Observing The Life of the Forest

Dana Visalli/*Methow Naturalist* /www.methownaturalist.com/dana@methownet.com

Character	Ecological Elements to Observe
Forest Type	Is the forest coniferous, broadleaf, or mixed? Why does one or the other type prevail in this forest? Conifers often dominate in our forest ecosystems due to our very cold winters (generally no photosynthesis possible) and very dry summers (also often no photosynthesis as stomata close to prevent water loss). In areas where soil moisture collects, cottonwoods, aspens and other broadleaf trees typically outcompete conifers. Why?
Dominant Species	What are the dominant species in the overstory, the tree understory, the shrub and the herbaceous/grass levels of the forest? How does the species composition change with slope, aspect and micro-climate (in swales, for example)? What characteristics of the dominant tree species allows it to prevail at this time in the forest (e.g. requirements for seed germination, shade tolerance/intolerance, tree grow rate & longevity, seed dispersal, deciduous/evergreen).
Seral Stage	What is seral stage of the forest: early, mid or late seral (climax)? The most shade intolerant trees will typically be the early-seral colonizers, and the most shade-tolerant species adapted to the habitat will be the climax species. What factors appear to be involved in establishing and maintaining the current seral stage— insect and/or fungal predators and parasites, precipitation/drought, high water table, soil type, physical disturbance: ice, avalanche, fire, wind.
Fire History	In a natural regime in the Methow, ponderosa forests burn often, every 10-20 years. For Douglas-fir the average periodicity would be closer to 30 years, and for lodgepole and true firs 50-100 years. How old does the dominant age-class appear to be (if the forest is dense small trees will be older than they look; often 80-90 years old in the Methow)? What signs of fire, recent and historic, can be found (cat-face burns on trees, charred bark, holes in ground from burned roots)?
Insect History & Sign	Bark beetles attack most of our conifers; the trees attempt to repel them by directing sap (pitch) into the entry holes. Pitch-filled holes are often visible, especially on lodgepole. On dead trees bark beetle galleys (feeding paths) are visible on the inner bark and outer wood (pull off bark). The pattern of the galleys varies with beetle species (an ID worksheet is available from *The Naturalist*). Ambrosia beetles drill 1/16th " diameter holes straight into dead sapwood and introduce decomposing fungi. Long-horned (adults have very long antennae) and metallic (adults are metallic-colored) woodboring beetle larvae bore into sapwood of dead trees and leave compacted boring dust under dead bark. Budworms (the larvae of a moth) chew and kill current year's foliage on Douglas-fir, spruce and larch.
Fungal Decomposers	Fungi are the primary decomposers of wood; many of them have visible reproductive structures, often mushroom-like but woody, called conks. They grow on the dead or dying tree or on adjacent ground. Many fruiting bodies can be identified to species with a mushroom ID book like *Mushrooms Demystified*. Root disease or 'root rot' often causes an expanding circle of dead trees. Two distinctive forms of decay are laminated root rot—causing wood to separate at annual rings like the pages of a book—and brown cubical rot, which decomposes heartwood creating blocky brown rectangles of rotten wood.
Parasites	Major hosts for mistletoe (which is a parasitic flowering plant) include Douglas-fir, true firs, lodgepole and ponderosa pines, and hemlock. The short green shoots of the plant can sometimes be found growing out of the tree stems. More noticeable are the clustered 'brooms' of branches and needles that form on infected trees, especially on Douglas-fir. A fungal infection of ponderosa called Elytroderma needle blight causes needles at branch tips to clump together and turn upward.
Mosses, Lichens, Fungi	These attractive organisms can go unnoticed unless attention is drawn to them. A 10x handlens will reveal more of their elaborate structure than the naked eye will. Mosses and lichens can be on tree trunks and branches, on the ground and on rocks. Keep a rough tally of how many different species of each you are seeing, and learn to identify several of the most common or showy species.
Conifers	Conifer cones vary in design and seed dispersal strategy with each species. Fir cones stand upright on branches and they disintegrate on the branch, so hypothetically squirrels cannot get at the ripe seeds. Fir cones are surprisingly beautiful and worth looking for, especially when an uphill trail allows one to look straight into the branches of trees downslope. Douglas-fir, ponderosa pine, spruce and hemlock all hang downward, and the seeds fall out between the opening cone bracts when ripe. Squirrels will cut down any of these before they ripen to obtain the seeds. Generations of squirrels will shuck cones in the same spot, creating a mass of cone scales called a midden that can be 100 years old and 10' deep; the midden serves as a heavy mulch on the ground. Squirrels will stash cones in the ground and in the moist center of middens—this keeps the cones from opening for a time and serves as a larder for the squirrels, but it also effectively plants the seeds of cones that get overlooked.

Aspens, Cottonwoods, Willows	These three tree types are all in the Willow Family. They are all dioecious, which means their male and female catkins (elongated, wind-pollinated flowers) are on different plants. Catkins appear in April and have a symmetrical beauty worth examining with a handlens. In May and June catkins can usually be found either still attached or on the ground; they are often necessary to identify our 21 Methow willows to species. Willows are both wind and insect pollinated, offering as they do minute amounts of nectar at the base of each male and female flower (the anthers and capsules located on the catkins). Because of this willows are alive with the sight and sound of insects in April. Female capsules split open in early June in the lowlands, releasing cottony seeds. The seeds are short-lived and must germinate on moist bare soil within weeks if they are to survive. Cottonwood buds are covered with waxy, aromatic propolis to protect against cold and herbivory; this wax is very much in evidence in the spring. Aspen leaves have flat stems and have evolved to 'quake' in the slightest breeze; what is the adaptive advantage of this? Aspens readily reproduce from underground roots, and each grove of trees is often a clone, all trees genetically identical. This will cause them to all leaf out at the same time in the spring and turn the same color at the same time in the fall—but this timing will vary from clone to clone.
Understory Plants:	Fireweed grows in openings in forested areas. It is pollinated primarily by bumblebees, which will fly to the bottom of a flowering stalk and work their way upwards, then fly to the bottom of an adjoining plant. The male and female reproductive organs ripen at different times; the anthers ripen first, followed a few days later by the pistil (female). Thus in a stalk that is in full bloom, the lower flowers will have only pistils ripe and receptive, while the upper flowers will have only anthers. This prevents bees from pollinating any flower with pollen from another on the same stalk (this would be undesirable because they have the exact same DNA). Clever of the plant. Meadowrue (*Thalictrum occidentale*), which also grows in openings, is dioecious, like the willows and cottonwood, and also like them is wind-pollinated. Placing male and female flowers on different plants also effectively prevents self-pollination. Deep-shade plants like Solomonseal, twisted-stalk and fairybells (*Smilicina, Streptophus* and *Disporum*) grow with broad leaves that stand parallel to the ground, optimizing solar gain (leaf position will be different in full light). These lilies all have reddish berries, which is highly visible to some wildlife, encouraging the animals to eat the berry and thereby disperse the seed.
Heather Family	The Heather Family has developed a specialized symbiotic relationship with specific fungi, so much so that the fungi are called Ericoid Mycorrhiza (the scientific name of the Heather Family is the Ericaceae). In some plants, like our blueberries (*Vaccinium*), the relationship is typically mycorrhizal; fine fungal 'roots' (mycelium) surround plant roots and increase the supply of vital nutrients (like phosphorus) and water to the plant; in return the plant produces sugars for the fungus. A few Heather Family species in our area are hemi-parasites; in white-veined pyrola, some of each leaf lacks chlorophyll because the plant is getting nutrition *through* the fungus from another plant, usually a tree. Other Ericaceae are completely parasitic and have given up photosynthesis completely; they have no green coloration. In our area this includes candystick (*Allotropa*), pinesap (*Hypopites*—now *Monotropa*), pinedrops (*Pterosphora*), and leafless pyrola (*Pyrola aphylla*). These are known as 'mycotrophic plants'—which translates as 'fungus-feeding.' In fact the fungus is somewhat parasitic on a nearby tree, and the mycotroph is 'epi-parasitic' on the fungus.
Orchid Family	Our mountain lady's-slipper (*Cypripedium*) is a 'trap pollinator.' A small bee enters the opening in the white frontal pouch, but cannot exit that way as the sidewalls are too slick to climb. The only escape is through a small passageway out the back, past the stigma and 'anther' (antheridia in orchids). As the bee makes its escape the flower actually glues a wad of pollen to its head. If this same bee visits another lady's-slipper it will deliver the pollen to the stigma. Our fairyslipper (*Calypso*) is a 'deception pollinator'; it emits an attracting fragrance but offers no nectar or edible pollen. This trick only works with young bees. Some of our orchids are mycotrophs (see Heather Family above); they have completely abandoned photosynthesis and have no green color, rather they are epi-parasites on a mycorrhizal fungus. Our orchid species in this category are three local coral-roots, striped, spotted and Mertens' (*Corallorhiza*, which translates 'coral-root,' and no doubt refers to fungus-harboring nodules on the roots).
Seeds	Seeds are of course a critical link in the survival of any plant's genetic line. All seeds have to disperse to find suitable habitat for germination. In the case of annuals (of which there are almost none in the forest) they can fall to the ground under the parent, as that plant will die at the end of its growing season. Mistletoe seeds need to germinate on the bark of an acceptable host tree—they are actually expelled from their capsule at 60 mph, shooting through the forest in a blind effort to hit a viable host. Most seeds have to disperse to the ground away from the parent plant. Our conifer seeds almost always have one small wing attached, which allows the seed to spiral down and away from the parent tree; they have been known to travel ¼ mile on the wind. Berries often turn red to attract consumers that will later expel the still-viable seed with feces. Other seeds have barbs and hooks to hitch a ride with passing animals.
Soil	Observe the difference in the amount of humus in an aspen-cottonwood forest and a conifer forest—conifers keep their needles for several years and are somewhat resistant to decay, so there should be more humus in the deciduous forest. Dig down several inches and observe with a handlens; in the warm season there will likely be small invertebrates moving through the soil, and white fungal mycelium present if the soil has moisture.
Animal Presence, Sign & Sounds	In the insect realm (see section above), orange-black anglewing butterflies commonly flit in sunny forest openings. They are usually males, guarding a small patch of territory and hoping for a passing female. Watch for the rather rare pollinators on forest flowers. 'Bark birds' are prominent in the forest—observe and listen for pygmy, white-breasted and red-breasted nuthatches (which move down tree trunks), brown creepers (which move up), and any of our 10 species of woodpeckers. Pileated woodpeckers make characteristic large rectangular holes as they hunt carpenter ants. Red-naped sapsuckers make perfectly round holes in aspens for nest cavities, and they drill lines of holes around birch and alder in the spring induce sap to flow—then they return and 'suck' it. Squirrels will drop and bury cones, create middens, and will also place mushrooms on conifer branches to dry. Growing mushrooms are frequently nibbled by squirrels, chipmunks, and mice. Check aspens for claw marks of black bear and cougars; such markings are abundant in the Methow.