SAGE GROUSE MANAGEMENT FOR MONTANA LANDOWNERS
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The sage grouse (*Centrocercus urophasianus*), also known as the sage hen, is the largest member of the grouse family. A mature male can weigh as much as eight pounds, but females weigh two to three pounds. Males and females have the same coloration, with shades of brown and black on their upper parts, paler sides and black abdomens. Males have an inflatable pouch in their breast area called a gular pouch or sac. During the courtship ritual, this inflated pouch is a bright white. The males also have bright yellow patches above their eyes during the spring season.

LIFE HISTORY

In late winter, males may travel several miles to gather at traditional booming grounds or “leks.” At first light, the males fly into the lek and begin to strut. They swell their gular sacs and then let the air out with an explosive “boom” sound that can be heard at a great distance. The male opens his tail to form a large multipointed fan. Leks vary in size from a few hundred square feet to several acres. They are found in sagebrush openings, often on a ridge or some other windswept area that becomes free of snow sooner than surrounding areas. The dominant males seek positions close to the center on the lek while subordinate males are near the outer edges. The hens assume a sneaking posture and quickly pass the lek’s outer edges. When they arrive in the breeding area of the dominant males, they may fight with other hens for access to the preferred male. Several days after breeding, females move to nesting areas that are located within two to four miles of the lek. Nesting areas are usually selected near the edge of dense sagebrush with a heavy herbaceous understory. The hen lays five to 13 eggs (the average is seven) over a seven- to 10-day period in a shallow scrape lined with plant material and feathers. The incubation period begins in May and lasts for 25 days. If the first nest is destroyed, hens will renest, but these attempts will produce fewer eggs. Hatching success varies from 10 to 86 percent with an average of approximately 35 percent. Skunks, red fox, coyotes, ground squirrels, badgers, magpies and ravens are the primary nest predators. As soon as they are hatched, chicks are able to search for food. Hens usually rear their brood approximately one to two miles from the nest site. During the brood stage, clumps of sagebrush, interspersed with open areas, are the preferred habitat. Broods feed in open areas and seek a high protein diet

composed of 60 percent insect matter, usually made up of ants, grasshoppers and beetles. Almost 90 percent of chick mortalities occur during the first two weeks of life. Chick survival may be the most important factor influencing sage grouse populations. In one Wyoming study, 73 percent of the hens that successfully hatched clutches lost their entire brood within two weeks. Average mortality is 63 percent between the time eggs are hatched until the brood is able to fly (fledging). Death is usually due to starvation, predation or exposure to cold, wet weather. By three months of age, juvenile sage grouse have diets similar to that of adults, which is primarily succulent forbs, leaves and insects. Forbs are the small, broadleaf plants that grow under or between grasses. Sagebrush and meadow habitat is used for food, shade and protection. Because of the importance of forbs during this time, drainage bottoms, streambeds and agricultural fields are also used. In fall, sage grouse assemble in flocks before moving to winter range. As forbs dry out, grouse begin to eat more sagebrush. The drop in temperature triggers a movement to winter range, which may be close or may require a migration. Ideal winter ranges face south or west and offer gentle slopes of wind-blown ridges that contain large expanses of sagebrush. During winter, sage grouse feed in all weather conditions, subsisting entirely on sagebrush leaves. At this time, the grouse are widely dispersed, but congregate as snow depth increases.

LIMITING FACTORS

Wildlife species, including sage grouse, are constantly tested. Those that survive the tests stay around and pass their genes to future generations. This natural selection process may result in very high mortality numbers, but it allows for the development of a population that has the capabilities to survive in the world the sage grouse occupies. Generally, the public looks for simple, single-factor explanations to wildlife population limitations. However, it is rare for only one factor to be involved, and it is also rare for one factor to work independently of other factors. Winter storms, for example, usually only limit a population if cover or food is insufficient. Predators can only be effective if habitat characteristics make it possible for them to find nests or birds. Early brood-rearing habitat may be the greatest limiting factor for sage grouse. Even when nesting is successful, almost 65 percent of the chicks die before fledging. This means that more than half of the chicks never make it out of their brood-rearing habitat. Poor nesting cover can also limit sage grouse populations. More important, nesting cover that will result in successful nests must be available. Many studies have provided information on where hens select nest sites but it is more important to provide the kind of nesting habitat selected by hens that have successful nests.

Predation

Predators are a concern when managing sage grouse. The golden eagle is the number one predator of adult and juvenile sage grouse older than one month. Some activists have expressed concern that raptors use power poles or fence posts as perches. These concerns are somewhat exaggerated. While there is little doubt eagles use poles as perches, it is unlikely that their view is better than that of a soaring eagle. In addition, a raptor perching on a fence post has a much more limited observation area than it would while soaring. There are certainly

more benefits from using fences to control grazing than there are predation costs associated with raptors using fence posts as perches. The greater predator concern involves nest predation. Red fox, ravens and badgers were the most common nest predators identified in a Wyoming study. Magpies, ground squirrels, coyotes and skunks are also known nest predators. Nest fate appears to be related to how much herbaceous cover exists under the sagebrush at the nest site. More herbaceous cover makes it more difficult for predators to detect nesting hens. It may be that more herbaceous cover also allows the hen to find food more easily. When food is easily found in one area, the hen does not travel as far and therefore does not leave her scent over an expanded area. This makes her harder for predators to detect. There is disagreement about how best to provide the herbaceous understory successful nests require. One theory suggests totally protecting the understory and sagebrush canopy. But a Utah study found predation rates on sage grouse nests were lower in areas where sagebrush had been mechanically controlled than in untreated areas. In a Grand Teton National Park study where grazing and brush control has been prohibited since the 1930s, predators still destroyed 43 percent of sage grouse nests. This issue will be further discussed in the section titled “Habitat Needs.”

Weather

Weather is a sage grouse mortality factor that is beyond our control. Even with the best winter cover and habitat, unusual storms may cause icing or snow depths that are severe enough to render even the best cover insufficient. Quality cover lessens the impact, but the ability of sage grouse to reproduce may provide the primary means of recovery. Wet spring weather can sometimes impact nest success or brood survival. Flooding of nests or chicks in low areas can be a problem. Also, if chicks are wet for extended periods, their survival rate will be lower. Wet weather, however, also increases the number of insects, an important food for chicks.

Natural Cycles

Cycling in sage grouse populations is a phenomenon for which there is no sure explanation. A 10-year cycle has been confirmed in both Colorado and Wyoming. If such a cycle exists in other states, it would be an unexplained mortality factor.

Disease

Disease and parasites are not likely to affect sage grouse populations. Sage grouse are susceptible to encephalitis, but because it is mosquito born, significant infestations are unlikely. Some recent evidence suggests that in wetter areas, West Nile virus may be a concern. Intestinal worms, such as cecal worms, tapeworm and nematodes, are common but do not contribute to significant losses of sage grouse. Mites and lice are found on sage grouse but are relatively unimportant mortality factors.

Other Mortality Factors

Collisions with fences have been reported as a sage grouse mortality factor. This is uncommon enough to make it of little consequence from a population standpoint. It may be a method of removing individuals with poor observation or maneuverability traits from the gene pool. Spraying for grasshoppers with toxaphene has been reported to kill sage grouse that ingest the treated

grasshoppers. Insecticides such as malathion kill nearly all insects and eliminate a critical component of chick diets. Hens and their broods are sometimes attracted to alfalfa fields because of the lush vegetation. Mortality takes place during mowing when sage grouse crouch and refuse to flush or flush at the last moment, losing their feet or legs to the mower. The pattern used to mow a field can save hens and chicks. By starting in the center and mowing in an increasingly larger pattern, sage grouse are encouraged to move toward the outside, where they are more willing to flush. Another option is to use a flushing bar. This is a metal bar with suspended chains that sweep the ground before the blades pass over. The flushing bar is attached to the front of the swather or mowing blades. Unless the equipment is moving fast, the flushing bar will encourage the sage grouse to flush.

SAGE GROUSE NUTRITION

The search for nutritious food is a major activity for sage grouse. You must understand the nutritional requirements of sage grouse at different ages and at different times of the year in order to provide habitat. Sage grouse do not have a muscular gizzard to grind seeds, as do other game birds. Their diet is, therefore, limited to soft foods such as leaves and insects. Sage grouse depend on sagebrush habitat to satisfy their nutritional demands (as well as cover demands) for most of the year. Sagebrush must always be available to satisfy the body maintenance and nutritional requirements of sage grouse. However, that diet is dominated by forbs and insects from May to September. Forbs are high in crude protein, calcium and phosphorus, which sage grouse need. Therefore, pure stands of dense sagebrush do not satisfy the year-round nutritional needs of sage grouse. The importance of protein-rich insects in the diet of chicks cannot be overstated. For several weeks after hatching, insects are critical for chicks to maximize their chance for survival. As chicks get larger, they need greater food quantities, but the need for a high-protein diet remains the same. Protein is needed for tissue growth, to develop juvenile feathers and to withstand cold and wet weather. During this period, forbs are added to help create a highprotein diet. Studies in Oregon, Washington and Nevada found the amount of forbs and insects in chick diets has a huge impact on the number of young surviving into late summer. Recent studies have shown the physical condition of the hen, prior to nesting, also has an impact on the survival of a hen’s brood. This may be because a hen in good condition has more energy to expend in nest selection, incubation and egg production. A hen in good condition also needs to feed less often, which reduces the risk of her movements attracting predators. Forbs are an important component of hens’ diet before they lay eggs. Other game birds obtain calcium from grit. Because sage grouse have no muscular gizzard, calcium needed for egg production is primarily obtained from forbs. Key forbs are legumes and milky-juiced composites. A nesting sage grouse diet consists of more than 50 percent forbs. To obtain these forbs most efficiently, and with the least amount of foraging movement, the forbs must be in close proximity to nesting habitat. Sagebrush leaves are the main food consumed by sage grouse from October through April. Sagebrush three to 18 inches tall is easiest for sage grouse to feed on, but when snow cover is deep, sagebrush taller than 24 inches

is used. Even though sage grouse can obtain most of the water they need from snow, dew, succulent plants and insects, most good sage grouse populations are found in areas that have a free water supply. Sage grouse can travel 1.5 to two miles for water and use livestock drinking troughs. These troughs should be equipped with ramps, floats or other escape devices to prevent drowning.

HABITAT NEEDS

Sage grouse must have sagebrush as a year-round habitat component. The age, density and stand size of the sagebrush along with understory, canopy and vegetation near the sagebrush are extremely important and vary according to the habitat needs of sage grouse during various times of the year. To understand sage grouse habitat needs, we must know what they need at various times of the year. Sage grouse habitat can be divided into five habitat categories: 1) winter, 2) leks or prenesting, 3) nesting, 4) early brood and 5) late brood or summer. The range of a sage grouse is only a few square miles if all habitat needs are met. In general, sage grouse habitat should consist of vegetative communities with 40 percent winter habitat, 5 percent lek or prenesting habitat, 15 percent nesting habitat, 10 percent early brood habitat, and 30 percent late brood and summer habitat.

Mixed stands of sagebrush of different age classes interspersed with grassy openings and water provide ideal sage grouse habitat. During winter, sage grouse cover consists of large sagebrush stands of varying heights and canopy covers. Canopy cover should be at least 20 percent. Southand west-facing gentle slopes with windblown ridges are preferred. Most spring habitat is near leks. From February through April sage grouse gather in the vicinity of these one- to 10-acre areas of low vegetation. The lek is usually composed of low grass but may have scattered small shrubs. Nearby escape cover is needed, as is a food source to provide nutrition for displaying males and prenesting hens. Forbs are an important component of the hens' diet during the prelaying period, and forbs will make up 50 percent of the hens' diet if they are available. Habitat for successful sage grouse nesting requires sagebrush between 15 and 30 inches tall as well as a canopy cover of 15 to 20 percent. The understory is equally important and should have residual grass from the previous year at least eight inches tall. Studies have shown that, although hens will nest in old stands of dense sagebrush, there are significantly more **successful** nests in younger stands. Old, dense stands are less likely to have sufficient understory growth and their forb production will be greatly reduced, requiring the hen to forage farther from the nest. A Utah study found nest predation rates were greater in mature sagebrush stands than in stands that had been chained and seeded 25 years before. A vegetation mosaic, or patchy pattern, within nesting habitat is extremely important. Hens typically select nesting habitat on the edge of the sagebrush stand. This may be because of the proximity of suitable early-brood habitat, or it may be related to access to forbs or escape from predators. Early brood-rearing habitat must be close to nesting habitat. When they are selecting brood-rearing habitat, sage grouse prefer vegetation that is less than six inches tall. Brush should be in scattered clumps for escape and thermal cover. Because insects

comprise more than 60 percent of the early-brood diet, hens select moist meadows or drainages where insects are likely to be abundant. Grasshoppers, beetles and ants are the most common insects in their diet.

Late brood or summer habitat must have a higher forb component. If the sagebrush stand is open enough to allow forb growth, these areas will be used during late-brood rearing. Several studies have found that sage grouse broods use distant areas offering more forbs rather than nearby areas having fewer forbs. Important forb species include dandelion, salsify, clover, sweetclover, alfalfa, prickly lettuce, yarrow and milk vetch. Although shrub cover is important, it is interesting to note that broods use areas that are less shrubby than average for that habitat. By summer, the juveniles are three months old and have food habits that are very similar to those of the adults. Beginning in September, brood flocks drift toward sagebrush wintering areas and their diet shifts from forbs and insects to sagebrush.

HABITAT ENHANCEMENT

Sage grouse, as their name implies, are closely associated with sagebrush. This seems simple enough. What makes managing sage grouse habit complex is that they require a variety of sagebrush ages and densities with the proper mix of other habitat types. Additionally, the importance of forbs to the survival of summer broods cannot be emphasized enough. Prescribed livestock grazing can be an important tool to enhance forb growth. Because there has been a recent decline in sage grouse numbers, the ability of landowners to properly manage sage grouse populations and habitat is extremely important to the future of this unique game bird. The best way to enhance sage grouse habitat is to make sure that sagebrush exists at a variety of ages and densities and is mixed with other important vegetation species. ***In most of the West, improvements in brood habitat will pay the biggest dividends to landowners who want more sage grouse.*** If there is currently any successful nesting on your land, you can improve brood-rearing habitat so the average rate of 63 percent mortality is reduced. A Wyoming biologist points to chick survival as the driving force of the local population of sage grouse. Before discussing early brood habitat enhancement, let’s look at other components of sage grouse habitat.

Winter Habitat

In areas with old, overmature sagebrush or large expanses of dense sagebrush, it is a good idea to try creating diversity in the habitat. Strive to create a mosaic of various ages of sagebrush stands. Develop a continuous rotation plan so there will always be a balance of five to 10 age classes of sagebrush. Be sure these age classes are not in one block but rather in numerous, widely scattered, smaller patches. The most effective way to create this mosaic is with burning, chiseling, herbicides and chaining.

Summer and Late Brood Habitat

Irregular patterns or strips of sagebrush provide the greatest benefits to sage grouse. It is usually not necessary to remove all the sagebrush in order to develop the young age stands. As long as the stand is open enough to enhance herbaceous growth, especially forbs, the necessary habitat for sage grouse will be created. Decreasing the density of the sagebrush as well as the age of the

stands are only two goals of the habitat manipulation. Remember that the remaining herbaceous cover is equally important. If you use herbicides, spray as early in the spring as possible so forbs will not be affected. Check with your county extension agent or local chemical dealer to determine appropriate spray rates. Chaining or chiseling sagebrush stands are alternate methods of creating patches. An advantage to these mechanical methods is that some sagebrush will remain and the soil disturbance stimulates herbaceous vegetation. Prescribed burning is often an option for treating sagebrush. Burning patches in late fall or early spring is a good way to create a pattern of openings. Burning also stimulates forb production. If soil conditions are suitable, always consider reseeding after treatments. Include forbs such as alfalfa, sanfoin, sweetclover, birdsfoot trefoil, small burnett, Western yarrow and vetch in your reseeding mixture.

Creating Leks

Leks, or booming grounds, are areas that sage grouse have used for generations. But some landowners may want to develop areas that offer grouse new booming grounds. Although adult males will continue to use the same strutting grounds each year, subadult males may visit and eventually establish a territory on a new lek. Developing one- to 10-acre openings within sagebrush stands will produce potential leks and also provide diversity and stimulate forb production. Techniques described previously will work to create leks. Plowing and dragging might also be necessary. Select sites that are slightly elevated so strutting males are easily seen by birds flying 20 to 30 feet above the ground. Remember that leks must be near escape cover with a good food source available nearby for males and pre-nesting hens.

Nesting Habitat

To improve nesting success, begin by identifying nesting areas. These should be within two miles of the lek and next to areas you will manage as brood areas. They should be made up of several scattered areas, rather than one large area. Old, dense stands of sagebrush do not make good nesting habitat. Understory herbaceous cover should be at least eight inches tall and have a forb component. Shrub height should be 15 to 30 inches, and shrub canopy cover should be 15 to 20 percent. The challenge in developing nesting habitat involves maintaining the correct overstory so sunlight can penetrate to stimulate the understory. Manual thinning is possible but costly because of the labor it requires. Studies in Wyoming have shown that applications of the herbicide tebuthiuron reduced the original sagebrush canopy from 34 percent to 23 percent. Reducing sagebrush also increased grass and forb production. Be sure you manage grazing to maintain enough understory so that eight inches of residual grass will be available the next spring. Single strand electric fencing powered by a solar charger will allow separate grazing management of nesting areas within larger pastures. It is not necessary to totally eliminate livestock from nesting areas. After nesting is completed in mid-June, livestock can graze the area until you achieve the vegetation level you want. When properly managed, grazing can actually stimulate the growth of forbs.

Early-brood Habitat

Stimulating insect and forb production can enhance early-brood habitat. Grasshoppers are more abundant where cheatgrass dominates rather than in older sagebrush stands with perennial grass understories. Beetles are most abundant in mosaics of shrub-dominated sites as well as open areas with some bare ground. Create early-brood habitat in the immediate vicinity (one to two miles) of nesting areas. Low sagebrush in scattered clumps can be developed by treating stands mechanically, chemically or by burning. Encouraging forbs through seeding or prescribed livestock grazing will enhance early-brood habitat. Broods prefer the forbs and lower vegetation (two to six inches) created by moderate livestock grazing on meadows. Sage grouse avoid dense, ungrazed vegetation, as well as heavily grazed meadows.

POPULATION MANAGEMENT

Managing sage grouse populations is usually closely related to providing habitat components that will increase survival. But there are additional strategies you should consider if your goal is to actively influence your sage grouse population.

Population Monitoring

Landowners should establish a population trend survey to monitor their sage grouse population. This survey will indicate whether the population is increasing, decreasing or remaining stable. It will also allow you to determine if hunter harvest, habitat enhancement or other management strategies are having the desired effect on the sage grouse population. It's best conducted in late summer so the critical brood-rearing period is included in determining hunter harvest levels. It is important that the survey be conducted annually along the same route, at the same time of year, the same time of day, the same speed and by the same number of observers. In other words, the results will be most comparable with other years if variation between years is minimized. Select a route that you can drive in about two hours. The route should be through typical sage grouse habitat on your land. Be sure to mark the route on a map so the same path can be driven each year. Create a tally sheet on which you can write the date, time, weather, average speed and the names of observers. Indicate on the tally sheet the number of sage grouse observed along various segments (usually one mile) of the route. Your results will be more reliable if you conduct the trend survey for two or three days in a row, or as close as possible, each year. Also, if weather conditions are extreme, delay the survey until the return of more typical weather conditions. Resist the temptation to extend the route or to conduct the survey more often. Interest in putting effort into the survey is usually greatest the first year or two and then wanes in following years. A more limited survey is more likely to be conducted every year. Yearly repetition and the comparisons between years determine the ultimate value of the survey information. Remember, this is not a population estimate. This trend survey, actually much more accurate than a total population survey, is designed to make relative comparisons between years. The assumption is that the sage grouse population along the selected route is representative of the sage grouse population of the whole habitat area.

Hunter Harvest

Sage grouse harvest strategies should provide birds for sport hunters while minimizing the impact hunters have on populations at low levels. For game birds like pheasants, the impact of hunting on a population is very small because only males are harvested, and one male can service several females. Because male and female sage grouse have similar coloration, it is difficult to quickly tell them apart. Male and female young-of-the-year are also close in size, so it is virtually impossible for hunters to select exclusively males. Although adult males are twice as large as females, most hunters cannot detect this difference when the birds flush. Even if they could, the desirability of an old male sage grouse as table fare, compared to a young succulent bird-of-the-year, is very low. Also, would we really want to focus harvest on proven seed-stock males that could pass on traits that allowed them to be survivors? These are the birds that know how to avoid predators, withstand winters and survive mortality factors that have eliminated other sage grouse. The answer is to keep hunting mortality at a relatively low level. When all mortality factors are considered, the effect of hunting is minor. On average, 63 percent of hatchlings die before they can fly. Although this mortality is very significant compared to hunter harvest, hunting is a mortality factor that can be controlled by the landowner. Anyone who has hunted sage grouse recognizes that with good dogs and good hunters, flocks can be repeatedly flushed once they are found, and it is possible to harvest a large percentage of the birds. The best way for a landowner to manage harvest is to limit harvest by shooting only a specific percentage of birds flushed in a given area. If landowners want to increase the size of the population on their land, the harvest should be kept at 10 percent or less of flushed birds. If the population is already at the desired level, manage your harvest so that no more than 30 percent of the flushed birds are taken. This will allow a healthy sage grouse population to replace the harvested birds through reproduction.

Artificial Feeding

Some landowners have considered artificial feeding as a way to help sage grouse populations. Even during severe winters, artificial feeding is inadvisable for sage grouse. Even if they accepted the feed at feed grounds, which is unlikely, the large concentration of birds would face increased exposure to predators, disease and other mortality factors. If you have sage grouse, you have sagebrush. Sagebrush is the only food grouse need during winter.

Stocking

Some have suggested stocking as a way to increase the number of sage grouse in an area. There has been some success in transplanting wild birds to suitable habitat that is not already being used by sage grouse. If sage grouse are already in the area, restocking is a waste of time. If the existing birds are not thriving, then the habitat needs to be improved in order to have more birds. Transplanted birds will do no better than local sage grouse. **Predator Control**

Predator control is often considered as a way to increase sage grouse populations. There is no doubt predation on sage grouse nests is very common. A study in Washington found that 31 to 47 percent of nests are lost to predators. Predation of broods is also significant, but the extent has not been determined. It is interesting to note that modern sage grouse populations were at their highest

levels in the early 1960s, when predator control programs and the use of Compound 1080 for predator control were at their highest levels. Predator control can be effective in reducing sage grouse mortality. But landowners need to understand that predator control is a short-term solution to predation and must be continual to have a lasting effect. Also, magpies and ravens are major nest predators, and eagles are the most common predator of adult sage grouse. These birds are protected by federal law and cannot be controlled. Good quality nesting and brood habitat provide many of the same population benefits as predator control, but on a more permanent basis. Controlling skunks, fox and badgers will reduce depredations, but these control programs will be much more effective if they are done alongside efforts to improve the habitat.