

LANDSCAPE CROSS SECTION

Students map shifts in plants or animals across an area with a gradient of species and environmental conditions, such as an intertidal zone, the slope of a hill, or a transition from shore to pond.

A straight line that cuts across an object or area is called a transect. A cross-section diagram is a side view showing the species or features that occur along a transect, as well as other details and observations. (A cross section could also show a phenomenon that has vertical structure, such as a species of moss or lichen on a tree.) Making cross sections of a transect is a powerful tool for noticing patterns of organisms or other features within an ecosystem. The approach prepares students to think about how patterns in organism distribution are related to environmental conditions, and helps them make detailed observations of landscape features.

NATURAL PHENOMENA

Look for areas that transition between environmental conditions (wet to dry, sun to shade, direct to indirect sunlight, one soil type to another, elevations, etc.) with associated changes in the distribution of plants or animals. Or look for an area with variation in patterns of distribution of plant or animal species (even if you're not sure about what types of changing conditions might have caused them).

This might include intertidal zones (on vertical rock faces or wharf pilings, or as you walk from shore to sea among exposed tide pools); a recently fallen tree, along which there are changes in lichen and moss species; a stream profile showing changes in vegetation on either side (being sure to make your area wide enough to show the transition to riparian vegetation along the stream bank); a line across a boulder; the edge of a marsh showing a transition from wet to dry along the bank and emergent or floating vegetation zones in the water; a transect of a valley or a hill on a north-south transect line (north-facing slopes in the northern hemisphere are more lush and damp; they get less direct sunlight than south-facing slopes); vegetation zones up a tall mountain showing plant communities at different elevations (best done on a road trip where you can drive between zones and stop periodically to journal).

PROCEDURE SUMMARY

1. Make a cross-section diagram to show the distribution of plants and other living things in the transect.
2. Begin by drawing a profile of the ground and making rough outlines of any zones or patterns of species you see.
3. Use symbols to show where plants and other organisms occur, making a key to show what the symbols mean.

DEMONSTRATION

When the whiteboard icon appears in the procedure description: Draw a line representing the contour of



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Excerpted from the book *How to Teach Nature Journaling*,
published by Heyday books.

Time

Introduction: 10 minutes
Activity: 30–50 minutes
Discussion: 10–15 minutes



Materials

- Journals and pencils
- Examples of cross sections pulled from the internet or other resources



optional

- Compasses
- Measuring tapes
- Rulers

Teaching Notes

Students can make a cross-section diagram to a part of their map as a follow-up to the activity *Mapping*. Once students know this technique and the type of insight it provides, they can include a small cross section in other journal entries. Use the discussion questions to help students see the technique as a transferable investigation tool.



Depending on the size of your group and the available area for study, decide whether students should all walk the exact same transect (spread out slightly to avoid being in one another's way) or each walk their own transect.

the ground. Then add simple symbols for different kinds of trees and bushes. You can label the plant symbols on the page or create a key to your symbols on the bottom or side of the page. Add a cardinal direction arrow and a stick figure of a person for scale. Represent written notes and questions with sets of lines.

PROCEDURE STEP-BY-STEP

1. Tell students that they'll be exploring the patterns of distribution of organisms, then tell them to walk along the transect and observe patterns in small groups.

- a. "We're going to be making a side view or cross-section diagram to show the patterns of plants and other living things along a straight line between _____ and _____."
- b. "Before we use our journals, let's take five minutes to check this out in teams of three or four. The transect begins [name landmark] and ends [name other landmark]. Walk in between those two points and look for patterns of where things occur."
- c. (After students return) "Please find someone in a different group from you and discuss: What patterns did you notice? What else did you observe?"

2. Explain how cross sections are used to show zonation and patterns and give students time to observe examples of cross-section diagrams in small groups.

- a. "Scientists and engineers sometimes use drawings called cross-section diagrams to explore and explain vertical zones and patterns. Let's look at a few examples." (Show students printed examples from the internet or other sources.)
- b. "As you look at these examples, talk with those around you about how information is shown in this diagram. How did the author record their ideas and observations?"

- c. (After students have had some time to look in small groups) "What kinds of approaches to recording observations did you see?" (Students might say: symbols are used to show distribution of species instead of detailed drawings; the contour of the ground is included; the cross section includes a key for symbols; written notes of observations are included; a simplified map shows where the cross section occurs in the landscape.)



3. Demonstrate how to begin making a cross-section diagram by putting in a profile of the ground surface, then blocking out the zones of different organisms.

- a. "Here's a useful way to approach your cross section. Begin by drawing an approximate profile of the ground (and water) surface, and a stick figure of yourself (noting your height) to show scale."

- b. "Then, using light lines, block in the boundaries of the zones or patterns of organisms you observed."

4. Describe how to show distribution of specific organisms using symbols, and how to create a key for the symbols.

- a. "Add organisms or other things you observed to the zones. When you want to add an organism to your cross section (that tree, for example), first make and label a key symbol."
- b. "Key symbols can be letters or simplified shapes."

5. Emphasize that students don't need to make detailed drawings of every species and should use symbols above and below the line of ground to show where organisms occur.

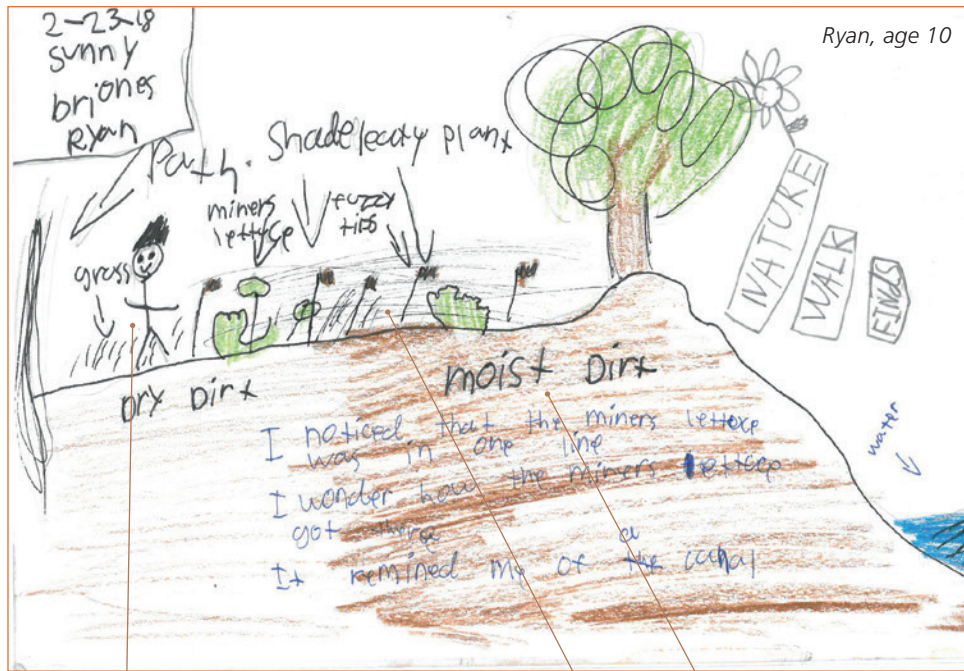
- a. "Do not make detailed drawings, because the goal of a cross section is not to show the details of how a species looks; it is to show where they are distributed relative to each other and the environment."
- b. "Use the key symbol to show where a species occurs in the cross section. Then add the next species."
- c. "If there is not enough space above the line of the ground on your cross section to show all the organisms, you can label them below the ground on your diagram."

6. Ask students whether they have any questions about the procedure, then spread them out to begin their cross section, offering reminders on timing, and, throughout the process, supporting students who are struggling.

- a. (About halfway through) "We're about halfway through our time. If you've only just begun filling in symbols on your diagram, be sure to focus on that part of the activity now."
- b. If a student finishes early, approach them and ask, "Are there any more details you can add about the environmental factors that could influence the distribution of these species?" (or) "Is there one species you could map in more detail or record other observations about?"

7. Reconvene the class in a location suitable for a discussion. Have students make a scale, add cardinal directions and metadata, and make a small inset map.

- a. "Include a scale bar to show distance, and a small inset map to show how the transect fits into the larger landscape."
- b. "Be sure to add in the date, location, and weather conditions."



Ryan has drawn himself to show scale.

This labeled drawing holds a lot of information: sun vs. shade, wet vs. dry soil, and plant distribution.

DISCUSSION

Lead a discussion using the general discussion questions and questions from one of the Crosscutting Concept categories. Interperse pair talk with group discussion.

General Discussion

- “Find a partner and talk about what you noticed through making your cross section. What patterns did you notice?”
- “What types of things were higher up or lower down? Were certain organisms or things in some places and not others?”
- “What are some of the natural forces that influence or affect the organisms you recorded on your cross section?”
- “Add these factors to your diagram using labels, arrows, drawings, and icons.”
- “How might these natural forces have influenced the patterns of distribution you recorded in your cross section?”
- “When might a scientist choose to use a cross section in their work? What are cross sections for?”
- “How did making a cross section help you learn about this landscape and these species?”
- “What are some other situations where you might want to make a cross section or include one in a journal entry?”

Patterns

- “What were some of the patterns of distribution in the species you recorded in your cross section?”

- “Pick one species and discuss its distribution in detail. Where was it? Where wasn’t it? What did it grow next to? What kinds of patterns of growth did it show—for example, in clumps? all next to each other? only one in a given area?”
- “What are some possible explanations for these patterns? This might include living things or nonliving environmental factors or forces.”

Cause and Effect

- “Look at the patterns of species distribution you observed. What are some possible explanations for why certain things grow or live in certain areas?”
- “What seen and unseen forces may be behind patterns we observed?”
- “How might the distribution of species along the cross section change depending on the season, weather, or other factors?”

Stability and Change

- “What factors do you think influence the distribution of species and other natural factors along this cross section?”
- “If one of these factors changed—for example, if there were more sunlight or more water—how might that affect the distribution of these species?”
- “Do you see any evidence that the distribution of species or the environmental factors might be changing?”

- d. "What might have the patterns of species looked like in this area _____ years ago? What might they look like in the future?"
- e. "Where do you see different ages or sizes of plants? How do you think the distribution of the plants along the transect might change in the future?"



FOLLOW-UP ACTIVITIES

Combining Map and Cross-Section Views

Do *Mapping* before this activity, or afterward. On the map, show where the cross section cuts across the landscape.

Looking Back

Look through old journal entries to identify where cross sections would have been helpful in previous investigations.

Any gradient—such as forest to meadow, dry to wet, shade to sunlight—or changes in soil type or agricultural management (plowed or watered) create zones that lend themselves perfectly to investigations with a cross section.

