

How Wildflowers Could Help Save Sage-Grouse

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Sagebrush (*Artemisia*¹) steppe once covered about 170 million acres across the western United States. In western North America, this habitat supported populations of greater sage-grouse² (*Centrocercus urophasianus*) estimated as high as 14 million birds (Dumroese 2020). The arrival of Euro-Americans began a saga of unmitigated disaster for the greater sage-grouse. Half of the sagebrush steppe habitat has been lost entirely. The process started with conversion to agricultural uses, primarily a combination of domestic livestock grazing and irrigation projects. More recently, losses are primarily due to urban sprawl, energy projects, infrastructure, and wildfires. As a consequence, the total number of greater sage-grouse in the US has declined by 97 percent, to only 400,000 birds. The entire population in Oregon is estimated at only 14,200 birds (Foster and Vold 2020).

In Oregon, most of the primary negative impacts on sage-grouse are related to human actions. (See sidebar) Thus, human intervention to preserve existing sagebrush steppe and restore degraded habitat is crucial for survival of sage-grouse populations. In this article we describe the relationship between sage-grouse and their sagebrush habitat and discuss ways that this habitat might be restored.

A year in the life of sage-grouse

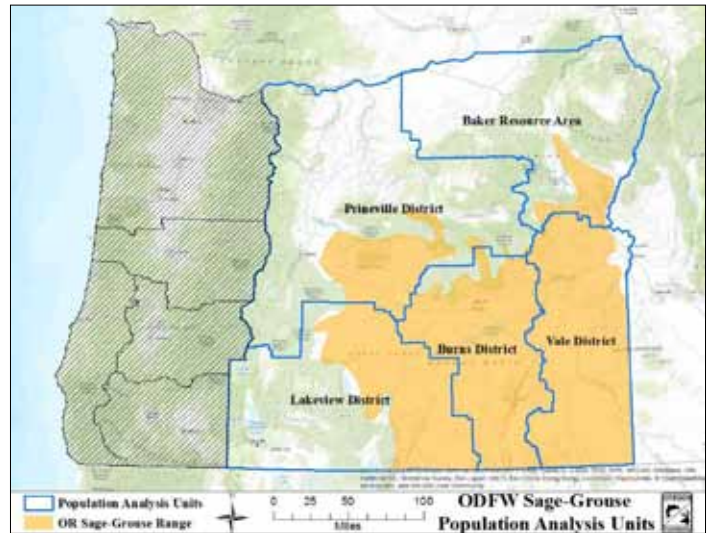
Sage-grouse are the ultimate sagebrush steppe specialists, requiring sagebrush habitat year-round.

Spring

Each spring sage-grouse return to their breeding grounds, called leks, to perform an elaborate courtship. This ritual of male dancing ranks as one of the top wildlife “wonders of the world.” From March through May, males gather as the sun rises to strut for female attention and vie for dominance. Males inflate and deflate two bright yellow throat

¹When we use the name sagebrush without a modifier, it means collectively the woody *Artemisia* species found in the Great Basin steppes, including the various hybrids between them: *Artemisia tridentata* (sps. *tridentata*, *vaseyana*, and *wyomingensis*), *A. arbuscula* (sps. *arbuscula* and *longiloba*), *A. cana*, *A. nova*, *A. papposa* and *A. rigida*.

²There are two species of sage-grouse: greater sage-grouse and Gunnison sage-grouse (*Centrocercus minimus*). In Oregon we have only greater sage-grouse, which we will, for convenience, refer to simply as sage-grouse in this paper.



Sage-grouse habitat in Oregon is the northern extension of the Great Basin. Map from the Oregon Greater Sage-grouse Population Monitoring: 2020 Annual Report.

sacs to make a strange popping sound, like champagne bottles opening. As they strut, they fan their spiky tails, occasionally sparring with each other with their wings. Females³ watch from the cover of nearby sagebrush. This waiting and watching lasts for many mornings before the hens choose their mates. It appears that a few dominant males receive almost all the attention from the females. After a hen mates with her chosen cock, she flies off in search of the ideal sagebrush shrub under which to make her nest on the ground. Sagebrush with a spreading growth form provide more secure nesting conditions than plants with columnar growth form because the spreading branches provide additional screening from predators. Hens usually fly no more than three to four miles from the lek. The males play no part in the raising of the young. Hens choose nest sites that not only provide hiding cover from predators but are also surrounded by forbs and insects. Before and after breeding, hens require increased levels of calcium, protein and fat-soluble vitamins (A, E, D₃ and K) to produce eggs (Barnett and

³Females are about half the size of males. Both sexes have small heads and long tails with black bellies and clean white underwings, easily spotted in flight. The female has a mottled breast and neck, while the males sport a white breast and white neck feathers above a black neck ring.

The Saga of Resource Development in Oregon

Much of the shrub steppe in Oregon has been lost to large wildfires, developed for other uses or severely degraded by improper grazing. Energy development and urban expansion are huge threats outside of Oregon, but those threats are fairly negligible here compared to invasive annual grasses and conifer encroachment. Eighty percent of the remaining sagebrush steppe is estimated to be so degraded that it does not meet the needs of sage-grouse. Many of the factors that eliminate or degrade sagebrush habitat interact with each other and have a compounding effect on the birds. Wildfires, annual weed invasion, conifer encroachment, lax enforcement of grazing regulations as well as range “improvement” projects such as seeding with crested wheatgrass all contribute. Some of the remaining sagebrush steppe is so fragmented, without connections to larger areas, that it is unavailable as suitable habitat.

More frequent and prolonged droughts contribute to large wildfires, which have replaced vast areas of sagebrush with exotic annual weeds that spread rapidly on bulldozed fire breaks. Fire is now particularly devastating to sage-grouse habitat in lower elevation (Wyoming big sagebrush) sites. Historically, distribution of the vegetation (fuel) was patchy with bare soil or rocks between the clusters. Frequent fires ignited by lightning or by native people resulted in a highly heterogeneous landscape, both spatially and temporally (through varying stages of post-fire succession), which was perfect for providing all of the habitat requirements for sage-grouse at all life stages. Now, exotic annual grasses create a continuous fuelbed, and the climatic trend is toward more episodes of extreme fire weather, a combination that yields the current “megafires.” Megafires leave large areas of annual grass monocultures in their wake that are vulnerable to very frequent fire return intervals, effectively preventing the reestablishment of any perennial vegetation. Rabbitbrush often replaces sagebrush by quickly recolonizing after fire by re-sprouting and widespread dispersal of copious quantities of seed. In contrast, it can take 20 to 50 years for big sagebrush to recolonize a site without replanting by humans.

Conifer encroachment is another primary threat to sage-grouse habitat, particularly in the higher elevation (mountain big sage) sites. Western juniper (*Juniperus occidentalis*) may occupy as much as 150% more area than it did pre-European settlement. In Oregon, conifer encroachment has made a substantial amount of historical sage-grouse habitat unsuitable. Sage-grouse tend to actively avoid sagebrush steppe habitats with conifers, where they experience higher predator mortality. Juniper encroachment of the uplands also affects the hydrologic conditions of the surrounding areas by reducing the amount of water that uplands contribute to

surrounding areas. Less water in the lower areas results in increased shrub mortality and formerly mesic habitats fail to sustain the forbs and insects that are critical for sage-grouse.



In the early years, large bands of sheep “stripped the desert clean” of all forage. Historical photo from the Bowman Museum, Prineville.

Historic overgrazing

Where sagebrush remains, the legacy of historic overgrazing is the primary cause of the loss of native wildflowers and grasses in the understory. During the early decades of western range use, domestic livestock grazing eliminated the diverse array of forbs and grasses that are characteristic of steppe communities, leaving a depauperate shrub steppe. Because sheep show a higher preference for forbs, they were often blamed for the destruction of rangeland. Reub Long described the situation: “When the grass belonged to no one, the sheepherders knew that if they didn’t get the last spear of grass, that someone else would. There was no point in grazing lightly” (Jackman and Long 1967). In those early decades, the rangelands were stripped bare, whether by sheep, cattle, or horses. Large bands of 2,000 to 3,000 ewes (with lambs) could remove all the forage in a single pass, but they did not necessarily cause more damage than cattle and horses. Sheep were herded across the landscape in mass and then were gone, while horses and cattle tended to remain in a location, grazing any regrowth the plants could muster to produce flowers or seeds. They grazed the seedlings too, thus ensuring the demise both of existing plants and their potential replacements.

Excessive grazing left native species less resistant to drought: depleted reserves in the roots led to smaller root systems and feeble regrowth when water became available. Essentially all of eastern Oregon was subjected to unregulated livestock grazing in the late 1800s and early 1900s. That said, given the opportunity, many plant communities recovered if the overuse was stopped soon enough, that is, before the plants were dead, the seedbank was depleted, and before invasive species occupied the site and changed the frequency and intensity of wildfire.



Sage-grouse hens feed on tender leaves and buds of composites with milky sap. Photo by Tom Koerner.



Day-old sage-grouse chicks have their eyes open and are covered in downy feathers. Photo by USFWS.

Crawford 1994). Viable eggs depend on quality forbs⁴ in the hen's diet. Nutritive food is also needed during the incubation period. Hens usually lay 6 to 10 eggs over a period of about 10 days. The chicks hatch after about 4 weeks, covered in down and with their eyes open. In Oregon, hatching begins in late April and lasts through nearly the end of June (Foster and Vold 2020). By the time they are five weeks old, chicks are relatively good flyers. The broods will stay together for nearly three months. The chicks are voracious eaters, following their mother out of the nest in search of insects and wildflowers.

Survival rates for sage-grouse chicks vary, but typically fewer than half will make it to winter. A large number of predators seek out sage-grouse eggs and chicks for a delicious meal: ravens, ground squirrels, coyotes, snakes,

⁴Biologists use the term "forb" as a collective term for herbaceous, non-graminoid flowering plants. We might think of them as wildflowers that aren't shrubs.

eagles, hawks, owls, badgers, and bobcats. Considering the variety and resourcefulness of the cadre of predators, the survival of any chicks is a credit to a sage-grouse hen's dedication and shrewdness.

Summer

From May through July sage-grouse hens need a site with sagebrush canopy cover between 15 and 25 percent. Excessive canopy coverage (>40 percent) for brood rearing habitat is just as undesirable as inadequate canopy coverage (<10 percent). As upland sagebrush habitats dry out over the summer, broods are drawn to riparian areas, springs, wet meadows, irrigated fields and other moist, green spots where they can feed on wildflowers, ants, beetles, grasshoppers, and succulent leaves and later-blooming flowers (especially legumes). During summer days, hens and their broods forage for tender flowers and leaves in the early morning, rest during the heat of the day, then resume foraging until twilight when they seek a safe place to roost on the ground. By the end of summer sage-grouse juveniles are about two-thirds the size of adults and can follow the hen for long distances.

Fall

Fall is a time of transition, both for diet and physical location. Although sage-grouse continue to stock up on protein-rich foods found near mesic habitats they begin eating more sagebrush through the fall. Sagebrush is the species that sustains them through winter. Most birds have left their summer ranges by late October and make their way to winter range. The distances that birds migrate vary and some do not migrate at all.

Winter

During the winter, sage-grouse shelter under sagebrush and are often covered by the snow. Preferred winter habitat



In winter, sage-grouse use sagebrush as a source of food and cover. Photo by Tom Koerner.

is 10 to 30 percent canopy cover of sagebrush that extends 10 to 14 inches above the snow. They are able to burrow in the snow for warmth and ingest snow instead of seeking out liquid water to drink. They feed exclusively on sagebrush leaves, which are rich in oils and protein and provide adequate energy for survival. In fact, male sage-grouse often gain weight over the winter and most are in their best physical condition as the spring mating season approaches. While nutritious for sage-grouse, sagebrush leaves are not suitable for many other animals because they contain toxic terpenoids (the same chemicals found in turpentine). Sage-grouse are able to sequester these chemicals during digestion and excrete them separately as a “cecal dropping,” which looks like a silver-dollar-sized drop of tar. This may remind you of the way monarch larvae ingest toxic compounds in milkweeds, except that the sage-grouse eliminate the toxins while the monarchs retain them for protection from predators. Just as milk becomes flavored by particular plants a cow consumes, it appears that sage-grouse may take on the flavor of sagebrush. In his narrative of 1838, John Kirk Townsend reported that he and other early explorers couldn’t resist shooting the “cock of the plains” but found them “so strong and bitter as not to be eatable” (Townsend 1999).

Sagebrush steppe as habitat

Wildlife habitat must provide cover, food, and water, as well as sites for breeding. Eastern Oregon hosts a variety of sagebrush steppe habitats (Shultz 2012). The three subspecies of *Artemisia tridentata* grow in on different sites. Basin big sagebrush (*A. tridentata* ssp. *tridentata*) is found on deep well-drained soils in cool valleys; Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) grows on harsh, dry sites from the lowest elevations in the valleys to mountain slopes, and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) is generally found at the higher elevations on mountain slopes. Three-tip sagebrush (*A. tripartita*) is occasionally found on sandy, gravelly or ashy ridgetops and slopes. Silver sagebrush (*A. cana* ssp. *bolanderi*) grows in the playas, preferring poorly drained clay soils. Low sagebrush (*A. arbuscula* ssp. *arbuscula*) is usually found in islands of rocky soil amid large stands of big sagebrush. Early sagebrush (*A. arbuscula* ssp. *longiloba*) is the most valuable sagebrush species for sage-grouse (Rosentreter 2005). As its common name suggests, it flowers earlier than the other low sagebrush subspecies and grows in alkaline clay soils with

poor drainage, from low to high elevations. On basalt soils in extreme southeastern Oregon, low and early sagebrush are more common, and Owyhee sagebrush (*A. papposa*) extends into Oregon from adjacent Idaho.

Because sage-grouse depend on sagebrush steppe for all of their needs, their populations are at risk. During 200 years of Euro-American development of the West, the sagebrush steppe has been radically altered toward two extremes: too little or too much sagebrush. In the former case, a diverse sagebrush community has been replaced by a relatively simple community of annual weeds, usually dominated by cheatgrass; if there is an overstory it is most often rabbitbrush or western juniper. At the other extreme, what remains is a dense canopy of sagebrush with a severely depleted (or missing) herbaceous understory. Dense sagebrush can lack the herbaceous component that provides food; sparse sagebrush provides too little hiding cover. Whether there is too much or too little sagebrush,



Ideal sagebrush steppe for sage-grouse has open sagebrush, some bunchgrasses and a diverse mix of forbs. Photo by Stu Garrett.



Degraded sagebrush steppe has dense sagebrush and bare soil. Photo by Stu Garrett.

degraded habitat lacks the native wildflowers that were once part of the steppe community. While biologists formerly considered that the right sagebrush species, condition, and amount of *Artemisia* was the crucial factor for sage-grouse habitat, they now agree that having an adequate component of the right species of forbs is equally important (Dumroese *et al.* 2015, Luna *et al.* 2018, Pennington *et al.* 2016, Walker and Shaw 2005). Without both, greater sage-grouse will not survive. Grass is not a component of sage-grouse diets but it provides important hiding cover and nesting material.

The open sites in sagebrush steppe called playas were especially important to sage-grouse. Playas are flat-bottom depressions found in interior basins in arid and semi-arid regions that periodically fill with water that slowly infiltrates into the ground water system or evaporates, causing the deposition of salt, sand or mud around the edges of the depression. Sage-grouse leks can occur in playas, but more importantly the playas served as mesic refuges of forbs and insects for the sage-grouse. In southeastern Oregon most of the playas have been dug out to create spring-summer livestock watering holes. Livestock congregate in these areas, which become overgrazed, trampled and dry out earlier than undisturbed playas. Thus, they no longer function as mesic refuges.

Why are forbs important to sage-grouse?

Forbs are crucial for nutrition in two ways: they are eaten directly by the birds and they also attract insects that the birds eat. Sage-grouse have a crop⁵ but not a muscular gizzard, and must eat soft plant parts that can be digested without grinding. Only adult sage-grouse can eat sagebrush leaves⁶ and then only during the winter. The rest of the year they eat juicy leaves, buds, flowers, and immature seeds, but not hard, dry seeds or coarse cellulose. Not only are the softer foods more digestible, but they are more nutritious, with a concentration of protein, fat, and essential minerals, including calcium and phosphorus not found in more fibrous foods.

Chicks require digestible food with the necessary protein and amino acids for development. Flower petals are made of hemi-cellulose which is easier to digest than the stiffer cellulose of stems and branches. The best parts of all are the anthers: they are little nutritional pollen bombs, packed with protein and lipids (Rosentreter 2005).

Flowers attract insects that feed on leaves, pollen, nectar, or seeds. For about three weeks after the chicks hatch, insects are a critical food for both chicks and adults

⁵The crop is a muscular pouch located in a bird's neck above the top of the chest or sternum. As an enlargement of the esophagus, the crop functions as a storage place for food and is where digestion starts. In birds whose diet focuses on seeds, the food is pushed through a narrow passage called the gizzard, which is a muscular organ that uses grit to grind the food.

⁶The juveniles cannot digest sagebrush at all until they are over six weeks old.



Anthers are packed with pollen: “little pellets of nutritive power.” Bitterroot (*Lewisia rediviva*) photo by Robert Korfhage.



Some flowers have value for the insects they attract. *Cryptanthus celosioides* photo by Robert Korfhage.



Sage-grouse like to eat leaves, buds, and flowers of sunflower family species with milky juice. Western hawksbeard (*Crepis occidentalis*) is a favorite. Photo by Paul Slichter.



Sagebrush false dandelion (*Nothocalais troximoides*) is not a showy wildflower but sage-grouse seek out its leaves, buds and flowers. Photo by Paul Slichter.



Agoseris is one of the most important genera for sage-grouse as they eat the leaves during brood rearing. As an early successional species that tolerates disturbance, annual agoseris (*Agoseris heterophylla*) is a good candidate for restoration projects.

(Johnson and Boyce 1991). Although forbs contain higher levels of calcium and ascorbic acid (Vitamin C), invertebrates provide more protein than plant materials (Smith *et al.* 2019). In a dietary study of sage-grouse chicks, Johnson and Boyce (1990) found that newly hatched chicks fed only plant material died within 10 days. Those fed insects and vegetation survived, and the ones given extra insects gained more weight and were healthier than birds fed the standard number of insects. During the summer, insects become especially important if the sage-grouse have to survive without mesic areas; their crops have been found to be full of grasshoppers. Many types of insects, in all stages from larvae to adults, help sustain sage-grouse: moths, flies, beetles, ants, grasshoppers.

Favorite wildflowers of sage-grouse

Not all forbs are equal in the eyes of sage-grouse. Roger Rosentreter (2016), using his extensive knowledge of sage-grouse and the literature on sage-grouse diets, has created three categories for forbs: most preferred, fair, and poor or least preferred. Sage-grouse favorite wildflowers are yellow composites with milky sap and tender forbs, especially non-toxic legumes. Intermediate in preference are composites without milky sap, lilies, desert parsley, penstemons, paintbrushes, and buckwheats. The least beneficial ones include gummy yellow and coarse composites, other coarse forbs, and toxic legumes. As important as leaves and flowers are to sage-grouse, the value of some species is how they attract insects. Even toxic legumes like lupines have value because they attract insects and fix nitrogen that benefits other plants. As described above, providing a diversity and abundance of arthropods is a key component of recovery of sage-grouse populations. Plant phenology and cycles of abundance or scarcity of annuals also play a role. In springs with above average rainfall, flushes of small tender annuals like annual agoseris (*Agoseris heterophylla*), narrowleaf collomia (*Collomia linearis*), and annual phlox (*Microsteris gracilis*) augment the populations of perennial forbs.



Leaves of woolly groundsel (*Packera cana*) are likely a bit coarse, but the flowers are eaten and also support invertebrates consumed by the birds. Photo by Cindy Roché.

Table 1. Forb preference categories and food value for sage-grouse. Adapted from Roger Rosentreter (2016). **Bold** indicates the most preferred category.

Species group	Examples	Leaves	Flower parts	Immature or soft seeds	A magnet for diverse & abundant insects
Yellow composites with milky sap (Lactuceae)	<i>Agoseris, Crepis, Hieracium, Microseris, Nothocalais Packera, Senecio, Taraxacum</i>	good	good	good	good
Composites with nonmilky sap	<i>Balsamorhiza, Blepharipappus, Chaenactis, Erigeron, Townsendia</i>	fair	good	good	good
Tender legumes (Fabaceae)	<i>Astragalus, Trifolium, Vicia</i>	good	good	good	good
Desert and spring parsleys (Apiaceae)	<i>Lomatium, Cymopterus</i>	fair	good	fair	good
Lilies (Liliaceae)	<i>Calochortus, Fritillaria</i>	good	good	good	good
Penstemons (Plantaginaceae)	<i>Penstemon</i>	good	fair	fair	good
Paintbrushes (Orobanchaceae)	<i>Castilleja Orthocarpus</i>	good	fair	fair	good
Other small tender forbs	<i>Cerastium, Lithophragma, Mentzelia</i>	good	good	fair	good
Buckwheats (Polygonaceae)	<i>Eriogonum</i>	fair	good	good	good
Toxic legumes	<i>Lupinus</i>	poor	poor	poor	good
Coarse composites (incl. all thistles)	<i>Cirsium, Dieteria, Layia</i>	poor	poor	fair	good
Oily, hairy and gummy composites	<i>Achillea, Ambrosia, Anthemis, Grindelia, Madia</i>	poor	poor	fair	fair
Coarse borages & mustards	<i>Amsinckia, Cryptantha, Sisymbrium, Lepidium</i>	poor	poor	fair	good
Blue flax	<i>Linum</i>	poor	poor	poor	fair

Restoration and saving the sage-grouse

The objectives for habitat management to benefit sage-grouse (Walker and Shaw 2005) recommend prioritizing sites already used by sage-grouse: first, protect high quality sagebrush steppe; second, enhance slightly degraded habitat; third, restore degraded habitats that still receive some sage-grouse use. It is extremely difficult and expensive to restore severely altered sagebrush habitat to its original state; in most cases, it is probably impossible to do more than relatively minor mitigation. In nesting locations that satisfy a minimum level of habitat requirement livestock grazing should never occur in the spring-early summer period in direct competition with the sage-grouse for succulent forbs. There is already plenty of competition for forbs from pronghorn antelope, deer, rabbits, mice, and any number of insect larvae and adults. Grazing in spring and early summer also inhibits seed set by forbs and

reduces seedling replacement. Sometimes well-intentioned efforts hurt greater sage-grouse populations, such as when water developments designed to improve livestock distribution simply expand habitat destruction by introducing livestock grazing and weeds to previously undisturbed areas.

In a dense stand of sagebrush, some of the shrubs may need to be removed to free up resources for forb establishment (*e.g.*, light, space, nutrients, and water). Removing sagebrush may be done by various mechanical means, or very carefully by fire, but any disturbance may stimulate an increase in weeds that prevent establishment of native forbs. A seed source must be present for the native forbs, and grazing must be controlled so the desired species have a chance to grow. Choice of species among those adapted to the site should consider, first, the value on the species for sage-grouse, and second, the ease of establishment of that species. For example, milky-sapped composites like



Threadleaf phacelia (*Phacelis linearis*) leaves are too glandular and hairy to be eaten, but the flowers are eaten and support invertebrates. Photo by Stu Garrett.

Agoseris and *Crepis* are on the “best foods” list and are ecologically early successional species, making them prime candidates for restoration projects.

The East Cascade Audubon Society (ECAS, Bend Chapter of the National Audubon Society) is joining forces with the Oregon Desert Land Trust (ODLT) to begin research on how to restore forbs to sagebrush steppe in central Oregon. The goal is to increase the number of forbs and consequently the number of insects in an area that is currently used by sage-grouse. A series of plots will be set up on ODLT land where conditions range from overly dense sagebrush to areas needing only more forbs and grasses. The goal is to learn how to restore degraded sagebrush steppe habitat over a wider region in central Oregon. The project will focus on seeding with native forbs, reducing overly dense sagebrush, and determining the timing and amount of grazing that can occur without hindering restoration. The property includes both sagebrush steppe and a mesic site. While research or demonstration plots are part of the project, the emphasis remains on restoring the ODLT site while gathering information to scale the methods to restoring public and private lands in central Oregon. ECAS has received a grant from Deschutes County to begin the project on 320 acres owned by ODLT near Brothers, Oregon. The Institute for Applied Ecology (Corvallis) and the USDA Great Basin Native Plant Project are also partners. Native Plant Society of Oregon volunteers will assist with on-the-ground projects. The ECAS-ODLT partnership is an exciting and much needed project that has the potential to take sage-grouse conservation to a new level.

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Lomatium flowers are good forage and also attract insects. Photo by Robert Korfhage.

ticularly on important points we needed to clarify or had neglected to mention.

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Cindy Roché was raised on a farm in northeastern Washington. She earned a BS in Forest Management and MS in Rangeland Ecology from Washington State University (WSU) and a PhD in Plant Science (University of Idaho). She has worked as a range conservationist with the US Forest Service and with WSU Cooperative Extension in rangeland weeds. She moved to central Oregon from the Rogue Valley five years ago and enjoys exploring the High Lava Plains as well as the Cascade Mountains. Roché has assisted with sage-grouse lek counts, sagebrush planting, and raven surveys in nesting areas. After hearing Stu's talk on sage-grouse for the High Desert Chapter, she wanted his message to reach a larger audience. Photo inside front cover.



Dr. Stu Garrett has a long-standing interest in natural history, particularly local botany and geology and is active in the protection of Oregon's special places. He practiced family medicine in Bend from 1978 to 2012. He co-founded the local chapter of the Native Plant Society of Oregon and served as president of both the local and statewide NPSO organizations. His fascination with the ecology of Oregon's sage-

brush steppe includes the animals that dwell there, especially the greater sage-grouse. He has noted the dramatic decrease in local grouse numbers and is concerned that more is not being done to correct problems in its habitat. Leks that hosted bird numbers in the dozens east of Bend are now abandoned. He feels that local residents, particularly bird-lovers and botanists, should step up and do more locally to save this remarkable species. As a consequence, five years ago he took on the job of coordinating sage-grouse activities for the local Audubon chapter (ECAS). Through ECAS he has worked closely with ODFW, USFWS, Deschutes NF, Deschutes County, and BLM on various projects to help the sage-grouse. Projects have included putting up wire fence markers, monitoring for predators, trapping mosquitos for West Nile virus, removing young conifers, restoring damaged sagebrush steppe with native plantings, assisting private landowners with restoration and research activities, coordinating with National Audubon, leading field trips in greater sage-grouse habitat, and developing a local research study to look at ways to improve habitat in eastern Deschutes County. The local greater sage-grouse population is in a precarious position and it has a viable future only if we step up and restore their habitat.
