Recognizing symbiotic relationships

Can you spot that dynamic duo?

As John Muir once wrote, "When we try to pick out anything by itself, we find it hitched to everything else in the Universe." When you learn about one species of plant or animal, you often find that it is involved in multiple dynamic relationships that go beyond simple food chains. We call these symbiotic relationships. In these dynamic duos, one organism forms a connection to another organism.

Symbiotic relationships fall into three main categories, defined by the benefits or detriments to the parties involved. **Parasitism** describes a relationship where one organism benefits while another is negatively affected. At other times, both organisms benefit, a partnership dubbed **mutualism**. Sometimes one species benefits from the arrangement while the other is unaffected; this is called **commensalism**.

Here in the Rocky Mountain West, we can observe symbiotic relationships between many amazing plants and animals. Can you decide what type of relationships are described below?

Great Horned Owl *(Bubo virginianus)* and Northern Flicker *(Colaptes auratus)*

What's that knocking? If you live in a wooded area, it's probably a woodpecker using its strong, sturdy beak to drum out a beat to attract a mate or search along trunks for larvae to eat. It may even be boring out a cavity nest.

Woodpeckers are skilled nest excavators, drilling into the soft wood of tree trunks to carve out cozy spots to rear their young. These snug, well-constructed homes are also vital to other species of birds and rodents who nest in abandoned woodpecker cavities.

Owls seek out specific woodpecker species whose cavities are appropriately sized and located in suitable habitats. Great Horned Owls, for example, search for Northern Flicker cavities that they can customize for their own use.

Cutthroat Trout *(Oncorhynchus clarkii)* and Western Pearlshell Mussel *(Margaritifera falcata)*

We hear a lot about invasive mussels in the state, but did you know that Wyoming is home to seven native freshwater mussels? These mussels help keep our rivers and lakes clean through their process of filtering water for food; they are also a food source for other animals.

We can thank fish, and even salamanders in some cases, for helping young mussels get started in life. Female mussels can produce hundreds of thousands of larvae. If they are lucky, the tiny juveniles attach to fish gills, where they can

develop safely while benefiting from the nutrients the fish takes in. For example, the Western Pearlshell is known to depend on Cutthroat Trout as a host. Once the mussels undergo metamorphosis, they fall off and resume their life on lake and river bottoms.

Algae + fungus = Lichen (Wolf Lichen, *Letharia vulpina*)

Mushrooms as farmers? Sort of. When algae or cyanobacteria live within the filaments of fungi, they form a two-species organism called lichen. Fungi cannot photosynthesize, but algae and cyanobacteria can, offering a constant source of nourishment. In return, the fungi offers a secure home, protected from harsh elements. This symbiotic relationship allows both species to endure and persist in areas other organisms could not.

You may have noticed the bright green and shrubby wolf lichen that hangs off live and dead pine trees. While toxic to some animals, it was important for making dye used by indigenous people.

Lichens, including wolf lichen, also provide a food source for deer and elk. Hummingbirds use lichens to line their nests.

Brown-headed Cowbird *(Molothrus ater)* and Chipping Sparrow *(Spizella passerina)*

Cowbirds are famously terrible parents. Females lay their eggs in the nests of other birds, leaving the care and feeding up to unsuspecting strangers. More than 200 species are known to have been cowbird hosts.

When the host bird leaves to grab a bite to eat, a cowbird will sneak in and lay an egg in the nest. The deceived bird will return and go about the rearing process. When the cowbird hatches, it will usually out-eat, outgrow, and outmaneuver the true nestlings. Yellow Warblers, Red-winged Blackbirds, and sparrows, such as the Chipping Sparrow, are common hosts.

Coyote *(Canis latrans)* and Badger *(Taxidea taxus)*

Teamwork makes the dream work—if your dream is to capture a meal that has the ability to run deep into a burrow. Slow, lumbering badgers are well suited to digging into prairie dog or ground squirrel dens, while coyotes are swift sprinters but slow diggers. Each animal brings unique skills to the effort with coyotes running down prey that the badger rousted


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Coyote


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Badger

from safety. This partnership has only recently been captured by video, confirming what scientists have long suspected.

Whitebark Pine *(Pinus albicaulis)* and Clark's Nutcracker *(Nucifraga columbiana)*

Found in high altitudes in the West, whitebark pines depend on a bird, Clark's Nutcracker, to use its specialized beak to dig into the unopened scales of pine cones for seeds. The nutcracker then carries the foraged seeds in a pouch under its tongue to a location where it buries the seeds in shallow soil caches.

These birds are known to cache up to 90,000+ seeds in a year and the lucky seeds that are forgotten often sprout. This is important for the pines because it takes decades for them to begin to produce cones, and even longer for the cones to mature. The nutcrackers help the seeds find their way to an ideal planting spot, usually in an area far from the parent tree.

Grizzly bears also benefit from the seed caches, seeking them out as a way to get a quick, nutritious meal.

White-lined Sphinx Moth *(Hyles lineata)* and Blue Columbine *(Aquilegia coerulea)*

Pollinator and plant relationships are well documented, so choosing just one duo in this category is difficult! In the case of moths as pollinators, they often choose white or pale-colored flowers with wide, open petals that are easily seen in the moonlight (when moths are most active).

The Blue Columbine fits this description and has the added feature of a long spur at the base of the flower, which holds the nectar moths seek. Unlike some pollinators, the White-lined Sphinx has a long proboscis that can access the nectar-filled spur. In the process, the White-lined Sphinx gathers pollen from the Blue Columbine's stamen, aiding in fertilization.

Well, how did you do? In many of these cases, a variety of species can be affected by these relationships. It would take hundreds of pages to follow the paths of all the dynamic duos involved.

Answers: *Commensal, commensal, mutual, parasitic, mutual, mutual, mutual*

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Donald Owen, California Department of Forestry and Fire Protection

Whitebark Pine

Gary Churchill/Audubon Photography Awards

Clark's Nutcracker


Nicole Tomky

White-lined Sphinx and Blue Columbine