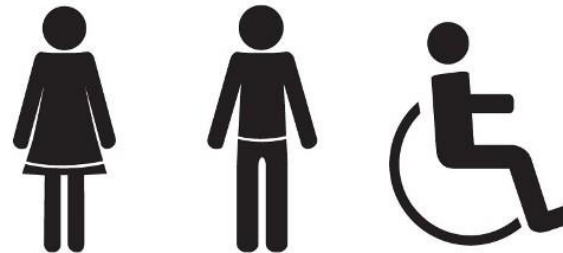
Buds, berries & leaves

Monitoring moorland plants



Housekeeping

- Emergency Exits
- Fire assembly point
- Toilets



Today's Session

1. Presentation

- The importance of moorlands
- What is phenology?
- Conservation works
- Species links
- Plant ecology, ID & folklore
- ID Quiz

SHORT BREAK

- Upland habitats
- How to conduct a survey
- Submitting your records
- How data will be used

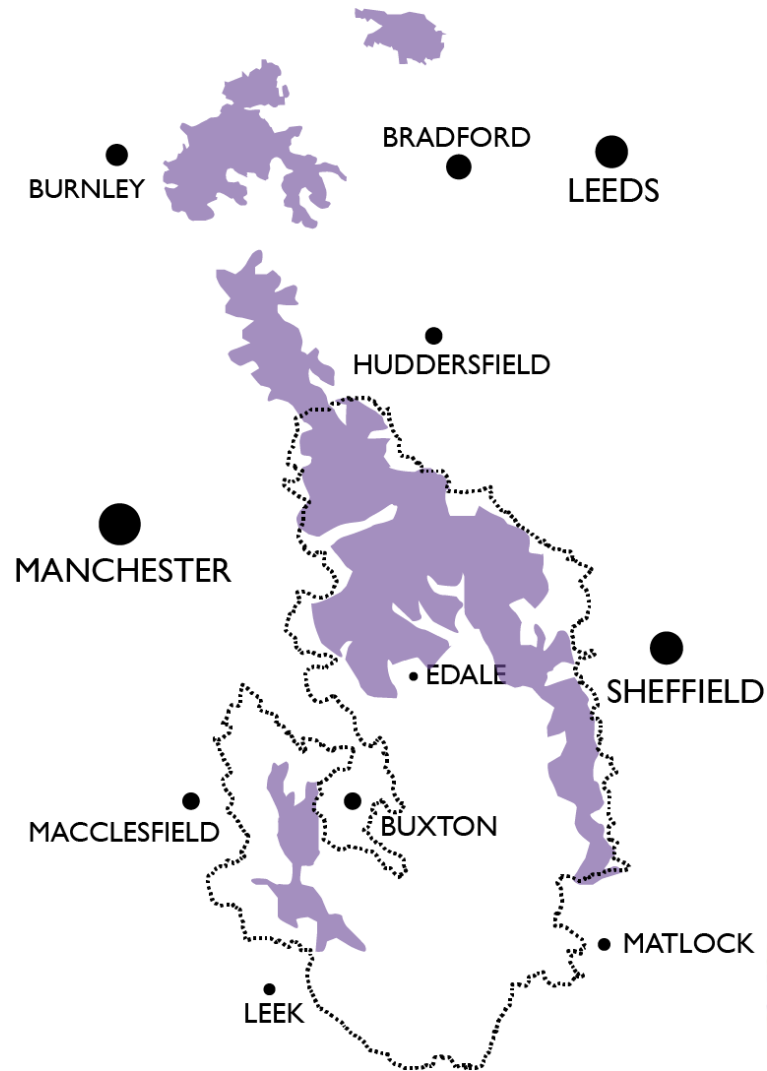
2. Practical session to practice survey methods and field ID

3. Feedback



The importance of moorlands

- The Peak District & South Pennine moorlands are of great importance, being the most southerly point in the range of some species.
- Climate change may affect these population ranges and it will be noticed here first.
- Designated as both a Special Protection Area (SPA) for breeding birds and as a Special Area of Conservation (SAC) for internationally important habitats.



What is phenology?

- Phenology is the study of life history stages, such as leafing, flowering and berry ripening in plants, or migration and breeding in animals.
- Changes in climate can alter the timing of phenological events which may cause mismatch between the life stages of different species, for example:
 - Earlier or later flowering may change the amount of flowers available to pollinators
 - Changes in the fruiting period may result in reduced food availability for birds
- Repeated recording of these crucial stages enables us to identify changes in phenology.



Bees rely on nectar being available at the right time and plants rely on the pollinators too



Coat colour change in mountain hares is another example of phenology



1901. (1st Month, 31 Days)

Birds: Sparrow, Star
Thrush, Hedge-sparrow,
headed gull.

Queen Victoria 12
at 6-30 P

reigned 63

Walked 6 1/2 miles.

Rain

AUGUST 8th Mo

4 TUESDAY

Chaffinch, Sparrow, lark
Martin
(b)

Britain's Ultimatum to
Britain declared war
midnight

Rain

1939

30 Days SEPTEMBER

3 SUNDAY [246-119]

13th after Trinity

Magpie Jay, Nuthatch, Hedge-sparrow
Wood Pigeon, Pheasant,
(b)

Britain & Germany at war
from 11 am
France & Germany at war
5 pm.

Athens torpedoed without
warning 9 pm 250 miles
west of Hebrides.

Rain & thunder in early morning

Daffodils on the shed door

Records may be found in the strangest places!

One of our favourites is this set of daffodil flowering dates painted on Alan Chester's garden shed. Alan sends us a new picture of his shed door every spring.

When we analysed the dates, they produced a very clear relationship with temperature.



www.naturescalendar.org.uk



**WOODLAND
TRUST**



Which plants?

Field and laboratory experiments have shown changes in the phenology of many moorland species.

We have selected four species that are suitably distributed throughout the Peak District and South Pennines moorlands:

- Heather (*Calluna vulgaris*)
- Bilberry (*Vaccinium myrtillus*)
- Crowberry (*Empetrum nigrum*)
- Rowan (*Sorbus aucuparia*)



Conservation works

- All of the plant species in the study have benefitted from our conservation works.
- Bilberry and crowberry have been re-introduced as plug plants (as well as cross-leaved heath, cloudberry and cotton grasses).
- Heather has reseeded in bare areas thanks to the spreading of heather brash.
- Rowan trees are one of the native broadleaf tree species planted as part of our Clough Woodland Project.



Conservation works



Black Hill - 2005

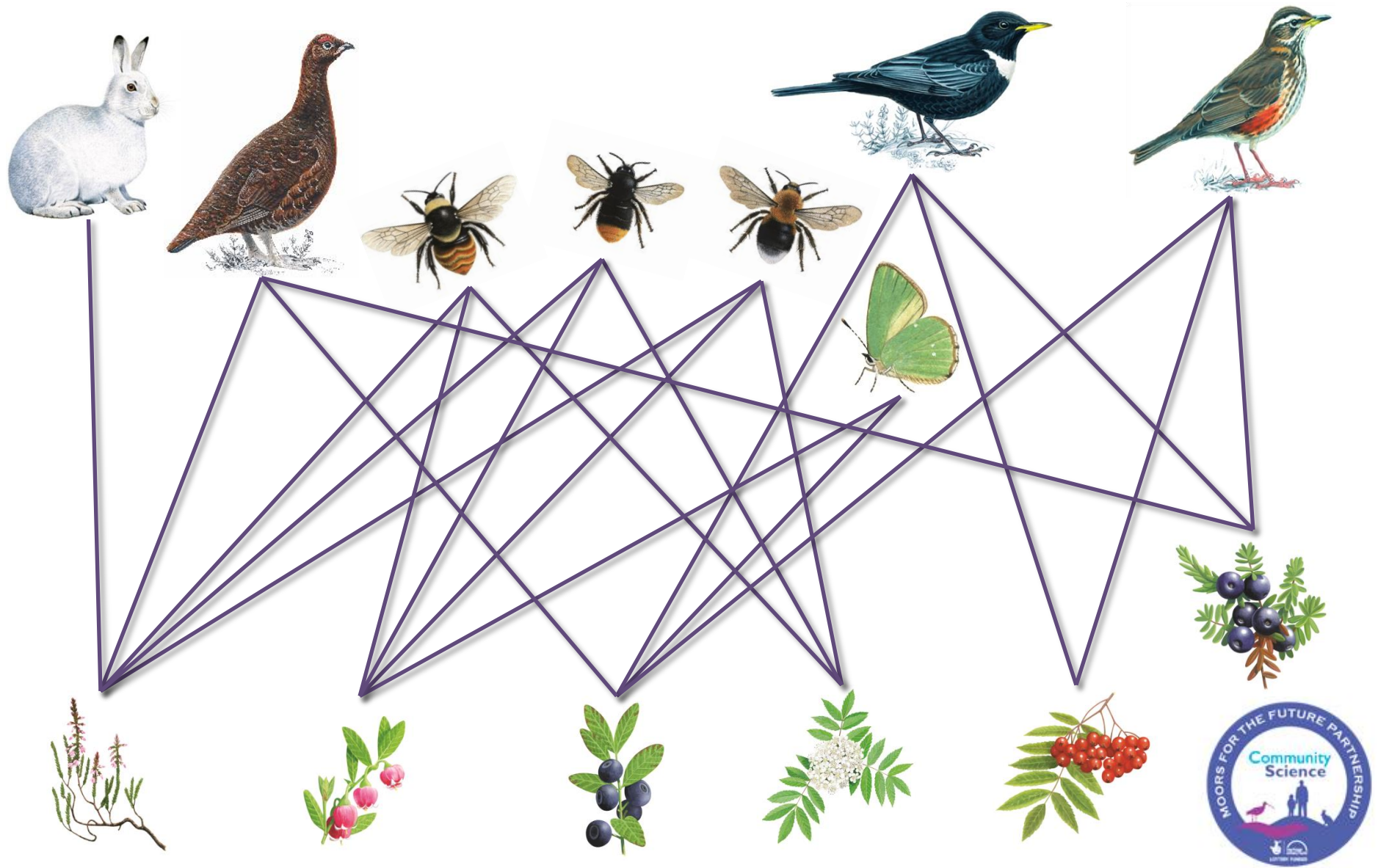


Animals & our plants

- The subjects of our other surveys have strong relationships with our chosen plant species.



Species links



Heather

(Calluna vulgaris)

- The dominant heathland plant in many parts of Britain & Ireland.
- Flowering is the key phenological event to record – usually between July-Sept.
- Leaves are small and stalkless growing in four vertical rows along the branches and are present year round.
- Flowers are bell shaped and pink or pale purple.



Heather

(Calluna vulgaris)



Why we're interested...

- Heather is an important source of nectar for many insect species, including the bees and butterflies included in our other surveys.
- Changes in the timing of flowering may result in food not being available during the flying times of insects or a lack of available pollinators.



Heather

(Calluna vulgaris)

- Can occasionally produce white flowers – regarded as lucky in Scotland – especially at weddings.
- Heather was traditionally used for making brooms – Calluna comes from Greek kallúno meaning “to beautify, sweep, clean”.
- Many cultures have traditionally prepared heather tea.
- Heather honey is often produced by beekeepers.
- Loved by bumblebees too!



Bilberry

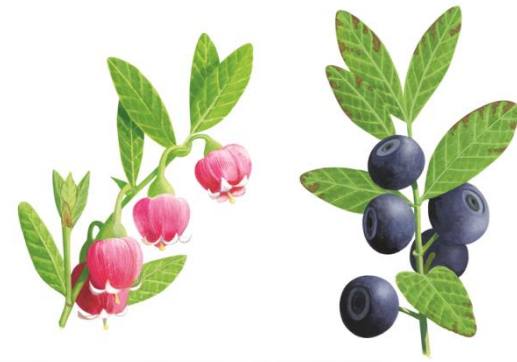
(Vaccinium myrtillus)

- Found in the north and west of the UK on well-drained heaths and moorland as well as on hummocks in peat bogs.
- We will monitor leafing, flowering, fruiting and leaf fall.
- Leaves are oval with toothed edges.
- The small pink flowers hang singly below stems and usually appear between April and June.
- Berries follow from July to Sept.



Bilberry

(Vaccinium myrtillus)



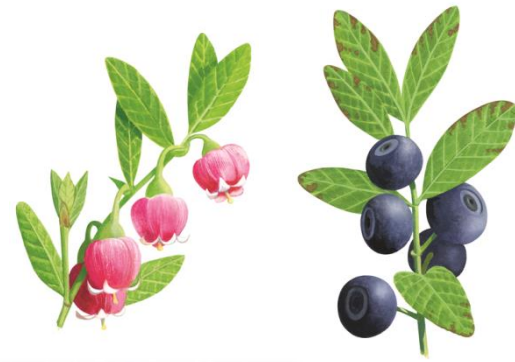
Why we're interested...

- On exposed sites bilberry is predicted to decline due to decreased protection from low winter temperatures provided by the snow layer.
- Bilberry in woodland areas is expected to benefit from an extended growing season.
- The timing of both flowering and fruiting is important for pollinators such as bumblebees, and fruit eating birds such as ring ouzel.



Bilberry

(Vaccinium myrtillus)



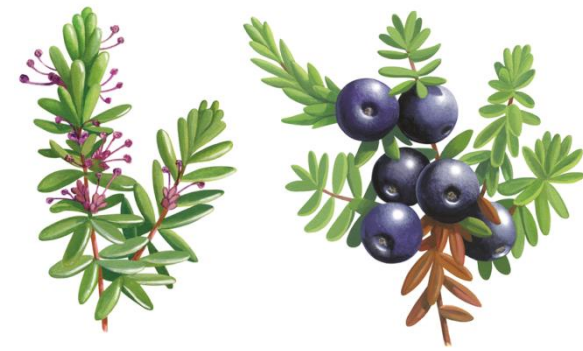
- Deciduous so loses its leaves.
- Goes by many other common names including whortleberry, winberry and blaeberry in Scotland.
- Of all the berries on the moors, bilberries are the most often consumed by people in the UK.
- Did bilberries improve the eyesight of RAF pilots in WWII?
- Closely related to American blueberry – the berries look similar but smaller.



Crowberry

(Empetrum nigrum)

- Found in upland areas of north and west England, and across Wales & Scotland.
- We will be recording flowering and fruiting times.
- Needle-like leaves on reddish-brown stems with a distinctive white stripe underneath.
- Flowers are small and purple – berries black and shiny.



Crowberry

(Empetrum nigrum)



Why we're interested...

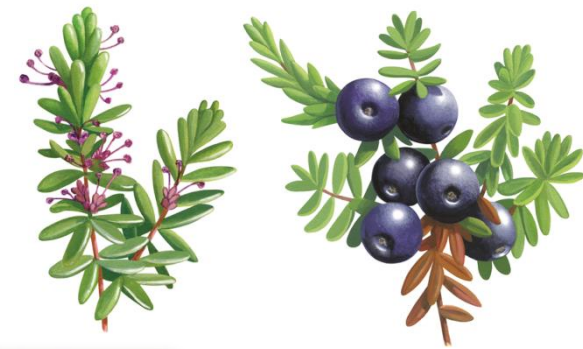
- The range of crowberry in the UK is moving northward, potentially a result of increasing mean winter temperatures.
- At the southern end of its range crowberry has exhibited advanced phenology and a growth season extended by up to 75 days.
- Crowberry is an important food source for both grouse and other bird species.



Crowberry

(Empetrum nigrum)

- Berries are edible but flavour is said to improve after cooking.
- Harvested in Scandinavia on a large scale.
- The leaves and stems have been used as traditional medicines by some arctic tribes.
- Have traditionally been used to dye fabrics in the Shetland Isles.



Rowan / Mountain Ash

(Sorbus aucuparia)

- Found throughout the British Isles from sea-level to over 900 m altitude, higher than any other British tree species.
- We will monitor leafing, flowering, fruiting and leaf fall.
- Leaves are comprised of 5-8 pairs of leaflets plus one leaflet at the end.
- Flowers are creamy white in dense clusters and fruit are orange-red in clusters.



Rowan / Mountain Ash

(Sorbus aucuparia)

Why we're interested...

- Phenological studies have indicated that the rowan may be susceptible to changing climate, and there is an apparent change in leafing across the UK.
- Rowan is a target species for The Woodland Trust's 'Nature's calendar' survey, we want to replicate similar data in a more focused area.



Rowan / Mountain Ash

(Sorbus aucuparia)

- A tree surrounded by mythology.
- In folklore, thought to protect against witchcraft and enchantment – plant one outside your home to protect it from evil!
- Known as mountain ash but not closely related to the ash despite similar leaf shape.
- The berries are edible and full of vitamin C, but taste sour.
- Can live to 200 years old.



Don't be fooled by these...

- There are some other species you may encounter alongside our four targets – let's get to know these:



Other heathers

Bell heather

(Erica cinerea)

- Small bunches of deep purple flowers that tend to appear earlier than those of common heather (*Calluna*).
- Longer leaves than *Calluna* and leave stems in untidy clumps.
- Leaves are dark green.
- Can often be found mixed in with *Calluna* on drier areas of the moor.



Other heathers

Cross-leaved heath

(Erica tetralix)

- Very similar flowers to bell heather but usually just one bunch at the end of each stem.
- Flowers also a paler pink.
- Tidy arrangement of leaves leaving the stem in fours.
- Leaves are a grey-green colour with some tiny hairs.
- Not likely to be found in such extensive areas as *Calluna*.



Other heathers

Cornish Heath

(Erica vagans)

- Unlikely to be spotted in the Peak District but recently discovered on our Edale Transect!
- Usually grows on more alkaline soils – in Britain, native only to the Lizard peninsula in Cornwall.
- Flowers pale pink.
- Tidy arrangement of evergreen leaves.



Other *Vaccinium*s

Cowberry

(*Vaccinium vitis-idaea*)

- Can resemble bilberry but is evergreen so does not lose its leaves.
- Leaves are thicker and feel waxy with a downturned edge and no serrations around the edge.
- Beautiful, white bell-like flowers followed by vibrant red berries in bunches.



Other *Vaccinium*

Cranberry

(*Vaccinium oxycoccos*)



- Low-growing across the ground with tiny leaves.
- Likes to grow in wet areas and across the top of *Sphagnum* mosses.
- Produces small pink flowers and large, dark red berries.
- Easily distinguished from our target plants but worth looking for!



Other trees

Birch

(*Betula Spp.*)

- Two species, silver birch (*Betula pendula*) and downy birch (*Betula pubescens*).
- Very similar to one another but some subtle differences, although they can hybridise.
- Both have white bark and triangular shaped leaves.
- Easily distinguished from rowan all year round.



Useful resources & further information



Field Guides

- FSC laminate guide - <http://www.field-studies-council.org/publications/pubs/moorland-plants.aspx>

Websites

- Community Science - www.moorsforthefuture.org.uk/community-science
- Woodland Trust (*for rowan*) - <http://www.woodlandtrust.org.uk/visiting-woods/trees-woods-and-wildlife/british-trees/native-trees/rowan/>
- Woodland Trust (*Twig ID Sheet*) - <http://www.woodlandtrust.org.uk/naturedetectives/activities/2015/09/twig-id/>
- Plantlife (upland & heathland pages) - http://www.plantlife.org.uk/wild_plants/habitats
- MoorPLANTS App - <http://www.moorsforthefuture.org.uk/moorapps>
- Woodland Trust (Tree ID App) - <https://www.woodlandtrust.org.uk/visiting-woods/trees-woods-and-wildlife/british-trees/identify-trees-with-our-tree-id-app/>

Quiz time!



Cross-leaved heath (*Erica tetralix*)



Quiz time!



Crowberry (*Empetrum nigrum*)



Quiz time!



Ash (Fraxinus excelsior)



Quiz time!



Bell heather (*Erica cinerea*)



Quiz time!



Cowberry (*Vaccinium vitis-idaea*)



Quiz time!



Birch (*Betula spp.*)



Quiz time!



Bilberry (*Vaccinium myrtillus*)



Quiz time!



Rowan (*Sorbus aucuparia*)



Quiz time!



Cranberry (*Vaccinium oxycococcus*)



Quiz time!



Heather (*Calluna vulgaris*)



Tea break!

- Resume in 10-15 mins



Habitats

Acid bogs

- Wet, peat forming sites created by the build-up of *Sphagnum* mosses that retain water and decay slowly.
- Blanket bogs atop the hills in the Peak District.
- Mix of vegetation, but most commonly seen with cotton grasses and other mosses like star moss (*Polytrichum* spp.).
- Shrubs also found but do not dominate as on dry-heaths.



Common cotton grass



Star moss



Sphagnum moss



Habitats

Heaths / Moorlands

- Dominated by heathers and dwarf shrubs like bilberry and crowberry and larger bushes such as gorse.
- Typically found on poor, acid, often sandy, well drained soils, hence known as “dry heath”.
- Waterlogged moors become peat generating bogs, some can be rich in *Sphagnum* mosses.



Typical heathland



Heather



A tasty crop of bilberries



Habitats

Acid Grasslands

- Dominated by grasses and herbs.
- Found on a range of lime-deficient soils derived from acid rocks such as sandstones and gritstones.
- Usually species-poor, but some patches are home to rarer plants such as the greater butterfly orchid.
- Often dominated by Purple moor grass (*Molinia caerulea*), Mat grass (*Nardus stricta*) and Wavy hair grass (*Deschampsia flexuosa*) in the Peak.



Purple moor grass and rushes



Wavy hair grass



Greater butterfly orchid



Habitats

Bracken hillsides

- Bracken is a species of fern common in the hills of the Peak District.
- It is a very successful plant (it is poisonous) that dominates, creating a distinctive habitat lacking in many other species.
- Its thick cover provides nesting sites for birds and invertebrates alike.



A bracken covered hillside



A stand of bracken



Bracken dying off in autumn



Transect monitoring



- A network of fixed route transects 1-2 km long.
- We use the same transects for this survey as for our bumblebee survey.
- Standardised methodology and repeated visits to the same sites will provide high-quality long-term data to reliably detect changes in the timing of events.

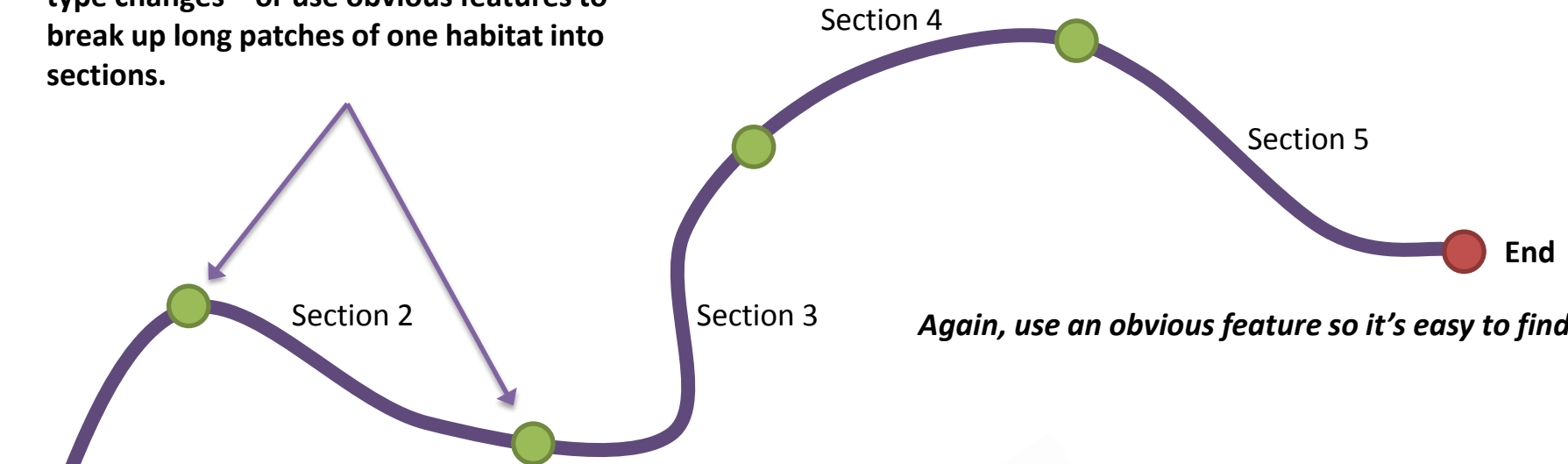


Transects



There should be between 4 and 10 sections on a transect

Section breaks should be where the habitat type changes – or use obvious features to break up long patches of one habitat into sections.



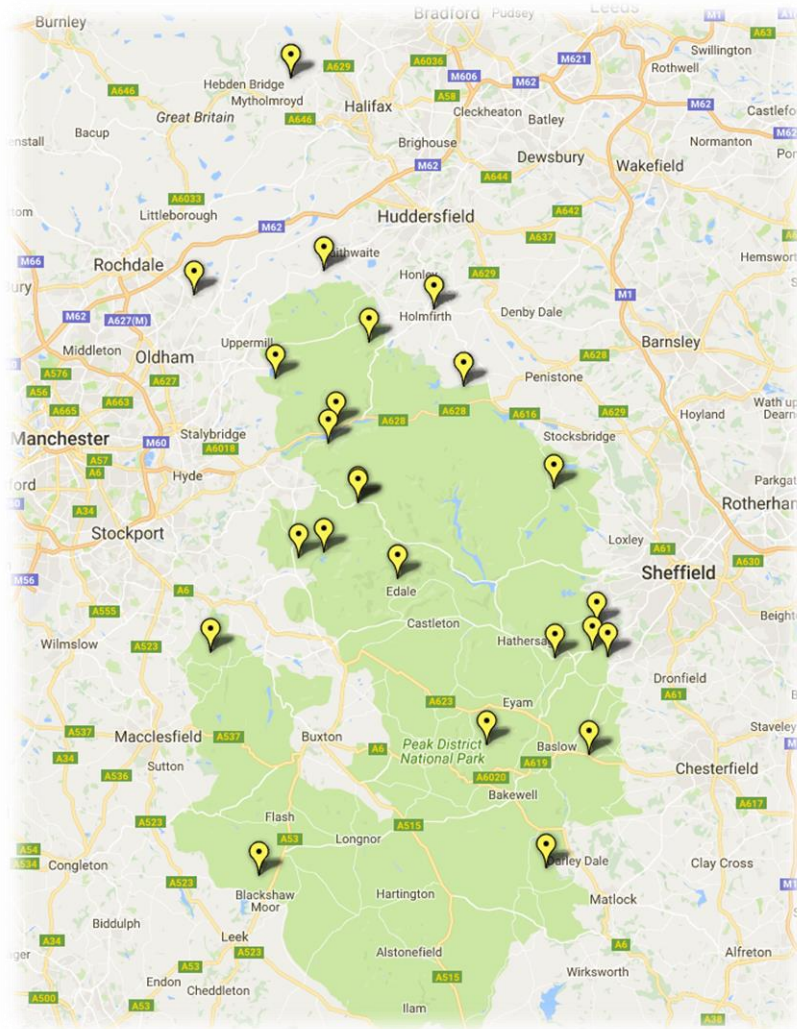
Again, use an obvious feature so it's easy to find.

Use an obvious feature so it's easy to find.



Where to survey

- Transects within the Peak District and South Pennines (some locations have two transects).
- Maps, transect guides and survey forms are available to download from the Community Science Project website or on request.
- If you'd like establish a new transect of your own that you can walk regularly, come and speak to us.



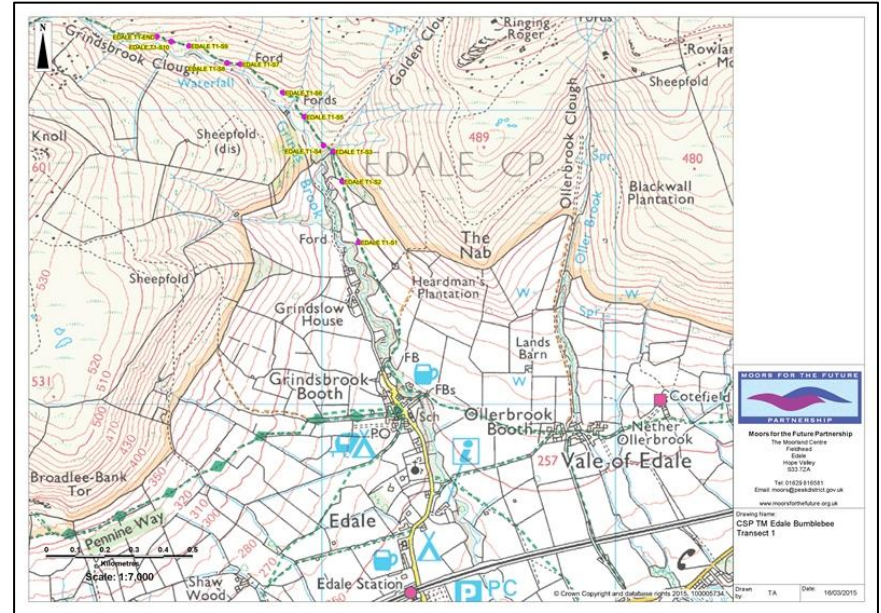
When to survey

- Transects should be walked at least once per month but should be timed to try and catch the onset of phenological events.
- Not dictated by weather but we recommend keeping dry!
- Use our [Facebook page](#) or [Forum](#) to discuss with others what transects have not been surveyed recently and any ID queries.
- Survey one way for bumblebees and record plants on the way back or vice versa!



What to take with you

- Map & guide of the transect
- Transect survey form
- Binoculars may be useful for closer views of more distant rowan trees
- Camera to take photos for verification
- GPS unit (if you have one)
- Health & Safety guidelines



Health & safety

Please ensure that you are aware of the risks involved in moorland surveying and use your common sense.

Don't forget to:

- Wear appropriate footwear for rough ground.
- Check the weather forecast before you go out.
- Wear appropriate clothing, and take additional layers.
- Take a hat and/or sunscreen – it is easy to get burnt on the hill.
- Let someone know where you are going, and carry a mobile phone.
- Please take care of the moors – do not smoke, and take your litter home.



Conducting the survey

- Navigate to the starting point of the transect.
- Walk the transect at a steady pace to enable accurate ID of plants and growth stages.
- Look for the three shrub species **2 m to each side** of the edge of the footpath.
- Look for rowan trees up to **20 m from the sides** of the path.
- Record the signs of the phenological stages on the recording form.

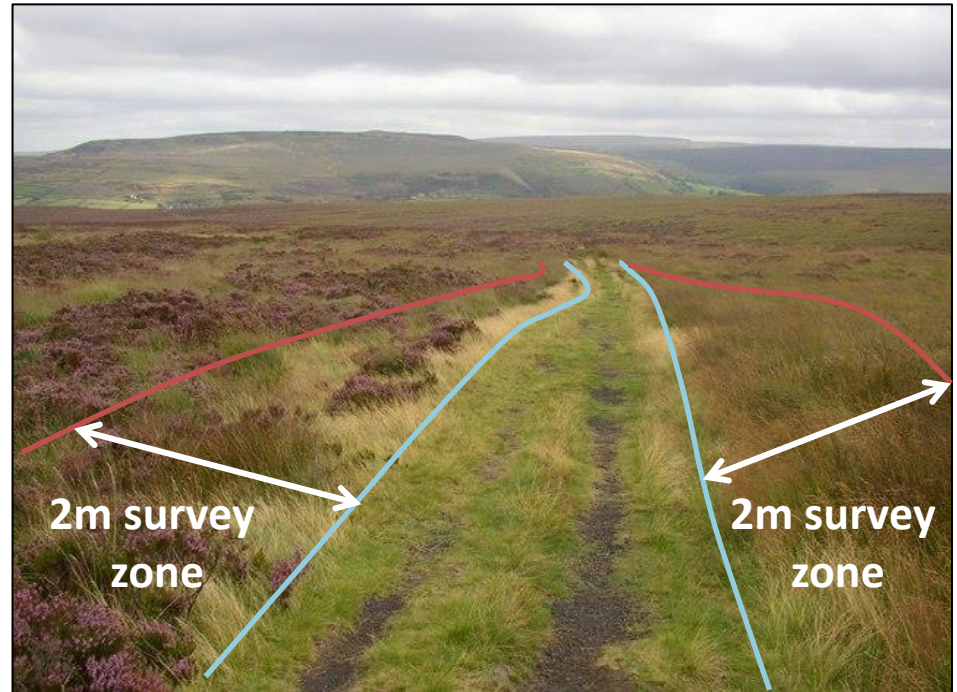


Photo: Humphrey Bolton





Field recording

Fill in the details at the top of the survey form first. This information will help when analysing the data.

Remember to check how many sections your transect has so you can fill in the form accurately.

Buds, Berries and Leaves Survey Form





Date		Start Time	
Transect Name		Finish Time	
Recorder Name		No. of people who took part	

The number of sections varies between transects, please refer to the corresponding transect guide for each survey.
Please refer to stage definition sheet for more detailed descriptions of growth stages.

Section	1	2	3	4	5	6	7	8	9	10
Bilberry in leaf (>10% of plants in section in leaf)										
Bilberry in flower (>10% of plants in section in flower)										
Bilberry with ripe fruit (>10% of plants in section with ripe fruit)										
Bilberry leaf fall (>50% of plants in section with some bare twigs)										
Bilberry plant bare (>50% of plants in section completely bare)										
Crowberry in flower (>10% of plants in section in flower)										
Crowberry with ripe fruit (>10% of plants in section with ripe fruit)										
Heather in flower (>10% of plants in section in flower)										
Rowan in leaf (>10% of plants in section in leaf)										
Rowan in flower (>10% of plants in section in leaf)										
Rowan with ripe fruit (>10% of plants in section with ripe fruit)										
Rowan leaf fall (>50% of plants in section with some bare twigs)										
Rowan plant bare (>50% of plants in section completely bare)										

Notes Record in here main habitat type, changes in habitat / management since last visit, obvious disturbance etc.



Field recording

- **In leaf:** When >10% of plants in the section have some leaves which are fully open – *bilberry and rowan*.
- **In flower:** When >10% of plants in the section have some flowers with petals that are open enough to make the inside of the flower visible – *bilberry, crowberry, heather and rowan*.
- **With ripe fruit:** When >10% of plants in the section have fruit that is ripe (soft to touch and in full colour) – *bilberry, crowberry and rowan*.
- **Leaf fall:** When >50% of plants in the section have some bare twigs or branches – *bilberry and rowan*.
- **Plant bare:** When >50% of plants in the section are completely bare except for shrivelled leaves – *bilberry and rowan*.





Field recording

At the end of each section tick the boxes that correspond to the growth stages seen for each species in the section - If more than one stage was recorded (such as both flowers and ripe fruit being present) tick both but only the latest stage (ripe fruit) will be submitted on to the database.

If the species was present in a section but a growth stage was not, mark the box with an 'X'.

If a species was not present in a section write 'absent' or 'A'.

**Buds, Berries and Leaves
Survey Form**

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Rowan leaf fall (>50% of plants in section with some bare twigs)										
Rowan plant bare (>50% of plants in section completely bare)										

Notes Record in here main habitat type, changes in habitat / management since last visit, obvious disturbance etc.





Field recording

When you complete the route don't forget to enter your finish time

In the notes section include anything that might have affected the our target species e.g. recent unseasonable weather heavily shaded areas or the presence of streams

**Buds, Berries and Leaves
Survey Form**

Date		Start Time	
Transect Name		Finish Time	
Recorder Name		No. of people who took part	

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Submitting your records



- All data will be entered on to the biological recording website iRecord (www.brc.ac.uk/irecord).
- Records are passed on to the Biological Records Centre, and are verified by volunteers (who are experts in their field).
- We encourage all our recorders to use this facility by setting up their own account – it is quick and easy.
- A link to our iRecord page can be found on our [website](#).
- A step-by-step guide to submitting results for this survey can be found on our [website](#).
- Alternatively, you can post the recording form to Moors for the Future – fill in details on reverse.



What will your data tell us?



- Where are the plant species present and absent in the project area?
- What affects plant phenology – habitat, topography (slope, aspect and elevation), management, microclimate, water table depth?
- What changes are occurring over time? Are the timing of phenological events changing in the Peak District & South Pennines?
- What might be causing these changes? Is it climate change, management?
- Are there any potential impacts on other species?



Other surveys



The image shows a 'Community Science' survey form and a website interface. The form is titled 'Help us to understand how moorlands are being affected by climate change' and includes a table for recording sightings. The website interface shows a search bar and a list of species including 'Moor & L.', 'Learning & Discovery', 'Events', 'Policies & Maintenance', and 'Blog'. A smartphone in the foreground displays a mobile app interface with a 'Select an animal' dropdown menu and a grid of photos of rabbits.

Species	Date	Time	Location	Count	Notes
Moor & L.					
Learning & Discovery					
Events					
Policies & Maintenance					



Supporting you

www.moorsforthefuture.org.uk/community-science

We are here to help you and our website offers all the support you should need including:

- Further information and guidelines
- Updates on which transects need surveying
- Survey forms, transect guides and maps for download
- Help on submitting your records online
- How to establish new transects

You can also contact us via:



www.facebook.com/MoorCitizens



moorcitizens@peakdistrict.gov.uk



[@MoorCitizens](https://twitter.com/MoorCitizens)



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Thank You



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