



## Natural Resources Conservation Service

### CONSERVATION PRACTICE STANDARD

## GRAZING MANAGEMENT

### CODE 528

#### (ac)

#### DEFINITION

Managing vegetation with grazing and browsing animals to achieve specific ecological, economic, and management objectives.

#### PURPOSE

Use practice to accomplish one or more of the following purposes:

- Improve or maintain desirable species composition, structure, productivity, health and/or vigor of plants and plant communities.
- Improve or maintain the quantity, quality, and/or balance of forages to meet the nutritional needs and ensure the health and performance of grazing and browsing animals.
- Reduce or eliminate the transportation of sediment, nutrients, pathogens, or chemicals to surface and/or groundwater.
- Improve or maintain upland hydrology, riparian dynamics, or watershed function to reduce surface or groundwater depletion and improve naturally available moisture.
- Improve or maintain soil health components and indicators, such as soil organic matter, soil aggregate stability, soil organism habitat, or increase infiltration and water holding capacity, reduce runoff and compaction.
- Prevent or reduce sheet, rill, classic gully, ephemeral gully, bank, and wind erosion.
- Improve or maintain terrestrial habitat for wildlife and invertebrates and/or aquatic habitat for fish and other organisms.
- Manage biomass accumulation for the desired fuel load to reduce wildfire risk or to facilitate prescribed burning.
- Reduce plant pest pressure from invasive and/or undesirable plants and other pests as part of an integrated plan.

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where grazing and browsing animals are managed.

#### CRITERIA

##### General Criteria Applicable to All Purposes

This practice is intended to address specific resource concerns through management of vegetation with herbivores.

Manage livestock numbers and grazing periods to adjust the intensity, frequency, timing, duration, and distribution of grazing and browsing to meet the planned objectives for plant communities, the animals, and the associated resources. This includes adjusting animal numbers, grazing periods, and movements

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NRCS, NHCP  
January 2024

based on the rate of plant growth, available forage, livestock forage demand, or other desired objectives (e.g., degree of forage utilization, targeted plant height or standing biomass, residual forage mass, or animal performance).

Plan forage harvest in accordance with site production limitations, rate of plant growth, physiological development of plants, and nutritional needs of the animals.

Maintain appropriate residual vegetation throughout the year to meet management objectives, build ecosystem resistance and resilience to disturbances and address resource concerns.

Provide desired plants sufficient recovery time from grazing/browsing to meet planned objectives. Deferment or rest should be planned for critical periods of plant or animal needs.

Manage grazing/ browsing animals to improve ecosystem function and maintain planned vegetative cover on sensitive sites such as riparian areas, wetlands, habitats of concern, and karst areas etc.

Provide adequate quantity, quality, and distribution of drinking water for animals during periods of occupancy.

Develop and document contingencies to prepare for episodic disturbances such as drought, flood, wildfire, insect infestation, and other events that could develop or intensify with climate change.

Ensure excess nutrients brought into the system with supplemental/substitutional feeding are managed and/or applied in an environmentally appropriate manner.

Utilize holding areas when conditions are not appropriate for grazing (such as drought or excessively wet soils). Locate holding areas where they avoid creating additional resource concerns.

Develop and implement a monitoring strategy that supports adaptive management and documents decisions based upon ecologic triggers and thresholds to optimize the conservation outcome.

**Additional Criteria to Improve or Maintain the Desirable Species Composition, Structure, Productivity, Health and/or Vigor of Plants and Plant Communities.**

Base the intensity, frequency, timing, and duration of grazing and browsing to manage for desirable plant species with consideration to the ecological site potential.

Where invasive plant pressure is a concern, maintain or improve desired species' competitive ability with strategies such as changing the season/time of use.

If stocking rate exceeds carrying capacity of the grazing land, remove livestock from the site until adequate recovery of desired plant species is achieved. If the stocking rate is out of balance, adjust livestock numbers to match the carry capacity of the land.

On pastureland, cropland, or other appropriate land use, test soil periodically for nutrient status and soil reaction and apply fertilizer and/or soil amendments according to soil test results as needed to improve or maintain plant vigor.

**Additional Criteria to Improve or Maintain the Quantity, Quality, and/or Balance of Forages to Meet the Nutritional Needs and Ensure the Health and Performance of Grazing and Browsing Animals.**

Plan grazing/browsing to balance forage quantity and/or quality goals of the producer within the capability of the resource to respond to management.

Plan grazing to improve plant and animal health by managing for optimal plant diversity, diet selection, delivery of nutrients and by reducing detrimental effects or losses from toxic plant and other hazards.

Provide feed as needed to meet the desired nutritional demand of the kind and class of grazing and browsing livestock.

Use National Research Council or Land Grant University recommendations for protein and energy requirements for grazing and/or browsing livestock.

**Additional Criteria to Reduce or Eliminate the Transportation of Sediment, Nutrients, Pathogens, or Chemicals to Surface and/or Groundwater.**

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Maintain or improve hydrologic function including infiltration and/or filtering capacity and soil surface stability to reduce runoff by providing adequate ground cover, plant spacing, and plant density.

Manage intensity, frequency, timing, and duration of grazing, browsing and/or feeding to reduce the number, size, and frequency of heavy use areas, maintain vegetative cover and improve nutrient distribution.

Utilize strategic placement of water facilities, feeding areas and other infrastructure to minimize deposition of animal wastes into concentrated flow areas or waterbodies.

Minimize animal impacts on stream bank or shoreline stability.

**Additional Criteria to Improve or Maintain Upland Hydrology, Riparian Dynamics, or Watershed Function to Reduce Surface or Groundwater Depletion and Improve Naturally Available Moisture.**

Manage livestock impacts to uplands, riparian and watersheds or other critical or sensitive areas to improve or maintain plant community structure, composition, and function.

Manage intensity, frequency, timing, and duration of grazing/ browsing to:

- Provide adequate ground cover and plant density to maintain or improve infiltration capacity and reduce runoff.
- Maintain plant structure and composition to improve filtering capacity of the vegetation.
- Avoid or minimize grazing when soils are wet or prone to compaction.
- Maintain adequate riparian community structure and function to support desired riparian, wetland, floodplain, and stream species.

**Additional Criteria to Improve or Maintain Soil Health Components and Indicators, such as Soil Organic Matter, Soil Aggregate Stability, Soil Organism Habitat, or Increase Infiltration and Water Holding Capacity, Reduce Runoff and Compaction.**

Plan intensity, frequency, timing, and duration of grazing/browsing to:

- Allow adequate recovery of plants.
- Maximize root growth and production of root exudates to increase soil organic matter.
- Maintain enough live leaf area for solar energy capture.
- Reduce compaction by improving soil biological activity, water infiltration, and increasing production and vigor of live plant roots.
- Maintain or increase plant diversity to improve soil microbial diversity, aggregate stability, and soil organism habitat.
- Improve or maintain plant cover and residue to limit water loss through evaporation and moderate soil temperature.
- Manage grazing/browsing to encourage deep rooted perennial plants.
- Manage livestock to avoid trailing.

- Minimize or separate locations of heavy use areas to improve nutrient distribution.
- Avoid or minimize grazing when soils are wet or prone to compaction. Mitigate or move livestock to designated areas in adverse conditions to protect the integrity of the soil.

**Additional Criteria to Prevent or Reduce Sheet, Rill, Classic Gully, Ephemeral Gully, Bank, and Wind Erosion.**

Plan intensity, timing, frequency, and duration of grazing/browsing to:

- Provide adequate ground cover from plant canopy, litter, and trampled plant residue to protect the soil surface from hoof and raindrop impact.
- Reduce detachment and transport of soil particles caused by water and wind action.
- Prevent or mitigate the effects of compaction and trailing by livestock.
- Minimize grazing animal impact on areas that have high soil erosion potential.
- Locate facilitating infrastructure (fence, watering facilities, etc.) in locations away from streambank, shoreline, and concentrated flow areas.

**Additional Criteria to Improve or Maintain Terrestrial Habitat for Wildlife and Invertebrates and/or Aquatic Habitat for Fish and Other Organisms.**

–

Identify target species or guild and follow approved habitat requirements when planning grazing management.

Plan intensity, frequency, timing, and duration of grazing/browsing to develop and maintain plant structure, density, and diversity for the habitat requirements of the target species or guilds.

**Additional Criteria to Manage Biomass Accumulation for the Desired Fuel Load to Reduce Wildfire Risk or to Facilitate Prescribed Burning.**

–

Plan intensity, frequency, timing, and duration of grazing/ browsing to:

- Manage fuel continuity, structure, and abundance to reduce wildfire behavior and intensity.
- Facilitate desired conditions such as fine fuel management for prescribed burns.

**Additional Criteria to Reduce Plant Pest Pressure From Invasive and/or Undesirable Plants and Other Pests as Part of an Integrated Plan.**

Plan intensity, frequency, timing, and duration of grazing/browsing to manage undesirable plant species.

When supplemental/substitutional feeds are provided, avoid introducing noxious, invasive, or undesirable species.

Provide adequate rest to enhance regrowth of desirable species.

Maximize grazing/browsing impact on target species when most palatable to the animal, and/or most damaging to the target species.

Utilize livestock species most suited to graze or browse undesirable plants.

Mitigate short-term negative impact to other resources (SWAPA+H+E) and document within the grazing management plan.

Utilize CPS Brush Management (Code 314) and/or CPS Herbaceous Weed Treatment (Code 315) in conjunction with grazing management to treat invasive species and to promote community resistance and protect desired plant communities.

## **CONSIDERATIONS**

Where practical and beneficial, start the grazing sequence in a different management unit each growing season.

Match stocking rates with carrying capacity to minimize the need for supplemental/substitutional feed.

Use herding of livestock to achieve a greater flexibility and adaptation of grazing management and/or where additional guardianship is needed to prevent livestock interaction with toxic plants and/or predators.

Herders operating in hazardous conditions, including in the proximity of dangerous plants and animals, should take appropriate precautions to ensure their safety.

Use drought and other weather forecasting tools to promote the accuracy of forage production projections.

Refer to agency approved localized climate projections in the development of the grazing management plan.

Consider parasite life cycles, type(s) of livestock, residual grazing heights and rest/deferment cycles to manage parasites.

Plan biosecurity measures to prevent the transfer of disease-causing organisms, pests, or invasive species being introduced or spread.

Design and install facilities to minimize stress, spread of diseases and parasites, contact with harmful organisms and toxic plants.

Design and install livestock feeding, handling, and watering facilities in a manner to improve and/or maintain animal distribution.

Provide shelter in the form of windbreaks, sheds, shade structures, and other protective features where conditions warrant the protection of livestock from severe weather, intense heat/humidity, and predators.

Minimize grazing infrastructure when effects are negative to fish and wildlife species of concern.

When managing biomass accumulation, consider increased variability of precipitation, rising average air temperatures and/or encroachment of plant species that may fuel wildfire.

Improve energy efficiency by minimizing the need for stored forages and maximizing the number of grazing days.

Consider the needs of other enterprises utilizing the same land, such as wildlife and recreational uses.

Provide deferment or rest from grazing/ browsing as necessary to ensure the success of other conservation practices.

When feeding areas accumulate excess nutrients, consider developing a Comprehensive Nutrient Management Plan or refer to CPS Nutrient Management (Code 590), CPS Waste Storage (Code 313), CPS Heavy Use Area Protection (Code 561), CPS Waste Transfer (Code 634), or CPS Feed Management (Code 592).

Refer to CPS Brush Management (Code 314), CPS Herbaceous Weed Control (Code 315) and CPS Prescribed Burning (Code 338) for additional management options on woody species and herbaceous weeds.

Refer to CPS Fuel Break (Code 383) and CPS Firebreak (Code 394) for additional criteria and considerations for reducing fuel loads to minimize wildfire risk.

Refer to CPS Prescribed Burning (Code 338) for additional criteria and considerations for planning prescribed burns.

## PLANS AND SPECIFICATIONS

From information collected through the conservation planning process, a grazing management plan (GMP) will be followed on lands that are part of a grazing system. At a minimum, the grazing plan will include the requirements found in the National Range and Pasture Manual and should be completed with active client involvement. The GMP will include:

- Goals and objectives- The long-term goals and more immediate objectives should be described in the grazing management plan. This includes the client's ambitions for their operation, their livestock, their land and resources, and actions to address identified resource concerns related to soil water, air, plants, and animals.
- Resource inventory- The inventory includes existing conservation practices and infrastructure, and the current condition of the natural resources present on the planning area. The inventory should identify the following benchmark conditions:
  - History of the operation.
  - Current stocking rates.
  - Location and condition of planned and existing practices such as fences, wells, pipelines, and watering facilities with quality, quantity, distribution, and seasonal availability information.
  - Existing resource conditions and concerns.
  - Critical/sensitive areas such as riparian, wetlands, habitats-of-concern, and karst areas etc.
  - Ecological site(s), current ecological state, or plant community descriptions(s) including potential forage production.
  - Noxious and invasive species location and extent.
  - Heavy use areas, animal trailing sites, or areas with erosion and runoff occurring or compaction concerns.
  - Areas of cultural significance.
  - Other areas with opportunities to enhance resource concerns.
- Forage inventory including:
  - Existing quality, quantity, and species in each management unit(s).
  - Carrying capacity should be established with forage animal balance that aligns livestock and wildlife demand with forage produced or provided.
- Grazing schedule/strategy for livestock that identifies:
  - Periods of grazing/ browsing.
  - Rest or deferment periods after grazing/browsing events or to accommodate other treatment activities within a management unit.
  - The flexibility needed for adaptive management decisions as supported by the contingency plan and monitoring plan to achieve desired outcomes.
  - Site specific strategies or targeted grazing to address resource concerns, including critical and sensitive areas, taking into consideration the unique attributes of each identified area and the necessary grazing management to maintain or improve the site.
- Contingency preparations that serve as a guide for adaptive management decisions to minimize or mitigate resource or economic impacts from episodic events (e.g., drought, soil saturation, flooding, fire, insects, etc.) which may intensify with climate change.
- Monitoring with appropriate protocols and records that assess whether the grazing strategy is on track to meet the identified goals and objectives. Record keeping should be maintained and short

and/or long-term monitoring conducted to support timely adaptive management decisions. Identifying key areas, key plants, or other monitoring or assessment indicators that help managers make grazing management decisions should be documented.

These plans and specifications will be available through implementation requirements and/or other information for applying the practice to achieve its intended purpose.

## **OPERATION AND MAINTENANCE**

### **Operation**

Grazing management will be applied on a continuing basis throughout the livestock occupation period of all planned grazing units.

Adaptive management decisions will be made as needed and documented within the plan to ensure that the goals and objectives of the grazing strategy are met.

Utilize short and long-term monitoring to achieve successful outcomes, reach goals and objectives and support timely adaptive management decisions.

Identify key areas, key plants, or other monitoring indicators to evaluate grazing management decisions.

### **Maintenance**

Monitoring data and grazing records will be used on a regular basis to make changes as necessary to ensure that objectives are being met.

All conservation practices [e.g., CPS Fence (Code 382), Brush Management (Code 314), Herbaceous Weed Treatment (Code 315), Prescribed Burning (Code 338), Pasture and Hay Planting (Code 512), Range Planting (Code 550), Pest Management Conservation System (Code 595) and conservation practices to support livestock water systems etc.] that are needed to facilitate adequate grazing and browsing distribution as planned by this practice standard will be maintained in good working order and operated as intended.

## **REFERENCES**

Ball, D., E. Ballard, M. Kennedy, G. Lacefield, D. Undersander. 2008. Extending grazing and reducing stored feed needs. University of Kentucky Cooperative Extension Service AGR-199.

Baron, V. S., E. Mapfumo, A. C. Dick, M. A. Naeth, E. K. Okine, and D. S. Chanasyk. 2002. Grazing intensity impacts on pasture carbon and nitrogen flow. *Rangeland Ecology & Management/Journal of Range Management Archives*, 55(6), 535-541.

Borman, M. M., C. R. Massingill and E. W. Elmore. 1999. Riparian area responses to changes in management. *Rangelands* 21; 3-7.

Briske, D. D. editor. {2011}. *Conservation Benefits of Rangeland Practices: Assessment, Recommendations, and Knowledge Gaps*. U.S. Department of Agriculture, Natural Resources Conservation Service.

Bruegger, R. A., L. A. Varelas, L. D. Howery, A. Torell, M. B. Stephenson and D. W. Bailey. 2016. Targeted grazing in southern Arizona: using cattle to reduce fine fuel loads. *Rangeland Ecology and Management* 69 (1): 43-51.

Davies, K. W., C. S. Boyd, J. D. Bates and A. Hulet. 2015. Dormant season grazing may decrease wildfire probability by increasing fuel moisture and reducing fuel amount and continuity. *International Journal of Wildland Fire* 24 (6): 849-856 <https://doi.org/10.1071/WF14209>

- Derner, J. D. and G. E. Schuman. 2007. Carbon sequestration and rangelands: a synthesis of land management and precipitation effects. *Journal of Soil and Water Conservation* 62: 7-85.
- Follet, R.F., J. M. Kimble and R. Lal. 2001. *The Potential of U.S. Grazing Lands to Sequester Carbon and Mitigate the Greenhouse Effect*. Lewis Publishers, Boca Raton, Florida.
- Franzluebbers, A. J. 2020. Cattle grazing effects on the environment: greenhouse gas emissions and carbon footprint. *Management Strategies for Sustainable Cattle Production in Southern Pastures*, 11-34.
- Franzluebbers, A. J., L. K. Paine, J. R. Winsten, M. Krome, M. A. Sanderson, K. Ogles and D. Thompson. 2012. Well-managed grazing systems: a forgotten hero of conservation. *Journal of Soil and Water Conservation*, Vol. 67, No. 4: 101A-104A.
- Fuhlendorf, S. D., D. M. Engle. 2001. Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. *BioScience*, Volume 51, Issue 8, 625-632.
- Hewins, D. B., M. P. Lyseng, D. F. Schoderbek, M. Alexander, W. D. Willms, C. N. Carlyle, S. X. Chang and E. W. Bork. 2018. Grazing and climate effects on soil organic carbon concentration and particle size association in northern grasslands. *Scientific Reports* 8 (1): 1336.
- Hodgson, J. and A. W. Illius. Editors. 1996. *Ecology and Management of Grazing Systems*. CABI, Wellingford, United Kingdom.
- Holechek, J. L., R. D. Pieper and C. H. Herbel. 2000. *Range management principles and practices*. 5th edition. Prentice Hall, New Jersey.
- Kumar, S., R. P. Udawatta and S. H. Anderson. 2010. Root length density and carbon content of agroforestry and grass buffers under grazed pasture systems in a Hapludalf. *Agroforestry Systems*, 80, 85-96.
- Nader, G., Z. Henkin, E. Smith, R. Ingram and N. Narvaez. 2007. Planned herbivory in the management of wildfire fuels-grazing is most effective at treating smaller diameter live fuels that can greatly impact the rate of spread of a fire along with the flame height. *Society for Range Management, Rangelands* 5, 18-24.
- Naeth, M. A., A. W. Bailey, D. J. Pluth, D. S. Chanasysk, R. T. Hardin. 1991. Grazing impacts on litter and soil organic matter in mixed prairie and fescue grassland ecosystems of Alberta. *Journal of Range Management* 44, 7e12.
- National Research Council, Nutrient Requirement Series, Nutrient Requirements of Domestic Animals. National Academy Press. Washington, D.C.
- Nelson, C. Jerry, editor. {2012}. *Conservation Outcomes from Pastureland and Hayland Practices: Assessment, Recommendations and Knowledge Gaps*. Allen Press, Lawrence, Kansas.
- Oates, L. G., and R. D. Jackson. 2014. Livestock Management Strategy Affects Net Ecosystem Carbon Balance of Subhumid Pasture, *Rangeland Ecology and Management* 67:19–29.
- Oles, K. M, D. A. Weixelman, D. F. Lile, K. W. Tate, L. K. Snell, L. M. Roche. 2017. Riparian meadow response to modern conservation grazing management. *Environmental Management*. 60: 383-395.
- Roche, L. M, B. B. Cutts, J. D. Derner, M.N. Lubell, K. W. Tate, On-Ranch Grazing Strategies: Context for the Rotational Grazing Dilemma, *Rangeland Ecology and Management* 68 (2015) 248-256.
- Rotz, C. A., K. J. Soder, R. H Skinner, C. J. Dell, P. J, Kleinman, J. P Schmidt, R. B. Bryant. 2009. Grazing can reduce the environmental impact of dairy production systems. *Forage and Grazinglands*. 1-8.
- Sanderson, M. A., R. H. Skinner, D. J. Barker, G. R. Edwards, & al, e. (2004). Plant species diversity and management of temperate forage and grazing land ecosystems. *Crop Science*, 44(4), 1132-1144.



Schuman, G. E., L. J. Ingram, P. D. Stahl, and G. F. Vance. 2005. Dynamics of long-term carbon sequestration on rangelands in the western USA. In *XX International grassland congress*, vol. 26, 590. Wageningen: Academic Publishers.

Swanson, S., S. Wyman, C. Evans. 2015 Practical grazing management to maintain or restore riparian functions and values on rangelands, *Journal of Rangeland Applications: Volume 2*, 1-28.

Taylor, C.A., Jr. 2006. Targeted grazing to manage fire risk. In: K. Launchbaugh and J. Walker (EDS) pgs 108-115, *Targeted Grazing: A Natural Approach to Vegetation Management and Landscape Enhancement*. American Sheep Industry.

Teague, W. R., S. L. Dowhower, S. A. Baker, N. Haile, P. B. DeLaune, & D. M. Conover. (2011). Grazing management impacts on vegetation, soil biota and soil chemical, physical and hydrological properties in tall grass prairie. *Agriculture, ecosystems & environment*, 141 (3-4), 310-322.

Undersander, D., B. Albert, D. Cosgrove, D. Johnson, P. Peterson. (n.d.) 2002. Pasture for profit. A guide to rotational grazing (A3529).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2020. National Range and Pasture Handbook. Washington, D.C.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2021. National Range and Pasture Manual.

Vavra, M., 2005. Livestock grazing and wildlife: developing compatibilities. *Rangeland Ecology Management* 58 (2): 128-134.