



Livestock/Wildlife Best Management Practice Manual

Conservation Practices to Protect Surface and Ground Water

Wyoming Department of Environmental Quality
Water Quality Division
Nonpoint Source Program

2013 Update
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The purpose of this document is to provide information about best management practices that the Wyoming Nonpoint Source Program supports as eligible for Clean Water Act Section 319 funding. This document is prepared as part of the Wyoming Nonpoint Source Management Plan as required by Section 319(b) of the Clean Water Act.

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Introduction

1.1 Purpose of this Document

The purpose of this document is to provide information about domestic livestock and wildlife best management practices (BMPs) that can be voluntarily implemented to prevent, reduce, or eliminate nonpoint source pollution to Wyoming's water resources. This document focuses on those BMPs that the Wyoming Department of Environmental Quality (WDEQ), Nonpoint Source Program has determined to be eligible for Clean Water Act (CWA) Section 319 funding. This document is prepared as part of the Wyoming Nonpoint Source Management Plan as required by Section 319(b) of the CWA, which states that management programs and BMPs must be developed by each state to reduce identified causes of nonpoint source pollution.

The Wyoming Nonpoint Source Program works through voluntary and incentive methods to reduce nonpoint source pollution and will work with agencies, individual producers, and other stakeholders to promote the implementation of BMPs on a voluntary basis with financial assistance from Section 319 grants. More information about Section 319 grants and how to apply for grant funding can be found on the [Nonpoint Source Program website](#). Please note that Section 319 funds are not eligible for activities that are required as part of a permitting or regulatory action. [Appendix A](#) provides information about Concentrated Animal Feeding Operations (CAFOs) that require a discharge permit under the Wyoming Pollutant Discharge Elimination System (WYPDES) Program; permitted CAFOs are not eligible for Section 319 funding. In contrast, Animal Feeding Operations (AFOs) do not require a WYPDES discharge permit and are eligible for Section 319 cost-share assistance.

Inclusion of a BMP in this manual does not guarantee Section 319 funding for that BMP. The Wyoming Nonpoint Source Program will recommend funding for BMP implementation projects on a project-by-project basis, and will take into consideration the advantages and limitations of proposed BMPs to evaluate the most efficient and cost-effective solutions possible.

1.2 How to Use this Document

This document provides a summary of selected BMPs and references to more detailed information about those BMPs. This document should be used as follows:

- As documentation of which BMPs the Wyoming Nonpoint Source Program and Nonpoint Source Task Force endorse as eligible for funding through the Section 319 grant program,
- As an educational tool about BMPs, and
- As a tool to direct users to detailed information about selected BMPs.

This document provides a basic description of each BMP, a brief summary of the criteria and maintenance needs, and links to reference documents where more information can be

found on that BMP. This document is not an exhaustive resource on BMP design and implementation, but rather, should be used as an educational tool and a directory of where to find more information about selected BMPs.

The blue, underlined text in this document represents a website link. If viewing this document in an electronic format, the user can be directed to the appropriate website by clicking on the blue, underlined text or on the URL address link. The full URL addresses are also provided for all referenced websites to accommodate users who are not viewing an electronic copy of this document. Typing the URL address into an internet browsing application will direct the user to the appropriate website. For websites outside the WDEQ, the WDEQ is not responsible for the content or maintenance of those websites.

1.3 Nonpoint Source Pollution from Livestock/Wildlife Management Activities

Unlike point source pollution, which can be traced back to a single defined source, nonpoint source pollution is caused by surface water runoff that is diffuse in nature and often widespread, making it difficult to assess the source of the problem. Nonpoint source pollution occurs when runoff from rainfall or snowmelt travels over and/or percolates through the ground and picks up contaminants. These contaminants are deposited into streams, lakes, rivers, and ground water. Nonpoint sources of pollution continue to be recognized as the nation's largest remaining cause of surface water quality impairments, and the 2012 Wyoming Integrated 305(b)/303(d) Report shows that the majority of surface water quality impairments in Wyoming are due wholly or in part to nonpoint source pollution.

Both domestic livestock and wildlife populations have the potential to contribute to nonpoint source pollution. Overgrazing of upland areas by wildlife and domestic livestock can lead to unstable, exposed soil that is more susceptible to erosion. Within riparian areas, excessive bank trampling and wading can result in increased erosion of stream banks and sedimentation. Overgrazing of riparian areas can also have detrimental effects on vegetation that is essential for stable aquatic ecosystems and stable channel geomorphology. In addition, all warm-blooded animals have the potential to contribute pathogens to waterways through direct excretion or runoff carrying excrement from riparian and upland areas to surface waters. Animal population densities, the species present, the amount of time spent within or near waterbodies, and other site-specific factors will affect the amount of pollution that actually occurs. For purposes of this manual, best management practices refer to both domestic livestock production and wildlife management activities unless otherwise specified.

Domestic livestock production is an important part of the state economy and livestock grazing occurs over much of the rangelands in Wyoming. The cattle industry is the largest component of the Wyoming agricultural sector, with sheep, lambs, hogs, pigs, poultry, wool and dairy production also being important components of the Wyoming agricultural industry. Domestic livestock grazing occurs on both private and public lands. Through a variety of local, state, and federal funding sources, including Section 319 grants, many Wyoming producers have implemented BMPs that have successfully reduced nonpoint

source pollution from domestic livestock activities. Public land management agencies, such as the United States Forest Service (USFS) and Bureau of Land Management (BLM), are responsible for working with permittees to manage grazing activities on public lands such that natural resources are also protected. The Natural Resources Conservation Service (NRCS) and local conservation districts work to assist producers with conservation of natural resources on private lands.

Wyoming's extensive wildlife populations are also important ecological, cultural, and economic resources to the state. Recreationists and tourists come to Wyoming for hunting and wildlife-viewing opportunities. Wyoming's extensive range and forest lands offer important habitat and/or migration routes for many wildlife species. While not as extensive, riparian areas within Wyoming provide critical wildlife habitat. Per Wyoming State Statute 23-1-101, "wildlife" means all wild mammals, birds, fish, amphibians, reptiles, crustaceans and mollusks, and wild bison designated by the Wyoming Game and Fish Commission. Wildlife are the property of the State of Wyoming and are managed by the Wyoming Game and Fish Department (WGFD). The [WGFD 2010 State Wildlife Action Plan](#) outlines broad-based strategies to maintain the health and diversity of wildlife within Wyoming.

Unbranded and unclaimed free-roaming horses (wild horses) on public lands administered by the BLM are managed in accordance with the Wild Free-Roaming Horse and Burro Act of 1971. The BLM is responsible for wild horse management in Wyoming; the WGFD does not manage wild horse populations. Since August 2003, the BLM has worked under a consent decree between the State of Wyoming and the United States that dictates the BLM must keep wild horse populations at Appropriate Management Levels (AMLs).

While improper grazing and other animal management practices can have devastating impacts on water quality and aquatic habitats, nonpoint source pollution from livestock and wildlife can be minimized, mitigated, or eliminated through the implementation of proper BMPs. Agricultural producers, wildlife management agencies, and pest management agencies may need to work together to simultaneously manage wildlife, domestic livestock, and pest populations that cumulatively impact forage resources and water quality.

1.4 Livestock and Wildlife Best Management Practices

BMPs are designed to reduce the quantities of pollutants that are introduced to surface and ground water. Managerial BMPs are often used in conjunction with structural BMPs to produce the desired management system. This document covers both managerial practices, such as innovative grazing management strategies, and specific structural practices, such as fencing and vegetated filter strips, as both managerial and structural methods are important.

Some BMPs work through prevention by improving pasture or range land or by preventing riparian vegetation or stream bank damage caused by grazing and browsing animals. Such preventative BMPs can result in improved soil structure and more complete vegetation cover, which can increase infiltration rates and thereby reduce the amount of runoff that

carries pollutants and sediment to waterbodies. Generally, as grazing land vegetation becomes denser and soil conditions improve, water quality also improves.

Other grazing BMPs, such as riparian buffers, filter strips, or grassed swales, work to treat or intercept contaminated runoff from grazing lands before it reaches natural waterways. The installation of these practices can also promote infiltration and can slow and cool runoff, helping to prevent temperature increases in receiving waterbodies that could lower dissolved oxygen levels and affect fish habitat. This document includes both preventative and treatment BMPs, as both methods are important for the reduction of nonpoint source pollution from livestock/wildlife management.

The choice of a particular BMP or series of BMPs depends on many factors. When choosing a BMP, a land manager must consider local climate, location, topography, maintenance, ground water, installation costs, and the pollutants needing to be addressed. For water development projects, a land manager may be able to utilize infrastructure already in place from past oil and gas development activities that are no longer active.

Some of the BMPs discussed in this manual may also require design and construction oversight by an engineer or other natural resource professional. Permits may also be required from local, state, or federal government agencies for some types of BMPs. [Appendix B](#) includes a list of some of the major permitting agencies within the state and the types of permits they issue. [Appendix C](#) includes contact information for agencies that can provide technical assistance for BMP implementation, including determining the level of design and construction oversight needed. Be certain to check with appropriate agencies during the planning process to determine permit or other regulatory requirements. BMP implementation that could affect sage grouse habitat or populations may need to consult with the Wyoming Game and Fish prior to implementation to be in compliance with Governor Mead's [Executive Order 2011-5](#) on Greater Sage-Grouse Core Area Protection.

Specific BMPs may or may not always be appropriate for a particular site or situation; therefore, thorough research, planning, and design should always go into the selection, implementation, and installation of any BMP. BMPs are often not complete in themselves and should be used as part of an integrated management plan to improve and maintain natural resources, including soil, vegetation, and water resources, and to maintain a sustained yield of domestic animals and wildlife. Implementing or installing more than one BMP in a series can overcome the drawbacks of any single method while providing enhanced pollution prevention.

Allotment management plans, conservation plans, grazing system plans, or similar documents should contain a list of the BMPs most appropriate for the area. Practices should be selected, designed, implemented, and maintained in accordance with site-specific considerations to ensure that the practices function together to achieve the overall management goals. In addition, management plans should be developed with reasonable goals and objectives, and progress toward goals and objectives should be monitored. Monitoring must include measures of changes in resource conditions as well as measurements of completion of objectives and tasks. Monitoring the success of BMP

implementation is important to allow for flexibility and adjustment of the BMPs as needed. Finally, proper operation and maintenance of implemented BMPs is important to ensure long-term protection of natural resources.

The following BMP factsheets provide information on some of the most common BMPs for reduction of nonpoint source pollution from livestock/wildlife management activities. The BMPs in this manual are to be used to guide the voluntary implementation of livestock/wildlife management activities on public and private lands by private, state, and federal land managers. They are intended to complement and enhance existing policies, procedures, and regulations. In addition, BMPs and conservation practices that are listed in United States Department of Agriculture (USDA) technical guides, manuals, or handbooks will be considered for Section 319 funding, even if not listed in this manual. In particular, the USDA Natural Resources Conservation Service's (NRCS) Field Office Technical Guides (FOTGs) offer information about BMPs and conservation practices that are utilized by the NRCS throughout Wyoming. Wyoming's electronic FOTG is available on the [NRCS Wyoming website](#). Other BMPs will be evaluated on a case-by-case basis for funding by the Wyoming Nonpoint Source Program and the Nonpoint Source Task Force.

1.5 General Resources

Many resources already exist that provide information about BMPs for livestock and wildlife management. The WDEQ notes the following references as sources of general information about grazing management and livestock/wildlife BMPs:

[Barnyards & Backyards: Rural Living in Wyoming](#). Maintained by the University of Wyoming.

<http://www.uwyo.edu/barnbackyard/>

[Glossary of Terms used in Range Management](#). 4th Edition. The Society for Range Management.

http://www.rangelands.org/publications_referencebooks.shtml

[NRCS Wyoming Electronic Field Office Technical Guide, County Locator](#). U.S. Department of Agriculture, Natural Resources Conservation Service.

http://efotg.sc.egov.usda.gov/efotg_locator.aspx

[National Management Measures for the Control of Nonpoint Pollution from Agriculture](#). 2003. EPA 841-B-03-004. U. S. Environmental Protection Agency, Office of Water, Washington, D.C.

http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm

[Standards for Healthy Rangelands & Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming](#). 2008. U.S. Department of the Interior Bureau of Land Management.

http://www.blm.gov/wy/st/en/programs/grazing/standards_and_guidelines.html

[The Quivira Coalition: Publications for Download](#). 2012. The Quivira Coalition.

http://quiviracoalition.org/Publications/Publications_for_Download/index.html

[University of Wyoming Cooperative Extension, Publications Database Search](#). University of Wyoming.

http://www.wyomingextension.org/publications/Search_Start.asp

[University of Wyoming Cooperative Extension Resource Areas Website](#). Maintained by the University of Wyoming.

<http://www.extension.org/main/communities>

[National Best Management Practices for Water Quality Management on National Forest Lands](#). Volume I: National Core BMP Technical Guide. April 2012. United States Department of Agriculture, Forest Service. FS-990a.

http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

In addition, the following agencies are important resources for livestock/wildlife management technical and/or financial assistance (additional contact information for these agencies is listed in [Appendix C](#)):

- [Natural Resources Conservation Service-Wyoming](#)
- [Wyoming Department of Agriculture](#)
- [Wyoming Game and Fish Department](#)
- [Bureau of Land Management](#)
- [Wyoming Association of Conservation Districts](#)
- [University of Wyoming College of Agriculture and Natural Resources](#)
- [University of Wyoming Cooperative Extension](#)
- [United States Fish and Wildlife Service](#)
- [United States Forest Service](#)

BMP 1: General Livestock Grazing Management



Photo of livestock herding. Source: Wyoming Division of Tourism

The management of livestock grazing to sustainably achieve desired production and conservation objectives.

Water Quality Benefits

Reduced soil erosion and stabilized stream banks

Riparian areas protected

Increased infiltration of runoff

Reduced nutrient and fecal contamination of water resources

Reduced or eliminated noxious weed populations

Description:

Grazing management refers to the manipulation of animal grazing to achieve desired production and conservation objectives. Grazing should be conducted to provide a continuous supply of forage to grazing animals, achieve desired economic results, and conserve natural resources, including vegetation, soil, and water resources. Grazing management should sustainably maintain the productive potential of the pasture or rangeland. In regards to water quality, grazing management involves managing forage harvest by all grazing animals at a sustainable yield that does not accelerate erosion and sedimentation above acceptable levels within waterbodies affected by grazing activity. By maintaining sustainable forage yields, plant cover can be preserved or increased, which in turn, can help slow or reduce runoff and promote water infiltration and ground water recharge.

In order to provide a sustained level of vegetation diversity and productivity, it is necessary to know the forage demands and seasons of all local grazing animals. Livestock foraging can be managed through grazing management systems that use practices such as prescribed grazing, herding, and controlled stocking rates. Fencing and access control can also help manage domestic animals. In addition, the provision of alternative shade and water locations can encourage better distribution of livestock, and off-site food plots and salting points can also be strategically placed to adjust grazing animal distributions. Locating these items away from natural water bodies and riparian zones can help preserve these ecologically sensitive areas.

The controlled allowance or exclusion of grazing animals on any given piece of land where grazing or browsing animals are managed, often referred to as prescribed grazing, can be carried out with the intent to achieve certain conservation objectives. For example, prescribed grazing can improve water quality and quantity by protecting, maintaining, and improving riparian and upland vegetation, by promoting infiltration, by protecting against stream bank erosion, and by limiting fecal deposits near natural water bodies. In addition, prescribed grazing can help improve or maintain the desired composition of plant species and can help improve or maintain the animals' health and productivity. Prescribed grazing is often used to reduce or eliminate noxious weed populations.

BMP 1: General Livestock Grazing Management

Description continued:

The following are brief descriptions of several types of prescribed grazing systems:

- *Deferred grazing*: discontinuance or deferment of grazing a specific pasture or unit for a specified time period to promote plant reproduction, establishment of new plants, or restoration of plant vigor.
- *Deferred-rotation grazing*: any grazing system that provides for a systematic rotation of the deferment among pastures.
- *Intermittent grazing*: alternate grazing and resting of a pasture or unit for variable time periods.
- *Rest-rotation grazing*: any form of a deferred-rotation grazing system in which at least one grazing unit is rested from grazing for a full year.
- *Rotational grazing*: in rotational grazing, a pasture is divided into multiple smaller pastures and the animals graze the pastures on a flexible, rotating basis; alternating periods of use and rest allows the vegetation to recover during periods of rest and encourages uniform grazing of the pasture in use.
- *High intensity/short-duration grazing*: grazing management whereby relatively short periods (days) of relatively concentrated livestock grazing in a small area occurs, coordinated with periods of non-grazing; periods of grazing and non-grazing are based upon plant growth characteristics.

Criteria:

The number of all grazing animals should always be maintained in balance with their habitat. In order to plan a successful proper grazing management system, consideration should be given to a site's season of use, vegetation type, soil type, local climate and precipitation rates, plant growth rate, and type of grazing animals. Grazing systems can be tailored to site conditions and grazing animal types.

In order to ensure proper practice functioning, appropriate accommodations must be provided. For example, adequate quantity and quality of drinking water should be provided for grazing animals at all times. In addition, grazing or browsing animals must be properly managed to meet desired objectives. Prescribed grazing must consider the number of animals, type of animals, grazing distribution, duration, season-of-use, frequency, intensity, and vegetative recovery time. Adjustments to these livestock grazing management practices will aid in meeting desired objectives.

Landowners and managers should develop prescribed grazing plans to include adequate vegetation cover, especially in sensitive riparian areas. Rate of plant growth and available forage should always be accounted for when managing and planning prescribed grazing. Grazing management should evaluate areas of high livestock concentration and consider how to minimize concentration to enhance nutrient distribution and improve or maintain ground cover.

Landowners and managers can increase and/or maintain the soil infiltration capacity and vegetation filtration capacity, as well as reduce runoff and sedimentation by providing adequate ground cover and plant density. Livestock producers and land managers can reduce surface water quality contaminations from animal waste and sedimentation by utilizing BMPs such as water gaps and fencing where appropriate and applicable. Fencing is often necessary to properly implement prescribed grazing, as it can be used to divide and temporarily or permanently exclude grazing animals from certain areas.

BMP 1: General Livestock Grazing Management

Maintenance: All grazing systems and habitats should be continually modified and evaluated and adjusted as required. Care must be taken to maintain a long-term perspective for watershed protection and production. Structures used for proper grazing method practices, such as fences or alternative water and shade structures, should be maintained, repaired, and replaced as needed. Grazing should be monitored and recorded on a regular basis to ensure that objectives are being met and to make any necessary adjustments.

Landowners should consider short and long-term weather conditions and forage production potential when determining grazing management practices. Appropriate utilization levels and periods of deferment and/or rest allow plants the opportunity to thrive and reproduce each year. Additional maintenance for landowners and land managers may include designing and maintaining fences, treating invasive weed and pest species, and reseeded or improving pasture vegetation to ensure objectives of the prescribed grazing management are achievable.

- References:**
- [Prescribed Grazing: Code 528](http://efotg.sc.gov.usda.gov/references/public/WY/Prescribed_Grazing_(528)_standard.pdf). 2012. Natural Resources Conservation Service. [http://efotg.sc.gov.usda.gov/references/public/WY/Prescribed_Grazing_\(528\)_standard.pdf](http://efotg.sc.gov.usda.gov/references/public/WY/Prescribed_Grazing_(528)_standard.pdf)
 - [Prescribed Grazing: Practice Introduction](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026090.pdf). Natural Resources Conservation Service. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026090.pdf
 - [A Summary of Livestock Grazing Systems Used on Rangelands in the Western United States and Canada](http://www.ag.arizona.edu/pubs/natresources/az1184.pdf). 2000. University of Arizona Cooperative Extension. Publication AZ1184. <http://www.ag.arizona.edu/pubs/natresources/az1184.pdf>
 - [Rangeland Health and Planned Grazing Field Guide](http://quiviracoalition.org/images/pdfs/77-Planned_Grazing_Field_Guide.pdf). Gazia, K. and N. Sayre. The Quivira Coalition, Earth Works Institute, and The New Ranch Network. April 2008. Fourth Edition. http://quiviracoalition.org/images/pdfs/77-Planned_Grazing_Field_Guide.pdf
 - [Guidelines for Managing Cattle Grazing in Riparian Areas to Protect Water Quality: Review of Research and Best Management Practices Policy](http://oregonstate.edu/dept/range/sites/default/files/RNG455-555PDFLinks/Mosley_grazing_strategies.pdf). 1999. Idaho Forest, Wildlife and Range Policy Analysis Group, Idaho Forest, Wildlife and Range Experiment Station, and the University of Idaho. http://oregonstate.edu/dept/range/sites/default/files/RNG455-555PDFLinks/Mosley_grazing_strategies.pdf
 - [Grazing Management for Streamside Areas](http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/BULLETIN_NO470001789.pdf). January 1993. Wyoming Game and Fish Department Habitat Extension Bulletin No. 47. http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/BULLETIN_NO470001789.pdf
 - [Managing for Mulch](http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/HABITAT_MANAGINGFORMULCH0000340.pdf). Molinar, F., D. Galt, and J. Holechek. 2001. Rangelands 23(4), pp. 3-7. http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/HABITAT_MANAGINGFORMULCH0000340.pdf
 - [Grazing Response Index: A Simple, Effective Method to Evaluate Plant Responses to Grazing](http://extension.usu.edu/files/publications/factsheet/3_1_3.pdf). Utah State University Cooperative Extension Publication, Factsheet No. 3.1.3. http://extension.usu.edu/files/publications/factsheet/3_1_3.pdf
 - [Grazing Studies: What We've Learned](http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/HABITAT_GRAZINGSTUDIES0000338.pdf). Holechek, J., H. Gomez, F. Molinar, and D. Galt. 1999. Rangelands 21(2), pp. 12-26. http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/HABITAT_GRAZINGSTUDIES0000338.pdf

BMP 1: General Livestock Grazing Management

**References
continued:**

[Cattle Management Manual](http://www.wyomingextension.org/agpubs/pubs/MP-97.pdf). 2000. University of Wyoming Cooperative Extension Service Publication MP-97.

<http://www.wyomingextension.org/agpubs/pubs/MP-97.pdf>

[Barnyards and Backyards Domestic Animals Resources Website](http://www.uwo.edu/barnbackyard/resources/domestic-animals.html). Maintained by the University of Wyoming.

<http://www.uwo.edu/barnbackyard/resources/domestic-animals.html>

[Stocking Rate: The Key to Successful Livestock Production](http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2050/PSS-2871web.pdf). Redfearn, D. and T. Bidwell. Oklahoma Cooperative Extension Service Publication PSS-2871.

<http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-2050/PSS-2871web.pdf>

BMP 2: Alternative Water Sources and Shade



Photo of a stock tank. Source: WDEQ

Help producers and land managers limit the amount of time livestock and wildlife spend in or near surface waters to protect water quality and riparian areas.

Water Quality Benefits

Reduced degradation of stream banks and riparian vegetation

Reduced nutrient and fecal contamination of water resources

Riparian areas protected

Description:

Landowners and managers can increase livestock and wildlife distribution, reduce degradation of stream banks and riparian vegetation, and reduce contamination of surface waters by planting windbreaks and shade trees, as well as developing off-stream watering sources. By providing off-stream water sources and shade away from riparian areas, the amount of time that grazing and browsing animals spend near or within the natural streams and riparian zones can be greatly reduced; thereby reducing stream bank disturbance and preventing the direct deposition of animal waste into water bodies.

Alternate water and shade sources can be achieved in various ways. For example, off-stream watering areas can be provided through permanent or portable devices, such as troughs or stock tanks, or through water wells or spring development. Solar and/or wind power have been used to power off-stream water wells. Water gaps, or designated, fenced areas for livestock access to water courses, can also be utilized. Pipelines are also used to provide alternative water sources. In addition, alternative shade can be provided by building shelters or planting trees. Shelterbelts or living snow fences provide shade and wind protection for livestock and wildlife.

Criteria:

When providing alternative shade with trees or vegetated windbreaks, utilized plant species should be adapted to the local soils, climate, and site conditions. Species with good leaf retention are recommended, as they provide the most amount of shade and protection against the wind. If constructing a roofed shelter, it should be durably constructed and able to withstand local storm events, wind and snow loads, and anticipated livestock and wildlife activities.

Off-stream watering facilities should also be durably constructed and should be designed to provide adequate water supply for the daily requirements of the grazing and browsing animals. All water tanks should include escape ramps for birds and small mammals. Water facilities should be located in a way that promotes even grazing distribution and reduces grazing pressure on sensitive areas. When using constructed water wells as water sources, the underground supply of water must be sufficient in quality and quantity. In order to prevent water contamination, wells must be located away from potential sources of pollution, and surface runoff should be diverted away from the wellheads. Developed springs should have associated exclosures or other means to protect them from damage.

BMP 2: Alternative Water Sources and Shade

Maintenance: When providing alternative shade areas with vegetation, trees may have to be thinned or pruned, and supplemental water and nutrients may have to be provided until the vegetation has fully established itself. In addition, routine maintenance, inspections, and repairs will have to be performed on constructed shelters and watering facilities.

Watering facilities should be checked for leaks and repaired as necessary and should be regularly cleaned of collected debris and algae. Maintenance and cleaning of watering facilities can be made easier by providing a system that allows the water to completely drain. Areas surrounding alternative shade or watering facilities will also need to be monitored for erosion. In general, place alternative water or shade facilities in flat regions, away from areas with steep topography, in order to avoid slope disturbance and erosion.

References: [Watering Facility: Code 614](http://efotg.sc.gov.usda.gov/references/public/WY/Watering_Facility_(NO)_(614)_Standard.pdf). 2011. Natural Resources Conservation Service.
[http://efotg.sc.gov.usda.gov/references/public/WY/Watering_Facility_\(NO\)_\(614\)_Standard.pdf](http://efotg.sc.gov.usda.gov/references/public/WY/Watering_Facility_(NO)_(614)_Standard.pdf)

[Watering Well: Code 642](http://efotg.sc.gov.usda.gov/references/public/WY/Water_Well_(NO)_(642)_Standard.pdf). 2008. Natural Resources Conservation Service.
[http://efotg.sc.gov.usda.gov/references/public/WY/Water_Well_\(NO\)_\(642\)_Standard.pdf](http://efotg.sc.gov.usda.gov/references/public/WY/Water_Well_(NO)_(642)_Standard.pdf)

[Best Management Practices to Control the Effects of Livestock Grazing Riparian Areas](http://ohioline.osu.edu/ls-fact/0004.html). Ohio State University Extension.
<http://ohioline.osu.edu/ls-fact/0004.html>

[Selection of Alternative Livestock Watering Systems](https://utextension.tennessee.edu/publications/Documents/PB1641.pdf). Agricultural Extension Service. The University of Tennessee.
<https://utextension.tennessee.edu/publications/Documents/PB1641.pdf>

[Livestock Grazing Distribution](http://www.wyomingextension.org/agpubs/pubs/MP111_05.pdf). Horn, B. 2005. University of Wyoming Cooperative Extension Publication MP-111.05
http://www.wyomingextension.org/agpubs/pubs/MP111_05.pdf

[Grazing Distribution](http://www.ksre.ksu.edu/library/crpsl2/mf515.pdf). Ohlenbusch, P. and J. Harner III. 2003. Kansas State University Agricultural Experiment Station and Cooperative Extension Service Publication MF-515.
<http://www.ksre.ksu.edu/library/crpsl2/mf515.pdf>

BMP 3: Range and Pasture Planting



Photo of a seeded pasture. Source: Alabama NRCS

Establishing vegetation on rangeland, pastures, or other locations where grazing and browsing occurs to help stabilize soils and prevent erosion.

Water Quality Benefits

Decreased soil erosion and runoff volume

Reduced sediment transport to nearby surface waters

Increased infiltration of runoff

Description: Range and pasture planting is a practice intended to establish vegetation on rangeland, native or naturalized pastures, grazed forest, or other locations where grazing and browsing occurs. Vegetation, such as grasses, forbs, legumes, shrubs, and trees, can be planted and restored to a condition similar to the natural, historic plant community or to a desired condition for forage production.

Range and pasture planting can be applied on lands where forage production or conservation is needed or on lands where desired vegetation is below the level for natural reseeding to occur. Range and pasture planting can provide several benefits, including the reduction of soil erosion and the improvement in water quality and quantity. Restored vegetation can stabilize soils, can improve the soils' infiltration capacity, and can protect against wind and water erosion. In addition, vegetation can provide adequate forage and cover for livestock and wildlife, and therefore, can help maintain and improve the animals' overall health. In addition, range and pasture planting can increase carbon sequestration.

Criteria: Successful rangeland reclamation or replanting of pastureland is contingent upon several factors, such as the use of weed-free seed and the use of native or cultivated seed varieties that are acclimated to local soils, precipitation, and climate. Plant species should be selected based upon local soil conditions, resistance to local pests and diseases, and local climate conditions, such as rainfall patterns, temperature extremes, and growing season length. Native plants that stabilize soil surfaces and increase infiltration rates, such as deep rooted species, should be selected in order to improve and maintain water quality and quantity. Non-native, invasive species should not be used.

In addition, range planting can include the planting of shrubs and trees near riparian areas to provide stream bank stability and cool water temperatures. Selected plant species should be designed to meet the desired nutritional requirements of grazing animals and should also be designed to provide adequate cover for the animals. In areas frequently visited by grazing and browsing animals, selected plant species should be able to tolerate close grazing and trampling.

Maintenance: When first establishing the range or pasture land vegetation, plants must be monitored to ensure successful growth. Seedlings should be monitored for water stress, and livestock should be initially excluded until plants are well established. Replanting may be necessary if drought or another uncontrollable event occurs and prevents the adequate establishment of the range or pasture land plantings.

BMP 3: Range and Pasture Planting

Maintenance continued:

Once the vegetation is established, routine activities, such as mowing, prescribed burning, and flash grazing, may be periodically required to maintain standing plants. In addition, the use of pesticides and herbicides may be periodically necessary, but they should be applied in such a manner that does not compromise the local water quality.

References:

[Pasture and Hay Planting: Code 512](http://efotg.sc.egov.usda.gov/references/public/WY/Pasture_&_Hay_Planting_(512)_Specification_Guide_Sheet.pdf). 2006. Specification Guide Sheet. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Pasture_&_Hay_Planting_\(512\)_Specification_Guide_Sheet.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Pasture_&_Hay_Planting_(512)_Specification_Guide_Sheet.pdf)

[Range Planting: Code 550](http://efotg.sc.egov.usda.gov/references/public/WY/Range_Planting_(AC)_550_Standard.pdf). 2011. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Range_Planting_\(AC\)_550_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Range_Planting_(AC)_550_Standard.pdf)

BMP 4: Stream Crossings



Photo of a designated stream crossing. Source: Alabama NRCS

Establishing stable stream access points and crossings to prevent excess damage from trampling and to protect water quality and riparian areas.

Water Quality Benefits

Reduced degradation of stream banks and riparian vegetation

Reduced nutrient and fecal contamination of water resources

Riparian areas protected

Description:

Controlled stream crossings are stabilized areas or structures that are constructed across a stream to provide travel ways for livestock, wildlife, people, equipment, and vehicles. When creating a livestock only stream crossing, stream bottoms are often covered with coarse gravel in order to provide animals with firm footing while discouraging them from lingering in the stream. The use of fencing is often required in conjunction with stream crossings to exclude livestock and wildlife from accessing or crossing the stream at non-designated areas.

Stream crossings can also be utilized as designated areas for livestock access to water courses, or water gaps. Constructed stream crossings can improve water quality by reducing the amount of sediment and nutrient loadings into the streams, and they can also reduce streambank and streambed erosion. Stream crossings are necessary on grazing or browsing lands that have continuous waterways running through them. However, the number of stream crossings across a waterway should be kept to a minimum and avoided when alternative travel-ways are available.

Criteria:

When initially constructing a stream crossing, several factors must be considered, including the effects on upstream and downstream flow conditions, the effects on fish passages and wildlife habitats, and the short term effects on water quality that will be caused by the initial installation and construction of the stream crossing.

Stream crossings should only be constructed in areas where the streambed is already stable or can be made stable. When using coarse gravel to stabilize the stream crossing, selected rocks should be able to withstand exposure to air, water, freezing, and thawing, and should be large enough to stay immobile during flood flows. Geotextile can also be used with rocks in areas that have very soft or unstable subgrade.

To discourage animals from lingering in or near the waterways, it is recommended that stream crossings be located away from shady riparian areas. Crossing through wetland areas should also be avoided when possible. However, planned vegetation can be used near stream crossing to help stabilize soils and side slopes. The planned, permanent vegetation should ideally be deep rooted, low-lying, and tolerant to frequent trampling and should be planted as soon as practical after the construction of the stream crossing.

BMP 4: Stream Crossings

Maintenance: Operation and maintenance plans should be created and implemented throughout the use of the stream crossings. Constructed stream crossings and associated fences should also be regularly inspected, especially after major storm events, and both should be repaired and replaced as necessary. Planned vegetation should also be monitored in order to ensure successful establishment, and vegetated areas may occasionally need reseeding or replanting.

References:

[Best Management Practices to Control the Effects of Livestock Grazing Riparian Areas.](http://ohioline.osu.edu/lr-fact/0004.html)
Ohio State University Extension.
<http://ohioline.osu.edu/lr-fact/0004.html>

[Stream Crossing: Code 578.](http://efotg.sc.egov.usda.gov/references/public/WY/Stream_Crossing_(NO)_(578)_Standard.pdf) 2006. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Stream_Crossing_\(NO\)_\(578\)_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Stream_Crossing_(NO)_(578)_Standard.pdf)

BMP 5: Manure Management



Photo of an animal waste covered storage area. Source: WDEQ

Handling, utilizing, composting, and storing animal waste in a way such that nutrients and pathogens are not introduced into water resources.

Water Quality Benefits

Reduced nutrient and fecal contamination of water resources

Description:

Animal manure can introduce pathogens and nutrients to surface and ground waters. To protect water quality and prevent stormwater pollution, animal waste management techniques should be employed. There are several different ways to handle animal waste, including waste utilization, composting, and waste storage facilities.

Manure and waste utilization consists of the direct use of wastes, such as animal manure, on land to maintain or improve soil and plant nutrient resources. Some grazing and browsing animal manures can essentially be utilized as a natural fertilizer for fields and crops, but must be used in an environmental sound way. Manure and waste utilization, when correctly implemented, can protect water and air quality, while improving soils and crop production.

Composting, or the process of controlled and accelerated aerobic biodegradation and stabilization of organic waste, can be used for grazing and browsing animal manure. Composted organic material can create a fertile soil amendment. Therefore, by composting animal waste, one can prevent water contamination, while creating a usable, fertile soil supplement.

Waste storage facilities are constructed, sheltered impoundments or embankments that are used for temporary storage of agricultural wastes, such as manure, wastewater, and contaminated runoff. By intercepting and properly storing wastes, the amount of contaminant loading to surface waters can be greatly reduced.

Criteria:

When employing waste utilization techniques to manage animal manure, waste should be handled in a way that minimizes the chance of surface or ground water contamination. For example, manure and waste should never be applied in areas that are frequently flooded or in areas that have shallow water tables. If using liquid waste, the application rate should not exceed the ground's infiltration rate, and wastes should not be applied when the potential for runoff exists, such as when the grounds are frozen, snow covered, or completely saturated.

To successfully utilize the practice of composting for waste management, several factors must be considered, such as site selection, carbon-nitrogen ratio, moisture levels, temperature of compost mix, and proper management.

BMP 5: Manure Management

Criteria continued: Composting facilities should not be located in areas where there is a potential for ground water contamination, such as areas with shallow water tables or in areas with highly permeable soils. In addition, facilities should be located outside of floodplains, and contaminated runoff from composting facilities should always be directed to management facilities for further treatment. Compost facilities should also be protected from wind in cold or dry climates to prevent excess drying of the compost materials.

When using waste storage facilities for temporary waste management, facilities should be planned, designed, and constructed in a way to prevent water contamination. For example, in order to prevent ground water contamination, storage facilities should be constructed with impervious liners, should be located outside of floodplains, and should be at least 2 feet above the high water table level. Waste storage facilities should also be located as close to the source of waste and polluted runoff as possible.

Maintenance: The practices of waste utilization, composting, and waste storage facilities all require the development of operation and maintenance plans that comply with all regulations and are consistent with the purpose of the practices. Waste utilization practices require periodic inspections and maintenance of the equipment and the facilities. In addition, records should be kept and maintained on waste utilization factors such as quantity and nutrient content of utilized manure, soil conditions, waste application methods, and crop yields.

Composting also requires the management of compost piles for temperatures, odors, moisture levels, and oxygen levels. Adjustments may be necessary throughout the composting period to ensure proper composting processes. Lastly, waste storage facilities also need to be managed and maintained, and wastes are required to be removed from the facilities at planned times, rates, and volumes.

References: [Animal Manure Management](#). 2011. Cooperative Extension System and The University of Wyoming.
http://www.extension.org/animal_manure_management

[Composting Facility: Code 317](#). 2003. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Composting_Facility_\(NO\)_317_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Composting_Facility_(NO)_317_Standard.pdf)

[The Scoop on Manure Management](#). Meador, R. Barnyards and Backyards, Summer 2007.
http://www.uwyo.edu/barnbackyard/_files/documents/magazine/2007/summer/manure-mgt-summer-barnyards-2007-web-pd.pdf

[Waste Storage Facility: Code 313](#). 2000. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Waste_Storage_Facility_\(NO\)_313_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Waste_Storage_Facility_(NO)_313_Standard.pdf)

[Waste Recycling: Code 633](#). 2012. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Waste_Recycling_\(AC\)_633_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Waste_Recycling_(AC)_633_Standard.pdf)

BMP 6: Fencing



Photo of a standard fence. Source: WDEQ

Controlling and limiting access to an area of land with constructed structures, such as fences, that act as barriers to animals.

Water Quality Benefits

Reduced soil erosion on upland areas

Reduced degradation of stream banks and riparian vegetation

Reduced nutrient and fecal contamination of water resources

Riparian areas protected

Description:

Fencing consists of enclosing, dividing, or controlling access to an area of land with a constructed structure that acts as a barrier to animals. Fencing can help achieve conservation objectives by providing a means to control and direct the movement of animals. Grazing and browsing animals can be excluded from riparian zones and other environmentally sensitive areas, thereby preventing stream bank degradation, direct deposits of animal wastes into water bodies, compaction of soils, and loss of riparian vegetation. In general, fencing can preserve riparian areas, valuable wildlife habitats and plant species by excluding animals from designated areas.

Fencing is applicable in any area where management of animal movement is necessary. Often, fences are necessary to help implement practices such as prescribed grazing, livestock exclusion, and stream crossings. In addition, some fences, when installed laterally across a slope, can help to slow down runoff, and if frequenting animals create a channel along the fence, it can serve as a slope diversion structure, intercepting and diverting slope runoff.

Criteria:

Fences must be installed properly using the appropriate materials to be effective. Type, design, and positioning of fence should meet objectives and site challenges and should be built of durable, quality materials. Depending upon the need, fences can be permanent, portable, or temporary.

When planning the fence design and location factors, such as topography, soil properties, erosion problems, livestock and wildlife management and safety, location of watering facilities, and human access points, should all be considered. The creation of possible runoff channels along fences should be considered in when planning locations, as animals will often concentrate around the fence line and paths may become channels that can collect and accelerate runoff. Fence designs and locations should also factor in access for construction, maintenance, and repair.

The use of wildlife-friendly fences is encouraged when feasible. In general, wildlife-friendly fences should be three wires with the top wire not more than 40 inches above ground level and the bottom wire smooth and 18 inches above ground level.

BMP 6: Fencing

Maintenance: Fences should be inspected on a regular basis and should always be inspected after major storms or other disturbance events to ensure proper functioning. When necessary, maintenance, repairs, and replacements should be performed in a timely manner. Broken fencing material and hardware should always be safely removed and properly discarded.

References: [Fence: Code 382](http://efotg.sc.egov.usda.gov/references/public/WY/Fence_(FT)_(382)_Standard.pdf). 2011. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Fence_\(FT\)_\(382\)_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Fence_(FT)_(382)_Standard.pdf)

[Livestock Grazing Distribution](http://www.wyomingextension.org/agpubs/pubs/MP111_05.pdf). Horn, B. 2005. University of Wyoming Cooperative Extension Publication MP-111.05
http://www.wyomingextension.org/agpubs/pubs/MP111_05.pdf

[Planning Fencing Systems for Intensive Grazing Management](http://www.uky.edu/Ag/AnimalSciences/pubs/id74.pdf). Turner, L.W., C.W. Absher, and J.K. Evans. 1997. University of Kentucky Cooperative Extension Service Publication ID-74.
<http://www.uky.edu/Ag/AnimalSciences/pubs/id74.pdf>

[Grazing Distribution](http://www.ksre.ksu.edu/library/crpsl2/mf515.pdf). Ohlenbusch, P. and J. Harner III. 2003. Kansas State University Agricultural Experiment Station and Cooperative Extension Service Publication MF-515.
<http://www.ksre.ksu.edu/library/crpsl2/mf515.pdf>

BMP 7: Land Treatment



Photo of mechanical land treatment. Source: NRCS

Using biological, mechanical, or chemical methods to enhance grazing lands, control pests, and improve water quality by reducing erosion and promoting infiltration.

Water Quality Benefits

- Reduced soil erosion and stabilized stream banks
- Reduced conifer encroachment into riparian areas
- Reduced or eliminated noxious weed populations

Description:

The practice of land treatment consists of the use of biological, mechanical, or chemical methods to enhance grazing lands, control pests, and improve water quality by reducing erosion and promoting infiltration.

Biological land treatment involves the use of living organisms to manipulate and enhance grazing lands. Some examples include the use of insects or multiple species grazing to control undesirable vegetation, the use of beavers to stabilize stream banks, and the use of livestock to create beneficial hoof impact. Land treatment can also be performed through mechanical, labor intensive means.

Mechanical treatment methods work to promote and improve infiltration. Some of these practices include contour furrowing, terracing, pitting, ripping, chiseling, seeding, brush clearing, prescribed burning, and aerating.

Chemical treatment, such as the use of fertilizers, herbicides, or pesticides, can be used to enhance grazing lands and control pests, but chemicals should always be applied in a manner that does not compromise surface or ground water quality. Landowners who choose to apply chemical treatments for vegetation control should read and following instructions on the chemical label. Land treatment may also include addressing conifer encroachment into riparian areas and removal of invasive non-native/weed species in riparian areas.

Criteria:

Several factors must be considered for proper land treatment. If using biological methods, much must be known about the animals being utilized. For example, if using insects or multiple species grazing to control undesirable vegetation species, one should have thorough knowledge and understanding of the utilized species' dietary habits and effects on local ecosystems. If utilizing hoof impact for beneficial land treatment, conditions should be dry, as animal hoof action can cause soil compaction under wet conditions.

Mechanical land treatment methods should be tailored to local soils and slopes. For example, mechanical practices that disturb soils, such as terracing, pitting, or aerating, should not be used where surface disturbances will result in unacceptable levels of erosion. In addition, local watershed function should be considered when planning mechanical land treatment, as some mechanical practices work to increase infiltration and ground water recharge.

BMP 7: Land Treatment

Criteria continued: Chemical treatment practices should always be used sparingly, and chemicals should be utilized in accordance with label directions, as improper storage, handling, or application of chemicals can result in surface or ground water impairment. Improper storage, handling, or application of chemicals could result in surface or ground water contamination.

Maintenance: When using biological land treatment practices, utilized species should be managed, and their populations should be maintained at sustainable levels. Machines used for mechanical land treatments should be properly maintained, stored, and repaired as necessary. Chemicals should also be properly maintained, stored, and handled to avoid surface or ground water contamination.

References: [Grazing Land Mechanical Treatment: Code 548](http://efotg.sc.egov.usda.gov/references/public/WY/Grazing_Land_Mechanical_Treatment__AC__548__Standard.pdf). 2012. Natural Resources Conservation Service.
http://efotg.sc.egov.usda.gov/references/public/WY/Grazing_Land_Mechanical_Treatment__AC__548__Standard.pdf

[Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management](http://www.blm.gov/pgdata/etc/medialib/blm/wy/wildlife/docs.Par.8891.File.dat/fsbfiremgmtguidelines.pdf). Wyoming Interagency Vegetation Committee. 2002. Wyoming Game and Fish Department and Wyoming BLM. Cheyenne, WY. 53 pp.
<http://www.blm.gov/pgdata/etc/medialib/blm/wy/wildlife/docs.Par.8891.File.dat/fsbfiremgmtguidelines.pdf>

[Considerations for Prescribed Burning](http://aces.nmsu.edu/pubs/_circulars/Cr-522.pdf). Duncan, K.W. Revised 2003. New Mexico State University Cooperative Extension Service Circular 522.
http://aces.nmsu.edu/pubs/_circulars/Cr-522.pdf

BMP 8: Access Roads



Photo of private, seasonal access road. Source: WDEQ

Fixed routes provided for vehicular travel necessary for agricultural or wildlife operation management as a means to reduce land degradation and erosion.

Water Quality Benefits

Reduced soil erosion

Reduced transport of sediment to nearby surface waters

Downstream water quality protected

Description: Access roads are travel-ways that provide fixed routes for vehicular travel necessary for resource activities involved in the management of livestock, wildlife habitat, agriculture, and other conservation enterprises. All access roads should be sited, designed, and constructed in such a way that minimizes erosion and sedimentation and protects adjacent soil, water, wildlife, and other natural resources.

Access roads are applicable where access is needed from a private or public road to an agricultural or conservation land use enterprises, such as livestock, wildlife, or wild horse management. However, access roads should be kept to a minimum and used only when necessary, and roads that are not needed should be closed and reclaimed when possible. Road types can range from seasonal use, gravel roads that are designed for low speed, infrequent use to all-weather roads that are heavily used by the public.

Criteria: When planning and designing access roads, environmental values and impacts should be considered. Access roads should be sited in ways that serve the intended vehicular travel-way purpose while avoiding adverse impacts to water quality, air quality, and environmental sensitive areas. Roads should generally follow the natural contours and slopes to minimize the disturbance of drainage patterns. Access roads should also be located away from water courses and sited where water management problems are not created. Stream crossings should be minimized, but if necessary, they should be located and constructed in a way that minimizes adverse impacts to riparian vegetation, stream banks, and stream channels.

All access roads should also be designed with proper drainage systems, such as culverts, roadside ditches, or water bars, and where possible, filter strips, or grassed channels should be utilized alongside roadways to provide some stormwater runoff management. The effects of access road construction on downstream water courses and water bodies should also be considered, and measures should be taken to minimize erosion and sedimentation. After construction of access roads, road banks, and disturbed areas should be vegetated as soon as possible.

Maintenance: Proper maintenance of access roads is necessary to minimize erosion and sedimentation. Drainage systems should be inspected and repaired as necessary to maintain their full flow capacity. Gravel access roads may also need occasional re-grading and re-graveling.

When vegetated buffer areas, such as filter strips or grassed channels, are used alongside access roads, vegetation cover should be maintained, repaired, and reseeded as needed.

BMP 8: Access Roads

Maintenance continued:

The use of fertilizers and pesticides on vegetation is not recommended, but if necessary, they should be applied in such a way that does not compromise the local water quality

References:

[Access Road: Code 560](http://efotg.sc.egov.usda.gov/references/public/WY/Access_Road_(FT)_(560)_Standard_2011.pdf). 2011. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Access_Road_\(FT\)_\(560\)_Standard_2011.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Access_Road_(FT)_(560)_Standard_2011.pdf)

BMP 9: Vegetated Filter Strips



Photo of a vegetated filter strip. Source: NRCS

Strips of planted vegetation adjacent to surface waters that reduce the amount of pollutants reaching surface waters by filtering and treating polluted runoff.

Water Quality Benefits

Reduced runoff velocity which traps sediment, nutrients, pesticides, and other pollutants

Increased infiltration of runoff

Increased uptake of excess nutrients

Description:

Vegetated filter strips (a.k.a. field borders, contour buffer strips, filter strips, grass buffer strips, grassed filters) are uniformly graded, densely vegetated sections of land that are designed to treat sheet flow runoff from adjacent land. When used for agricultural purposes, they are often situated between cropland/pastureland and environmentally sensitive areas.

Vegetated filter strips can have different practice titles depending upon their placement and arrangement in relation to the agricultural field. For example, field border filter strips are established at the edge or around the perimeter of an agricultural field, while contour buffer strips are established around a hill slope or alternated with wider cropped strips along the contour down the slope.

Vegetated filter strips generally treat sheet flow runoff, and the overland flow entering the filter strip should be primarily sheet flow. Concentrated flows should be dispersed to prevent damage to the filter strips caused by gully or rill erosion. Level spreaders can be used to help distribute concentrated flows of runoff evenly across the filter strips. Vegetated filter strips are designed to slow runoff velocities, to trap sediments and other pollutants, and to promote infiltration into underlying soils. Filter strips can provide effective pollutant control, especially for particulate pollutants. In addition, filter strips can help increase carbon storage and provide wildlife habitat and forage.

Although filter strips are often planted with turf grass, native vegetation can also be utilized, and their use can lead to more effective pollutant removal. Native, deep rooted plant species that produce dense foliage are highly recommended as they have the best ability to hold and capture eroded soil during runoff events. In addition, trees and shrubs can be incorporated into filter strips to increase runoff treatment efficiency, protect against wind erosion, provide additional wildlife habitat and forage, and create an aesthetic visual buffer. Filter strips can be designed and managed in such a way as to provide cover and nesting habitat for a variety of ground-nesting birds, including upland game birds.

Filter strips differ from natural buffers in that they are constructed areas, designed specifically for the purpose of runoff control and pollutant and sediment capture and removal. Filter strips are often be used in conjunction with other BMPs for runoff pretreatment.

BMP 9: Vegetated Filter Strips

Criteria: Filter strips should be strategically located to reduce runoff and increase infiltration and ground water recharge. It is recommended that they be located along the downslope edge of the agricultural land, but as mentioned previously, can also be used around the entire perimeter of a field or on sloping cropland in alternation with strip crops. Filter strips can also be used in conjunction with riparian buffers, often located up-gradient and adjacent to the riparian areas.

Vegetation for filter strips can consist of either a single plant species or mixture of plant species that are adapted to the local soil and climate. The use of native perennial plant species is highly recommended, as they are already adapted to local site conditions, provide longer periods of resource protection, and are best suited for wildlife habitat enhancement. The use of native species can also reduce the need for the use of fertilizers and pesticides. Chosen plant species should also be tolerant to sediment deposition and to any of the chemicals applied to the adjacent cropland. Filter strips should not be used as access roads, and vehicle, equipment, or livestock traffic should be limited and especially avoided when soils are saturated and susceptible to compaction.

Maintenance: Adequate maintenance is essential for filter strips to remain effective. Filter strips should be routinely inspected. Inspections should look for signs of erosion, for bare spots, and for other damage to the vegetation cover. Disturbed areas should be reseeded and repaired as necessary, and any gullies and rills that develop in the vegetated buffer strip should be filled and reseeded. Sediment build up should also be removed and redistributed from the filter strips as needed. In addition, it is recommended that sediment be removed from the top of the strip to maintain sheet flow. If a level spreader is utilized, it should be inspected and removed of sediment accumulation.

Vegetation should be mowed or harvested as needed to encourage dense growth, to maintain ideal growing conditions, and to remove excess nutrients or contaminants that may be contained in the plant tissue. Prescribed burning and prescribed grazing may be used to manage filter strip vegetation when approved and if properly implemented. Noxious weeds and invasive plants should be controlled to sustain the effectiveness of the strip. Fertilizers, pesticides, and herbicides should only be used for maintenance of vegetated filter strips if needed and should be applied in such a manner that does not compromise local water quality. In addition, maintenance activities that result in the disturbance of vegetation, such as mowing, harvesting, or weed control activities, should be conducted with caution to avoid harming any potential residing wildlife.

References: [Filter Strips: Code 393](http://efotg.sc.egov.usda.gov/references/public/WY/Filter_Strip_(AC)_(393)_Standard.pdf). 2005. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Filter_Strip_\(AC\)_\(393\)_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Filter_Strip_(AC)_(393)_Standard.pdf)

[Vegetated Filter Strip](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=76). National Pollutant Discharge Elimination System (NPDES). 2006. U.S. Environmental Protection Agency.
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[Vegetated Filter Strips](http://www.mass.gov/dep/water/laws/v2c2.pdf). *Structural BMP Specifications for the Massachusetts Stormwater Handbook: Chapter 2*. Vol. 2. 17-21.
<http://www.mass.gov/dep/water/laws/v2c2.pdf>

BMP 10: Grassed Swales



Photo of a grassed channel. Source: NRCS

Vegetated channels used to treat and convey runoff at a slow, controlled rate in order to allow time for nutrient absorption and sediment capture.

Water Quality Benefits

Captured sediment is prevented from reaching surface waters

Increased infiltration of runoff

Increased uptake of excess nutrients

Gully erosion prevented

Description:

Grassed swales (a.k.a. grassed channels, grassed waterways, bioswales) are vegetated channels designed to treat and convey stormwater runoff at a slow, controlled rate. Pollutant and sediment removal in grassed channels is primarily accomplished by gravitational settling, filtration through the grass and soil, and infiltration through the subsoil. Grassed swales are often useful when utilized in a series of BMPs as a pretreatment mechanism. Grassed swales differ from filter strips, in that swales are concave, channelized, vegetated systems, whereas filter strips are level-to-gently-sloped vegetated surfaces.

Although vegetation within swales serves to reduce flow velocities, grassed swales should be constructed with a relatively wide, flat bottom to promote slow and even flow rates and to avoid channelization, erosion, and high velocities. Check dams, constructed perpendicular to the direction of flow, can be used within the swale to increase the detention time, allowing for more pollutant removal through settling, filtration, and infiltration. A variation of the grassed swale, referred to as a wet swale, utilizes wetland vegetation to increase pollutant removal. Wet swales are designed to have shallow permanent pools of water at the bottom of the swale that support wetland vegetation. Grassed swales can be designed and managed in such a way as to provide cover and nesting habitat for a variety of ground-nesting birds, including upland game birds.

Criteria:

Grassed swales are applicable in most regions, with the exception of areas with arid climates, where irrigation needs may outweigh benefits, and in areas with extreme cold climates, where ground freezing may decrease effectiveness. When siting a grassed channel, important wildlife habitat and ecological sensitive areas should be avoided and protected. In addition, tall grasses and forbs can be planted along the channel margins to provide wildlife habitat. Grassed waterways should not be used as access roads, and proper equipment and vehicle crossings should be provided to prevent damage. Livestock grazing should also be managed to protect grassed swales.

Vegetation should always be established within the channel as soon as conditions permit and should be protected from erosion using mulching, filter fences, temporary diversion structures, or through other erosion control means until the vegetation is fully established. Waterways should have stable outlets with adequate capacities to prevent ponding or flooding. Vegetation for grassed waterways can consist of either a single

BMP 10: Grassed Swales

Criteria continued: grass species or mixture of plant species that are adapted to the local soil and climate. The use of native perennial grass species is highly recommended, as they are already adapted to local site conditions and effective at pollutant removal. Deep-rooted native grasses can increase swale effectiveness, as deep-roots can increase infiltration rates and stabilize soils. The use of native species can reduce the need for the use of fertilizers and pesticides. Chosen plant species should be tolerant to sediment deposition and to any of the chemicals applied to the adjacent cropland. Grassed channels can also be used in conjunction with vegetated filter strips, with the filter strips lining each side of the channel, to increase pollutant removal efficiency and improve water quality.

Maintenance: Grassed swales can last an indefinite period of time if properly designed and maintained. A maintenance program should be established to maintain waterway capacity, vegetative cover, and outlet stability. When initially establishing vegetation, channels should be protected from concentrated flows and grazing. Established vegetation should be periodically inspected for damage and repaired and re-seeded when necessary. For wet swales, failing wetland plants may also need replacement. Periodic grazing or mowing of the established vegetation may also help improve the grassed channel's function, but livestock can cause soil compaction and damage to swales and should be excluded when possible. Removal of accumulated sediment is also necessary to ensure proper functioning of the grassed waterway.

References: [Grassed Channel \(Biofilter Swale\)](#). *Structural BMP Specifications for the Massachusetts Stormwater Handbook: Chapter 2*. Vol. 2. 73-76.
<http://www.mass.gov/dep/water/laws/v2c2.pdf>

[Grassed Swales](#). National Pollutant Discharge Elimination System (NPDES). 2006. U.S. Environmental Protection Agency.
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=75

[Grassed Waterway: Code 412](#). 2005. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Grassed_Waterway_\(AC\)_412_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Grassed_Waterway_(AC)_412_Standard.pdf)

BMP 11: Riparian Buffer



Photo of a riparian buffer along a creek. Source: NRCS

Established areas of dense vegetation adjacent to natural water bodies, which maintain the integrity of waterways and reduce pollution by preventing stream bank erosion and treating polluted runoff.

Water Quality Benefits

Stabilized stream banks and reduced soil erosion

Sediment and other pollutants filtered and captured

Increased infiltration of runoff and uptake of excess nutrients

Temperature of streams and rivers is lowered by the slowing and cooling runoff and provision of shade

Description:

Riparian buffers are established areas of dense vegetation located adjacent to and up-gradient from natural watercourses, waterbodies, and associated wetlands. Riparian forest buffers are comprised of trees, shrubs, and grasses and are managed to maintain the integrity of the waterways and to reduce nonpoint source pollution. Riparian buffers can be used to maintain or improve water quality by preventing streambank erosion and by reducing sediment, organic material, and nutrient loads. Vegetation can help intercept, filter, slow, and cool runoff, increase soil infiltration rates, and stabilize soils, thereby absorbing nutrients and pesticides and preventing excess sedimentation.

When using riparian buffers as a grazing runoff management practice, locate riparian buffers in areas downslope from pastures to ensure effectiveness. Riparian buffers are often used in conjunction with other nutrient and sediment control best management practices, such as vegetated filter strips, to increase pollutant removal efficiency.

The use of riparian buffers can also provide terrestrial and aquatic wildlife habitat, can provide food and thermal protection for fish and wildlife, and can help lower or maintain water temperatures by creating shade. The creation or maintenance of a riparian buffer can also help restore riparian plant communities, and it is generally recommended that native plant species be utilized or preserved when creating or maintaining a riparian area.

Criteria:

In order to obtain maximum efficiency, riparian forest buffers should be designed and positioned appropriately to accomplish their intended purpose. The buffer width varies with soil type, vegetation cover, and pollutant load amounts, but in general, the minimum width should be at least 35 feet. In addition, an up-gradient filter strip should be installed adjacent to the riparian buffer.

Vegetation for riparian buffers should be carefully selected. Dominant vegetation should consist of existing, native, non-invasive species. The use of native species can also reduce the need for the use of fertilizers and pesticides. Species diversity is also very important and recommended to avoid devastation and loss of function from a species-specific pest.

BMP 11: Riparian Buffer

Criteria continued: Use plant communities that benefit aquatic and terrestrial wildlife and have multiple values. In general, the location, layout, and density of a constructed riparian buffer should complement and mimic natural riparian forests. When the plantings are properly selected and maintained and the practice is used in conjunction with other nutrient and sediment control practices, riparian buffers can be highly effective and low maintenance.

Maintenance: Riparian buffers should be periodically inspected to ensure proper functioning, and any damaged areas should be repaired as necessary. Riparian areas should be protected from activities that can cause adverse impacts such as heavy vehicle, equipment, wildlife, livestock, and pedestrian traffic, concentrated flows, or fire.

Livestock and wildlife should be controlled or excluded from riparian buffer zones, especially when initially being established. Exclusion fencing and proper stream crossings may need to be installed to ensure controlled access of grazing and browsing animals. Vegetation maintenance, such as removing and replacing dead trees or shrubs, weeding, and controlling undesirable vegetation, should be performed until the desired riparian vegetation has fully established itself and the buffer is fully functional. Even after the riparian area has established itself, vegetation maintenance will be periodically necessary to maintain practice efficiency. Fertilizers, pesticides, and herbicides should be applied in such a manner that does not compromise the local water quality.

References: [Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations](#). 2005. EPA 600-R-05-118. U.S. Environmental Protection Agency.

http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=140503

[Riparian Buffer Zone](#). NRCS Planning & Design Manual. Natural Resources Conservation Service.

<ftp://ftp-fc.sc.egov.usda.gov/WSI/UrbanBMPs/streams/bank/riparianzone.pdf>

[Riparian Forest Buffer: Code 391](#). 2010. Natural Resources Conservation Service.

[http://efotg.sc.egov.usda.gov/references/public/WY/Riparian_Forest_Buffer_\(391\)_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Riparian_Forest_Buffer_(391)_Standard.pdf)

[Strategies for Livestock Management in Riparian Areas in New Mexico](#). Baker, T., J. Boren, and C. Allison. 2001. New Mexico State University Cooperative Extension Service Guide B-119.

http://aces.nmsu.edu/pubs/_b/b-119.pdf

[Livestock Grazing on Western Riparian Areas](#). 1990. Northwest Resource Information Center. U.S. Environmental Protection Agency.

http://www.blm.gov/id/st/en/info/publications/livestock_grazing.html

[Guidelines for Managing Cattle Grazing in Riparian Areas to Protect Water Quality: Review of Research and Best Management Practices Policy](#). 1999. Idaho Forest, Wildlife and Range Policy Analysis Group, Idaho Forest, Wildlife and Range Experiment Station, and the University of Idaho.

http://oregonstate.edu/dept/range/sites/default/files/RNG455-555PDFLinks/Mosley_grazing_strategies.pdf

BMP 12: Diversion Structures



Photo of a diversion structure. Source: Coshocton

Channels constructed to intercept and divert slope runoff to a desired location to prevent erosion.

Water Quality Benefits

Decreased runoff and erosion leading to less sediment, nutrients, and other pollutants in nearby surface waters

Improved ability to establish vegetation on slopes

Reduced velocity and volume of runoff

Description: Diversion structures (a.k.a. permanent slope diversions) are typically channels with supporting ridges on the downhill side that are constructed in a manner to intercept and divert slope runoff to a desired location. Diversion structures are generally placed laterally across a slope and are designed to prevent slope erosion by collecting the down-slope runoff and redirecting the runoff to outlets that can convey the water without causing erosion. Slope diversion structures intercept surface runoff water, thereby breaking up the length of the slope and preventing water from proceeding downslope at an increasing volume and velocity. Diversion structures can also be used at the top of a slope to prevent down-slope runoff or at the middle or bottom of a slope to intercept and divert excess slope runoff.

Slope diversions can be very effective for erosion control on steep or long slopes. In addition, their use can help promote the successful establishment of vegetation growing on slopes. Permanent slope diversions are often used on slopes where surface runoff water control and management is needed. Diversion structures can also be used as temporary erosion control measures to divert runoff until permanent management systems can be put in place or until vegetation is able to properly establish itself.

Criteria: Diversion structures have few limitations, can be easily modified, and are applicable in all regions where soils and topography are such that the diversion can be constructed and a suitable outlet is available. Diversion structures can be constructed with vegetated swales as channels, which would additionally promote infiltration along with collecting and conveying slope runoff. However, channels do not have to be vegetated and can be constructed with rock or concrete lining. Hardened channels may be more appropriate in arid climates where vegetated swales may be infeasible due to irrigation needs.

Diversions are not recommended below areas with high sediment loads, due to potential damaging effects of large amounts of accumulated sediment. Each diversion should have a safe and stable outlet that will convey runoff to a point where outflow will not cause damage. Outlets can be grassed waterways, vegetated areas, sediment basins, stable watercourses, or combinations of these practices.

Maintenance: Diversion structures require periodic inspection and maintenance. Frequent inspections should be performed when the diversion structure is first being established, but the demand decreases once stabilized. Established slope diversions should still be inspected regularly, cleared of sediment, and repaired as needed.

BMP 12: Diversion Structures

Maintenance continued:

Accumulated sediment does not always have to be removed, but instead can be redistributed in a way that maintains the capacity of the diversion. Diversion ridge heights and outlet elevations should also be maintained to sustain diversion capacity. If vegetation is utilized, weeding and reseeding may be necessary, and trees and brush should be controlled.

References:

[Diversion: Code 362](http://efotg.sc.gov.usda.gov/references/public/WY/Diversion_(FT)_(362)_Standard.pdf). 2006. Natural Resources Conservation Service.
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[Permanent Slope Diversions](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=33). National Pollutant Discharge Elimination System (NPDES). 2006. U.S. Environmental Protection Agency.
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[Soil Erosion Control: Structural Methods](http://www.metrocouncil.org/environment/Water/BMP/CH3_RPPSoilStructural.pdf). *Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates*. 2001. Prepared by Barr Engineering Co. Prepared for the Metropolitan Council.
http://www.metrocouncil.org/environment/Water/BMP/CH3_RPPSoilStructural.pdf

BMP 13: Ponds



Photo of a farm pond. Source: NRCS

Impoundments filled with water to provide water for livestock or wildlife, to provide aquatic habitat, and to assist with fire control.

Water Quality Benefits

Sediment is captured and not transported downstream

Can provide alternative water sources away from environmentally sensitive riparian areas

Description: Constructed ponds are water impoundments that are made by constructing an embankment or by excavating a pit or dugout. Ponds serve to provide water for livestock and wildlife, provide aquatic habitat, assist with fire control, and help maintain or improve water quality. Ponds can be designed for wildlife habitat as well; considerations include nesting islands, nesting platforms, and maximizing the edge-to-area ratio of the pond.

Criteria: When constructing a pond, owners are responsible for securing all necessary permits, complying with all laws and regulations, and meeting all legal requirements applicable to the installation, operation, and maintenance of the pond and its associated structures. Several factors must be considered when planning, designing, and siting ponds. The topography and geology of the site should permit the provision of a dependable supply of water in the ponds at all times. Soils should be impervious enough to prevent excess seepage losses, and if they are not, some measure should be performed to seal ponds. There are several methods for pond sealing, including but not limited to lining ponds with compacted clay, lining ponds with manufactured synthetic barriers, and lining ponds with compacted soil-dispersant mixtures.

Although site conditions should provide an adequate supply of water in ponds, pond flooding should be prevented. Ponds should be sited and constructed so that storms can safely pass through without flooding. In addition, drainage areas above the ponds should be protected against erosion. Areas adjacent to the pond or other disturbed areas around the pond should be vegetated and seeded shortly after pond construction to prevent erosion. Vegetation placement and selection can assist in maintaining and improving fish and wildlife habitat and species diversity. Natural vegetation should be retained. Excavated topsoil can also be stockpiled to facilitate re-vegetation.

Ponds should be located and constructed in such a way that minimizes the impacts on existing fish and wildlife habitats, and the effects of ponds on downstream flows and downstream water temperatures should also be considered when siting ponds. The effects of short-term construction-related activities on downstream waters should be considered, and measures should be taken to minimize any adverse impacts.

Maintenance: Constructed ponds require operation and maintenance plans. Surrounding vegetation should be maintained, replaced, and reseeded as needed. Disturbed and barren areas around the pond should be seeded and re-vegetated as soon as possible. If pond lining is required, maintenance operations are necessary to prevent or repair damage to the liner. This includes activities such as excluding animals and equipment when initially lining the pond and repairing any damaged, disturbed, or eroded areas. Temporary fencing

BMP 13: Ponds

Maintenance continued:

may be necessary to prevent liner damage and to ensure successful establishment of vegetation. Landowners wishing to stock ponds with fish will first need to obtain a permit from the Wyoming Game and Fish Department.

References:

[Pond: Code 378](http://efotg.sc.egov.usda.gov/references/public/WY/Pond_(NO)_378_Standard.pdf). 2012. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Pond_\(NO\)_378_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Pond_(NO)_378_Standard.pdf)

[Pond Sealing or Lining Flexible Membrane: Code 521A](http://efotg.sc.egov.usda.gov/references/public/WY/Pond_Sealing_or_Lining_Flexible_Membrane_(NO)_521A_Standard.pdf). 2008. Natural Resources Conservation Service.
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[Pond Sealing or Lining Soil Dispersant Treatment: Code 521B](http://efotg.sc.egov.usda.gov/references/public/WY/Pond_Sealing_or_Lining_Soil_Dispersant_(NO)_521B_Standard.pdf). 2012. Natural Resources Conservation Service.
[http://efotg.sc.egov.usda.gov/references/public/WY/Pond_Sealing_or_Lining_Soil_Dispersant_\(NO\)_521B_Standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Pond_Sealing_or_Lining_Soil_Dispersant_(NO)_521B_Standard.pdf)

[Pond Sealing or Lining Bentonite Sealant: Code 521C](http://efotg.sc.egov.usda.gov/references/public/WY/Pond_Sealing_or_Lining_Bentonite_Sealant_(NO)_521C_Standard.pdf). 2012. Natural Resources Conservation Service.
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BMP 14: Windbreaks



Photo of a multi-row windbreak. Source: NRCS

Rows of vegetation or constructed structures used to obstruct and slow wind to reduce soil erosion.

Water Quality Benefits

Reduced wind erosion reduces amount of sediment deposited in surface waters

Stabilized soils reduce sediment transport in runoff

Description:

Windbreaks or shelterbelts are single or multiple rows of trees or shrubs in linear configurations that help with dust control by obstructing and slowing the wind near the ground and preventing soil from blowing off site. Windbreaks can help improve water quality and air quality. By preventing wind erosion, windbreaks can reduce the transport of sediment and its associated pollutants and can thereby improve local water quality. In addition, the practice can improve air quality by reducing and intercepting amount of harmful airborne particulates, chemicals, and odors introduced to the atmosphere. Windbreaks can also help protect agricultural operations from damage caused by high winds and wind borne particles. Windbreaks can also benefit wildlife by providing nesting habitat; resting, feeding, and security areas; and habitat that meets cover needs during winter. Design of windbreaks should consider both plant species and configuration.

Vegetated windbreaks can help with managing stormwater runoff by stabilizing soils, slowing runoff, promoting infiltration, and providing some pollutant removal capabilities. Windbreaks can provide other benefits, such as managing snow deposition, improving irrigation efficiency, increasing carbon storage in biomass and soils, and enhancing aesthetics. Wood board fences and straw bales can also function as wind barriers, but function primarily only to obstruct wind born erosion and manage snow deposition.

Criteria:

Windbreaks can be applied on any lands that require protection against wind erosion and wind damage. Plant species used for windbreaks and shelterbelts should be adapted to the local soils, climate, and site conditions. Native species are the most ideal, as they are already adapted to the local conditions. The use of native species can also reduce the need for the use of fertilizers and pesticides. Planting should be done at a time and manner that ensures the survival and growth of the selected species. The installation of temporary wind control measures may be necessary to protect and ensure initial vegetation establishment and to provide supplemental wind erosion control.

It is also recommended that a diverse variety of species be provided to ensure that a species-specific pest does not cause the complete loss of function of the windbreak. Plant species selection can be tailored to provide additional benefits; for example, if the provision of wildlife habitat is valued, the establishment of plant species that benefit targeted wildlife species should be considered, and if aesthetics are valued, the establishment of evergreen species or other visually pleasing plant species should be considered. Selected plant species should not compete with any adjacent crops for resources and should have minimal adverse effects on adjacent crops and croplands.

BMP 14: Windbreaks

Criteria continued: To improve their overall efficiency, windbreaks and shelterbelts should be oriented as close to perpendicular as possible to the oncoming winds and snow bearing winds.

Windbreaks should not interfere with the operation of irrigation systems, but can sometimes be designed to help improve irrigation efficiency. For example, windbreaks with vegetation taller than the spray height of a sprinkler irrigation system can help improve the irrigation system's efficiency by blocking overspray. In addition, if using windbreaks to provide shelter for livestock, the direction of drainage of runoff from rainfall and snowmelt should be considered. The drainage from snowmelt from the windbreak should also not flow across the livestock area, and the drainage of animal waste from the livestock area should not flow into the windbreak.

Maintenance: Windbreaks should be periodically inspected, maintained, and repaired to ensure proper functioning. Vegetated windbreaks should be protected from activities that can cause adverse impacts, such as heavy vehicle, equipment, livestock, wildlife, or pedestrian traffic, concentrated flows, and fire.

Vegetation maintenance, such as providing supplemental water, thinning and pruning, removing and replacing dead trees or shrubs, and controlling undesirable vegetation, should be periodically performed until the desired vegetation has fully established itself and the windbreak is fully functional. Fertilizers, pesticides, and herbicides should be applied in such a way that does not compromise the local water quality. Other barrier structures, such as fences, should also be annually inspected for damage and repaired or replaced as necessary.

References: [Dust Control: BMP 7](http://www.deq.idaho.gov/media/616476-7.pdf). *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2: Erosion and Sediment Controls; Section 4*. 2005. Idaho Department of Environmental Quality Water Quality Division. 38-40.
<http://www.deq.idaho.gov/media/616476-7.pdf>

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[http://efotg.sc.egov.usda.gov/references/public/WY/Windbreak-Shelterbelt_Establishment_\(380\)_WY_standard.pdf](http://efotg.sc.egov.usda.gov/references/public/WY/Windbreak-Shelterbelt_Establishment_(380)_WY_standard.pdf)

[Principles of Wind Erosion and its Control](http://www.ars.usda.gov/SP2UserFiles/Place/54300520/419PrinciplesofWinderosionanditscontrol.pdf). Presley, D. and J. Tatarko. 2009. Kansas State University Agricultural Experiment Station and Cooperative Extension Service Publication MF-2860.
<http://www.ars.usda.gov/SP2UserFiles/Place/54300520/419PrinciplesofWinderosionanditscontrol.pdf>

BMP 15: General Wildlife Grazing Management



Photo Source: Wyoming Game and Fish Department

Management of grazing impacts from wildlife to sustainably achieve desired population levels, maintain adequate habitat, and achieve conservation objectives.

Water Quality Benefits

Reduced soil erosion and stabilized stream banks

Riparian areas protected

Reduced nutrient and fecal contamination of water resources

Description:

Managing grazing impacts from wildlife involves the manipulation of animal grazing to achieve desired populations levels and conservation objectives. Grazing should be managed to provide a continuous supply of forage to grazing animals, achieve desired economic results, and conserve natural resources, including vegetation, soil, and water resources. Grazing management should sustainably maintain the productive potential of the pasture or rangeland. In regards to the water quality of nearby waterbodies affected by grazing activity, this practice involves managing forage harvest by all grazing animals at a sustainable yield that does not accelerate erosion and sedimentation above acceptable levels.

To provide for a sustained level of vegetation diversity and productivity, it is necessary to know the demand and seasons of wildlife use of forage and browse. The numbers of all grazing animals should be maintained in balance with their habitat. Maintaining adequate habitat for the desired wildlife objective levels is the preferred solution to providing wildlife forage needs. The establishment of watering sites and cover may encourage better distribution, and vegetation management, prescribed burning, and range seeding may also alter the distribution of grazing wildlife. Harvest rates and predator populations will also affect population abundance and distribution.

It is believed that properly designed grazing management systems have the potential to be beneficial for both livestock and wildlife. Grazing systems designed to be beneficial for livestock can also be beneficial for wildlife, while poor grazing management negatively affects both livestock production and the ability to support wildlife populations.

Wildlife species differ in their habitat needs, and different grazing management strategies will benefit different wildlife species. When designing a grazing management strategy with a wildlife management objective, the year-round habitat and forage requirements for the desired species should be considered, and the plant community dynamics should be understood. Changing habitat to benefit one species could negatively impact available habitat for other species. However, in general, Wyoming's extensive grazed rangelands are important habitat for many wildlife species, and management systems that promote sustainable and diverse native vegetation will in turn support diverse and quality habitat for wildlife. In addition, preservation and restoration of riparian areas is critical to maintaining wildlife habitat.

BMP 15: General Wildlife Grazing Management

Criteria: All habitats must be monitored and evaluated continually, and grazing adjusted as required. Care must be taken to maintain a long-term perspective for watershed protection and production.

Wildlife is the property of the State of Wyoming and is managed by the Wyoming Game and Fish Department (WGFD). Many wildlife management activities are restricted by law and require either permits or approval from the WGFD. The WGFD should be consulted before any wildlife management projects are undertaken. Wyoming Weed and Pest Districts should be contacted for assistance in management of animals designated as pests per Wyoming State Statutes 11-5-102 (a)(xii).

References: [Cover: Its Importance to Wyoming's Wildlife.](#) Olson, R. 1992. University of Wyoming Cooperative Extension Bulletin B-967.
<http://www.wyomingextension.org/agpubs/pubs/B967R.pdf>

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[Mule Deer Habitat Requirements and Management in Wyoming.](#) Olson, R. 1992. University of Wyoming Cooperative Extension Bulletin B-965.
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[White-Tailed Deer Habitat Requirements and Management in Wyoming.](#) Olson, R. 1992. University of Wyoming Cooperative Extension Bulletin B-964.
<http://www.wyomingextension.org/agpubs/pubs/B964R.pdf>

[Livestock grazing and wildlife: developing compatibilities.](#) Vavra, M. 2005. Rangeland Ecology and Management 58(2), pp. 128-134.
http://ckwri.tamuk.edu/fileadmin/user_upload/PHOTOS/Deer-Research_Program/Student_papers/Livestock_grazing_and_wildlife_1.pdf

[Using Proper Grazing Techniques Can Benefit Both Wildlife and Livestock.](#) Woodward, J. Wyoming Game and Fish Department Habitat Extension Biologist—Gillette. June 2007.
http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/HABITAT_PROPERGRAZING0000341.pdf

[Improving Streamside Wildlife Habitats.](#) Reprinted March 1999. Wyoming Game and Fish Department Habitat Extension Bulletin No. 9.
http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/BULLETIN_NO90001762.pdf

[Wyoming Game and Fish Habitat Extension Bulletins Website.](#) Maintained by the Wyoming Game and Fish Department.
<http://gf.state.wy.us/web2011/wildlife-1000616.aspx>

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BMP 15: General Wildlife Grazing Management

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[Feeding the Wild: Using proper grazing techniques can benefit both wildlife and livestock](http://gf.state.wy.us/habitat/TerrestrialHome/InformationAndEducationArticles/Using%20proper%20grazing%20techniques%20can%20benefit%20both%20wildlife%20&%20livestock_07June_Woodward.pdf). 2007. Wyoming Wildlife. 43.
http://gf.state.wy.us/habitat/TerrestrialHome/InformationAndEducationArticles/Using%20proper%20grazing%20techniques%20can%20benefit%20both%20wildlife%20&%20livestock_07June_Woodward.pdf

BMP 16: Wild Horse Management



Photo Source: Bureau of Land Management

Management of wild horse herds to sustainably achieve desired population levels and conservation objectives.

Water Quality Benefits

Reduced soil erosion and stabilized stream banks

Riparian areas protected

Reduced nutrient and fecal contamination of water resources

Description:

Wild horses are unbranded, unclaimed, free-roaming horses found on public lands in the United States. Wild horses have descended from domesticated horses that escaped or were released by human explorers or inhabitants since the 1600s. The BLM estimates that there are currently approximately 5,000 wild horses in Wyoming, located primarily in the southwestern part of the state near Rock Springs and Rawlins, with additional populations near Lander, Worland, and Cody. With no natural predators and a 20 percent growth rate per year, wild horse populations have the potential to increase rapidly. Overpopulated herds of wild horses can cause significant environmental damage to the rangelands they inhabit, including overgrazing, trampled stream banks, and degraded riparian conditions. Deteriorated range conditions, in turn, negatively impact the health of wild horses as well as the livestock and wildlife that are also dependent on healthy, productive rangelands and riparian areas for forage and/or habitat.

Wild horses on public lands administered by the BLM are managed by BLM in accordance with the Wild Free-Roaming Horse and Burro Act of 1971. This Act establishes that the BLM is responsible for protection, management, and control of wild horses and directs that the horses be maintained in an ecological balance with livestock, wildlife, and habitat. Herd management areas are monitored by BLM to determine Appropriate Management Levels (AMLs) – the point at which wild horse and burro herd populations are consistent with the land’s capacity to support them. Determinations of AMLs are based on climate data, precipitation, vegetation, and grazing utilization by horses, cattle, sheep, and big game. The BLM maintains rangeland health and ensures sustained vegetation production by removing wild horses from public lands and by balancing the numbers of all grazing animals with their habitat.

Criteria:

As with livestock and wildlife, wild horses should be managed such that plant cover and community composition are maintained and erosion and sedimentation are not accelerated above acceptable levels for waterbodies within herd management areas. Management must be based on accurate carrying capacity numbers and an understanding of habitats used, the seasons of use, forage requirements, terrain, and water needs. Riparian areas can be fenced to prevent wild horse access with upland, off-creek water sources established to provide alternative water sources for wild horses.

Wild horses are the property of the federal government and are managed by the BLM. Wild horse management activities are restricted by law and are limited to implementation by the BLM. The BLM should be consulted before any wild horse management actions are undertaken.

BMP 16: Wild Horse Management

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http://www.blm.gov/wy/st/en/programs/Wild_Horses.html

Appendix A: Animal Feeding Operations (AFOs) versus Concentrated Animal Feeding Operations (CAFOs)

In animal feeding operations (AFOs), animals are confined in a small land area where feed is brought to them rather than the animals grazing or seeking feed in an open area, such as in a rangeland or an open pasture. Potential sources of water quality pollution from AFOs include urine, manure, feed, and dead animals. An operation is considered an AFO if the animals are confined for at least 45 days in a 12-month period and there is an absence of grass or other vegetation in the confinement area during the normal growing season.

The United States Environmental Protection Agency (EPA) has set criteria to further designate certain AFOs as Concentrated Animal Feeding Operations (CAFOs), for which a point source discharge permit is required under the Wyoming Pollutant Discharge Elimination System (WYPDES) Program. These criteria were established as a federal rule in the February 12, 2003 Federal Register and are primarily based on the number of animal units contained in the AFO. Depending on the number of animal units, the facility is designated as a large, medium, or small CAFO. For example, AFOs that confine at least 1,000 cattle or cow-calf pairs are designated as Large CAFOs. Facilities designated as Large CAFOs require a WYPDES permit. Facilities that, based on animal units, qualify as a Medium CAFO require WYPDES permit coverage if they have either a manmade ditch or pipe that carries manure or wastewater to surface waters or have surface water that the animals come into contact because it passes through the confinement area. Facilities that, based on animal units, are designated as Small CAFOs are required to obtain a permit on a case-by-case basis by the permitting authority.

Grazing activities covered under a WYPDES permit or another regulatory mechanism are not eligible for Section 319 funding. Addressing potential pollution sources from AFOs remains voluntary and incentive-based. Producers with AFOs can voluntarily address potential water quality problems through adoption of appropriate BMPs and development of comprehensive nutrient management plans. The Wyoming Nonpoint Source Program has helped provide financial assistance to producers for AFO remediation through cost-share projects.

For assistance with distinguishing between AFOs and CAFOs, please contact the Wyoming Department of Environmental Quality at 307-777-7781 or refer to the following website:

[WYPDES Concentrated Animal Feeding Operations](http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_CAFO/CAFO.htm). Wyoming Department of Environment Quality.
http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_CAFO/CAFO.htm

Appendix B: State and Federal Agency Resources for Regulatory Requirements

The following lists some common state and federal regulatory requirements, such as permits, that may need to be considered as part of BMP implementation. This list is not intended to be comprehensive and additional local permits or regulations may also apply. Please contact the appropriate government agency for more information. Your local NRCS and/or conservation district may also be able to assist with understanding regulatory requirements associated with BMP implementation (see also Appendix C).

Permit/ Regulation	Description	Agency	Contact and Website
WYPDES permits for Concentrated Animal Feeding Operations	Surface water discharge permits required for animal feeding operations that qualify as Concentrated Animal Feeding Operations (CAFOs); see Appendix A .	Wyoming Department of Environmental Quality, Water Quality Division, WYPDES Program	John Deutscher 307-675-5635 http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_CAFO/CAFO.htm
WYPDES Storm Water Permits	Some activities require WYPDES permits for storm water discharge, including runoff from large and small construction sites.	Wyoming Department of Environmental Quality, Water Quality Division, WYPDES Program	Barb Sahl 307-777-7570 http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_Storm_Water/stormwater.asp
Temporary Turbidity Waivers	Waiver to authorize temporary increases in turbidity for certain short-term, construction-related activities. Projects working in live waters and activities that may cause an excursion above allowable turbidity levels may qualify for a turbidity waiver.	Wyoming Department of Environmental Quality, Water Quality Division, Watershed Protection Program	Jeff Clark 307-777-6891 http://deq.state.wy.us/wqd/watershed/index.asp#Assure
Clean Water Act Section 404 permits	Any person, firm, or agency (including Federal, state, and local government agencies) planning to work in navigable waters of the United States, or discharge dredged or fill material in waters of the United States, including wetlands, must first obtain a permit from the Corps of Engineers.	United States Army Corps Engineers, Wyoming Regulatory Office	Matt Bilodeau 307-777-772-2300 http://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm
Section 401 Certifications	The WDEQ Water Quality Division reviews and issues water quality certifications under Section 401 of the Clean Water Act. Section 401 water quality certification is required for	Wyoming Department of Environmental Quality, Water Quality Division, Watershed Protection Program	Jeremy ZumBerge 307-675-5638 http://deq.state.wy.us/wqd/watershed/index.asp#401_Certification

Permit/ Regulation	Description	Agency	Contact and Website
	any federal license or permit which may result in a fill or discharge into waters of the United States (see Section 404 permits).		
Surface Water Rights Permits	Permits for any request for putting surface waters of the state to a beneficial use: includes transporting water through ditch or pipelines, storage in reservoirs, storage in smaller reservoir facilities for stockwater or wildlife purposes, and enlargements to existing ditch or storage facilities, and for instream flow purposes.	Wyoming State Engineer's Office	John Barnes 307-777-6475 http://seo.state.wy.us/SW/index.aspx
Ground Water Rights Permits	A permit is required from the State Engineer's Office prior to the drilling of all water wells; ground water rights are issued for the same beneficial uses as for surface water rights.	Wyoming State Engineer's Office	Lisa Lindemann 307-777-6163 http://seo.state.wy.us/GW/index.aspx
Pesticide Certification	Training, licensing, certification, and/or inspection of pesticide users, dealers, commercial applicators, and public agencies using restricted use pesticides.	Wyoming Department of Agriculture	Slade Franklin 307-777-6585 http://wyagric.state.wy.us/divisions/ts/sections-a-programs/148
Open Burn and Smoke Management	Vegetative and non-vegetative burns may require a permit and/or registration with the WDEQ Air Quality Division.	Wyoming Department of Environmental Quality, Air Quality Division	Brian Bohlmann 307-777-6993 http://deq.state.wy.us/aqd/Smoke%20Management%20and%20Open%20Burning.asp
Private Fish Plant Application	Permits are required prior to stocking private ponds with fish.	Wyoming Game and Fish Department, Fish Division	Tina Walker 307-777-4559 http://wgfd.wyo.gov/web2011/fishing-1000194.aspx

Appendix C: Sources of BMP Technical Assistance and Contact Information

[Bureau of Land Management--Wyoming](#)

5353 Yellowstone
Cheyenne, WY 82009
Phone: (307) 775-6256
Fax: (307) 775-6129
Website: <http://www.blm.gov/wy/st/en.html>

[United States Fish and Wildlife Service—Mountain-Prairie Region](#)

134 Union Blvd
Lakewood, Colorado 80228
Phone: (303) 236-7905
Website: <http://www.fws.gov/mountain-prairie/index.html>

[United States Forest Service—Rocky Mountain Region](#)

740 Simms Street
Golden, CO 80401
Phone: (303) 275-5350
Website: <http://www.fs.usda.gov/r2>

[University of Wyoming Cooperative Extension Service](#)

Department 3354
1000 East University Avenue
Laramie, WY 82071
Phone: (307) 766-5124
Website: <http://www.uwyo.edu/ces>

[University of Wyoming College of Agriculture and Natural Resources](#)

Department 3354
1000 East University Avenue
Laramie, WY 82071
Phone: (307) 766-4133
Website: <http://www.uwyo.edu/uwag/>

[Wyoming Association of Conservation Districts](#)

517 E. 19th Street
Cheyenne, WY 82001
Phone: (307) 632-5716
Fax: (307) 638-4099
Website: <http://www.conservewy.com/>

[Wyoming Department of Agriculture](#)

2219 Carey Avenue
Cheyenne, WY 82002
Phone: (307) 777-7321
Fax: (307) 777-6593
Website: <http://wyagric.state.wy.us>

[Wyoming Game and Fish Department](#)

5400 Bishop Blvd.
Cheyenne, WY 82006
Phone: (307) 777-4600
Website: <http://wgfd.wyo.gov/web2011/home.aspx>

[Wyoming NRCS State Office](#)

P.O. Box 33124
100 East B Street, 3rd Floor
Casper, WY 82602-5011
Phone: (307) 233-6750
Fax (mailroom): (307) 233-6795
Fax (Admin): (307) 233-6783
Fax (Front Office): (307) 233-6753
Website: <http://www.wy.nrcs.usda.gov>

[NRCS Field Offices](#)

East Area NRCS Office
911 South Wind River Drive
Douglas, Wyoming 82633
Phone: (307) 358-3050, ext. 5
Fax: (307) 358-5719

West Area NRCS Office
508 N. Broadway Ave.
Riverton, Wyoming 82501-3458
Phone: (307) 856-7524
Fax: (307) 856-2383

Afton NRCS Field Office (West)
P.O. Box 1606
625 Washington Street, Room C
Afton, Wyoming 83110
Phone: (307) 886-9001
Fax: (307) 886-3744

Baggs NRCS District Office (East)
P.O. Box 217
285 North Penland Street
Baggs, Wyoming 82321-0217
Phone: (307) 383-2550
Fax: (307) 383-7861

Buffalo NRCS Field Office (East)
621 West Fetterman
Buffalo, Wyoming 82834-2342
Phone: (307) 684-2526
Fax: (307) 684-5972

Casper NRCS Field Office (East)
5880 Enterprise Drive, Suite 100
Casper, Wyoming 82609
Phone: (307) 261-5436 or (307) 261-5402
Fax: (307) 261-5435

NRCS Field Offices Continued

Cheyenne NRCS Field Office (East)
11221 East Highway 30
Cheyenne, Wyoming 82009
Phone: (307) 772-2314
Fax: (307) 772-2120

Cokeville NRCS District Office (West)
P.O. Box 98
110 Pine Street, Cokeville Town Hall, Room 1
Cokeville, Wyoming 83114-0098
Phone: (307) 279-3256
Fax: (307) 279-3024

Douglas NRCS Field Office (East)
911 South Wind River Drive
Douglas, Wyoming 82633
Phone: (307) 358-3050
Fax: (307) 358-5719

Dubois NRCS Field Office (West)
P.O. Box 27
706 Meckem Street
Dubois, Wyoming 82513-0027
Phone: (307) 455-2388
Fax: (307) 455-3098

Fort Washakie NRCS Field Office (West)
P.O. Box 127
Ft. Washakie, Wyoming 82514-0127
Phone: (307) 332-9636

Gillette NRCS Field Office (East)
601 4J Court, Suite C
Gillette, Wyoming 82716
Phone: (307) 682-8843
Fax: (307) 682-3813

Greybull NRCS Field Office (West)
408 Greybull Avenue
Greybull, Wyoming 82426-2036
Phone: (307) 765-2483
Fax: (307) 765-9243

Kaycee NRCS District Office (East)
P.O. Box 48 (350 Nolan Avenue)
Kaycee, Wyoming 82639-9900
Phone: (307) 738-2321

Lander Quiet Presence NRCS Office (West)
221 South 2nd Street
Lander, Wyoming 82520-2801
Phone: (307) 332-3114
Fax: (307) 332-3154

Laramie NRCS Field Office (East)
5015 Stone Road
Laramie, Wyoming 82072
Phone: (307) 745-3698
Fax: (307) 745-6764

Lovell NRCS District Office (West)
359 Nevada Avenue
Lovell, Wyoming 82431-2007
(307) 548-7422
FAX (307) 548-7422

Lusk NRCS Field Office (East)
P.O. Box 659 (905 South Main, Suite 120)
Lusk, Wyoming 82225-0659
Phone: (307) 334-2953
Fax: (307) 334-3539

Lyman NRCS Field Office (West)
P.O. Box 370
100 East Sage Street
Lyman, Wyoming 82937-0370
Phone: (307) 787-3211
Fax: (307) 787-3810

Medicine Bow NRCS District Office (East)
P.O. Box 6
510 Utah
Medicine Bow, Wyoming 82329-0006
Phone: (307) 379-2542

Newcastle NRCS Field Office (East)
1225 Washington Boulevard, Suite 3
Newcastle, Wyoming 82701-2930
Phone: (307) 746-3264
Fax: (307) 746-2870

Pinedale NRCS Field Office (West)
P.O. Box 36 (1625 W Pine)
Pinedale, Wyoming 82941-0036
Phone: (307) 367-2257
Fax: (307) 367-2282

Powell NRCS Field Office (West)
1017 Highway 14A
Powell, Wyoming 82435
Phone: (307) 754-9301
Fax: (307) 754-2761

Riverton NRCS Field Office (West)
508 N. Broadway Ave.
Riverton, Wyoming 82501-3458
Phone: (307) 856-7524
Fax: (307) 856-2383

Rock Springs NRCS Field Office (West)
Gateway Office Bldg.
79 Winston Drive, Suite 110
Rock Springs, Wyoming 82901
Phone: (307) 362-3062
Fax: (307) 362-1459

Saratoga NRCS Field Office (East)
P.O. Box 607
101 Cypress
Saratoga, Wyoming 82331
Phone: (307) 326-5657
Fax: (307) 326-8572

Sheridan NRCS Field Office (East)
1949 Sugarland Drive, Suite 102
Sheridan, Wyoming 82801-5720
Phone: (307) 672-5820
Fax: (307) 672-0052

Sundance NRCS Field Office (East)
P.O. Box 1070
117 S. 21st
Sundance, Wyoming 82729-1070
Phone: (307) 283-2870
Fax: (307) 283-2170

Thermopolis NRCS Field Office (West)
601 Broadway, Suite A
Thermopolis, Wyoming 82443
Phone: (307) 864-3488
Fax: (307) 864-4167

Torrington NRCS Field Office (East)
1441 East M Street, Suite B
Torrington, Wyoming 82240-3521
Phone: (307) 532-4880
Fax: (307) 532-5783

Wheatland NRCS Field Office (East)
1502 Progress Ct.
Wheatland, Wyoming 82201-3211
Phone: (307) 322-9060
Fax: (307) 322-4109

Worland NRCS Field Office (West)
208 Shiloh Road
Worland, Wyoming 82401
Phone: (307) 347-2456
Fax: (307) 347-8806

Wyoming Conservation Districts

Campbell County Conservation District
PO Box 2577
601 4J Ct, Suite D
Gillette, WY 82717
307-682-1824 (phone) 307-682-3813 (fax)
www.cccdwy.net
icd@vcn.com

Cody Conservation District
1145 Sheridan Ave, Suite 5
Cody, WY 82414
307-899-0037
codycd@bresnan.net

Converse County Natural Resource District
911 Windriver Drive
Douglas, WY 82633
307-358-3050
michelle.huntington@wy.nacdnet.net
www.conserveconverse.org

Crook County Natural Resource District
PO Box 1070
117 S. 21st Street
Sundance, WY 82729
307-283-2501
sdm.mason@gmail.com
www.ccnrd.org

Dubois-Crowheart Conservation District
PO Box 27
706 Meckem Street
Dubois, WY 82513
307-455-2388
dccd@dteworld.com

Hot Springs Conservation District
601 Broadway, Suite A
Thermopolis, WY 82443
307-864-3488
carla.thomas@wy.nacdnet.net
www.conservewy.com/hscd.html

Lake DeSmet Conservation District
621 West Fetterman
Buffalo, WY 82834
307-684-2526
nikki.lohse@wy.nacdnet.net
www.ldcd.org

Laramie County Conservation District
11221 US Highway 30
Cheyenne, WY 82009
307-772-2600
info@lccdnet.org
www.lccdnet.org

Laramie Rivers Conservation District
5015 Stone Road
Laramie, WY 82070
307-721-0072
tony.hoch@wy.nacdnet.net
www.LRCD.net

Lincoln Conservation District
PO Box 98
110 Pine Street
Cokeville, WY 83114
307-279-3256
brenda.lazcanotegui@wy.nacdnet.net
www.lincolnconservationdistrict.org

Lingle-Fort Laramie Conservation District
1441 East M, Suite B
Torrington, WY 82240
307-532-4880
nancy.borton@wy.nacdnet.net
www.goshencountyconservationdistricts.com

Little Snake River Conservation District
PO Box 355
285 North Penland Street
Baggs, WY 82321
307-383-7860
lsrcd@yahoo.com

Lower Wind River Conservation District
508 N. Broadway
Riverton, WY 82501
307-856-7524
cathy.meyer@wy.nacdnet.net

Medicine Bow Conservation District
PO Box 6
510 Utah Street
Medicine Bow, WY 82324
307-379-2221
todd@medbowcd.org
www.medbowcd.org

Meeteetse Conservation District
PO Box 237
2103 State Street
Meeteetse, WY 82433
307-868-2484
mcd@tctwest.net
www.meeteetsecd-wy.gov

Natrona County Conservation District
5880 Enterprise Drive, Suite 100
Casper, WY 82609
307-234-4022
lisa.ogden@wy.nacdnet.net
www.natronacountyconservationdistrict.com

Niobrara Conservation District
PO Box 659
Lusk, WY 82225
307-334-2953
lshaw@wyoming.com
North Platte Valley Conservation District
1441 East M, Suite B
Torrington, WY 82240
307-532-4880
nancy.borton@wy.nacdnet.net
www.goshencountyconservationdistricts.com

Platte County Resource District
1502 Progress Court
Wheatland, WY 82201
307-322-9060
brady.irvine@wy.nacdnet.net
www.conservewy.com/pcrd.html

Popo Agie Conservation District
221 S. 2nd Street
Lander, WY 82520
307-332-3114
pacd@wyoming.com
www.popoagie.org

Powder River Conservation District
PO Box 48
Kaycee, WY 82639
307-738-2321
anita.bartlett@wy.nacdnet.net
www.powderrivercd.org

Powell-Clarks Fork Conservation District
1017 Highway 14A
Powell, WY 82435
307-754-9301
ann.trosper@wy.nacdnet.net
www.pcfcd.org

Saratoga-Encampment-Rawlins Conservation District
PO Box 633
101 Cypress Avenue
Saratoga, WY 82331
307-326-8156
jarrunner@gmail.com
www.sercd.org

Sheridan County Conservation District
1949 Sugarland Drive, Suite 102
Sheridan, WY 82801
307-672-5820
carrie.rogaczewski@wy.nacdnet.net
www.sccdofwyo.org/

Shoshone Conservation District
359 Nevada Avenue
Lovell, WY 82431
307-548-7422
shoshonecd@tctwest.net

South Big Horn Conservation District
408 Greybull Avenue
Greybull, WY 82426
307-765-2483
janet.hallsted@wy.nacdnet.net
www.conservewy.com/sbhcd

South Goshen Conservation District
1441 East M, Suite B
Torrington, WY 82240
307-532-4880
nancy.borton@wy.nacdnet.net
www.goshencountyconservationdistricts.com

Star Valley Conservation District
PO Box 216
61 E. 5th Avenue
Afton, WY 83110
307-885-7823
bashworth@starvalleycd.org
www.starvalleycd.org

Sublette County Conservation District
PO Box 647
1625 W. Pine Street
Pinedale, WY 82941
307-367-2257
sccd@wy.nacdnet.net
www.sublettecountycd.com

Sweetwater County Conservation District
79 Winston Drive, Suite 110
Rock Springs, WY 82901
307-362-3062
admin@swccd.us
www.swccd.us

Teton Conservation District
PO Box 1070
420 W. Pearl Avenue
Jackson, WY 83001
307-733-2110
randy@tetonconservation.org
www.tetonconservation.org

Uinta County Conservation District
PO Box 370
100 East Sage Street
Lyman, WY 82937
307-787-3794
ksabey@bvea.net
www.uintacountycd.com

Washakie County Conservation District
208 Shiloh Road
Worland, WY 82401
307-347-2456
wccd@rtconnect.net
www.washakiecd.com

Weston County Natural Resource District
1225 Washington Boulevard, #3
Newcastle, WY 82701
307-746-3264
jennifer.hinkhouse@wy.nacdnet.net

Appendix D: Glossary

access roads: Travel-ways that provide fixed routes for vehicular travel necessary for resource activities involved in the management of cropland, wildlife, livestock, and other conservation enterprises. All access roads should be sited, designed, and constructed in such a way that minimizes erosion and sedimentation and protects adjacent soil, water, wildlife, and other natural resources.

alternative water sources and shade: The practice of providing off-stream watering areas and alternative shade areas as a way to reduce the degradation of natural riparian areas and natural water bodies. By providing shade or drinking water for livestock or wildlife in locations away from natural riparian areas, the amount of time that grazing and browsing animals spend near the natural streams and riparian zones can be reduced; thereby, reducing streambank disturbance and reducing direct deposition of animal waste into natural water bodies.

best management practice: A practice or combination of practices that are determined by a state or designated area wide planning agency to be the most effective and practicable (including technological, economic, and institutional considerations) means of controlling nonpoint pollutants at levels compatible with environmental quality goals. Abbr. BMP.

browse: (n) That part of leaf and twig growth of shrubs, woody vines and trees available for animal consumption. (v) To consume browse.

brush: Half shrubs, shrubs, or small trees that occur on sites where they are not a part of the potential natural (climax) plant community, or where they are indigenous but occur in amounts significantly exceeding that which is normal for the site.

carbon sequestration: The biological process of removing of carbon dioxide from the atmosphere and depositing and storing it in soils or in plants.

carrying capacity: (1) The number of individuals that can be supported in an area. (2) The maximum stocking rate possible without inducing damage to vegetation or related resources. It may vary from year to year on the same area due to fluctuating forage production.

chemical treatment: Method of controlling pest organisms or undesirable vegetation by means of chemicals such as herbicides and pesticides.

chiseling: Breaking or loosening the soil, without inversion, with a chisel cultivator or chisel plow. A practice used in grasslands having rhizomatous species.

composting: The process of controlled and accelerated aerobic biodegradation and stabilization of organic waste.

cover: (1) Plant cover in this document refers to the combined aerial parts of plants, plant residue or stubble, and mulch providing coverage and protection for soil. (2) Shelter and protection for animals and birds.

deferment: Delay or discontinuance of livestock grazing on an area for an adequate time period to provide for plant reproduction, establishment of new plants, or restoration of vigor of existing plants.

designated pests: Per Wyoming State Statutes 11-5-102 (a)(xii), "designated pest" means any animal or insect species that is determined to be detrimental to the health or general welfare of the state based upon the following: (A) has demonstrated the ability to aggressively invade native plant communities and agricultural crops; (B) is injurious or poisonous to livestock; (C) is a carrier of disease or parasites; (D) can, by virtue of either its direct or indirect effect, negatively impact management of agricultural or natural ecosystems.

deteriorated range: Range on which present vegetation and soil conditions represent a significant departure from natural potential.

diversions: Channels with supporting ridges on the downhill side that are constructed in a manner to intercept and divert slope runoff to a desired location. Diversion structures are generally placed laterally across a slope and are designed to prevent slope erosion by collecting the down-slope runoff and redirecting the runoff to outlets that can convey the water without causing erosion.

erosion: (1) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. (2) Detachment and movement of soil or rock fragments by water, wind, ice or gravity.

forage: (n) All browse and herbaceous foods that are available to grazing animals. It may be grazed or harvested for

feeding: (v) Act of consuming forage. *graze/grazing:* The consumption of any kind of standing vegetation by domestic livestock or wildlife.

fencing: The practice of enclosing, dividing, or controlling access to an area of land with a constructed structure that acts as a barrier to livestock. Fencing can help achieve conservation objectives by providing a means to control and direct the movement of animals.

geotextile: Permeable fabrics often used in association with soil that have the ability to reinforce, protect, separate, filter, or drain.

grassed swales: Vegetated channels designed to treat and convey stormwater runoff at a slow, controlled rate. Pollutant and sediment removal in grassed channels is primarily accomplished by gravitational settling, filtration through the grass and soil, and infiltration through the subsoil. Grassed swales are often useful when utilized in a series of BMPs as a pretreatment mechanism.

grazing land: A collective term that includes all lands having plants harvestable by grazing without reference to land tenure, other land uses, management, or treatment practices.

grazing system: A specialization of grazing management that defines systematically recurring periods of grazing and deferment for two or more pastures or management units. Description of a system should include the number of pastures or units, Animal Unit Months (AUMs), length of grazing period, and length of deferment or rest period for any unit.

habitat: A geographical area that can provide for the key essentials of life, normally considered to be food, water and cover.

herding: The handling or tending of a herd. In close herding, the herd is kept closely bunched, restricting the natural spread of the animals when grazing. In open herding, the herd is allowed to spread naturally while grazing. In trail herding, movement of the herd is directed and controlled to

a restricted overland route.

infiltration: The flow of a fluid into a substance through pores or small openings.

infiltration rate: Maximum rate at which soil under specified conditions can absorb rain or shallow impounded water, expressed in quantity of water absorbed by the soil per unit of time.

land treatment: The use of biological, mechanical, or chemical methods to enhance grazing lands, control pests, and improve water quality by reducing erosion and promoting infiltration.

management plan: A program of action designed to reach given objectives.

manure and waste utilization: The direct use of wastes, such as animal manure, on land to maintain or improve soil and plant nutrient resources. Manure and waste utilization, when correctly implemented, can protect water and air quality, while improving soils and crop production.

mechanical practices/treatment: (1) Soil and water conservation practices that primarily change the surface of the land or that store, convey, regulate, or dispose of runoff water without excessive erosion. (2) Methods of controlling pests or undesirable vegetation by mechanical means such as mowing, chaining, root plowing, and brush beating.

nonpoint source water pollution: Pollution arising from an ill-defined and diffuse source, such as runoff from cultivated fields, grazing land, or urban areas.

pitting: Making shallow pits of suitable capacity and distribution to retain water from rainfall or snowmelt on rangeland or pasture.

plant community: A group of one or more populations of plants in a common spatial arrangement.

ponds: Constructed water impoundments that are made by constructing an embankment or by excavating a pit or dugout. Ponds serve to provide water for livestock and wildlife, provide aquatic habitat, assist with fire control, and help maintain or improve water quality.

prescribed burning: The scientific, intentional application of fire to wild land fuels in either their natural or modified state under such conditions (fuel moisture, soil moisture, etc.) as to allow the fire to be confined to a predetermined area and to produce the intensity of heat and rate of spread required to further certain planned objectives and silviculture, wildlife management, range and prairie management, and fire-hazard reduction.

proper grazing: The act of continuously obtaining proper use, with proper use being defined as a degree of utilization of current year's growth which, if continued, will achieve management objectives and maintain or improve the long-term productivity of the site.

range and pasture planting: A practice intended to establish vegetation on rangeland, native or naturalized pastures, grazed forest, or other locations where grazing and browsing occurs. Vegetation, such as grasses, forbs, legumes, shrubs, and trees, can be planted and restored to a condition similar to the natural, historic plant community or to a desired condition for forage production. Range and pasture planting can be applied on lands where forage production or conservation is needed or on lands where desired vegetation is below the level for natural reseeding to occur.

range condition: The present state of the plant community on a range site in relation to the potential natural plant community for that site.

range site: A distinctive kind of rangeland, which in the absence of abnormal disturbance and physical site deterioration, has the potential to support a native plant community typified by an association of species different from that of other sites. This differentiation is based upon significant differences in kind or proportion of species, or total productivity.

reclaim: The process of returning disturbed lands to their former uses or other productive uses. syn. rehabilitation

rehabilitation: Returning of the land to farm use or to productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.

riparian area: The banks and adjacent areas of water bodies, water courses, seeps and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a more moist habitat than that of contiguous flood plains and uplands.

riparian buffers: Established areas of dense vegetation located adjacent to and up-gradient from natural watercourses, water bodies, and associated wetlands. Riparian forest buffers are comprised of trees, shrubs, and grasses and are managed to maintain the integrity of the waterways and to reduce nonpoint source pollution.

ripping: The mechanical penetration and shearing of range soils to depths of 8 to 18 inches for the purpose of breaking hardpan layers to facilitate penetration of plant roots, water, organic matter, and nutrients. An improvement practice used where native grasses of a rhizomatous nature can spread into the ripped soil.

sedimentation: The process or action of depositing sediment.

seeding: A method of establishing a stand of plants artificially by sowing seed. In broadcast seeding, seed is sown over the surface of the soil. In drill seeding, seed is placed in relatively narrow furrow rows, generally less than a foot apart. Partial seeding may be done in strips, furrow rows, trenches, or in spots.

soil type: A subdivision of a soil series based on surface texture.

stocking rate: The number of specified kind and class of animals grazing a unit of land for a specified time period; may be expressed as animals per land area, or the reciprocal, area of land per animal. syn. stocking density.

stream crossing: Stabilized areas or structures that are constructed across a stream to provide travel ways for livestock, wildlife, people, equipment, and vehicles.

sustained yield: Production of plant and animal populations under management procedures that insure replacement of the harvested part by regrowth or reproduction before another harvest occurs. The level of regrowth or reproduction may vary somewhat from year to year due to climatic or other natural conditions.

terrace: An embankment or combination of an embankment and channel constructed across a slope to control erosion by diverting and temporarily storing surface runoff instead of permitting it to flow uninterrupted down the slope. Terraces or terrace systems may be classified by their alignment, gradient, outlet, and cross-section. Alignment may be parallel or nonparallel. Gradient may be level, uniformly

graded, or variably graded. Grade is often incorporated to permit paralleling the terraces. Outlets may be soil infiltration only, vegetated waterways, tile outlets, or combinations thereof. Cross-section may be narrow base, broad base, bench, steep backslope, flat channel, or channel.

use: (1) The proportion of current year's forage production that is consumed or destroyed by grazing animals. May refer either to a single species or to the vegetation as a whole. Syn., degree of use. (2) The putting of land to a purpose such as grazing, bedding, shelter, trailing, watering, watershed, recreation, forestry, etc.

vegetated filter strips: Uniformly graded, densely vegetated sections of land that are designed to treat sheet runoff from adjacent land; helps remove sediment, organic matter, and other pollutants from runoff.

vegetation: Plants in general or the sum total of plant life in an area.

vegetation type: A plant community with distinguishable characteristics.

waste storage facilities: Constructed, sheltered impoundments or embankments that are used for temporary storage of agricultural wastes, such as manure, wastewater, and contaminated runoff.

water gap: Designated, fenced areas that allow livestock controlled access to water courses.

watershed: (1) A total area of land above a given point on a waterway that contributes runoff water to the flow at that point. (2) A major subdivision of a drainage basin.

wetland: Land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetland areas are regulated by the U.S. Army Corps of Engineers under section 404 of the Clean Water Act. There are specific regulatory definitions and requirements for delineation of wetland areas, please refer to these definitions and requirements for more detail.

wildlife: Per Wyoming State Statutes 23-1-101, wildlife is defined as “all wild mammals, birds, fish, amphibians, reptiles, crustaceans and mollusks, and wild bison designated by the Wyoming game and fish commission and the Wyoming livestock board within Wyoming.”

windbreak: A barrier, often comprised of a planting of single or multiple rows of trees or shrubs in linear configurations, that helps with dust control by obstructing and slowing the wind near the ground and preventing soil from blowing off site. By preventing wind erosion, windbreaks can reduce the transport of sediment and its associated pollutants and can thereby improve local water quality.

Appendix E: Additional References

The following are references for photos that were not listed within the factsheet, along with full references for websites that were provided within paragraphs but not fully cited thereafter. References used for information on individual best management practices can be found at the beginning of each factsheet. If viewing this document in an electronic format, click on the blue underlined text to be redirected to the appropriate website. URL addresses are also provided for those who are viewing the hard copy. For websites outside the WDEQ, the WDEQ is not responsible for the content of or maintenance of those websites.

[Alabama NRCS Animals Photo Gallery](http://www.al.nrcs.usda.gov/technical/photo/anim.html). Natural Resources Conservation Service. U.S. Department of Agriculture.

<http://www.al.nrcs.usda.gov/technical/photo/anim.html>

[BLM-Wyoming Wild Horse Website](http://www.blm.gov/wy/st/en/programs/Wild_Horses.html). United States Department of the Interior, Bureau of Land Management.

http://www.blm.gov/wy/st/en/programs/Wild_Horses.html

[Engineering Assistance](http://www.coshoctoncounty.net/agency/swcd/Engineering.php). Coshocton Soil and Water Conservation District. 2011. Coshocton County.

<http://www.coshoctoncounty.net/agency/swcd/Engineering.php>

[Executive Order 2011-5 Greater Sage-Grouse Core Area Protection. Office of the Governor, State of Wyoming](http://governor.wy.gov/Documents/Sage%20Grouse%20Executive%20Order.pdf).

<http://governor.wy.gov/Documents/Sage%20Grouse%20Executive%20Order.pdf>

[NRCS Photo Gallery](http://photogallery.nrcs.usda.gov). Natural Resources Conservation Service. U.S. Department of Agriculture.

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[NRCS Wyoming Website](http://www.wy.nrcs.usda.gov/). 2012. United States Department of Agriculture, Natural Resources Conservation Service.

<http://www.wy.nrcs.usda.gov/>

[Wyoming Game and Fish Department 2010 State Wildlife Action Plan](http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SWAP_2010_FULL0000602.pdf). 2010. Wyoming Game and Fish Department.

http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SWAP_2010_FULL0000602.pdf

[Wyoming Game and Fish Department \(WGFD\) Website](http://gf.state.wy.us/index.asp). 2002. State of Wyoming.

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[Wyoming Nonpoint Source Program Website](http://deq.state.wy.us/wqd/watershed/nps/NPS.htm). 2012. Wyoming Department of Environmental Quality.

<http://deq.state.wy.us/wqd/watershed/nps/NPS.htm>

[Wyoming Pollutant Discharge Elimination System \(WYPDES\)](http://deq.state.wy.us/wqd/wypdes_permitting/index.asp). 2011. Wyoming Department of Environmental Quality.

http://deq.state.wy.us/wqd/wypdes_permitting/index.asp