

ESTABLISHING RULES FOR FIELD TRIPS

Before you go outside, take the time to develop a list of safety rules with the class. Record their ideas. Here is a sample list:

RULES FOR FIELD TRIPS

- Always walk.
- Stay in the boundaries.
- Don't stick your hand into anything.
- Find out which plants are poisonous, and don't touch or eat them.
- Take along a first aid kit.
- Unless we are collecting, don't take anything.
- Don't leave anything behind, and don't litter.
- Take a wristwatch in each group. Keep on schedule.
- Remember that noise scares away most animals.
- Leave the place the way we found it. Gently replace rocks, logs, or vegetation. This is someone else's home.



SITE REPORT

Biome (check one):

- Taiga
- Temperate evergreen forest
- Temperate deciduous forest
- Temperate mixed forest
- Savanna
- Chaparral
- Grassland
- Desert
- Subtropical forest
- Evergreen tropical rain forest

Is the site on public land **OR** private land? (check one)

Do you need to have permission to use the site? Yes No

Topography (check any in your site):

- Flat or little elevation change
- Hilly
- Cliffs or bluffs
- Slope (describe direction of slope below)
- Rocky outcroppings
- Boulders

Human-made topography (check one):

- Footpath
- Dirt road
- Paved sidewalk
- Paved road
- Bridge
- Stone wall
- Fencing
- Buildings

Additional teacher comments:

Name: _____
Area: _____ m ²
Latitude: _____ ° _____ ' _____ "
Longitude: _____ ° _____ ' _____ "
Average elevation: _____ meters

PLOT REPORT**Water level (check one):**

- No standing water
- Shallow pools during wet season
- Bog (wet, spongy ground with lots of surface peat)
- Marsh (waterlogged ground with herbaceous plants)
- Swamp (spongy ground with areas of standing water and woody plants)
- Pond or lake
- Stream, brook, or river

Team Name: _____

Elevation: _____ meters

Microhabitat (check any you find in your plot):

- Trees
- Shrubs
- Herbaceous (non-woody) plants
- Dead standing trees
- Dead trunks or branches on the ground
- Piles of brush
- Leaf litter mostly broad-leaved
- Leaf litter mostly conifer needles
- Running water
- Standing water or wet area
- Areas of bare ground
- Garbage/litter

Dominant vegetation (check one):

- Grass or other herbaceous (non-woody) plants
- Cactus or other succulent plants
- Low-growing woody shrubs
- Scattered trees
- Dense forest

Soil type (check one):

- Sand (loose, gritty particles)
- Silt (medium-sized, sedimentary particles)
- Clay (fine particles, form a paste with water)
- Loam (a mixture of sand, silt, and clay)
- Gravel (rock fragments)

How often is your site affected by people (check one):

- No signs of human disruption
- Occasional visits by people
- Once maintained, but now abandoned
- Seasonal use (agricultural fields, ball fields, lawns, public parks)
- Managed for wildlife (wildlife refuges, nature reserves)

Evidence of animals other than arthropods (please describe):

Additional student or teacher comments:

PLANT REPORT

For every new plant specimen you find, fill out this report.

How confident are you on your identification (check one):

- Not sure
- Very sure
- Completely sure

Journal entry/observation date: _____

Division: _____

Family: _____

Genus: _____

Species: _____

Common name: _____

Nickname: _____

What evidence did you use to support your identification (check any used for identification):

- Web site dichotomous key
- Field guide or other resource
- Local expert
- Teacher
- Another student

Leaf type (check one):

- Tiny scale
- Needle
- Strap-shaped (narrow)
- Broad-leaf

Leaf arrangement (check one):

- Opposite
- Alternate
- Whorled

Growth form (check one):

- Woody tree
- Woody shrub
- Herbaceous (non-woody)
- Vine

Reproductive status (check one):

- Flowers
- Fruits
- Cones
- No reproductive structures present (without fruit or flowers)

Abundance of this plant in plot:

Description:

Additional student or teacher comments:

WEATHER REPORT**Weather type (check one):**

- Clear
- Partly Cloudy
- Cloudy
- Fog
- Drizzle
- Showers
- Snow

Journal entry/observation date: _____

Temperature: _____ °C

Precipitation: _____ mm

Wind speed (check one):

- Smoke rises vertically
(less than 1 kilometer per hour)
- Wind direction shown by smoke drift
(1–5 kilometers per hour)
- Wind felt on face, leaves rustle
(6–11 kilometers per hour)
- Leaves, small twigs in constant motion, lightweight flag extends
(12–19 kilometers per hour)
- Raises dust and loose paper, small branches move
(20–28 kilometers per hour)
- Small leaves on trees sway, crested wavelets on inland waters
(29–38 kilometers per hour)

Additional student or teacher comments:

ARTHROPOD REPORT

For every new arthropod specimen you find, fill out this report.

How confident are you on your identification (check one):

- Not sure
- Very sure
- Completely sure

What evidence did you use to support your identification (check any used for identification):

- Web site dichotomous key
- Field guide or other resource
- Local expert
- Teacher
- Another student

Legs (check one):

- 3 pairs of legs
- 4 pairs of legs
- 7 pairs of legs
- More than 7 pairs of legs

Mouth parts (check one):

- Coiled tube
- Straight tube
- Biting jaws

Journal entry/observation date: _____
Subphylum: _____
Order: _____
Family: _____
Genus: _____
Species: _____
Common name: _____
Nickname: _____

Observed behavior (check any observed):

- Catching other arthropod (predator)
- Feeding on flower
- Feeding on plant
- Getting eaten (prey)
- Courtship
- Mating/copulation
- Laying eggs
- Flying, fluttering
- Flying, hovering
- Flying, zigzag
- Flying, straight
- Moving on ground slow
- Moving on ground fast
- Building structure
- Manipulation of antennae

Abundance of arthropod in plot:

Observed relationships to other arthropods and plants:

Description:

Additional student or teacher comments:

SOME CLUES TO DESCRIBING AND UNDERSTANDING ORGANISMS

Here are some clues to describing and understanding organisms to help focus your biodiversity research in these three places:

- in the classroom (as you form your questions and build hypotheses)
- in the field (as you observe and collect data)
- in the “lab” (back at school, as you analyze data, create graphic presentations, and review hypotheses)

(Remember: Some clues can be seen only close-up in the lab, but with practice, you’ll see many in the field.)

After noting a characteristic of the organism, always ask yourself, “Why might it be this way? What might this clue indicate?”

FOR ALL ORGANISMS, CONSIDER MICROHABITAT:

Does the organism always occur in the same “zone”? Consider:

- temperature
- moisture level
- sunlight/shade
- soil type

PLANTS

Distribution

- Does the plant occur in clumps, or is it on its own, far from others of the same species?
- If in clumps, do they seem randomly distributed, or do you see a pattern?
- Is it always associated with the same plant species, or do you find it with a variety of other plants?

Growth Form *How does the plant hold itself up when it doesn’t have a skeleton?*

- Does the plant stand up by itself, sprawl along the ground, or use something else for support (vines)?
- Is it woody or herbaceous (non-woody)?
- If it’s woody, is there one main trunk (trees), or are there several (shrubs)?

Leaf Type *Does the leaf look like:*

- a regular broad-leaf, with a little stem (petiole) and a flat, wide blade?
- a long strap?
- a needle or a tiny scale?

If the leaf has a petiole and blade, what shape is the blade?

Leaf Arrangement *How are the leaves arranged on a stem?*

- Are there two leaves attached to the same part of the stem (opposite)?
- Are there more than two leaves attached to the same part of the stem (whorled)?
- Do the leaves attach to the stem in a zigzag or spiral pattern (alternate)?

Reproduction *How does the plant produce offspring?*

- Do you see flowers on the plant?
- Where are the male parts (stamens) and female parts (pistils) of the flower?
- How do you suppose the pollen reaches an appropriate pistil?
- Do you see fruits or cones on the plant?
- If so, can you find the seeds?
- How do you think seeds get around to new locations?

Plant Defense *How do you suppose plants protect themselves from predators when they can't run away?*

- Do you see anything eating the plant, or signs that something has been eating it?
- Does the plant have any spines?
- Do the leaves look very hairy?
- Are certain parts of the plant very tough and hard to digest?
- Does the plant have a distinct smell?

ARTHROPODS

Behavior *Look for clues to how and where it "earns its living," for example:*

- Is it constantly visiting flowers?
- Does it run around in the open?
- Is it found only in the dark, under stones or logs?
- Does it lie waiting in some kind of trap?

Location *Look for clues to the kind of places it prefers.*

- If on vegetation, is it chewing leaves? Piercing? Sucking?
- Is it always on the same type of plant?
- Does it occur in large numbers or on its own?

Occupation *What's it up to? For example:*

- Is it involved with another arthropod?
- Is it eating? Is it being eaten?
- Is it just "hanging out"?
- Is it mating? Is it laying eggs?
- Is it tending to eggs or larvae?
- Is it carrying eggs or larvae?
- Is it fighting? Showing off ("displaying")?

Morphology *How's it built?*

- Mouthparts: How do you think it might feed? Might it suck? Pierce? Bite? Does it have poison fangs?
- Legs and other appendages: How long are they? How long are legs compared to other appendages? (For example, does it have huge rear legs like a grasshopper? Or a long "stinger" like an ichneumonid wasp?)
- Eyes: How big are they? How complicated? (For example, does it have huge compound eyes like a dragonfly? Or tiny, simple eyes like many spiders?)

TYPES OF OAK LEAVES



1



2



3



4



5



6



7



8



9



10



11



12

PLANT/INSECT INTERACTIONS

These are some questions to ask when you see an insect on a plant:

Does the insect have a beneficial, neutral, or detrimental impact on the plant?

Is the insect collecting pollen or any other substance from the plant?

Is the insect eating part of the plant, resting on the plant, or looking for prey on the plant?

If the insect is eating the plant, what part of the plant is it attacking (flower, leaf, stem, fruit, seed, root, bark)?

Do you see any relationship between the mouthparts of the insect and how it exploits the plant?

Is the insect an exposed feeder (on the surface of the plant) or a concealed feeder (within the plant tissues)?

Is the insect a specialist (found on a single plant species or related plant species) or a generalist (found on many different plant species)?

Does the plant have any sort of latex (sticky white or colored sap)?

Does the plant have any characteristic odor?

Does the plant have any mechanical defenses?
If so, how does the insect avoid them?

How might the insect defend itself from predators?

Is the insect camouflaged, or does it have warning coloration (that might alert a predator to its toxicity or bad flavor)?

MUSEUM EXHIBIT SPECIALISTS

These are some of the key exhibit specialists and descriptions of the work they do:

Scientist Curator

determines the scientific content of the exhibit, drafts label copy

Exhibit Designer

works with the design team to develop the concept and the content of the exhibit, plans the space

Exhibit Developer

develops and administers the schedule and the budget, monitors progress, coordinates efforts of the various teams

Researcher

researches subject and checks scientific accuracy

Writers

script the exhibition, decide what the story line is; write copy for banners, brochures, guidebooks, label copy, information to go on the Web

Graphic Designers

decide on how to present copy and how it will look (font, color, illustrations)

Museum Artists

create maps, illustrations, murals, dioramas, models

Media Specialists

develop audio and video materials; create Web components and computer interactives

Evaluators

before the exhibit, determine the interests and needs of the intended audience; afterward, assess the effectiveness of the exhibit

Construction Team

builds the displays; does carpentry, electrical wiring, metalwork

Tour Guides

lead visitors through the exhibit and provide educational commentary

Live Plant/Animal Specialist

selects specimens, cares for them during the exhibit

VISITOR QUESTIONNAIRE

Dear Visitor,

Thank you for coming to our exhibit. We hope you will take a few minutes to fill out this form. We will use it to evaluate our exhibit.

Please rank the exhibit on the following. Use a scale of 1 (low) to 5 (high). Circle your response.

Interesting	1	2	3	4	5
Informative	1	2	3	4	5
Attractive	1	2	3	4	5
Easy to understand	1	2	3	4	5
Well organized	1	2	3	4	5

What was your favorite part?

What could we improve?

What is the main idea of the exhibit?

What did you learn about biodiversity that you never knew before?

Other comments:

TASKS AND FOCUS QUESTIONS**CHAPTER 1****LESSON 2****FIELD TRIP****EXPERIENCING THE OUTDOOR SITE**

Tasks	Focus Questions
<i>To observe living things at the site</i>	What living things have you observed so far? Have you looked at both plants and animals?
<i>To use more than one sense to make observations</i>	How many different senses have you used to make observations?
<i>To record observations</i>	How are you recording your observations? How would you report them to someone who has not been to the site?

TASKS AND FOCUS QUESTIONS**CHAPTER 2****LESSON 3****FIELD TRIP****STAKING A CLAIM**

Tasks	Focus Questions
<i>To mark and measure their team plots</i>	How did you measure your plot? What tools did you use? How will you mark the boundaries of your plot?
<i>To develop a system for finding the team plot</i>	How will you find your plot the next time? Did you draw a map? What permanent features did you use as points of reference?
<i>To make preliminary observations</i>	What have you observed about the plants and animals in your plot? Where have you recorded your observations?
<i>To record data on the Site Registration Form</i>	How much data have you been able to record on the Site Registration Form? What tools have you used to collect the data? Which items will require further research? What reference materials will you use?

TASKS AND FOCUS QUESTIONS**CHAPTER 2 OPTIONAL ACTIVITY #1****FIELD TRIP MAPPING THE SITE**

<i>Tasks</i>	<i>Focus Questions</i>
<i>To develop a plan for mapping the entire site</i>	How shall we divide up the area? How have you divided the tasks within your teams?
<i>To collect data necessary to create an accurate map of the site</i>	How are you measuring distances? What tools are you using?
<i>To draw a map of the site</i>	What symbols will represent the different objects at the site? Have you created a legend for the map?

TASKS AND FOCUS QUESTIONS

CHAPTER 3 LESSON 2

FIELD TRIP A CLOSE OBSERVATIONS

Tasks	Focus Questions
<i>To prompt students to use more than one sense to make observations</i>	Which of your senses have you used to observe? Have you touched the plant, smelled it, looked at it with a hand lens?
<i>To seek patterns</i>	What patterns have you noticed on the plant? How are the leaves or needles arranged along the stem? What patterns do the veins make? Do all the blossoms have the same shape and the same number of petals?
<i>To encourage measurement</i>	Have you measured the plant? What parts have you measured?
<i>To focus on plant processes</i>	What is the plant doing right now? Is it producing buds, seeds, fruits, leaves, or blossoms?
<i>To look for relationships</i>	Do you think the plant may have an ecological relationship to another plant, or to an animal? Why do you think so?
<i>To ensure record keeping</i>	Where have you recorded your observations? Have you included written descriptions, measurements, and drawings?
<i>To measure and record environmental factors</i>	What environmental factors are you measuring? What tools are you using to take the measurements?

TASKS AND FOCUS QUESTIONS

CHAPTER 4**LESSON 2****FIELD TRIP****HOW MANY PLANTS ARE
THERE IN EACH PLOT**

Tasks	Focus Questions
<i>To count all the plants in each plot</i>	How are you counting? How has your team divided up the task?
<i>To solve problems as they arise</i>	What problems have you encountered about what or how to count? How did you solve them? Should we discuss the problems as a group? Let's remember to post our solutions on the Web.
<i>To record new questions</i>	What new questions arose today? Where did you record them?
<i>To collect data on environmental factors</i>	How are you measuring and recording the environmental factors that influence your plot? What tools are you using?

TASKS AND FOCUS QUESTIONS

CHAPTER 4

LESSON 3

OPTIONAL
ACTIVITY BCALCULATING THE PERCENTAGE
COVER IN EACH SQUARE

Tasks	Focus Questions
<i>To determine what percentage of the plot is covered by vegetation</i>	How have you subdivided the plot? Into how many divisions? How will you calculate the percentage coverage?
<i>To measure environmental factors that influence the plot</i>	What factors are you measuring? What tools are you using to measure?
<i>To record data</i>	How are you recording the data?

FOCUS QUESTIONS

CHAPTER 5 LESSON 4

FIELD TRIP A CLOSE OBSERVATIONS

<i>Focus Questions</i>	<i>Possible Responses</i>
<i>What is the first thing you noticed about this animal?</i>	Shape, color, size, method of locomotion
<i>How do you know it is an arthropod?</i>	Jointed appendages, segmented body, hard exoskeleton
<i>What can you count?</i>	Legs, wings, body segments
<i>Where exactly did you find it?</i>	On a plant, in the soil, in the air, under a rock
<i>What was it doing?</i>	Eating, moving, resting
<i>How does it move?</i>	Walk, hop, fly
<i>Have you observed it interacting with a plant or with another animal?</i>	Responses will vary

TASKS AND FOCUS QUESTIONS

CHAPTER 5 LESSON 4

FIELD TRIP B COLLECTING

Tasks	Focus Questions
<i>To focus on collecting techniques</i>	Where did you find the arthropod? How did you capture it?
<i>To encourage planning</i>	What will you do with it: release it, keep it for a while, or kill and preserve it? If you are going to keep it alive, how will you provide for its needs? If it will become part of the preserved collection, how will you preserve it?
<i>To record data</i>	What data will you record on the specimen label? What data will you record in your journal?
<i>To discourage overcollecting</i>	Has anyone else already captured an arthropod like yours? How do they compare? Which one should we keep for the collection?

TASKS AND FOCUS QUESTIONS

CHAPTER 6**LESSON 2****FIELD TRIP****OBSERVING ARTHROPODS
IN THEIR MICROHABITATS**

Tasks	Focus Questions
<i>To select a microhabitat for study</i>	Which microhabitat are you observing? What do you expect to find?
<i>To make use of appropriate collecting tools and techniques</i>	How will you collect arthropods in this microhabitat? Why have you chosen that method?
<i>To analyze the microhabitat in detail</i>	What environmental factors are you recording? How might they influence what you find?
<i>To record observations</i>	How are you recording? Have you included drawings, written descriptions, and measurements?
<i>To identify arthropods found in the microhabitat</i>	Have you been able to identify the arthropods you found? Are you collecting specimens to take back for further identification?

TASKS AND FOCUS QUESTIONS

CHAPTER 7**LESSON 4****FIELD TRIP****OBSERVING PLANT AND
ARTHROPOD INTERACTIONS**

<i>Tasks</i>	<i>Focus Questions</i>
<i>To observe microhabitats on plants</i>	What part of the plant are you observing? What kinds of microhabitats have you discovered on the plant?
<i>To observe arthropod presence on a plant</i>	What arthropods are present on the plant you are observing? Exactly where on the plant are they?
<i>To observe arthropod behavior</i>	How is the arthropod using the plant? Do you see interactions between different species of arthropods on the plant?
<i>To encourage speculation</i>	Do you think the plant-arthropod relationship is mutually beneficial, or is it harmful to the plant? If you are not sure, how could you find out?