BLM

# “Wonder into Wilderness”

## Educator’s Learning and Activity Guide

*Bruneau-Jarbidge Rivers Wilderness*
*Photo: Bob Wick*

## Outdoor Lessons for Curious Young Learners

**U.S. Department of the Interior**
Bureau of Land Management
Boise District Office

# Acknowledgements

**Project Learning Tree** is an award-winning environmental education program designed for teachers and other educators, parents, and community leaders working with youth from preschool through grade 12. Visit Project Learning Tree at: www.plt.org/

**Leave No Trace** Center for Outdoor Ethics teaches people of all ages how to enjoy the outdoors responsibly, and is the most widely accepted outdoor ethics program used on public lands. Through relevant and targeted education, research and outreach, the Center ensures the long-term health of our natural world. Visit Leave No Trace at: www.lnt.org/

Special thanks to **Student Teacher Ross Parsons** for developing and compiling this educator's guide. Ross is a recent graduate of the McCall Outdoor Science School.

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Photo: American Fork Citizen

An outdoor classroom can offer a new environment for young learners to increase their curiosity and drive for adventure.

## National Wilderness Overview

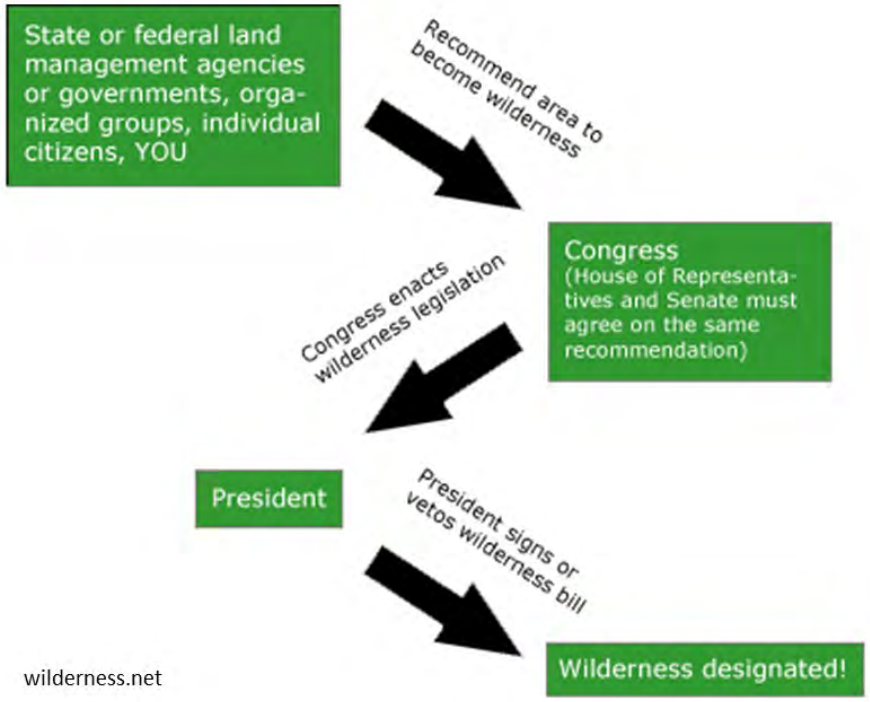
- The U.S. has 758 wilderness areas that cover nearly 110 million acres. That's bigger than the State of California!
- Excluding Alaska, the contiguous U.S. is only 2.7% wilderness. That's about the size of Minnesota.
- The largest wilderness area, the Wrangell–Saint Elias Wilderness, is just over 9 million acres.
- Roughly 2.3 million acres, the Frank Church–River of No Return Wilderness in Idaho is the largest unbroken wilderness in the contiguous 48.
- Connecticut, Delaware, Iowa, Kansas, Maryland, and Rhode Island are the only states without a designated wilderness area.

# Wilderness Facts

## *What is wilderness?*

With strong Congressional support, the passage of the 1964 Wilderness Act ensured future generations would benefit from the enduring resource of wilderness. As defined by the Wilderness Act, wilderness is an area where earth and communities have been untrammeled by humans. Humans are visitors and shall not remain permanently. Furthermore, wilderness is an area of underdeveloped Federal land which has successfully retained its primeval character and influence. Such character and influence would therefore be without permanent improvements and human habitation. A wilderness area is one which: 1) has been predominately affected by the forces of earth, 2) has incredible opportunities for solitude and primitive or unconfined recreation, 3) consists of at least five thousand acres of land or is of sufficient or practical size, and 4) may comprise of certain features which are particularly valuable to science, education, or scenic and/or historic value.

## *Who gets to create wilderness?*




The process of creating a wilderness can be accomplished with clear communication and collaboration from all parties involved.

## *Why should we care about wilderness?*

Wilderness is much more than pristine landscapes and unobstructed views; it allows for us to live better, healthier lives. For example, wilderness' untamed lands literally filter

and clean the water we drink and the air we breathe. A refuge from the hustle and bustle of everyday life, wilderness gives us an escape to solitude. Even more, wilderness acts as an unspoiled site for science. Because wilderness is in its 'natural state', scientists can observe changes in a unique setting, preparing us for issues such as climate change and rising $CO_2$ levels. Finally, wilderness offers us prime recreation, from fishing and hunting to wildlife watching and backpacking. No matter your activity of choice, wilderness provides a healthy and happy avenue to life.

## *What are Leave No Trace Principles?*

Following Leave No Trace (LNT) Principles encourages users to treat lands responsibly while recreating. Teaching and implementing LNT principals are crucial for ensuring the enjoyment of future generations (see page 13 of this guide).

The Leave No Trace Seven Principals are as follows:

1. Plan Ahead and Prepare
2. Travel and Camp on Durable Surfaces
3. Dispose of Waste Properly
4. Leave What You Find
5. Minimize Campfire Impacts
6. Respect Wildlife
7. Be Considerate of Other Visitors

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## *What are important pieces of literature surrounding wilderness?*

The following are selected works that are significant to wilderness. Although these works are considered famous by some, be aware that *you* are just as capable of writing about wilderness. All it takes is your five senses and a pencil! (There are various activities in this guide that address creative writing and wilderness).

*A Sand County Almanac* by Aldo Leopold

*Walden* by Henry David Thoreau

*The Yosemite* by John Muir

*Eating Stone* by Ellen Meloy

# BLM Activities for Outreach by Age Group

These activities are intended for various audiences. It is anticipated that each activity can and should be tailored to your specific audience. Please change/alter activities as you see fit. There is more than way to facilitate/teach a lesson.

Questions? Please contact Ross Parsons at rossparsons208@gmail.com

## Older Students 12–18

### Career Day

**Time:** 10–20 minutes (depending on visitors)

**Materials:** None, unless specific to career

**Objective:** Inform students about how they could work for the BLM and create a positive image for the BLM.

**Activity:** Tell students about the steps you took to get your job with the BLM. Inform students what you do on a normal day, including the benefits of your job. Finally, answer any questions that students may have.

### Planning a Trip

**Time:** 30–40 minutes

**Materials:** Maps, photographs, anything specific to area of travel

**Objective:** Teach about planning ahead and preparing for a backcountry outing. Engage students' creativity and curiosity in landscapes by learning about what they like to do. Introduce Outstanding Remarkable Values (ORV) and how they are determined.

**Activity:** Tell students that they will be planning an imaginary trip (or, even better, encourage a real scenario) for them and their friends. If students are unfamiliar with the area, show pictures of the places where they could visit. Encourage them to think of things they will need for the trip and make a packing list. Ask questions like: What if it rains? What if your car has a flat tire? Think of as many real–world scenarios/mishaps that could occur.

Some products from this activity could include:

- Students write up a story of their adventure and things that they did. This could help students think of things that they missed on their packing list.
- Have students create a video (if facilities offer such possibilities) that "recreates" their adventure and share it with the class. A video could be substituted with a short skit or play.
- Split students into groups and assign them areas to travel to. Provide them information on their designated area so they can address ORV's of each area.

## Fire on the Mountain

**Time:** 45 minutes

**Materials:** See "Resources for Activities", pages 14–22

**Objective:** Students will understand:

- How to identify different fire regimes in Idaho
- How forests move away from 'historic normal'
- That different forests burn at different frequencies and intensities

**Activity:** See "Resources for Activities", pages 14–22

## Loving It Too Much

**Time:** 45 minutes or more

**Materials:** Graph paper, pencils, white board, copies of "Statistics", "Questions", and "Problems in Paradise" (see "Resources for Activities", pages 23–25).

**Objective:** In this Project Learning Tree exercise, students will explain how park visitors and activities both inside and outside wilderness boundaries affect ecosystems within wilderness areas. Students will offer possible solutions to problems facing wilderness areas.

**Activities:** Begin by asking how many students have visited a wilderness area. Have students share their experiences with one another or the entire group.

- Where did they go?
- What did they do?
- What did they see?

Talk about some of the local and/or famous wilderness areas. Ask students which of these activities are allowed in wilderness areas:

- Grazing
- Camp fires
- Hunting
- Two+ week stays
- Motorcycles
- ATV's
- Bicycles
- Justin Bieber (You'll probably get a laugh out of this one)

Discuss that although wilderness areas are multiple use, they are being conserved for

future generations so that people can enjoy it the same way that we do (like, for example, a time capsule that will remain the same).

Divide the group into teams of 2–4 students. Pass out printouts for each group. Have teams use the "Statistics" to draw a line graph of U.S. population growth since 1800 and a graph of park visitation from 1950–2005. Depending on the level of the group, you may need to give them help in setting up and plotting their graph.

Have students work in their groups to answer the "Questions". Encourage group collaboration and teamwork. Afterward, go over the answers as a whole group.

Pass out copies of "Problems in Paradise" (individually or one per group). While students are reading, write the following discussion questions on a whiteboard:

- What problems have been caused by increased visitors to wilderness areas?
- What other problems do wilderness areas face?
- Do any of the same problems affect your local or community parks?
- What solutions would you recommend to combat these problems?
- What other information would you like to know before making recommendations?
- What problems might your recommendations solve?
- What problems might your recommendations create?
- Would your recommendations work for all parks or only for some?
- What can be done when the best action to protect resources inside wilderness areas would have a negative impact on communities outside the wilderness?
- How much public input should wilderness agencies consider when creating wilderness plans?

Finally, discuss these questions as a group, in pairs, or by journaling.

## Checks and Balances

**Time:** 30+ minutes

**Materials:** Directions and cards located in "Resources for Activities", pages 26–28

**Objective:** Students will investigate the difficulties of managing a wilderness area.

**Activity:** Start off by engaging students in this topic by asking the following discussion questions (to be discussed with partners or as a group).

- What does it mean to "manage" a species such as elk or deer?
- Why is this important? What are a few examples of how we manage species?
- What will happen if a species becomes overpopulated? How will that affect the food chain?

Break the group up into 6 small groups. Their goal is to keep the 100 deer, elk, horned toad, etc. alive through the nine rounds. If the population rises about 200, they die as the land cannot support that population. Conversely, if the population drops below 10, they die because species cannot repopulate.

# Younger Students 6–12

## Wilderness ABCs

**Time:** 30 minutes; Hike: variable

**Materials:** Paper, pencil

**Objectives:** Get students outside and cater to bodily–kinesthetic intelligence. Foster an appreciation through hands–on experience. This may be a perfect activity for 'high–energy' students.

**Activity:** Take students out for a hike. Ask students whether they have ever visited a wilderness area. What was their favorite thing about visiting the wilderness? Ask what can (or cannot) be found in a wilderness area. What does this mean to them?

Individually or with partners, have students write the alphabet down the left side of a paper. As they hike, have students write down things that start with each letter. For example, "A" could be "air", "B" could be "birch", and "C" could be "carbon dioxide". If you think the group could benefit from being quiet, tell the students that they must walk, observe, and write in complete silence until everyone is finished. At the end of the "silent hike", have everyone share their findings to the group or in pairs.

## Story Time

**Time:** 10–30 minutes

**Materials:** Poem poster/hard copy of some kind. For an excellent selection of poetry, see www.poetrysoup.com/famous/poems/wilderness

**Objective:** Engage linguistic intelligences. Use creativity to help foster an appreciation for wilderness.

**Activity:** Read a poem, or poems about wilderness. If time allows, gather 4–5 selected poems and distribute to students. Have them read all the poems in a couple of small groups. To finish, have students share which poem their group related with most and why.

## Haiku Hike

**Time:** 10–30 minutes

**Materials:** paper, pencil

**Objective:** Engage linguistic intelligences. Use creativity to help foster an appreciation for wilderness.

**Activity:** Students will go on a self-guided hike. Remind students to explore freely, but to stay within eye sight of an adult. Encourage them to explore for at least 5 minutes before finally writing a Haiku. Students can write a Haiku on anything that appeals to them—a tree, an animal, or the landscape itself. Remind students that a Haiku is easy and fun. If they are having difficulties counting syllables, remind students to vocally "clap" through a word. For example, the word "water" has 2 syllables—"wa-ter".

*Line 1:* 5 syllables

*Line 2:* 7 syllables

*Line 3:* 5 syllables

Have students sit quietly until everyone is finished. You could have a "gathering call" to let students know that it is time to come in (coyote howl, bird whistle, etc.).

## Forest Consequences

**Time:** 50 minutes

**Materials:** Morris Woods handout (see "Resources for Activities", pages 29-31)

**Objective:** Students will evaluate the options for managing or using a piece of forested land. Students will make a land use decision and explore the consequences of that decision.

**Activity:** Have students imagine that they have been given a large piece of forested land on the outskirts of town. They can do anything that they want with it. What would they do?

Ask about the consequences of their plan.

Read the scenario written in italics on the handout. Divide the students up into groups of 4. Explain that each team should work together to decide what the Morrisville Town Council should do. Everyone must agree (this would be a great time to touch on group communication and collaboration). Pass out the student copies. Give the students plenty of time to work out a proposal. Have each team present its proposal.

Potential wrap-up discussion questions include:

Was it difficult or easy to decide what to do? Why?

What were the most important points raised in each proposal?

What else do you need to know to make a good decision?

If you knew the town of Morrisville was in a severe economic recession, would it

have changed your teams' plan? If yes, how? If no why not?

If you knew that a rare plant grew in several sections of the forest, would your plan have changed? What about a rare squirrel? A rare mosquito?

What differences might exist between the way you made your decision and the way a real town council would have made their decision?

There is a saying that people should consider the effects of their actions to the 7th generation. Did you consider future generations when you decided on a land management plan, or were you concerned only with how Morrisville would be affected in the present?

How do the proposals relate to one another? What would you do if two of the proposals could be accepted? What would be the compromises? Would combining proposals make them more sustainable?

## Service Learning

**Time:** Planning–1hr + Execution:1 day (This can be shorter depending on how much adult involvement there is, and could be longer depending on the desired depth of service).

**Materials:** Whiteboard, markers, dependent on service

**Objective:** Get students engaged in community service while learning about the value of wilderness. Increase self–efficacy through planning and implementation of a significant project that will help the community.

**Activity:** Start off by framing questions that encourage students to think about problems that are facing wilderness areas (or, for them to have some sort of connection have them think about problems that face their local parks and open spaces). Ask what sort of solutions—realistic and feasible—could be planned out. To really push the learning aspect of service learning, have students study the issue at hand and come up with solutions, discussing the possible positive and negative impacts that may come of their work. You could have students work in small groups (2–5).

Take the students out and have them actually do the service. Some kind of reward at the end of the service may push the students to work hard. Simple, low–cost rewards could be home–made popsicles. The main idea of this activity is to create ecologically concerned individuals for life.

## Jeopardy

**Time:** 1 hour or less

**Materials:** Computer, Jeopardy file (www.iteachbio.com/Life%20Science/Ecology/Ecology%20Jeopardy.ppt), and projector. If technology access is an issue, you can easily

do this with index cards and a scoreboard of some kind.

**Objectives:** Test student comprehension and create teachable moments in a fun, moderately competitive manner.

## Micro-Adventure

**Time:** 20–40 minutes depending on age group and how well you can "sell" it

**Materials:** Pencil, paper

**Objective:** Get students outside and thinking about wilderness even if you can't actually get out in the backcountry.

**Activity:** Explain this activity indoors to help avoid distractions. Tell students that they will be going on an adventure. Have them choose an area about 1 square yard in size. Tell them that they are to pretend to be an ant and go on an adventure anywhere in their one square yard space. Encourage students to name landmarks, create trails, and construct mountains or valleys. Students are able to construct features with objects outside of their box (for example, they could gather twigs or bark to represent mountains and valleys). If you want to take up more time, have a "gallery walk" after 10 minutes of construction. Have students explain what they built. Follow up questions you could ask include:

> How is this area accessed?
>
> What sorts of interactions do humans have with this landscape/ecosystem?
>
> Who manages this landscape/ecosystem? Do they take public input?
>
> If there is a watershed, ask students how upstream actions affect those downstream.

## Create a Creature

**Time:** 10–20 minutes

**Materials:** None

**Objective:** Encourage students to think about plant and animal adaptations.

**Activity:** Start by asking:

> What is an adaptation? Why do plants and animals do it?
>
> What is the craziest adaptation you can think of (ex: snake's tongue for sensing, bear hibernation to save energy)?

Using only biomass that is 'dead and down', give students 10 or so minutes to create their own creature. Encourage students to create a creature with amazing adaptations. They do *not* have to be realistic. For example, students could have dead tree bark represent the belly of their animal. The bark could be both fire resistant and emit a nasty smell to potential predators. Again, encourage students to be creative with their creatures. After a sufficient amount of time, have a "gallery walk", encouraging students to explain all the adaptations for their creatures.

## Poetree

**Time:** 15+ minutes

**Materials:** Pencils, paper, colored pencils

**Objective:** Help engage students' creativity while creating a tangible item that could be used in further education.

**Activity:** Have students write a poem about wilderness. Well written poems could be used as advertising for the BLM, as well as giving a nice touch to kiosks to show that we are conserving the land for future generations. The more color the better!

## Fireboard

**Time:** 30–45 minutes

**Materials:** Two cookie sheets, matches, natural litter (twigs, tinder, etc.), dryer lint, small board with plenty of holes in it (small enough to hold a match)

**Optional Materials:** Thermometer, aluminum foil

**Objective:** Engage students through the use of fire to consider their environment and the effect of prescribed burns and the severity of fire.

**Activity:** Separate the students into two groups. Have them work together to build their own "forest", using natural litter, matches, and dryer lint. Assign one of two forest types to the students; "managed" or "unmanaged". For example, a "managed" Ponderosa forest (if you happen to be located in one) will have spaced out trees with minimal understory, while the "unmanaged" forest will have tons of trees close together with various heights.

If possible, frontload some key understandings beforehand while on a walk. Concepts and vocabulary such as understory, managed, unmanaged, and nutrient recycling may need to be addressed.

Once fire scenarios are set, ask students which one will burn hotter and quicker. What does this mean for the forest health? Which trees will survive in these two fires? Why

should we even care about trees and the forest health?

Light the fires! If you have an infrared thermometer, have students record the temperature as the fire continues. If you have extra time, encourage students to have a 'round table' discussion about the pros and cons to managing (or not managing) a forest.

## Leave No Trace (LNT) Skits

**Time:** 45 minutes

**Materials:** Cards or handouts with LNT Principles with simple key points

**Objective:** To use peer education to teach LNT principles and to engage creativity and student interest in their local ecosystems

**Activity:** Break the students into seven groups and give each group one of the LNT principle cards. Have each group prepare a skit that will teach the mains point(s) of the principle. This may end up being a "good–camper, bad camper" style skit, providing a great opportunity to use humor to remember the principles.

## Sense of Place

**Time:** 20–40 minutes depending on age and discussion

**Materials:** Journal/notebook and a pencil

**Objective:** To allow time for exploration using students' senses

**Activity:** Take the students outside. It may be helpful to explain the activity inside to limit distractions. Have the students find their own personal space and record their four senses (feel free to add taste if appropriate). Have them think of a creation story as to how this area came to look like it does. You can have this be as serious or creative as you like. If anyone feels like sharing, have the students do so with one another or as a group.

# Resources for Activities

## Fire on the Mountain!

**Overview:** Students will learn what fire regimes and condition classes are and how they relate to fire and biomass.

**Keywords:** fire, fire regime, condition class, biomass

**Age / Grade Range:** **6th- 12th grade**

**Background:** Different types of trees, and thus different types of forests, burn at both different frequencies and intensities. For example, lodgepole pine forests typically burn more frequent and much hotter than, say, ponderosa pine forests. A forest is typically designated as one of five fire regimes, depending on the forest's frequency and severity of burning. Furthermore, forests can be assigned condition class groups—signaling how far away from "historic normal" they are. Species competition, structural stage, and canopy closure are a few variables that are used to calculate condition class. There are three condition classes—I, II, and III. For example, a condition class I forest is one of 'low departure from historic norm'. Rather, it is in what is considered its 'natural state'—relatively unaffected from humans. On the other hand, a condition class III is one of 'high departure from historic norm'. Perhaps this forest has been fire suppressed or over-harvested, resulting in poor soils and insufficient snags, deadfall, and nutrient recycling.

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**Next Generation Science Standards & Common Core:**

| | |
|---|---|
| **HS-ESS3-1.** | Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. |

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**Goals:** In this lesson, students will learn about fire regimes and condition classes and how they pertain to forest management and biofuels. They will use short descriptions of different forests to create a play, skit, poem, or public memo to teach their peers about what they have learned.

**Essential Questions:**
- What are a few common fire regimes in Idaho?
- How do condition classes affect forest fires and biomass accumulation?
- In Idaho, which forests should we utilize for maximum biomass extraction?

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**Objectives:**

**Enduring Understandings:**
- Students will be able to identify different fire regimes in Idaho.
- Students will understand how forests move away from 'historic normal'.
- Students will understand that different forests burn at different frequencies and intensities.

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**Materials:**

**For this lesson, you will need;**
- 3 "Attachments", included in this lesson

**Materials:**

**For this lesson, you will need:**

- The three "Attachments", included in this lesson

**Set up:**

No set-up needed

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**Classroom Time:**

30-45 minutes, one class day

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**Introduction (Engage):**

Ask: "Let's pretend that you decide to burn sagebrush and an aspen tree at the same time. Will these two vegetation types burn at the same intensity? Or rather, will one burn hotter than the other? Why or why not?"

Ask: "Based off what you have seen and heard of in your life, would you expect a sagebrush meadow or a 10,000 foot pine forest in Idaho to burn more frequently? Let's say that the sagebrush meadow in in Southern Idaho and receives 10 inches of water a year, while the 10,000 foot forest receives 15 inches of water a year."

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**Activity (Explore):**

Tell students they have 5-10 minutes (depending on location) to find two pieces of woody biomass. One must be a piece that they think will burn quick and hot, and the other must be one that will burn slightly slower and cooler.
When students return, have them briefly share their objects, as well as explain their justifications.

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**Explanation**

After listening to students' findings, explain to students that different forests burn at different frequencies (i.e., how often?) and different intensities (i.e., how hot?). "To categorize this, scientists put different forest ecosystems into one of five fire regimes" (See attachment 1).

Ask the students to analyze the PDF for a few moments. Ask one student to identify how each 'group' is distinguished. Or rather, how is each condition class different? Which variables make up this difference? Use detailed theoretical examples to drive this home.

Note: Depending on age and prior knowledge, more explanation into terms such as "severity", "dominate overstory vegetation" or "replacement" may be needed. Furthermore, a discussion of colloquial terms may be needed. For example, some students may already know a 'replacement' fire as a 'catastrophic' fire.

Next, delve into condition class: "Here's a scenario: let's say there are two acres of trees in the forest. Over 100 years, one acre is never explored by humans. There is no recreation, no roads, and forests fires are allowed to burn if one is ever ignited. In the other acre of forest, there are hiking trails, houses, and fires are extinguished each time one is ignited."

Ask: Would the two forests look differently? How? Give specific examples.
Have students pair/share for 90 seconds, then group discuss.

"The idea that similar forests can have a different history can be explained and qualified by using condition classes." (See Attachment 2.) "A condition class is defined as 'distance from historical normal'. Or rather, different condition classes explain how far removed a forest is from its 'natural' state. For example, a forest that has been allowed to burn without fire suppression and has a relative open canopy and limited species competition will be considered a condition class I. On the other hand, a forest that has been fire suppressed and has a ton of species completion will be considered a condition class III. Rather, it is far removed from its 'natural' state'."

Use visuals (Attachment 2) to explain this.

Ask: Why would we care how far 'removed' a forest is from its natural state?

Ask: Which condition class would you expect to have more biomass, and thus be more efficient for biomass harvest?

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**Elaboration:**

Separate students into two groups. Pass out Attachments 3.1 and 3.2 (one to each group). Tell students that they are to read their story aloud as a group. Then, have students 'report' their findings in the story to their peers. Tell students that they can 'report' their story by creating a play, skit, poem, or public memo. Even an informal report will do. Tell students no matter the forum they decide to use that they must include the forest type, fire regime, and condition class of their forest. Give students 5-10 minutes to prepare their report.

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**Evaluation:**

Throughout the rest of the day, stop and ask students what condition class they think a forest stand is. Have them give detailed defenses of their responses. If you happen to pass a ponderosa or lodgepole pine forest, ask what fire regime they are looking at. Have them recite, if possible, any variables (frequency, severity) of that forest stand.

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## Additional Resources

For further information on fire regimes and condition classes, as well as detailed U.S. maps, consult the following web address: http://www.firescience.gov/projects/09-2-01-9/supdocs/09-2-01-9_Chapter_3_Fire_Regimes.pdf

# Attachment 1

## Fire Regine Groups

| Group | Frequency | Severity | Severity description |
|---|---|---|---|
| I | 0 – 35 years | Low/ mixed | Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory |
| II | 0 – 35 years | Replacement | High-severity fires replacing greater than 75% of the dominant overstory vegetation |
| III | 35 – 200 years | Mixed / low | Generally mixed-severity; can also include low-severity fires |
| IV | 35 – 200 years | Replacement | High-severity fires |
| V | 200+ years | Replacement / any severity | Generally replacement-severity; can include any severity type in this frequency range |

Table 3.2: Fire regime groups used in the current LANDFIRE data bases. These groups have been modified from earlier versions (Hardy et al. 2001, Schmidt et al. 2002 ) to include low-severity fires in Fire Regime III and fires of any severity in Fire Regime V. Adapted from FRCC Guidebook, Version 1.2.1 (Anon. 2010).

# Attachment 2

Condition Classes I, II and III

Condition Class I

Condition Class II

Condition Class III

# Attachment 3.1

## Lodgepole Pine

Howdy there folks!

I'm your friendly Lodgepole pine. You can tell who I am because of my short needles that are in bunches (also known as fascicles) of two. You can always make the two needles into an "L" shape if you forget my name! Perhaps you have seen me in the Sawtooth Mountains in Idaho. I also grow very well in Yellowstone National Park and Central Colorado. We Lodgepoles are a very sociable group—we like to be very close to one another. It's almost like we are inseparable. Unfortunately for us, we do not live for that long. Typically, we only survive 35-200 years. Usually during a year with limited water (also known as a drought year) a large replacement fire occurs. By 'replacement' I mean near-total elimination of me and my *amigos*. Fires will sweep through our dense area and catch the entire tree on fire. That's so sad, right?... But guess what?! Frequent fires are how we Lodgepoles spread our seeds. You see, we have *serotinous (sir-aut-in-us) cones, meaning that our cones need some sort of disturbance in order to open. More times than often a fire will be used to open our cones.* Scientists say that we are a Type 4 Fire Regime.

# Attachment 3.2

Ponderosa Pine

Hi there!

I'm your friendly Ponderosa Pine. You can tell who I am because of my 'puzzle piece' bark, rich vanilla scent, and long needles with three per bundle (also known as fascicle). Maybe you have seen me around McCall or Central Idaho. I also grow in Northern California and along the Front Range in Colorado, just to name a few places. You know I am a happy tree when you see me and my friends with plenty of space. When other shade-loving trees gather around us, we tend to get stressed out because of over-competition for resources. We prefer space so we can soak up available water and take in nutrients as we please. Scientifically, a ponderosa pine forest is a Type 1 Fire Regime., meaning that we would prefer to have low severity fire every 0-35 years. Fires like this would eliminate other species who are trying to take our precious water and nutrients. Because we are a Type 1 Fire Regime, fires in our forests are pretty mellow. Very rarely will the flames get above a few feet tall. Thanks to our fire resistant bark, we won't get hurt by the fire! How neat is that?

# Attachment 4

Loving It Too Much

Student Page

## Statistics

### U.S. Population

| Year | Population |
|---|---|
| 1800 | 5,308,483 |
| 1820 | 9,6[illegible]453 |
| 1840 | 17,069,453 |
| 1860 | 31,443,321 |
| 1880 | 50,189,209 |
| 1900 | 76,212,168 |
| 1920 | 106,021,537 |
| 1940 | 132,164,569 |
| 1960 | 179,323,175 |
| 1980 | 226,542,199 |
| 2000 | 281,422,426 |
| 2009 | 306,847,025 |

Source: Statistical Abstracts of the United States (accessed 7/6/09 at www.census.gov/compendia/statab)

### Land Area

All National Park Service Areas

| Year | Land (in 1,000 acres) |
|---|---|
| 1950 | 24,598 |
| 1955 | 24,646 |
| 1960 | 25,704 |
| 1965 | 26,549 |
| 1970 | 28,543 |
| 1975 | 29,091 |
| 1980 | 70,936* |
| 1985 | 75,749 |
| 1990 | 76,362 |
| 1995 | 77,355 |
| 2000 | 78,153 |
| 2005 | 79,048 |

*Includes 41,845 million acres of Alaskan lands added to the system in 1978. To convert to hectares, multiply acres by .4047 hectares.
Source: Statistical Abstracts of the United States (accessed 8/5/08 at www.census.gov/compendia/statab)

### Recreation Visits

All National Park Service Areas

| Year | Population (in millions) |
|---|---|
| 1950 | 33.0 |
| 1955 | 56.6 |
| 1960 | 79.2 |
| 1965 | 121.3 |
| 1970 | 172.0 |
| 1975 | 238.8 |
| 1980 | 300.3 |
| 1985 | 263.4 |
| 1990 | 258.7 |
| 1995 | 269.6 |
| 2000 | 285.9 |
| 2005 | 273.5 |

Source: Statistical Abstracts of the United States (accessed 8/5/08 at www.census.gov/compendia/statab)

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# Questions

1 Based on the graphs you drew, what trends do you see in the size of the U.S. population? What trends do you see in the number of visits to national parks?

2 What circumstances might explain changes in the number of visits to national parks since 1950?

3 What do you predict will happen to the size of the U.S. population, and how will that change affect the number of visits to national parks in the future?

4 What changes do you think were made to parks to accommodate the increasing numbers of park visitors? What problems, if any, might the increasing numbers of visitors have caused?

5 If the number of park visitors was restricted, could continued population growth still cause problems in the parks? If so, how? If not, why not?

Student Page

# Problems in Paradise

Our nation's "crown jewels." That's how some people have described our national parks. Unfortunately, our parks face some big problems. Many people feel that if we don't take steps soon, our parks will suffer.

## Inside Pressures

In 2003, more than 266 million visitors spent time in the historic homes and forts, recreation areas, seashores, memorials, and parks that make up our National Park System. That's more than eight times as many people as visited the parks in 1950. And park visitation is expected to rise.

Cars, campers, and motor homes already jam the most popular parks. Hikers often crowd trails. Visitors have destroyed trailside vegetation in many areas. Vandalism is a problem in almost every park: People steal Native American artifacts, plants, and other pieces of the parks to sell them to collectors; people spray graffiti on park rocks and walls; and vandals have even used park-protected items for target practice.

Accommodating so many people has put additional pressures on our parks. For example, more roads have been built to handle the increased traffic. New campgrounds have been built and existing ones have been expanded. More concessions, including snack bars, hotels, and souvenir shops, have been built in many parks. All of these developments mean less habitat for plants and animals that live in the parks.

## Outside Pressures

Aside from the problems being caused by increasing numbers of park visitors, other problems are caused by activities outside the park boundaries. As the population increases, civilization creeps closer and closer to park boundaries. Wild animals, whose natural ranges extend beyond park boundaries, are being squeezed together for living space as people develop land outside parks. In addition, resource extraction and other human activities have brought pollutants and invasive species into the parks. Let's look at a few threats facing certain parks:

- On some days, air pollution can be a major problem in Great Smoky Mountains National Park (Tennessee and North Carolina) and in Shenandoah National Park (Virginia).
- Copper smelters near Glacier National Park (Montana) have caused fluoride contamination in some parts of the park.
- Extensive development in Florida has drained, diverted, or polluted water necessary for the survival of many plants and animals in Everglades National Park. In the past 70 years, many wading birds that once nested in the Everglades have disappeared.
- Even in remote Isle Royale National Park (Michigan), non-native plants and animals are threatening the park's native species and habitats.
- People are flocking to the area near Joshua Tree National Park in California because of its lower cost of living (as compared to Los Angeles), to escape the problems of city life such as crime and traffic, or to simply reconnect with nature. Development is encroaching upon the park and depleting desert groundwater resources.

## Finding Solutions

Many of these problems in the parks are being addressed, at least to some extent. For example, studies in Cape Cod National Seashore (Massachusetts) have led to a management plan with different zones, protecting nesting seabirds and the beaches where people swim and allowing off-road vehicle use. And an Everglades Restoration Plan has been developed to reverse the changes that have diverted water away from the Florida Everglades.

However, it's going to take more action to completely protect all of our parks.

National parks belong to all people: young and old, able-bodied and disabled, those seeking complete solitude and those seeking a nice view. Most important, the parks belong to future citizens. Meeting the needs of people today while protecting our resources for the future is a big challenge for the National Park Service. How well it meets this challenge will determine whether, and in what condition, our parks survive.

# Attachment 4.1

## Checks and Balances

# CHECKS AND BALANCES

### OBJECTIVES

Students will: 1) evaluate hypothetical wildlife management decisions; and 2) identify at least four factors that can affect the size of a wildlife population.

### METHOD

Students become managers of a herd of animals in a paper-and-pencil and discussion-based activity.

### BACKGROUND

Wildlife managers attempt to maintain healthy populations of wild animals, while factors—both avoidable and unavoidable—affect the populations. Some of these factors are loss of habitat, weather conditions, pollution of food and water sources, development of other natural resources, poaching and recreation pressures. Many people are unaware of how such pressures can affect wildlife.

In the United States, it is the legal responsibility of state wildlife agencies to manage the wildlife populations within their respective states. It is the legal responsibility of the U.S. Fish and Wildlife Service, under the U.S. Department of the Interior, to govern some policies and programs affecting migratory species of animals (principally birds) and threatened or endangered species, as well as illegal importation and exportation of animals and animal products. Illegal interstate transportation of all species, with additional responsibilities related to the overall well-being of U.S. wildlife.

**Age:** Grades 6-12
**Subjects:** Mathematics, Science, Vocational Agriculture
**Skills:** analysis, computation (calculating percentages), evaluation
**Duration:** one to two 40-minute periods
**Group Size:** any
**Settings:** classroom
**Conceptual Framework References:** I.C.3., I.C.4., I.D., III.A.1., III.C., III.C.1., III.C.2., III.E., III.E.1., III.E.2., III.F., IV.A., IV.A.1., IV.A.2., IV.A.3., IV.C., IV.C.1., IV.C.2., IV.C.3., IV.D., IV.D.1., IV.D.2., IV.D.3., IV.D.5., IV.E., IV.E.1., IV.E.4., IV.E.5., IV.E.6., IV.E.7., IV.E.10., IV.E.11., VI.A., VI.A.2., VI.A.3., VI.A.4., VI.B., VI.C., VI.C.12., VI.C.15., VI.C.16., VII.A., VII.B., VII.B.2., VII.B.4., VII.B.7.
**Key Vocabulary:** management, population, herd
**Appendices:** Simulations

Wildlife management is based on the best scientific and technical knowledge available. Such knowledge is growing; however, it is still limited, and is continually affected by changes in the complex relationships between wildlife, human beings and their shared environments.

In a sense, everyone shares responsibility for wildlife management. Although there are legally responsible agencies, their work requires the thoughtful and informed cooperation of citizens. There are frequently differences of opinion about the most appropriate policies and programs affecting wildlife. Individual citizens, private conservation groups, private industry, community groups, and others all make important contributions to the overall conservation and protection of wildlife and its habitat.

The major purpose of this activity is for students hypothetically to assume the role of wildlife managers and thus gain insight into some of the complex variables that influence stewardship of wildlife. This activity is not designed to provide a comprehensive understanding of all possible factors which can affect wildlife.

### MATERIALS

paper and pencils; paper to make condition cards; dice, one per student

### PROCEDURE

1. Each student is asked to be the manager of a moose (or other animal) population. The carrying capacity of the habitat is 100 animals. The point of the activity is to end up with a viable population after nine rounds, simulating nine years. If at any time the student's population reaches less than 10 or more than 200 individual animals, that student no longer has a viable "herd" and watches the other students until the conclusion of the activity.
2. Each student has a beginning population of 100 animals. The cards are separated into three decks of a total of 36 cards: a condition deck (18 cards), a reproduction deck (9 cards) and a management deck (9 cards). Shuffle the cards within each deck. Explain that cards will be drawn in the following sequence: condition card, reproduction card, condition card, management card. This sequence of draw will be repeated, each repetition representing an annual cycle (the students may think of each draw as representing a different season, e.g., autumn, winter, spring, summer). As each card is drawn, it is read aloud to the entire class. Each student then rolls his or her die and follows the instructions on the card to determine his or her herd population's new size. Some computations will result in fractions; numbers may be rounded to the nearest whole. NOTE: Students may object to the use of dice to determine the impact of decisions made for wildlife management purposes. Their concerns are appropriate; wildlife management is based on more than the chance elements reflected in the use of dice. However, chance has its impacts as well, as in the case of weather conditions in a given year. Encourage the students to discuss and consider what is realistic, and what is unrealistic, about the impact of dice in this activity—encouraging the recognition that wildlife management is far more complex than can be represented through this activity.
3. Wrap up the activity with a class discussion. Include topics such as: Identify and describe what appeared to be the impacts of the condition, reproduction and management cards. Given one of the objectives of this activity—to evaluate hypothetical management decisions—what seemed to be the benefits and/or liabilities, if any, of management decisions made? Did populations "managed" under different strategies by different students show different trends? How do these compare? Would students "manage" differently if given a second chance? What aspects of this activity seemed realistic? Which didn't? What are examples of ways that habitat can be improved? Short term? Long term? Is human management of wildlife populations necessary? Beneficial? Why or why not? For people? For the animals?

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## EXTENSION OR VARIATION

Add a monetary aspect to the activity. Students allowing hunting might have more available revenue for projects like habitat enhancement based on income from sale of hunting licenses. Other expenses might include salaries of wildlife managers, funds for research, feeding animals in severe conditions, relocation, etc.

## EVALUATION

1. Name four factors that can affect the size of a wildlife population.
2. Some wildlife managers have said that wildlife management involves more management of people than of wildlife. Explain what they might mean by the comment.

## INSTRUCTIONS FOR MAKING CARDS

Make the following cards, according to three categories: **Reproduction Cards, Condition Cards, Management Cards.** There are 36 cards in total. The number in parentheses indicates how many of each card are to be made. NOTE: The numbers of cards and the suggestions for numerical manipulations, e.g., three times the roll, are relatively arbitrary. They are designed for students to recognize that a number of diverse factors can affect wildlife; the numerical weights should not be interpreted literally.

As the cards are read aloud, be certain to note differences in decreasing or increasing herd size by percentage or by number.

(After using these cards once, students may want to experiment with making additional cards, or changing these cards. Students may also want to make additional complete sets of cards for use by small groups or individual students.)

NOTE CONCERNING REPRODUCTION CARDS: The rate of reproduction is designed to vary with population density. The method for determining your population's rate of reproduction at a particular population

size is derived from a number of assumptions. One of them is that carrying capacity is 100 individuals. As your population drops below 100, the potential rate of reproduction increases reaching a peak at just above 50 individuals. This effect mimics the potential for rapid population growth many herbivore populations can exhibit when population levels are well below carrying capacity; in other words, food resources are readily available for reproductive effort, given that other environmental factors prove favorable. Below 10 individuals, reproduction is not allowed, reflecting severe reduction in reproductive activity observed at very low population levels because of, for example, imbalanced sex ratios, the inability to find suitable mates, or the disruption of social and mating systems. As the population grows above 100 individuals, the reproduction rate steadily decreases, reflecting the increasing activity of limiting factors as the population exceeds carrying capacity.



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| | |
|---|---|
| Reproduction | **Reproduction Card—Average Year (6)**<br>This has been an average reproduction year. Increase your herd by (100/your current population size) times three times your roll, if your current population is over 50 individuals. If your population is between 50 and 10, increase your population by three times your roll. If your population is under 10, don't reproduce. |
| Condition | **Weather Card (2)**<br>_____Students need to specify what) has had a serious negative impact on the survival of the herd. Decrease your herd by the percentage equal to five times your roll. |
| Condition | **Weather Card (2)**<br>_____(Students need to specify what) has had a dramatic positive impact on the survival of the herd. Increase your herd by the percentage equal to five times your roll. |
| Condition | **Habitat Destruction Card (2)**<br>_____(Students need to specify what) has occurred, destroying critical habitat. Decrease herd size by the number five times your roll. |
| Condition | **Predator Card (1)**<br>Predation has occurred, affecting the herd size. Decrease herd size by the percentage equal to your roll. |
| Condition | **Habitat Degradation Card (4)**<br>_____(Students need to specify what) has occurred, damaging critical habitat. Decrease herd by the number equal to three times your roll. |
| Condition | **Disease Card (1)**<br>Disease has struck the herd. Decrease herd by the percentage equal to your roll. |
| Condition | **Habitat Loss Card (5)**<br>_____(Students need to specify what) has resulted in a loss of critical habitat for the herd. Decrease herd by the number equal to five times your roll. |
| Condition | **Poaching Card (1)**<br>Poaching—illegal killing of animals—has reduced the size of the herd. Decrease herd by the number equal to two times your roll. |
| Management | **Habitat Restoration Card (1)**<br>_____(Students need to specify what) has occurred, restoring critical habitat. Increase herd by the percentage equal to five times your roll. |

| | |
|---|---|
| Reproduction | **Reproduction Card—Excellent Year (3)**<br>This has been an excellent reproduction year. Increase your herd by (100/your current population size) times five times your roll, if your current population is over 50 individuals. If your population is between 50 and 10, increase your population by the number equal to five times your roll. If your population is under ten, you may not reproduce. |
| Management | **Habitat Alteration Card (2)**<br>_____(Students need to specify what) has occurred, altering critical habitat. Increase or decrease (students choose which before rolling die) herd by the percentage equal to three times your roll. |
| Management | **Habitat Improvement Card (1)**<br>_____(Students need to specify what) has occurred, improving critical habitat. Increase herd by five times your roll. |
| Management | **Research Card (1)**<br>_____(Students need to specify what) research has been successfully accomplished. Increase or decrease (students choose which before rolling the die) herd by two times your roll. |
| Management | **Law Enforcement Card (1)**<br>_____(Students need to specify what) law enforcement activities have protected the herd against illegal actions like poaching. Increase herd by the percentage equal to two times your roll. |
| Management | **Education Card (1)**<br>_____(Students need to specify what) education activities have led to increased understanding of wildlife and habitat. Increase or decrease (students choose which before rolling the die) herd by the percentage equal to two times your roll, or by two times your roll. |
| Management | **Habitat Acquisition Card (1)**<br>Habitat acquisition has increased the area of available and suitable habitat. Increase herd by five times your roll. |
| Management | **Hunting Card (1)**<br>A request for a hunting season has been made. Do you wish to allow hunting in your area? If yes, decrease your herd by the percentage equal to five times your roll. If no, record no change in the size of your herd. |

# Attachment 4.2

Forest Consequences

Student Page

## Morris Woods

*Recently a citizen donated 250 acres (101 hectares) of nearby land to the town of Morrisville. The land, known as Morris Woods, is completely covered with forest, including about 100 acres (40.5 ha) of old-growth forest that is over 150 years old and has very large trees. A nice stream flows through the forest and it has good places for swimming. Deer, raccoon, frogs, salamanders, foxes, many different birds, and other animals live in the forest.*

*Morrisville is a medium-sized, middle-class town. Many people who live there work for a local lumber company, but a lot of people also work at a computer-parts plant in a neighboring town. Many people work in Morrisville itself at the schools and library and in all sorts of small businesses.*

*There are no zoning restrictions on Morris Woods, and the town council has to decide what to do with the land. Some people want to preserve the entire area with all of its animals and plants so that it can provide people with a "wilderness" experience close to home. A developer has offered to buy the land and build a shopping mall and luxury homes. A local forest management company has offered to buy the land and sustainably manage it to provide forest products, wildlife habitat, and scenic hiking trails.*

### What To Do

Imagine that you are a member of the Morrisville Town Council and it is your responsibility to approve the best plan for Morris Woods. For each of the following proposals presented to the Council, consider:

- What facts presented in the proposal support that land use?
- What opinions are presented in the proposal?
- What are the advantages of adopting the proposal?
- What would be costs to the town or negative effects of the proposal?
- Who benefits most from the proposal? Who would be most harmed by it?
- If you adopted the proposal, what changes, if any, would you want to make to it?

Based on this information, decide whether your group will select one of these proposals, or offer a compromise or alternate proposal.

*(continued on next page)*

Student Page

# Morris Woods (continued)

## Proposal #1

**Proposal:** Morrisville should retain ownership of Morris Woods and manage it as a protected natural area. The city should build and maintain hiking trails through it so the people of Morrisville can enjoy it.

**Perspective:** Morris Woods is a unique area. Giant trees, some more than 100 feet (30.5 m) tall and more than 30 feet (9 m) around, make up about 100 acres (40.5 ha) of the forest. Some of these trees are over 150 years old and were growing long before Morrisville even existed. Walking among them is an incredible experience. Many other plants and many different kinds of animals also live in Morris Woods.

If we allow trees to be cleared for development, the habitat of those creatures will be destroyed. Several kinds of fish breed in the streams that flow through Morris Woods. Studies conducted in the woods just a year ago showed that those fish depend on cool water and gravel bottoms to lay their eggs. If parts of the forest are cleared and a vegetative buffer is not kept, the fish may not be able to breed because (a) soil and other debris from the cleared land may wash into the streams and cover the gravel; and (b) with fewer trees to shade the stream and condition the air, temperatures in the stream will increase. Similar problems may result if parts of the forest are managed for timber production.

Morrisville doesn't need a mall. It has all the shops the townspeople need right in town. And if we did build a mall, what would happen to all those business owners downtown? They'd go out of business!

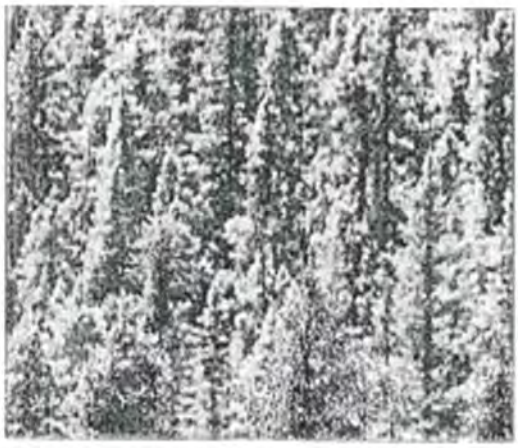
There are no forests as old and as large as Morris Woods anywhere in our region. Why should the people of Morrisville sacrifice their natural heritage so some business people can make a lot of money? Setting the land aside and maintaining hiking trails will be the best thing for the people of Morrisville today, and for future Morrisville residents.

## Proposal #2

**Proposal:** Morrisville should sell Morris Woods to the Simpson Tree Farm, which would manage the forest for multiple uses.

**Perspective:** Simpson Tree Farm is owned by a family forest landowner, which owns and manages much of the forestland near Morrisville. Trees cut on the Tree Farm are processed into lumber at the mill in Morrisville. That lumber is in high demand and is used for local construction.

We, at Simpson Tree Farm, offer to buy Morris Woods from the city. We will manage it in a way that will sustain both commercial and ecological benefits. We plan to set aside an area of old-growth forest and to establish a buffer strip of forest around the stream to protect those important habitat areas. In other parts of



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Student Page

# Morris Woods (continued)

the forest, we will practice selective cutting. We will make sure that tree cutting takes place under carefully controlled circumstances. Our regular practice is to immediately replant areas where trees have been cut to assure forest sustainability. We will allow hiking and other recreation in the forest.

The money from the sale of Morris Woods will provide a much-needed economic boost to Morrisville and could help education and social programs that have suffered. It could also provide new jobs for foresters, scientists, loggers, truckers, and mill workers.

Setting aside the entire forest as a wilderness park would lock up an important and needed supply of inexpensive, high-quality wood—and we already have several parks in and around Morrisville. The Morrisville area has plenty of retail business, and forestland is too precious to waste.

Like other natural resources, forests should provide economic, social, and ecological benefits at the same time. We can provide these benefits in a sustainable way. If the land is developed for a mall and luxury homes, valuable resources and wildlife habitat will be lost indefinitely. According to our management plan, there will be minimal environmental trade-offs, and Simpson's long history of responsible forest management speaks for itself.

## Proposal #3

**Proposal:** Morrisville should sell Morris Woods to the Morris Woods Development Company to provide a shopping mall on a large tract and new homes on the remaining portion while preserving its "forest character."

**Perspective:** Shopping malls are very convenient places for people to shop; all the stores are together under one roof and people can go from one store to another without going outside—a big plus, especially in bad weather. Malls often contain many national chains, offering shoppers more choices and very competitive prices. Malls draw people from a wide area, and their shopping can mean big money. So far, no one has built a shopping mall in Morrisville, or anywhere near it. The closest mall is more than an hour's drive away. The mall would take up roughly 80 acres of land.

The Morris Woods shopping mall would be a great convenience to the people of Morrisville and surrounding communities. The money generated from the sale of the land and from property taxes could be used to improve Morrisville schools and the town library, and to provide social services such as medical care and affordable housing.

After building the mall, we at Morris Woods Development Company would build luxury houses (at either 80 homes on 3 acre plots, 50 homes on 5 acre plots, or 25 homes on 10 acre plots) in another area of Morris Woods. Those houses would provide families with beautiful homes in a wooded setting near town. Their property taxes would also help schools, the library, and other social services. Morris Woods Development Company plans to leave a buffer strip of forest around the stream and to preserve an area of old-growth forest. The roads through our development will be pleasant for walking or bicycling.

Locking up the entire woods as wilderness for a handful of nature enthusiasts is not in the best public interest. Our development plan will make the land more accessible for many different uses: recreation, leisure, shopping, commerce, and homes. And why should Simpson Tree Farm be the sole beneficiary of land that belongs to all of us? It is only fair that Morris Woods is developed in a way that benefits the most people possible, and our proposal offers those benefits.