

## Observing the Methow's Shrub-Steppe

<p><b>Sounds and odors:</b> What sounds are audible, what odors are wafting through the atmosphere?</p>	<p>Vesper sparrows sing from April to June, often in bitterbrush; Brewer's sparrows sing in the sage; meadowlarks are common (but declining) in grass habitats. An energetic, high-pitched rattling sound indicates you are standing next to a rattlesnake. The odor of sage dominates the air after a rain; bitterbrush is covered in yellow flowers in May with a strong scent of cinnamon.</p>
<p><b>Watch for movement:</b> Birds, mammals and reptiles may only be visible momentarily.</p>	<p>Small birds will often fly off to a more distant shrub, but then pop up to observe the source of the disturbance. Raptors may be soaring overhead. Horned lizards are the color of soil and can only be seen when they move.</p>
<p><b>Plant communities:</b> How are topography and aspect defining plant communities?</p>	<p>Among the shrub-steppe there are cliffs, swales, meadows, riparian areas, ponds, saline pools, trees, and areas of 'stone soil' (lithosol); plant and animal communities will vary with the habitat, and with the degree of solar gain (insolation) that each site receives.</p>
<p><b>Plant species:</b> What are the primary plant species in each of the different growth forms, and what plants dominate?</p>	<p>Plant communities are made up of trees, shrubs, perennials (which die back to the roots each fall), and annuals (in which only the seeds overwinter). Grasses can be either perennial or annual, while all sedges are perennials; sedges are most often found in areas with saturated soil in the spring.</p>
<p><b>Edible plants:</b> What are some of the edible and poisonous species present?</p>	<p>Edible: balsamroot, bitterroot, bluebells, blue camas, cattail, mariposa lily, serviceberry, springbeauty, waterleaf, wild onion, yellowbell, wild celery (<i>Lomatium nudicaule</i>). Poisonous: death-camas, locoweed (species of <i>Astragalus</i> and <i>Oxytropis</i>), water-hemlock (<i>Cicuta douglasii</i>, found in wetlands).</p>
<p><b>Useful plants:</b> What are some of the plants that have been useful to the native people of this land?</p>	<p>Cattail and tules from wetlands were the most important mat-weaving material for local natives. Rocky mountain maple was used for snowshoes and bows. A fish poison can be made out of 'wild carrot' (<i>Lomatium dissectum</i>). Dogbane bark and fireweed stem-fiber makes a very strong twine or rope. Sagebrush bark was used to weave clothing. Oregon-grape, alder and wolf lichen were used as dyes. Serviceberry and mock orange wood is extremely hard and was used for arrows.</p>
<p><b>Flowers:</b> What's in bloom? What is the proportion wind- to insect-pollinated species, and of generalist pollination flowers to specialists?</p>	<p>Flowers that are round like a wheel are usually pollination generalists; any of the several groups of insect pollinators (flies and beetles, bees and wasps, butterflies and moths) can get at both nectar and pollen. Flowers that are bilateral are usually specialists, meaning they are pollinated by one insect group only. Grasses, sedges, sagebrush and aspen are all wind pollinated.</p>
<p><b>Insects:</b> Which insects are pollinating which flowers?</p>	<p>Bilateral flowers with the nectary concealed by flower petals (e.g. lupine, monkshood) are usually pollinated by bumblebees. Flowers with nectar held at the end of a long, tubular spur (e.g. columbine, larkspur) are often pollinated by butterflies and moths and/or hummingbirds.</p>
<p><b>Fire:</b> What is the fire history of the area?</p>	<p>Shrubs are killed or burned to the ground during fires. Pure grassland suggests a fire occurred in the past 10 years (or the area was cleared for agriculture); bitterbrush or sage over 4 feet tall suggests no fire for at least 20 years. Over 30% shrub abundance suggests no fire for at least 30 years.</p>
<p><b>Soil Crust:</b> Is there any? If so, what types of organisms are they composed of (lichen, moss, clubmoss, liverwort)?</p>	<p>Soil crust refers to the thin layer of lichens and mosses that were formerly widespread on the surface of soils throughout the arid, inland west. These crusts play a very important role in the ecology of the shrub-steppe, but are easily destroyed by trampling, and are now greatly diminished in our area.</p>

<p><b>Disturbance:</b> What is the level of ‘natural’ and human-caused disturbance of the area?</p>	<p>Natural disturbance includes periodic fire, weather-related plant impacts (e.g. winter-kill from wind and desiccation, summer drought), flooding of streams. Human-cause disturbance (including grazing by ungulates) typically results in the displacement of native vegetation by non-natives, often in our shrub-steppe by cheatgrass, bulbous bluegrass, annual mustards, knapweed, kochia (<i>Kochia scoparia</i>) and Russian thistle (aka tumbleweed, <i>Salsola kali</i>). Balsamroot increases with heavy grazing, while grasses diminish.</p>
<p><b>Drought adaptations:</b> Plants adapt either by tolerating, avoiding, or escaping drought.</p>	<p>Many species in the Goosefoot Family (e.g. lambsquarters) tolerate drought by retaining salts in their tissues, and can thus draw moisture from relatively dry soil. Avoidance of drought is accomplished by retaining moisture—by a waxy coating on leaves (the cuticle), by leaf hairiness (hairs reduce air movement, sunlight, and evaporation), leaf shape (low surface to volume ratio), succulence (storing water in leaves), and opening leaf stomata only at night (stonecrop and cacti). Plants can escape drought by completing their lifecycle in the spring, or by growing in areas with additional moisture (wetlands and riparian areas).</p>
<p><b>Animals:</b> What are the signs of animal life?</p>	<p>Birds leave feathers and nests; they may regularly perch on rocks and pass nutrient-rich excreta, which leads to bright lichen blooms on the rocks. Many mammals burrow in the shrub steppe; the burrow entrances may be inhabited by tree frogs and salamanders. Mammal sign includes tracks, scat, bones and hair.</p>
<p><b>Energy:</b> How does energy move through the ecosystem?</p>	<p>Solar energy is transformed into organic compounds (sugar) by photosynthetic plants, lichens, and cyanobacteria—these form the base of the food chain in the shrub-steppe. What are the primary consumers in the system, the herbivores? What are the secondary and tertiary consumers (the carnivores. 90% of available energy is lost every time one creature eats another, so hopefully the large, fierce carnivores are relatively rare around you).</p>
<p><b>Nutrients:</b> How are nutrients retained and recycled in the ecosystem?</p>	<p>This is a largely invisible process, but we can make educated guesses. Plants cycle moisture and oxygen back to the atmosphere, animals release carbon dioxide. Lichens, cyanobacteria and some plants (e.g. lupine &amp; other members of the Pea Family, bitterbrush) can acquire nitrogen from the atmosphere and ‘fix’ it, making it available in the soil. Soil crusts prevent soil erosion and help retain the native supply of phosphorus.</p>
<p><b>Limiting Factors:</b> What are some of the factors that limit growth in the shrub-steppe?</p>	<p>The shrub-steppe does not grow as much biomass as a rainforest; why not? Moisture is a limiting factor, freezing temperatures and low sunlight limit growth in winter, heat can limit photosynthesis in summer. Nitrogen may be lacking due to insufficient nitrogen-fixing plants, erosion may be removing phosphorus. Grazing by native or domestic ungulates may be stunting plant growth.</p>
<p><b>Diversity:</b> How biologically diverse is the ecosystem in terms of plant species? What factors may be limiting diversity?</p>	<p>The shrub-steppe is sometimes dominated by one species—stands of bluebunch wheatgrass for example—and is sometimes strikingly diverse, with up to 50 plant species in an acre. Saline and nutrient-poor soils typically reduce diversity.</p>
<p><b>Native Americans:</b> How would a Native American look at the shrub-steppe landscape?</p>	<p>Natives in our area may have visited the forests and high mountains, but they lived in the shrub-steppe. They knew which plants were useful for food and which for tools, they knew where different plant species grew and where animal species lived. They largely lived outdoors. “The Lakota was a true naturalist—a lover of nature. He loved the earth and all things of the earth, the attachment growing with age. It was good for the skin to touch the earth and the old people liked to remove their moccasins and walk with bare feet on the sacred earth.” Chief Luther Standing Bear</p>