Biology of Birds and Burns

Summary: To gain understanding of the role of fire in forest ecosystems, students conduct surveys on a simulated burned and unburned National Forest plots (created on the playground, in a field or gym)

Prep Time: 60 min

Time: 90 min

Grade Level: 3rd-6th

Goals

- Learn about fire as a non-living and necessary part of the communities found in many western National Forests of the United States
- Provide students with hands-on experience with biological surveys through collecting plant and bird data

Learner Objectives

Students will… .

- In an area set up by the teacher, conduct surveys on the playground in an area representing a post-fire National Forest, ranking bare ground, grasses and forbs, shrubs, snags and trees from highest amount to lowest amount
- Use provided data to describe the height range of the dominant vegetation in the areas being surveyed.
- Create graphs of bird species and number of individuals/species found in the survey plot.

Materials

- Chalk, flagging, traffic cones or other means of demarcating "burned" and "unburned" plots for students.
- Student worksheets: *Fire, Plants and Birds Survey*
- Data sheet for teachers with examples, instructions for setup and general post-burn data
- *Bird Cards* for each group for "sampling" birds

Oregon State Standards

Oregon Science
3.1, 3.2, 3.3,
3.3S.1, 3.3S.2
4.1, 4.2, 4.3,
4.2L.1, 4.2E.1
5.1, 5.1L.1, 5.2,
5.2L.1, 5.3, 5.3S.2
6.1, 6.2, 6.2L.2,
6.3

Common Core Standards

Math
3.OA.A.1
3.OA.A.3
4.OA.A.1
4.OA.A.2
6.RP.A.3c
6.RP.A.3d

Vocabulary

- Abiotic Factor
- Community
- Disturbance
- Edge

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Biology of Birds and Burns

Background Information

Fire is a natural disturbance that occurs as a healthy part of many types ecosystems. In these ecosystems, fire is often necessary for maintaining healthy plant communities. Fires in these ecosystems occur at different time intervals and temperature intensities depending on the community. Each ecosystem has evolved a unique time interval for which it will burn. Forest fires promote diverse age classes of trees, vegetation height, amount of foliage (leaves and flowers) and types of plants. The intensity of the burns will determine what vegetation burns and how the soil nutrients are affected.

For over 100 years, forest managers have suppressed fires that start on public lands in the western United State. This has created an overgrowth of some types of vegetation, particularly understory shrubs, allowed forest encroachment on natural grasslands, decreased forest and grassland health and has altered the range and habitats of many species of plants and birds. In recent years, scientists have discovered that fire is an important and natural source of disturbance in forest and grassland communities. As such, foresters, scientists, conservationists and other public agencies and non-profit groups have begun reintroducing fire, or attempting to duplicate the effects of fire, in forested and grassland habitats. The Ashland Forest Resiliency Project in southern Oregon is an example of one such effort. This project is a ten-year project, involving public agencies, such as the City of Ashland and the US Forest Service, and non-profit conservation groups such as The Nature Conservancy and Lomakatsi Restoration Project, designed to improve forest health in the Ashland Creek Watershed by reducing flammable fuels, thinning small trees and conducting controlled burns.

Fire is a typically short-lived and pointed disturbance to an ecosystem, influencing bird communities to change drastically in a short period of time (Stephens 2011). Forest dwelling birds tend to move out of the burned areas and birds that prefer grasses and shrubs move into burned areas. While drastic changes in plant and bird communities may seem like a "bad" thing, these changes typically represent decreases in forest dwelling species and an increase in shrub and edge dwelling species. The highest diversity is generally found 4-10 years after a fire, when plant diversity is also at the highest. In healthy forests, fire often burns in a mosaic. This mean some areas burn at high intensities, removing all or most of the vegetation, while some areas burn at low intensities, burning little to none of the vegetation.

One way to explore the effects of fire is to explore the types of plants and animals found in both burned and unburned areas. Once surveys of this area are complete, the information gathered about vegetation type, height and density and about animal species can be compared. This type of data is useful for scientists, land managers, and policy makers as the incorporate and apply new science to how lands are managed for human use and as wildlife habitat.

Getting Ready

- Read background information
- Make copies of the *Vegetation Plot* cards (two burned and two unburned)
- Make copies of the *Biology of Birds and Burns Survey* sheet
- Provide sets of *Bird Cards* for student groups to "sample" with (each group should get one set of cards, burned or unburned, depending on where they are sampling).

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Biology of Birds and Burns

Discuss:

- Ask students to list the abiotic factors that influence habitats (sunlight, water, air, soil)
- Ask students if they know of one other abiotic factor, that also influences many habitats, particularly those in southern Oregon forests.
- After students have had a chance to discuss this "mystery factor," tell them it is fire.
- Discuss with students: Many plant and bird species have adapted to fire in their communities. For instance, some conifers' cones require fire to open and release their seeds. Some birds prefer open habitat that has been burned. We can learn more about fire's effects of local habitats by doing plant and bird surveys.
- Explain to students that they will be breaking into four groups and conducting plant and bird surveys in their own "National Forest" plot. Two groups will be in an area that burned and two in an area that did not burn. This demonstrates the multiple surveys sites that scientists often use when conducting a study. Groups will get to share and compare their data, and make observations about their results.

Investigate

- Have students break into four groups, have two groups work on the "unburned" area and two groups work on the "burned" area. Give each group a set of *Bird Cards and the corresponding Vegetation Survey Plot.*
- Students will use the information presented in the "study plots" to fill in their data sheet. Have students multiply the number of squares covered by each type of vegetation by 5% to give the total percent of the plot covered by that type of vegetation.
- Once students have filled in their *Plant Survey Tables, have students each draw three Bird Cards. Record the number of times a bird card is drawn as number of individuals in the Bird Data section of the survey sheet.*
- After bird and vegetation surveys are complete, have students graph their vegetation data (x-axis= type of vegetation, y-axis= percent cover) and bird data (x-axis= species, y-axis= number of times drawn (individuals)).
- Once student groups have finished conducting their surveys, have groups join forces with opposite groups (burned with unburned) and compare/contrast data. Have students brainstorm and write down observations about their findings.

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Biology of Birds and Burns

Conclusion

1. Have students summarize the data they collected and discuss how it relates actual fire-adapted forest habitats:
    - If fire had burned all of this habitat what would our bird community look like?
    - If fire had burned none of this habitat what would our bird community look like?
    - Ask students "Do you think fire changed the community? Why?
    - Ask students "Do you think this change HARMED the community? Why?
2. Wrap up with a final summary discussion: Fire is part of these communities. Without fire, forests and grasslands become overgrown and species, such as the wrentit, lose habitat. When fire is allowed to be part of a healthy ecosystem, we have a greater diversity of species found in our National Forests

Classroom Extensions

Variation: Instead of printing the vegetation plots for students, teachers can create 5m x 5m diagrams of the vegetation plots for students to "survey," making sure to label where each vegetation type occurs.

Outdoor connections

- Take students to an area, such as the Quartz Fire, in the Applegate Valley of Southern Oregon, where a fire has burned in a National Forest. Have them conduct these surveys in person, using 5m by 5m plots for the vegetation sampling.
- Students could either look for birds while they are in the field, or use the cards and dice bird count method from above.

Further Resources

- **Ashland Forest Resiliency Project:** http://ashland.or.us/SectionIndex.asp?SectionID=503&utm_source=watershed&utm_medium=web&utm_campaign=watershed
- **Sierra Nevada Avian Monitoring Information Network, Fire Project:** http://data.prbo.org/apps/snamin/index.php?page=fire-home-page

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Literature Cited

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Burnett, Ryan D., Mel Preston and Nathan Seavy. "Plumas-Lassen Administrative Study 2011 Post-fire Avian Monitoring Network." Contribution Number 1869. PRBO Conservation Science, 2012. **Web**. 11 January, 2013.

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Stephens, J.L., I.A. Ausprey, N.E. Seavy, and J.D. Alexander. "Avian and Vegetation Response to the Quartz Wildlife, 2001-2010." Rep. No. KBO-2011-0014. Klamath Bird Observatory: Ashland, OR, 2011.

Stuart, John D. and John O. Sawyer. 2001. Trees and Shrubs of California. University of California Press. Berkeley and Los Angeles, CA.

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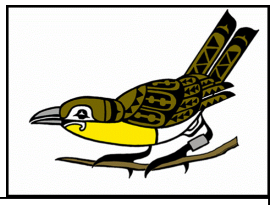
Date:_____



Biology of Birds and Burns Survey Sheet

Plant Survey Table

Vegetation Type	**Number of Squares**	**Percent Cover (Number of Squares x 4%)**
Example: *Trees*	*4*	*4 x 4%= 16%*
Soil		
Grasses and Forbs		
Shrubs		
Trees		
Snags		
Burned vegetation		

Bird Survey Table

Bird Species	**Number of Individuals (number of times card is drawn)**
Example: *Lazuli Bunting*	*3*

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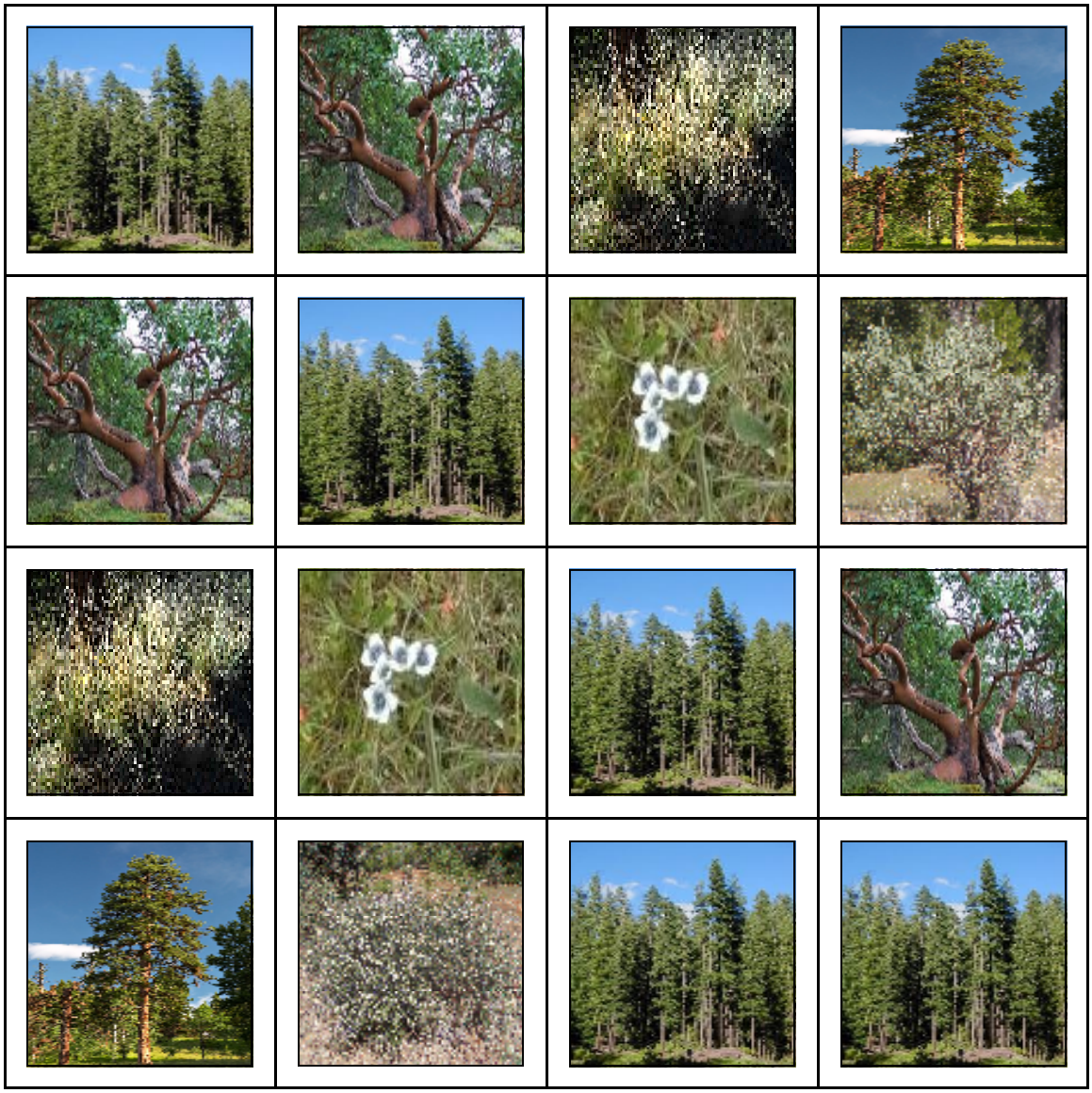
Unburned Vegetation Survey Plot



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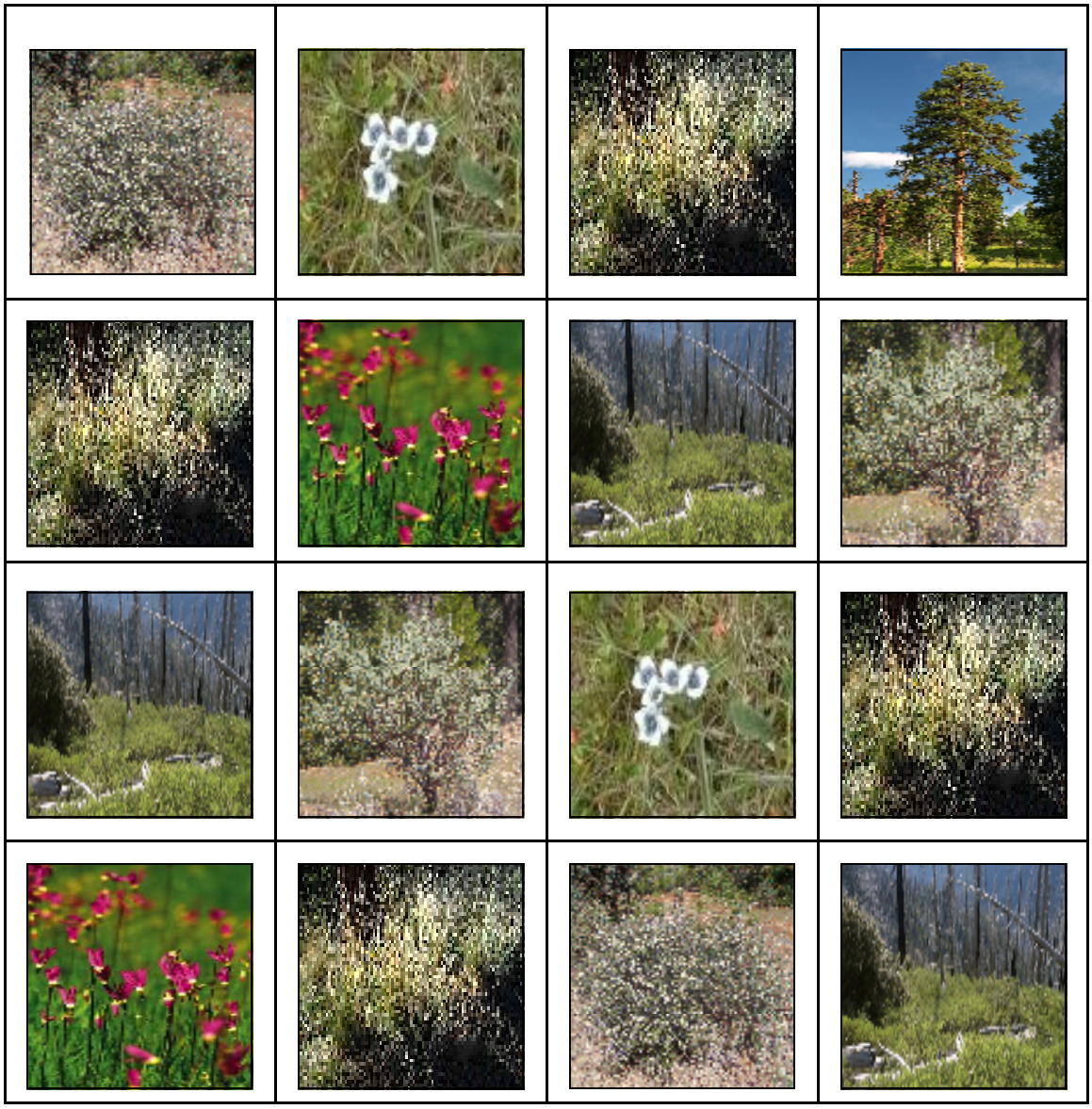
Burned Vegetation Survey Plot



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Buck Brush
Ceanothus cuneatus

Description:

- Silver to gray evergreen leaves
- May or may not have thorns
- "Popcorn" type flowers bloom in early spring

Habitat:

- Rocky outcrops, associated with serpentine and/or chaparral

Cool Fact:

- Buck brush produces thousands of seeds that wait until after a fire to start growing.
- Buck brush can produce seeds at an early age to help it reproduce in the event of a fire.

Cats Ears
Calochortus tolmiei

Description:

- Grows from a bulb
- Flowers with white hairs on three petals and are pollinated by insects

Habitat:

- Found in grassy dry slopes and open woodlands at moderate elevations

Cool Fact:

- The bulbs of cat ears were eaten by the Takelma and other tribes throughout the West.

Cards adapted from: Siskiyou Field Institute

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Whiteleaf Manzanita
Arctostaphylos spp.

Description:

- Medium sized shrub with evergreen leaves
- Has pink bell-shaped flowers in the spring and red berries that appear in the fall
- Bark is thin, smooth and red to brown in color

Habitat:

- Crevices and rocky outcroppings in mixed forests, chaparral and serpentine habitats

Cool Facts:

- Manzanita produce thousands of seeds that don't sprout until after a fire.
- Edible berries used for tea

Ponderosa Pine
Pinus ponderosa

Description:

- Yellow-green to greenish needles grow in clusters of three; cones are brown to reddish brown
- Bark has cinnamon or yellowish color and looks like puzzle pieces

Habitat:

- Found in coniferous forests, chaparral and mixed woodlands at low to mid-elevations

Cool Facts:

- Ponderosa pines have thick bark that helps them fire resistant
- Can live up to 600 years

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Pacific Madrone
Arbutus menziesii

Description:

- Leaves are broad, oval-shaped and evergreen
- Flowers are white or pink and berries are orange-red
- Bark is thin and reddish, peels off in strips to reveal young greenish bark

Habitat:

- Found on dry sites in coniferous forests, woodlands and chaparral that experience mild winters

Cool Facts:

- Madrone is not fire resistant but can sprout from burned and injured tissue
- Many birds devour madrone berries in late summer and fall

Douglas-Fir
Pseudotsuga menziesii

Description:

- Needles are short, flat and grow in a spiral around branches
- Cones are long; scales with overlapping tri-tipped bracts
- Bark often has a diamond pattern

Habitat:

- Found in coniferous and mixed deciduous forests, from low to mid-elevations

Cool Facts:

- Old-growth Douglas-fir forests are home to many threatened species, such as the Spotted Owl

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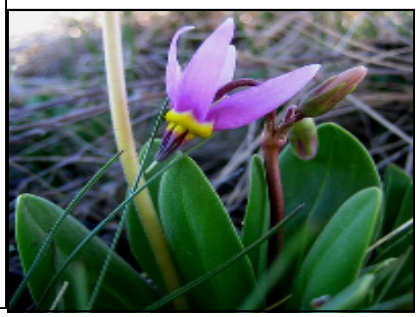
SHOOTING STAR
DODECATHEON POETICUM

Description:

- Pinkish purple flowers have five petals, and a yellow or white band between the petals and tip of flower
- Petals sweep back from tip of flower
- Leaves are green, broad and oval-shaped

Habitat:

- Found in dry, open woodlands, chaparral and wet meadows



Cool Facts:

- There are many varieties of shooting star found in Oregon; species are often separated

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Hermit Warbler
Bird Identification Card

Description	Hermit Warblers have two white wing bars, a black throat, and a yellow head. Often easier to hear than see, this bird spends the majority of its time in the tops of trees.
Interesting Facts	When arriving on to their breeding grounds, male Hermit Warblers immediately begin to defend their territories in the tops of conifer trees, providing an excellent vantage point to spot females and other males.
Conservation	Scientists use the presence of Hermit Warblers to study and measure the health of both mature and young conifer forests with a closed canopy.
Range	Hermit Warblers are found throughout Washington, Oregon, California, and parts of Mexico and Guatemala.
Habitat	During the breeding season Hermit Warblers are found in upland, or high elevation, conifer forests with a closed canopy. When traveling between breeding and wintering grounds, Hermit Warblers can be found in a variety of habitats including riparian (streamside), conifer and mixed-conifer forests, and parks. On the wintering grounds, Hermit Warblers are found in pine-oak and cloud forests Mexico and Guatemala.

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Black-throated Gray Warbler
Bird Identification Card

Description	Both males and females have a white supercillium (or eyebrow), a yellow spot on their lores (between their eyes and bill), a dark gray crown and cheek, and two white wing-bars. Males have a black throat, while females have a white throat.
Interesting Facts	The Black-throated Gray Warbler is one of the few warbler species that does not cross the continental divide. It remains in the west and follows oceans and mountain ranges as it moves between breeding and wintering grounds. Despite this, every year a few get lost and show up in eastern states.
Conservation	The presence of Black-throated Gray Warblers help scientists study the health of young pole forests and deciduous forests.
Range	Black-throated Gray Warblers breed from south-west British Columbia, Canada through parts of Washington, Oregon, and California, as well as Nevada, Wyoming, Utah, Colorado, New Mexico, and Arizona. In the winter, this bird is found central and western Mexico.
Habitat	During the breeding season, Black-throated Gray Warblers in western Oregon prefer forests with White Oak and Douglas Fir. When traveling between breeding and wintering grounds, Black-throated Gray Warblers prefer forests similar to those used during breeding. On the wintering grounds, Black-throated Gray Warblers are found in riparian (streamside habitats), and pine-oak forests in western Mexico.

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Lazuli Bunting
Bird Identification Card

Description	Male Lazuli Buntings have a bright blue head with a cone shaped bill, a rusty colored breast and white belly. These colorful male birds also have a blue back and wings, and wings have two bright white wing bars. Females are a dull grayish-brown with small white wing bars.
Interesting Facts	Male Lazuli Buntings over the age of two have their own unique song; younger males copy the older ones until they develop their own song.
Conservation	Scientists use the presence of Lazuli Buntings to study and understand the health of habitats associated with the Klamath Mountains, mixed conifer hardwood forests, and post-fire habitats.
Range	Lazuli Buntings breed throughout southeastern British Columbia and Alberta, Canada, through the western states. During winter, Lazuli Buntings are found in western Mexico.
Habitat	During the breeding season Lazuli Buntings are found in recent post-fire habitats as well as brushy habitats up to 3,000 meters (9,800 feet) When traveling between breeding and wintering grounds, Lazuli Buntings inhabit riparian (streamside) and brushy habitats. On its wintering grounds, Lazuli Buntings are found in oak forests and fields.

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Dark-eyed Junco
Bird Identification Card

Description	Male Dark-eyed Juncos have a dark gray to black head and breast, where females have a lighter shade of gray. Both male and female Dark-eyed Juncos have a pink cone shaped bill, white belly, reddish back, and gray tail. In flight, the outer tail feathers flash white.
Interesting Facts	Dark-eyed Juncos are one of the most common birds in North America, spanning the continent from Alaska to Nova Scotia and south to northern Mexico. Scientists estimate that there are approximately 630 million juncos in North America. The oldest recorded Dark-eyed Junco was 11 years 4 months old.
Conservation	Scientists use the presence of Dark-eyed Juncos to study and understand the health of conifer forest habitats.
Range	Dark-eyed Juncos breed throughout Alaska and Canada and winter throughout the eastern and southern United States and into Northern Mexico. In western states and New England, Juncos both breed and winter.
Habitat	Dark-eyed Juncos breed in conifer, mixed-conifer hardwood, and oak forests with an open canopy. During winter months, Dark-eyed Junco's are often seen at bird feeders, and in brushy areas that include the edges of forests, chaparral, sagebrush, and riparian (streamside) areas.

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Brown Creeper
Bird Identification Card

Description	Male and female Brown Creepers are identical. Brown Creepers have a white supercillium (eyebrow), white belly and breast, a brown, gray, and white streaked back, and a down curved bill. These birds are well suited for foraging for insects hiding in cracks in the bark and camouflaging with bark.
Interesting Facts	Brown Creeper's make their nests in between the trunk and a loose piece of bark of a large dead or dying tree.
Conservation	Scientists use the presence of Brown Creepers to study and understand the health of habitats associated old-growth mature, Douglas fir, and western white pine forests.
Range	Although widely distributed across conifer forests throughout North America, from Alaska to Newfoundland and south to Nicaragua, Brown Creepers are generally considered to be a resident bird.
Habitat	Brown Creepers are found in conifer and mixed-conifer hardwood forests, especially in old-growth, unlogged stands. In the winter, Brown Creepers are found in a wider variety of wooded habitats.

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Western Tanager
Bird Identification Card

Description	Male Western Tanagers have a bright red head, yellow breast and belly, and black wings and tail. Females are similar to the males, but have only a little red at the base of their bill. Both males and females have bright yellow wing bars.
Interesting Facts	Western Tanagers venture farther north than any other tanager species. The red coloration of the feathers on male Western Tanagers is caused by their diet!
Conservation	Scientists use the presence of Western Tanagers to study and understand the health of habitats at the edge of forest canopies and the conifer forests in the Klamath Mountains.
Range	Western Tanagers are found through out the western United States and Canada up to 60 degrees north latitude and south through Mexico and Central America to Costa Rica.
Habitat	During the breeding season Western Tanagers are found in both conifer and mixed-conifer hardwood forest habitats as well as riparian, Aspen, and oak habitats. On the wintering grounds, or when traveling between breeding and wintering grounds, Western Tanagers can be found in a variety of habitats including forests, orchards, and parks.

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Red-breasted Nuthatch
Bird Identification Card

Description	Red-breasted Nuthatches are blue-gray birds with a black-cap and stripe through the eye, broken up by a white stripe above the eye, and cinnamon colored breasts. Females are paler than males, but otherwise identical.
Interesting Facts	Red-breasted Nuthatches coat the outside of their nest cavity with resin, often applied with bark., possibly to discourage pests.
Conservation	Scientists use the presence of Red-breasted Nuthatches to study and understand the health of habitats associated with conifer forests.
Range	In winter, Red-breasted Nuthatches can be found throughout the United States. During the breeding season, they are found across many western states, north to Alaska and throughout most of Canada.
Habitat	In the western part of their range Red-breasted Nuthatches can be found in coniferous forests consisting of larch, hemlock, spruce, pine, fir and cedar. In the eastern part of their range, Red-breasted Nuthatches are found in more deciduous forests of aspen, birch, poplar, oak and maple. In the winter, Red-breasted Nuthatches can sometimes be found in parks, orchards and areas dominated by shrubs.

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House Wren
Bird Identification Card

Description	House Wrens are small, compact birds that often carry their longish tail above their body line. They are pale brown overall, though they are darker above than below. House Wrens have darker barring on their wings and tail and a faint eyebrow. Females and males are identical.
Interesting Facts	House Wrens, despite their small size, are fierce competitors for nest cavities and will often chase away or out-compete larger birds. House Wrens are cavity nesters and survive and breed well near human establishments. They have been found nesting in old shoes, farming equipment, watering cans, basically any nook or cranny they can build a nest in!
Conservation	Scientists could use the presence of House Wrens to study and understand the health of habitats associated with forest edges and of open-canopy forests.
Range	During the breeding season, House Wrens can be found all but the most southern part of the United States and up into southern Canada. They are year-round residents of southwestern California and South America and winter in central America and the southern United States.
Habitat	Due to their large geographic range, House Wrens can be found in a variety of habitats. Their basic habitat requirement are that there be trees, shrubs, interspersed clearings and cavities to nest in. House Wrens can often be found nesting along burned areas and clear-cuts.

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Spotted Towhee
Bird Identification Card

Description	Spotted Towhees are large sparrows, well camouflaged for foraging in leaf litter. Males have black heads, throats and backs, while females have paler brownish heads, throats and backs. Both have red eyes, rust-colored sides, white breasts and white spots and streaks on their wings.
Interesting Facts	Like other towhees and sparrows, Spotted Towhees forage on the ground. They use a "double scratch" method of moving leaf litter to uncover seeds. They do this by scratching with both feet as they hop backwards. During the breeding season and summer months, Spotted Towhees eat primarily insects and insect larvae. During the fall and winter seeds, glowers and other plant matter makes up the majority of their diet.
Conservation	Scientists could use the presence of House Wrens to study and understand the health of habitats associated with forest edges and of open-canopy forests.
Range	Spotted Towhees are found year-round in the western and southwestern United States.
Habitat	Spotted Towhees can be found in chaparral, along forest edges, dry thickets, old fields, brushy areas, canyon bottoms, shrubby backyards and in other areas with shrub thickets and leaf litter for foraging in.

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Birds for Unburned Vegetation Plots

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Birds for Unburned Vegetation Plots

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Birds for Unburned Vegetation Plots

Birds for both Burned and Unburned Vegetation Plots

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Birds for Burned Vegetation Plots

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Birds for Burned Vegetation Plots

Birds for both Burned and Unburned Vegetation Plots

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