

Native Plant Curriculum for Middle and High School Students

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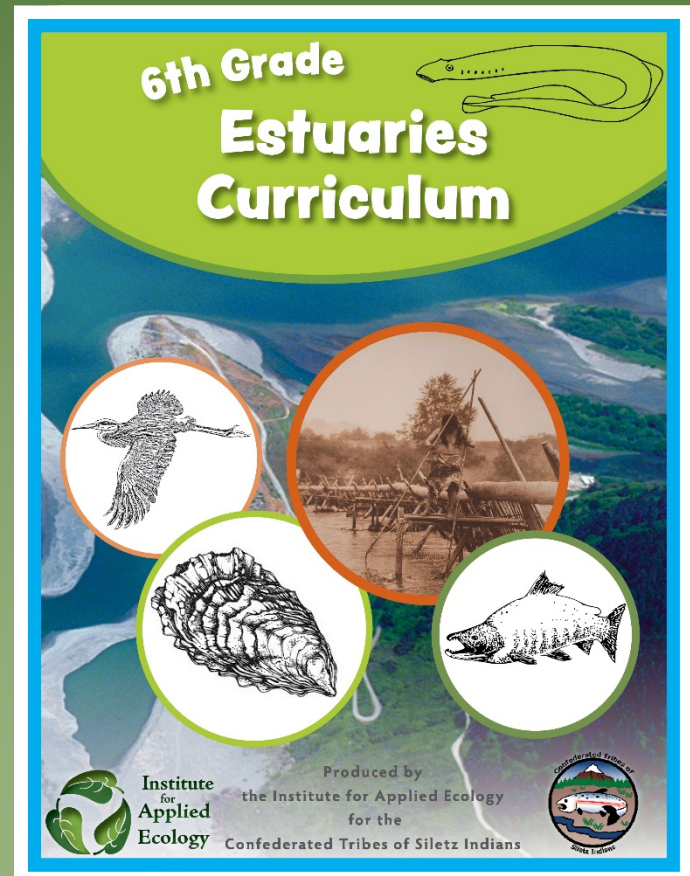
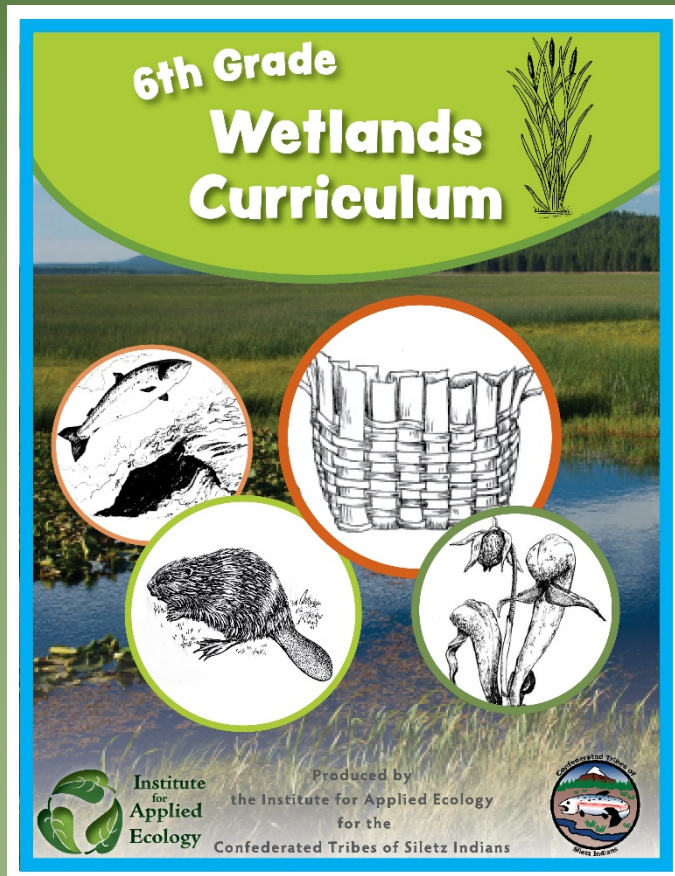
Institute for Applied Ecology

We are a non-profit organization
founded in 1999, with a mission to
conserve native ecosystems through
restoration, research and education.

6th grade Wetlands & Estuaries Curriculum



IAE produced two curriculum workbooks about the ecology & cultural uses of wetlands & estuaries in partnership with The Confederated Tribes of Siletz Indians (CTSI). These are available for free PDF download from the CTSI website:



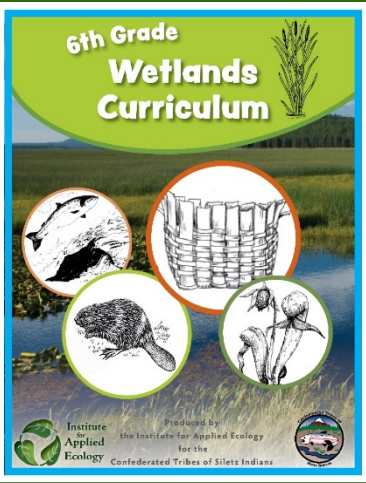


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Wetlands Ecology Lessons

- 1. What is a Wetland?** 1-9

Students learn what wetlands are, including their characteristics and the different types of wetlands: swamps, marshes, bogs, and fens. Students also learn some of the Dee-Ni vocabulary that pertains to wetlands.
- 2. Identifying Wetland Plants and Animals** 10-25

Students learn how to identify some of the common wetland plants and animals using natural items as well as wetland animal and plant cards to play various matching and guessing games.
- 3. My Pack Basket: How Wetland Plants are Used for Fiber** 26-34

Students learn how to identify some of the common wetland plants and animals using natural items as well as wetland animal and plant cards to play various matching and guessing games.
- 4. Ecosystem Services of Wetlands** 35-41

Students learn about the ways that wetlands filter water and reduce the risk of flooding by doing a science experiment using common kitchen items and natural materials.
- 5. Designing a Wetland Restoration Plan** 42-52

This lesson introduces the basics of wetland restoration through exploring restoration concepts, terminology, and methods. Learn about common restoration tools and weigh the trade-offs land managers juggle when planning a restoration project. You will work as part of a team using design principles to plan, budget, and market a restoration plan to the Siletz Tribal Council.



6th Grade
**Estuaries
Curriculum**



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Produced by the Institute for Applied Ecology for the Confederated Tribes of Siletz Indians

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Estuaries Ecology Lessons

- 1. What is an Estuary?** 1-9
Students define estuaries and identify their unique characteristics and types. Students learn select Dee-Ni vocabulary that pertains to estuaries.
- 2. Cultural Uses of Estuaries** 10-15
Students will learn about tidal fish weirs (traps) historically used by native people in Oregon's estuaries. Then they will design, build, and test a miniature model fishing weir.
- 3. Estuary Food Webs** 16-20
Students will build an estuary food web to examine the flow of food energy through the estuary ecosystem through role-playing different organisms.
- 4. Salmon Use of Estuaries** 21-28
In this lesson students will learn about the life stages of salmon and their migration from freshwater habitats to saltwater habitats and back. Students will illustrate how salmon regulate the salt concentration in their bodies, and how they use estuaries as important transition zones. Students will also simulate a salmon migration and encounter obstacles and benefits along the way.
- 5. Oyster Ecosystem Services and Restoration** 29-35
In activity #1 students learn how native Olympia Oysters filter water through an in-class experiment with live oysters in tanks. In activity #2 Students create an oyster reef restoration design.

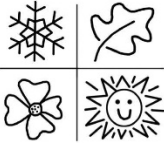




Wetlands Lesson 2

Time Estimate:

60-90 minutes



Best Season:
Any- Indoor classroom

Learning Objectives

- Differentiate between several species of wetland plants and animals.
- Be able to match pictures of wetland plants and animals with their corresponding names and descriptions.
- Describe how wetland plants and animals differ from non wetland plants and animals.

Next Generation Science Standards

This lesson meets the following 6th

Grade standards:

MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-2)

Identifying Wetland Plants and Animals

"We are all speaking to an unseen world, speaking for our Mother Earth, trying to stop our spiritual blindness. We speak for the animal kingdom for those in the waters, for the four-leggeds and the one-leggeds (trees) and the creepy crawlers. I pray our Creator hears us. The creatures have a right to be."

—Agnes Baker Pilgrim, Siletz Tribal Elder

Overview

Students learn how to identify some of the common wetland plants and animals using natural items as well as wetland animal and plant cards to play various matching and guessing games.

Preparation

- Collect the natural materials, and print out the cards beforehand. Print the cards on cardstock or laminate them.

Materials

- **"Wetland in a Bag" materials**- Here are examples of some of the natural items you can use for this activity. These items can be collected at a nearby wetland, park, your yard or borrowed from nature centers, OSU Extension Service, or US Fish and Wildlife offices.
 - * An opaque bag: this could be a pillowcase, paper grocery bag, or reusable tote bag.
 - * Blindfold or eye mask
 - * Cattail stalk and flower (the part that looks like a hot dog)
 - * Leaves- Cattail, Juncus, Skunk Cabbage, Yellow Pond Lily, Wapato, Tule, etc.
 - * Flowers- Skunk Cabbage, Yellow Pond Lily, or any other flowers you can find.
 - * Seeds or Roots- Wapato, Yellow Pond Lily, Skunk Cabbage, or other seeds.
 - * Twigs- Willow, Cranberry, Bog Huckleberry, Black Cottonwood
 - * Bird Feather
 - * Turtle Shell
 - * Fur- pelt, small piece, fake fur, or a stuffed specimen. Wetland mammals preferred.
 - * Tap water- in a small container
 - * Wetland Mud- in a small container or bag that can be opened to reach into.
 - * A toy frog, fish, insect, duck, turtle etc.
 - * Snake skin or toy snake
 - * Bird's nest (only one that has fallen from a tree)
 - * Egg Shells- from a chicken
- **Wetland Plant and Animal cards**- the print outs for these can be found at the end of this lesson plan. Print the cards preferably on cardstock paper or laminate them. There are several options for printing these cards, depending on which activities and games you would like to do with the students. Printing directions are listed with each game's directions.





Wetlands Lesson 2

Identifying Wetland Plants and Animals

Dee-Ni Vocabulary

Otter: Naa-ghaa-t'u'-ne	Cattail: Chaa-'ak-t'i
Frog: K'wee-lhin'-chu	Salamander: Tee-li~-ch'e'
Turtle: Ts'ee-nntelh	Willow: Gee-lish
Goose: Haa~-chu	Tule: Ch'uu-suth
Lamprey: Dvsh-xa~	Skunk Cabbage: Daa-chuu-se'e
Mink: Mvlh-yaa-'ishl-ghelh-ne	Beaver: Chii-nn'telh



Pacific Lamprey
Dvsh-xa~
Entosphenus tridentatus

Background Information

Wetlands are not only diverse in their types, but in their biology. There are an abundance of plants and animals that prefer, or can only live in wetlands. Many of these have been harvested and used for millenia by Native Americans for weaving, food, medicine, and clothing. The wetland plant and animal activity cards that are included in this lesson provide most of the background information needed for this lesson.

-The wetland **animal** cards list: **Name** (English, Dee- Ni, and Latin), **Length, Weight, Description, Consumes** (what it eats), **Makes** (if it alters the landscape, like a beaver dam), and **Human use** (includes known historic and cultural Native American uses).

-The wetland **plant** cards list: **Name** (Dee- Ni, English, and Latin), **Description** (general growth form and height), **Leaves** (size, shape, and color), **Flowers** (size, shape, color, and bloom time), **Habitat** (wetland type), and **Human use** (food, medicine, weaving, clothing, etc.)

Warm-up Activity: Wetland in a Bag

Start the lesson by grabbing the students' attention with this tactile activity. Use the list from the **Materials** section to prepare this activity ahead of time. Place the materials you were able to acquire inside the bag. Here are the activity procedures:

1. Call a volunteer to the front of the room, and then put a blindfold or eye mask on them. Tell the students that the blindfolded person will be guessing what the item is, but no one else should say what it is so the answer isn't given away.
2. Hold the bag of items open for the volunteer, and have them reach inside it to remove one object. Or you can reach into the bag to pick an item of your choice and place it in the student's hands. Have the student lift up the object so that the rest of the class can see it.
3. Ask the volunteer to use their senses of touch and smell to investigate the object. **Have them describe what they sense to the class using descriptive words.** Give them examples of descriptive words if need be: smooth, slimy, rough, slippery, soft, etc. Only after describing the object may they try to guess what it is. If they need extra help they can get hints from the teacher or the class.
4. Remove the blindfold or eye mask so the volunteer can see the object. Ask them questions like: Did you know what it was right away? If they guessed correctly: How did you know what it was? If they didn't guess it: Were you surprised when you found out what it really was?
5. Repeat the process for several more volunteers. Once an item is removed from the bag don't put it back in.
6. Activity debrief: Ask students to review all of the objects they felt in the bag. Which ones were plants? Which ones were animals? Ask the students why they think the objects in the bag belong in a wetland or not. Would any one of the objects also appear in a dry area? Why or why not?



Cattail

Dee-Ni: Chaa'ak-t'i
Typha latifolia

Description: 3- 8 ft (2.7 -7.3m) tall. Grows in large stands. The interlocking leaves are spongy inside.

Leaves: 0.4 -1 in (1- 2.5 cm) wide, grayish green, alternate, flat, long and narrow (somewhat grass-like).

Flowers: Cylindrical, brown "hot dog" shape on top of tall stalk. Blooms from late June through August. Sometimes called "Corn Dog Grass" or "Swamp Sausage." The light, fluffy, cotton like seeds are carried by the wind.

Habitat: Shallow, standing or slow-moving water of marshes, lagoons, sloughs, lakes, ponds and pools, and roadside ditches.

Human use: The roots are edible if growing in clean spaces, and the stems and leaves can be woven into mats, clothes, etc. Seed fluff used for stuffing pillows, mattresses, diapers, and fire starting.

Tule

Dee-Ni: Ch'uu-suthl
Scirpus lacustris

Description: 3- 8 ft (2.7 -7.3m) tall. Sometimes grows in large colonies. Grass-like. Stems are round, spongy inside, and taper from 1.18 in (3cm) at the base to 0.08 in (2mm) at the tip.

Leaves: Plant is mostly made up of stems, and has a few small leaves, which are sheath-like at the base of the stems.

Flowers: 0.31-0.59 in (8-15mm) long. Grow in clusters at the tips of the stems. Brown.

Habitat: Deep or shallow water, or in muddy or marshy ground around lakes, ponds, streams, and marshes.

Human use: Edible roots. Stems used widely for weaving mats, clothing, bags, bedding, hats, sandals, houses, and even boats.



Soft Rush

Dee-Ni: Baa-bvs
Juncus effusus

Description: 8- 40 in (20cm - 1m) tall. Grows in distinct clumps, like a bunch grass. The blades/stems of a rush are round, each pushing directly from the soil with no branching.

Leaves: Plant is mostly made up of stems, and has brown sheath-like leaves wrapped around the stems.

Flowers: Greenish to brownish cluster that looks like a continuation of the stem.

Habitat: Wet fields, pastures, tidal flats, shallow water at edges of ponds or lakes.

Human use: Used for weaving, sometimes mixed with cattails to weave cordage.

Willow

Dee-Ni: Gee-lish
Salix spp.

Description: 6- 40 ft (2 -12m) tall shrubs and trees.

Leaves: Oval to lance-shaped, broadest near tip; upper leaf surfaces are green, glossy, leaf undersides are waxy with dense, white, often rusty hairs; leaf edges occasionally have fine teeth; leaf stalks are 0.2 -0.4 in (5-10mm) long.

Flowers: In catkins on short stalks.



Habitat: Shrub swamps, moist woods and clearings, streambanks and lakeshores.

Human use: Mainly used for weaving baskets, fish nets, twine, and for building sweat lodges. Also used as a medicine similar to Aspirin.



Wapato
Dee-Ni: Gus
Sagittaria latifolia

Description: 8- 35 in (20 -89cm) tall. Leaves and flower stalk grow in tufts out of roots with potato-like tubers attached.

Leaves: Arrowhead-shaped. 10 in (25cm) long and 8 in (20cm) wide; sometimes submerged, but above water later in summer.

Flowers: White, 0.4 -0.8 in(1-2cm) across, 3 petals. Grow on a 8-19 in (20-48cm) tall stalk. Blooms from middle to late August.

Habitat: Easily established in mud at edges of marshes, lakes, ponds, and sloughs.

Human use: Historic widespread use of the starchy edible tuber, which was often baked.

Yellow Pond-Lily
Dee-Ni: Lhts~ chvslh-mvn dan'
Nuphar polysepalum

Description: Leaves floating on the surface of the water are attached by long (up to 8 ft or 2.4m) stalks to fleshy roots in the mud.

Leaves: Floating leaves are large 4- 16 in (10-40cm) long) but thin, broadly oval and heart-shaped, with deep notch at base where long leaf stalks attach.

Flowers: Yellow, large up to 4 in (10cm) across bowl-shaped, on stalks that usually extend well above surface of water.

Habitat: Ponds, lakes, slow-moving streams and deep freshwater marshes.

Human use: The roots have been used medicinally to treat tuberculosis. The seeds can be roasted like popcorn eaten.



Western Skunk Cabbage
Dee-Ni: Daa-chuu-se's
Lysichiton americanus

Description: 12- 59 in (30cm- 1.5m) tall. Flower stalks and large leaves emerge directly from ground

Leaves: Up to 5 ft (1.5m) long, and 1.6 ft (49cm) wide. Lance-shaped to oblong-oval, fleshy, thin.

Flowers: Yellow. Skunky smell. Up to 1 ft (30.5cm) long, round, corn cob looking spike covered in small flowers and surrounded by a large yellow petal-like bract. Blooms in early spring before the leaves appear.

Habitat: Swamps and marshes

Human use: The Roots were eaten as an emergency survival food, but have to be prepared in a certain way (do NOT try). Leaves can be rolled into a cone-shaped container for berry collection, or used in steam pit bakes.

Bog Cranberry
Dee-Ni: Chvslh-mvn dee-chi
Vaccinium oxycoccos

Description: 2 in (5cm) tall. Small, evergreen shrub that creeps low along the ground on slender vine like stems.

Leaves: 0.1-0.4 in (3-10mm) long, alternate, evergreen, leathery, sharp pointed, with edges rolled under. Dark green on top, grey-waxy below.

Flowers: Deep pink to red growing alone or in clusters at the ends of slender stems. Fruit is a red, juicy berry.

Habitat: Bogs and wet meadows half buried in moss.

Human use: Edible berries. Berries and bark have been used medicinally for nausea and urinary tract infections.



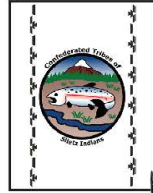
Wetlands Lesson 2

Identifying Wetland Plants and Animals

Teacher Directions, continued



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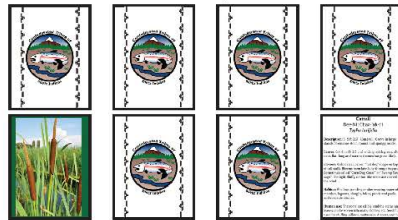
2.



• **Who am I?** For this activity you will need to print two different sets of cards:

1. One set of cards: one-side with a plant or animal picture, and "Siletz Tribes" logo on the other side.
2. A second set of cards: one-side with a plant or animal description, and "Siletz Tribes" on the other side.
 1. Hand out one card to each student, make sure that there is a picture card and a matching description card handed out to different students.
 2. The students have to find the card that matches theirs. For example, a person with the beaver picture card has to find the person with the beaver description card. The students cannot show each other their cards, but must describe them without using the name of the animal. Students will walk around the room asking other students about their cards and comparing them until they find a match.
 3. Once everyone has found their match the activity can be repeated by mixing up the cards and handing out different ones to everyone.

A:



B:



• **Memory Matching Card Game.** For this game there are two printing options:

Option A: print using the printing directions listed above for the "Who Am I?" game.

For this option students will match the picture card with its corresponding description card.

Option B: print **two** of each picture card with the "Siletz Tribes" logo on the other side. For this option the students will match duplicate pictures. Here are the directions for the matching memory game:

1. Mix cards up and lay them all face-down on a table in a grid pattern.
2. Youngest player goes first and turns two cards of their choosing over. If cards match, they take the cards and have another turn. If cards don't match put the card down in the same spot, and move to the next player. The player with the most cards at the end is the winner.
3. When all cards are matched, the player with the most sets of matching cards wins.



Wetlands Lesson 2

Identifying Wetland Plants and Animals

IN THE FIELD!



Take a set of the cards on a field trip to a wetland and use them to identify the plants and animals that the students encounter there. One activity option is to give a plant card to each student, or a small group and see if they can find that plant. Once most of the plants have been found, do a show-and-tell tour where each student or group teaches the other students about their plant and how to identify it.

SCIENCE INQUIRY

Students can go further into this subject by learning how to use plant and animal field guides (see those listed in the “Resources” section) to identify wetland organisms. Students can add to the deck of cards by making their own wetland plant and animal cards from photos or their own drawings and information they find in books and online. Another option is to have students make their own Wetland Plant and/or Animal field guide for a specific local wetland. These could be printed and shared with the community.



Reflection

How can you tell whether a plant is a wetland plant/animal vs. a non-wetland plant/animal? Research some of the adaptations that wetland plants and animals have. What are some non-native, invasive wetland plants and animals found in your area? What are other games or activities that you could do with the plant and animal cards?

Assessment

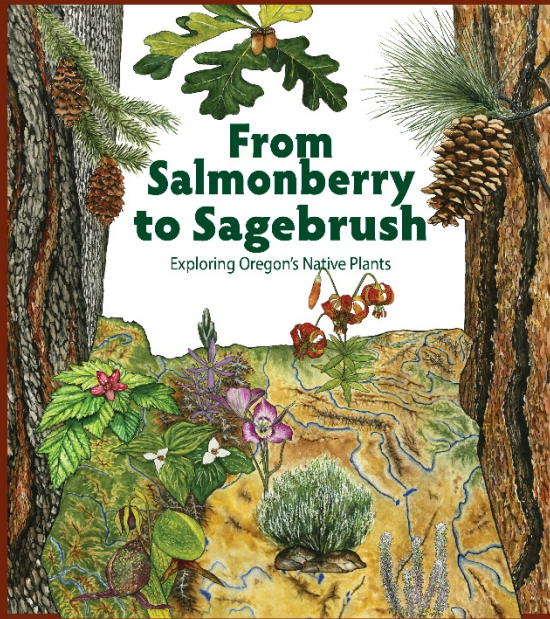


- 1 Identify two animals, and two plants using only the picture cards, or by matching a picture card to a description card.
- 2 List the characteristics for one wetland plant and one wetland animal.
- 3 Describe two characteristics that are different between a wetland plant/animal and a non-wetland plant/animal.

Resources

- ♦ *Project WET Curriculum and Activity Guide*. Project WET Foundation, 1995. www.projectwet.org
- ♦ Guard, B. Jennifer, et al. *Wetland Plants of Oregon & Washington*. Lone Pine Pub., 1995.
- ♦ Russo, Candace Banners., and Erin Rose. O'Neil. *A Guide to Oregon and Washington Wetland Wildlife: and Their Habitats*. Northwest Habitat Institute, 2007.
- ♦ Slattery, Britt Eckhardt. *Wow! The Wonders of Wetlands: an Educators Guide*. Environmental Concern Inc., 2003.

Institute for Applied Ecology (IAE) has produced three workbooks of high school native plant curriculum. These are available as free PDF downloads, or hard copy purchase on our website: <https://appliedeco.org/programs/education/about-project-botany/>



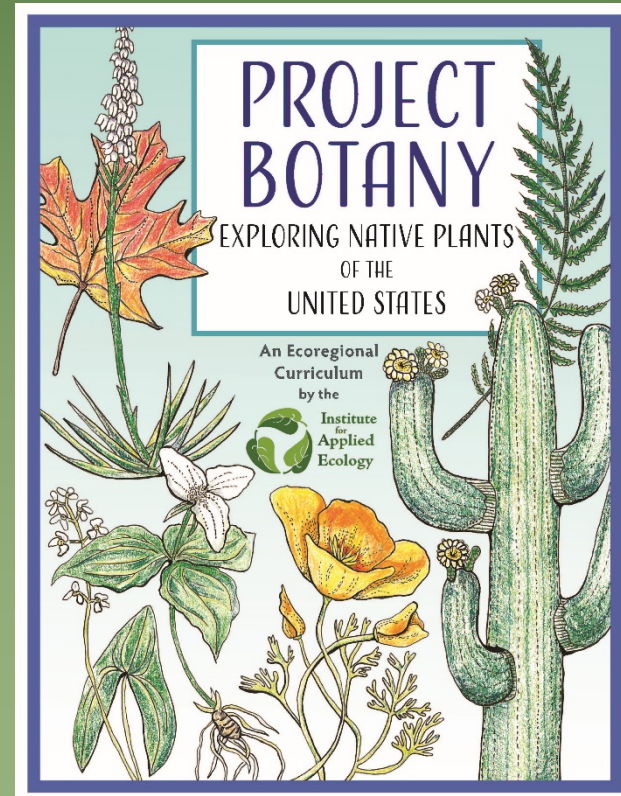
An ecoregional curriculum for grades 9-12



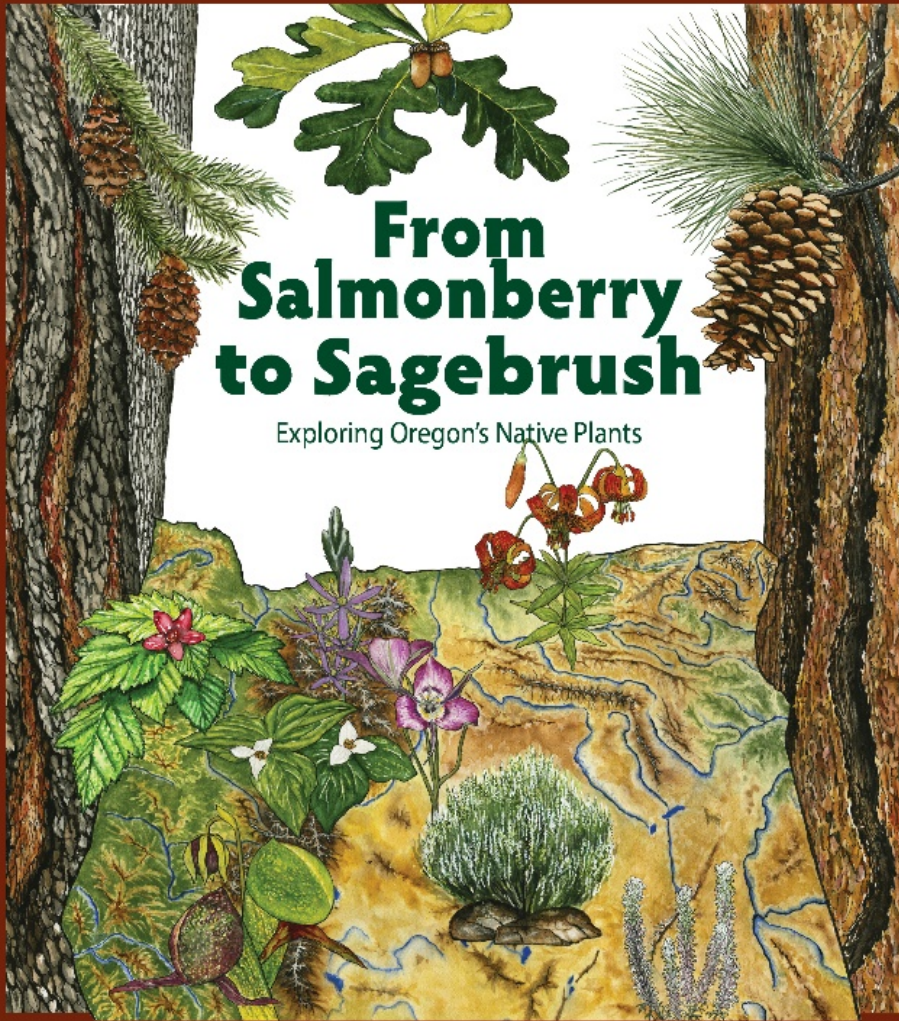
From Ponderosa to Prickly Pear

Exploring the
Native Plants
of New Mexico

An ecoregional
curriculum for
grades 9-12



The goal of this curriculum series is to introduce students to the wondrous biodiversity of flora, and the connections between plants and their ecosystems. These curricula are designed specifically for the native plants of each region and use the concept of ecoregions to build a sense of place.



An ecoregional curriculum for grades 9-12



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- Published in 2011, this is IAE's first curriculum workbook

- Designed specifically for Oregon's native plants and can be adapted to different ecoregions within the state

- The curriculum's lessons encourage students to study what is outside their door and to become informed and active citizens in local natural area issues and decisions in their future

- Oregon Education Standards correlated to the lessons

- Recommended botanical field guides for Oregon Ecoregions, schoolyard plant species lists and Oregon ethnobotanical plants and their uses, are found in the appendices



From Ponderosa to Prickly Pear

**Exploring the
Native Plants
of New Mexico**

**An ecoregional
curriculum for
grades 9-12**




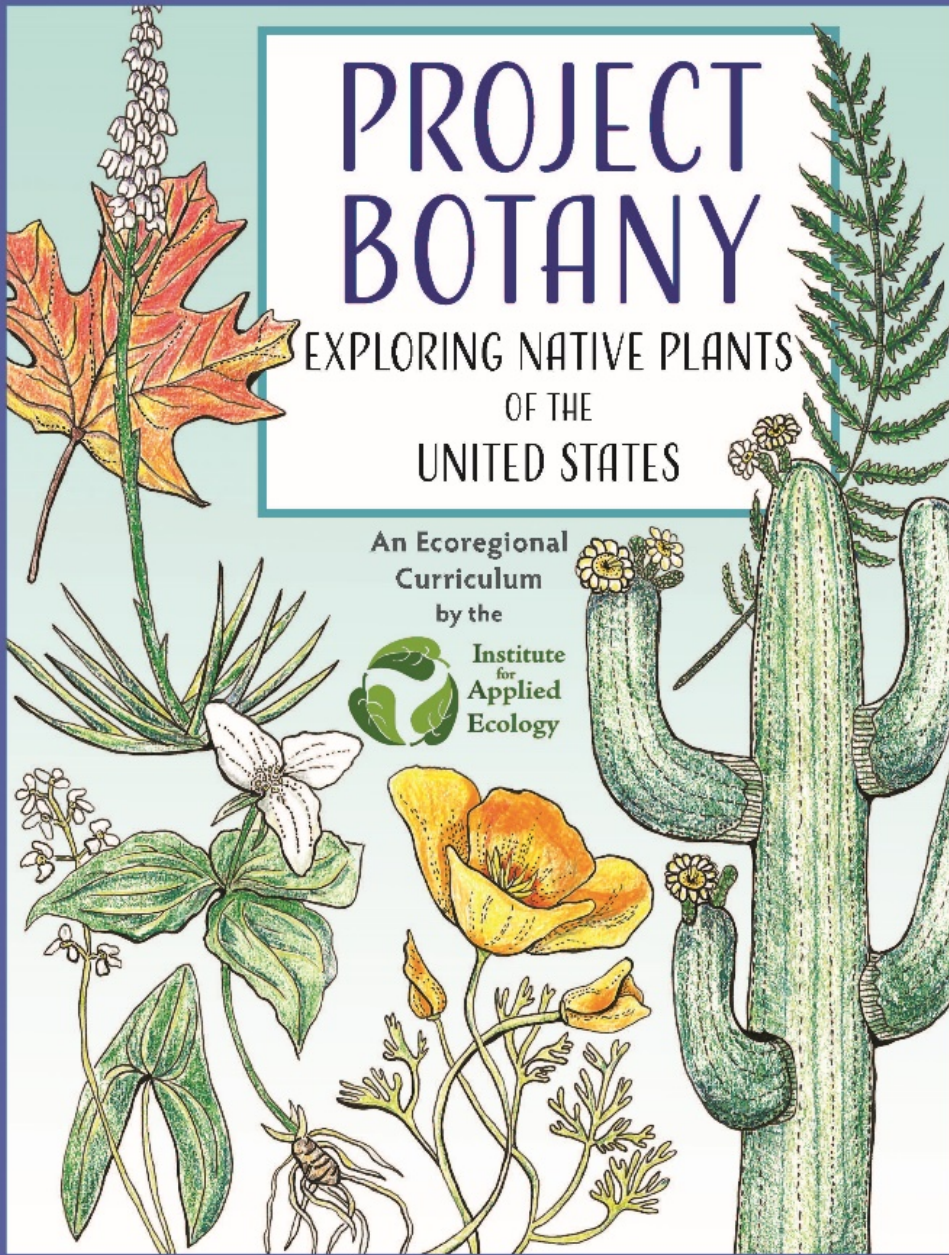
- Published in 2016, this is IAE's second curriculum workbook
- Adapted for New Mexico from the Oregon curriculum by staff from IAE's Southwest office in Santa Fe
- Lessons encourage students to explore what is outside their door and to journey through the flora, ecology, landscape management, and cultural plant relationships unique to New Mexico and the Southwest
- Made possible thanks to grant funding from the Native Plant Society of New Mexico



PROJECT BOTANY

EXPLORING NATIVE PLANTS
OF THE
UNITED STATES

An Ecoregional
Curriculum
by the
 Institute
for
Applied
Ecology



- IAE's third curriculum workbook
- Adapted from the Oregon and New Mexico curriculum books to be useable in every state
- Includes ecoregion maps and recommended field guides for each state
- This curriculum is intended to serve as a guide to study the native plants that define our local landscapes with the intention that students will gain a better understanding and appreciation of the place that they call home



Native Plant Curriculum Funding Partners



The Bureau of Land Management (BLM) gave support and funding for the vision and creation of the native plant curriculum from the local to national level.



National Fish and Wildlife Foundation (NFWF) Native Plant Conservation Initiative, funded the curriculum printing, teacher workshops, and developing a model to implement in other states.



The Native Plant Society of New Mexico (NPSNM) in addition to the BLM, provided funding for the curriculum workbook: *From Ponderosa to Prickly Pear: Exploring the Native Plants of New Mexico*.

Guiding Principles of Lesson Development

- Use the framework of the North American Association of Environmental Education (NAAEE) Guidelines for excellence in environmental education materials
- Place-based
- Hands-on, experiential, and inquiry-based learning
- Support service-learning goals and foster community partnerships
- Promote interdisciplinary learning
- Align with the Oregon Department of Education standards and Next Generation Science Standards (NGSS)



Curriculum Organization

Learning Progression with an Emphasis on Skill Building

Section Topics

- **Plant Identification** – framework of essential skills
- **Ecoregions** – exploring the diversity of the state
- **Ecology of Native Plants** – understanding relationships
- **Native, Non-native, & Invasive Plants** - how to tell the differences & impacts on ecosystems
- **Ethnobotany** – the plant/people connections
- **Climate Change and Phenology** – looking at the future & the roll of citizen science
- **The Future of Native Plants** –current issues



How Do I Adapt A Native Plant Curriculum To My Region?

1. Find a Knowledgeable Partner



2. Assemble an advisory council of experts

3. Adapt the general framework of lessons to meet your regional needs



4. Work with teachers



An Ecosystem Through An Artist's Eye

8th Western Native Plant Conference Presentation: **Native Plant Curriculum for Middle and High School Students.**
Presented by: Tyler Knapp, Ecological Education Coordinator, Institute for Applied Ecology. tyler@appliedeco.org
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An Ecosystem Through an Artist's Eye

Nature is painting for us, day after day, pictures of infinite beauty.

—John Ruskin (1819-1900)

Time Estimate:

1–1.5 hours



Best Season:

Any, repeat in all seasons



Learning Objectives

- Practice observation skills on multiple scales
- Translate observations to paper through illustration
- Interpret and compare multiple views of the same landscape
- Encourage flexible thinking skills

Materials Needed

- 5" x 7" viewing frame from photo mat board, cardboard or poster board
- pencil or pen
- hand lens or magnifying glass
- optional colored pencils

Vocabulary Words

- abiotic
- landscape
- macro
- microscopic
- perspective
- ecosystem
- perspective

Overview

Students will use drawings to understand the different perspectives gained from making observations on different ecological scales. Students will focus on the local habitat by drawing three different views, one landscape view, one smaller scale view, and one magnified close-up view. This activity encourages aesthetic appreciation for the local landscape while exercising flexible thinking skills and hand-eye coordination.

Background Information

By making observations on three different scales, a macro or landscape view, a close-up view, and a microscopic view, you can observe patterns in nature from many perspectives. A nimble mind that can make observations on multiple scales and from many perspectives will be able to approach complex problems with greater ease.

As we observe the form of the landscape at different ecological scales, we can contemplate the functioning or processes that occur at those different levels to make our ecosystems function as a whole.

For example, at the landscape scale, we might observe patterns related to processes such as climate, nutrient and water cycling, and soil formation. At a human scale, we can examine wildlife habitat, erosion, herbivory, and many other functions. On a microscopic scale, we can focus on photosynthesis, pollination, and decomposition.

As you observe patterns in each of the three scales, you will also observe the work of the natural processes that occur at these scales. At the landscape

scale, larger patterns and processes are at work. Look for patterns in the vegetation and ponder the environmental factors such as climate, soil type, geology, landforms, and water that create the patterns you see in your frame. In the close-up view, do you see plants growing in clusters or individually, do you have different layers of plants (ground level and canopy)? What kind of colors, textures, and contrasts do you see? Can you see things moving (such as insects) in your view? In the microscopic view, look very closely at one part of one plant (such as the underside of the leaf). Look for patterns and textures, colors and contrasts. Think about what types of processes might create the patterns you see.

When looking at patterns within a landscape, be aware of large scale abiotic patterns creating what you see, and also notice the micro-abiotic factors that create patterns. Looking for these small scale patterns can explain why a certain plant grows in one place but is absent from a similar looking area just meters away.

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An Ecosystem Through an Artist's Eye

Background Information *continued*

Look for patterns and textures, colors and contrasts. Think about what types of processes might create the patterns you see. What patterns and processes might you find at all three scales?

Patterns we observe in vegetation can be directly linked to abiotic factors of the ecosystem, be it on a macro or microscopic scale. In this activity, focus on the abiotic factors you see at a human scale. For example, with a large rock or boulder in a meadow, we might ask how does this rock affect the plants that grow in the meadow? Plants growing close to the rock could take advantage of

differences in microclimate, such as moisture trapped by the shade on the north side, additional heat stored in the rock to keep the plant warm through the night, shade on the roots, cooler morning sun/afternoon shade (or the opposite). If the rock is located on a slope, the rock could channel water towards or away from certain areas. The rock could provide relief from harsh winds. The warmth and protection of the rock could be a benefit to insects. All of these changes could be taking place in the space of a couple meters. What other abiotic factors could affect plants growing nearby (examples: slope, soil type, light, water, wind, temperature variances)?

Directions

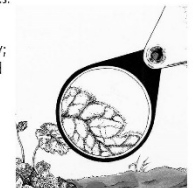
- Discuss what things you might notice in a landscape or macro view. Looking clear to the horizon, close your eyes and listen to your teacher read an inspiring quote from literature. Imagine how the scene must have looked to the writer.
- Spread out. Look through your viewing frame at arm's length, select a spot, and draw the landscape view you see in your frame on your paper. Take your time to observe before beginning. Look for and include in your drawing patterns of color, texture and contrast. Regroup and share your drawings and feelings while looking at the landscape.
- Discuss the process at work in a close-up view and listen to your teacher read a quote. Now select a spot to observe and draw the detail of your landscape close-up. Use your viewing frame to look at an area at your feet and draw what you see. Look for details, differences in size, color, shapes. Regroup and share your drawings and feelings while making observations at the close-up scale.
- In the microscopic view, pick one plant to look at in greater detail. Isolate an area of the plant by looking through a hand lens and explore in close detail what you see. Fill your drawing frame

with what you see in the hand lens. Pay particular attention to patterns, textures, and colors as you draw. Look at your subject, then take a minute to draw, and then look again. Repeat this process until you have sufficient detail. Fill your entire frame with what you see! Regroup and share. Did this view turn up any surprises? What processes are at work to create what you see at this scale?

- Return to the same location and repeat this exercise during each season and look for changes throughout the year.

Assessments

- Summarize the activity by comparing and contrasting views, and discussing the processes associated with different ecological scales.
- Participate in the activity; work independently and join discussions.



This lesson is an excerpt from IAE's curriculum book for grades 9-12 titled "From Salmonberry to Sagebrush: Exploring Oregon's Native Plants." Purchase here: <https://appliedeco.org/product/native-plant-curriculum/>

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Oregon white oak savanna: landscape view



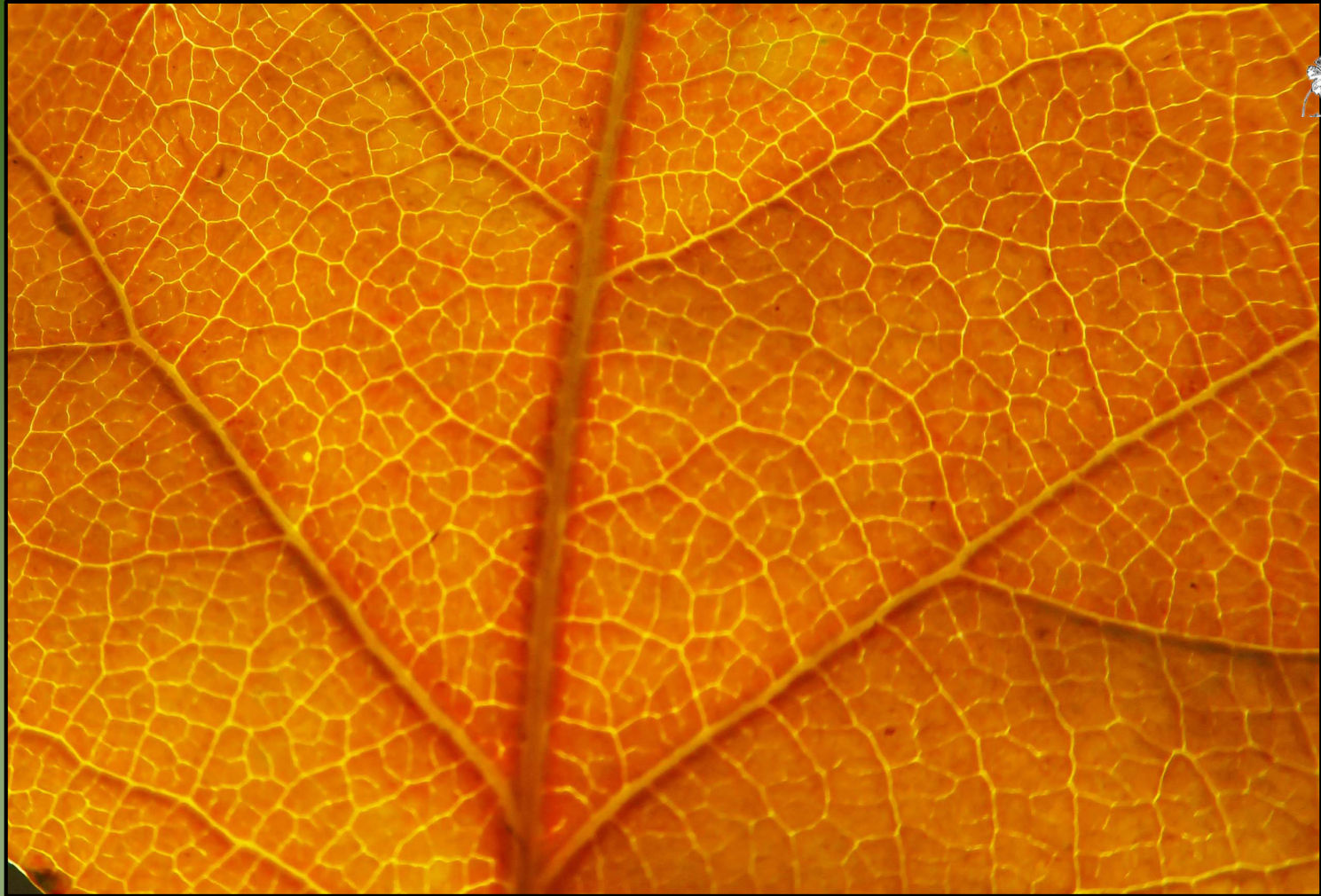
Take your time to observe before beginning to draw this landscape. Look for and include in your drawing patterns of color, texture and contrast.
Label your drawing with one observation from this landscape

Oregon white oak *Quercus garryana* close-up view

Draw one of these close-up photos.
Look for details, differences in size, color, texture, and shapes.
Label your drawing with one observation.



Oregon white oak *Quercus garryana* leaf: microscopic view



Explore in close detail what you see. Pay particular attention to patterns, textures, and colors as you draw. Look at the leaf, then take a minute to draw, and then look again. Repeat this process until you have sufficient detail.

Label your drawing with one observation from your microscopic view

Lesson reflections:

- How can color, texture, and contrast help you understand an ecosystem?
- What abiotic factors could affect plants growing nearby?
- How can you use both biotic and abiotic features of the landscape to help you understand the ecosystem?
- Use one of your drawings as the basis of a journal entry. Describe in detail what you have experienced with your senses.





“Progress does not have to be patented to be worthwhile. Progress can also be measured by our interactions with nature and its preservation. Can we teach children to look at a flower and see all the things it represents: beauty, the health of an ecosystem, and the potential for healing? ”

— Richard Louv, Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder

Thanks

Teachers and Students for Exploring the Places They Call Home

Partners: Oregon Bureau of Land Management
National Fish and Wildlife Foundation
Oregon Natural Resource Education Program
Confederated Tribes of Siletz Indians
Native Plant Society of New Mexico

