Exploring the Outdoors with Aldo Leopold

An outdoor activities guide for educators
LEP: Exploring the Outdoors with Aldo Leopold
was developed by

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This activities guide was developed for the Leopold Education Project.

All activities relate to the writings of Aldo Leopold in *A Sand County Almanac*.

Page numbers of quotes from *A Sand County Almanac* refer to the paperback edition, copyright 1949 by Oxford University Press, Inc. (Copies available for purchase from the Aldo Leopold Foundation)

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The Leopold Education Project is administered by the Aldo Leopold Foundation. Please visit our website or contact us for more information
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Each of the activities in this new publication offer great lessons, appropriate, important and worthy of being taught at interpretive sites. It will be a great resource for new interpreters looking for new ideas, and for veteran interpreters looking for fresh ideas. When interpreters work with more formal and structured groups like home school programs, class field trips, or school visits, these activities will be used just as interpreters use the current “Projects” now. The link to the writings of Aldo Leopold adds depth and substance that other programs lack. Here are some of the strengths of these activities:

- I was impressed with the thematic statements for each lesson. Thematic interpretation is now the norm among professional interpreters. This feature will be useful and welcome.
- This project is user-friendly with the sidebar that is well organized, detailed and contains succinct information about the activity.
- The subject matter as reflected in the themes is appropriate for interpreters and will fit at most interpretive sites.
- The supplemental information at the end is excellent.
- All of the activities can be done outdoors; many are multi-sensory, appeal to different learning styles and apply various questioning strategies. These attributes are excellent for non-formal audiences.
- Many activities were developed in light of interpretive principles and apply to the Principles of Interpretation.
- The use of tangibles and intangibles is great and is an important concept being applied in interpretation today.
- The use of quotes for each activity is wonderful — very interpretive. Interpreters love quotes to spice up a program or eloquently drive home a point.

NOTE: Ted T. Cable is Assistant Department Head and Professor of Park Management and Conservation at Kansas State University. Dr. Cable has consulted on conservation projects in more than 20 states and has worked extensively in Canada, Latin America and Africa. He has published widely in the fields of human dimensions of natural resource management, ecotourism and environmental interpretation. He has authored or coauthored five books and more than 150 articles on conservation-related topics. The LEP Activities Guide Writing Team asked Dr. Cable to initially review the new activities. These are excerpts of some of his comments. Areas he thought needed improvement were addressed in the final draft. For more information, check out Interpretation for the 21st Century: Fifteen Guiding Principles for Interpreting Nature and Culture (Second Edition) by Larry Beck and Ted Cable.
About Aldo Leopold

Considered the father of wildlife management, Aldo Leopold was a conservationist, forester, teacher, family man, writer, philosopher and outdoor enthusiast. Leopold’s legacy lives on in his students, his children and those who have been touched by his writings.

Born to Carl Leopold and Clara Starker Leopold in 1887, Rand Aldo Leopold, known as Aldo, was raised on the bluffs of the Mississippi River in Burlington, Iowa. He was the eldest of four children — two brothers and a sister. As a young student, Leopold was average. His interest was in the natural world, first in ornithology and later in botany. He spent many hours afield observing, journaling and sketching. He attended Lawrenceville Preparatory School and later went on to Yale.

Upon graduation from the Sheffield Scientific School and then the Forestry School at Yale with a master’s degree, Leopold accepted a position with the newly established U.S. Forest Service and was assigned to the Southwest. The New Mexico Territory provided Leopold with an ideal setting in which to begin the evolution of his thoughts on land use, game management and aesthetics. While in Santa Fe, Leopold met and married Maria Alvira Estella Bergere, a schoolteacher of Spanish/Italian descent who came from a wealthy ranching legacy. They had five children — three boys and two girls.

After much deliberation, Leopold accepted a transfer with the Forest Service to be the assistant director of the Forest Products Laboratory in Wisconsin. His interest in game management continued to grow. He soon became widely accepted as an authority in the field, and he was offered the opportunity to conduct a national game survey for the sporting ammunitions industry. Upon completion of his research, Leopold wrote Game Management and was later offered a position with the Department of Agricultural Economics at the University of Wisconsin, Madison. It was here that he became the nation’s first chair of game management.

Leopold was also one of the nation’s first university instructors in this pioneering field. “The Professor,” as he was called fondly by his students, had one main objective as an educator: “To teach the student to see the land, to understand what he sees, and enjoy what he understands.”

In the spring of 1935, Aldo and his family purchased an abandoned farm on the Wisconsin River. The original property was 80 (expanded over time into 120) acres with only a run-down chicken coop on the site. They cleaned out the manure in the chicken coop and turned it into the “shack.” The property served as a land laboratory for the family (as well as for his graduate students). They went to work to restore the property to its original health. It was the time Leopold spent on the shack property that inspired the essays in A Sand County Almanac, where he articulated his land ethic. Two weeks prior to his death, he learned that his essays would be published.

On April 2, 1948, Leopold died of a heart attack on his neighbor’s farm while helping to fight a grass fire that threatened the Leopold property. The shack still stands today and the property has become a land management reserve.
**ACTIVITY FORMAT KEY**

**OVERVIEW & OBJECTIVES:** Describes what participants will learn and do. Also introduces a concept from Leopold’s writing.  
*Note:* Activities may be adjusted to fit the instructor’s needs.

**BACKGROUND:** Information to help the educator implement the activity and understand more about the essay.

**PACKING LIST:** Lists suggested materials needed to facilitate the activity.

**PREPARATION:** Things to do to prepare for the activity before participants arrive.

**PROCEDURE CARDS:**
- **ORIENTATION CARD:** Introduces the activity.
- **ACTIVITY CARDS:** Hands-on choices to implement concept. Use one or more as needed.
- **WRAP-UP CARD:** Concludes the activity.
- **RESTATEMENT OF THEME/WHAT PART DO I PLAY? CARD:** Ties activity back to Leopold’s writing, and provides a “real world” application to provoke thought and/or action.  
*Note:* Many activities also incorporate participant worksheets to reproduce and take into the field.

**GLOSSARY WORDS:** Words printed in **orange** are defined in the Glossary at the back of the Activities Guide.
LOOK, SEE AND DISCOVER!

TARGET AUDIENCE:
Mixed groups, families, ages pre-K – adult

SUGGESTED TIME:
(preparation time not included)
Take a Closer Look: 30 – 45 minutes
Making Seed Balls: 30 minutes

ESSAY FROM A SAND COUNTY ALMANAC:
“Draba” p. 26

KEY QUOTE:
“He who searches for spring with his knees in the mud, finds it in abundance.” — Aldo Leopold, p. 26

PROJECT CONNECTIONS:
WET
• The Life Box
• Life in the Fast Lane
• Wetland Soils in Living Color

WILD
• Seed Need
• Who Fits Here
• Eco Enrichers
• Fire Ecologies

WILD AQUATIC
• Marsh Market

FLYING WILD
• Bird Action

SCIENCE & CIVICS
• Layering the Soil
• A Place for Everything

PLT
• Have Seeds Will Travel
• Field, Forest & Stream
• Tree Life Cycle
• Soil Stories
• Rain Reasons
• The Forest of S.T. Shrew
• Every Tree for Itself

THEME: You have to look to see! By focusing on a smaller area, you can hone your observation skills and learn to see more around you.

OVERVIEW & OBJECTIVES:
In his essay “Draba,” Aldo Leopold draws attention to the tiniest of spring flowers that can only be discovered by someone who gets on hands and knees and searches for it. In Take a Closer Look, participants will hone their observation skills by exploring an outdoor area, listing what they see, then comparing their list to others. In Making Seed Balls, participants will also make seed balls that they can take home and observe as they grow.

BACKGROUND:
In Leopold’s very short essay “Draba,” he encourages the reader to take time to look for and appreciate the importance of even the smallest of plants. There are things in any environment that are essential parts of the habitat but are easy to ignore due to their size or relative insignificance. Leopold always stressed that everything in the environment had a purpose. He describes Draba as “it is no spring flower, but only a postscript to a hope.”

There are many species of Draba, all members of the mustard family (Brassicaceae). Draba reptans, also commonly known as spring Draba or whitlow grass, is found throughout most of the United States. It is an annual that starts its growth in early spring, flowering as early as February or March. Often considered a weed, this plant seldom grows to more than four or five inches tall. The leaves form at the base of the plant; leaves and stems are covered in tiny branched hairs. Spring Draba has tiny white flowers with four notched petals. From these flowers develop flattened, paper-like seed pods. Leopold writes, “Sand too poor and sun too weak for bigger, better blooms are good enough for Draba.” In order to survive, Draba has adapted to marginal habitat — areas that are less favorable for other plants. It has also adapted to blooming earlier in the spring when competition for resources is low.
PACKING LIST:
Take a Closer Look:
• A Sand County ALMANAC
• Plant guides (optional)
• Clipboards, writing or drawing materials (one set per group)
• Hula hoops or rope that can be tied in a circle (one per group)
• String 2-feet long (one per group)

Making Seed Balls:
• Pictures of local wildflower plants (can be seed packets)
• Components to make balls:
  • 3 parts soil humus or compost (available from gardening stores)
  • 5 parts dry red clay (available from potter’s supply — also called terra cotta clay)
  • 1 – 2 parts water
  • 1 part mixed wildflower and/or native grass seed (available at many garden stores, on-line or from Pheasants Forever local chapter — make sure to use native seeds for your area)
• Bucket and mixing tools
• Plastic baggies or plastic wrap to store seed balls (one per participant)

PREPARATION:
• Read the essay “Draba” (p. 26 in A Sand County ALMANAC).
• Choose an area large enough for the group you are expecting to explore individually or in small groups.
• Mark areas to be explored with hula hoops or rope.
• Assemble materials needed for the activity.
• Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
LOOK, SEE AND DISCOVER  
ORIENTATION CARD

Read aloud the essay “Draba” on page 26 of *A Sand County ALMANAC*. (Paraphrase as needed.)

Ask participants as many questions as you want:

- What do you think is the difference between looking at something and really seeing something? How do you feel when you discover something you haven’t seen before?
- Very quickly take a look around and describe some of the things you see.
  - What do you notice about the things mentioned?
  - What do they have in common?
  - Why did you notice them first?
- How do you think we can become better observers of nature?
- Look around you, it is now (season). How do you think this area will look in (season)? Why do you think we might see those changes?
- What do you think Leopold meant in describing Draba as “it is no spring flower, but only a postscript to a hope”?

LOOK, SEE AND DISCOVER  
TAKE A CLOSER LOOK CARD

Take participants outdoors to a natural area.

- Divide participants into small groups of about three or family groups and have them choose an area that has been marked with hula hoops or ropes (one group per area), and hand out string (one 2-foot piece per group).
- Ask participants to write down or draw what they see inside of the hula hoop or rope circle. Have them make note of the smallest and the largest plants they see.
- Have participants tie the ends of their string together and lay it down within the circle. Ask them to get very close and really look at what they see in the smaller circle and describe/draw their observations. Allow about 10 – 15 minutes depending on how involved the groups are.
Create a seed ball to plant and observe later:

- Ask participants what it takes to make mud.
- Ask them what seeds need to germinate.
- Have everyone help make the seed balls.
  - 3 parts - soil humus or compost
  - 5 parts - dry red clay
  - 1 – 2 parts - water
  - 1 part - mixed wildflower and/or native grass seed
- Mix ingredients in a bucket or other container.
- Pinch off marble sized pieces and roll into balls. Give to participants to take home in a plastic bag.
- Have them write on a piece of paper to take the balls out of the plastic bag and dry for 24 – 48 hours (put instructions with balls as a reminder).
- Store balls until time to spread outside.
- Give instructions on how to water and care for plants.

Take a Closer Look:

- Bring participants back together and share what each group has observed.
- Did anyone discover something new or something they’ve never seen?
- What was the smallest plant? The largest?

Making Seed Balls:

- Show participants pictures of the plants that will grow from their seed balls.
- Emphasize that they are responsible for helping their plants grow and watching them as they grow.
Read aloud or paraphrase:

“He who searches for spring with his knees in the mud, finds it in abundance.”
– Aldo Leopold, A Sand County ALMANAC, p. 26

• How will you look at nature after today?
• What new discoveries can you make if you look closely and really see?
HABITAT HIGH-RISE

TARGET AUDIENCE:
Ages pre-K – 10, families

SUGGESTED TIME:
(preparation time not included)
60 minutes

ESSAY FROM A SAND COUNTY ALMANAC:
“Home Range”
p. 78 – 81

KEY QUOTE:
“The wild things that live on my farm are reluctant to tell me, in so many words, how much of my township is included in the daily or nightly beat. I am curious about this, for it gives me the ratio between the size of their universe and the size of mine…”
—Aldo Leopold, p. 78

THEME: By closely observing an animal’s home, you can discover how they live and what they do.

OVERVIEW & OBJECTIVES:
In his essay “Home Range,” Leopold describes what he learned by watching animals in their home environment, and interprets the evidence they left behind. In this activity, participants will investigate a habitat area to discover and translate clues of animals’ activities.

BACKGROUND:
Leopold observed wildlife and investigated the extent of their daily travels including the search for food, water and shelter. If one looks at different vertical levels in the habitat, clues to the animals’ activities are often revealed — for example, the grouse’s prior presence and food preferences are observed in debris left behind; the rabbit may race to an underground safe haven below the woodpile. Leopold states, “Like people, my animals frequently disclose by their actions what they decline to divulge in words.”

Scientists call the area or range in which an animal lives out its life as the animal’s “home range.” Some animals require a very small home range. For example, a shrew may live in an area no larger than a quarter acre. Everything it needs including food, water, a home, a mate and space to raise its young can be found there. In comparison, a grizzly bear may cover more than a hundred square miles in its lifetime to find all of the things it needs to survive and raise young.

Many different types of animals can share a home range. By taking a closer look at an area where animals live, we can begin to see the evidence that shows us how they use their home range. A way to really look at what nature shows us is to take a closer look at where the animals live.

This activity will divide a habitat into levels like an apartment building with a basement, ground floor, middle floors and top floor. The chart gives examples of what can be found at different levels.

PROJECT CONNECTIONS:
WONDERS OF WETLANDS
• Run for the Border
• People of the Bog
• Over Hill and Dale

WILD
• Which Niche
• Urban Nature Search
• Shrinking Habitat
• Learning to Look, Looking to See

WILD AQUATIC
• Sockeye Scents
• Micro Odyssey
• Designing a Habitat

FLYING WILD
• Create Your Own Food Web
• Food Chain Tag

PLT
• The Forest of S.T. Shrew
• Soil Stories
**LEVEL** | **EXAMPLES**
--- | ---
**Basement**  
(below your feet)  
Soil, mud, sand, rock, water | Crawling insects, reptiles, amphibians, small mammals, tracks, burrows, tunnels, trails, signs of feeding, buried nuts, root systems  
Look under rocks and logs to find even more!
**Ground floor**  
(between your feet and knees)  
Leaf litter, small plants, plant stems, water | Reptiles, amphibians, ground-nesting birds and their nests, small mammals, feathers, fur, scat, owl pellets, molts, insects, spiders and their webs, signs of feeding, bones, antlers, fish, seeds, fungi, lichens, moss, above-ground roots
**Middle floors**  
(from the level of your knees to your head)  
Plant stems, tree trunks, shrubs, cacti, wildflowers | Flying insects, birds, amphibians, insects, mammals, spiders and their webs, bats, deer rub or browse marks, tree cavities, chewed plants, nests, insect molts, fungus, lichen, moss, feathers, fur, molts, galls
**Top floor**  
(above your head)  
Tree canopy, tree trunks, open sky, rock formations or soil banks | Seeds, pine cones, birds, nests, insects, spiders, mammals, bats, galls, water, lichens, moss, leaves

**PACKING LIST:**
- A *Sand County ALMANAC*
- Discovery tools: shovels, hand lenses, trowels, binoculars, etc.
- Field guides (see Appendix for recommended guides)
- Clipboards, pencils and copies of HABITAT HIGH-RISE DISCOVERY SHEET
- Flip charts, markers

**PREPARATION:**
- Read the essay “Home Range” (p. 78 – 81 in *A Sand County ALMANAC*).
- Scout a nature trail or other outdoor area with several habitat areas.
- Make copies of the HABITAT HIGH-RISE DISCOVERY SHEETS.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Once outdoors, ask participants:

- What is a home range? Define if needed. (See Background.)
- What is your personal home range? Do you share part of it with others?
- What is a habitat? (A place where an animal finds food, water, shelter and space)
- How would you describe this place where we are? (forest, grassland, mountainside, desert, wetland, etc.)
- What animals do you think might live here?
- Will we see all of the animals that live here? How else might we know what lives here?
- Predict how many different home ranges we will find.

Think of habitat as an apartment building. Envision this habitat as an apartment building with four floors:

- Basement (under your feet)
- Ground floor (from your feet to your knees)
- Middle floor (from your knees to your head)
- Top floor (above your head)

Divide participants into groups and distribute HABITAT HIGH-RISE DISCOVERY SHEETS, along with pencils and clipboards to each group. Give each group a defined area and a set time to explore and fill out their discovery sheets.
Bring groups back together in the area. Have a flip chart for recording.

Ask each group to share one thing they observed:

- Describe the clues you found that suggested an animal was on one of the floors of your habitat high-rise.
- List on flip chart the animals found at each floor.
- By evidence found, who shares this area as part of their home range?

---

Read aloud the quote below or paraphrase as needed:

“The wild things that live on my farm are reluctant to tell me, in so many words, how much of my township is included in the daily or nightly beat. I am curious about this, for it gives me the ratio between the size of their universe and the size of mine…”

– Aldo Leopold, A Sand County ALMANAC, p. 78

Ask participants:

- Would someone in the future be able to determine how you live by the evidence you are leaving behind?
- What evidence would be left that would most tell how you lived?
### BASEMENT • below your feet

What did you observe? List or draw.

<table>
<thead>
<tr>
<th>I/we saw:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I/we heard:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I/we touched:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I/we smelled:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Describe how you would feel if you lived here.
## HABITAT HIGH-RISE DISCOVERY SHEET

### GROUND FLOOR • between your feet and knees

What did you observe? List or draw.

<table>
<thead>
<tr>
<th align="left">I/we saw:</th>
</tr>
</thead>
<tbody>
<tr>
<td align="left"></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th align="left">I/we heard:</th>
</tr>
</thead>
<tbody>
<tr>
<td align="left"></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th align="left">I/we touched:</th>
</tr>
</thead>
<tbody>
<tr>
<td align="left"></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th align="left">I/we smelled:</th>
</tr>
</thead>
<tbody>
<tr>
<td align="left"></td>
</tr>
</tbody>
</table>

Describe how you would feel if you lived here.
<table>
<thead>
<tr>
<th>What did you observe? List or draw.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/we saw:</td>
</tr>
<tr>
<td>I/we heard:</td>
</tr>
<tr>
<td>I/we touched:</td>
</tr>
<tr>
<td>I/we smelled:</td>
</tr>
</tbody>
</table>

Describe how you would feel if you lived here.
# HABITAT HIGH-RISE DISCOVERY SHEET

**TOP FLOOR • above your head**

What did you observe? List or draw.

<table>
<thead>
<tr>
<th>I/we saw:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/we heard:</td>
</tr>
<tr>
<td>I/we touched:</td>
</tr>
<tr>
<td>I/we smelled:</td>
</tr>
</tbody>
</table>

Describe how you would feel if you lived here.
TARGET AUDIENCE:
Ages 10 – adult, families

SUGGESTED TIME:
(preparation time not included)
60 – 90 minutes

ESSAY FROM
A SAND COUNTY
ALMANAC:
“Prairie Birthday”
p. 44 – 50

KEY QUOTE:
“What a thousand acres
of Silphiums looked like
when they tickled the
bellies of the buffalo is a
question never again to
be answered, and per-
haps not even asked.”
—Aldo Leopold, p. 45

PROJECT
CONNECTIONS:
WET
• Thirsty Plants
• Stream Sense

WONDERS OF
WETLANDS
• Wetland Weirdos
• Wetland Wheel
• Marsh Market
• Life in the Fast Lane

WILD
• Drawing on Nature
• Learn to Look, Look-
ing to See
• Saturday Morning
Wildlife Watching

WILD AQUATIC
• Aquatic Roots
• Water Plant Art

PLT
• The Shape of Things
• The Fallen Log
• Are Vacant Lots Vacant

THEME: Native plants have adaptations that make them suitable for their respective environments.

OVERVIEW & OBJECTIVES:
In his essay “Prairie Birthday,” Leopold discusses that most people do not pay attention to the blooming times of plants (their “prairie birthdays”). In this activity, participants will discover unique characteristics and adaptations of plants in their local area. Leopold tells the story of his favorite prairie plant, the compass plant. After completing this scavenger hunt, participants will be able to tell a story about the plants they encounter.

BACKGROUND:
Leopold liked to observe plants flowering around the Wisconsin countryside where he lived. He noted the time of year each plant would bloom, and called the blooming time its “prairie birthday.” Even in Leopold’s time, native prairie ecosystems were on the decline due to mowing, grazing and plowing. He and his family conducted one of the first prairie restoration projects in the country on their Wisconsin farm. Since Leopold’s time, scientists have learned a lot about how to manage prairies to protect native species and restore land to a healthy state.

In his essay, Leopold describes his discovery of a small patch of compass plant, or Silphium lacinatum, which had escaped mowing in a country cemetery. S. lacinatum is a native prairie plant that sends up yellow blooms each July. Leopold took pleasure in seeing it grow year after year, and
celebrated its “prairie birthday.” He regretted that most people never got to know the *S. lacinatum* and therefore never missed it when it vanished. *S. lacinatum*, commonly called compass plant, is a prairie species that grows in rocky, sandy prairies. A prairie glade with thin soils and rocky outcrops would be a typical habitat to find compass plant. This plant is in the Aster family, Asteraceae, and looks like a sunflower on tall stems. The common name results from the leaves turning at an angle, appearing to “point” to the North. It is resilient to most environmental and human impacts, but will lose the battle to constant mowing, grazing or plowing.

Old country cemeteries and railroad rights-of-way remain excellent remnants of prairies because the management of these areas favors prairie species. Fire, rather than mowing, was used in country cemeteries to “clean up” the vegetation around the plots. The prairie species were able to survive these periodic fires. Accidental fires along railroads also encouraged prairie species. Neither of these practices is as common today. Changes in soil, water availability or chemical parameters, whether natural or human influenced, may favor non-native species. In “disturbed” areas (like roadsides, vacant lots or agricultural fields), plants may be inadvertently introduced from Europe, Asia or other parts of the U.S. These non-native plants do not typically have natural controls, like disease or predators, and may become invasive. Many of these plants are considered “weeds.” In our global world today, it is difficult to determine whether a plant is native or non-native. Plants may be classified into several categories. Native plants are those plants that are adapted to the climate and soils of a particular area and have survived in these conditions for possibly thousands of years. Many of these plants have limited tolerance for change.

**Prairie ecosystems** are complex, diverse systems that are subjected to ever-changing, sometimes harsh conditions. Prairie plants evolved in the presence of conditions of extremes such as hot summer temperatures, strong winds and periodic drought. These conditions create severe stress for plants. Prairie fires and large grazing animals such as bison also affected the growth and survival of plants in the prairie. Plants of the prairie ecosystem must be adapted to all of the factors that affect their survival through the changing seasons. The competition for space, nutrients and water are limiting factors for plants in the prairie ecosystem. Extensive root systems, sometimes two to three times the length of the aboveground plant, enable the prairie plant to reach water trapped in soil layers deep below the surface. In times of drought, the prairie plant will be able to access moisture unavailable to other plants.

Blooming and seed production require high demands for water and nutrients. Specific species of prairie plants are adapted to bloom and pro-
duce seeds at different times in the growing season. Some are early season bloomers like dogtooth violets and wild indigo. Others require a longer growth period before blooming, and are timed to bloom mid-summer like Black-eyed Susans and butterfly milkweed. Late-blooming prairie plants may need less moisture to produce blooms and be able to bloom during the hot and dry late months of summer.

To be able to bloom and produce seed successfully when moisture may be limited, prairie plants have short or graduated blooming periods. In a short blooming period, the plant maximizes its blooming potential by a strong display of color, pattern and scent to attract pollinating insects quickly. The seed then matures quickly, before drought can compromise its development. For plants that have developed a graduated blooming strategy, the plant produces flowers that bloom a few at a time over a period of time. Compass plant (S. lacinatum), gayfeather and the mulleins are all examples of this approach. Graduated flowering allows the plant to produce flowers over a wider period of time. Some flowers may be stressed by a period of drought and not produce mature seed. If moisture becomes available the plant can still respond by producing new flowers that successfully mature.

Human activities such as irrigation can affect the availability of moisture to plants from the water table. A depleted water table can create artificial conditions of drought even when annual moisture levels are not abnormally low. During periods of severe drought, prairie plants will avoid the stress of blooming altogether. They will survive the growing season by reducing growth and storing nutrients in their root systems. Many species of perennial prairie plants can live for very long periods of time. Skipping the blooming stage for a single growing season when moisture is limited is an adaptation to survival.

Throughout Leopold’s writing, he encourages us to notice what’s happening in our environment and care for the plants and animals that share our space. On this scavenger hunt, participants will discover several unique qualities of plants in their ecosystem.

**PACKING LIST:**
- A *Sand County ALMANAC*
- Copies of BOTANY SCAVENGER HUNT GUIDE SHEET (5 per small group)
- Answer key for guide sheet (as appropriate)
- Clipboards and pencils (1 – 2 per small group)
- Crayons (1 set per small group)
- Field guides to local plants (1 per small group, see Appendix for suggested field guides)
- 20 numbered flags or numbered wooden stakes with ribbon

### Optional Materials:
- Small backpack or zip-lock for group materials
- Plant terms sheet, root diagrams, plant keys for local plants (or you can bookmark in field guides)
- Prizes for those groups who complete the hunt
- PowerPoint presentation or laminated photographs showing examples of local plants
- Compass plant root visual aid (sunflower plant taped to a 30-foot long rope that is frayed at the bottom to show the extensive root system of a prairie plant)

### PREPARATION:
- Read the essay “A Prairie Birthday” (p. 44 – 50 in *A Sand County ALMANAC*).
- Scout a local outdoor area and flag or stake the plant stations you want your group to visit. (20 is a nice number for the hunt — you may have less.) Make sure all stations are numbered. Create a set of numbered cards the groups will choose from before they go out and explore the prairie. Each group will record information on 3 – 5 plants, but should visit all to see what they look like and try to guess the names.
- Make a key with the answers to all plant stations in the scavenger hunt. Note: There may be more than one common name for a given plant.
- Make copies of (or bookmark in field guides) plant term definitions, root diagrams and keys for local plants. Be sure flagged plants are in the guides you are using.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.

### Optional:
- Create a visual aid to demonstrate the roots of a compass plant by attaching 30 feet of rope to a fake sunflower plant. Mark on the rope the area that would be the stalk/stem of the plant. Fray the ends to represent roots. If you can, hang the plant from the ceiling to symbolize how extensive the roots of prairie plants are.
- Gather photographs or develop a PowerPoint presentation showing examples of local plants.
Introduce participants to your ecosystem. For example, the prairie is an ecosystem dominated by non-woody plants, both grasses and forbs, and adapted to conditions of intense light, extremes of temperature, wind and moisture. Prairie plants must be adapted to survive a variety of stressful conditions. Some prairie plants survive by growing deep root systems to access water, others by adjusting their blooming periods to make use of available moisture.

- Show plant PowerPoint or share photographs of local plants.
- Discuss the components of a healthy ecosystem.
- Using plant keys for local plants in field guides (and/or additional plant terms sheets), introduce common terms used to describe a plant’s leaves and flowers.
- Optional: Show visual aid of compass plant (rope hanging with flower head) to illustrate how extensive the root systems of prairie plants can be.

Take participants to the outdoor area you have scouted and flagged. The goal of this scavenger hunt is for the participants to observe unique characteristics about local plants and to be able to identify the species based on these observations, as well as discovering common characteristics of specific floral families (i.e. this stem looks like it belongs in the mint family).

- Divide participants into groups.
- Distribute to each group: one clipboard, 3 – 5 BOTANY SCAVENGER HUNT GUIDE SHEETS and a pencil.
- Give each group 3 – 5 numbers corresponding to your plant stations. The numbers will match the 3 – 5 plant stations they are to investigate. They will fill out one guide sheet per plant station. (For example, you have set up 20 plant stations. Group one is assigned plant station numbers 3, 6, 9, 12, 16.)
• Let the group know that the plant stations have been flagged and numbered. They should find the plants and complete guide sheets as best they can for their designated five plants first. As time allows, encourage groups to visit additional plant stations to see if they can identify the plant at that station based on previous knowledge or using field guides (a prize may be given at the end of the hunt for the group who correctly identifies the most plants).
• Give the groups a set amount of time to complete the hunt, and turn them loose to explore.
Bring the groups back together.

- Allow groups time to compare their answers to the instructor’s answer key.
- Have a participant from each group share one discovery or experience they had in their time in the field.

Read aloud the passage below:

“What a thousand acres of Silphiums looked like when they tickled the bellies of the buffalo is a question never again to be answered, and perhaps not even asked ... Why does Silphium disappear from grazed areas? I once saw a farmer turn his cows into a virgin prairie meadow previously used only sporadically for mowing wild hay. The cows cropped the Silphium to the ground before any other plant was visibly eaten at all. One can imagine that the buffalo once had the same preference for Silphium, but he brooked no fences to confine his nibblings all summer long to one meadow. In short, the buffalo’s pasturing was discontinuous, and therefore tolerable to Silphium. It is a kind providence that has withheld a sense of history from the thousands of species of plants and animals that have exterminated each other to build the present world. The same kind providence now withholds it from us. Few grieved when the last buffalo left Wisconsin, and few will grieve when the last Silphium follows him to the lush prairies of never-never land.”

— Aldo Leopold, *A Sand County ALMANAC*, p. 45 – 50
• What is Leopold trying to say in this essay?
• Did you see any plants today that you had not noticed before? Are any of these plants threatened or endangered?
• What do you think this landscape looked like 200 years ago? What will it look like 200 years from now?
**BOTANY SCAVENGER HUNT GUIDE SHEET**  
Record your findings on this sheet.

<table>
<thead>
<tr>
<th>Names of members in group:</th>
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<tr>
<td>Date:</td>
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<tr>
<td>Location:</td>
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<table>
<thead>
<tr>
<th>PLANT FLAG #:</th>
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</thead>
<tbody>
<tr>
<td>PLANT NAME:</td>
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<tr>
<td>(name your plant)</td>
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**LEAVES:** List 5 details about the leaf of your plant:  
(toothed, lobed, alternate, opposite, hairy, palmate, whorled, basal, size…)

1. 
2. 
3. 
4. 
5. 

**FLOWERS:** List 5 details about your plant:  
(color, shape, petals, stamens, sepals, pistil, umbel, disk, rays…)

1. 
2. 
3. 
4. 
5. 

**ADAPTATIONS:**
How might this plant cope with extreme weather (hot sun, wind, cold and drought)?

How is this plant pollinated?

Do you see evidence that anything eats this plant?

Does this plant have competition for water, nutrients, sunlight and space?
**HABITAT:**
Describe where this plant is growing.

Record 3 details about its environment and soil:
What is growing nearby?

Is it growing in a disturbed area?

What do you think the elevation is? (How can you find the answer later?)

**SAMPLE:**
Do a crayon rubbing, sketch or take a photo of your plant (but please don’t pick it).

**DISCOVERY:**
What new or interesting observation did you make about this plant?

**HISTORICAL TRIVIA:**
Is this plant native? Does anything about it make you think it might have been used for something else (medicine, dye, food)?

**HUMAN/WILDLIFE IMPACT:**
How is this area used by humans? By wildlife?

Can you find any evidence of human activities that impact this plant?
LANDSCAPE SCENE INVESTIGATORS

OVERVIEW & OBJECTIVES:
In his essay “January Thaw,” Leopold describes what he has learned by watching animals in their home environment and interprets the evidence that has been left behind. In this activity, participants will assume the role of “Landscape Scene Investigator” to solve mysteries of the natural world, then report in depth what likely occurred in the designated mystery areas.

BACKGROUND:
In Leopold’s essay “January Thaw,” he describes observations he made in nature while tracking a skunk after a midwinter blizzard. He believes that January is an ideal time to discover nature’s mysteries and speculate who has done what and why. Much like an investigator, he surveys the scene after a January snowfall and finds the evidence animals have left behind. He does not just limit his observations and investigations to animals, but is also quite aware of what plants are doing this time of year.

Making direct observations of animal behavior can be challenging. Oftentimes, wildlife biologists rely on indirect observations or animal signs to learn about animal behavior. In the winter, much can be learned from studying various animal signs, such as tracks, browse evidence (i.e. teeth marks on leaves and twigs), urine stains, feces, tunnels in the snow, fur, feathers, etc.

The fun of being a “Landscape Scene Investigator” is that sometimes you can solve nature’s mysteries and sometimes not, but the excitement lies in the guessing and wondering! In groups, participants will become investigators and attempt to interpret animal evidence, just as Leopold did in

THEME: Wildlife often leaves evidence of their activities and interactions in nature. You can solve wildlife mysteries with this evidence.

TARGET AUDIENCE:
Ages 8 – adult, families

SUGGESTED TIME:
(preparation time not included)
60 – 90 minutes

ESSAY FROM A SAND COUNTY ALMANAC:
“January Thaw” p. 3 – 5

KEY QUOTE:
“There is time not only to see who has done what, but to speculate why.”
—Aldo Leopold, p. 4

PROJECT CONNECTIONS:
WONDERS OF WETLANDS
• Whose Clues
• Life in the Fast Lane
• Wetland Address
WILD
• Tracks
• Dropping in on Deer
WILD AQUATIC
• The Edge of Home
FLYING WILD
• The Birdsong Beat
• Eye See You
• Bird Behavior Scavenger Hunt
PLT
• Are Vacant Lots Vacant?
• Birds and Worms

INSTRUCTOR’S NOTE:
While a snowy day is the ideal time to do this activity, it can be done in any season, in any place where animal evidence can be found.
his essay, Leopold did this type of pondering year-round in all types of environments. He invites us to play along in solving nature’s mysteries and discover the answers that are laid out for us to find!

PACKING LIST:
- A Sand County ALMANAC
- Roll of yellow caution tape or orange flags
- Clipboard
- Backpacks (one for every 5 – 6 participants) filled with the supplies
  - Note pad/index cards (for recording evidence)
  - Pencils, crayons, colored pencils
  - Magnifying glass
  - Copies of LSI EVIDENCE RECORDING FORM
  - Tape measure and string
  - One activity card per backpack (EVIDENCE CARD, THE SCENE CARD, NATURE’S BATTLES CARD and CRIME OR NO CRIME CARD)

Optional materials:
- LSI Badges
- Rubber gloves and plastic zip-lock baggie
- Plastic envelope for carrying collected matter
- Large paper clamp
- Permanent marker/highlighter
- Calculator
- Scissors
- Digital camera
- Appropriate field guides

PREPARATION:
- Read the essay “January Thaw” (p. 3 – 5 in A Sand County ALMANAC).
- Assemble supplies in the backpacks and make LSI Badges — if using.
- Identify a nearby natural area for evidence of animal activities and interactions (tracks, tree rubbings, galls, plant/tree diseases, something dead, an empty nest, feathers, litter, feces, blood, etc.). You may want to “plant” additional evidence on the site to create a mystery for the groups to solve.
- Rope/tape off and number the mystery areas/sites you would like each group to investigate with yellow caution tape or colorful flags (Four mystery areas is a good number for a group of 20 participants.)
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Divide participants into groups (suggested 4 – 5 per group) and distribute one backpack to each group.

- Explain to the group that they are all LSI Agents and they have a case to solve! They should record their data on the reporting form by listing all factual data and their interpretations. Their goal is to read the landscape from the clues provided at each site, then as agents, create a logical story of what happened at the designated scene.
- Give the groups adequate time to assess their landscape scene. After they have recorded details of their scene, and if time permits, you may choose to rotate the groups.

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Read the Leopold quote:

“The tracks lead on, showing no interest in possible food, and no concern over the rompings or retributions of his neighbors. I wonder what he has on his mind; what got him out of bed?”

— Aldo Leopold, *A Sand County ALMANAC*, p. 5

**Mystery:**

Look for animal tracks? What can you deduce from these tracks? Record your findings on the LSI EVIDENCE RECORDING FORM.
Read the Leopold quote:
“The rough-leg has no opinion why grass grows, but he is well aware that snow melts in order that hawks may again catch mice.”
— Aldo Leopold, *A Sand County ALMANAC*, p. 4

Mystery:
Evaluate the habitat you are in. What animals might frequent this area? What makes this a good habitat for that animal? List your theories.

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Read the Leopold quote:
“Tufts of rabbit-hair bespeak the year’s first battles among the amorous bucks. Further on I find a bloody spot, encircled by a wide-sweeping arc of owl’s wings. To this rabbit the thaw brought freedom from want, but also a reckless abandonment of fear.”
— Aldo Leopold, *A Sand County ALMANAC*, p. 5

Mystery:
Explore your surroundings. Can you find evidence of interactions between animals?
Read the Leopold quote:

“…who could not wait until night to inspect the damage to his well-ordered world.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 4

**Mystery:**

Find evidence at the scene where something has been damaged. Who or what do you think did it? Do you think it was a crime or a natural occurrence? Explain your theory.
# LSI - Landscape Scene Investigator Evidence Recording Form

<table>
<thead>
<tr>
<th>Date:</th>
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<tbody>
<tr>
<td>Time:</td>
</tr>
<tr>
<td>Approximate temp/weather:</td>
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<table>
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<tr>
<th>Site/location compass or GPS coordinates (optional):</th>
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<tr>
<th>LSI investigators on scene (names):</th>
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<tr>
<th>Check appropriate box:</th>
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<tbody>
<tr>
<td>☐ EVIDENCE CARD</td>
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<td>☐ NATURE’S BATTLES CARD</td>
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<td>☐ THE SCENE CARD</td>
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<td>☐ CRIME OR NO CRIME? CARD</td>
</tr>
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<table>
<thead>
<tr>
<th>List all factual evidence found at your scene:</th>
</tr>
</thead>
</table>

SKETCH YOUR LANDSCAPE:
Sketch your site and its clues. Please note if it is an aerial view, side view or map view. Indicate which direction is north.

INTERPRETING THE LANDSCAPE:
Based upon your landscape observations, develop a theory that interprets the evidence you found. Formulate your story. (You may use a camera to record evidence to validate your interpretations.)
Bring groups together.

- Have each group report their interpretation of the scene they investigated.
- If time permits, have participants share a mystery from their neighborhood.

Read aloud the quote below:

“There is time not only to see who has done what, but to speculate why.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 4

Ask participants:

- What will you share about your investigation with your friends and family?
- *Challenge:* On your way home today find a mystery in your neighborhood. Try and solve.
OVERVIEW & OBJECTIVES:
In several essays that he wrote, Aldo Leopold talked about a “land ethic” and the value that people put on soil, water, plants and animals. He believed that our values determine how we use the land. In this activity, participants will look at land for its different values, think about how a “land ethic” changes the way people make decisions about how land is used, and connect such decisions to the health of the land.

BACKGROUND:
In his essay “The Land Ethic,” Aldo Leopold sees land as a community that includes soil, water, plants and animals and of which people are an important part, especially in the decisions they make about how land will be used. Land can be valued in a variety of ways, including economically, aesthetically and ecologically. How land is valued and used changes through time. Leopold defined a land ethic as having respect for the biotic com-

THEME: By analyzing how values affect decisions made about land use, you can understand why land looks the way it does today and learn from the past to inform future choices.
munity and feeling responsible for the health of land. And he defined conservation as “a state of harmony between men and land.”

In his essay “The Sand Counties,” Leopold asserts that land most people would define as poor farmland has value for many non-economic reasons. The dry, sandy lands hold a variety of plants and animals that could not be found on richer soils. He questions the definition of the land as “poor,” suggesting that there are many different types of value that land holds for different people. These values might include, but are not limited to, aesthetic (beauty), ecological (interaction between plants and animals and their environment), scientific (study of the natural world), historical (history or past events) and cultural (state of civilization of a certain period).

When Leopold bought his own Sand County farm, he was able to get a good deal on the price. The land was considered to be a poor value because it had little topsoil and was devoid of trees and other plant life. But Leopold saw something in the land that no one else saw, not even his family at first. He saw how through perseverance and hard work, he could improve the land and bring back its value in many different ways. He had a vision for restoring the worn-out land.

PACKING LIST:
• A Sand County ALMANAC
• Clipboards, index cards or journal, pencils or pens
• WHO DECIDES? CARDS

PREPARATION:
• Read the essays “The Land Ethic” (p. 201 – 226) and “The Sand Counties” (p. 101 – 104 in A Sand County ALMANAC).
• Choose an area large enough for the group you are expecting to explore (size of a grocery store parking lot) individually or in groups.
• Have clipboards, index cards, pencils or pens and question cards ready.
• Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Ask participants to share before exploring a natural area:

- Name something you have that you value and want to take care of.
- What is land? What does it include?
- Is land valuable? Why or why not?

Give each participant an index card or journal (optional) and pencil for recording.
- Have groups/individuals separate and explore within the designated area.
- Have them list or draw something they found appealing and say why.
- Ask them to pick one thing they think is particularly valuable and assign it a dollar amount.
Separate into groups.

- Give each group a WHO DECIDES? CARD.
- Send groups to explore their designated area to answer the question on their card.
How might the property just explored be used to make money?

Is there anything of historic or cultural value here?

If a scientist wanted to do research, what might he or she study?

What specifically makes the land aesthetic or beautiful?

What animals might use this area? What would be important to them?

What kind of recreation could you do here?

If you owned this property, what would you want to do to protect its most valuable aspects?

Is there value alone in just the existence of soil, plants and animals?
EXPLORE:
Gather the group to share what they found:

- Ask participants to describe what they liked or show what they have drawn.
- Ask them to share their “most valuable” choice and the dollar amount they chose.
- Ask why it had value to them.
- Did everyone identify the same most valuable thing?
- Have the entire group discuss all the things that were named as valuable. As a group decide on the top three.

WHO DECIDES?:
Gather the group and share their questions and their decisions.

- Can we do more than one thing at a time in respect to managing land?
- Come up with a land use management plan for this property that incorporates as many uses as possible.

Read aloud the quote below:

“A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land.”
—Aldo Leopold, *A Sand County ALMANAC*, p. 221

- Leopold spent a lifetime developing his land ethic. He continued to refine it throughout his life.
- What is your land ethic today?
OVERVIEW & OBJECTIVES:
In his essay “Cheat Takes Over,” Leopold discusses the attack of invasive cheat grass on native grass species of the western United States and identifies the need for human intervention. In this activity, participants will identify local native plant species that are competing for habitat with invasive plants and work to remove the invasive competitors. In so doing, they will understand how removing invasive plant species can increase biodiversity of an area.

BACKGROUND:
Leopold discusses the historical origins and impacts of invasive species (such as cheat grass, Dutch elm disease, carp, English sparrow and starlings) in the United States. Invasive plants and animals are a threat to native species and the diverse ecosystems that provide habitat for native populations. Most of these invasives were introduced from another country, where native herbivores, predators, fire or human intervention kept their numbers in check.

In the absence of natural competitors or other controls, invasive plants in large numbers compete with native species for water, light, nutrients or space. Often, they end up forming monocultures where one plant dominates an area that at one time supported a diverse population of plant and animal life.

THEME: The diversity of native plants and animals is being threatened by invaders. You can help.

TARGET AUDIENCE: Ages 11 – adult, families

SUGGESTED TIME: (preparation time not included) 60 – 90 minutes

ESSAY FROM A SAND COUNTY ALMANAC: “Cheat Takes Over” p. 154 – 158

KEY QUOTE: “Where one pest is stopped by natural barriers, another arrives to breach the same wall by a new approach. In the end every region and every resource get their quota of uninvited ecological guests.” —Aldo Leopold, p. 154

PROJECT CONNECTIONS:
WILD
• World Travelers
• Rare Bird Eggs for Sale
• Ethni Thinking
• Planting Animals
WILD AQUATIC
• Aquatic Roots
• Thirsty Plants
PLT
• Viewpoints on the Line
• Invasive Species

INSTRUCTOR’S NOTE:
If time allows, consider serving refreshments at your facility after the activity to celebrate your accomplishments.
There are many different kinds of natives. Each of them is important to the health of the ecosystem. Insects and other animals depend on this variety of plants. When an area has a great variety of living things it is referred to as being biodiverse. If the invaders take over there will only be a few kinds of plants, maybe only one kind of plant. This is called a monoculture.

All eco-regions throughout the United States struggle with invasive plant species (i.e. seresia lespedeza and crown vetch in grasslands, garlic mustard and English ivy in forests and melaleuca or reed canary grass in waterways). This activity complements invasive plant removal and habitat restoration programs in parks or other natural areas by framing the effort as a battle for more native plant territory. Participants will stake out a territory around a desirable native plant and then help win the battle to reclaim that territory, by pulling/cutting invasive plants.

**Packing List:**
- A Sand County ALMANAC
- Wood or metal stakes, or wire to attach flags
- Flags with photographs of local native plants
- Shovels, trowels, clippers, trimmers, etc.
- Work gloves
- Buckets or bags
- Restoration journal (to stay at facility)

**Optional Materials:**
- Refreshments and/or prizes to help celebrate participants’ hard work
- Camera for “before” and “after” photo-documentation

**Preparation:**
- Read the essay “Cheat Takes Over” (p. 154 – 158 in A Sand County ALMANAC).
- Select an area in your habitat where there is an individual native plant, or a small area of native plants, among many invasive plants.
- Research effective removal methods for the invasives you will work to remove and gather supplies.
- Create and print several miniature flags with plant pictures that correspond to the native plants you’ll be battling for. (See example below.)
- Tape these flags onto stakes or wire and place them to mark the perimeter of your “battle ground.”
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.

Sample native plant flag
ALLIES AND INVADERS
ORIENTATION CARD

Explain that there is a battle among plants on this site. The invading plants are trying to take over the whole area. There are many plants that have lived here for a long time. Identify the native plants. If they lose the battle, they will lose their home.

- How can you help in this battle?
- Share the stories of these natives as you show them the flagged area.
- Identify natives you will be fighting for.
- Identify the invasives you will be removing. Provide some background information about these invasives, including where they came from, how they got here, why they thrive.
- Take a “before” picture for documentation.

ALLIES AND INVADERS
INVASIVE PLANT REMOVAL CARD

Divide participants and begin removal of invasive plants.

- For the particular invasive plant(s) you are removing, provide instructions on effective removal methods.
- Distribute tools (gloves, shovels, clippers, buckets, etc.)
- Using the proper removal and disposal methods for the invasives in question, allow the participants to eradicate the invaders from the area.
- When time allotted is up and/or the invasives have been removed, thank the participants for their help in this battle.
Provide opportunities to document and/or celebrate the group’s contribution to help native plants reclaim their territory.

- Take an “after” picture of the site. Take a photo of your work group too.
- Ask participants to sign and write about their day’s experiences in a journal, which could be displayed at your facility.
- If appropriate, invite participants to bring their families and friends back to see the battleground and the native plants they helped.
- If time and budget allow, celebrate your victory. Provide refreshments.

Read aloud the quote below:

“Where one pest is stopped by natural barriers, another arrives to breach the same wall by a new approach. In the end every region and every resource get their quota of uninvited ecological guests.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 154

Ask participants:

- What do you think this area will look like next week, month, year?
- How could we make sure that these invasive species don’t come back?
- Are there other areas in/around your community where native species are threatened by invasives?
- Can you make a difference? Can a group make a difference?
OVERVIEW & OBJECTIVES:
In his essay “If I Were the Wind,” Leopold describes observations he made about wind and its interactions with soil, plants and animals (including himself) on a blustery November day. In this activity, participants will explore a variety of dispersal mechanisms common to seeds and design a wind-dispersed seed.

BACKGROUND:
Wind is responsible for a lot of things in nature — this was recognized by Leopold in his essay “If I Were the Wind.” One of the ways wind influences an occurrence in nature is in the process of seed dispersal. Using the wind and other systems, seeds move around their environment to find a good place to take root. This activity touches on the variety of ways seeds are spread, paying special attention to the way wind does its job.

In “If I Were the Wind,” Leopold describes a flock of birds “…dipping and rising, blown up and blown down, blown together and blown apart …the wind wrestling lovingly with each winnowing wing.” Winnowing means to blow away or scatter. Anyone who has played with seeds that use the wind for transport (such as dandelion or milkweed seeds) can probably relate the actions of such seeds on the wind being similar to that of the birds in this essay.

Just as not all birds fly to move from one place to another, not all seeds rely on the wind for transport. Some plants rely on water or animals for their dispersal. Exploring the different mechanisms of seed dispersal can give insight not only into the life histories of flowering plants, but also

THEME: Wind is a natural force. You will learn how plants use wind to disperse seeds.
into the movement of the animals, wind and water that carry seeds to their destinations.

Animals depend on plants for food and shelter, and plants depend upon animals for providing nutrients from their waste products (such as urine and droppings). Some plants depend on animals to help with seed dispersal. Many seeds are carried and dispersed by animals, catching a ride on fur or perhaps eaten as a seed, fruit or berry. Often, in island ecosystems, birds are responsible for seed dispersal and carry the first plant life into those isolated places. Wind and water are also fundamental methods of seed transportation. Some plants develop elaborate structural designs in order to keep their seeds afloat on the wind or water for as long as possible.

Most seed-producing plants have a mechanism for scattering seeds, to increase the chance that the seed will germinate in a place where it has room to grow.

Different Types of Seed Dispersal Include:

- **Parachutes and Helicopters**
  use the wind to carry them to a better place. Seeds that use parachutes usually have a lightweight end with many fine hairs that can catch the wind and ride the air waves. Helicopters are usually heavier and have wing-like structures to catch the wind instead of hairs. Helicopters twirl around and around as they flutter quickly, yet gently, toward the ground. Examples include maple or ash tree helicopters, fuzzy milkweed and dandelion parachutes.

- **Floaters**
  are seeds that grow on plants that live in or very near water. The fruits fall onto the water and float to another place. When they stop at the water’s edge, the seed can germinate or sprout and grow in its new watery home. Examples include sedges and coconuts.

- **Hitchhikers**
  are dry seed-filled fruits that are designed to be carried by animals. They have a sticky or prickly outer layer that can attach to a furry passerby. These prickly hitchhiking seeds may have been the inspiration for the invention of Velcro. Examples include wild carrot or Queen Anne’s Lace seeds, cockleburs and burdock burrs.

- **Appetizers**
  are seeds that are often found in berries and other succulent fruits. The fruits are tasty to animals that eat the fruit whole — seeds and all. The seeds pass through the animal’s digestive system unharmed and are deposited in the animal’s scat. Here the seeds may grow. Examples include tomatoes, berries, persimmons, peppers and grapes.

- **Poppers**
  are seeds that are pushed out with force from their protective seed pod. As the seed pod dries, its shape begins to change inside, putting pressure on the seeds. An opening on the seed pod gets gradually larger as the pressure on the seeds continues, until finally, the hole gets wide enough and the seeds are forced out with a POP! Examples include jewelweed and witch hazel.

- **Droppers**
  simply drop from the parent plant, root and then grow. These types of seeds protect themselves from the drop to the ground by having a protective outer shell, husk or a cap. It is also helpful if the seed is round, so it can drop and roll to a suitable growing place. Examples include acorns and nuts.

**PACKING LIST:***

- A Sand County ALMANAC
- Seed metaphor items: balloon, feather, small bag of snack chips, sponge, peanut M&M, Velcro hook-side, ping-pong ball
- Copies of SEED DISPERSAL CARDS
- Socks cut into 3-inch tubes to slip over each participant’s shoe (for younger groups)
- Downy leg feathers from any bird (at least two for demonstration)

**Optional Demonstration:**

- Materials for testing seed “stickiness” (felt, Velcro, knitted cloth, piece of real or fake fur, feather, pipe cleaners, pillow filling or sheep wool)
- Seed design materials (tape, clay, packing peanuts, glue, feathers, paper, scissors, pipe cleaners, pillow filling or sheep wool)
- Sunflower seeds (for the seed in the designs)
- Fan (if day is calm or design is done indoors)

**PREPARATION:**

- Read the essay “If I were the Wind” (p. 66 – 67 in A Sand County ALMANAC).
- Scout an outdoor area to find what seeds may be available.
- Make copies of the SEED DISPERSAL CARDS, enough for 1 per group (more if time allows).
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Discuss and demonstrate wind effect on seeds:

- Ask participants to describe a dandelion seed and how we can make the seeds move. (Blow on the dandelion seed head and scatter the seeds.) Continue the discussion by asking for descriptions of how the seed moves without our help. (It floats on the air currents.)
- Take two small, fluffy feathers and place them in the palm of your hand. Ask participants how we can make them fly (blow on them). Holding your hand up over the group, blow on the feathers. Watch the feathers as they drift and sway on the air currents dropping to the ground. After the feathers land, ask participants for descriptions of the feathers’ action.
- Give participants a series of objects that can serve as metaphors for the seed dispersal mechanisms, and explore how these objects may be similar to a seed: Balloon (parachute); feather (helicopter); sponge (floater); bag of snack chips (poppers); peanut M&M (appetizer); ping-pong ball (droppers); Velcro hook-side (hitchhikers).

Take participants to an outdoor area where a variety of seeds can be observed.

Younger participants:

- Guide the group along a trail while they are wearing a piece of sock pulled on over a shoe to ankle height.
- Go through the SEED DISPERSAL CARDS with the group as you travel watching for seeds that are floating on the wind. Note: Refer to background information for examples.
- After a variety of seeds have been collected on the socks, bring participants into a circle to examine the seeds.

Older participants:

- Give each pair/group a SEED DISPERSAL CARD describing a type of seed dispersal mechanism that they are to find. Note: Refer to background information for examples.
- Allow time for the search.
- Bring participants back together to share their findings.

Note: Only distribute cards for the dispersal types known to be in your search area.
Divide participants into groups to design a seed that can be dispersed by wind.

- Give participants various materials (such as tape, clay, packing peanuts, glue, feathers, paper, scissors, pipe cleaners, pillow filling, sheep wool, etc.) to design and build a wind-dispersed seed. Allow about 10 minutes.
- Allow participants to test their designs. Use a fan if there is no wind.

Group Discussion:

- We explored ways plants use wind. How is wind used by animals?
- How do people use wind?
- What are the positive and negative impacts of wind?
Read aloud the quote below (paraphrase as needed). What does “winnowing” mean?

“The flock emerges from the low clouds, a tattered banner of birds, dipping and rising, blown up and blown down, blown together and blown apart, but advancing, the wind wrestling lovingly with each winnowing wing.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 66

• Think about wind. How does it affect you?
• How do you use wind now?
• Will wind play a positive role in our future?
• What if there were no wind? How would life be different?
SEED DISPERSAL CARD
PARACHUTES AND HELICOPTORS
Find a seed that can use the wind to travel.

SEED DISPERSAL CARD
HITCHHIKERS
Find a seed that could stick to a passerby before dropping or being pulled off and dropped in a new place.

SEED DISPERSAL CARD
POPPERS
Find a seed in a pod-like protective cover that when ripe could “pop” out its seeds. Some examples are jewelweed, witch hazel and milkweed.

SEED DISPERSAL CARD
FLOATERS
Find a seed that could drop into water and float to a place where it could germinate.

SEED DISPERSAL CARD
APPETIZERS
Find a seed that might make a tasty meal for an animal.

SEED DISPERSAL CARD
DROPPERS
Find a seed that could drop from the parent plant, root and then grow.
OVERVIEW & OBJECTIVES:
In his essay “Great Possessions,” Leopold describes what he learned by listening to birds as they awaken and begin calling from pre-dawn through sunrise. In this activity, participants will use mnemonic sounds to imitate bird songs and understand the regular, timed sequence of birds awakening as they “recreate” the dawn chorus described by Aldo Leopold.

BACKGROUND:
Aldo Leopold was an early riser, often waking as early as 3:00 a.m. in the summer. With coffee cup and notebook in hand, he would sit still on his favorite bench and just listen. As the sun rose, he could observe the activities of birds he heard. With practice, he was able to identify birds by call and understand their behavior.

While humans divide land by acres, states, property lines and fences, animals delineate their boundaries or territories using scent, sound and various behaviors. By getting up before our human neighbors, we will likely hear our non-human neighbors as they awaken, and observe evidence of their nighttime activities.

Mnemonics are words or phrases that help us remember. In this activity they help us remember the rhythm, tone and pitch of a bird call.
Mnemonics are different from phonetics, which help us pronounce a word properly. It is fun to learn by imitating bird calls and listening to early morning bird calls.

Phenology is the study of seasonal patterns in nature over time. Historical records of seasonal plant and animal activity, such as those kept by the Leopold family, are used by some scientists to understand climate change and its effect on flora and fauna. For example: changes in the migration of birds may indicate climate change. The timing of the robin’s return or the male redwing blackbird establishing his territory in the cattail marshes earlier than in the past, may be a response to our warming climate.

PACKING LIST:
- A Sand County ALMANAC
- DIGITAL TIME CARDS indicating time for each bird call.
  Note: For groups who cannot tell time, use cards numbered 1 – 8 in place of time cards.
- BIRD SOUND CARDS with mnemonic information and time based on the chart below. A set for reproduction and use based on Leopold’s essay is included, or you may design cards depicting birds in your local area.
- SOUND MAP SHEET, pencil and clipboard or laminated classroom set with erasable markers
- Bird identification guides

Optional Materials:
- Stuffed animal bird with a built-in call
- A laminated set of activity cards with bird pictures and identification information about each bird species
- Cowbell and pictures of essay animals (rabbit, woodcock, pheasant, mink, heron, wood duck)
- Binoculars
- Birdsong Identifyer®

PREPARATION:
- Read the essay “Great Possessions” (p. 41 – 44 in A Sand County ALMANAC).
- Reproduce BIRD SOUND CARDS (one per participant).
- Print or produce DIGITAL TIME CARDS (or make cards labeled 1 – 8 for groups who can not tell time).
- Make copies of SOUND MAP SHEET (one per participant).
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.

Aldo Leopold’s list of birds observed at the shack

<table>
<thead>
<tr>
<th>ORDER</th>
<th>TIME</th>
<th>BIRD</th>
<th>MNEMONIC FOR BIRD’S CALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3:35 a.m.</td>
<td>Field Sparrow</td>
<td>Tew…….tew….tew,tew,tew,tew,tew</td>
</tr>
<tr>
<td>2</td>
<td>3:40 a.m.</td>
<td>American Robin</td>
<td>Cheerup, cherrily, cheerily</td>
</tr>
<tr>
<td>3</td>
<td>3:45 a.m.</td>
<td>Baltimore Oriole</td>
<td>Pidoo tewdi tewdi yewdi tew tidew</td>
</tr>
<tr>
<td>4</td>
<td>3:50 a.m.</td>
<td>Indigo Bunting</td>
<td>Sweet sweet chew chew chew</td>
</tr>
<tr>
<td>5</td>
<td>4:00 a.m.</td>
<td>House Wren</td>
<td>Churff - chrff chrff chrff</td>
</tr>
<tr>
<td>6</td>
<td>4:05 a.m.</td>
<td>Rose-breasted Grosbeak</td>
<td>Chink Chink Chink</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brown Thrasher</td>
<td>What’s Up What’s Up (phrases repeated 2 times)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow Warbler</td>
<td>Sweet, sweet, sweet, I’m so sweet</td>
</tr>
<tr>
<td>7</td>
<td>4:10 a.m.</td>
<td>Eastern Bluebird</td>
<td>Cheer, cheerful charmer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>White-eyed Vireo</td>
<td>Chick-per-a-weeo-chick</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red-eyed Vireo</td>
<td>Look-up, over-here, see-me, up-here</td>
</tr>
<tr>
<td>8</td>
<td>4:15 a.m.</td>
<td>Rufous-sided Towhee</td>
<td>Drink your tee-e-e-e, Drink your tee-e-e-e-e</td>
</tr>
</tbody>
</table>
SOUND MAP SHEET

Use the symbols below to indicate the approximate direction of the sounds you hear.

SOUND KEY:

○ = Bird
X = Other animal (dog, human, squirrel, etc.)
+ = Non-living object (plane, car, door, etc.)
Humans cannot duplicate bird calls exactly, but we can make up words and phrases that help us remember bird calls. To introduce bird calls and mnemonic devices, ask participants:

- What does a crow sound like? (*caw, caw*)
- What does a rooster sound like? (*cock-a-doodle-doo*)

Then:

- Why do birds sing?
- When are birds most actively singing?
- Have you ever awakened early in the morning to hear the day’s first bird song?
- Optional: Sound mapping

Divide into groups. Each group will be given a BIRD SOUND CARD.

- Each group will read their bird name and practice simulating the bird call using the mnemonic information printed on the card. All groups will practice their bird call at the same time.
- Optional: If you have an Identiflyer® or a recording of actual bird calls, play the recording of each assigned bird so the groups can hear what the bird call sounds like.

*Instructor reads aloud:*

“This daily ceremony, contrary to what you might suppose, begins with the utmost decorum. Who originally laid down its protocols I do not know. At 3:30 a.m., with such dignity as I can muster of a July morning, I step from my cabin door, bearing in either hand my emblems of sovereignty, a coffee pot and notebook. I seat myself on a bench, facing the white wake of the morning star. I set the pot beside me. I extract a cup from my shirt front, hoping none will notice its informal mode of transport. I get out my watch, pour coffee, and lay notebook on knee. This is the cue for proclamations to begin.”

— Aldo Leopold, *A Sand County ALMANAC*, p. 41
• Using your DIGITAL TIME CARDS (or numbered cards for younger participants), hold up times for groups to see and begin singing.

• As you hold up the 3:35 a.m. time card, signal the field sparrow group to begin and continue singing.

• As time cards are shown, additional bird groups join in, creating a crescendo.

• All birds sing continually until the full dawn chorus is achieved at 4:15 a.m.

• Optional: The group may want to repeat the dawn chorus.

**Close this activity by reading the following quote:**

“Once in a while we turn up a coon or mink, returning late from the night’s foray. Sometimes we rout a heron from his unfinished fishing, or surprise a mother wood duck with her convoy of ducklings, headed full-steam for the shelter of the pickerelweeds. Sometimes we see deer sauntering back to the thickets, replete with alfalfa blooms, veronica, and wild lettuce. More often we see only the interweaving darkened lines that lazy hoofs have traced on the silken fabric of the dew. I can feel the sun now. The bird-chorus has run out of breath. The far clank of cowbells (Optional: As you read, ring the cow bell.) bespeaks a herd ambling to pasture. A tractor roars warning that my neighbor is astir. The world has shrunk to those mean dimensions known to county clerks. We turn toward home, and breakfast.”

— Aldo Leopold, *A Sand County ALMANAC*, p. 43 – 44

• Optional: Pass along additional pictures (rabbit, woodcock, pheasant, mink, heron and wood duck) as they occur in the essay.
Distribute SOUND MAP SHEET, clipboards and pencils. Take the group to an area where birds are likely to be heard and arrange participants to allow enough space between them to give a sense of solitude.

- Ask participants to close their eyes and listen carefully for the sound of birds.
- Instruct the participants to use the symbols on the SOUND MAP SHEET to indicate the direction of the sounds they hear.
- If you aren’t hearing birds at this time in your area, direct participants to listen for and map any sounds they hear. You may also use bird song recordings and move around the group for this mapping exercise.

Read aloud or paraphrase the following quote:

“The robin’s insistent caroling awakens the oriole, who now tells the world of orioles that the pendant branch of the elm belongs to him…”

– Aldo Leopold, A Sand County ALMANAC, p. 42

Dawn Chorus:
- Describe the chorus you just created.
- Have you heard a similar chorus in your neighborhood?
- Share your thoughts or stories.

Sound Mapping:
Review what participants heard and directions from which sounds originated.
- What sounds were similar to the bird calls in the dawn chorus activity?
- Did you hear more human or non-human made sounds?
- Did you hear more sounds with your eyes closed than open? If yes, why?
Leopold’s observations were made many years ago. He was able to recognize that daily patterns of animal activity changed seasonally and sometimes from year to year. These patterns of seasonal change are called phenology. From the time her father wrote this essay to today, Aldo Leopold’s daughter, Nina, has kept phenological records of seasonal plant and animal activity on their farm. Some scientists use such records to understand changes in climate and its effect on flora and fauna. You can keep these records too!

- Now that you have learned to identify some birds in your area, begin looking and listening for birds in your own neighborhood. Record your observations, noting date, time and bird species.
- As you make observations about birds, you may notice seasonal changes in other animals and plants (such as when a tree loses its leaves, the spring’s first dandelion bloom or when hummingbirds return). A collection of these observations will become your family’s phenological record.
3:35 a.m.  
**FIELD SPARROW**  
Tew…….tew….tew,tew,tew,tew,tew

3:40 a.m.  
**AMERICAN ROBIN**  
Cheerup, cherrily, cheerily

3:45 a.m.  
**NORTHERN ORIOLE**  
Pidoo tewdi tewdi yewdi tew tidew

3:50 a.m.  
**INDIGO BUNTING**  
Sweet sweet chew chew chew

4:00 a.m.  
**HOUSE WREN**  
Churff chrff chrff chrff

4:05 a.m.  
**ROSE-BREASTED GROSBEAK**  
Chink Chink Chink
4:05 a.m.  
**BROWN THRASHER**
*What’s Up  What’s Up*  
(phrases repeated 2 times)

4:05 a.m.  
**YELLOW WARBLER**
*Sweet, sweet, sweet, I’m so sweet*

4:10 a.m.  
**EASTERN BLUEBIRD**
*Cheer, cheerful charmer*

4:10 a.m.  
**WHITE-EYED VIREO**
*Chick-per-a-weeo-chick*

4:15 a.m.  
**RUFOUS-SIDED TOWEE**
*Drink your tee-e-e-e-e,  
Drink your tee-e-e-e-e*

4:15 a.m.  
**NORTHERN CARDINAL**
*What-cheer! What-cheer! What-cheer!*
RULES OF WILD THINGS

TARGET AUDIENCE:
Ages 12 – adult, families

SUGGESTED TIME:
(preparation time not included)
Rule Discovery Hike: 45 – 60 minutes
Anthropomorphic Quotes: 30 – 45 minutes

ESSAY FROM A SAND COUNTY ALMANAC:
“65290”
p. 87 – 92

KEY QUOTE:
“I suspect that in the chickadee Sunday School two mortal sins are taught: thou shalt not venture into windy places in winter, thou shalt not get wet before a blizzard.”
—Aldo Leopold, p. 90

PROJECT CONNECTIONS:
WET
• Nature Rules
WONDERS OF WETLANDS
• Regulation Rummy
WILD
• Bottleneck Genes
• What Bear Goes Where?
WILD AQUATIC
• When a Whale is Right
FLYING WILD
• Habitat Match
PLT
• We All Need Trees
• There Ought to be a Law

THEME: You can make observations and use language to understand the “rules” that help animals and plants survive.

OVERVIEW & OBJECTIVES:
In his essay “65290,” Leopold observed that in the animal world, survival depends on following certain “rules.” In this activity, participants will take a nature hike, observe animals and plants, and create “rules” for each to survive. They will identify survival challenges wild things must deal with and formulate theories on how plants and animals meet these challenges. In addition, participants will explore ways anthropomorphism is used in A Sand County ALMANAC.

BACKGROUND:
Aldo Leopold succeeds in making the lives and interactions of wild things more vivid by describing their habits like one might describe human behavior. In his essay “65290,” he closely observed the behavior of a chickadee that was banded with the number 65290 and returned to his feeder for several years. From his observations, he listed two “commandments” that a chickadee might learn in “Sunday School.”

Three species of chickadees, the Black-capped, Carolina and Mountain have ranges that collectively cover most of the United States. They frequent bird feeders and can be recognized by their call. (Chick-a-dee-dee-dee-dee.) Leopold used the Black-capped chickadee caught and banded at his feeder to explain two important “commandments” or rules: (1) Don’t go into windy places in winter, and (2) Don’t get wet before a blizzard. In the winter, wind can allow water and cold air to get under a bird’s feathers. Survival is a delicate balance for such a small bird. If a chickadee ventures into a...
cold and windy place, valuable energy needed to find food may have to be used instead to keep warm. Getting wet before a blizzard makes it impossible for a bird this small to maintain its body temperature and conserve energy, greatly reducing any chance for survival through a storm.

Animals in the wild face a variety of dangers and challenges while meeting their basic survival needs: food, water, shelter and care for their young. Most of these challenges have to do with starvation, dehydration, exposure or predation, and often animals will have to risk one to avoid another. For example, a deer will sometimes risk predation (being eaten by another animal) to get to a water source (avoiding dehydration). A bird may risk exposure (getting too wet, too hot or too cold) to get to a food source (avoiding starvation). By observing animals in the wild, we can gain a better understanding of how they negotiate these challenges while meeting their basic survival needs.

Leopold's description of a “chickadee Sunday School” and “two mortal sins” are examples of anthropomorphism (assigning human characteristics to nonhuman things). See ANTHROPOMORPHIC QUOTES for examples.

While anthropomorphism as a literary device can help humans connect with and enjoy nature, it is important to understand that assigning human characteristics to non-human things does not represent a scientifically accurate explanation of plant and animal characteristics or behavior.

PACKING LIST:
• A Sand County ALMANAC
• Stokes Nature Guides or similar books that highlight behaviors and life history of plants and animals (see Appendix for recommended field guides)
• Clipboards and pencils
• RULE DISCOVERY WORKSHEETS
• ANTHROPOMORPHIC QUOTES (for older participants)

PREPARATION:
• Read the essay “65290” (p. 87 – 92 in A Sand County ALMANAC).
• Research the life history of several common plants and animals that participants can observe on a hike in your area.

Rule Discovery Hike:
• For each of the species researched, identify dangers to their survival and how they deal with those threats. Examples:
  a. Squirrel • Hawks and coyotes are predators of squirrels. How do the squirrels stay safe? They climb trees. Rule: Never get too far from a tree.
  b. Nut Tree • The danger is young trees will be shaded out. Nut tree seeds are moved by animals to a winter food cache. Rule: Don’t drop all your seeds in one place.
• Make copies of RULE DISCOVERY WORKSHEET for participants.
• Scout trail to locate the plants and animals you’ve researched. Note: It may be difficult to find animals, so look for signs such as a log where a salamander might hide, a track or trail, a burrow, a nest, etc.

Anthropomorphism in A Sand County Almanac: (for older groups)
• Make copies of the ANTHROPOMORPHIC QUOTES.
• Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Most of us have to live by rules. Ask participants:

- What rules do you have at home or school?
- What rules relate to your safety?
- What rules might help you survive in the wild?

Aldo Leopold wrote an essay about a chickadee, and the rules that it had to follow to survive in the wild. We can get a clear understanding of the natural world when we consider, as Aldo Leopold did, the rules of wild things.

Today, we will look for some plants and animals and explore some of the rules they might need to survive.

Take participants outdoors to a nearby trail or natural area.

- Distribute RULE DISCOVERY WORKSHEETS, clipboards and pencils to all participants.
- As a group have them fill out the first box on their RULE DISCOVERY WORKSHEET.
  - Share an example of one of the plants or animals researched and ask: What could be of danger to this species?
  - Identify possible threats and as a group, pick one threat and agree on a rule and record on worksheet.
- Break up into groups and fill out the remainder of the RULE DISCOVERY WORKSHEET as long as time allows.
Distribute ANTHROPOMORPHIC QUOTE CARDS. Have participants answer the following questions for each quote (Note: May divide participants into pairs):

- What was Leopold talking about in this quote?
- Have you ever observed or experienced something similar in nature?
- Why would Leopold talk about nature in this way?

Read aloud the quote below:

“I suspect that in the chickadee Sunday School two mortal sins are taught: thou shalt not venture into windy places in winter, thou shalt not get wet before a blizzard.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 90

**Rule Discovery Hike:**

- Share your observations and rules from your RULE DISCOVERY SHEET.
- Do any of the rules you developed apply to you?

**Anthropomorphic Quotes:**

- What anthropomorphic characteristics did Leopold use in your quote?
- Can you think of an example of anthropomorphism used today?
Aldo Leopold was known for work he did with wildlife and land management. He recognized that by setting game limits and restrictions on land use, the resources would be protected and more people could enjoy. Today, resource agencies have established regulations and rules for this same reason. Examples: Parks and nature centers have rules about staying on trails, not picking wildflowers and containing campfires. Anglers have limits on number and size of fish they can take. Hunters must be licensed and can only hunt during certain seasons. Zoos don’t allow feeding the animals.

**Rule Discovery Hike:**

- What rules might apply here?
- Is it okay to break a rule? What if everyone broke the rules?
- If no one knew you broke a rule, is it okay?
- How will what you learned today affect your actions in the future?

**Anthropomorphic Quotes:**

- What might be confusing about giving human traits to animals?
- How does this confusion affect conservation laws?
<table>
<thead>
<tr>
<th>NAME OF PLANT / ANIMAL</th>
<th>DANGERS FOR THIS PLANT / ANIMAL</th>
<th>RULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXAMPLES:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squirrel</td>
<td>Hawks, Coyotes (any animal that might want to eat a squirrel).</td>
<td>Never get too far from a tree.</td>
</tr>
<tr>
<td>Nut producing trees</td>
<td>Young trees will be shaded out.</td>
<td>Don’t drop all your seeds in one place.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<td>“January Thaw” p. 3</td>
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<td>“January Thaw” p. 4</td>
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<td>CARDINAL, CHIPMUNK, GOOSE</td>
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<td>“The Geese Return” p. 18</td>
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“Why is he abroad in daylight? Probably because he feels grieved about the thaw.”

“The track is likely to display an indifference to mundane affairs uncommon at other seasons; it leads straight across-country, as if its maker had hitched his wagon to a star and dropped the reins.”

“Indeed, it is all too clear that every surviving oak is the product either of rabbit negligence or of rabbit scarcity.” (p. 6)

“We mourned the loss of the old tree, but knew that a dozen of its progeny standing straight and stalwart on the sands had already taken over its job of wood-making.” (p. 9)

“The rough-leg has no opinion why grass grows, but he is well aware that snow melts in order that hawks may again catch mice.”

“The geese that proclaim the seasons to our farm are aware of many things, including the Wisconsin statutes.”

“A cardinal, whistling spring to a thaw but later finding himself mistaken, can retrieve his error by resuming his winter silence. A chipmunk, emerging for a sunbath but finding a blizzard, has only to go back to bed. But a migrating goose, staking two hundred miles of black night on the chance of finding a hole in the lake, has no easy chance for retreat.”

“The enthusiasm of geese for high water is a subtle thing, and might be overlooked by those unfamiliar with goose-gossip, but the enthusiasm of carp is unmistakable.”

“How sweetly the spreading waters murmur condolences for the wreckage they have inflicted on Monday morning dates!”
ANTHROPOMORPHIC QUOTE
BUR OAK
“Bur Oak” p. 27

ANTHROPOMORPHIC QUOTE
WOODCOCK
“Sky Dance” p. 30

ANTHROPOMORPHIC QUOTE
UPLAND SANDPIPER
“Back from the Argentine” p. 34

ANTHROPOMORPHIC QUOTE
SONGBIRDS
“Great Possessions” p. 42

ANTHROPOMORPHIC QUOTE
DOG
“Great Possessions” p. 43

ANTHROPOMORPHIC QUOTE
SILPHIUM
“A Prairie Birthday” p. 49

ANTHROPOMORPHIC QUOTE
RIVER
“The Green Pasture” p. 51

ANTHROPOMORPHIC QUOTE
VARIOUS BIRDS
“The Choral Copse” p. 53
Bur oaks were the shock troops sent by the invading forest to storm the prairie; fire is what they had to fight.

But the average battle line between the prairie and the forest was about where it is now, and the net outcome of the battle was a draw. One reason for this was that there were allies that threw their support first to one side, then the other. Thus rabbits and mice mowed down the prairie herbs in summer, and in winter girdled any oak seedlings that survived the fires.

This sliding scale is dictated by vanity, the dancer demanding a romantic light intensity of exactly 0.05 foot-candles.

At 3:35 the nearest sparrow avows, in a clear tenor chant, that he holds the jackpine copse north to the river bank, and south to the old wagon track.

The robin’s insistent caroling awakens the oriole, who now tells the world of orioles that the pendant branch of the elm belongs to him, together with all the fiber-bearing milkweed stalks nearby, all the loose strings in the garden, and the exclusive right to flash like a burst of fire from one of these to another.

The indigo bunting on the hill asserts title to the dead oak limb left by the 1936 drought, and to diverse near-by bugs and bushes. He does not claim, but I think he implies, the right to out-blue all bluebirds, and all spiderworts that have turned their faces to the dawn.

The county records may allege that you own this pasture, but the plover airily rules out such trivial legalities. He has just flown 4000 miles to reassert the title he got from the Indians, and until the young plovers are a-wing, this pasture is his, and none may trespass without his protest.

Perhaps it takes a decade for a Silphium to reach flowering age; how old, then, was my pet plant in the cemetery? It may have been older than the oldest tombstone, which is dated 1850. Perhaps it watched the fugitive Black Hawk retreat from the Madison lakes to the Wisconsin River; it stood on the route of that famous march. Certainly it saw the successive funerals of the local pioneers as they retired, one by one, to their repose beneath the bluestem.

He has paid scant respect to all these vocal goings-on, for to him the evidence of tenantry is not song, but scent. Any illiterate bundle of feathers, he says, can make a noise in a tree.

By September, the day breaks with little help from the birds. A song sparrow may give a single half-hearted song, a woodcock may twitter overhead en route to his daytime thicket, a barred owl may terminate the night’s argument with one last wavering call, but few other birds have anything to say or sing about.

I know a painting so evanescent that it is seldom viewed at all, except by some wandering deer. It is a river who wields the brush, and it is the same river who, before I can bring my friends to view his work, erases it forever from human view.

Like other artists, my river is temperamental; there is no predicting when the mood to paint will come upon him, or how long it will last.
ANTHROPOMORPHIC QUOTE
QUAIL
“The Choral Copse” p. 53

ANTHROPOMORPHIC QUOTE
JACKPINES
“Smoky Gold” p. 57

ANTHROPOMORPHIC QUOTE
OWLS, STARS, GEESE, FREIGHT TRAINS AND COFFEE POTS
“Too Early” p. 59

ANTHROPOMORPHIC QUOTE
OWLS, STARS, GEESE, FREIGHT TRAINS AND COFFEE POTS
“Too Early” p. 59

ANTHROPOMORPHIC QUOTE
SQUIRRELS, JAYS, CROWS AND PHEASANTS
“Too Early” p. 62

ANTHROPOMORPHIC QUOTE
DEER
“Red Lanterns” p. 65

ANTHROPOMORPHIC QUOTE
BLACKBERRY
“Red Lanterns” p. 65

ANTHROPOMORPHIC QUOTE
WIND
“If I Were the Wind” p. 66
“I try to read, from the age of the young jackpines marching across an old field, how long ago the luckless farmer found out that sand plains were meant to grow solitude, not corn. Jackpines tell tall tales to the unwary, for they put on several whorls of branches each year, instead of only one.”

“The silence is broken by a dozen contralto voices, no longer able to restrain their praise of the day to come.”

“Orion, the most widely traveled, says literally nothing. The coffee pot, from its first soft gurgle, understates the virtues of what simmers within. The owl, in his trisyllabic commentary, plays down the story of the night’s murders. The goose on the bar, rising briefly to a point of order in some inaudible anserine debate, lets fall no hint that he speaks with the authority of all the far hills and the sea.

The freight, I admit, is hardly reticent about his own importance, yet even he has a kind of modesty; his eye is single to his own noisy business, and he never comes roaring into somebody else’s camp.”

“Getting up too early is a vice habitual in horned owls, stars, geese and freight trains. Some hunters acquire it from geese, and some coffee pots from hunters.”

“Orion must have been the original mentor of the too-early company, for it is he who signals for too-early rising.”

“Has the deer a poetical weakness for singing waters, or a practical liking for a bed that cannot be approached without making a noise? Judging by the indignant flick of his great white flag it might be either, or both.”

“By sun up every squirrel is exaggerating some fancied indignity to his person, and every jay proclaiming with false emotion about supposititious dangers to society, at this very moment discovered by him. Distant crows are berating a hypothetical owl, just to tell the world how vigilant crows are, and a pheasant cock, musing perhaps on his philanderings of bygone days, beats the air with his wings and tells the world in raucous warning that he owns this marsh and all the hens in it.”

“The wind that makes music in November corn is in a hurry.”

“At sunset on the last day of grouse season, every blackberry blows out his light. I do not understand how a mere bush can thus be infallibly informed about the Wisconsin statutes, nor have I ever gone back the next day to find out.”
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<td>TREE</td>
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<td>&quot;If I Were the Wind&quot; p. 66</td>
<td>“Axe in Hand” p. 69</td>
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<td>&quot;Axe in Hand&quot; p. 70</td>
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<td>&quot;Axe in Hand&quot; p. 71</td>
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<td>WILD THINGS</td>
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<td>&quot;Home Range&quot; p. 78</td>
<td>“Pines Above the Snow” p. 82</td>
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<td>PINES</td>
<td>&quot;Pines Above the Snow” p. 85</td>
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“The pine stays green all winter, the birch punches the clock in October; do I favor the tree that, like myself, braves the winter wind?”

“A tree tries to argue, bare limbs waving, but there is no detaining the wind.”

“Thus to me the aspen is in good repute because he glorifies October and he feeds my grouse in winter, but to some of my neighbors he is a mere weed, perhaps because he sprouted so vigorously in the stump lots their grandfathers were attempting to clear.”

“In this pine, the wind will sing for me in April, at which time the birch is only rattling naked twigs.”

“May after May my pines follow their candles skyward, each headed straight for the zenith, and each meaning to get there if only there be years enough before the last trumpet blows. It is a very old pine who at last forgets which of his many candles is the most important, and thus flattens his crown against the sky. You may forget, but no pine of your own planting will do so in your lifetime.

If you are thriftily inclined, you will find pines congenial company, for, unlike the hand-to-mouth hardwoods, they never pay current bills out of current earnings; they live solely on their savings of the year before. In fact every pine carries an open bankbook, in which his cash balance is recorded by 30 June of each year.”

“The wild things that live on my farm are reluctant to tell me, in so many words, how much of my township is included within their daily or nightly beat.”

“The precocious jackpine sometimes blooms and bears cones a year or two after leaving the nursery, and a few of my 13-year-old jacks already boast of grandchildren. My 13-year-old reds first bloomed this year, but my whites have not yet bloomed; they adhere closely to the Anglo-Saxon doctrine of free, white and twenty-one.”

“Such a leaderless pine is doomed to frustration, for the surviving branches disagree among themselves who is to head the skyward march.”
ANTHROPOMORPHIC QUOTE
PINES
“Pines Above the Snow” p. 86

ANTHROPOMORPHIC QUOTE
PINES
“Pines Above the Snow” p. 87

ANTHROPOMORPHIC QUOTE
CHICKADEES
“65290” p. 88

ANTHROPOMORPHIC QUOTE
WEATHER
“65290” p. 90
“Each species of pine has its own constitution, which prescribes a term of office for needles appropriate to its way of life.”

“Pines, like people, are choosy about their associates and do not succeed in suppressing their likes and dislikes.”

“It seems that weather is the only killer so devoid of humor and dimension as to kill a chickadee.”

“When he first entered our trap, he showed no visible sign of genius. Like his classmates, his valor for suet was greater than his discretion.”

“When banded and released he fluttered up to a limb, pecked his new aluminum anklet in mild annoyance, shook his mussed feathers, cursed gently, and hurried away to catch up with the gang. It is doubtful whether he drew any philosophical deductions from his experience (such as ‘all is not ants’ eggs that glitters’), for he was caught again three times that same winter.”
SELL IT TO SAVE IT

A Fine Skin of the Great Auk
FOR SALE!

Is an announcement of the past, but if you can write Chas. K. Worthen of Warsaw, Ill. You can get lowest rates on fine skins of Ivory-billed Woodpeckers, Carolina Paroquets, Copper-tailed Trogons, and many other rarities difficult to obtain. It is impossible to mention everything in our stock of over 10,000 fine Bird and Mammal Skins. To mention a few others we have: Franklin’s and Richardson’s Grouse, Ashy and Forktailed Petrels, Xantus Marbled and Ancient Murrelets, Farallone Cormorants, Pacific Fulmars, Black-vented Shearwaters, Least, Crested, and Parrot Auk, Aleutian and Pribilof Sandpipers, Rio Grande Turkeys, Apinado Falcons, Artic Horned Owls, Great Black Swift, St. Lucas, Canes’ and Sulphur-bellied Flycatchers, Swainson’s, Bachman’s Red-faced, Grace’s, Hermit, Goldencheeked, Lucy’s, Virginian’s, Olive and Brasher’s Warblers, Mirador Yellow-throat, White-naped Nuthatch, Anabel’s Bluebirds, etc. etc. Also many beautiful Tropical Species. Finely mounted heads of Deer, Elk, Caribou, Rocky Mountain Sheep and Goats, etc. Fine Gooses of many varieties—order a few beauties for your Gooses of many varieties—order a few beauties for your Cabinet. I also have a few sets of Illinois Geological reports (Vols 1-8) complete and elegantly illustrated. This magnificent work is now becoming extremely rare. Send two stamps for catalogue or with letters of inquiry. Reference, all prominent Scientists or Institutions throughout the country.

CHAS. K. WORTHEN,
Naturalist, Taxidermist, and Dealer,
WARSAW, ILL., U.S.A.
Established in 1875.

1895 Ad

THEME: Just as human activities can lead to the extinction of animals, you can help protect threatened and endangered species/habitat.

OVERVIEW & OBJECTIVES:
In his essay “On a Monument to the Pigeon,” Leopold laments the extinction of the passenger pigeon, and makes the case that the short-term gains of the pigeon hunters of the 19th Century pale in comparison with the long-term loss of this bird species to later generations. In this activity, participants will be challenged to articulate the value of preserving threatened and endangered species/habitat, and explore the role that zoos, parks, conservation organizations and governments can play in helping to protect endangered animals and habitats from extinction.

BACKGROUND:
In his essay “On a Monument to the Pigeon,”

ESSAY FROM A SAND COUNTY ALMANAC:
“On a Monument to the Pigeon” p. 108 – 112

KEY QUOTE:
“Our grandfathers were less well-housed, well-fed, well-clothed than we are. The strivings by which they bettered their lot are also those which deprived us of (passenger) pigeons. Perhaps we now grieve because we are not sure, in our hearts, that we have gained by this exchange. The gadgets of industry bring us more comfort than the pigeons did, but do they add as much to the glory of the spring?” Aldo Leopold, p. 109

PROJECT CONNECTIONS:
WET
• Where are the Frogs
• Macroinvertebrate Mayhem
WILD
• Hazardous Links
• Who Fits Here
• History of Wildlife Management
• Polar Bears in Phoenix
• Here Today Gone Tomorrow
• Too Close for Comfort
WILD AQUATIC
• Watershed
• Plastic Jellyfish

TARGET AUDIENCE:
Ages 12 – adult, families

SUGGESTED TIME:
(preparation time not included)
60 – 90 minutes

SUGGESTED TIME:
(preparation time not included)
60 – 90 minutes
Leopold laments that we will never again see the giant flocks of passenger pigeons that once dominated the skies over his Wisconsin farm. Passenger pigeons were the most numerous bird species in North America until they became extinct due to habitat loss and over-hunting in the 19th Century. Many other species such as the Carolina Parakeet, Great Auk, Dodo, Dusky Seaside Sparrow, and Heath Hen became extinct due to the actions of humans. The great demand for land, food and fashion combined with a lack of hunting and land-use regulations in the early years of the United States led to widespread over-hunting, habitat degradation and the eventual extinction or near-extinction of many animal species.

Aldo Leopold is often called the "Father of Wildlife Management." During his time as a forest ranger and surveyor in the New Mexico wilderness, Leopold saw the detrimental effects of unregulated human actions (over-hunting, habitat destruction and fragmentation) on the landscape. Leopold pioneered a land management system (including enforced hunting regulations, wildlife refuge areas and habitat/wildlife restoration projects) to bring the habitat of the Gila National Wilderness back into a healthy balance. Based on his innovations in land management, Leopold published a book entitled “Game Management,” and through his work founded the profession of wildlife management.

Today, demand for animal by-products used in medicine, food, fashion, and worldwide habitat loss, threaten an unprecedented number of animal species. Animals and plants in immediate danger of disappearing (becoming endangered) are called endangered, and those that are declining in numbers and may disappear are called threatened. In the United States and other developed countries, hunting and fishing regulations that manage game and protect non-game populations (such as migratory birds) are enforced. Land use is regulated to preserve habitat in areas where threatened or endangered species live. Worldwide, however, many countries do not have the resources or governmental structure in place to enforce such regulations or implement land management plans for habitat protection.

Due in part to Leopold's work, we are lucky in the United States to have agencies in every state that manage not only wildlife, but fisheries and forests for the citizens of their state. These agencies are funded by license fees from hunters and anglers as well as taxes paid on their equipment. Today the nation's 12.5 million hunters have become essential partners in wildlife management. They pay millions of dollars for licenses, tags and permits and they contribute more than $250 million in excise taxes on guns, ammunition and other equipment. They also give $280 million annually to conservation organizations like Pheasants Forever, Ducks Unlimited and the National Wild Turkey Federation among others. Since 1982, volunteer members of Pheasants Forever, a habitat organization, have established over five million acres of habitat by planting native plants for food and establishing cover to help pheasants and other wildlife, in addition to improving water quality.

Other species such as deer, turkeys, elk, Canada geese and sturgeon have come back from the brink of extinction because of research, regulations and restoration programs. One of the most publicized is the American Bald Eagle. Bald eagles were first listed as "endangered" in 1967, after hunting, poisoning and widespread use of DDT reduced the number of bald eagles to 417 breeding pairs in the continental United States. The eagles' status was changed from “endangered” to “threatened” in 1995 and removed from the list in 2007.

**PACKING LIST:**
- A _Sand County ALMANAC_
- Copies of 1895 Ad "A Fine Skin of the Great Auk for Sale" (included)
- Pens/pencils, paper and clipboards or journals
- Pictures and descriptions of threatened and endangered species and/or habitats in your area (or a map to show the origin of threatened and endangered species housed at your zoo). See Web Resources for links to threatened and endangered species.

**PREPARATION:**
- Read the essay “On a Monument to the Pigeon” (p. 108 – 112 in _A Sand County ALMANAC_).
- Make copies of the 1895 Ad “A Fine Skin of the Great Auk for Sale” to distribute.
- Gather photographs and information about threatened and endangered species and/or habitats in your area or at your facility.
- Research land or wildlife management programs, regulations and organizations in your area that help protect threatened and endangered species and habitats. See Web Resources for links.
- Prepare clipboards with pencil/paper or journals for participants to design their advertisements.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
A Fine Skin of the Great Auk

FOR SALE!

Is an announcement of the past, but if you can write Chas. K. Worthen of Warsaw, Ill. You can get lowest rates on fine skins of Ivory-billed Woodpeckers, Carolina Paroquets, Copper-tailed Trogans, and many other rarities difficult to obtain. It is impossible to mention everything in our stock of over 10,000 fine Bird and Mammal Skins. To mention a few others we have: Franklin’s and Richardson’s Grouse. Ashy and Forktailed Petrels. Xantus, Marbled and Ancient Murrelets. Faralione Cormorants. Pacific Fulmars. Black-vented Shearwaters. Least, Crested, and Parrot Auks. Aleutian and Pybiloof Sandpipers. Rio Grande Turkeys. Aplomado Falcons. Artic Horned Owls. Great Black Swift. St. Lucas, Canes’ and Sulphur-belled Flycatchers. Swainson’s, Bachman’s Red-faced, Grace’s, Hermit, Goldencheeked, Lucy’s, Virginia’s, Olive and Brasher’s Warblers. Mirador Yellow-throat. White-naped Nuthatch. Anabel’s Bluebirds. Etc. etc. Also many beautiful Tropical Species. Finely mounted heads of Deer, Elk, Caribou, Rocky Mountain Sheep and Goats, etc. Fine Goode of many varieties—order a few beauties for your Goode of many varieties—order a few beauties for your cabinet. I also have a few sets of Illinois Geological reports (Vols 1-8) complete and elegantly illustrated. This magnificent work is now becoming extremely rare. Send two stamps for catalogue or with letters of inquiry. Reference, all prominent Scientists or Institutions throughout the country.

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Established in 1875.
SELL IT TO SAVE IT
ORIENTATION CARD

Lead participants in a discussion about threatened and endangered species or habitats. Tie the discussion to what is happening in your region or at your facility. Refer to and use background information to guide your discussion.

SELL IT TO SAVE IT
SELL IT TO SAVE IT CARD

Read aloud or distribute copies of the 1895 ad. The 1895 advertisement was designed to entice people to purchase products from rare animals.

• What animal species on this list are extinct? Why do you think they became extinct?
• Why might people purchase parts from threatened or endangered species?
• How does their value in the wild compare to their value as consumer products?

Distribute pictures and descriptions of some threatened and endangered species or habitats.

Option 1:
• Design an ad to convince people that a threatened or endangered species has value.
  • Hint: Imagine it is 50 years from today, and you are telling a story about your ad’s subject to your grandchildren. Will you find this animal in a zoo in 50 years or will this animal and its habitat still exist in the wild?
• Pretend that you are an active member in a conservation organization such as Pheasants Forever/Quail Forever. Write the ad to other members in the organization urging them to get involved in protecting the species or habitat.

**Option 2:**
• An elegy is a poem, speech or essay describing a death or mourning. Imagine your species or habitat has become extinct and write an elegy for it.
Gather participants to share their advertisements or elegy.

- Do you think we should try to save all animals or habitats from threat or extinction at all costs?
- What are the trade-offs when we protect species or habitats?

*Note:* This would be an opportunity for a leader to share information about their facility’s management plans or programs to help protect threatened and endangered species or habitats.

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Read or paraphrase the following quote aloud:

“Our grandfathers were less well-housed, well-fed, well-clothed than we are. The strivings by which they bettered their lot are also those which deprived us of (passenger) pigeons. Perhaps we now grieve because we are not sure, in our hearts, that we have gained by this exchange. The gadgets of industry bring us more comfort than the pigeons did, but do they add as much to the glory of the spring?”

— Aldo Leopold, *A Sand County ALMANAC*, p. 109

- What will you tell future generations about the animals or habitats you explored today?
- What species or habitats will you find in parks and zoos in the future? Which ones will exist in the wild?
- Where will the subject of your advertisement or elegy be in 50 years?
- How can you become involved with a conservation organization like Pheasants Forever/Quail Forever to help protect the animals and habitats you care about?
ATOM ADVENTURERS

OVERVIEW & OBJECTIVES:
In his essay “Odyssey,” Leopold traces the journey of nutrients through the landscape, emphasizing how much more quickly nutrients move through some human-altered landscapes than natural landscapes. In this activity, participants will find evidence of nutrients moving in the landscape, then compare and contrast nutrient cycles in two scenarios of land management. They will understand the benefit of reducing nutrient loss in an ecosystem and best land management practices and restoration projects to slow nutrient loss.

BACKGROUND:
Through his experience as a landowner, Aldo Leopold understood the complexity of nutrient cycling, and the ways in which humans by their land management practices can affect nutrient cycles. Past landowners of the Wisconsin farm Leopold purchased did not manage this land as a healthy ecosystem, and abandoned it in a degraded state. The farm’s topsoil had been eroded and carried downstream, and the remaining soil lacked nutrients critical to sustain plant life. On this land, Leopold and his family conducted one of the first prairie restoration projects in the country and planted thousands of trees to restore the soil of their abandoned farm.

Soil nutrients (such as nitrogen, phosphorous, potassium, calcium, magnesium) occur in nature and are critical to all plant growth on earth. In a healthy ecosystem, naturally occurring processes perpetually cycle nutrients through soil, water, plants and animals at a rate that supports the healthy function of all life in the ecosystem. Changes in land use practices can cause nutrients (attached to soil particles or suspended in water) to run off or leave the land at an accelerated rate. As nutrients leave the land and flow into rivers, lakes and the ocean, soil loses nutrients critical to plant growth and excess nutrient accumulation in water causes problems for aquatic plant and animal life. Humans can support land health and maintain good water quality by managing land to keep nutrients in place.

Examples of a “Healthy Landscape” include: (1) a native or restored forest or prairie, where plant roots and organic matter slow the movement of water, keeping soil in place, and decaying plants release nutrients back to the soil; (2) a farm field using windbreaks and cover crops with roots to keep soil in place; or (3) a healthy riparian area.

THEME: You can support land health and maintain good water quality by managing land to keep nutrients in place.

TARGET AUDIENCE: Ages 11 – adult, families

SUGGESTED TIME: (preparation time not included) 45 – 60 minutes

ESSAYS FROM A SAND COUNTY ALMANAC:
“Odyssey” p. 104 – 108

KEY QUOTE:
“An atom at large in the biota is too free to know its freedom; an atom back in the sea has forgotten it. For every atom lost to the sea, the prairie pulls another out of the decaying rocks. The only certain truth is that its creatures must suck hard, live fast, and die often, lest its losses exceed its gains.” —Aldo Leopold, p. 107

PROJECT CONNECTIONS:
WET
• Capture, Store, and Release
• Just Passing Through

WONDERS OF WETLANDS
• Nutrients: Nutrition or Nuisance
• Recipe for Trouble
• Water Under Foot
• Nature’s Filter

WILD
• Eco Enrichers
• Forest in a Jar

WILD AQUATIC
• Watershed
• What’s in the Water

FLYING WILD
• Food Chain Tag
where tree cover keeps soil and nutrients from washing into the river or stream.

Examples of an “Unhealthy Landscape” include: (1) a forest that has been clear-cut, leaving bare soil to be washed or blown away; (2) a farm field that has been tilled and left bare for the winter, leaving soil to blow or wash away; (3) a steep stream bank with no vegetation, or a stream used as a cattle crossing allowing nutrients from animals and soil to wash directly into the water.

At each station, participants will roll the cube to tell them that they (the nutrients) will move from the station where they are to the station rolled on the cube. For example, from the “soil” station: If the participant rolls “soil” on the cube, the instructor may explain: As nutrients move from soil to soil, they adhere to soil particles and stay where they are (get back in line at soil station and roll again). If the participant rolls “freshwater” on the cube, the instructor may explain: As nutrients move from soil to freshwater (when water washes over soil) nutrients are dissolved or suspended in water (go to freshwater station). If the participant rolls “plant” on the cube, the instructor may explain: As nutrients move from soil to plants, they are absorbed by plant roots and used to build and maintain plant tissue (go to plant station).

**PACKING LIST:**

- A Sand County ALMANAC
- Four different colored pony beads (from craft stores)
- Five containers to hold beads
- String or chenille pipe cleaners for beading bracelets (two per participant)
- Five large signs designating the following stations: soil, plant, freshwater, animal, ocean
- Heavy card stock and packing tape (to construct cubes) **Hint:** Use the small cubes from USPS or shipping company.
- Nine cubes labeled according to the Healthy Land and Unhealthy Land charts. To label the cubes you will need 13 soil labels, 9 plant labels, 12 animal labels, 12 freshwater labels and 8 ocean labels.

**PREPARATION:**

- Read the essay “Odyssey” (p. 104 – 108 in A Sand County ALMANAC).
- Create ten cubes and cube sides according to the chart below (see example cube template and chart listing cube labels for each station).
- Make signs for each of the five stations (soil, plant, freshwater, animal, ocean).
- Cut string in bracelet-lengths or use chenille pipe cleaners (tie knots at one end of each string ahead of time for younger participants).

**Round One (Healthy Landscape):**

- Set up five stations. Assign one color for each station. Each station will include: a sign, a cube and a container with the station’s color of bead.

**Round Two (Unhealthy Landscape):**

- Replace cubes from round one with cubes for round two’s unhealthy land cubes. Distribute second string or chenille pipe cleaner.
- Restock the beads at each station if needed.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.

### Healthy Landscape Station Cubes

<table>
<thead>
<tr>
<th>SOIL STATION CUBE</th>
<th>PLANT STATION CUBE</th>
<th>ANIMAL STATION CUBE</th>
<th>FRESHWATER STATION CUBE</th>
<th>OCEAN STATION CUBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 soil 1 freshwater 2 plant</td>
<td>2 plants 1 animal 3 soil</td>
<td>3 animal 2 soil 1 freshwater</td>
<td>1 freshwater 2 soil 1 animal 1 plant 1 ocean</td>
<td>4 ocean 1 plant 1 animal</td>
</tr>
</tbody>
</table>

### Unhealthy Landscape Station Cubes

<table>
<thead>
<tr>
<th>SOIL STATION CUBE</th>
<th>PLANT STATION CUBE</th>
<th>ANIMAL STATION CUBE</th>
<th>FRESHWATER STATION CUBE</th>
<th>OCEAN STATION CUBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 soil 4 freshwater 1 plant</td>
<td>1 plants 4 animal 1 soil</td>
<td>1 animal 1 soil 4 freshwater</td>
<td>1 freshwater 1 animal 1 plant 3 ocean</td>
<td>4 ocean 1 plant 1 animal</td>
</tr>
</tbody>
</table>
Example of healthy soil station cube

Soil

Soil

Plant

Soil

Plant

Freshwater
Cube Template

Print on heavy cardstock and fold to make cubes.
There are nutrients moving through soil, plants, animals and water.

- What is a nutrient?
- What are the nutrients that help you stay healthy and grow?
- Why do plants need nutrients?
- Are they different from yours?

Explain to participants that they will play two rounds of a game that represents the nutrient cycle.

- Participants (representing nutrients) will move between the soil, plants, animals, freshwater and ocean, represented by five designated stations.
- In the first round, participants will be a nutrient in a healthy landscape. In the second round, they will be a nutrient in an unhealthy landscape.
- They will pick up one bead per roll of the cube. The roll will tell them where to get their next bead. This will create a bracelet to tell the story of where they stopped along the way.

**Round One (Healthy Landscape):**

Give each participant a string or chenille pipe cleaner and tell them they are going to become a nutrient moving through a healthy landscape. Examples of a “Healthy Landscape” include:

1. a native or restored forest or prairie, where plant roots and organic matter slow the movement of water, keeping soil in place, and decaying plants release nutrients back to the soil;
2. a farm field using windbreaks and cover crops with roots to keep soil in place; or
3. a healthy riparian area where plants keep soil and nutrients from washing into the river or stream.

- Divide participants equally among the 5 stations. This is their starting point and they will begin their journey by placing a bead from that station onto their bracelet. The game will end when a set time has elapsed or a certain number of beads have been collected.
• Participants take turns rolling the cube, then moving to the station indicated. *Note: Any time the station rolled is the same as the station where the participant already is, they place another bead from that station on their bracelet and move to the back of the line to roll again.*

• Upon arrival at each new station, they place a bead from that station on their bracelet, and roll the cube to indicate where they will go next.

• When the set time has elapsed or a certain number of beads have been collected, tie off the strings or twist the pipe cleaners and gather the group. Allow a few volunteers to tell the “story” of where they went as a nutrient on the “healthy” land. (Participants will notice that some nutrients traveled to many different places, and others stayed in the same place.)

**Round Two (Unhealthy Landscape):**

*Reset the game with the “unhealthy land” cubes (the stations and bead colors will stay the same).*  
*Note: The Ocean Cube remains the same.* You may need to restock beads at some stations.

*Give each participant a second string or chenille pipe cleaner and tell them they are going to become a nutrient moving through an unhealthy landscape. They will create another bracelet to tell the story of where they stopped along the way.*  
Examples of an “Unhealthy Landscape” include: (1) a forest that has been clear-cut, leaving bare soil to be washed or blown away; (2) a farm field that has been tilled and left bare for the winter, leaving soil to blow or wash away; (3) a steep stream bank with no vegetation, or a stream used as a cattle crossing allowing nutrients from animals and soil to wash directly into the water.

• Repeat the steps from Round One.
ATOM ADVENTURERS
WRAP-UP CARD

Lead a discussion about the different journeys that participants took.

- Where did you spend the most time?
- Why do you think more nutrients ended up in freshwater or ocean on the unhealthy land?
- Why do you think more nutrients stayed in the soil on the healthy land?
- How can we change our land use practices to keep nutrients in the soil?
- How can we make the second-round cycle more like the first?

Read aloud the quote below:

“An atom at large in the biota is too free to know its freedom; an atom back in the sea has forgotten it. For every atom lost to the sea, the prairie pulls another out of the decaying rocks. The only certain truth is that its creatures must suck hard, live fast, and die often, lest its losses exceed its gains.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 107

ATOM ADVENTURERS
WHAT PART DO I PLAY? CARD

Aldo Leopold and his family conducted one of the first prairie restoration projects in the country and planted thousands of trees to restore the soil on their Wisconsin farm. Since Leopold’s time, scientists have learned a lot about how to restore land to a healthy state. Many community members and families have become involved in restoration projects through organizations like Pheasants Forever/Quail Forever, Trout Unlimited and the National Arbor Day Foundation among others.

- What can you do at home (with your farm, yard or garden) to help keep nutrients in the soil and out of the water system? (i.e. plant trees, grasses, use compost, etc.)
- Do you have any outdoor hobbies (such as bicycling, fishing, boating, gardening or bird watching) that are affected by nutrient cycles and/or land management?
- Are there areas in or around your community that need restoration (such as stream banks, eroded areas, etc.)? How can you help?
CAPTURING THE LANDSCAPE THROUGH DIGITAL PHOTOGRAPHY

TARGET AUDIENCE:
Ages 11 – adult, families

OVERVIEW & OBJECTIVES:
In his essay “The Green Pasture,” Leopold describes the ephemeral beauty he observes in the natural world. He uses the analogy of a river as an artist, painting a different picture along the sandbars each day, only to be erased as the water changes. In this activity, participants will use photography to capture nature’s fleeting moments before they escape from our view. Participants will learn the basics of digital photography and practice taking photographs that tell a story.

BACKGROUND:
In “The Green Pasture,” Leopold warns us to be ready to capture nature’s beauty in our mind’s eye, because it is fleeting and may vanish in a second. He encourages the reader to not only look at the big picture, but to find beauty in the smallest details. Leopold is most famous for documenting the natural landscape through his writing, but he also found photography to be useful in his work and fun for the whole family. Today, digital cameras make it easier than ever to enjoy the natural world through photography.

On a work trip to Germany, Leopold purchased a beautiful 2x2 Zeiss camera. He brought it back from Germany and took pictures, which he then made into glass slides to use in his classes at the University of Wisconsin. Carl, his son, watched his dad take pictures and soon was en-

THEME: The natural landscape is ever-changing. You can learn to use cameras to capture beautiful moments.

SUGGESTED TIME:
(preparation time not included)
90 minutes – 3 hours

ESSAY FROM A SAND COUNTY ALMANAC:
“The Green Pasture” p. 51 – 52

KEY QUOTE:
“Some paintings become famous because, being durable, they are viewed by successive generations, in each of which are likely to be found a few appreciative eyes”
—Aldo Leopold, p. 51

PROJECT CONNECTIONS:
WONDERS OF WETLANDS
• Introducing Wetlands
WILD
• Adaptation Artistry
• Drawing on Nature
• Spider Web Geometry
WILD AQUATIC
• Water Plant Art
FLYING WILD
• Celebrate Migration Day
• Teaming Up for Birds
SCIENCE & CIVICS
• Getting Acquainted
PLT
• The Closer You Look
• Looking at Leaves
• The Shape of Things

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THEME: The natural landscape is ever-changing. You can learn to use cameras to capture beautiful moments.
thrilled by the whole process; in his own words, Carl just “Ate it up!” He said he knew how to use the camera and never remembers his dad sitting down to show him how to take pictures.

In a 2008 interview with Carl Leopold, he related the following: As a youth he went to car shows and took pictures of his favorite cars and zeroed in on pretty hubcaps! He snuck the camera into the theater and took pictures of Greta Garbo, among other actors. He took it to a track meet and captured Jesse Owens, the world record breaker in track and field. He even started a camera club with friends at school. The teens became acquaintances with a local jeweler whose hobby was photography. The jeweler became the sponsor for their photo club and showed them new ways to take pictures and taught them about various types of equipment. Carl took photos at the Shack (their family’s cabin) and captured family outings on film. Many of the pictures seen today of the Leopold family are missing Carl because he was the photographer. He entered some of his pictures in contests at school. Both father and son’s love of nature was enhanced by using a camera. Carl encourages those interested in taking pictures to practice, then practice some more! A photographer will learn techniques by taking photos and experimenting. And above all, it’s just fun to get outside!

Aldo Leopold was an avid hunter in his early years, but later in life he liked to hunt with his camera. Photography can become a lifelong hobby for many people, and it doesn’t require buying a license. Today, like Leopold and his son, we can gather our camera gear, get outside and observe nature. Who knows when we might even capture an award-winning photo!

**PACKING LIST:**
- A Sand County ALMANAC
- PowerPoint presentation
- LCD projector and computer with software that reads different camera brands or instructor must have universal memory card reader to download participants’ pictures.
- Digital cameras (facility provides or participants bring their own with instruction book)
- Copies of PHOTO CHALLENGE CARDS
- Hand-outs (from PowerPoint and photography definitions)
- Two pictures of “The Shack” (or a landmark building from your local area) then and now.

**PREPARATION:**
- Read the essay “The Green Pasture” (p. 51–52 in A Sand County ALMANAC).
- Prepare camera equipment (charge batteries, install memory cards if needed) or, if advertised as “bring your own camera,” be sure participants do this.
- Review PowerPoint slide show and modify as appropriate for your program.
- Set up computer for PowerPoint presentation and camera downloads.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
- Plan enough time for group to go outdoors and capture their photos.

**INSTRUCTOR’S NOTE:**
This activity is meant to be used in conjunction with the included PowerPoint presentation, and can be extended as part of a digital photography workshop.
CAPTURING THE LANDSCAPE THROUGH DIGITAL PHOTOGRAPHY

ORIENTATION CARD

Indoors, introduce the group to the basics of digital photography:

- Show the PowerPoint presentation.
- Check that participants have prepared their cameras (batteries charged, memory cards installed) or distribute cameras to the group.
- As a group, practice setting cameras in various modes for specific photos (landscape, portrait, macro, etc.).
- Orient participants to some great photo opportunities at your facility (i.e. certain species of flora in bloom, or a tree in full color in autumn, or sightings of certain animals at the center, zoo or in the park).
- Distribute PHOTO CHALLENGE CARDS. Set a time limit, and send them outdoors to take photos!

CAPTURING THE LANDSCAPE THROUGH DIGITAL PHOTOGRAPHY

WRAP-UP CARD

As the group returns, download their photos onto instructor's computer.

- Have each participant select and share up to three favorite photographs with the group.

The review session should be open for participants to comment, give suggestions and ask questions. The instructor does not have to be a professional photographer, but should guide participants and encourage them to practice the key concepts of photography taught today and enjoy their time outdoors. Based on instructor’s level of expertise and program priorities, look at different aspects of the participant’s photographs.

- Option 1: Give technical feedback on the photographs as appropriate.
- Option 2: Identify and interpret the subjects of the photographs.
Read aloud and discuss the quote below:

“Some paintings become famous because, being durable, they are viewed by successive generations, in each of which are likely to be found a few appreciative eyes.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 51

Share with the group: Leopold is most famous for documenting the natural landscape through his writing, but he also found photography to be useful in his work and fun for the whole family. Photography is one way to document changes in seasonal patterns (phenology). By photographing plants and animals at specific times of the year and recording the dates and times, you can learn a great deal about migration patterns, when species will be in an area, or specific growing times.

(over)
How will the basic skills you learned today help you observe and record nature in a different way?
How would you begin your own phenological (observation of seasonal changes in nature) diary through photos?
What will you do to explore nature through photography, and how will you share this love of nature with others?

FLORA CHALLENGE:
• Find an interesting composition of a plant.
• Take 2 photos showing 2 different types of lighting (back, front or side lighting).
• Take 2 photos showing 2 different depths of field.

ANIMAL CHALLENGE:
• Try to find a mammal, reptile or bird in action and take its photo.
• Take a photo that directs attention to the living object.

THE PRIZE WINNER!
• Find a subject that you especially like and capture it in a photograph. This photo would be one that you would enter in a contest. Remember, less is more and sometimes the most simple subjects make the most magnificent photos. Good Luck!

LANDSCAPE CHALLENGE:
• Take a photo of a landscape that will be different in a month.
• Find a spot that you think might be different in five years and capture it on film.
CAPTURING THE LANDSCAPE THROUGH ART

TARGET AUDIENCE:
Ages pre-K – adult, families

SUGGESTED TIME:
(preparation time not included)
45 – 90 minutes

ESSAY FROM A SAND COUNTY ALMANAC:
“The Green Pasture” p. 51 – 52

KEY QUOTE:
“Do not return for a second view of the green pasture, for there is none. Either falling water has dried it out, or rising water has scoured the bar to its original austerity of clean sand. But in your mind you may hang up your picture, and hope that in some other summer the mood to paint may come upon the river.”
—Aldo Leopold, p. 52

PROJECT CONNECTIONS:
WONDERS OF WETLANDS
• Introducing Wetlands

WILD
• Adaptation Artistry
• Drawing on Nature
• Spider-Web Geometry

WILD AQUATIC
• Water Plant Art

FLYING WILD
• Celebrate Migration Day
• Team Up for Birds

SCIENCE & CIVICS
• Getting Acquainted

PLT
• The Closer You Look
• Looking at Leaves
• The Shape of Things

THEME: By observing nature through the eyes of an artist, you can find beauty in the big picture and in the smallest of details.

OVERVIEW & OBJECTIVES:
In his essay “The Green Pasture,” Leopold talks about the ways a riverbank landscape will change in a matter of minutes, days and weeks. He encourages the reader to take pictures of beautiful scenes “in your mind’s eye” before they change or go away. In this activity, participants will be challenged to take a closer look at their natural surroundings and make an artistic record of their findings. They will practice observation skills, looking at outlines, colors and patterns in nature as they take in the big picture, as well as notice the smallest of details.

BACKGROUND:
Leopold in his essay explains that natural landscapes are ever-changing. If you have a special area in nature, it is likely to look different from how you remembered it each time you visit. In the essay “The Green Pasture,” he describes how high
water in a river can wash a picture painted in the ridges of sand away like a dry-erase board. Regardless, the picture in your mind of this special place is yours forever. This is why it is important to take in all the details of the place or object you are observing. The details in Leopold’s mind consisted of the brilliant colored flowers growing amid a thick green carpet of *eleocharis*.

Through his writing, Leopold paints beautiful pictures with his words and challenges us to look at nature as art. Finding the colors and objects that stand out and making us stop and take a closer look is what art is all about. Leopold challenges us to search for the patterns, colors and shapes which will help us paint the picture of our outdoor experiences.

**PACKING LIST:**
- *A Sand County ALMANAC*
- Example of nature photographs from a calendar or other resource
- Two pictures, then and now, of a landmark building from your area or your facility
- Small cardboard frames of various sizes (i.e. picture mats from a local craft supply store in various sizes — 4x6, 5x7, 8x10)
- Clipboards (one for each team of two)
- Seven pieces of white paper (8½ x 11) for each pair
- Colored pencils or crayons
- Field guides (optional)

**Indoors:**
- Scissors
- Glue sticks
- Watercolors, brushes or other medium
- Large sheet of poster board or roll of butcher paper to make collage

**PREPARATION:**
- Read the essay “The Green Pasture” (p. 51–52 in *A Sand County ALMANAC*).
- Choose an outdoor area large enough for each group of two to explore.
- Have clipboards, cardboard frames, paper and crayons ready to take outdoors.
- Have paper large enough to create a collage from the individual pictures.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Display nature photographs from a nature calendar or other resource and ask participants:

- What makes a good photograph? (composition, interesting subject, vibrant colors, varying light or patterns)
- What part of the picture is your eye drawn to and why?
- Hold up an example of a landscape photo and ask participants what part of this photo is most interesting. Allow for a variety of responses, but lead the group toward a specific aspect that can be looked at closer (i.e. If the picture is of a forest in fall then lead group to look more closely at a leaf and focus on smaller parts of the picture.)

Gather participants to take a close look at nature. Distribute clipboards, paper, pencils/crayons and frames to each pair.

**Freeze Frame:**

- Demonstrate how to use the frame. In pairs, one participant will hold their frame over a still object while the other sketches. If they have a field guide with them, participants can find out what their object is.
- Give pairs approximately five minutes each to sketch the object then the participants switch and must find another object for second partner to sketch.

**Textures and Patterns:**

- Each pair will find three objects that have texture (i.e. tree bark, leaf, rock).
- The pair will do rubbings of each object with crayons/pencils using three sheets of paper.
- If possible, have them try to identify their objects.
Quick Shot:

- Each pair will locate and observe an animal in motion, note its shape and color.
- Pairs take turns sketching their moving animals. *Hint: Focus on the outline of your subject, then sketch.*
CAPTURING THE LANDSCAPE THROUGH ART

WRAP-UP CARD

• Gather participants where you have laid out the large sheet of paper.
• Participants will work together to lay out their pictures and re-create the landscape on one large sheet of paper. (Some will have ground pictures, above ground pictures or sky pictures, etc.)
• Use scissors to cut out each image. The participants may need to draw in parts of the landscape such as the outline of a tree so that the bark rubbings can be attached to the trunk branches or leaves placed in appropriate areas.
• When the group is satisfied with the layout of the landscape, glue the pieces in place.
• Participants may then color or paint extra things they saw while they were out in the field. At this time, try to identify the plants and animals that were seen and write the names next to the drawings.
• Collage may hang in the facility, or it may be cut into pieces so that individuals, classrooms or families can take home a piece of the landscape.

CAPTURING THE LANDSCAPE THROUGH ART

WHAT PART DO I PLAY? CARD

Leopold enjoyed getting outdoors and taking pictures. He loved to capture nature at its best. He realized that things in nature are always changing and he trained himself to take a picture in his mind because many times the objects that he was viewing would disappear.

Read aloud and discuss the quote below:

“Do not return for a second view of the green pasture, for there is none. Either falling water has dried it out, or rising water has scoured the bar to its original austerity of clean sand. But in your mind you may hang up your picture, and hope that in some other summer the mood to paint may come upon the river.”

– Aldo Leopold, A Sand County ALMANAC, p. 52

• Did this happen to you today?
• What do you think that this place will look like the next time you visit?
• Will it be different five years from now? If so, how?
• Show a photo of an old picture of your facility, park, zoo, nature center or landmark in the community that participants would recognize. Compare it with recent photos.
• Why do you think that this landscape has changed?
• How will you use the techniques you learned today in the future?
ON YOUR OWN

TARGET AUDIENCE:
Ages 11 – adult, families

SUGGESTED TIME:
(preparation time not included)
90 minutes – 3 hours

ESSAY FROM
A SAND COUNTY
ALMANAC:
“Flambeau”
p. 112 – 116

KEY QUOTE:
“The elemental simplici-
ties of wilderness travel
were thrills not only
because of their novelty,
but because they repres-
ent complete freedom
to make mistakes. The
wilderness gave them
their first taste of those
rewards and penalties
for wise and foolish acts
which every woodsman
faces daily, but against
which civilization has
built a thousand buffers.
These boys were ‘on
their own’ in this partic-
ular sense.”
—Aldo Leopold, p. 113

THEME: The wilderness is a great place to test your creativity, ingenuity and awareness.

OVERVIEW & OBJECTIVES:
In his essay “Flambeau,” Leopold tells the story of meeting two young men on a camping trip and describes how such a trip provides real world consequences and the freedom to make mistakes. In this activity, participants will test their abilities and demonstrate creative problem-solving skills through a series of open-ended challenges. Upon completion of chosen challenges, participants will share lessons learned from their successes and failures.

BACKGROUND:
In his essay “Flambeau,” Leopold shares his experiences of a camping trip on the Flambeau River in northern Wisconsin. While camping, he comes across two fellows canoeing and listens to their two-day survival stories of going by “sun-time,” fishing for their food, trial and error efforts to build fires and seeking “refuge” from mosquitoes! He remembers the thrill in their voices and the appreciation of freedom to try such things, as well as the enjoyment found in both their successful and failed attempts at living outdoors.

Freedom to enjoy the outdoors includes being safe and recognizing that you might be placed in a dangerous situation that will test your skills and limits. This awareness, plus being prepared with the proper equipment and knowledge, is the key to a safe and successful outdoor experience.

Spending time in the wilderness can be quite peaceful and restorative; however, accidents and mishaps can and do occur! If you spend time in the outdoors as an angler, hunter, hiker, photographer, skier, trapper oriker; at any given time you could find yourself in a life-threatening situation. That is why it is very important to plan ahead and prepare: know your location and how to read a map and compass. Know basic first aid. Know how to tell time without a watch. Know what foods are best to eat for your activity. Keep hydrated. Wear proper clothing. Know how to build a fire. Watch weather patterns and locate a place of retreat if weather conditions deteriorate.

The bottom line is to be smart and take the time to learn the skills and techniques needed for outdoor survival. Create your own emergency survival kit and take it with you when you are out and about! Nature gives us the freedom to enjoy its beauty, but always be ready for the unexpected — then you will have a successful story to tell around the campfire, a fire that you built!

PROJECT CONNECTIONS:
WONDERS OF WETLANDS
• The Wetland Gourmet
• Soak it Up
• What a Boat!
WILD
• The Thicket Game
• Muskox Maneuvers
• Migration Barriers
• Oh, Deer!
WILD AQUATIC
• Turtle Hurdles
• Marsh Munchers
FLYING WILD
• Hidden Hazards
• Bird Hurdles
PACKING LIST:
Packing list is organized according to challenge. Choose which challenges fit your timeframe, audience and facilitation needs.

- A Sand County ALMANAC
- Copies of appropriate CHALLENGE INSTRUCTION CARDS
- Stopwatch (1 per station)
- Pencils and index cards

Match-Stick Fire Challenge:
- Three match sticks in an orange match container with striker on bottom (sporting goods outlets)

Fire Builders Challenge:
- Flint/steel
- Metal-match fire starter
- Bow drill (optional)
- Magnifying glass
- Tinder
- Char cloth
- Steel wool
- Cotton balls covered with Vaseline
- Dryer lint

Create a Shelter Challenge:
- Tarp
- Rope

Wild Edibles Challenge:
- Ribbons/tags/string
- Field guide
- List of common edibles in your area
- Clipboard
- Paper/pencil

Useful Tools Challenge:
- Rope
- Music CD
- $1 bill
- Large plastic garbage bag
- Duct tape
- Old t-shirt
- Tin can half filled with coffee
- Plastic zip-lock
- Aluminum foil
- Plastic soda bottle
- Paper clip
- Fishing line
- Shotgun shell
- Shoestring
- Dental floss
- Expired credit card
- Can of beans
- Fishing pole
- List of items sheet
- Clipboard/paper/pencil for recorded responses

Mis hap Challenge:
- Rope (75 ft)
- Orange cones (markers of some kind)
- Canoe paddle
- External frame backpack
- Sheet or tarp

Small Game Hunting Challenge:
- Three two-liter bottles
- Three cut-out images (squirrel, fish, bird, etc.)
- Surgical tubing

Suggested Sample Survival Kit for Wrap-Up Discussion:
- Knife
- Metal match
- Lighter
- Signal mirror
- Whistle
- Rope/para-cord
- Large heavy duty garbage bag
- Waterproof matches
- Compass
- Small flashlight/headlamp (LCD preferably)
- Iodine tablets
- First aid kit
- Metal container for collecting water
- Vaseline-coated cotton balls
- Water bottle

PREPARATION:
- Read the essay “Flambeau” (p. 112 – 116 in A Sand County ALMANAC).
- Choose the challenges that are most appropriate for your setting, timeframe and print/organize challenge cards to fit your timeframe, audience and facilitation needs.
- Each group will have 15 minutes to complete their challenge and a five minute supply check/deconstruct time so that each station is starting from scratch.
- Stations will need to be set up before participants arrive. It is recommended to have an adult at each station supervising (instructor, parent chaperone, chapter leader, teacher, etc.). The adults will be instructed not to give advice or directions; they are simply there to make sure the challenge is completed safely.
- Read through all challenge cards and assemble materials for each station.
- Provide pencils and index cards at each station for recording, and stopwatch to time the challenge.
- Prepare the small game hunting challenge by filling the 2-liter bottles half full of water. Pictures of the three animals should be affixed to the front of the bottles.
Introduce the activity with a discussion about the gifts and challenges to be found in nature:

Nature and wilderness are a gift to us. We are lucky to have the opportunities to experience such places, but we must respect them and understand that at times we may be forced to work a little harder for our food, water, shelter and overall comfort. Whether you are an angler, hunter, rafter, birder, backpacker, hiker, photographer or writer, you could find yourself in a life-threatening situation in the outdoors. Mother Nature is not always kind and beautiful. She can be unforgiving and you need to be prepared in such situations. It is fact that every year people die in the woods, mountains and rivers. The bottom line is to be prepared when taking part in outdoor activities. This simple rule will help you enjoy the best of Dear Mother Nature!

Ask participants:

- How many have ever been camping? Canoeing? Other outdoor experiences?
- By a show of hands, ask how many people have encountered an uncomfortable or potentially life-threatening situation in the outdoors. What situation? Share a few stories.

Read aloud the quote below:

“The elemental simplicities of wilderness travel were thrills not only because of their novelty, but because they represent complete freedom to make mistakes. The wilderness gave them their first taste of those rewards and penalties for wise and foolish acts which every woodsman faces daily, but against which civilization has built a thousand buffers. These boys were ‘on their own’ in this particular sense.”

– Aldo Leopold, A Sand County ALMANAC, p. 113

Divide participants into groups (5 – 6 per group) and introduce challenges:

Explain to the group that they will be presented with different challenges dealing with wilderness survival. The point is to challenge the creativity of individuals and see how working together is essential in potentially life threatening situations. Many of the tasks may not be accomplished and that is okay. These challenges will test abilities and allow the participants to see that there are consequences to their actions and decisions. We realize these are made-up scenarios, but
these situations are very real and could happen to anyone. This is what Leopold meant by “real rewards and real penalties.” The participants will be split into groups and rotate through a series of stations each supervised by an adult. At each station, they will have 15 minutes to try and complete their group challenge. Allow five minutes for the supervising adult to help reset the station for the next group to start from scratch. (Example: Replenish the three match sticks at the match stick fire challenge.) So have fun, work together and be safe! AND — May the “force of nature” be with you!

**Final Reminders:**

- The groups will continue with their challenge by trying new things until they succeed or until time runs out. *Note: The supervising adult may not help.*
- Please remind groups to complete their challenge without damaging habitat or harming wildlife. Participants must work as a group and watch out for each other’s safety.
- All participants will take part in challenges.
- After 15 minutes, regardless of whether or not the challenge was completed, the group will clean up, reset or disassemble their work to get it ready so the next group can start from scratch.
Gather group and select one spokesperson for each challenge to briefly share the experience (both successes and frustrations) their group had with that particular challenge. Talk to the group about the importance of being prepared and share with them some of these items that you would have in your personal survival kit when taking part in an outdoor activity.

**Suggested Sample Survival Kit:**

- Knife
- Metal match/lighter/waterproof matches
- Signal mirror
- Whistle
- Rope/para-cord
- Large heavy duty garbage bag
- Compass

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**In A Sand County ALMANAC,** Leopold discusses that spending time in the wilderness provides you with real rewards, and in some cases, real penalties.

- After your experiences today, what will you do to ensure that you will have a safe experience in the outdoors?
- How can you share these lessons with others?
- By practicing the skills of creativity and ingenuity, how can these skills help you in other non-wilderness situations?
- Leopold offers the freedom to make mistakes. Why can mistakes be good?

**Read aloud the quote below:**

“Perhaps every youth needs an occasional wilderness trip in order to learn the meaning of the particular freedom.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 113

Encourage group to take a trip outdoors and experience a wilderness setting without iPods or cell phones. Go with your family or friends. Find the pleasure nature can bring...
• Small flashlight/headlamp (LCD preferably)
• Iodine tablets
• First aid kit
• Metal container for collecting water
• Vaseline-coated cotton balls
• Water bottle

**Additional options depending on time:**

First have group come up with their own list that they would put in a survival kit. Then go over yours. OR — print off a list for groups and allow time for them to prioritize the importance of the items on the list. Then have the group reach consensus on the top three most important items.
Items Provided:  Tools: Flint/steel, metal-match fire starter, bow drill (optional), magnifying glass
Starting aids: Tinder, char cloth, steel wool, cotton balls covered with Vaseline, dryer lint

Your group is on a backpacking trip in the mountains and an unexpected storm has blown in. The temperatures have dropped quickly and everyone is wet. The matches that someone had in their pockets are wet and do not work. You must build a fire to stay warm and dry off. You have 15 minutes to build a fire using the items/tools provided. There will not be any matches! You do not need to use all items. Good Luck!

Items Provided: Three match sticks inside orange match container

You have all been lost for the day and night is setting in and the temperatures have dropped drastically. Your attire consists of jeans and sweatshirts and it looks like you will all have to build a fire to keep warm until daylight. Your group has 15 minutes and 3 match sticks to build a fire. Good Luck!

Items Provided: Ribbons/tags/string, field guide, list of common edibles in your area. clipboard, paper/pencil

Your fishing trip ended up being longer than what everyone expected because the group took a wrong path that strayed from the river bed. It is day two and there was only enough food for lunch the first day because you planned on eating what you caught. Your group has 15 minutes to go over the list of wild edibles in your area. Locate as many as you can and flag them. Write down how they might be prepared for eating-if time permits. Good Luck!

Items Provided: Rope, music CD, $1 bill, large plastic garbage bag, duct tape, fishing pole, old t-shirt, tin can half-filled with coffee, plastic zip-lock, aluminum foil, plastic soda bottle, dental floss, paper clip, fishing line, shotgun shell, shoe-string, old credit card, can of beans, a list with all these items listed on a sheet attached to the clipboard, paper/pencil

Collectively your group has a wide array of items in their packs. Your group has 15 minutes to discuss and record ways these common household items can be used in a survival situation. Be creative. You are stranded. How else will you use these items to get by for a day or two until rescued? Good Luck!

Items Provided: 3 two-liter bottles, surgical tubing (for sling shots), 3 cut-out images of a squirrel, fish, bird, or other

The group has been stranded for several days and your food supply is gone. You have been able to locate a few edible plants and fruits, but hunger is setting in. You are now going to have to hunt for food, but you do not have the proper equipment to do so. The group has 15 minutes to use the resources around you to somehow hunt the small game in the area. Keep in mind this is a survival situation and by no means should anyone use this tactic to harvest any type of animal without the proper equipment, training and licenses. One would hope a scenario such as this would never happen, but one never knows. Discuss what you may, if you had to, kill and eat in this area. Be safe; do not throw anything when someone is in the line of target. Good Luck!

Items Provided: Tarp, rope

Your group took a wrong turn on the trail and it is getting dark and you need to stop and spend the night to avoid getting lost. A couple of members in the group have two of the items above. You have 15 minutes to create a shelter that would withstand the elements: wind, rain/hail, snow, extreme sun exposure. Use your imagination. Good Luck!

Items Provided: Rope (75 ft), orange cones (markers of some kind), canoe paddle, external-frame backpack (optional), sheet or tarp

One of the individuals in your party has sprained both ankles and can’t walk. You have 15 minutes to designate who the injured person will be and use the items listed to safely transport the injured person from cone/marker #1 to cone/marker #2 (approximately 25 yards/75 ft). Remember, moving an injured person could paralyze them or injure them worse. You do not have to use all items for transport, but you may. All participants need to be involved in the transport. Do not lift above waist-level. One person should be designated as a spotter. Be careful and be smart about your decisions. Good Luck!

- Remind participants that they do not have to use all items, but they can if they so choose.
- In transport, let them know they should not lift above waist-level. Keep an eye on the student’s head during transport.
- Make sure a spotter is designated and step in when there is threat of any injury.
- Remember to not give clues other than the safety reminders.
MY SPECIAL PLACE

OVERVIEW & OBJECTIVES:
In his essays “On Top” and “Guacamaya,” Aldo Leopold wrote about the observations he made of special places outdoors. In this activity, participants will have a chance to connect and relate to a place they might find special by spending quiet time alone and recording thoughts and feelings through words and sketches.

BACKGROUND:
One of Leopold’s special places was a piece of land he and his family purchased in 1935 on the Wisconsin River where they converted a chicken shack to a cabin. He often visited “The Shack” to explore and write his observations in his journal. He reported those observations in his book *A Sand County ALMANAC*, and provided a detailed account of the interaction between plants, animals and history of the area. In addition to his essays about Wisconsin, Leopold wrote about other special places he discovered through his travels.

In his essay “Guacamaya,” Leopold writes about his discovery of the Thick-billed Parrot (called Guacamaya by the natives) in northern Mexico. He had a great appreciation for the parrot’s beauty and magical qualities. Because of some of the unexplainable features of the bird, he referred to it as a *numenon* of the land, or something having spiritual or magical significance. A philosopher might call it a numenon while a scientist might label the parrot a phenomenon, or something that could be observed, described or explained. Leopold viewed the parrot from both observations — with characteristics that could be described and with features that could not be explained. Leopold also mentions other magical animals he knew and created an equation to explain the relationships of that animal with the land. For example, he described the autumn landscape in the north woods with the equation: “the land, plus a red maple, plus a ruffed grouse” (p. 137). [Land = red maple + ruffed grouse] He mentioned two other numena

SUGGESTED TIME:
(preparation time not included)
60 – 90 minutes

ESSAY FROM A SAND COUNTY ALMANAC:
“Guacamaya”  
p. 137 – 141
“On Top”  
p. 122 – 128

KEY QUOTE:
“I hear young people, not yet born when I first rode out ‘on top’ exclaim about it as a wonderful place.”
—Aldo Leopold, p. 128

THEME: By spending time alone and using your senses, you can connect to a special place.

PROJECT CONNECTIONS:
WONDERS OF WETLANDS
• Tracking Plants, Keeping Track
• Wet ‘n’ Wild
• Whose Clues

WILD
• Ants on a Twig
• Learning to Look, Looking to See

WILD AQUATIC
• Blue Ribbon Niche
• Riparian Retreat

FLYING WILD
• Busy Bird Motel
• Home, Sweet Home

SCIENCE & CIVICS
• How to Evaluate Habitats

PLT
• Habitat Pen Pals
• Trees as Habitats

TARGET AUDIENCE:
Ages 11 – adult, families
he knew “the whiskey-jack (Canada Jay) of the muskegs (sphagnum bogs) and the pinonero (a similar-looking parrot) of the juniper foothills” (p. 138).

Because Leopold appreciated the Thick-billed Parrot for both its beauty and scientific value, he was concerned about its future survival. He was especially worried about what would happen to the parrot and its habitat when roads were built and visitors entered the area with guns or developers with bulldozers. Because humans have the power to help nature and also to destroy it, Leopold wanted us to develop a conservation aesthetic (an appreciation of beauty so nature would be preserved) and a land ethic (a sense of what are right and good ways to treat the land).

In still another essay “On Top,” Leopold describes with fondness an area of Arizona where he worked for the U.S. Forest Service. He wrote later that he did not visit it again because “I prefer not to see what tourists, roads, sawmills, and logging railroads have done for it, or to it.” His writing encourages us to think about the need to protect special places.

This activity allows participants to explore and find a “special place” by becoming familiar with a specific spot while using their senses and recording what they see, hear, smell and touch. Through these recordings, they can develop a better understanding of a particular setting and develop an appreciation of its natural beauty. Through journaling and answering guided questions, they can create equations that express the importance of this spot to them and how animals, plants and the land are related.

**PACKING LIST:**
- A *Sand County ALMANAC*
- Journals or writing paper and clipboard or index cards
- Pens, colored pencils

**Younger ages:**
- Copies of *MY SPECIAL PLACE GUIDE SHEET*

**Older ages:**
- NATURE THROUGH LITERATURE CARDS

**PREPARATION:**
- Read the essay “Guacamaja” (p. 137) and “On Top” (p. 122) in *A Sand County ALMANAC*.
- Choose an area large enough to give each person a place they can explore on their own.
- Print and organize procedure cards to fit your timeframe, audience and facilitation needs.
Read aloud the quote below:

“I hear young people, not yet born when I first rode out ‘on top’ exclaim about it as a wonderful place.”

– Aldo Leopold, *A Sand County ALMANAC*, p. 128

Ask participants:

- Do you have a place to go if you need to be alone? Where is that?
- If you have a place outdoors, where do you go?
- Do you spend time alone?
- Would you like to spend more time alone? If not, why?

Today you will experience some time alone exploring a safe place using your senses and recording what you see, hear, touch and smell. You will have a MY SPECIAL PLACE GUIDE SHEET or NATURE DISCOVERY CARD to help you get started, and you can record by writing or drawing your experiences. You will be safe and near others but please don’t talk to anyone. It is a quiet time to discover what is around you. Have some fun exploring and discovering nature.

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**My Special Place for younger participants:**

- Distribute pencils, clipboards (or journals) and the MY SPECIAL PLACE GUIDE SHEET. Review the directions.
- Take participants out and position them so that they each have a small area to observe on their own.
- Give them a set amount of time, and let them know how you will call them back together (a whistle, bird call, etc.).

**Nature Through Literature for older participants:**

- Divide participants into pairs.
- Distribute pencils, index cards (or optional journal) and give one NATURE THROUGH LITERATURE CARD to each pair.
- Take participants out and have them choose an area where they will complete the task on their card. Record their findings.
- Give them a set amount of time, and let them know how you will call them back together (a whistle, bird call, etc.). Suggested time: 10 – 15 minutes.
**MY SPECIAL PLACE**  
**WRAP-UP CARD**

Bring the group together. Select participants to share what they discovered, what they found that was special or how they feel about where they are and what they explored.

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**MY SPECIAL PLACE**  
**WHAT PART DO I PLAY? CARD**

Read aloud this quote:

“I hear young people, not yet born when I first rode out ‘on top’ exclaim about it as a wonderful place.”  
– Aldo Leopold, *A Sand County ALMANAC*, p. 128

Aldo Leopold was a curious man and he was inspired to explore and write about what he observed and discovered at a place that was very special to him. He and his family restored the worn out farm they visited on weekends by planting trees and grasses and cleaning up the debris. Leopold, his wife and five children always enjoyed going to “The Shack,” as they called it.

- Does a special place have to be “fancy”?
- What makes a person connect to a place?
- Why is it important to have special places?
- Find a special place in nature.
### MY SPECIAL PLACE GUIDE SHEET

**DIRECTIONS:** Fill out the following sheet:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close your eyes. Wait for a few minutes.</td>
<td>List or draw what you heard.</td>
</tr>
<tr>
<td>Close your eyes. Touch the ground around you.</td>
<td>List or draw what it felt like.</td>
</tr>
<tr>
<td>Close your eyes. What did you smell?</td>
<td>List or draw what you smelled.</td>
</tr>
<tr>
<td>With your eyes open, what do you notice?</td>
<td>List or draw it.</td>
</tr>
</tbody>
</table>

**Additional Note:** This guide sheet is designed to help you explore and document your experiences in a special place. It encourages you to engage with your senses in a mindful and creative way. Whether it’s a physical location or an internal space, the goal is to capture the essence of your special place. Use the provided blanks to fill in your observations, or draw directly on the sheet to express what you perceive. This exercise can be a valuable tool for self-reflection and personal growth.
<table>
<thead>
<tr>
<th><strong>Pick two things about your special place.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your place = __________________ + ____________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Name your special place.</strong></th>
</tr>
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<tbody>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Describe your place with a poem, song, story or drawing.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
LEOPOLD QUOTE: “Smoky Gold” p. 55

LEOPOLD QUOTE: “Smoky Gold” p. 57

LEOPOLD QUOTE: “On Top” p. 125

LEOPOLD QUOTE: “On Top” p. 125

LEOPOLD QUOTE: “On Top” p. 127

LEOPOLD QUOTE: “Guacamaja” p. 137

LEOPOLD QUOTE: “Guacamaja” p. 138

LEOPOLD QUOTE: “Guacamaja” p. 141
“Such an October gentian [a wildflower], dusted with tamarack gold, is worth a full stop and a long look, even when the dog signals grouse ahead.”

Stop and take a long look around your special place and find something that catches your eye. What did you find? How was it special to you and worth the “full stop and long look”?

“The tamaracks change from green to yellow when the first frosts have brought woodcock, fox sparrows, and juncos out of the north.”

Find a tree or other plant having leaves of different colors. Describe the colors and varying shades.

“On a fair morning, the mountain invited you to get down and roll in its new grass and flowers (your less inhibited horse did just this if you failed to keep a tight rein).”

Find something in your special place and touch it to get to know it better. Describe how it feels.

“The mountain in summer had as many moods as there were days and weathers; the dullest rider, as well as his horse, felt these moods to the marrow of his bones.”

If your place had a “mood” (i.e. glad, sad, scared, mad), what would it be? Why did you choose that mood?

“Everybody knows, for example, that the autumn landscape in the north woods is the land, plus a red maple, plus a roughed grouse.”

Using your special place, create a formula that describes two things about your place that would help you remember it.

\[ \text{Place} = \text{Land} + \text{Red Maple} + \text{Roughed Grouse} \]

Describe your place in detail.

“Cow-country place names are lewd, humorous, ironic, or sentimental, but seldom trite.”

Name your place using characteristics that could be recognized by others. (Apache Indians might name a place “Cottonwood at the Bend of a River”). Tell a story.

“But what woodpecker excavates a hole large enough? The Guacamaja (as the natives euphoniously called the parrot) is as big as a pigeon, and hardly to be squeezed into a flicker-loft.”

Find a bird near your special place and ask a question about it that you would like to answer. What is your question? How will you find an answer?

“A philosopher has called this imponderable essence the numenon of material things. It stands in contradistinction to phenomenon, which is ponderable and predictable, even to the tossings and turnings of the remotest star.”

Look at your special place by taking the roles of a philosopher and a scientist. Describe your place as a philosopher. A philosopher thinks about things that can’t be measured or observed (numena). Describe your place as a scientist. A scientist thinks about things that can be measured and observed (phenomena). How are they different?
OVERVIEW & OBJECTIVES:
In his essay “Come High Water,” Leopold describes the family’s experience of being marooned at their family farm along the Wisconsin River, and their discoveries during an early spring flood. They realized that many of the objects they found after the flood revealed a story and could be put to use. In this activity, participants will imagine the history of discarded objects they find, and explore ways these items could be reused.

BACKGROUND:
The Leopold family lived in Madison, Wisconsin, but often spent weekends staying in a restored chicken coop they called “The Shack.” Their land was located on the Wisconsin River and was prone to flooding in some years. Flooding is a natural process, especially during spring when heavy precipitation, and in some cases snow melt, can increase the volume of rivers.

If the Leopold family happened to be at the Shack, located just 150 yards from the river, when the water rose, they sometimes were marooned by flood waters that covered the road and prevented the family from getting back to Madison in time for work or school on Monday. On such occasions, it was fun to scavenge objects left behind and everyone was always surprised by what they might find and how they could put it to use. Old boards were used to build furniture, make repairs or contribute to a campfire. They also enjoyed observing how wildlife responded to the conditions. They tried to solve the mysteries, and tell the stories of each found object. Where did it come from? Who owned it? How many floods had carried the object in years past? It was like having a library full of history books in a lumber pile.

It is interesting to note that Leopold’s essay, written in the 1940s, promotes the concept of reusing discarded items. In the past, families commonly reused materials because new items were expensive to purchase or difficult to obtain. Even though materials are now relatively available to Americans, reducing, reusing and recycling are encouraged.

TARGET AUDIENCE:
Ages 10 – adult, families

SUGGESTED TIME:
(preparation time not included)
60 – 90 minutes

ESSAY FROM
A SAND COUNTY ALMANAC:
“Come High Water”
p. 23 – 25

KEY QUOTE:
“The autobiography of an old board is a kind of literature not yet taught on campuses, but any river bank farm is a library where he who hammers or saws may read at will. Come high water, there is always an accession of new books.”
—Aldo Leopold, p. 23

THEME: You can discover useful items from unexpected sources. One person’s trash is another’s treasure.
INSTRUCTOR'S NOTE:
This is a great activity to do near water, but you can bring your own scrap wood and other items to set the scene for this activity just about anywhere.

PACKING LIST:
- A Sand County ALMANAC
- Participant cards, enough for each participant to have at least one per group (more if time allows)

PREPARATION:
- Read the essay “Come High Water” (p. 23 – 25 in A Sand County ALMANAC).
- Scout an outdoor area — near water if possible — to do the activity.
- Put together a box of items that have the potential to be re-used as your backup.
- Make copies of COME HIGH WATER CARDS to hand out.
- Print and organize procedure cards to fit your timeframe, audience, and facilitation needs.

(the 3 R’s) are common ways to save money and conserve limited natural resources. Reducing refers to limiting consumption, or finding ways to meet our needs using fewer natural resources (such as buying items in bulk instead of individually wrapped packages). Reusing and recycling are different practices. Items that are reused are simply used again in their original form for the same purpose (such as washing out a plastic baggie to be used again to store food) or a new purpose (such as using a glass soda bottle as a flower vase). Recycled products have been used, collected, and re-processed into new or different products (a plastic soda bottle may become a t-shirt, or aluminum can may be re-processed into another aluminum can). These practices not only reduce waste in landfills, but conserve natural resources.

• Ideally you want the participants to find their own boards/objects, but always take a collection of wood scraps, pottery, beach glass and other discarded items as backup.
• Clipboard/paper/pencil (one per group)
Have participants imagine the Leopold family’s experience as you read “Come High Water” (pages 23 – 25) in A Sand County ALMANAC:

- Have you ever experienced a snow day, or had your regular schedule interrupted by extreme weather?
- Relate your experiences to the Leopolds’ experience.

Have participants imagine the Leopold family’s experience

- Ask participants to give examples of items that they recycle or reuse at home.
- Show examples of items you have collected, that have been reused.
  Some examples may include: jewelry made from beach glass; old piece of wood used as sign post in garden; vase carved out of driftwood; old eye glass piece made into a lapel pin; brick made into a candle holder; rock made into a vase; or a bird house made from a gourd.

Take participants outdoors and read aloud the quote below.

“The autobiography of an old board is a kind of literature not yet taught on campuses, but any river bank farm is a library where he who hammers or saws may read at will. Come high water, there is always an accession of new books.”

– Aldo Leopold, A Sand County ALMANAC, p. 23

- Divide into groups and distribute one or more COME HIGH WATER CARDS to each group.
- Give groups time to explore, collect and complete the assignment on their COME HIGH WATER CARD(S).
FLOODING THOUGHTS

WRAP-UP CARD

Gather the group and ask one spokesperson from each group to share their object’s stories and findings. For each found object, decide whether it should be taken from the land or left where it was found.

- When is it okay to remove objects from a natural area?
- When is it better to leave objects where you found them?
- Will you take your found object with you, or leave it?

FLOODING THOUGHTS

WHAT PART DO I PLAY? CARD

Aldo Leopold and his family often used old and previously used items instead of buying new things, even though at that time most people had not heard of the 3R’s.

- Why do you think the Leopold family reused items at their farm?
- Does your family reuse items or recycle at home? Why or why not?
- Can you think of more ways you could reduce, reuse, and recycle at home?

Read aloud as closing thought:

“The autobiography of an old board is a kind of literature not yet taught on campuses, but any river bank farm is a library where he who hammers or saws may read at will. Come high water, there is always an accession of new books.”

– Aldo Leopold, A Sand County ALMANAC, p. 23
Pretend you are a reporter interviewing this object.
Create a story of its experience. Perhaps it was found after a storm, flood, fire. Maybe it was just found along this nearby waterway or road.
One person is the reporter and the other person is the object. There may be bystanders (the rest of the group) that can be interviewed as well.
Be creative and relay the story to the public.

Discover a washed-up board or object along the water or trail and list the various ways this object can be recycled and used again.
Why is it important to recycle?

Imagine that you are Aldo Leopold picking up this board or object behind the Shack on the Wisconsin River.
What did he mean when he said that a salvaged board is twice as valuable as one bought from the lumber yard?
What would Leopold do with this board?
Discuss the importance of reusing items and recycling.
List examples of recycled products you may use at home.

Create a eulogy for this object found along the trail or waterway. (A eulogy is a tribute to someone or something that is gone.)
Why was it important?
What purpose did it serve?
How will it be remembered?

Discuss the impact that floods have on humans and the environment.
What are some biological issues dealing with floods?
Make a list of positives and negatives dealing with floods.
What did Aldo Leopold and his family think of the spring floods that occurred on their family farm?
Has anyone in your group or their families ever experienced a flood?
List your responses and report to the group.

Autobiography of an Old Board
Personify this piece of wood or object.
Relay its history as if you are the object.
Tell what you said, who you met, places you visited along this great river we call life.
LEP Glossary:

**absorb/absorption** • introduction or uptake of one substance into another.

**adaptations** • gradual variation in the characteristics of a plant or animal species as it adjusts to its environment.

**adapted** • genetically changed in order to improve or be made more fit for a particular environment.

**annual** • living only one growing season, as beans or corn.

**anthropomorphism** • attributing of human characteristics and purposes to inanimate objects, animals, plants or other natural phenomena.

**biodiversity** • variety among and within plant and animal species in an environment.

**browse** • (noun) tender shoots or twigs of shrubs and trees as food for cattle, deer, etc; (verb) to feed on or nibble at foliage, lichen, berries, etc.

**carnivore** • animal that eats other animals. These animals can be secondary consumers in the food chain or food web, meaning they eat herbivores. Or they can be tertiary consumers, meaning they eat other carnivores.

**competition** • interaction of two (or more) organisms (or species) such that, for each, the birth or growth rate is depressed and the death rate increased by the presence of the other organisms (or species).

**conservation** • the careful use of a natural resource in order to prevent depletion.

**cover crop** • a crop, usually a legume, planted to keep nutrients from leaching, soil from eroding, and land from weeding over; as during the winter.

**debris** (as in detritus) • the remains of anything broken down or destroyed.

**decompose** (also decomposer, decomposing) • to separate or resolve into constituent parts or elements; to disintegrate; to rot, spoil, or putrefy; fungi and bacteria that grow on dead or decomposing organic matter, such as feces or the remains of dead animals are called decomposers.

**dehydration** • process of removing water from a substance or compound.

**dispersal** • scattering or the process or result of the spreading of organisms from one place to another.

**Draba** • any of numerous low-growing cushion-forming plants of the genus Draba having rosette-forming leaves and terminal racemes of small flowers with leafless flower stalks or leafy stems.

**disturbed** • put out of order or disarranged.

**eco-region** • a recurring pattern of ecosystems associated with environmental conditions and natural features in characteristic combinations of soil and landforms.

**ecosystem** • An ecological community together with its environment, functioning as a unit.

**eleocharis** • sedges having dense spikes of flowers and leaves reduced to basal sheaths.

**endangered** • in imminent danger of extinction.

**environment** • the air, water, minerals, organisms and all other external factors surrounding and affecting a given organism at any time.

**ephemeral** • anything short-lived, as an insect that lives only for a day in its winged form.

**erosion** • progressive loss of land due to the combined action of water, wind and biological agents.

**evidence** • any object, action, event, pattern, etc., that conveys a meaning.

**exposure** • the condition of being exposed without protection to the effects of harsh weather, esp. the cold, solar radiation, precipitation and such.

**extinction** • coming to an end or dying out as in the loss of a species from the planet.

**fragmentation** • process whereby a large patch of habitat is broken down into many smaller patches of habitat, resulting in a loss in the amount and quality of habitat.
habitat • areas that meet the environmental requirements of a species.

habitat degradation • process in which natural habitat declines to a lower condition, quality or level capable of supporting the species originally present.

habitat destruction • process in which natural habitat is rendered functionally incapable of supporting the species originally present.

herbivores • animals that feed mainly or only on plants; in a food chain, herbivores are primary consumers.

home range • geographic area to which an organism normally confines its activity.

invasive • non-indigenous species (i.e. plants or animals) that adversely affect the habitats they invade economically, environmentally or ecologically.

key • a systematic tabular classification of the significant characteristics of the members of a group of organisms to facilitate identification and comparison.

land ethic • a perspective on environmental ethics first championed by Aldo Leopold in his book A Sand County ALMANAC. In it he wrote that there was a need for a “new ethic,” an “ethic dealing with man’s relation to land and to the animals and plants which grow upon it.”

limiting factor • a factor that controls a process, such as organism growth or species population, size or distribution. The availability of food, predation pressure or availability of shelter are examples of factors that could be limiting for an organism.

marginal habitat • a habitat supporting only a few species or individuals because of the limiting environmental conditions.

migration • the periodic passage of groups of animals (especially birds or fishes) from one region to another for feeding or breeding.

mnemonic • a device (such as a rhyme or acronym) used to aid recall.

monoculture • a single, homogenous culture without diversity like the cultivation of a single crop on a farm or in a region or country.

native prairie • the grasses and flowers of once-extensive grass-dominated ecosystems that are native to the Midwest region of the United States, extending from Canada south to Texas.

natural resources • a material source of wealth, such as timber, fresh water or a mineral deposit, that occurs in a natural state and has economic value.

non-native • not indigenous (originating and living or occurring naturally) to a particular area; foreign; of living things originating in a part of the world other than where they are growing.

numenon • a spiritual or mystical entity that exists as itself, apart from us that is not perceptible by the senses; we do not live in a world of numenon; we live in a world of phenomenon.

nutrient (soil nutrients; nutrient cycles) • chemical elements that are essential for life; examples include carbon, hydrogen, oxygen, phosphorous, potassium, nitrogen, sulfur, calcium, iron and magnesium.

organic matter • animals or plants in any stage of decomposition found on or under the ground; carbon-based materials made of once-living cells.

perennial • (of plants) having a life cycle lasting more than two years.

phenomenon • an occurrence, circumstance or fact that is perceptible by the senses.

phonetics • branch of linguistics that deals with the sounds of speech and their production, combination, description and representation by written symbols.

phenology • the science dealing with the influence of climate on the recurrence of such annual phenomena of animal and plant life as budding and bird migrations.

prairie • extensive area of flat or rolling, predominantly treeless grassland, especially the large tract or plain of central North America, characterized by a highly fertile soil and originally covered with coarse grasses, and merging into drier plateaus in the west.

prairie glade • grassy meadow of native prairie grasses and forbs under an open canopy of deciduous trees.

predation • a relation between animals in which one organism captures and feeds on others.

predator • any organism that exists by preying upon other organisms.
progeny • offspring or descendents considered as a group.

remnants • a surviving trace or vestige left over from formerly larger areas; as in a prairie remnant.

resilient • ability to return to original form after being changed by outside forces.

resources • total means available for economic and political development, such as mineral wealth, labor force, and armaments; contrast with natural resources.

restoration • a return of something to a former, original, normal or unimpaired condition; a reconstruction or reproduction.

riparian • of, pertaining to, or situated or dwelling on the bank of a river or other body of water.

scat • the excrement of an animal and evidence of its passing through an area.

scavenger • an animal, such as a bird or insect, that feeds on dead or decaying matter.

shrew • any of various small, chiefly insectivorous mammals of the family Soricidae, resembling a mouse but having a long pointed snout and small eyes and ears.

signs • (animal) an indicator, such as a dropping (see “scat”) or footprint, of the trail of an animal.

starvation • result of a serious, or total, lack of nutrients needed for the maintenance of life.

sturgeon • any of various large ganoid freshwater and marine fishes of the family Acipenseridae of the Northern Hemisphere, having edible flesh and valued as a source of caviar and Isinglass.

survival • living or continuing longer than, or beyond the existence of, another living thing or event; an outliving.

threatened • a species likely, in the near future, to become an endangered species within all or much of its range.

tracking • to follow the tracks of something; to trail.

weed • any undesirable or troublesome plant, especially one that grows profusely where it is not wanted.

whitlow grass • Draba is a large genus of cruciferous plants, commonly known as Whitlow-grasses of which there are over 300 species.

windbreak • a hedge, fence or row of trees designed to lessen the force of the wind and reduce erosion.

winnowing • to blow away; scatter; classically, to separate the chaff from grain by means of a current of air.
LEP Ancillary Glossary:

-accession- an increase by means of something added; an addition to or increase in value of property by means of improvements or natural growth.

-analogy- a resemblance of relations; an agreement or likeness between things in some circumstances or effects, when the things are otherwise entirely different.

-articulate- express, formulate or present verbally with clarity and effectiveness.

-convoy- to accompany or escort, usually for protection.

-decorum- appropriateness of behavior and conduct; the conventions and requirements of polite behavior.

-depth of field (photography)- range of distances over which a camera gives satisfactory definition, when its lens is in the best focus for a certain specific distance.

-euphoniously- pleasant in sound; agreeable to the ear.

-Identiflyer (Birdsong Identiflyer®)- an electronic device with song cards playing digital recordings of over 200 bird songs.

-pickerelweed- a freshwater plant (Pontederia cordata) of eastern North America, having heart-shaped leaves with long petioles and spikes of violet-blue flowers.

-protocols- agreed-upon standards and practices that allow individuals and systems to be compatible with each other and work within common larger systems.

-proclamation- the act of announcing in an official or formal manner that declares a territory or district subject to particular legal restrictions.

-sovereignty- supreme and independent power or authority in government as possessed or claimed by a state or community.

-stalwart- strong and stoutly built; sturdy and robust.
Recommended Field Guides Series:
Note: Field guides are listed by series so you can pick the individual guides that work for your subject.

Discover Nature Series, Stackpole Books

Golden Guides, St. Martin’s Press

Ken Kaufman’s Field Guides, Houghton Mifflin Company

National Audubon Society, Alfred A. Knopf Co.
  Field Guides
  First Field Guide Series
  Photography Guides
  Regional Guides

Peterson Field Guides, Houghton Mifflin & Co.

Peterson Field Guides for Young Naturalists, Houghton Mifflin & Co.

Peterson First Guides Series, Houghton Mifflin & Co.

National Wildlife Federation Field Guides, Sterling Publishing

Nature Study Guides, Stackpole Books

Take Along Guides, NorthWord Press, Creative Publishing International

Tom Brown’s Field Guides to Tracking and Survival, Penguin Group (USA)

Field Guide Series edited by Jeffrey Glassberg, Oxford University Press

Stokes’ Beginner’s Guides, Little Brown & Co.


Additional Individual Field Guides:


Scats and Tracks, James Halfpenny, ISBN: 076271140X.
Audio Field Guides
From Cornell Lab of Ornithology:

Lang Elliott’s Audio Guides, Stackpole Books

Recommended Web Resources:
Create on-line field guides for your region, www.enature.com
CSUBIOWEB FRUIT KEY, http://arnica.csustan.edu/key/key2.html
On-line key that will help users find the botanical terms for fruits and seeds. The terms are hyperlinked to images of sample fruit that are examples of each type. The key is also printable so it can be used off-line.

Has links to state organizations and many other federal and state links.

Leopold Education Project, www.lep.org

State-by-state links to groups studying and promoting native plant life, collected by the Michigan Botanical Club.

Pheasants Forever
http://www.pheasantsforever.org/
PF sponsors LEP and provides the Ringnecks education program for PF youth members.

Prairie Research Center, USGS Northern Prairie Wildlife Research Center, www.npwr.usgs.gov
Information for wildlife managers, scientists, and the public on natural resource issues and biota of the North American Great Plains.

Resources for Digital Photographers at Northwestern Oklahoma State University, www.nwosu.edu/resources
Numerous links to digital photography.

Richmond Audubon Society, www.richmondaudubon.org
RAS program to link youth to nature via digital cameras. Sample youth program using digital cameras. “See the RAS Kids Nature Photography session with our inner-city youth outreach at the James River Park’s Wetlands Section. “See them in action, see their photography.”

Tips for Teaching Outdoors: Field study, safety, and collection guidelines (downloadable PDF files)
http://happeninhabitats.pwnet.org/working_outdoors/index.php

University of Wisconsin – Leopold Digital Collection, http://www.news.wisc.edu/13501

US Department of Agriculture – Natural Resources Conservation Service Plant Database USDA-NRCS.
http://plants.usda.gov/index.html The Plant Data Center, Baton Rouge, LA 70874-4490 USA

Let’s Go Outside, Fish and Wildlife Service
Additional Literature
Recommendations:

Look, See and Discover

Habitat High-Rise

Botany Scavenger Hunt
For forested ecosystems:

Landscape Investigators
Field guides to tracks and tracking

Allies and Invaders
Field guides (see Appendix references)

Blown Away

Wake Up Little Birdie, Wake Up!
Lasky, Kathryn, *She's Wearing a Dead Bird on her Head!*, ISBN: 0613023536, Rebound by Sagebrush, 1999


**The Rules of Wild Things**


**Sell It to Save It**


**Capturing the Landscape through Art; Capturing the Landscape through Digital Photography**


**On Your Own**


Tom Brown survival guides

**My Special Place**


**Flooding Thoughts**
