

Riparian Habitat Group

Meadows

1) Describe the habitat:

a) Historic conditions: Prior to the influence of European American settlers, wet-moist meadows were probably more common in the mountains but very rare in the plains/basin regions. Wildlife ungulate pressure was most likely cyclic but not constant. A more diverse mix of species of grasses, forbs, and small shrubs was present, and included more of the palatable species, such as tufted hairgrass, alpine timothy, wheatgrass, and silky lupine.

b) Present conditions: There are likely fewer wet-moist meadows than there were historically. Meadows in the plains/basin regions have been created, primarily by irrigation projects, but montane meadows have been lost and degraded. Some meadows have become dried out and/or been invaded by trees, the soils in some meadows have become compacted, and the vegetation in many meadows has changed in composition and structure. Some of the less palatable and/or more grazing-resistant plant species (e.g. Baltic rush, some sedges, Kentucky bluegrass, common dandelion, and bur avens) have increased or invaded, while some of the more palatable and/or water-dependent species (e.g. tufted hairgrass, alpine timothy, bluejoint reedgrass, and water sedge) have decreased.

2) Identify the issues:

a) Use: Livestock grazing, recreation (e.g. hiking, off-road vehicle travel, and camping), wildlife use, agriculture (especially lowland and other privately owned meadows, which are often hayed), and mining and oil/gas extraction are major uses.

b) Access: Most meadow habitat is in public ownership and is very accessible—meadows are often where people focus their activities and there are usually roads to them. Most meadows on lowland sites are privately owned but, again, often have roads through them.

c) Problems: Incompatible livestock grazing, which compacts the soil, changes the vegetation composition and structure, and can lead to drying of meadows; high intensity recreation, as the openness of the habitat exposes it to intensive human activities; roads, livestock trails, and hiking trails, which typically go across meadows because it is easier (roads dam up the water system, culverts and trails allow cutting and gullyng, further draining the system, and the meadows become dry); early-season haying, which can destroy bird nests; mining and oil/gas extraction (as meadows are

often chosen over sagebrush or forested areas); encroachment of nonnative species; and recent increases in tree establishment in meadows.

d) What has been the cause of change to the habitat: Irrigation has increased the amount of meadow habitat, especially in the plains/basin regions. High intensity recreation, roads and trails, agriculture, mining and oil/gas extraction, and the encroachment of nonnative species have caused the loss and degradation of meadow habitat. Although grazing today is only about 25% as intense as it once was, it has had considerable impacts on wet-moist meadows, including the decrease in coverage of some native grasses, sedges, and forbs, and the increase of less palatable and more grazing-resistant species; trailing, gullying, hummocking, and drying of some meadow habitats; and soil compaction. Recent increases in tree establishment in montane meadows are not well understood, but are probably caused by a combination of factors, including less frequent fires, climate change, and grazing by domestic livestock (which can reduce competition from herbaceous plants and can lead to drying of some meadows, allowing trees to establish).

3) Primary bird species in Meadow habitat in Wyoming:

Level I:

Long-billed Curlew

Short-eared Owl

Level II:

Bobolink

Level III:

Northern Harrier

Best Management Practices

Wyoming Partners In Flight Best Management Practices for Meadows to Benefit Birds in Wyoming.

Introduction

Meadows generally are found on the moist soils of floodplains and terraces, along streams and valley bottoms, on lake margins, at the bases of slopes, below snow banks, and on other saturated sites. The natural sites vary from narrow shoestring bottomlands that border small streams to vast acreages of seasonally flooded plains. Most of the native meadows are inundated with floodwater in the spring and early summer but are relatively dry during late summer and fall.

These wet-moist meadows and wet-moist meadow-grasslands are dominated by vegetation that is transitional between wetland and upland species. Sedges, rushes, and grasses dominate the meadows, but numerous forbs and small shrubs are often important components. The complex plant communities in meadows comprise several hundred species, but some of the common ones include tufted hairgrass, Idaho fescue, water sedge, bluejoint reedgrass, alpine timothy, Kentucky bluegrass, cinquefoil, pussytoes, huckleberry, and willows. Species composition and productivity vary with elevation, climate, moisture availability, soil depth, and geologic substrate.

Relatively few bird species breed in meadows, yet they are important foraging areas for members of adjoining avian communities, particularly those in forest and riparian habitats. In the fall, montane meadows become important to both resident and migratory birds because of the abundant populations of insects, which peak late in the season. Several species of raptors, Common Poorwills, Common Nighthawks, swallows, hummingbirds, Northern Flickers, shrikes, and rosy-finches all forage extensively in meadows.

Landowners and land managers can take a variety of simple and inexpensive actions to improve habitat for birds and help them forage and nest successfully. By maintaining and restoring meadow habitat for birds, many other wildlife species will also benefit. As a landowner or land manager, the actions you take will depend on your goals, resources, and commitment, as well as the physical characteristics of your property, such as soil type, topography, and existing vegetation. The following Best Management Practices (BMPs) should provide some reasonable guidelines for managing meadow habitats to benefit a wide variety of resident and Neotropical migratory birds in Wyoming

Many of the BMPs for meadows fall into major categories of land use such as Grazing, Engineering, Recreation, etc. The recommended BMPs are broken out into

categories for convenience, although some are general enough to cross into other categories.

General

1) Consider both long- and short-term impacts and/or benefits of any activities within or adjacent to meadows. Limit activities that degrade or remove meadow habitats (e.g. conversion to cropland and roads, industrial developments such as oil wells, heavy recreational use, overgrazing, contaminated runoff, and invasion by exotic plants). Manage meadows for sustainable use without abuse over the long term.

2) Conserve unique representatives and/or large, ecologically functioning examples of meadow habitat.

3) Identify and protect those habitats that still have a thriving community of native grasses and forbs. Management should focus on restoring natural disturbance processes, such as fire, and removing invasive nonnative plants.

4) Regularly monitor birds to see how the management plan is working, and redirect efforts if necessary (with special emphasis for species that seem to be declining). Implement meadow monitoring programs to establish baseline data and identify changes in habitat quality (both positive and negative) through time. Use standardized methods to monitor the habitats and sensitive species in an area, before and at several-year intervals after treatments are applied, to aid in making proper land management decisions in the future.

5) Maintain small mammal and insect populations as prey for many bird species.

6) Manage for a variety of locally native plants. Different plant species host different insect populations, which provide food for a variety of bird species.

7) Avoid practices that degrade or destroy natural water flow or the vegetation in and around meadow habitats. Restore and enhance natural meadow habitats wherever possible.

8) Prevent the invasion of exotic plants and restore or rehabilitate degraded and disturbed sites to native plant communities. To reduce the likelihood of weed invasion in stands that contain a community of native grasses and forbs, maintain the vigor of native species, control livestock stocking levels and grazing regimes, avoid large-scale soil disturbances, and minimize habitat fragmentation. Remove exotic plants, like Canada thistle, that compete with native plant species and do not provide foraging or nesting opportunities for wildlife. Weed control with herbicides, biological agents, and mechanical techniques should be followed by reseeded and restoring native plant

species to prevent reinvasion of weeds. Rehabilitating sites depleted of native grasses and forbs may also require temporarily eliminating or reducing livestock grazing, removing encroaching trees, or other strategies.

9) To help maintain meadows, eliminate conifers that grow higher than the native grasses, forbs, and small shrubs.

10) Maintain or restore the hydrologic condition of meadows by controlling or eliminating risk factors such as water diversions, livestock and packstock grazing, roads, trails, off-road vehicle travel, and construction projects.

11) Develop conservation partnerships between landowners, land managers, and private organizations. While landowners need to derive income from the land, this can often be compatible with maintaining regional biological diversity, depending on how the land is used and what land management tools are employed. Identify the habitat needs of the birds in the area and the economic needs of the landowner so a baseline need is established. In some cases, landowners can derive income from hunters, birders, and naturalists who visit the region.

Grazing

Livestock grazing is one of the most extensive human-caused influences on meadows. Proper stocking levels and grazing regimes can be effective habitat management tools and compatible with meadow maintenance and improvement. However, improper grazing practices in meadows can eliminate vegetation and associated wildlife, encourage invasion of noxious plants, and cause drying of wet-moist meadows. The degraded condition of many meadows in the West is from uncontrolled grazing that occurred in the late 19th and early 20th centuries; today's successful manager can learn from past mistakes. Grazing systems, like deferred-rotation, rest-rotation, high intensity-low frequency, and short-duration, combine periods of use with nonuse, and can be effective management tools to increase animal productivity and achieve habitat objectives. These Best Management Practices for grazing focus on protecting meadows during crucial growing periods.

1) Grazing management plans should be developed and evaluated on a case-by-case basis by the managing agency or landowner because no single grazing strategy will fit all situations. Include meadow management as an integral part of each grazing management plan. Determine site-specific meadow objectives and tailor the grazing management plan to help meet the objectives. Consider the site's specific factors of concern; the site's potential and capability; its suitability for grazing livestock and the type of stock best suited to the area; and the ideal grazing strategy, including the time, place, amount, duration, and intensity of grazing. Monitor the effects of each grazing strategy on the meadow to check progress toward the objectives. Record how key

meadow plant species and the overall meadow ecosystem respond to grazing management (annual photographs taken from the same point are helpful).

2) Maintain proper stocking rates and livestock distribution to protect meadow ecosystems. Incompatible grazing can have harmful long-term effects on survival and regeneration of plants; can negatively influence the species, structure, and health of meadow vegetation; and can cause soil compaction. Manage grazing intensity at a level that will maintain the composition, density, and vigor of desired plants and will not damage meadow soils.

3) Manage pastures with meadow habitat as separate units in a rotation grazing system. Where feasible, use a deferred-rotation or rest-rotation system, whereby no pasture is grazed the same season (spring, summer, or fall) two years in a row. A year of rest for each meadow pasture every three to four years is beneficial for long-term meadow habitat maintenance.

4) Fencing can isolate areas into one or a few pastures; other pastures should be exclusively uplands. This can simplify management intended to protect meadows. If animal movement can be controlled by herding or some other method, fencing may not be necessary. However, fencing may be the best alternative for rapid restoration of meadow ecosystems.

5) Graze meadows intensively but for a short period of time. Avoid grazing a meadow for the entire grazing season. In some meadows a week might be too much, while in other meadows a month of grazing might be acceptable, depending on location, elevation, plant species, soils, moisture, and time of year.

6) Ensure adequate residual vegetation cover is left after grazing; this is essential for maintaining meadow health. Make sure there are some bunches of grass remaining in the meadow after grazing. Grazing approximately 40% of the annual growth of palatable grasses by the end of the grazing period will usually not be detrimental to meadows that are otherwise in good condition.

7) Allow time for plants to rest and regrow between grazing periods to ensure that they remain vigorous and productive. Plants that are continuously grazed during the growth period will lose their vigor and stop producing seeds, and their roots will die back, eventually causing a change in the plant community from more productive, palatable species to less productive and less palatable plants.

8) Avoid grazing meadows when the soil is wet or moist, as they are more susceptible to damage from trampling and overgrazing at that time. Most meadows are saturated with water in the spring and early summer but are relatively dry during late summer

and fall. Grazing later in the season will help protect meadows from soil compaction and vegetation loss.

9) Left on their own, cattle will tend to concentrate on and graze wet-moist meadows heavily before moving out to drier sites. Some meadows are not large enough to manage as separate units, so herding on horseback can be an effective tool for managing livestock. Make sure riders know the reasons behind herding and what is expected of them; poorly conducted riding can cause more damage to the meadow and to livestock performance than allowing the livestock to remain in the meadow.

10) Improve livestock distribution and forage use by using salt and mineral blocks, but avoid placing them within meadows or in immediately adjacent uplands.

11) Locate livestock-handling facilities and collection points outside of meadows. Branding, loading, and other handling efforts should be limited to areas and times that do not harm meadow soils and plants.

12) Changing from cattle to sheep, or vice versa, may help with implementing some of the suggested grazing BMPs.

13) Develop water and shade in upland areas to help spread grazing pressure. Keep in mind, however, that small birds can drown when they fall into stock tanks and troughs while drinking. Provide escape ramps to prevent drowning (Figure 7).

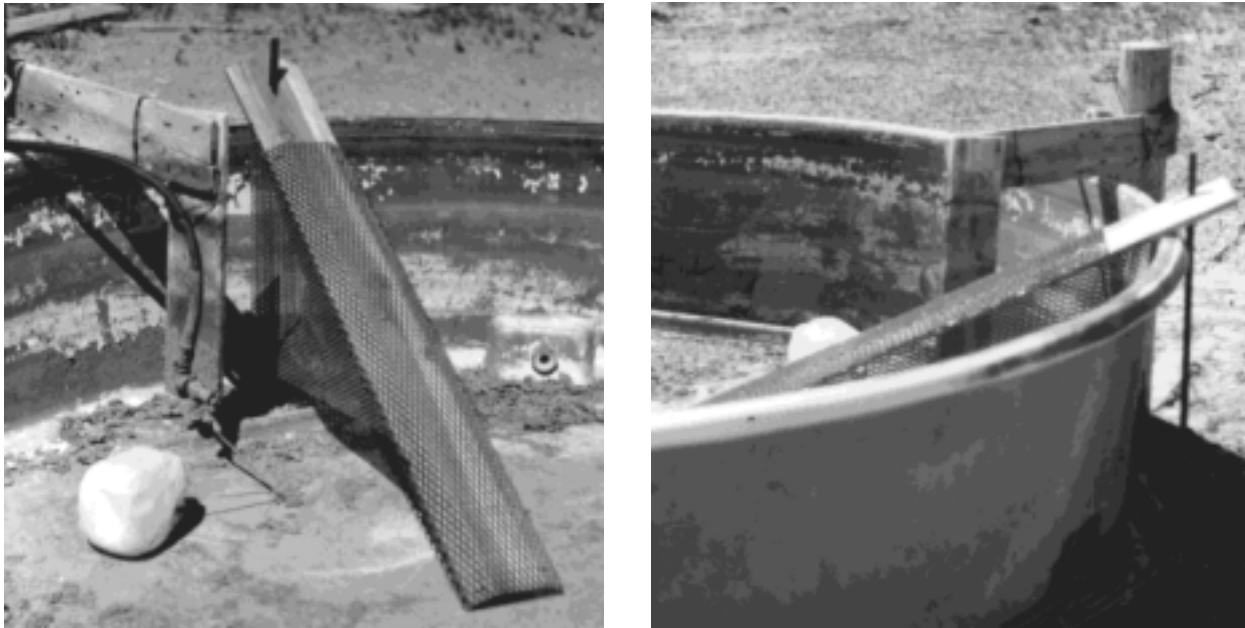


Figure 7. Escape ramps placed in stock tanks and troughs to prevent drowning of small birds and mammals (photographs courtesy of Mark Gorges, Bureau of Land Management).

14) Reduce stocking level, change timing of grazing, or rotate pastures to reduce or eliminate trampling of ground nests and nestlings (from May through mid-July for most songbirds).

15) Consider temporarily removing livestock from an area that is damaged or otherwise needing protection. For example, at higher elevations, extensive meadow degradation (e.g. hummocking and sod breaking) may allow conifers to invade through lowering of surface water tables. Livestock exclusion can be a short- or long-term option for areas such as wet-moist meadows that are easily degraded. By itself, removing livestock may not reverse the condition of severely damaged habitats and may need to be combined with reseedling, tree removal, and other rehabilitation methods to restore site conditions.

16) Keep livestock off burned sites for at least one to two growing seasons. Grazing after a burn can delay recovery by seriously damaging the soil and native perennials.

17) Management plans should consider other grazers, such as elk and deer, which can impact the vegetation in meadows. The prevalence of succulent vegetation in this habitat type makes it especially important for providing food for wildlife, including grizzly bears. In dry years, wildlife-domestic stock use conflicts could be heightened as both wildlife and livestock will tend to concentrate late season use on these areas of

lush vegetation. Managing for just one species can sometimes have negative impacts on other species, such as birds. Consider meadow conditions and big game impacts when setting herd objective levels. Do not exceed the carrying capacity of meadow habitats. When appropriate, fence livestock out of crucial big game winter range.

Farming

These recommendations for farming practices will benefit birds and other wildlife, and will also help protect meadow vegetation and soils.

- 1) Avoid driving tractors and other equipment in meadows, particularly while the soil is wet or moist.
- 2) Avoid converting existing meadows to cropland. Permanent easements on important meadow areas could benefit both landowners and wildlife. Develop conservation partnerships between landowners, land managers, and private organizations. While landowners need to derive income from the land, this can often be compatible with maintaining regional biological diversity, depending on how the land is used and what land management tools are employed. Identify the habitat needs of the birds in the area and the economic needs of the landowner so a baseline need is established.
- 3) If meadows are harvested for hay, carefully consider the timing to avoid harming nesting birds. Delay spring mowing as long as possible (preferably until nesting ends in late July), avoid night time mowing, and space mowings as widely as possible in time to allow the greatest probability of successful nesting.
- 4) Apply inorganic fertilizers based on measured soil requirements because their excessive use can harm soil organisms that are food for many species of birds.
- 5) Preserve uncultivated edges (e.g. grassy strips) and allow them to develop a natural vegetation structure. Complex strip vegetation is used by many species of birds; it also reduces soil erosion and movement of agricultural chemicals off of fields.
- 6) While it is better for birds (and cats) if cats are kept indoors, have domestic “barn” cats spayed or neutered, keep pet food and food bowls indoors so predators like raccoons and feral cats do not have an additional food source, and never intentionally feed feral cats. Cats (even well fed domestic cats) can be devastating to local songbird populations. Natural predators, like owls and hawks, are very efficient at controlling rodent pests, even around human dwellings.

Forestry

These recommendations can help reduce the impacts of forestry on meadow areas.

- 1) Maintain mature stands of trees adjacent to meadows to help species like the Olive-sided Flycatcher.
- 2) Maintain snags (standing dead trees) and dead-topped trees along perimeters of wet meadows. These provide nesting cavities for birds and enhance the number of insects available for food. Snags eventually topple and become organic debris, so retain an abundance of mature trees to replace them over time.
- 3) Maintain a shrubby understory in stands of trees adjacent to meadows to help species like the MacGillivray's Warbler and Yellow Warbler.
- 4) Avoid locating landings, log decks, or skid trails in or through wet-moist meadows.
- 5) Avoid operating heavy equipment through, along, or across wet-moist meadows. If equipment operation is necessary, use tracked equipment rather than wheeled vehicles, and preferably when the ground is dry or frozen and less vulnerable to damage.

Engineering

Use the recommendations below to minimize impacts of engineering projects.

- 1) Avoid existing meadows during construction projects. Ensure that meadow impacts are avoided wherever possible; impacts to meadows are minimized to the extent possible, during both planning and construction phases; and unavoidable meadow impacts are mitigated.
- 2) Avoid building roads through wet meadows. Although roads are often built through meadows because it is easier, wet meadows are particularly susceptible to damage from roads and trails. Roads often dam up the water system, culverts allow cutting and gullyng, further draining the system, and the meadows become dry. Locate roads in adjacent dry forests or uplands instead.
- 3) Design roads with adequate structures to prevent vehicles from leaving the roads and off-roading in meadows or adjacent wetlands and uplands.
- 4) Maintain buffer zones between wet-moist meadows and mining, oil, gas, sand/gravel, and geothermal activities, including structures, roads, and support facilities.

5) Restore disturbed areas with native vegetation, prevent grazing by livestock while plants recover, and eliminate the invasion of nonnative plants during the reclamation period.

6) Stabilize gully erosion with grade-stabilizers and apron headcuts, and revegetate eroded banks.

7) Minimize collisions between birds and power lines by avoiding constructing power lines in areas where birds concentrate during migration, breeding, or winter. However, if problems exist after construction, reduce the potential for collisions by using natural vegetation or human-made structures to shield power lines, modifying habitat near power lines to change its attractiveness to birds, and/or modifying land use to reduce disturbance (i.e. flushing birds near power lines). Some of the possibilities for line modification include enhancing the visibility of lines (e.g. flags or marker balls), burying the line, removing overhead groundwires, and removing small lightning shield wires in sensitive areas. Other possible mitigations include constructing lines parallel to the prevailing wind, constructing lines lower than flight corridors, and placing lines across rivers at oblique rather than right angles. To minimize avian mortality, power lines should be constructed to the most current standards using publications such as those from the Avian Power Line Interaction Committee (APLIC) (1994). For details on power line mitigation to benefit birds, please refer to these publications.

8) Minimize the electrocution of raptors on power lines by constructing and retrofitting power lines to the most current standards. Raptor electrocution can be addressed by a variety of mitigation measures, through design and retrofitting existing lines. Possible mitigation includes using insulating materials; gapping groundwires; adding pole-top extensions; lowering crossarms; and adding elevated perches, depending on the nature of the pole and the problem. Also, nest platforms may be installed on power line structures to enhance populations of raptors while minimizing the risk of electrocution and the risk to service. Nest platforms may be provided on the poles themselves or on “dummy” poles placed near those poles where nests have been built. To minimize avian mortality, power lines should be constructed and retrofitted to the most current standards using publications such as those from the Avian Power Line Interaction Committee (APLIC) (1996). For details on power line mitigation to benefit birds, please refer to these publications.

9) To minimize the effects of continuous noise on bird populations, reduce noise levels to 49 dBA or less, particularly during the bird nesting season. Constant noise generators should be located far enough away from sensitive habitats such as grouse leks and raptor nests that the noise that reaches those habitats is less than 49 dBA. For example, the noise impact from drill rigs is greater than 49 dBA when the rig is closer than about 800 feet (250 m) to a receptor; impact from a 26,000 horsepower compressor station is greater than 49 dBA when located closer than about 2,500 feet (750 m) to a

receptor. Near roads with 10,000 cars per day the population density of birds may be reduced up to 1 mile (1.5 km) from the road, while near very busy roads (up to 60,000 cars per day) the effect may be felt up to 2 miles (2.9 km) away. Avoid placing well pads, roads, and any other facilities requiring human presence within 825 feet (250 m) of raptor nests to prevent flushing adults from the nest. This buffer zone should be expanded in areas where prey are scarce, as raptors must spend more time searching for prey and may be less tolerant of disturbances. If necessary, implement mitigation measures to decrease continuous noise levels. For example, enclose compressor engines with buildings and install additional suppression around muffler exhausts. Noise barriers can be constructed at drilling and testing operations, and noise dampening around engines should be considered (including foam insulation around drilling rigs).

10) Where possible, avoid construction activities and other temporary disturbances during the breeding season in areas where priority bird species occur. Avoid noisy disturbances within $\frac{1}{2}$ to 1 mile (0.8 to 1.6 km) of active or occupied raptor nests, depending on the species, during the period from February 1 through July 31 to prevent nest abandonment.

Recreation

Recreation can affect birds by creating disturbances and habitat degradation, especially during the breeding season. The recommendations below can help minimize negative effects associated with recreation.

- 1) Consider potential disturbances to birds and habitat (and other wildlife) when planning or locating camping sites, picnic areas, and other sites of human activity within meadows.
- 2) Promote “Tread Lightly” recreation ethics. Educate recreationists about problems humans can cause in meadow habitat and how they can avoid damaging these areas.
- 3) If new recreation sites must be located within meadows, concentrate them in one area, rather than spreading them throughout the meadow, to limit negative impacts on breeding birds and habitat. Keep disturbance to soils and vegetation to less than 15% of the area within the developed site.
- 4) Avoid constructing new trails within meadow areas, as trails can cause gullying and lead to drying of meadows.
- 5) Keep all vehicles on established roads and trails or confined within areas established specifically for off-road recreation. Driving vehicles off-road across meadow habitats destroys vegetation, contributes to soil erosion and compaction, can lead to drying of wet-moist areas, and can destroy nests and nestlings.

6) Reduce impacts by keeping hikers, mountain bikers, and horseback riders to established, well-maintained trails. In sensitive areas, these users can damage vegetation and soils. It is not unusual to see several deepening trails crossing a meadow as people and pack animals have moved away from wet, muddy tracks that originated in previous years. Limit the number of roads and trails, and reclaim unused roadbeds with native vegetation.

7) Avoid using foggers for mosquito control in meadow habitats, especially during the nesting season, so a food source remains available for birds.

Pesticides

Pesticides can harm bird populations if used incorrectly. Insecticides can negatively affect bird populations for the very reason they were created—to kill insects. Birds, even seedeaters, depend on insects to feed their young. Loss of insect prey during the nesting season can be devastating, and can turn a habitat that regularly produces birds into one that does not. Also, many migrants rely on insects in meadows to store up or replenish fat reserves for their journey. Improperly used pesticides can directly kill birds, or weaken them and make them more susceptible to disease or unable to produce young. Herbicides change the composition of the vegetation in the meadow, which causes declines in prey abundance and loss of nesting sites. If pesticides must be used, label directions should always be followed carefully.

1) Strictly limit pesticide application in meadows and adjacent sites to activities that improve or maintain the meadow vegetation (e.g. elimination of competitive noxious weeds). Where pesticides are needed, use them as part of an Integrated Pest Management (IPM) program. IPM involves closely monitoring pest populations of both plants and animals, and using chemicals only when and where pests are likely to cause economically or ecologically important damage. This reduces exposure of wildlife to harmful chemicals and reduces the destruction of non-target insects and plants.

2) If available, use biological control for specific noxious species, rather than chemical control.

3) When possible, apply pesticides by hand to target weeds and other pests as specifically as possible.

4) Do not apply pesticides when there is a high probability of rain or wind.

5) Limit pesticide use to periods in the life cycle of the pest when the chemical is likely to be most effective and least toxic to non-target species.

Information and Education

1) Establish public education goals and implement programs to inform users of public lands and owners of private lands of the value, sensitivity, and importance of meadows to resident and Neotropical migratory birds and other species. This could range anywhere from interpretive signs on public lands, to distribution of Best Management Practices to landowners, to presentations at local grade schools, etc.

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