beetles

Science and Teaching for Field Instructors

Professional Learning Materials

Field Journaling With Students

Most outdoor science schools have student journals, but many field instructors report that they could use help in learning how to use them more often and more effectively. Journals are indispensable and ubiquitous tools in natural history and science, and if journals are used well they can become an equally powerful part of a field instructor's "toolkit." Used strategically, journaling can help focus students, help them make better observations, provide a venue for student reflection, and get students excited about the process of journaling itself. Field instructors may find that writing and drawing in their own field journals may also deepen their knowledge of natural history and their field instruction practices. Although there are other worthwhile purposes for using student journals, such as creative writing and art, this session focuses on field journals used to learn about science.

Participants take part in three model student journaling activities to help them appreciate some of the potential in field journaling with students. They also look at sample pages from the field journals of professional naturalists. Participants discuss how the naturalists use their journals, and connect this to the scaffolding necessary to set up students to journal successfully.

In an optional extension, instructors examine sample pages from printed student journals from a variety of programs and discuss the relevance and effectiveness of printed student journal pages. This conversation can be a launching point for your program to re-evaluate and perhaps redesign your own student journals.

Much of the content of this session has been generously shared by John Muir Laws and Emilie Lygren, co-authors of the curriculum *Opening the World Through Nature Journaling*. For free access to the curriculum referenced throughout the session and more resources on field journaling, visit johnmuirlaws.com

The goals of this session are:

- **Experience three journaling activities that can be used with students.**
- **Explore a variety of naturalists' journal pages, and discuss the purposes and strategies of field journaling.**
- **Use this knowledge to build an understanding of field journaling as a practice.**
- **Learn how to scaffold successful and engaging journaling experiences for students.**
- **Practice how to give useful feedback to students on their journal entries.**
- **Reflect on how to incorporate more journaling into outdoor science instruction.**
- **(OPTIONAL)- Discuss the pros and cons of a wide variety of sample pages from printed outdoor science school student journals.**

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

ABOUT BEETLES™

BEETLES™ (Better Environmental Education Teaching, Learning, and Expertise Sharing) is a program of The Lawrence Hall of Science at the University of California, Berkeley, that provides professional learning sessions, student activities, and supporting resources for outdoor science program leaders and their staff. The goal is to infuse outdoor science programs everywhere with research-based approaches and tools to science teaching and learning that help them continually improve their programs. *www.beetlesproject.org*

The Lawrence Hall of Science is the public science center of the University of California, Berkeley. *www.lawrencehallofscience.org*

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The following programs have contributed to the development of these materials by field testing and providing invaluable feedback to the development team. For a complete list of contributors and additional partners, please see our website at beetlesproject.org.

California: YMCA Camp Campbell, Rancho El Chorro Outdoor School, Blue Sky Meadow of Las Angeles County Outdoor Science School, YMCA Point Bonita, Walker Creek Ranch, Santa Cruz County Outdoor Science School, Foothill Horizons Outdoor School, Exploring New Horizons Outdoor Schools, Sierra Nevada Journey's School, San Joquin Outdoor Education, YMCA Camp Arroyo, Shady Creek Outdoor School, San Mateo Outdoor Education, Walden West Outdoor School, Westminster Woods.

Other locations: Balarat Outdoor Education, CO; Barrier Island Environmental Education Center, SC; Chincoteague Bay Field Station, VA; Eagle Bluff Environmental Learning Center, MN; Great Smokey Mountain Institute at Tremont, TN; Wellfleet Bay Wildlife Sancturary-Mass Audubon, MA; Mountain Trail Outdoor School, NC; NatureBridge, multiple locations; Nature's Classroom, multiple locations; North Cascade Institute Mountain School, WA; Northbay, MD; Outdoor Education Center at Camp Olympia, TX; The Ecology School, ME; UWSP Treehaven, WI; Wolf Ridge Environmental Learning Center, MN; YMCA Camp Mason Outdoor Center, NJ; and YMCA Erdman, HI.

Photos: Pages 1 and 3 by Kevin Beals. *Icons*: Backpack by Rémy Médard; Beetle by Ola Möller; Cut by Nathan Thomson; Outside by Petr Holusa; Park by Antar Walker; Time by Wayne Middleton all from The Noun Project.

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Field Journaling With Students

Contents

Many of the activities in this session are sourced from and/or adapted from the 2nd edition of the outstanding resource entitled *Opening the World Through Nature Journaling*—a curriculum co-authored by John Muir Laws and Emilie Lygren. Its activities are designed to give students the focus and structure necessary to successfully use journals as tools for learning. It can be downloaded free from johnmuirlaws.com and is highly recommended. The 3rd edition will include more activities and will be available in 2017. Our sincere and abundant thanks go out to John Muir Laws and Emilie Lygren for their generosity.

TEACHING ABOUT TEACHING

The presentations in this guide have been designed to "practice what we preach." This session is set up to reflect a learning-cycle approach to instruction. It has been carefully designed to give participants a full constructivist learning experience. Resist the temptation to skip parts or to cut out activities or discussion, and to reduce them to telling of information. Your participants are learners, and they should get a full learning-cycle, learner-centered, meaning-making experience on journaling.

PRESENTATION OPTION

Want to spend more time outdoors than in? This whole session can be done outdoors. Some slides can be skipped outdoors, but other text is important. You and your co-presenter can take turns writing text from slides on white boards (each taking turns writing and erasing on one white board), and/or print some out using black font on white background on as large sheets as possible. You may want to put them in plastic page protectors.

TIMING TIP

Keep things moving. The prompts provided in the session are purposefully designed to generate productive and interesting conversations, but interesting discussions can make it challenging to stay within the estimated time frame. You may need to gently limit some of the discussion, and then pick up on the topic at another time, perhaps after staff has had some experience with applying the teaching strategies.

SESSION OVERVIEW

	Field Journaling With Students	Activity Locations	Estimated Time
Invitation	**Introducing the Session** Participants are introduced to the guiding question and an overview of the session.		5 minutes
Exploration	**Modeling a Student Activity: *To Each Its Own*** The leader models a student journaling activity with the group, then leads a discussion about benefits of this type of activity.		40 minutes
Concept Invention	**Looking at Naturalists' Journals** Participants look at a wide array of sample pages from professional naturalists' journals. They discuss what the naturalist is focused on capturing and the strategies they use to record information.		15 minutes
	Fundamental Principles of Field Journaling Participants learn that science journaling prioritizes accurate observations over art and uses multiple strategies, especially drawing and writing, to record information.		5 minutes
Exploration	**Modeling a Student Activity: *Plant Time Line*** The leader models another student journaling activity. The group discusses how this activity goes beyond observation to provide for some conceptual development.		45 minutes
	Effective Strategies for Journaling with Students The leader shares tips for journaling with participants.		10 minutes
	Modeling Student Activities & Prompts 4 groups take part in 4 brief student journaling activities, then discuss what learning might occur for students and how to match journal prompts with learning goals.		40 minutes
Application	**Giving Feedback on Student Work** The leader models how to give supportive feedback to students, then participants practice giving feedback on each others' work.		10 minutes
Reflection	**OPTIONAL — Student Journal Pages** Participants look at a variety of sample pages from printed student journals and discuss which pages seem most and least useful. In lieu of this section, there is a five-minute, two-slide summary of how to support student journaling with sufficient materials.		OPTIONAL- 30 minutes
	Wrapping Up Participants write in their own journals about how they might incorporate more journaling in their instruction with students.		10 minutes
	TOTAL	**3 hrs (+30m)**	**~180 m (+30)**

PREPARATION

Before the day of the session:

1. **Prepare to present.** Choose who will present each part of the session (see below for info on model student activities). Consider including staff who have already experienced the session. Read through the write up, slides, handouts, sidebars and background section (page 49) to prepare to present. The more each presenter is able to "own" the session, the better the presentation. Write notes on a printed version, or however you prefer. If you choose to present the whole session outdoors, make large copies of slides and/or print out half page copies for yourself to refer to the information on them, or write it on white-boards. Modeling of student activities should be done outdoors, but if you have severe weather, you can bring leaves and other natural artifacts inside.
2. **Set up projection system/review multimedia.** Set up and test the projection system to be sure participants will be able to see items projected during the session.
3. **Download free copies of student journaling activities.** If you don't already have a copy of the excellent free journaling resource, *Opening the World Through Nature Journaling*, download it from johnmuirlaws.com The activities in this session are sourced from the 2nd edition of this resource. The 3rd edition will include more activities and will be available in 2017.
4. **Decide which student activities to model.** The two activities have been chosen to model different approaches to journaling. *To Each Its Own* is great for students new to journaling. It focuses on observation, and has a game-like quality to it. **You'll need an area where there are enough leaves of the same species for each learner to have one**. It can also be done indoors, in a pinch, by bringing leaves inside. Plant T*ime Line* emphasizes observation too, but also leads toward some conceptual development. But to do it, you need a lot of plants in an area that have various stages of reproductive parts development on display: bud, flower, fruit, seed... We recommend those two activities, but sometimes it's necessary to substitute. If so, use the chart on page 40 to help you make your choice(s).
5. **Prepare for modeling student activities.** Decide who among you and your staff might be best at modeling the activities during the session, and allow for preparation. Scout out nearby outdoor areas to do the activities.
6. **Make copies.** See materials list at right.
7. **Cut and prepare copies.** For *Naturalist Journal Samples* and [optional] *Student Journal Samples*: cut each journal page out and clip together as one set. For the *Journaling Prompts*, make enough copies for each participant to have one half-page prompt. Clip together each set (all of the Prompt 1's should be together, etc.) so they are easy to pass out to each group when it is time.
8. ***(Optional)* Make Session Overview to post on wall.** You may choose to post this during this session. Some presenters & participants prefer having it, so they can see the trajectory of the session.

MATERIALS

For the group:

- ❑ projection system
- ❑ computer
- ❑ presentation slides
- ❑ place to record participant ideas (white board, chart paper, etc)
- ❑ (optional) 1 plastic page protector for each sample page
- ❑ (optional if doing all activities outdoors) binder clips or rocks to keep sheets from blowing away.

For each participant:

- ❑ (optional) 1 hand lens
- ❑ 1 journal or paper & something to write on.
- ❑ 1 pencil

Copies and Printed Materials:

- ❑ *Naturalist Journal Samples*, starting on page 26 (1 set per group)
- ❑ *Journaling Prompts*, starting on page 34, 1 half-sheet per participant
- ❑ *Field Journaling with Students*, page 36, 1 per participant
- ❑ *Example of Journal Use*, page 37, 1 per participant
- ❑ *Guide to Opening the World Through Nature Journaling*, page 38, 1 per participant
- ❑ [optional]*Student Journal Samples*, starting on page 41 (1 set per group)

YOU ARE HERE:

5 minutes

TEACHING NOTES

Introducing the Session

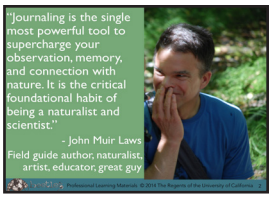
1. **Show slide 1:** *Field Journaling with Students.* **Introduce the session.**
   - **a.** Welcome participants. Make sure everyone is ready to begin and has the gear they need to be comfortable during the outdoor experiences.
   - **b.** Explain: The session is titled, *Field Journaling With Students.*

slide 1

2. **Introduce the session's guiding question. Ask:**
   - *How can field journaling be used to support student-centered learning in nature?*

3. **Ask two quick introductory questions:**
   - **a.** Ask participants to raise hands in response to the following two questions:
     - *How many of you would say you use journals a lot with students?*
     - *How many of you would say that our program under-utilizes journaling?*
   - **b.** Ask participants to *Turn & Talk* about how they have used journals with students, or why they haven't.

4. **Show Slide 2: John Muir Laws quote. Give participants time to read the quote.**



slide 2

5. **Explain that student journals are common, but often underused:**
   - **a.** Student journals are very common in outdoor science schools.
   - **b.** Programs often invest a lot in creating and printing them, but journals tend to be underused, and many field instructors aren't sure how best to use them.
   - **c.** Today, we'll be exploring how to use journals to support student-centered learning in nature.

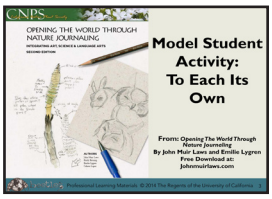
You may need to adjust this introduction a little bit depending on if or how your program is currently using journals.

YOU ARE HERE:

40 minutes

Modeling a Student Activity: *To Each Its Own*

1. **Show Slide 3:** *Model Student Activity: To Each Its Own.* **Explain that this model student activity is from the free curriculum *Opening the World Through Nature Journaling.***
   - **a.** We'll be modeling student activities from the *Open the World Through Nature Journaling* curriculum.



slide 3

b. This journaling curriculum by John Muir Laws and Emilie Lygren, has many great journaling activities, as well as strategies for how to use journals with students.

c. The authors of the curriculum have generously shared their materials with BEETLES and with you. Visit their website and download the free curriculum to see more activities and more information about nature journaling with students.

d. We'll start with an outdoor activity, *To Each Its Own*.

2. Remind participants to behave as adults during the activity; explain:

a. You'll be participating as adults, following your own curiosity, and discussing discoveries and ideas at your own level.

b. We'll be modeling how to lead it with *students*, so you should not derail discussions too far off-topic, and also keep focused on how students might respond to the activity.

c. Acting out negative student behaviors is not helpful. Imagining how your students might respond is helpful.

d. There will be some questions that might seem obvious to you, but are designed for students.

3. Lead the student activity, *To Each its Own* with your participants.

a. Use the activity lesson embedded here to model this activity with your participants, much as you would with students.

b. For additional information on the procedure, see the curriculum *Opening the World Through Nature Journaling.*

Introducing the Activity

1. Bring learners to the location of the activity, & tell them to each pick up a leaf of the same species.

a. Ask learners to grab their journals and pencils, then lead them to an area where there are enough leaves of the same species for each learner to have one (or, if you must be indoors, bring in enough leaves for each learner to have their own).

b. Ask learners to pick up a leaf from the same species of plant. Hold up an example so they know what to look for.

2. Explain that they'll be playing a game with their journals:

a. We're going to play a matching game.

b. Here are the rules of our game:

c. When I say 'go,' you will only have 11 minutes to make a diagram of your leaf in your journal.

TEACHING NOTES

How should staff behave during model activities? Some leaders ask participants to behave like children during model activities, however, we've found that this often leads to exaggerated negative behaviors, which can ruin the value of a model student activity experience. Ask them to participate as adults, while imagining how students would respond.

Rationale for starting with *To Each Its Own*. We have chosen to begin the session by modeling this activity because it is a simple and engaging introduction to journaling for students and instructors. In case of rain, bring leaves inside. Presenters can substitute other journaling sessions from the guide, depending on your staff needs. See the chart on the handout, Guide to "*Opening the World Through Nature Journaling*" to help choose a journaling activity appropriate for your situation.

TEACHING NOTES

3. **Explain that they'll be making life-size drawings of their leaf, recording accurate observations with drawing & writing.**
   - **a.** You'll make specific observations of the leaf and copy them into your journal using both drawing and writing.
   - **b.** Start with a life-size drawing in the middle of the page—you can try lightly tracing the leaf's shape to help make your drawing the right size.
   - **c.** Then, look for details that might make your leaf different from others.

4. **Explain that drawings & writing need to be accurate & detailed because others will try to match your diagram with the leaf.**
   - **a.** It's important to be accurate because when we are done making diagrams , we'll try to match each person's drawing to their leaf.
   - **b.** Your goal is to include as many observations as possible because they will be clues to help others know which leaf was yours and make a correct match.
   - **c.** For example, if you see a dark brown spot on your leaf, add a note that says "dark brown spot" and draw an arrow to where it goes on the drawing. (If you have a small portable whiteboard, show a very quick example of this as you speak.)

5. **Ask learners about other possibly significant details.**

   ▶ *"What might be other clues that would be helpful in telling one leaf from another?"*
   - **a.** Listen to responses. Share any of the ideas below, if they were not already mentioned:
     - broken off pieces or holes,
     - differences in coloration,
     - numerical count of things like pointed edges or lobes,
     - details on both sides of the leaf, weird curves or bumps.

6. **Explain that the goal is not to make pretty pictures, but to use both drawing & writing to show their observations.**
   - **a.** Your goal is to make lots of observations and to show them accurately.
   - **b.** If you're more comfortable drawing, draw more to show what you see.
   - **c.** If you're more comfortable writing, you can use more written descriptions—but use ***both*** writing and drawing to show what you see.

7. **Let early finishers know they should challenge themselves to keep looking for & adding more observations.**

Outside? If outdoors, use a binder clip or rock on each sample page to prevent them from blowing away.

Learners Make Diagrams of Leaves

1. **As learners are making their diagrams, circulate & check in.**
   - Encourage learners that are only drawing to write down some observations, and vice versa.

2. **Give enough time for drawings, but not so much that learners become restless:**
   a. Keep track of time—make sure learners have enough time to make a drawing and add some written observations.
   b. If they're engaged and you're not pressed for time, let them keep journaling. If they seem restless, let them know you'll wrap up soon.

3. **When it's about time, explain they have ~2 min. to add details, writing or drawing:**
   a. Use this time to add any critical details you haven't recorded yet.
   b. If you've used mostly writing so far, make sure you have a drawing, too.
   c. If you've been focused on your drawing, make sure to add some written observations.

Learners Match Leaves

1. **Call the learners back to the circle to put down their journals & match leaves to diagrams.**
   a. Put your leaves down carefully in the center of the circle, then place your journals at your feet opened to the page you were just working on.
   b. Take turns trying to match the leaves to the notes by placing the leaves on top of the diagram that most accurately matches the size, shape, or distinctive characteristics of the object.
   c. If you disagree with the placement of a leaf, you can change it.

2. **Once all leaves have been matched, ask them to turn to a partner & discuss the question:**

   ▶ *What kinds of written notes or drawn details were especially helpful in telling which leaf was which?*

3. **Debrief the student activity; ask how the instructions set them up for success—listen, then bring up ideas that weren't mentioned:**

   ▶ *As an instructor, how did I set you up to be successful and focused?*

   Listen to responses. Add any of the following, if they weren't mentioned:

   - The prompt gave a clear goal that guided the types of observations participants made and recorded in their journals.
   - During the introduction, the group listed features (distinguishing characteristics, color, numbers, etc) that could help a leaf be recognized.
   - The instructions also included ideas for how to record information, such as using arrows to point out key characteristics, tracing a leaf so it is shown life-size, and writing to describe leaf color.

TEACHING NOTES

4. Discuss the benefits of the journaling activity.

▶ *What are the benefits of doing an activity like this with students?*

Listen to their responses. If any of these aren't mentioned, consider adding:

- The activity has a game-like quality that focuses students on observing details in a non-threatening manner.
- "Seeing" happens when you draw. Students must look again and again as they make diagrams of their leaves. In the process, they improve their observation skills and notice details they probably would not have seen otherwise.
- Students learn to draw what they actually observe, rather than what they think a plant is *supposed* to look like.
- Students learn to collect and record data.
- To help their leaf be recognized they learn how to identify and show distinguishing characteristics.
- If they hold on to their journals in the future, the drawing may remind them of their experiences.
- Students who are less verbal get the chance to communicate their ideas through drawing and writing.
- The activity can be done virtually anywhere, including indoors.

5. Explain the emotional connections to nature through activities like this:

a. By spending time with an organism or object in nature, students can develop an emotional connection with a part of the natural world.

b. Doing multiple activities like this, focused on different aspects of nature, can lead students to deepen their relationships to nature as a whole.

6. Explain that students also benefit from some quiet, focused "down time."

a. Students slow down when they are journaling.

b. In outdoor science schools, students are busy with lots of social interactions—some can feel pushed to "go, go, go!"

c. All students crave and need some down time—even if they don't directly express that need.

7. Explain that naturalists and scientists use field journals.

- Naturalists and scientists use field journaling to observe more deeply, zero in on important features, and remember what they've seen.

8. While walking back indoors, pairs discuss differences and similarities between this and naturalist journals.

a. Tell them to partner up.

b. While walking back inside, tell pairs to discuss:

▶ *How might the journal entries of scientists or naturalists be different from what we just produced? How might they be similar?*

Looking at Naturalists' Journals

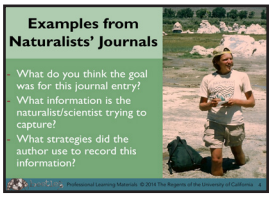
YOU ARE HERE:

15 minutes

TEACHING NOTES

1. **Show Slide 4:** *Examples from Naturalists' Journals.* ***Explain:***

   - To better understand how field journals are used in science, let's take a look at some examples of journal entries made by working naturalists and scientists.



slide 4

2. **Display sample pages from naturalists' journals and explain how to circulate and explore:**

   a. This is not a formal rotation—you'll circulate freely and check out and compare as many example pages as you can.

   b. Use the prompts on the slide to guide your exploration of journal entries.

   c. Discuss ideas with each other as you look at pages:

      - What do you think the goal was for this journal entry?
      - What information is the naturalist/scientist trying to capture?
      - What strategies did the author use to record this information?

3. **As the participants work, circulate and ask questions like:**

   - *What similarities do you see among these pages? Differences?*
   - *What evidence of the naturalists' thinking process do you see?*
   - *What do you think the naturalist was trying to record, and how did they do that?*

4. **After about 10 min., seat participants in a circle around the display of journal pages and discuss their discoveries. Ask:**

   - *What do you think were some of the goals of the naturalists and scientists who made these entries?*
   - *What information were the different naturalists and scientists trying to capture?*

   - Ask follow-up questions to uncover more about the group's thoughts and their interpretations of the journal pages.

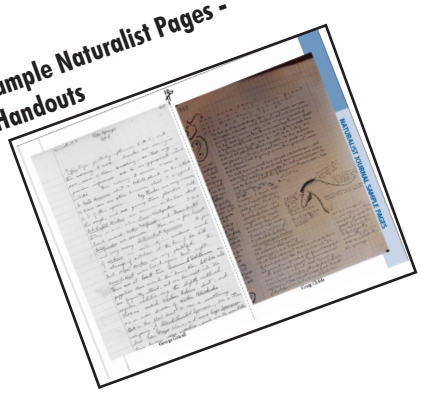
5. **Ask about strategies naturalists used for recording information:**

   - *What were the strategies different naturalists use to record information?*

   a. Listen and keep an informal list of the strategies mentioned. Mention some from the sidebar if they are not raised by participants.

   b. Ask for any final thoughts or interesting patterns participants noticed in the journal samples.

Sample Naturalist Pages - Handouts



Participants might say: some naturalists focused on specific, descriptive species accounts, while others captured a moment that was interesting to them; some of the information was more general, while other entries showed a naturalists' thinking about a topic.

Participants might say: labeled drawings, arrows indicating movement, charts, maps, written narrative, drawings from different perspectives, lists of organisms, tables of measurements, questions and observations, possible explanations.

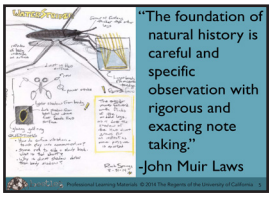
YOU ARE HERE:

5 minutes

TEACHING NOTES

The Fundamental Principles of Field Journaling

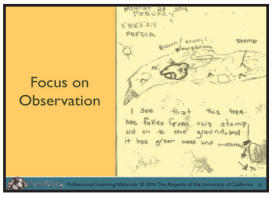
1. **Show Slide 5:** *Quote from John Muir Laws*. **Explain that there are common principles of journaling:**



slide 5

   a. Read the slide out loud.
   b. Journaling is an integral tool in the field of natural science.
   c. Naturalists and scientists use journals because they get similar benefits from the process of journaling that students would.
   d. The journal entries we looked at were different in a lot of ways, but there are some common principles of how field journal entries are constructed.
   e. Here are some of those common principles.

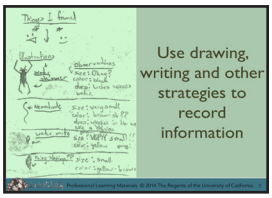
2. **Show Slide 6:** *Focus on observation*. **Explain that the goal is not to make pretty pictures:**



slide 6

   a. The goal of field journaling is to make accurate observations and to record information—not to make pretty pictures.
   b. This students' picture isn't "pretty", but she did a good job of recording information.

3. **Show slide 7:** *Use drawing, writing and other strategies to record information*. **Explain that different strategies are useful for recording information:**



slide 7

   a. The process of field journaling uses drawing and writing together to show observations, thoughts, events, questions, and memories.
   b. Naturalists and scientists also use other strategies, such as arrows, mapping, lists, charts, and other ways to organize and show information.
   c. In field journaling, the end goal is not drawing and writing—it is drawing and writing *in the service of learning and thinking*.
   d. Using multiple strategies to show information leads to a more full and accurate record of observations and experiences.
   e. Beyond that, using drawing, writing, and other ways of recording information leads the author of a field journal to *think* in different ways and engage with a subject from multiple perspectives.

4. **Show Slide 8:** ***Field Journaling & Science.*** **Explain:**

slide 8

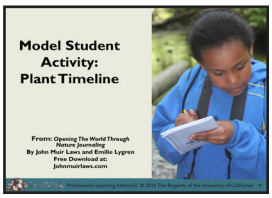
   a. Take a minute to read the quote.
   b. As a whole, the process of journaling leads to deeper understanding of the natural world.

c. Let's look at the process of journaling again, in another outdoor student activity, also from *Opening the World Through Nature Journaling*.

Modeling a Student Activity: *Plant Time Line*

1. Show Slide 9: *Model Student Activity: Plant Timeline*. Take the group outdoors to lead the model student activity with your participants.

- Ask learners to grab their pencils and journals, then lead them to an area with many flowers of the same species.



slide 9

Plant Timeline

1. Explain that they'll draw & write observations of a flower at its peak.

a. Check out these flowers. We're going to use our journals as a tool to learn a bit more about them.

b. First, you'll find a flower that's at the peak of its bloom. Make a careful diagram of it in the middle of your page & include some written observations.

2. Explain. They should draw older flowers to the right & younger flowers to the left of the first flower drawing:

a. Once you're finished with that first drawing, try to find a flower that is at the oldest stage possible. Observe carefully! It might be a fruit, not a flower. Draw that stage of the flower on the far right-hand side of your page.

b. Next, find a flower that's as young as possible- one that is maybe just a bud. Make a sketch of it on the left-hand side of your paper.

c. Then, look around at the flowers here and try to fill in as many stages as possible. You might start by showing the stages right after the peak of the bloom and making sketches of flowers that are older and older, or by trying to find flowers in between a bud and the peak of bloom.

3. Explain—remind them that the goal is not pretty pictures, & to include both writing & drawing:

a. Your goal is to make many observations and to show them on the page, in drawing and writing, not to make pretty pictures.

b. If you're more comfortable drawing, then draw more to show what you see. If you're more comfortable writing, then you can use more written descriptions—but use both writing and drawing to show what you see.

c. If any questions occur to you, write them down in your journal.

d. Ask learners if they have any questions, then send them out to journal.

YOU ARE HERE:

45 minutes

TEACHING NOTES

TEACHING NOTES

4. **Keep track of time, circulate & troubleshoot, & give learners positive feedback (but NOT on artistic ability or "prettiness" of pictures).**
   a. While learners are journaling, circulate to check in or to refocus learners who might be antsy—encourage them to make even more observations, to change their perspective, or to be more thorough in the documentation of their observations.
   b. Give positive feedback on learners' observations or styles of recording information—for example, if a learner included written notes, or made an interesting observation, say "wow, you must have really been paying attention to have noticed that," or "I really like how you made your drawing large so you had space to show the flower accurately."
   c. Again, do NOT comment on learners' artistic ability, or on the "prettiness" of the picture.

5. **After ~25 min., pairs discuss an interesting or surprising observation.**
   a. After about 25 minutes, call learners back and form a circle.
   b. Ask them to share one interesting or surprising observation with someone next to them.

2. **Debrief the activity; discuss the benefits of this activity for students.**
   a. Ask,

      ▶ *What are benefits from this activity that might be different from the first model activity (To Each Its Own)?*

   b. Listen to their responses. If they don't mention any of the following points, consider adding them:
      - Students are doing more sense-making, in this case about plant life cycles.
      - Students may have "aha" moments when they "discover" the connections between flowers, fruits, buds, and seeds.
      - *To Each Its Own* is focused on observation. This activity includes observation, but may also lead to some conceptual development.

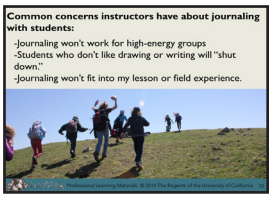
3. **Return inside.**

YOU ARE HERE:

10 minutes

Effective Strategies for Journaling With Students

1. **Show Slide 10:** *Common concerns instructors have about journaling with students*. **Explain that some instructors have concerns about journaling with students:**



slide 10

   a. We've discussed many benefits of field journaling for scientists and students.
   b. But a lot of instructors are concerned about challenges when journaling with students.
   c. Many instructors think high-energy groups won't be able to sit still long enough to draw and write.

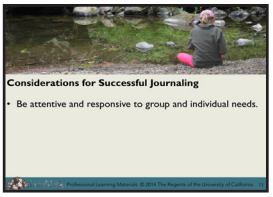
d. Some instructors are concerned that it will feel too much like schoolwork, and students won't be interested.

2. Explain that instructors who successfully use journals often suggest some considerations for journaling:

a. Many instructors use journals often and successfully to support science instruction.

b. There are important considerations to set up journaling to be meaningful, engaging, and accessible for students, which we will be exploring throughout the rest of the session.

3. Show Slide 11: *Considerations for Successful Journaling– Be attentive and responsive.* **Explain:**



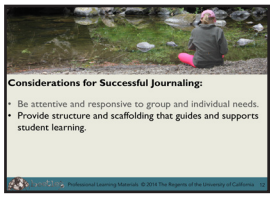
slide 11

a. This may seem like common sense, but be thoughtful about when you ask students to journal, and pay attention to the needs of your group.

b. Do journaling activities between higher energy activities or after an exploration activity during which students have had the space and opportunity to move around.

c. If students have just jumped off the bus, or are hot, cold, or hungry, it's not a great time to journal, because they'll be distracted by those basic needs.

4. Show Slide 12: *Considerations for Successful Journaling– Provide structure and scaffolding.*
Explain that students need some structure and scaffolding to succeed (but not too much):



slide 12

a. Another way to ensure success in journaling with students is to offer structure and scaffolding to guide students' experience and thinking—but what does this mean?

b. If you just say, "go journal!" students who aren't comfortable writing and drawing may be overwhelmed, intimidated, and may "check out."

c. Students who already like to draw may treat the experience like an art project and not push their observation skills.

d. On the other hand, if you tell students exactly what to write in their journals they probably won't have an engaging or useful learning experience.

5. Explain: like naturalists, students benefit from having a goal that focuses them, and strategies for recording information:

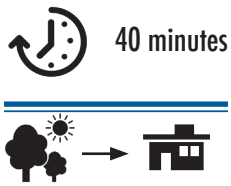
a. When a naturalist or scientist uses a field journal, they will likely have a goal that guides the focus of their observations, and some ideas about strategies to record their observations and thinking.

b. Set students up for success by giving them that same sort of structure.

TEACHING NOTES:

YOU ARE HERE:

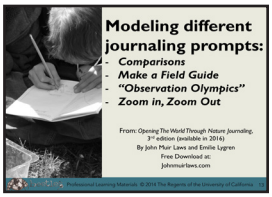
40 minutes



c. Ask students to focus on one aspect of the natural world, give them a goal for the types of observations to make, and suggest some ways to record information in their journals.

Modeling Student Activities and Prompts

1. **Show Slide 13.** *Modeling different journaling prompts.* **Explain that they'll be doing more journaling prompts/activities:**

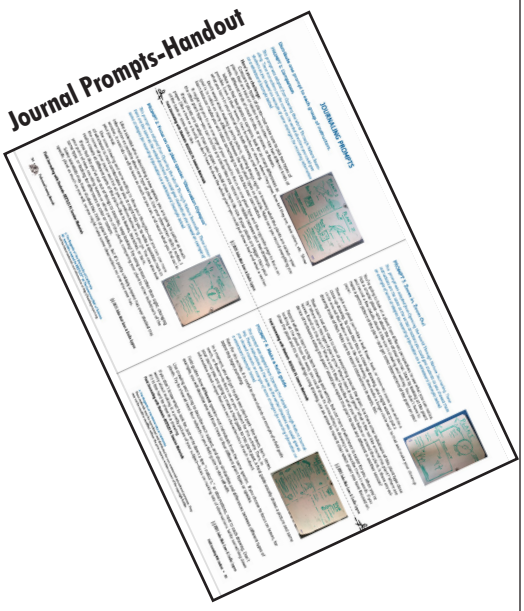


slide 13

   a. We've already done two student activities that showed different types of scaffolding.
   b. Now we'll do more student prompts/activities that show different ways to structure journaling.
   c. Again, these prompts are adapted from the *Opening the World Through Nature Journaling* curriculum.

2. **Bring participants outside and explain that each group will get a different prompt related to plants, and should think about the kinds of observations students might make, and how it could be used to support a field experience:**

   a. Each group will make a journaling entry relating to plants, but will get a different prompt.
   b. While you are doing the activity, think about: a) the kinds of observations students might make while answering this prompt; and b) what kind of learning experience this could support.



3. **Give each group a prompt, tell them to read it, then to take ~15 min. to do it:**

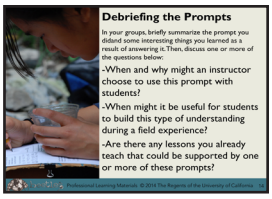
   a. Divide the participants into four groups.
   b. Give each member of a group copies of the same prompt (found on page 34-41 of this session). For example, everyone in Group 1 would get a copy of "PROMPT 1: Comparisons."
   c. Tell participants to take about fifteen minutes to complete the prompt.
   d. Each participant will make their own journal entry.
   e. If members of the same group have an interesting observation or a juicy question, they can discuss it with those around them, but their focus should be on their own journaling process.

4. **Call time, gather participants, and ask them to discuss debriefing questions in their small groups.**

   a. Give participants the following debriefing questions to discuss within their groups:

   - What did you learn through your observations and journaling?
   - How might an instructor be able to support student learning in a program?

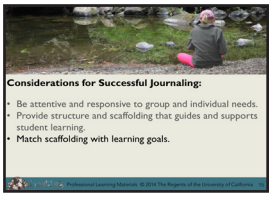
5. **Show Slide 14-** *Debriefing the Prompts*. **Bring participants back inside and ask them to discuss in new groups, each with a member from every prompt group.**



slide 14

   a. Ask participants to wrap up their conversations, then bring them back inside.
   b. Tell them to sit in groups of four, with one representative of each prompt group. Each group of four should have one person who did Prompt 1, one who did Prompt 2, one who did Prompt 3, and one who did Prompt 4.
   c. Tell participants to each summarize their prompt for their new groups, and share what they discussed after the activity.
   d. If they have time, they can discuss one or more of the questions on Slide 14.

6. **Show Slide 15:** *Considerations for Successful Journaling– Match scaffolding with learning goals.* **Explain:**

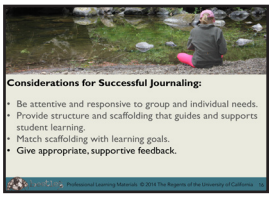


slide 15

   a. Instructors often aren't sure how to integrate journaling into their lessons or activities.
   b. To incorporate journaling into your teaching, choose a prompt that matches your learning goals for students and connects to the rest of your lesson, activity or field experience.
   c. The prompts we just did focused on plants, but these prompts could be altered to have students explore any aspect of nature—including other organisms, geographic or landscape features, or interesting phenomena.
   d. Students could also be asked to focus on making different types of observations or explanations to connect with bigger ideas in science.
   e. For example, when giving students a prompt to make comparisons between different organisms, an instructor could ask students to focus on observing structures and writing tentative explanations for how they might function.
   f. Students tend to become engaged in this type of journaling because it is authentic, interesting, and purposeful in the same way it is for scientists.

Giving Feedback on Student Work

1. **Show Slide 16:** *Considerations for Successful Journaling– Give appropriate, supportive feedback.* **Explain the importance of not commenting on prettiness of drawings:**



slide 16

   a. Another aspect of providing meaningful journaling experiences for students is giving supportive, appropriate feedback.

TEACHING NOTES

YOU ARE HERE:

10 minutes

TEACHING NOTES:

Sharing work. Some journalers–both adults and students–are nervous to show their work to others in a group. If your participants seem reticent about laying out their journals, tell them to pick the page they feel most comfortable sharing.

- **b.** How you react to student work matters, but it can be challenging to know how to give constructive, useful feedback.
- **c.** If you tell students "you don't have to make a pretty picture" before they journal and then the first thing you say when you see their work is "What a pretty picture!" you'll lose credibility, especially with students who are not confident in their artistic abilities.
- **d.** Yet, it's natural to comment on how pretty or well-made the drawings are.
- **e.** It is important to avoid this tendency because it sends the message that it's artistic ability, not making observations, that is valued.

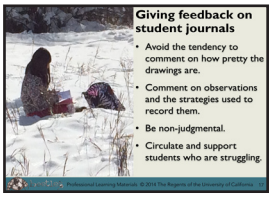
2. Explain that appropriate feedback is to comment on the observations they've recorded in drawing and writing:

- **a.** The key is to give feedback *on what you've asked students to do.*
- **b.** The journaling activities modeled in this session ask students to make focused observations and record information in drawing and writing.
- **c.** Comment on those aspects of students' work when you give feedback.

3. Give an example of appropriate, non-judgmental and specific feedback:

- **a.** In your feedback, emphasize different types of observations and different strategies for recording information.
- **b.** Do this in a non-judgmental, yet specific way.
- **c.** For example, instead of, "You really made some excellent observations in your journal," you might say: "Wow, I can see you used three different strategies for recording your observations- You made a drawing, you labeled it with words and arrows, and you wrote descriptive sentences."

4. Show slide 17. *Giving Feedback on Student Journals.* **Ask participants to lay journals in a circle open to a page from a journaling activity:**



slide 17

- **a.** We're going to model what it's like to give this kind of feedback.
- **b.** Everyone lay out your journals in a circle and open them to a page from one of these activities.

5. Model providing feedback on participants' journal pages.

- **a.** Pick one participants' journal page and comment on the observations recorded and the strategies used to show information. For example:
  - *I see you used arrows next to your written descriptions to show what they refer to. That helps me understand what you meant.*
  - *I see you made several detailed written descriptions. If you added some arrows it would help me to understand what they refer to.*
  - *Wow, look at how you noticed all those little holes in your leaf! I can tell you were paying attention and making close observations.*

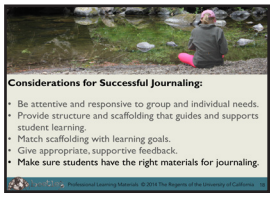
TEACHING NOTES

6. **Explain that there's always a comment about observations an instructor can make:**
   a. Even if you're totally stumped about what to say to a student, it's almost always at least possible to point out an observation a student made, or to reflect back to a student that they have fulfilled expectations by using drawing and writing to show their thoughts.

7. **Give about 2 minutes for pairs to practice giving verbal feedback about different pages, then gather the group and explain the importance of circulating and commenting with students.**
   a. Rotate through the journal samples with a partner and practice giving verbal feedback out loud on the pages you observe together.
   b. Gather participants and explain that it can be helpful to circulate during a journaling activity and give this type of supportive feedback—especially to students who seem nervous or less engaged.

8. **Explain that it is also useful for instructors to push students to deepen their observations and journaling by giving in-the-moment feedback.**
   a. Telling students what they are doing well is an important way to build their confidence, but it can also be important to push students to make and record their thoughts and observations.
   b. If you see a student who doesn't appear to be making specific observations or hasn't written down anything, encourage them to do so in the moment.
   c. Ask them "What are some things you've observed so far?" and if anything the student says is data they haven't recorded in drawing or writing, tell them to add it to their journal.

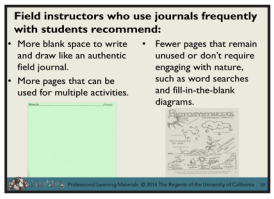
9. **Show slide 18:** *Considerations for Successful Journaling– Make sure students have the right materials for journaling*. **Explain importance of paper and pencils, and that the different journal pages impact experience of students:**



slide 18

   a. There's another important way to support meaningful journaling experiences for students—providing good materials. To journal, you need paper and pencils.
   b. There is a LOT of variety of types of pages included in these printed student journals. Different pages can impact the experience students have while journaling.

10. **Show slide 19:** *Field instructors who use journals frequently with students recommend*. **Explain that blank pages are most useful and many printed pages don't engage students with the environment:**



slide 19

   a. To use journaling to its best advantage, as we have today, all you need is blank paper.

Do optional section now: Student Journal Pages. If you choose to do the optional section, which involves instructors discussing possible benefits or drawbacks of different pages from printed student journals, jump to the final three slides and the optional text on page 22. When you have finished that section, return to the session and the slides as written here.

TEACHING NOTES:

b. BEETLES and many field instructors who use journals often with students recommend journals with more blank or multi-use pages, such as unlabeled lines or grids that can be used for different activities.

c. They also recommend fewer fill-in-the-blank worksheets or word searches that do not require students to engage with the environment.

11. Explain that some printed journal pages are useful, but they often leave very few blank pages for student journaling:

a. Some printed journal pages, such as pages with logistical information, key vocabulary, or pages that are reference tools for students can be useful to students.

b. But journals are often so filled with pre-structured, printed pages that there's very little blank space left for students to record their thoughts, memories, and observations—which is the point of journaling!

c. Giving students the invitation and the physical space to record their observations, thoughts, and experiences will deepen their relationship with the natural world.

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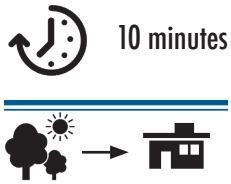
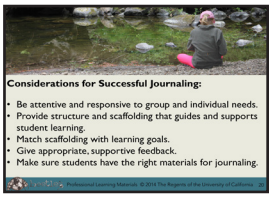


Wrapping Up

1. Show Slide 20: *Considerations for Successful Journaling*. **Briefly summarize the considerations for successfully using journals to support student-centered learning in nature.**



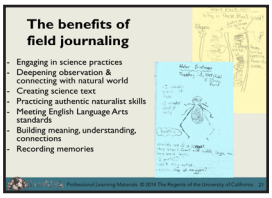
slide 20

a. Journaling is most successful and engaging for students when instructors consider all the factors we explored during this session.

b. Students will be able to successfully engage with journaling if basic needs are met, if they have access to adequate materials, if they're encouraged through supportive feedback, and if they are given scaffolding and prompts to guide their observations.

c. If an instructor matches journaling prompts with their learning goals for students, then the meaning students make while journaling will be authentic and relevant to the rest of their field experience.

2. Show Slide 21: *The benefits of field journaling*. **Reiterate some benefits for students:**



slide 21

a. Science or nature journaling is an essential practice of science. Students are engaging in science practices and meeting science standards by learning to write and communicate their science thinking in the ways scientists do.

b. Students deepen observations and connect with the natural world.

c. By creating accurate, detailed field journal entries, students are creating science text using both illustrations and academic language.

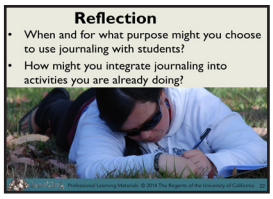
d. By inviting students to record their observations and thoughts you are inviting them into the lineage of naturalists and scientists who have gathered information about the natural world.

e. By engaging in field journaling, students are developing their disciplinary literacy in science, which is required to meet most English Language Arts standards.

f. They are building meanings, increasing their understanding, and making connections.

g. They are recording memories.

3. Show slide 22: *Reflection*. **Explain final reflection in journals:**



slide 22

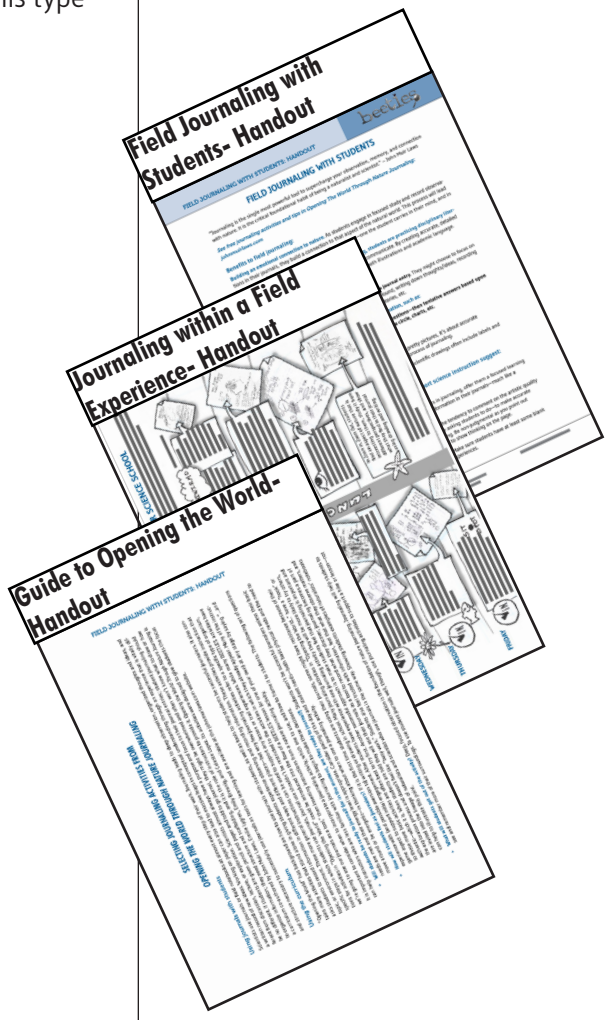
a. To make sure you leave with useful notes, and to end our session about journaling, you'll reflect in your journals.

b. Spend some time thinking back on the whole session and what you may have learned.

c. Record any "aha's" you had, and specifically think about how this type of journaling could influence your field instruction.

4. Pass out handouts:

- *Field Journaling With Students*,
- *Journaling Within a Field Experience*, and
- *Guide to Opening the World Through Nature Journaling*,



YOU ARE HERE:

30 minutes

TEACHING NOTES:

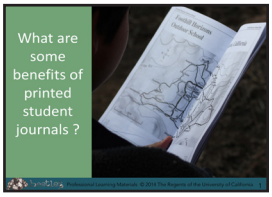
Revise your student journals? You may want to use the momentum of staff interest in journaling to revise your programs' student journals. This way you can keep the discussion going and re-design your programs' student journals to better suit your staff and program goals. Read the Suggestions for Follow-Up Activities for more information.

Slide numbers: please note the slide numbers start over in this optional section.

OPTIONAL: STUDENT JOURNAL PAGES

Looking at Printed Student Journals

1. **Show slide 1:** *What are some benefits of printed student journals?* **Explain:**



slide 1

   a. We're going to use this opportunity to take a look at some printed student journals in use by other programs. [We can use this conversation to inform our own journal/whether we think it is worth making our own journals.]

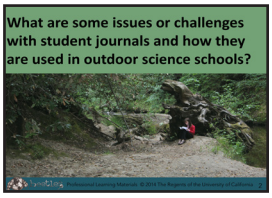
   b. Ask,

   ▶ *What are some benefits of using printed student journals in outdoor science schools?*

2. **Listen to their ideas & facilitate a brief discussion. You may want to add the following points into the conversation:**

   - Can provide students with key reminders of the outdoor science school experience.
   - Place to reflect on ideas and learning, and authentic field journaling.
   - Delivery of logistical information (map of site, trails, etc.).
   - Can help guide what field instructors do with students.
   - Resource/tool for students to use in investigations (field guides, rulers, graph templates).
   - Key vocabulary can be included for reference.
   - Helps meet expectations of classroom teachers.
   - Provides guidance and organized space to record data for specific activities.
   - Provides tasks to keep students occupied during unstructured times.
   - Delivers science content information.

3. **Show slide 25:** *What are some challenges with printed student journals & how they are used in outdoor science schools?*



slide 2

   a. Listen to their ideas, then consider sharing any of the following if they have not already been mentioned by the group:

   - Wasted space and lack of use—many pages are ignored.
   - Pages that can only be used for a specific activity don't get used by those who don't do that activity.
   - Mindless fill-in-the-blank worksheets.
   - Content delivery pages are often ignored.
   - Not enough blank pages or pages with space students can use for authentic field journaling.

TEACHING NOTES

4. **Spread student sample journal pages on a couple of tables or on the floor.**

5. **Show slide 26:** *Examine several journal pages & discuss.* **Explain the next activity:**

slide 3

   a. With a partner, you'll circulate among the sample journal pages and discuss the following:

      - *What do you think is the intent of the page? Does it seem useful?*
      - *Does it encourage an authentic use of field journaling-—something a naturalist or scientist would do?*
      - *Do you think it would be used successfully by most students?*
      - *Can it be used for multiple activities, or can it only be used with one particular activity?*

   b. Allow about ten minutes for participants to explore journal pages with partners.

6. **Gather the group, pairs categorize one page as "least useful," and one as "most useful," explaining rationale, and group discusses:**

   a. Gather everyone in a large seated circle around the journal pages.

   b. Tell them you'll create two categories in the center of the circle: Least useful/Most useful.

   c. Ask each pair to select one page they think is one of the most useful pages, and one that they think is one of the least useful.

   d. Each pair then takes turns picking up the two pages they selected, placing them in the appropriate category, and explaining their rationale.

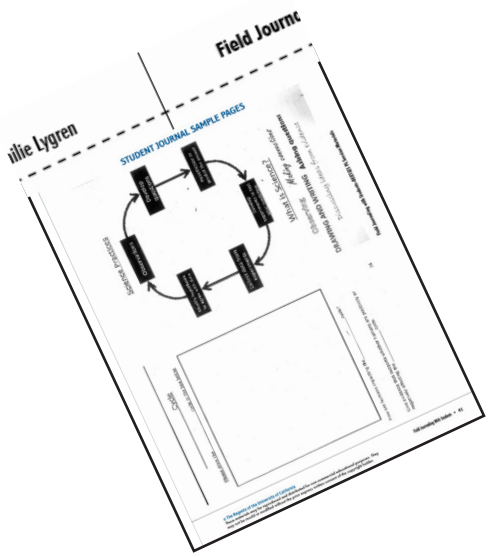
   e. Encourage agreement, disagreement, and general discussion about each selection.

7. **Help the group make generalizations about the kinds of pages categorized as most and least useful.**

   a. Point out any patterns you notice about how the group categorized the pages—try to characterize the kinds of pages they seem to find least and most useful.

   b. Tie-in their comments with any of the features currently appearing in the journals used by your program.

8. **Return to the session beginning at Slide 20,** *Field instructors who use journals frequently with students recommend*, **and Numbered Step 10 on page 20 of this write up.**



APPLYING SESSION TO INSTRUCTION

The session is not over! A critical phase of learning anything new is *application*, when the learner takes new knowledge and applies it. There's some application in the session, but, with all professional learning for instructors, the rubber meets the road (or trail) when instructors apply what they've learned to their instruction, and keep thinking about it and discussing it with their peers. If you want your instructors to try out new activities/approaches, program leader support is crucial. Even if they're excited by new ideas, it's easy for instructors, especially veteran instructors, to keep doing what they've been successfully doing already, and not try out new activities/approaches. Below are a variety of follow-up activities and discussions to dig deeper into the topic, and help you facilitate thoughtful implementation.

- **Discussing Implementation of *Journaling Activities*.** Assign your staff to each try out *a journaling activity, either the same activity, or different journaling activities,* during your next student program, and to write in their journal about how it went. Then, lead them in a discussion on the activity at the end of the program during a meeting. Here are some suggested questions to focus a reflection or discussion on:
  - » Did the activity inspire your students to make better observations, and to engage with nature?
  - » What was successful about the activity?
  - » What might you do differently the next time you lead it and why?
  - » How have you incorporated journaling into students' other field experiences, and what ideas do you have about incorporating it in the future?
- **Re-designing your program's student journals.** After this session, while your staff is revved up on the topic, you might want to have a follow-up session in which they attempt to improve the student journal for your program. It can take time to develop really good journal pages, so you may want to develop a plan for testing things out with students and bringing results back to the group.
- **Staff brainstorm of what they and you can do to encourage incorporation of journaling into your program.** After the session reflection, your staff will have already written ideas they have about implementation into their instruction. You can tap into these, and other ideas through a brainstorm of what they plan to do, and how you can support them in doing it.
- **Encourage your instructors to take up the practice of field journaling.** In the introduction to the book Field Notes on Science and Nature, Michael Canfield writes, "The value of taking field notes lies both in the actual information that is recorded as well as in what is gained in the process of recording itself." Field instructors who journal regularly will have a richer rapport with the place in which they teach, and a more complex knowledge of the local natural history of your site. As a result, they will be more versatile instructors, better prepared to engage

students deeply in the study of flora, fauna, and phenomena. When introducing students to journaling, they will be doing so from a place of authenticity, and could even share examples from their own journals. Offer *The Laws Guide to Nature Drawing and Journaling* as a resource for instructors to guide their practice.

- **Instructor Observations.** If you do observations of instructors, discuss how you might incorporate elements from this session into the observations.
- **Continuing a discussion.** If there was a topic that came up during discussion that you had to cut off, and if it seems like your staff is interested in, and would benefit from continuing the discussion, set aside some time to do so.
- **Before or after the session, assign your staff to read the Foreword by EO Wilson to the book, *Field Notes on Science & Nature*, edited by Michael R Canfield, pages ix-xii.** Tell them to use Active Reading strategies: underline what they think are important points, and write questions and connections they have in the margins (or use sticky notes to write on and attach to the text). Then assign the prompts below to discuss, first in pairs, then in the whole group.

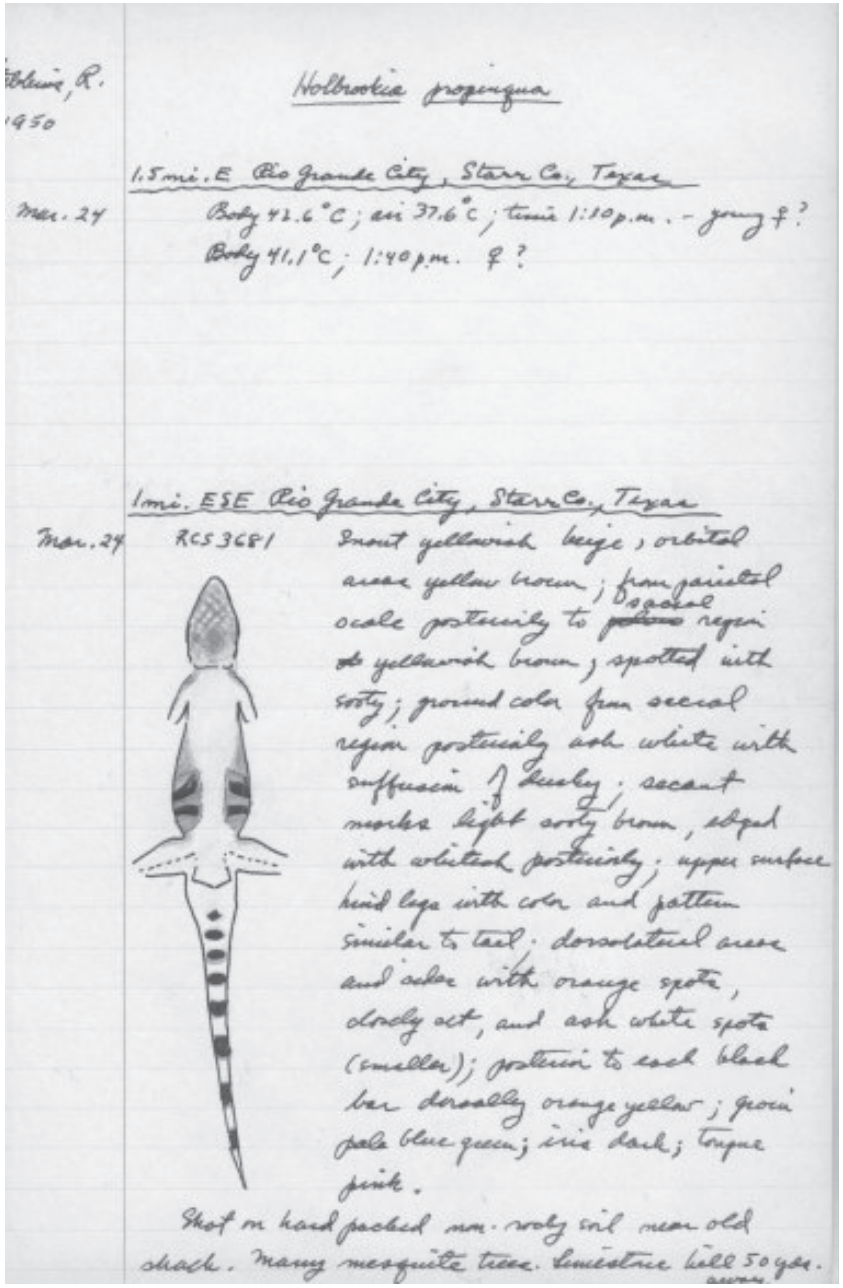
  Possible Questions/Prompts for Discussion

  1. What are some points/quotes you found interesting? (You might ask each instructor to choose one quote from the passage, to be ready to explain what they think the author meant by it, questions/connections they have about it, and why they found it interesting.
  2. What information from this passage do you think might be worth communicating to students, and how might you do that?
  3. If someone were to ask you, "what is the value to humanity in studying natural history, and in scientific journaling," how might you answer?

- **Assign your staff to read the chapters, *Building Knowledge Through Nature Journaling* and *Focused Awareness*, from The Laws Guide to Nature Drawing and Journaling by John Muir Laws (to be published in 2016).**

  Possible Questions/Prompts for Discussion

  1. What ideas or phrases struck you?
  2. Describe one thing you know through direct experience and one thing you know by being told by someone else. Does your "knowing" of those two things feel different?
  3. Do you trust things you know through personal experience more or less than things you know from books and other second hand sources?
  4. In your education, were you taught mostly by having direct experiences that led to learning, or through being told information? How do you think that affected you as a learner?
  5. The Focused Awareness passage is about journaling as a practice and choosing a small part of nature to focus on so as not to be overwhelmed. How do you think this could relate to a students' experience at an outdoor school?



Holbrookia propinqua

1.5 mi. E Rio Grande City, Starr Co, Texas

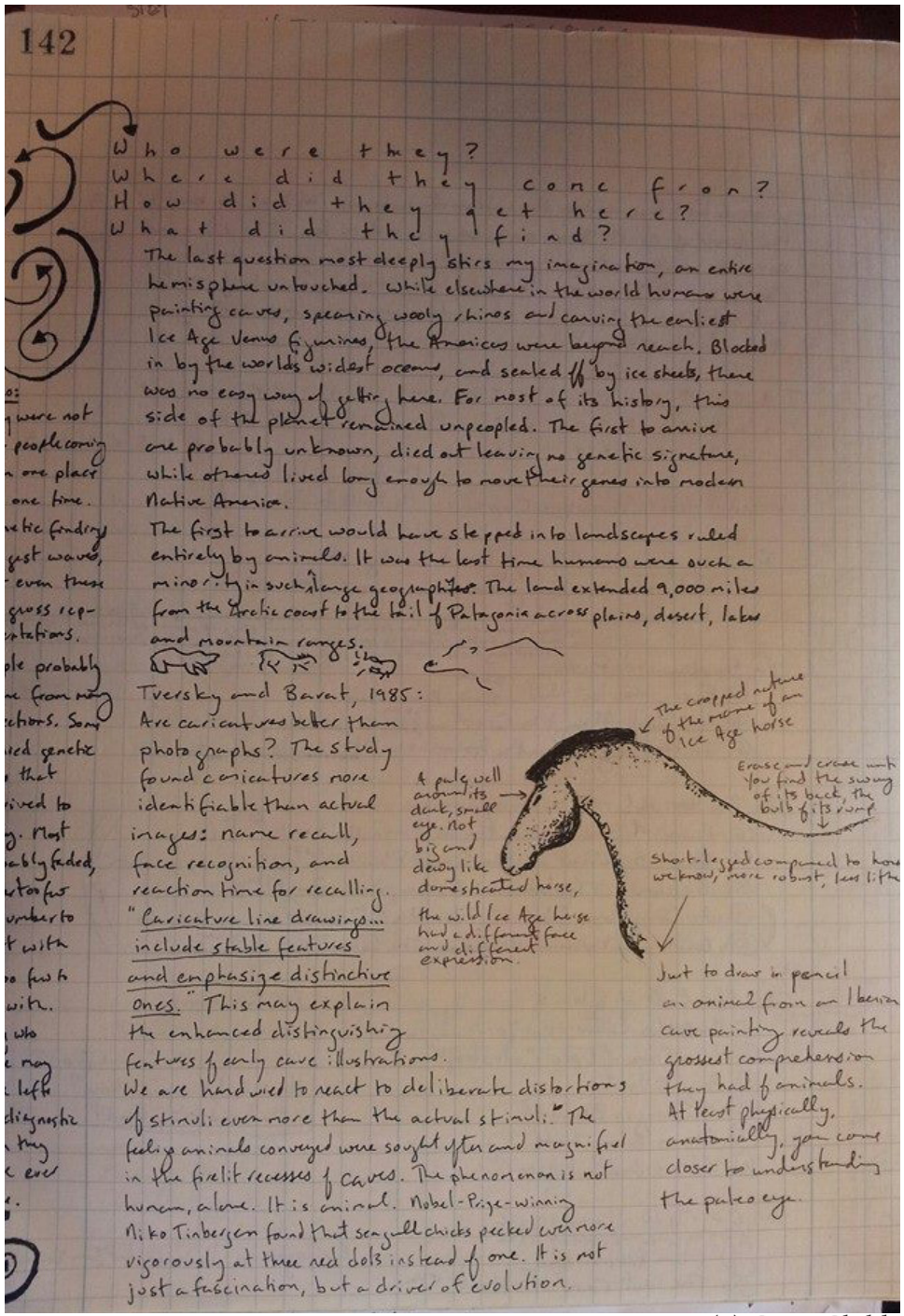
Mar. 24 Body 42.6°C; air 37.6°C; time 1:10 p.m. - young ♂?
Body 41.1°C; 1:40 p.m. ♀?

1 mi. ESE Rio Grande City, Starr Co, Texas

Mar. 24 RCS 3681 Snout yellowish beige; orbital area yellow brown; from parietal scale posteriorly to sacral region yellowish brown; spotted with sooty; ground color from sacral region posteriorly ash white with suffusion of dusky; sacral marks light sooty brown, edged with whitish posteriorly; upper surface hind legs with color and pattern similar to tail; dorsolateral areas and sides with orange spots, closely set, and ash white spots (smaller); posterior to each black bar dorsally orange yellow; ground pale blue green; iris dark; tongue pink.

Shot in hard packed non-rocky soil near old shack. Many mesquite trees. Limestone hills 50 yds. away

Field Journaling with Students-BEETLES PL Session Materials (c) Robert Stebbins



142

Who were they?
Where did they come from?
How did they get here?
What did they find?

The last question most deeply stirs my imagination, an entire hemisphere untouched. While elsewhere in the world humans were painting caves, spearing woolly rhinos and carving the earliest Ice Age Venus figurines, the Americas were beyond reach. Blocked in by the worlds widest oceans, and sealed off by ice sheets, there was no easy way of getting here. For most of its history, this side of the planet remained unpeopled. The first to arrive one probably unknown, died out leaving no genetic signature, while others lived long enough to move their genes into modern Native America.

The first to arrive would have stepped into landscapes ruled entirely by animals. It was the last time humans were such a minority in such large geographies. The land extended 9,000 miles from the Arctic coast to the tail of Patagonia across plains, desert, lake and mountain ranges.

Tversky and Barat, 1985:
Are caricatures better than photographs? The study found caricatures more identifiable than actual images: name recall, face recognition, and reaction time for recalling. "Caricature line drawings... include stable features and emphasize distinctive ones." This may explain the enhanced distinguishing features of early cave illustrations. We are hard wired to react to deliberate distortions of stimuli even more than the actual stimuli." The feelings animals conveyed were sought after and magnified in the firelit recesses of caves. The phenomenon is not human, alone. It is animal. Nobel-Prize-winning Niko Tinbergen found that seagull chicks pecked with more vigorously at three red dots instead of one. It is not just a fascination, but a driver of evolution.

A pale well around its dark, small eye. Not big and dopey like domesticated horse, the wild Ice Age horse had a different face and different expression

The cropped nature of the name of an Ice Age horse

Erase and erase until you find the swoop of its back, the bulb of its rump

short-legged compared to how we know, more robust, less lithe

Just to draw in pencil an animal from an Ice Age cave painting reveals the grossest comprehension they had of animals. At least physically, anatomically, you come closer to understanding the paleo eye.

Field Journaling with Students-BEETLES PL Session Materials (c) Craig Childs

Stebbins, R.

1945 Catalogue

Pinyon Wells, el. 4000 ft., Joshua Natl monument

264 Xantusia vigilis } (Oct. 14)
265 " "
266 Coleonyx variegatus } (Oct. 15)
266 " "

Oct. 16, 1945

267 ♂ im. Thryomanes bewickii 9.0 gms.
268 ♂ ad. " " 8.7 gms
269 Sceloporus magister
270 Coluber flagellum

Oct. 17, 1945

271 ♂ ad. Parus inornatus 15.8 gms.
272 ♀ ad. " " 16.8 gms.
273 Uta stansburiana
274 ♂ " "
275 ♂ " "
276 ♂ " "
277 Coleonyx variegatus
278 " "
279 " " } Collected Oct. 16
280 " "
281 ♂ Sceloporus occidentalis
282 ♀ ad. " "
283 ♂ ad. " "
284 ♀ ad. " "
285 " "

Field Journaling with Students-BEETLES PL Session Materials (c) Robert Stebbins

November 8
Cambridge
7:30 am
preparing to go to NYC
Happen to look out to squirrels in neighbor's Norway maple.

Madly eating Maple seeds. They have really fattened up.
White now on the backs of their ears.
I never tire of watching squirrels...

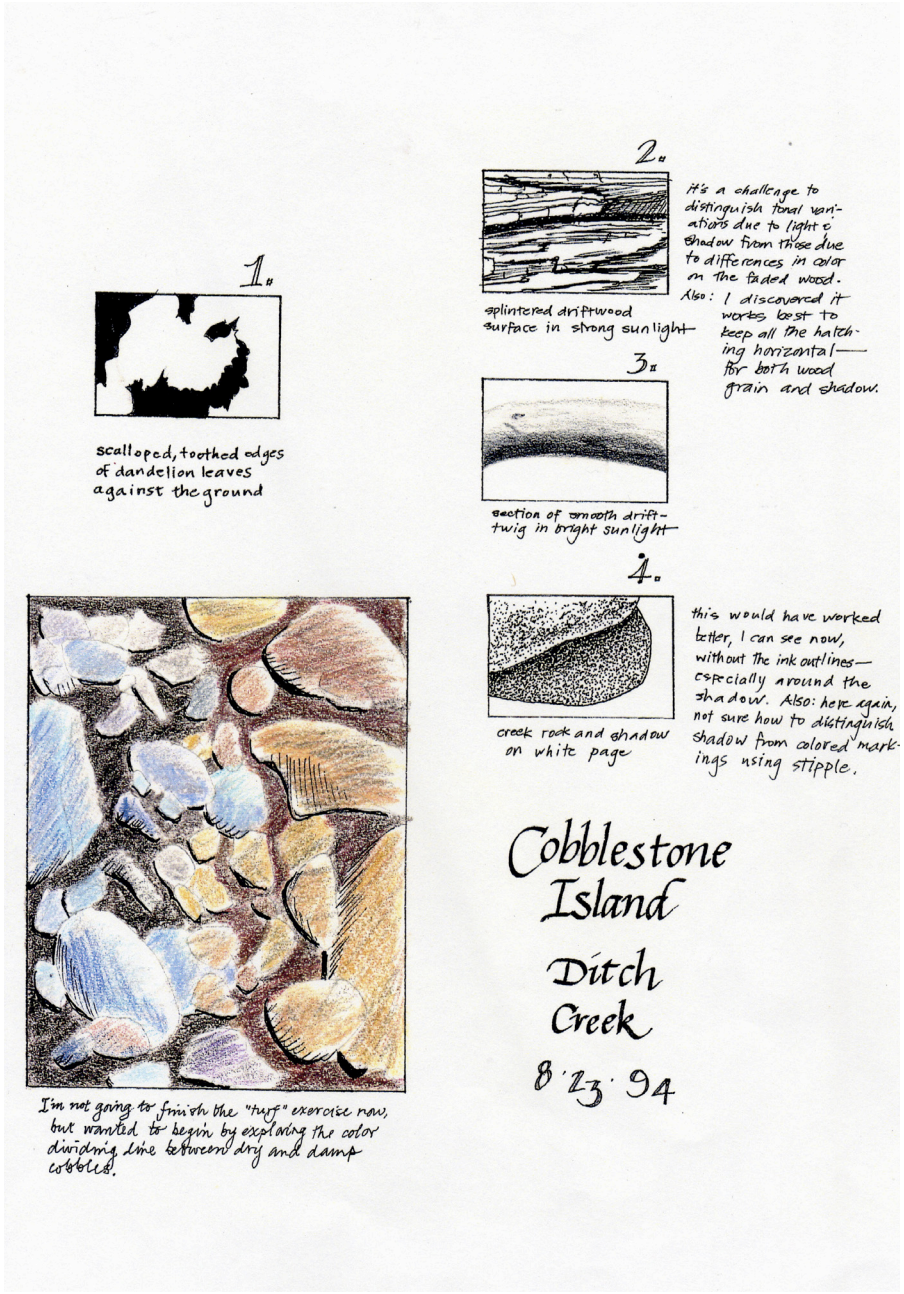
A quick P.E.I

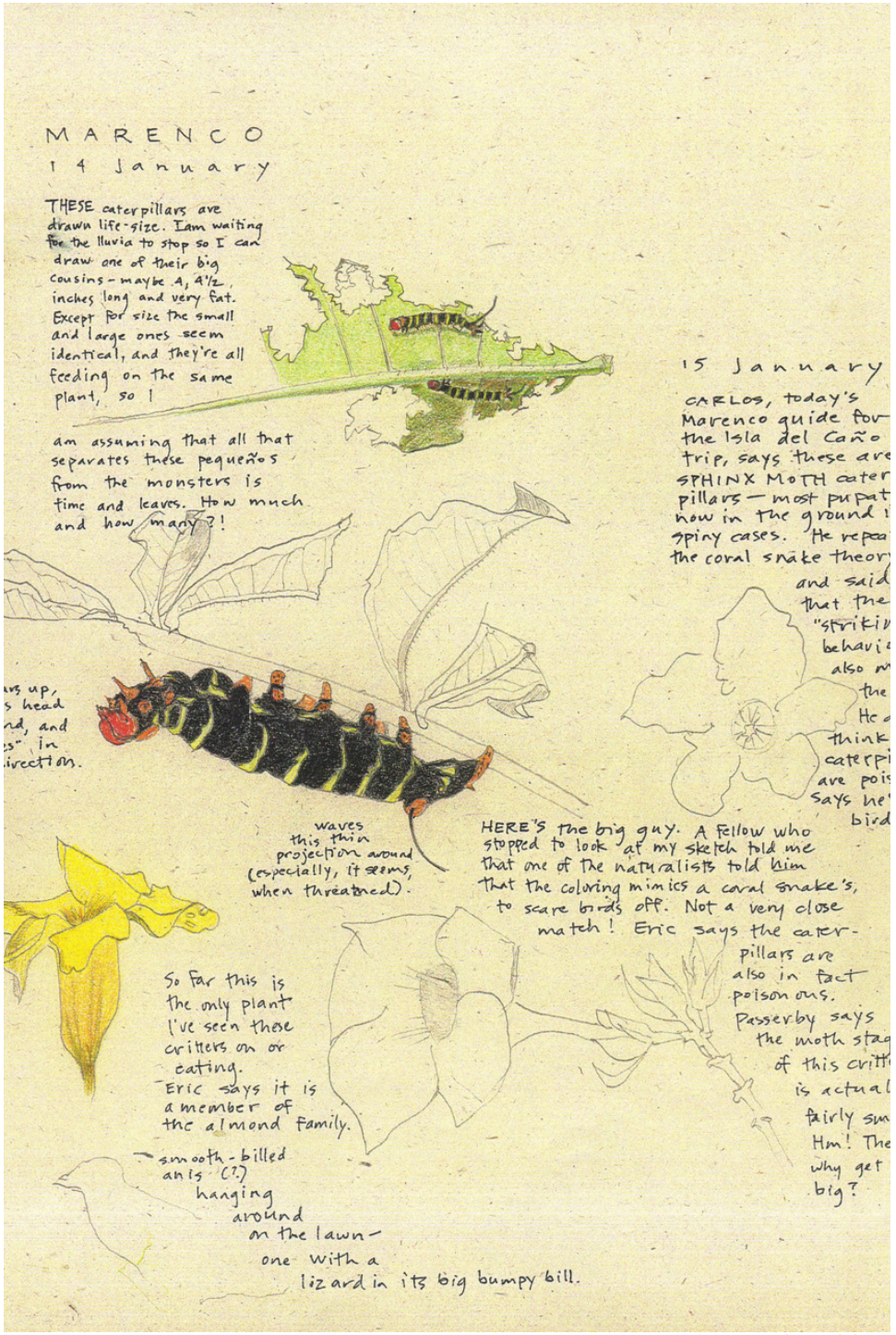
"crunch" "crunch" You can hear them as you walk the street below

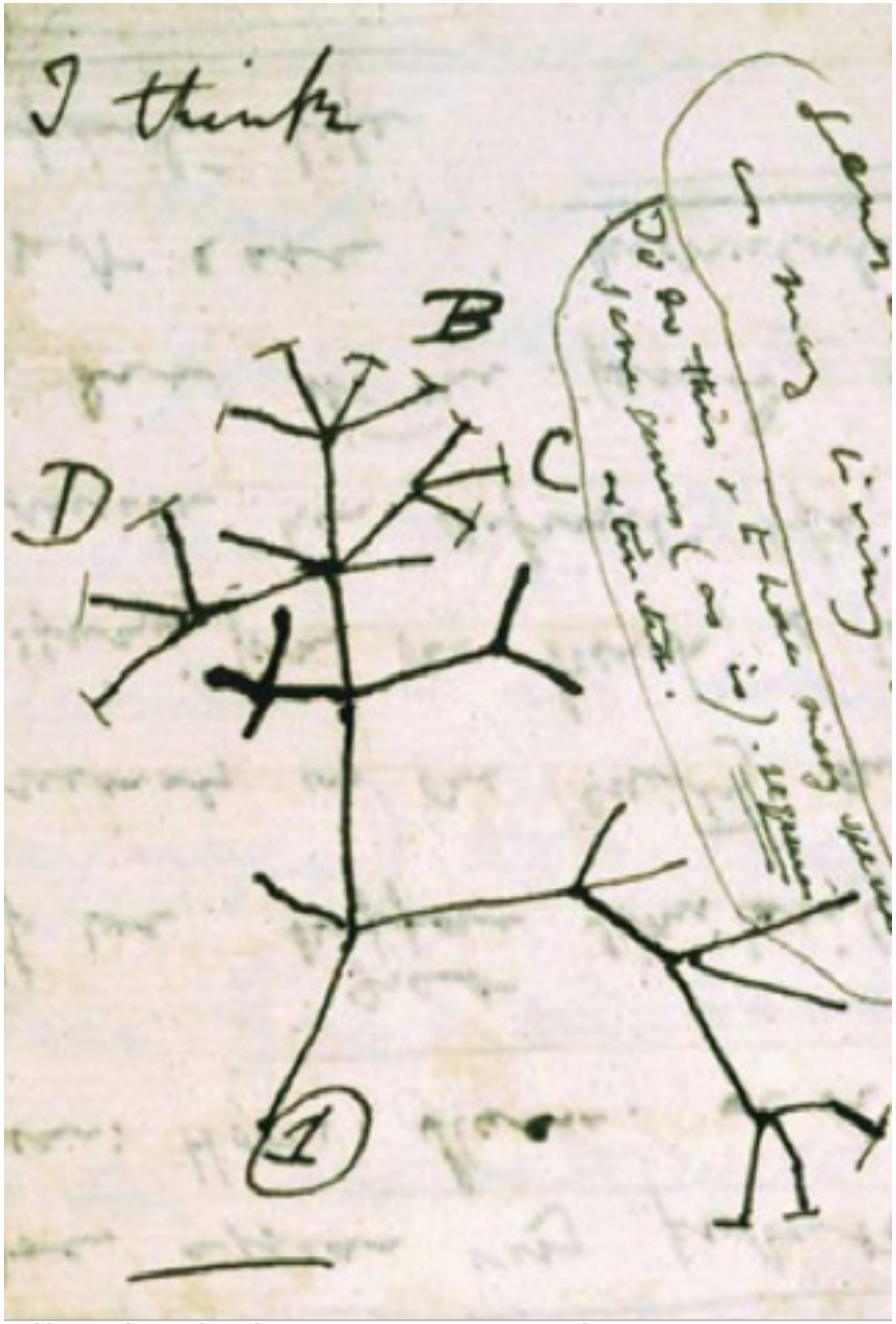
Then - Zoom - out my window a sharp-shinned hawk flashes by.

Are they all around and we just don't notice?

Field Journaling with Students-BEETLES PL Session Materials (c) Claire Walker Leslie



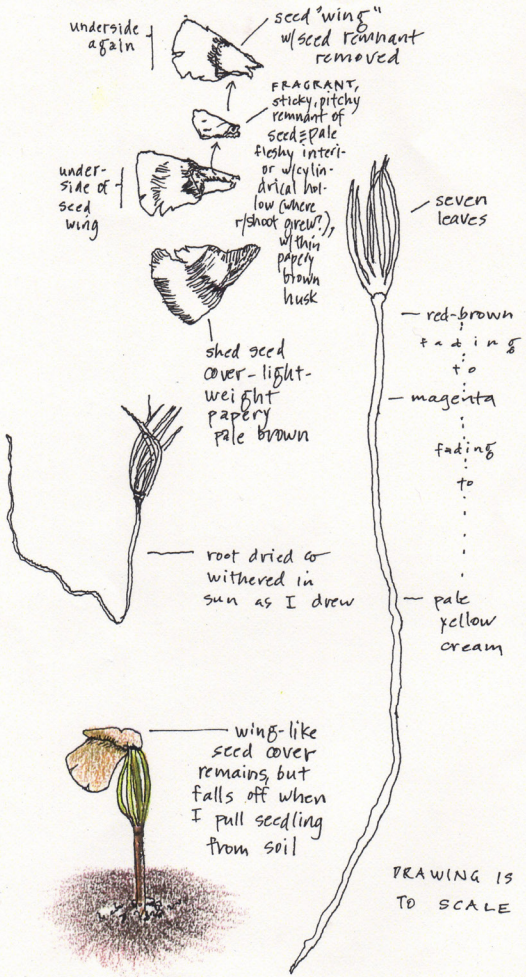




Field Journaling with Students-BEETLES PL Session Materials

Charles Darwin

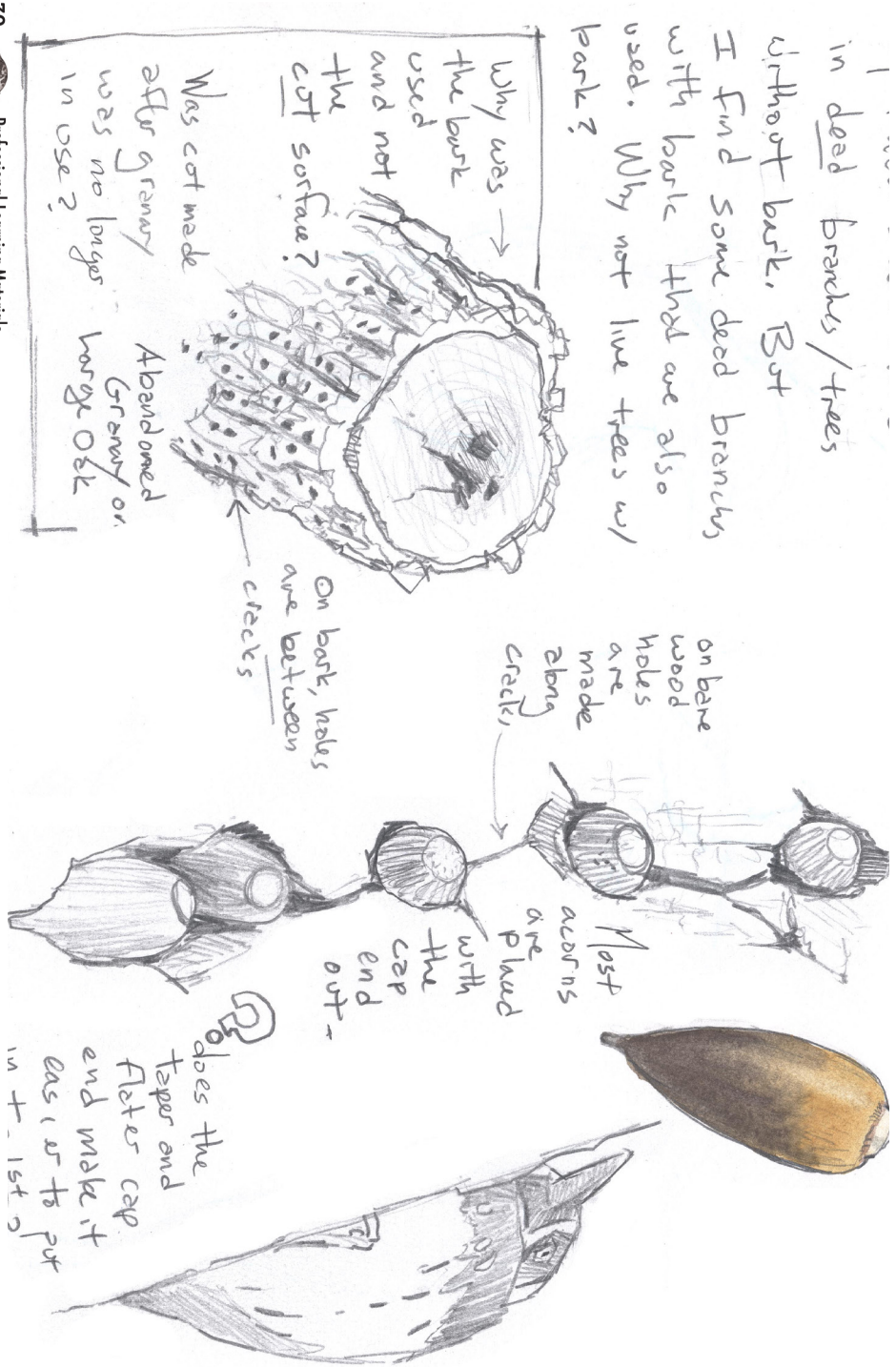
28 June
YUBA PASS

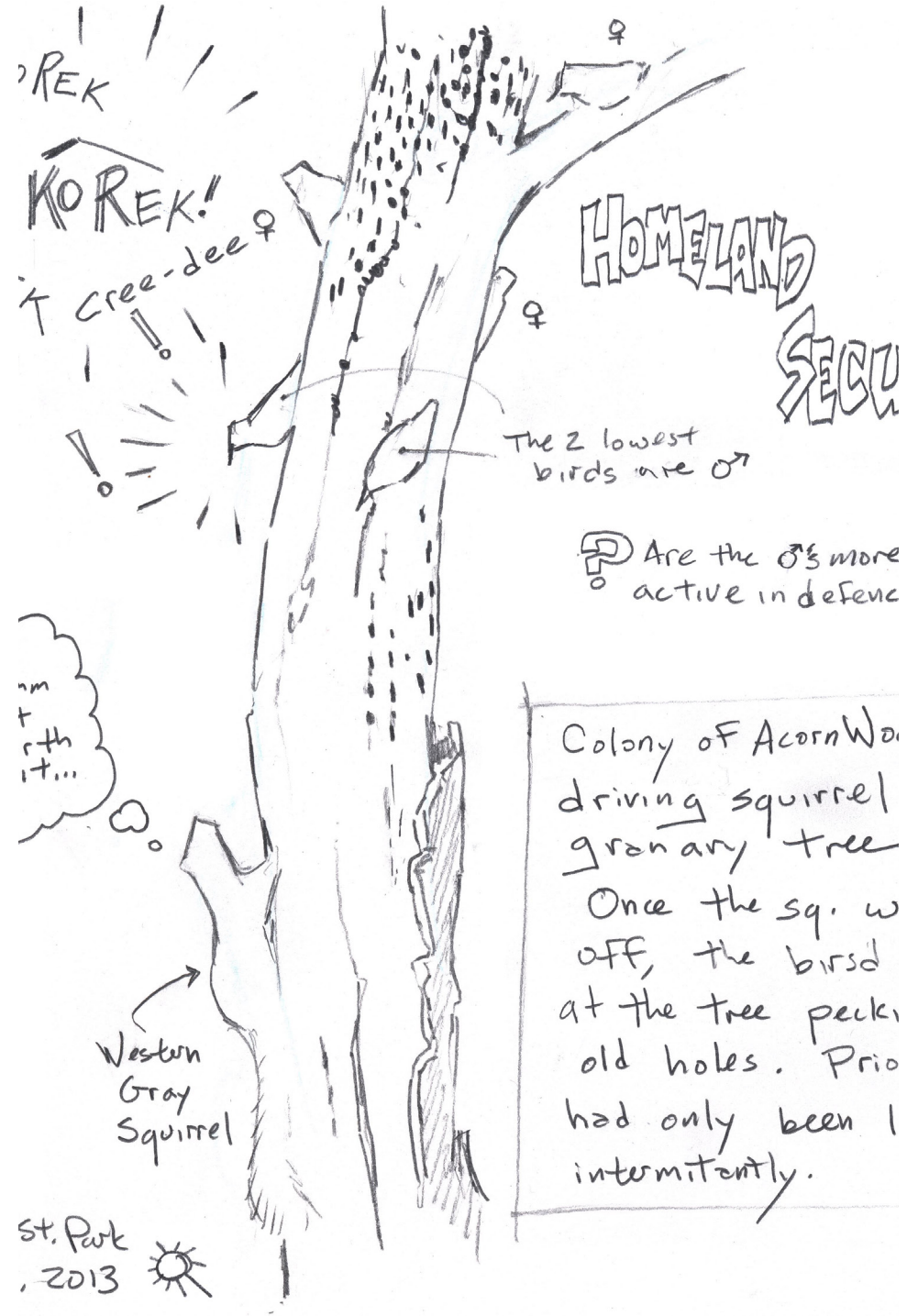


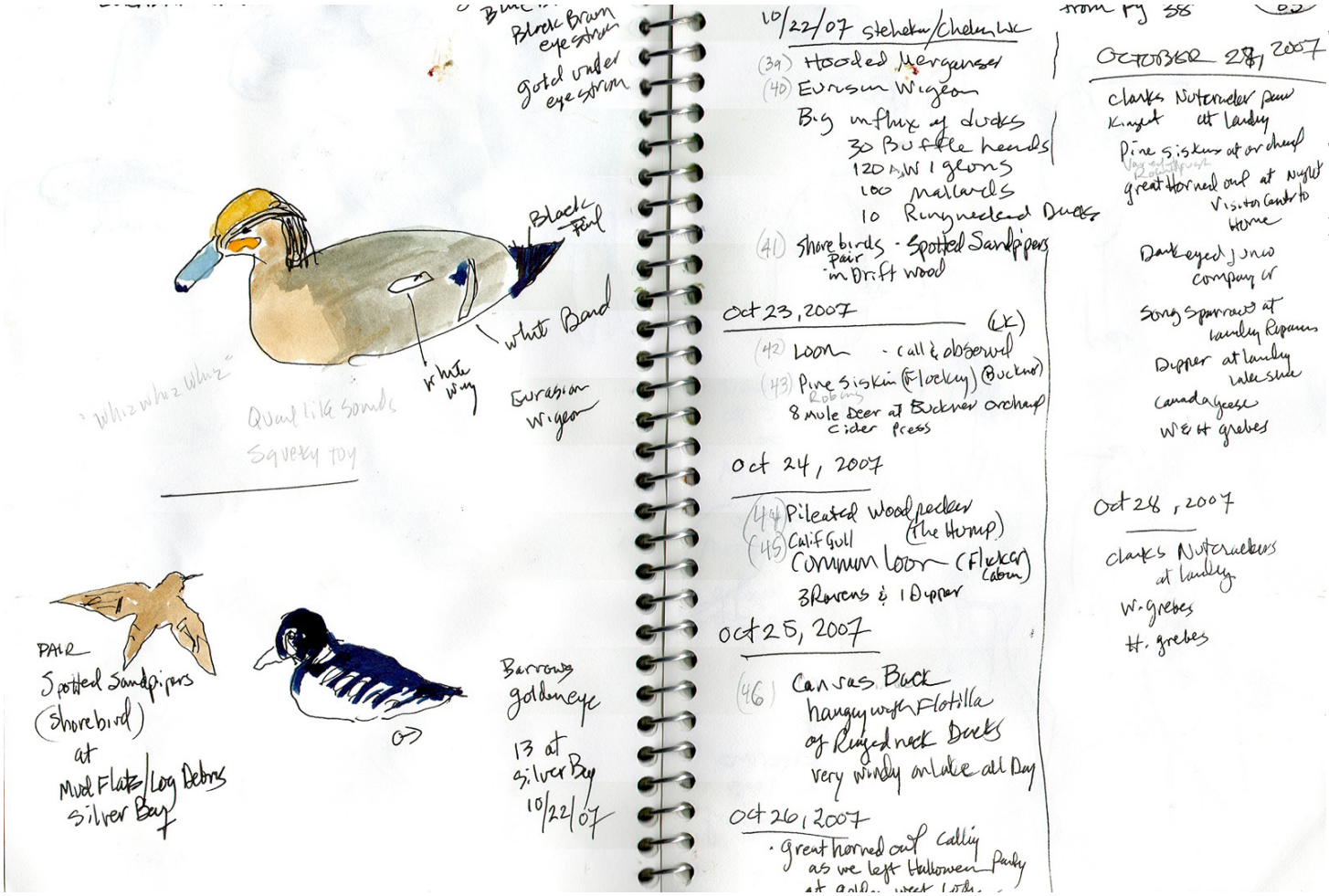
After drawing this tiny seedling to scale as it grew out of the loose open soil, I pulled it up by the root to sketch it. HOT SUN; clear blue sky. Sound of wind higher in tall trees but calm here on the ground. Sound of trucks over pass. Much birdsong & insect buzz. Edge of open meadow w/ standing H2O, corn lilies (?), mule ears (?). Nearby trees include fir, lodgepole pine

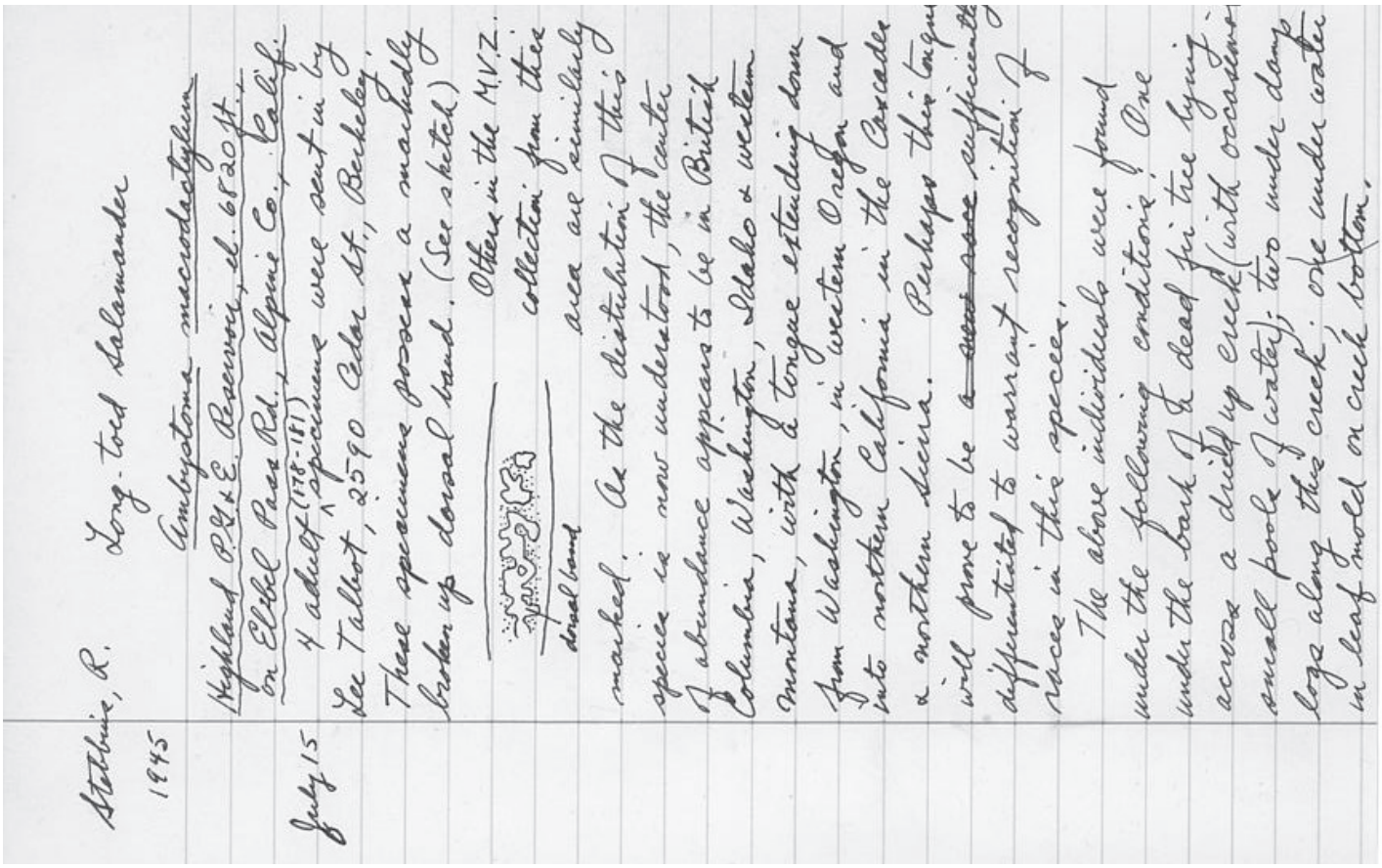
Field Journaling with Students-BEETLES PL Session Materials

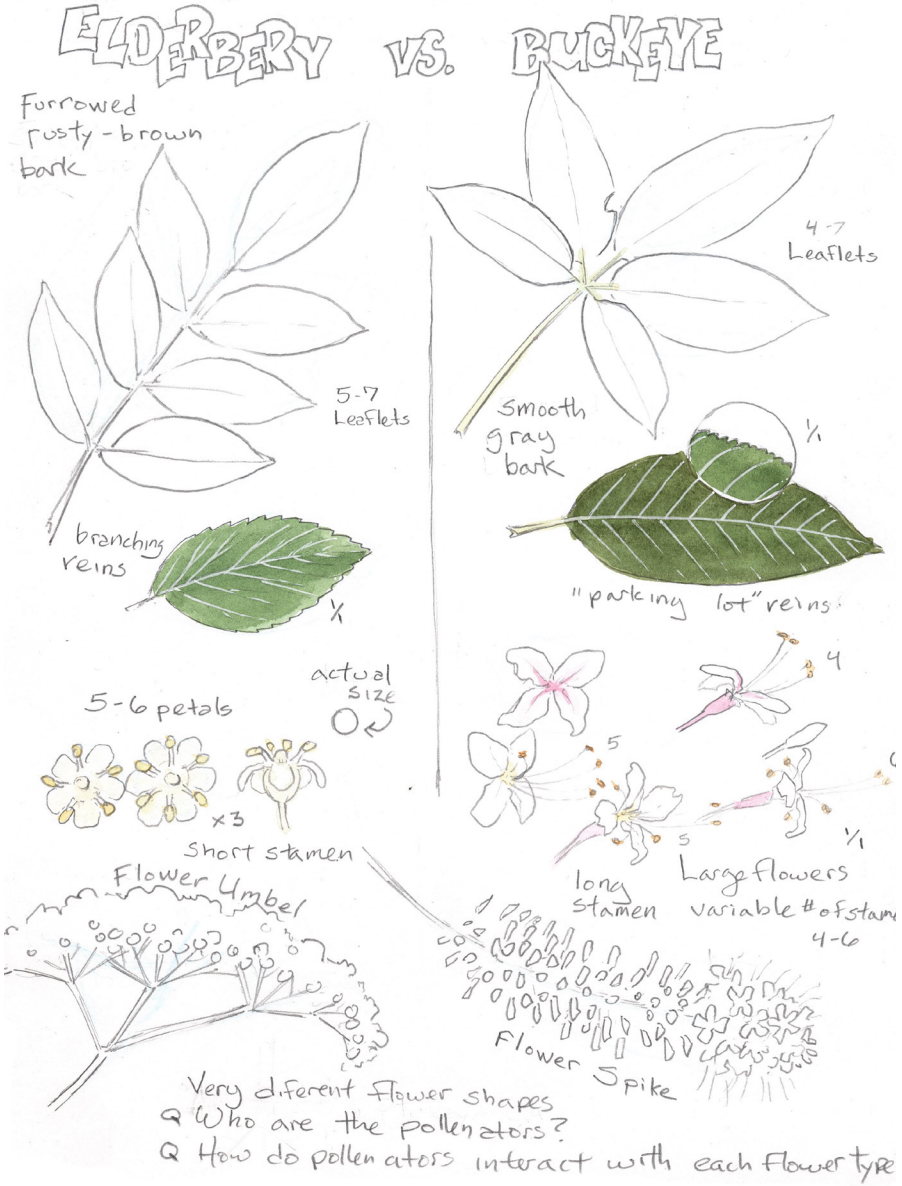
(c) Sarah Rabkin

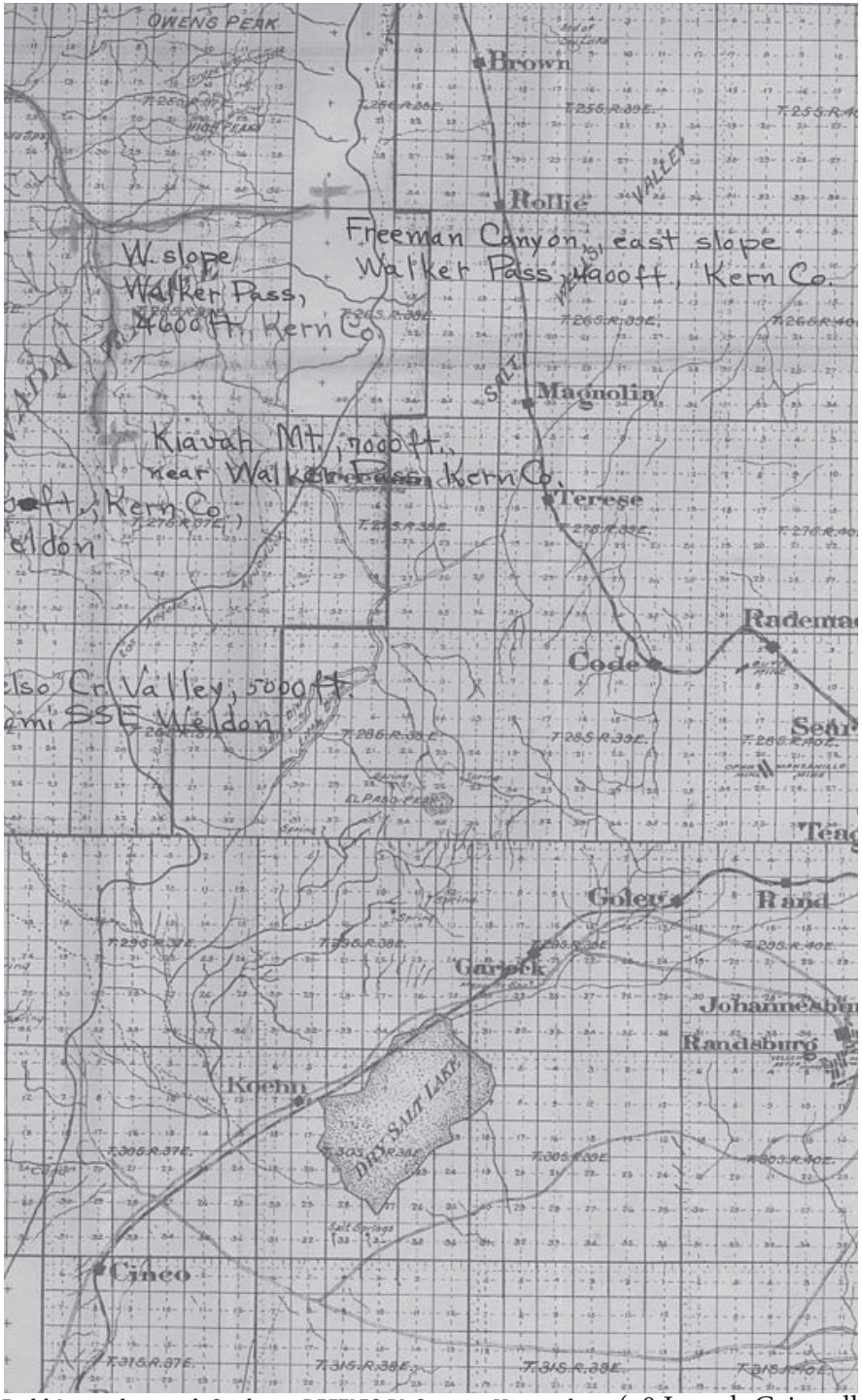










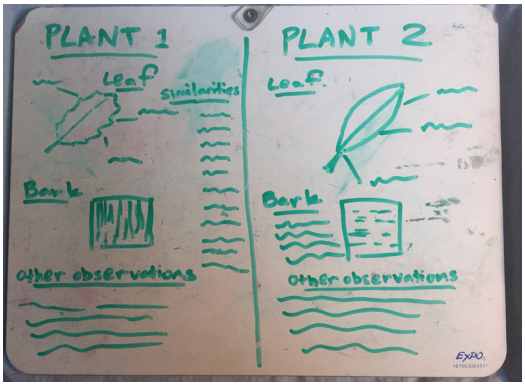


Field Journaling with Students-BEETLES PL Session Materials (c0 Joseph Grinnell

Field Journaling with Students-BEETLES PL Session Materials (c) Dodie Markey

JOURNALING PROMPTS

Distribute one prompt to each group of instructors.



PROMPT 1: Comparison

This prompt was adapted from Opening the World Through Nature Journaling. *These instructions are the same as the verbal directions you could give students as you showed an example of some strategies for recording information on a whiteboard (example below).*

Here's your challenge:

Compare two types of plants—but make sure to pick two types of plants that are kind of similar to each other—like two different kinds of trees, different kinds of small shrubs, or grasses, or flowers.

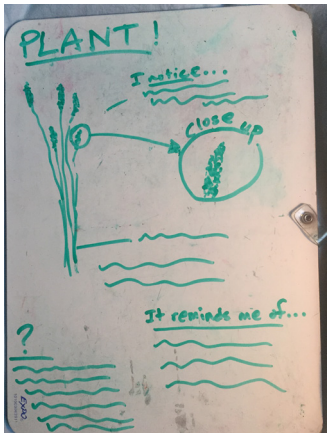
When you find two plants to compare, look for as many differences as possible. Look at their leaves, their branches or stems, where they grow, how tall they are, their colors, etc. Show what you learn in your journal using both drawing and writing.

Don't worry about making a pretty picture, spelling things right, or knowing what the plants are called-—your goal is to notice as many differences between the two plant types as possible. Make sure you record everything you learn because maybe you will notice something no one else has ever seen before.

It might help you to use one page of your journal to focus on one plant type and the opposite page to focus on the other plant type—you can also list any similarities you notice in the middle between your two drawings.

If your plants are smaller than your paper, you could show them life-size. If your plants are bigger than your paper (like a tree or a bush), you don't have to draw the whole plant—you could just show a leaf and what a section of the bark or stem looks like.

PROMPT 2: Focus on one plant species: "Observation Olympics"



This prompt was adapted from Opening the World Through Nature Journaling. *These instructions are the same as the verbal directions you could give students as you showed an example of some strategies for recording information on a whiteboard (example below).*

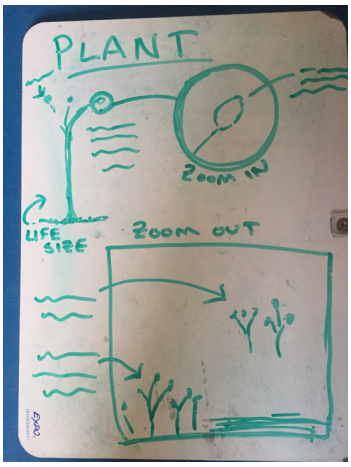
Like a scientist who is describing a new species, you are going to gather as much information as possible about one type of plant. Use your observation skills (I notice, I wonder, it reminds me of) to learn as much as you can, and record what you find out in your journal.

Use some drawing and some writing to show your thoughts—but you can use more of whichever is more comfortable for you. It might help you to write a question mark in the corner of your paper and list all your questions below it as you go. You can also look really closely at different parts of the plant—like its leaves, branches, or bark.

If you feel like you've run out of things to describe, keep looking! Try using senses other than sight, changing your point of view, counting leaves or other parts of the plant, comparing your plant to other individuals of the same type, or looking for differences in color or texture.

Some scientists may have studied this *TYPE* of plant before, but it's pretty unlikely anyone has ever studied this specific plant as much as you will, so you might make some observations no one else ever has.

PROMPT 3: Zoom in, Zoom Out



This prompt was adapted from Opening the World Through Nature Journaling. *These instructions are the same as the verbal directions you could give students as you showed them an example of some strategies for recording information on a whiteboard (example below).*

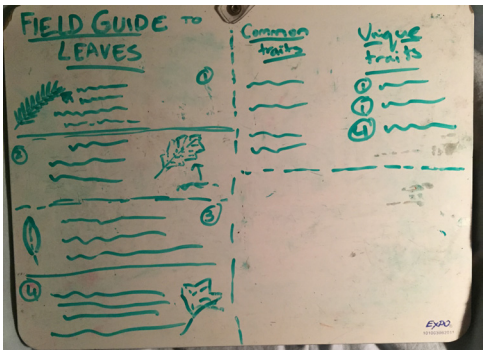
You're going to look at a plant from different perspectives to see what you can notice. Pick a smaller plant—one about the size of your journal. Start by looking at the plant and record a few details about it life-size in drawing and writing. You don't have to make a pretty picture of the plant—just get some observations of the plant on your paper.

Then pick one plant part—like a leaf, flower, bark, or stem—to zoom in on and do a close-up drawing. To show that this is a close-up drawing, you might want to put a circle around that feature on your life size drawing, then make a larger circle next to that and make your close-up drawing inside of that. Make sure to record observations in words, too.

Then zoom out and start to look at everything around the plant. Are there other individuals of this plant type close by? Where does this type of plant grow? Where does it not grow? What is the soil like around this plant? Where are leaves found on this plant? Where aren't they? Describe what you find below or around the plant. Is there any evidence of herbivores eating this plant? Would you expect this plant to look any different in another season?

Record what you learn using both drawing and writing, but use more of whichever is easier for you. When you're looking at the plant from far away, you could show its surroundings in drawings or describe them in words. If you show the plant and its surroundings using drawing, use an arrow to make it clear which plant you have focused on.

PROMPT 4: Make a field guide



This prompt was adapted from Opening the World Through Nature Journaling. *These instructions are the same as the verbal directions you could give as you showed students an example of some strategies for recording information on a whiteboard (example below).*

Note: For this activity, it is useful to show students an example of a field guide before they begin journaling.

In a moment, you will get to pick one plant part—like leaves, bark, stems, seeds, or flowers—to focus on as your subject for this activity. Then, in your journal you are going to make a field guide to this plant part. A field guide usually shows a picture and some information about unique features and characteristics of each subject.

Field guides show **different** species—not individuals from the same species. If you choose to focus on leaves, for example, you will describe one leaf from three or four different plant types or species.

Use drawing and writing to describe each subject, and show similarities and differences between different types of plants. Try to show at least four subjects in your field guide to start off with.

If you don't know what to look for, just write down a few "I notice's," or observations, next to each drawing. Don't worry about making it a pretty picture of your subject—focus on making lots of observations. Write something down if it is too hard to show in a drawing.

FIELD JOURNALING WITH STUDENTS

"Journaling is the single most powerful tool to supercharge your observation, memory, and connection with nature. It is the critical foundational habit of being a naturalist and scientist." – John Muir Laws

Remember: See free journaling activities and tips in *Opening The World Through Nature Journaling*: www.johnmuirlaws.com

Benefits to field journaling:

Building an emotional connection to nature. As students engage in focused study and record observations in their journals, they build a connection to that aspect of the natural world. This process will lead to a memory of that place and of the student's experience—one the student carries in their mind, and in the pages of their journal.

Connections to standards: By engaging in field journaling, students are practicing disciplinary literacy in science. They are learning how scientists write and communicate. By creating accurate, detailed field journal entries, they are creating science text, using both illustrations and academic language.

Naturalists and scientists:

- **Have different goals when they approach making a journal entry.** They might choose to focus on recording information about where an organism is found, writing down thoughts/ideas, recording data, capturing a moment, doing biodiversity inventories, etc.
- **Use different strategies to record information.** These might include: labeled drawings, text, measurements, questions, tentative answers based upon further observation, arrows, magnified view circle, charts, etc.

Field Journaling:

- **Focuses on observations before art.** It's not about pretty pictures, it's about accurate observations and the thinking that happens in the process of journaling.
- **Uses writing and drawing to record information.** Scientific drawings often include labels and accompanying descriptions in writing.

Instructors who use journals successfully to support science instruction suggest:

- **Pay attention to group and individual needs.** There are great times for journaling, and there are...less great times for journaling. If students are super energetic, have just gotten off the bus, or are very hungry, they won't be able to focus on journaling as much. Weather conditions, like very cold or windy conditions, or extreme heat, can also provide challenges. Set your students up for success in journaling by choosing a time and location for it where they will have the best possible chance of being engaged.
- **Offer structure and scaffolding.** To engage students in journaling, offer them a focused learning experience and some direction for how to record information in their journals—much like a naturalist or scientist.
- **Match scaffolding with learning goals.** The types of observations and thinking students do while journaling will vary based on the kind of scaffolding you offer. Think ahead of time about what part of nature students will focus on, kind of prompt will lead them to make observations and engage in thinking relevant to your learning goals.
- **Give appropriate and supportive feedback.** Avoid the tendency to comment on the artistic quality of drawings. Instead, give feedback on what you are asking students to do—to make accurate observations and record them in drawing and writing. Be non-judgmental as you point out observations students made or methods they used to show thinking on the page.
- **Give students adequate materials for journaling.** Make sure students have at least some blank pages on which to record their observations and experiences.

EXAMPLE OF JOURNAL USE DURING A WEEK OF OUTDOOR SCIENCE SCHOOL

This chart is an example of how an instructor could use journals to support student learning throughout a week-long field experience. This chart does not show every activity or experience students might have during a week of outdoor science school- in fact, it only shows activities that would be enhanced by journaling. This chart is also not meant to indicate that students are journaling the whole time during every activity- journaling is a tool used to deepen students' learning during one step of the activity

For example, in the BEETLES activity **Discovery Swap**, students spend about 20 minutes actively exploring, catching organisms, then spend about 15 minutes focused on studying one organism and recording their observations and ideas in their journals. They then use the information they gathered to discuss their discoveries with their peers.

MONDAY

MORNING

Greet students! Let them run around and explore and set expectations for individuals and groups. With a smaller group- learn their names, set expectations, and give students some opportunity to engage in sensory activities and to gain comfort being outside. Give them a few minutes to write down their expectations and goals for the week.

IN

Teach "I Notice, I Wonder, It Reminds me of" and give students a chance to explore and practice their observation skills.

INIWIRMO

Introduce a field journal as a tool that scientists use to record their observations and discoveries. Share a journal entry you made, or one from a local naturalist or scientist.

AFTERNOON

"Group Observations"

Later, ask students to find something interesting and to record "I notice's, I wonder's, and it reminds me of's" in drawing and writing.

TUESDAY

IN

Students study adaptations through BEETLES activities **Adaptation Intro Live** and **Structures and Behaviors**. In their journals, students sketch the structures and behaviors of a critter, then write explanations about how each might be an adaptation.

SIT SPOT

In the BEETLES Activity **Discovery Swap,** students explore, catch different pond macro-invertebrates, and focus on observing one organism and recording their observations of its structures and behaviors in their journal.

WEDNESDAY

IN

In a **Discovery Swap** focused on plants, students study one plant species and record their observations in their journals.

SOLO HIKE

On a solo hike, students stop, put down a circle of string, and make notes about the plants and leaves within it.

In *Make a Field Guide*, students draw leaves from different species, look for variations between them, and write explanations about why the variations might occur.

THURSDAY

IN

In the course of an investigation, students collect data in their journals and write down their thoughts about what the data could tell them.

In *Zoom in, Zoom Out,* students find an aspect of nature that is interesting to them, study it from different perspectives, and show what they find in their journal using drawing and writing.

FRIDAY

IN

At the end of their week, students find a place to sit quietly and reflect. They record their observations and questions, but focus on their own thoughts about their experience in addition to their surroundings.

SIT SPOT

LUNCH

Note: BEETLES activities or prompts from *Opening the World Through Nature Journaling* are represented throughout the chart. Activities from *Opening the World* are noted in *italics*; BEETLES activities are shown in **bold**.

SELECTING JOURNALING ACTIVITIES FROM *OPENING THE WORLD THROUGH NATURE JOURNALING*

Using journals with students

Scientists use journals or field notebooks at almost every step of their work. Journaling leads to deep observation, organized thoughts and ideas, and a written record of new ideas. Working on paper can also lead to massive leaps in conceptual understanding through an experience that is vitally different from discussion, lecture, or exploration. Scientists almost always have a purpose and focus to their journal entries; student journaling should be no different. If students are given pencil and paper and told to go journal, they might be overwhelmed and often won't know what to draw or how to organize information; they need structure and scaffolding, and it is the role of instructors to provide it. *Opening the World Through Nature Journaling* is a curriculum co-authored by John Muir Laws, Emilie Lygren, Emily Breunig, and Celeste Lopez. Its activities were designed to give students the focus and structure necessary to successfully use journals as tools for learning and are available at the johnmuirlaws.com website..

Using the curriculum

"Opening the World" has background on how to use journals with students, as well as tools to help students be successful journalers. It also contains many activities that stand alone in giving students experience observing and recording information. These activities provide instruction that asks students to record information in different ways and different places—but very few journaling activities refer to a specific type of organism, topic, or environment. These more general instructions can be used to support any lesson or trail experiences. While many BEETLES activities have specific steps in which students use journals, journal use shouldn't be restricted to the activities in which they already appear. Many of the instructions for activities in "Opening the World" could be introduced into the flow of a BEETLES lesson (or one of your own) at any stage by saying "...and we're going to use our journals as a tool," then inserting instructions from a nature journaling activity.

It is important to consider when to incorporate a journaling activity, which one to use, and how to frame it to students. The following set of questions can help instructors who are less familiar with journaling to begin to make these decisions.

- **Will students be ready to journal? (Or in the moment, are they ready to journal?)** Students won't be successful journalers unless their basic needs are met and their energy level is appropriate. Consider pacing of the day and student needs—both basic physical needs and the need to move around or be energetic—in thinking about when to use a journaling activity.
- **How will students feel as journalers?** If it is the first time students are using their journals, some might have resistance because of their experience with (and possible aversion to) writing or drawing in school. Many journaling activities in "Opening the World..." have a "hook" or game aspect to support initial engagement. After students have experience with one journaling activity they will be more likely to try others, so these more basic activities are often best to try first. Another successful approach is to make students feel that journaling is important and authentic—which it is. When students are told they will use their journals as a tool to record what they discover, journaling becomes a part of the exploration process and doesn't feel like "busy work." Students also feel trusted with information, feel that what they observe matters, and are invited into the lineage of naturalists and scientist who use journals in the same way. Showing students examples of naturalists' notebooks can help to illustrate this point.
- **What will students get out of the activity?** Deep, focused observation is the foundation of nature journaling. Journaling will help students to see and remember more of their surroundings. To use student journals well, though, use journaling activities to support a hike or lesson—not just to get students to observe. Many of these activities could be used at any stage of the learning cycle depending on how they are framed and what they ask students to focus on. Some activities are more exploration-based while others require students to develop understanding of an

idea or apply content they have learned. Some activities lend themselves particularly well to supporting certain parts of the learning cycle. This is indicated on the following chart with an "X" below a learning cycle stage, but it need not limit where these activities are used; many of these activities could be used at any stage in a lesson.

Here is an example of a thought process for deciding when and how to use journals. "OK, so I'm going to do the Spider Exploration after a couple active name games in the morning. We've done a couple journaling activities this week, so students are familiar with their journals. I want students to really go into depth when looking at the different kinds of spider webs. Since we are doing Spider Investigation later this week I'm hoping students will remember what they discovered while exploring. Journaling will help with that. I also want them to have a lot of ideas about how sheet webs and orb webs are different from one another. I want students to do the Comparisons activity (where students record every similarity or difference between two aspects of nature) while they are exploring different web types. But I think I'll give them a few minutes to check out webs without their journals first so they'll be ready to focus later."

Using the Chart

The chart on the next page serves as an index of the activities in "Opening the World Through Nature Journaling." It provides some additional information that can be useful in incorporating nature journaling into one's teaching. Activities are rated "beginning" or "challenging." Beginning activities are easy for students to understand and require only basic writing or drawing skills. Challenging activities have more complex instructions or might require more advanced drawing skills. Students at any level can succeed at any of these activities, but often it's best to offer a beginning activity to students the first time they use their journals.

There are some journaling activities included in the curriculum that give students practice observing and recording what they notice, but do little to aid in students' conceptual understanding. These activities are more stand-alone exercises that can be used to get students comfortable with journaling or to respond to a teachable moment. On the chart, these activities are denoted with an "X" in the column labeled "Observational" to indicate that they work best as observation practice for students. These activities are also listed as possible invitations because they can help students to become excited about exploring a topic or aspect of nature. The activities listed that do not have a marking in the Observation column will best support lessons or themes in a field experience.

Reflection activities

There are many language arts and poetry activities beginning on page 57 of "Opening the World Through Nature Journaling." They are not included in this chart but they should not be overlooked! These writing activities are invitations that offer rich opportunities for students to reflect on their experiences and produce work that speaks to their personal connections with nature. Use them midway through or to close out a lesson, hike, or program to give students the space to process and make meaning of what they have experienced.

Guide to Selecting Activities from "Opening the World Through Nature Journaling"

Note- This activity list is from the 2nd edition of "Opening the World Through Nature Journaling published in 2012. The 3rd edition will include new activities and can be found at johnmuirlaws.com in 2017.

ACTIVITY	Difficulty Level *(for students)*	Time (mins)	Appropriate Phase in Learning Cycle					Observational	Possible BEETLES Activity Connections
			Invitation	Exploration	Concept Invention	Application	Reflection		
Secret Plant Scavenger Hunt	beginning	45	X					X	*I Notice, I wonder, it reminds me of*
Diagramming	beginning	20-45	X					X	*Discovery Swap, Related & Different*
To Each it's Own	beginning	30-45	X					X	*I notice, I wonder, it reminds me of*
Zoom In Zoom Out	beginning	30-45	X	X		X			*Discovery Swap*
Diversity Inventory	beginning	30-45	X	X		X			various ecosystems and exploration activities
Comparisons	beginning	30-45	X	X	X	X			*Related & Different*, any "exploration" type activity
Group Observations	beginning	15-45	X	X					Any activity, especially exploration activities
Make a field guide	beginning	30-45		X	X	X	X		Any activity, especially exploration activities
Wildlife Gesture Sketching	challenging	30-45	X					X	Adaptations activities, such as Adaptation Intro Live
Cross section	challenging	30-45		X	X	X			Exploration activities
Mapping	challenging	30-45		X	X	X			Exploration activities
Timed Behavioral Observations	challenging	15-30		X		X			*Spider Exploration*, Inquiry Fever
Plant Timeline	challenging	30-45		X	X	X			Adaptations activities, such as those that relate to Structure and Function

_____ Cycle

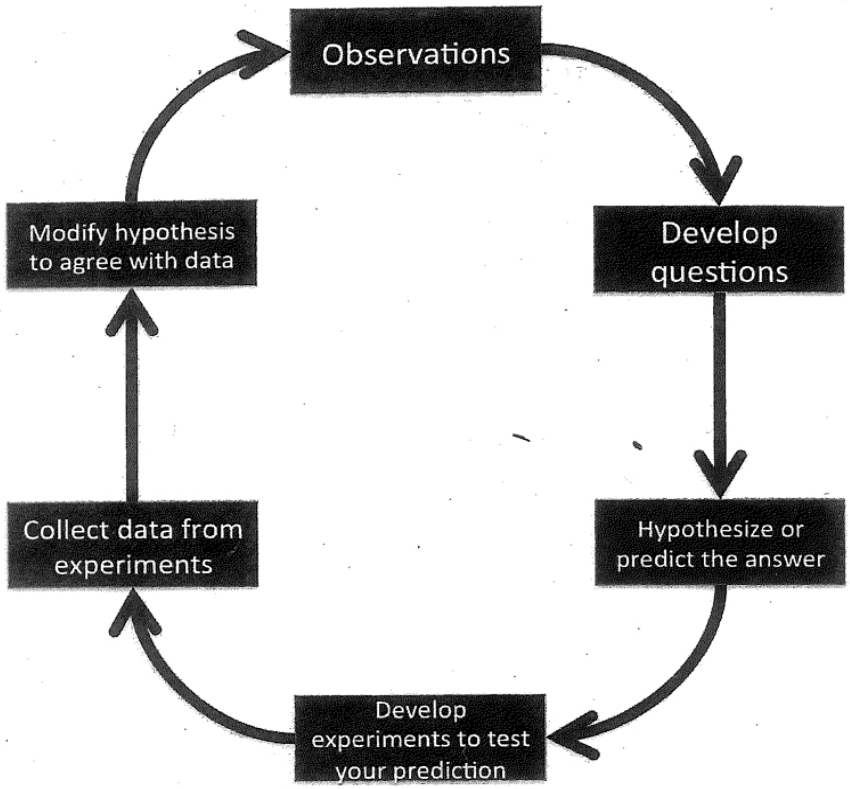
Please draw the _____ cycle in the box below

How are humans impacting the_____cycle?

Give evidence that supports whether humans are positively or negatively affecting the _____ cycle.

26

Science Practices



What is Science?

Observing

Making connections

DRAWING AND WRITING

Asking questions

Discussing ideas from evidence

2

Vocabulary

Abiotic: the non-living parts of the environment (such as air, rocks, water and sunlight)

Adaptation: a physical or behavioral characteristic that helps an organism survive in its environment

Biotic: the living parts of the environment

Climate: the long-term weather that determines what types of life will survive in a particular area

Consumer: an organism that feeds on plants or other animals to get energy

Decomposer: an organism that breaks down dead and decaying matter to get energy and recycles nutrients in the ecosystem (fungi, bacteria, and many invertebrates)

Ecology: the study of the interrelationships between organisms and their environment

Ecosystem: all the different species of organisms that interact with each other and with nonliving components of their habitat such as sunlight, air, water, soil and minerals

Erosion: the loosening and detachment of earthen material that is transported to another area through the movement of wind, water, ice or human and animal activity

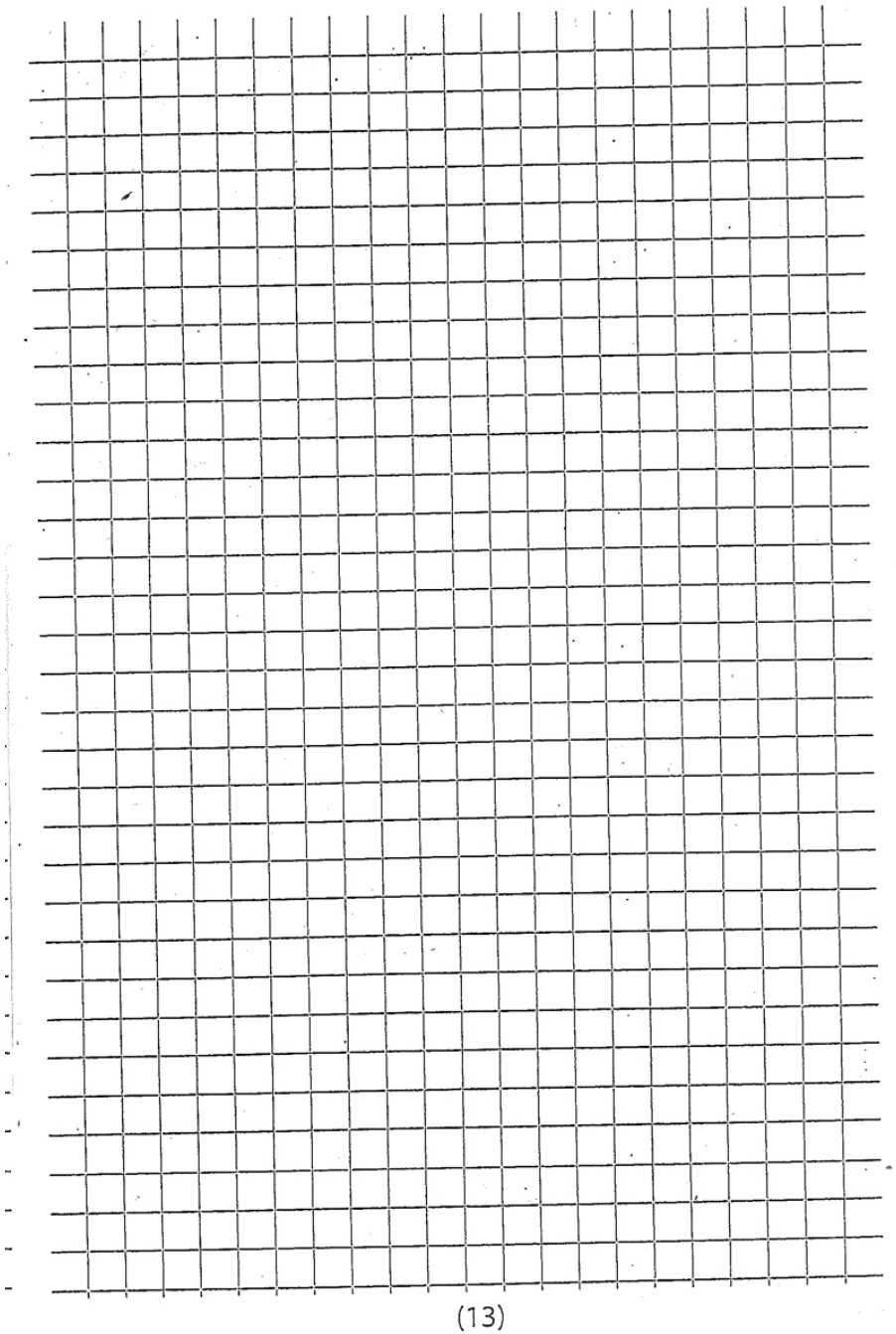
Geology: field of science that studies the dynamics and physical history of the earth, includingrocks and minerals in all forms

Habitat: the specific place in which an organism lives and has access to resources such as nutrients, water, shelter and space

Igneous Rock: formed by the cooling of magma, either above or below the earth's surface

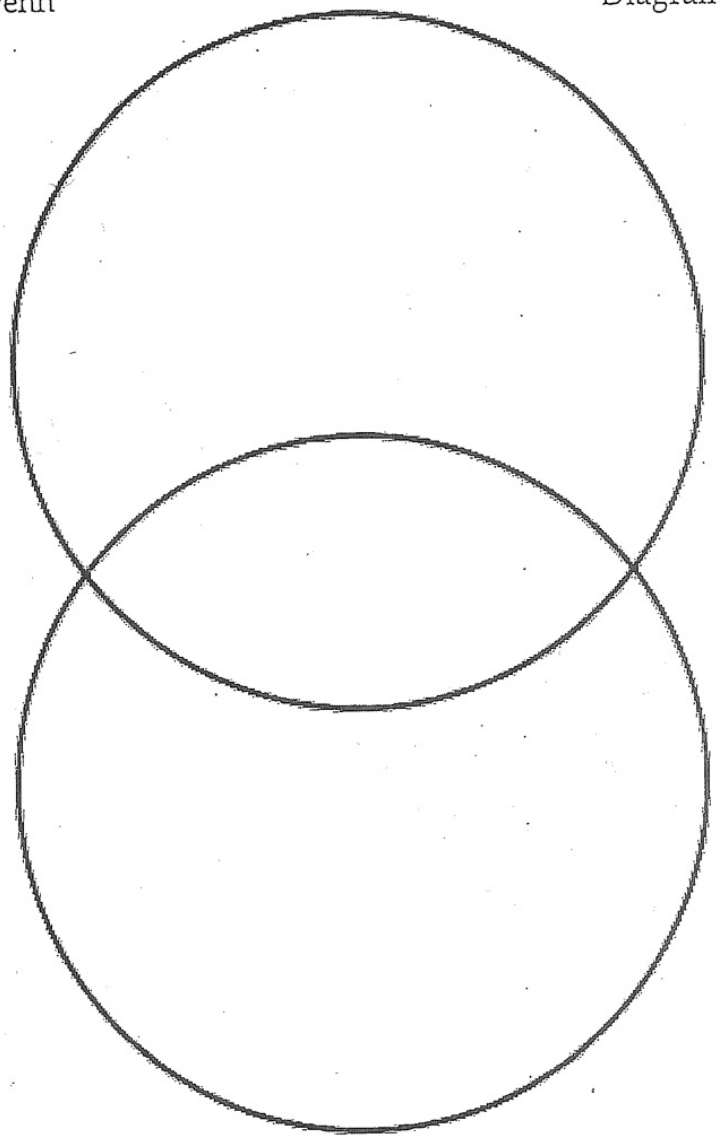
Invertebrate: an animal without a backbone (such as worms, insects, or snails)

Metamorphic Rock: pre-existing rock that is changed by extreme heat or pressure into another type of rock



(13)

Venn Diagram



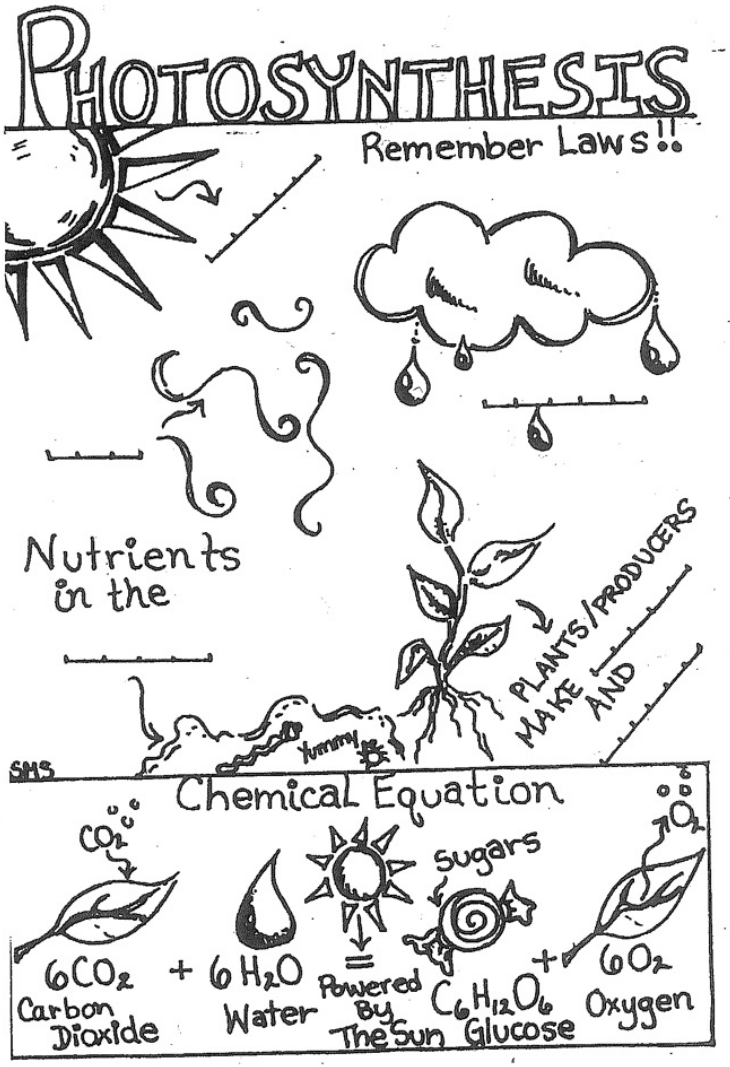
(17)

Aquatic Macroinvertebrate Pollution Tolerance

Aquatic invertebrates that have low tolerance for pollution (PTI=3)
Aquatic invertebrates that have medium tolerance for pollution(PTI=2)
Aquatic invertebrates that have high tolerance for pollution (PTI=1)

Name	Pollution Tolerance Index (PTI)	Write PTI # if you found this organism
Caddisfly Larva	3	
Mayfly Nymph	3	
Stonefly Nymph	3	
Dobsonfly Larva	3	
Flatworm	2	
Cranefly Larva	2	
Damselfly Nymph	2	
Dragonfly Nymph	2	
Freshwater Scud	2	
Aquatic Snail	2	
Water Mite	2	
Blackfly Larva	1	
Horsefly Larva	1	
Midge Larva	1	
Backswimmer	1	
Giant Water Bug	1	
Water Boatman	1	
Water Strider	1	
Mosquito Larva	1	
Whirligig Beetle	1	
Aquatic Worm	1	
Leech	1	
Crayfish	1	
Total of PTI # =		

PTI Scale:
0 – 5 = Poor water quality
6 – 9 = Fair water quality
10 – 13 = Good water quality
14 – 17 = Excellent water quality



Producers are the only living organisms on Earth that can take in non-living (abiotic) things and turn them into living (biotic) energy.

17

The Ohlone People

Did you ever wonder how the traditional people of the redwood forest lived? After looking around the forest, imagine what it was like to live here 1000 years ago.

The word **Ohlone** is Miwok language word meaning "western people." The Ohlone People possess a deep understanding of **ethnobotany** (the cultural uses of plants) in this area. For example, the **California bay laurel** is nature's insect repellant. Additionally, the smoke created by burning these leaves can be used to drive squirrels out of their burrows. The **tan oak** tree produces acorns that can be ground into a mush and used to make bread. The bark could also be used as a dye. The berries from the **manzanita** can be eaten raw, or soaked in water to make a cider.

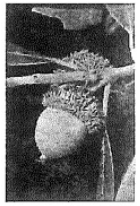
poison oak

manzanita

coastal redwood

California bay laurel

tan oak leaf



tan oak acorn

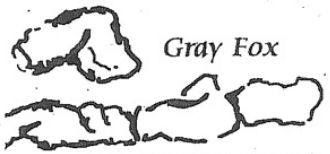
Pick one of the above plants and create a story that uses the plant to solve a problem.

Describe some ways plants are utilized by our society today.

What is one of your favorite foods? Describe what plants were involved in creating it.

ANIMAL SCATS of [redacted]

Gray Fox

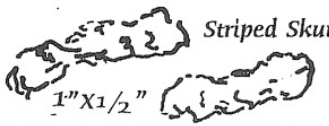


2" X 1/4" Often tapered. Composition varies.

Raccoon

3" X 3/4" Often Black. Even-Diameter cord with blunt ends.

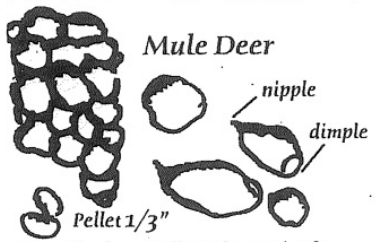
Striped Skunk



1"X1/2"

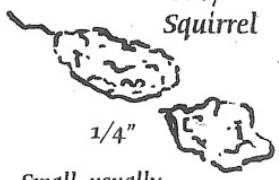
Cylindrical with blunt ends. May be composed entirely of insect parts.

Mule Deer



Usually dry. Pellets from nipple-dimple shape to oval.

Gray Squirrel



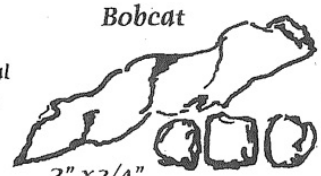
Small, usually unconnected ovals.

Coyote

Varies from pure black animal protein to mostly hair with some bones. Tips tapered into long tails.

3" x 1/2"

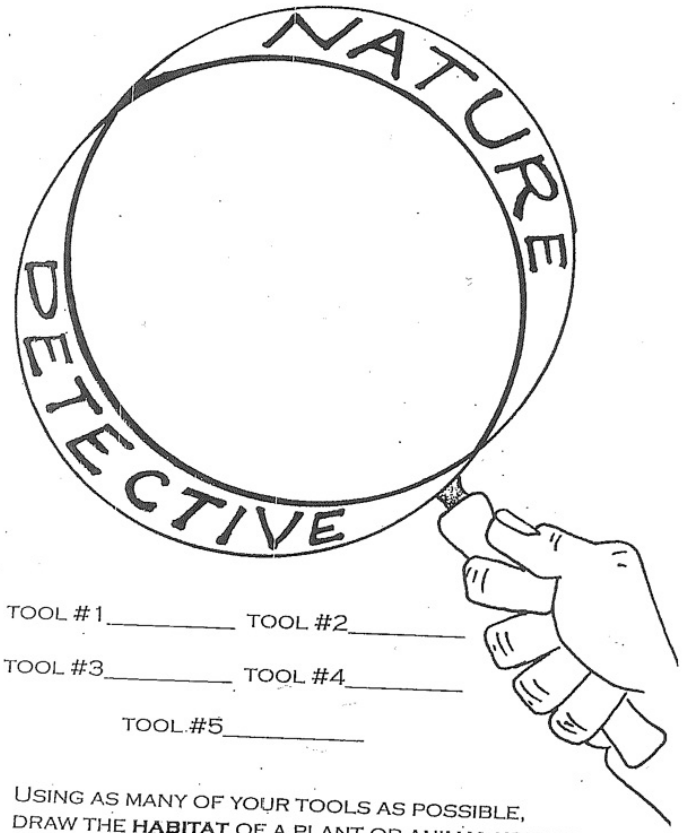
Bobcat



3" x 3/4"

If dry, tends to separate into segments. Ends often blunt.

AS SOON AS YOU SET FOOT AT [redacted] YOU BECAME A **NATURE DETECTIVE!** AS NATURE DETECTIVES, WE ALWAYS CARRY OUR BOX OF TOOLS WITH US ON EVERY ADVENTURE WE EMBARK UPON. WHAT'S IN OUR BOX OF TOOLS?



TOOL #1_____ TOOL #2_____

TOOL #3_____ TOOL #4_____

TOOL #5_____

USING AS MANY OF YOUR TOOLS AS POSSIBLE, DRAW THE **HABITAT** OF A PLANT OR ANIMAL YOU FIND AT [redacted] IN THE MAGNIFYING GLASS ABOVE. INCLUDE AS MANY **ABIOTIC** AND **BIOTIC** COMPONENTS TO ITS HABITAT THAT YOU FIND.

Outdoor School Pledge

I,_____, as a citizen of the Earth and new member of the [redacted] Community, understand that I have a responsibility to treat our home the planet Earth with care and respect. From this moment on, I pledge to:

I also understand how my actions affect other people. Therefore, I set the following goals to build positive relationships with others:

Signed _____

Witness _____

Welcome to Outdoor School!

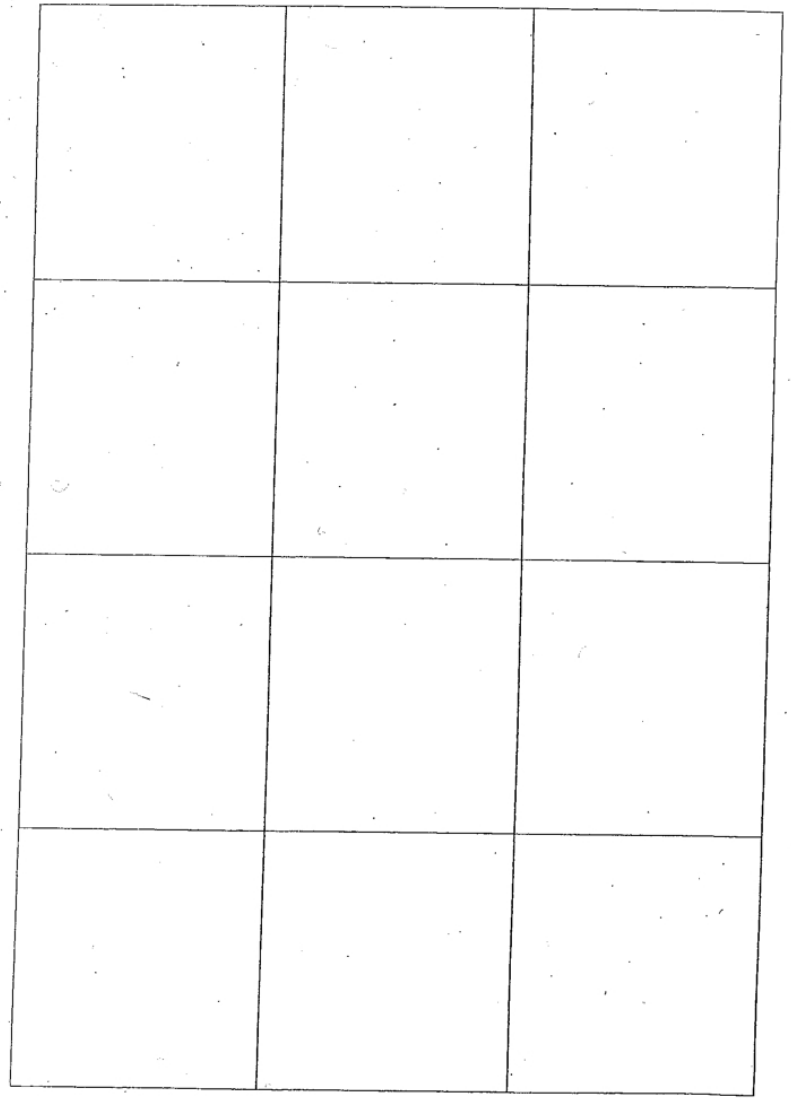
What expectations do you have for outdoor school this week? Have you heard anything about it from friends/brothers and sisters who have been here before? Write a few sentences about what you'd like to accomplish and experience here this week.

What is your cabin leader's nature name? Write one interesting thing they have told you so far.

What would your nature name be if you could choose one?

What do **you** think of when you hear the word *science*?

What aspects of science do you want to learn about/experience most this week?



"How glorious a greeting the sun gives the mountains!" -John Muir

Word Search

R	E	D	N	A	M	A	L	A	S	C	D	P	F
C	U	L	O	B	S	S	T	N	E	I	R	T	U
N	A	S	C	N	R	O	W	H	P	M	Y	N	N
H	O	T	B	Y	E	A	T	U	O	F	O	O	G
E	U	Y	M	K	C	H	C	L	Y	I	R	I	U
R	E	T	A	W	U	R	C	C	T	A	G	T	S
B	P	I	L	I	D	B	E	I	O	C	W	A	Y
I	R	N	G	N	O	Y	S	P	L	O	B	R	L
V	E	U	A	D	R	O	C	W	E	N	N	O	E
O	Y	M	E	Y	P	T	A	O	D	S	C	P	S
R	A	M	P	M	I	H	T	M	P	U	I	A	R
E	B	O	O	W	L	G	R	O	W	M	R	V	E
S	A	C	A	R	N	I	V	O	R	E	C	E	V
K	E	M	L	I	O	L	D	A	T	R	L	A	I
D	A	D	A	P	T	A	T	I	O	N	E	K	D

WORD BANK

ALGAE	NYMPH	GROW	DIVERSE
PREY	LICHEN	RACCOON	LIGHT
WINDY	AIR	WATER	NUTRIENTS
SOIL	FUNGUS	CYCLE	DECOMPOSITI(
BAY	CONSUMER	ADAPTATION	SALAMANDER
OAK	COMMUNITY	PRODUCERS	EVAPORATION
CARNIVORE	HERBIVORES	CIRCLE	SCAT

INTERDEPENDENCE

"In all things of nature there is something of the marvelous."
-Aristotle

Page Blank

Banana Slug Song

Chorus:
Ba - na - na - Slug! (Slug! Slug! Slug!)
Banana Slug Ba - na - na - na - na - na - na
Banana Slug Ba - na - na - na - na - na - na
Banana Slug Banana Slug

You know I love my baby (love my baby)
I love the way that it hugs (way that it hugs)
People don't understand it (don't understand it)
It's a banana slug (banana slug)

It's just got one foot (got one foot)
It ain't got no toes (got no toes)
It hangs out in the forest (out in the forest)
And helps to decompose (decompose)

The way you wiggle your antennae (wiggle your antennae)
You know it gives me such bliss (gives me such bliss)
Come on, come on banana slug (come on banana slug)
Why don't you blow me a kiss?

The way it slides through the forest (slides through the forest)
You know it looks so odd (looks so odd)
Its stomach is its foot (Its stomach is its foot)
It's a gastropod (gastropod)

Some people say that it's gross (say that it's gross)
Don't want to hear that jive (hear that jive)
'Cause if it weren't for my baby (if it weren't for my baby)
The forest might not survive (might not survive)

You know I love my baby (love my baby)
But he doesn't love me (doesn't love me)
He is hermaphroditic (hermaphroditic)
That means he's also a she

BACKGROUND INFORMATION FOR PRESENTERS

Scientists and Field Notebooks

Field journals and notebooks are ubiquitous in nearly all disciplines of science and natural history. Lab scientists use notebooks to keep records of data and experimental procedures; professional naturalists carry field journals everywhere, and draw what they see. Recording information on paper requires focused, quality observation, and practicing this makes scientists better at what they do. According to John Muir Laws, field guide artist and environmental educator, "Keeping a nature journal is the most effective way to train yourself to be a keen observer of the natural world."

A journal provides more than just the opportunity for deep observation. Working on paper also leads to conceptual understanding and new ideas. Bernd Heinrich, the famous bird biologist and author of *Mind of the Raven* writes "Taking notes has always helped me zero in on the interesting questions. They have made the difference between simply observing and being able to get the meat out of science." Scientists use journals to grapple with conflicting ideas or explore questions. A page provides a different forum than a collaborative environment or thinking about something. Darwin famously drew a simple branching tree in a journal as he considered 34 ideas of evolution. Countless other major and minor discoveries in science were worked out on paper first.

A journal is also a record, one that is not subject to the alteration and degradation that memory is prone to. John D. Perrine and James L. Patton call journals "Letters to the Future." (*Field Notes on Science & Nature*). The journal is not only a "letter" to the author's future self, who can access data or information—it is also a useful record for future generations of researchers.

For many field scientists and naturalists, a journal is also a meaningful place to write down the details of amazing experiences or to reflect on conversations and feelings. This leads to a personal connection with nature, in addition to developing a scientific approach to understanding how it works.

Effective Use of Student Journals at Outdoor Science Schools

Student field journal use is most effective when their process mirrors that of a professional naturalist. A scientist or naturalist will almost always have a purpose in mind when they begin a journal entry, but students lack the focus and experience to create that structure. Without structure, students will be overwhelmed and often won't know what to draw or how to organize information. It's the role of instructors to provide students with scaffolding so they can use journals effectively. The activities in this session were created to give students tools for obtaining and organizing information that resemble naturalists' approaches to journaling. They are sourced from the 2nd edition of *Opening the World Through Nature Journaling* by John Muir Laws and Emilie Lygren, which is a comprehensive resource that contains information about how to use journals to support meaningful learning experiences. The activities and much of the content in this session was generously shared by the authors, and the entire curriculum at *johnmuirlaws.com* is free to download. The 3rd edition, currently in process, will be available in 2016 and will contain new activities and even more information on journaling with students in a variety of settings.

In the world of outdoor science schools, many field instructors will not need to significantly alter their approach to successfully incorporate journaling into their teaching. Journaling supports science practices, such as observation, asking questions, and constructing explanations from evidence—and instructors can use journals when they are leading activities that incorporate any of these science practices. Ideally, instructors should integrate the learning students do while journaling into the rest of their lesson or field experience. If a group of students did *To Each Its Own* as a stand-alone activity, they would practice observational skills and deepen their connection to the natural world. However, even deeper learning is possible when an instructor matches the learning goals they have for students with journaling prompts. For example, an instructor who has an overall goal of students better understanding ideas around structure and function throughout the course of a field experience might use the journaling prompt

"Comparisons," which asks students to make comparisons between two similar organisms. This instructor could ask students to compare two tree species, to focus on how their structures are different from one another, and to write down tentative explanations for how those structures might function differently, and how their functions are related to their structures. This gives students the opportunity to engage with tangible, observable phenomena, and the learning students do in the process can be integrated into future discussions and activities.

Learning in this way relates to both the *Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science and other Technical Subjects*, and the *Next Generation Science Standards*. According to these documents, students must: "Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately," and "Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts."

As students journal, they gain exposure to all these skills, utilize other science practices, and engage with content. For more information about connecting journaling activities to the *Common Core State Standards* and the *Next Generation Science Standards*, see the 3rd edition of *Opening the World Through Nature Journaling,* available at johnmuirlaws.com in 2016.

Student journals should not be used solely for science instruction. A student journal can also be a place for personal reflection and creative expression. So much of student time at outdoor science schools is collaborative and social. A creative writing or reflective activity can enrich students' whole experience during a program because it will allow them to process their experience in writing. And if students write, they will remember—not just because they'll have a record of their thoughts, but also because they took the time to intentionally choose which thoughts were important to them in the moment.

Recommendations for Structuring Printed Student Journals

Students will feel more ownership over a journal if it contains mostly their thoughts and reflections. They will also be less likely to lose track of a journal if they care about the work within it. Printing journals takes time, money, and paper, so we should be judicious when creating student journals. Classroom-style worksheets or games can distract students from their surroundings. Pages that focus on content delivery take up space that could be filled with student thoughts and ideas. Offer mostly blank pages or pages with minimal structure that can be used in a variety of ways, such as grids, boxes, or lightly colored lines.

Many programs attempt to strike a balance between including resources like field guides or keys and having blank pages. Some instructors enjoy having field guides in journals because students can reference information easily on trail and are able to take home resources and information they might not have access to otherwise. The field guides can be simple and site- or region-specific. Other instructors prefer to keep field guide pages out of journals so the journal feels more personal and students get practice using real field guides as tools. Make a decision based on the goals of your staff and program.

There are some useful tools worth including in journals like rulers and formulas that help students use pace or arm length to make measurements. John Muir Laws (johnmuirlaws.com) has an index of these types of tools that can be printed or incorporated into a journal.

Barriers to Using Journals Effectively and Possible Solutions

Initially some students and instructors react negatively to journaling because they think it will be too much like school work. If students are just filling out a worksheet within a journal, this might be true. Overcome this barrier by providing blank pages in student journals and using activities that connect students to the environment. Student resistance to journaling can also come from poorly-worded journal prompts. Students can become bored or frustrated by prompts that tell them exactly what to write or directions that are so unfocused that students don't know where to start. Instructors can use focused journaling activities to ensure student success. Instructors can also

cultivate their own practice of nature journaling, which will help them to gain more confidence in helping students use journals as learning tools.

Students' varying comfort levels with drawing or writing can also cause issues when implementing journaling activities. Some students may feel that they are strong writers but are uncomfortable drawing, and vice versa. Reminding students that their observations and ideas are more important than how they are written or sketched helps take the pressure off. Other useful drawing and writing techniques and more ideas on how to encourage students to use journaling can also be found in *Opening the World Through Nature Journaling*— the *Tips for Naturalist Journaling with Students* handout has tips on leading journaling activities that are specific to outdoor science schools.

Instructors often share that it is difficult to make sure students have journals with them and easily accessible, because journals are often used at night or at other times within the program. If your program provides printed student journals, support your instructors and come up with a simple system to ensure that students will have their journals throughout field experiences. The simpler the system, the easier it is for instructors to integrate journaling into their teaching.

Another logistical barrier to using journals is weather. Many programs operate where there is frequent precipitation or cold temperatures (or both at once!), and instructors from such programs aren't sure when or if to journal with students in such conditions. Certain programs have found success through using materials from Rite in the Rain, a producer of waterproof paper. Other programs continue to use journals in cold and wet months by having students gather samples from the natural world- like leaves, small organisms, etc- and bringing them to an indoor space (or an area with a roof) for journaling. Instructors have also used the strategy of handing out index cards and golf pencils in environments like inter-tidal zones where materials often get a little wet. Later, students can paste the index cards into their journals.

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