NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FORAGE HARVEST MANAGEMENT

(Ac.)

CODE 511

DEFINITION

The timely cutting and removal of forages from the field as hay, green-chop or ensilage.

PURPOSE

- Optimize yield of forage at realistic quality and quantity.
- Promote vigorous plant re-growth.
- Maintain stand life.
- Manage for the desired species composition.
- Use forage plant biomass as a soil nutrient uptake tool.
- Control insects, diseases and weeds.
- Maintain and/or improve wildlife habitat.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where machine harvested forage crops are grown.

CRITERIA

General Criteria Applicable to All Purposes

Forage will be harvested at a frequency and height that will maintain a desired healthy plant community. Texas Cooperative Extension (TCE) forage harvest recommendations based on state of maturity, moisture content, length of cut, stubble height and harvest interval should be used to meet the following criteria.

Stage of Maturity. Harvest forage at the stage of maturity that provides the desired quality and quantity. Delay harvest if prolonged or heavy precipitation is forecast that would seriously damage cut forage.

Moisture Content. Harvest silage/haylage crops at the ideal moisture range for the type of storage structure(s) being utilized.

TCE recommendations for optimum moisture content and levels as well as methods and techniques to monitor and/or determine moisture content and levels can be used.

Treat direct cut hay crop silage (moisture content > 70%) with chemical preservatives or add dry feed stuffs to avoid fermentation and seepage losses of digestible dry matter.

For optimal dry hay quality, rake, ted, fluff, or invert swaths or windrow, and bale when hay has sufficient moisture to reduce leaf loss.

Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

Bale field cured hay at 15 to 20 percent moisture.

Bale forced air dried hay at 20 to 35 percent moisture.

Rake hay at 30 to 40 percent moisture and ted or invert swaths when moisture is above 40 percent.

Length of Cut. When harvested for ensilage, forage will be chopped to a size appropriate for type of storage structure (high moisture wrapped or tubed bales) that allows adequate packing to produce the anaerobic conditions necessary to ensure the proper ensiling process.

Contaminants. Forage shall not contain contaminants at levels injurious to the health or performance of the animal being fed.

Additional Criteria to Improve or Maintain Stand Life, Plant Vigor and Forage Species Mix

Stage of Maturity and Harvest Interval. Cut forage plants at a stage of maturity or harvest interval range that will provide adequate food reserves and/or basal or auxiliary tillers or buds for regrowth and/or reproduction to occur without loss of plant vigor.

Cut reseeding annuals at a stage of maturity and frequency that ensures the production of viable seed or ample carryover of hard seed to maintain desired stand density.

If plants show signs of short-term environmental stress, management will be applied in a manner that ensures continued health and vigor of stand.

Stubble Height. Cut forage plants at a height that will promote the vigor and health of the desired species. Cutting heights will provide adequate residual leaf area; adequate numbers of terminal, basal or auxiliary tillers or buds; insulation from extreme heat or cold; and/or unsevered stem bases that store food reserves needed for full, vigorous recovery. For introduced sod forming grasses a minimum cutting height of 3 inches and a minimum cutting height of 4 to 8 inches for introduced and native bunch type grasses will help insure longevity of the stand, see Prescribed Grazing Standard (528) for specific guidance on minimum use heights. The final warm season hay harvest should be made 4 to 6 weeks before the first killing frost.

Manipulate timing and cutting heights of harvest to ensure germination and establishment of reseeding or seeded annuals.

Additional Criteria for Use as a Nutrient Uptake Tool

Employ a harvest regime that utilizes the maximum amount of available or targeted nutrients. Expected nutrient uptake values are located in the Texas NRCS 590-633 spreadsheet/planning tool.

Additional Criteria to Control Disease, Insect, Weed and Invasive Plant Infestations

Schedule harvest periods to control disease, insect, and weed infestations. When a pesticide is used to control disease, insects or weeds, adhere to the specified days to harvest period stated on the pesticide label. Evaluate pest management options by planning conservation practice standard Pest Management (595).

Lessen incidence of disease, insect damage, and weed infestation by managing for desirable plant vigor. Plan and schedule removal of invasive plants as needed.

Additional Criteria to Improve Wildlife Habitat Values

If client objectives include providing suitable habitat for desired wildlife specie(s) then appropriate harvest schedule(s), cover patterns, and plant height to provide suitable habitat for the desired specie(s) should be maintained.

CONSIDERATIONS

Where applicable coordinate this practice with the current NRCS practice standard for Prescribed Grazing (528).

When nutrients or other soil amendments are applied, coordinate this practice with the current NRCS conservation practice standard for Nutrient Management (590) and/or Waste Utilization (633) as appropriate. An excess or improper balance of nutrients such as nitrogen can produce plant material that causes toxicity in some animals.

In animal feeding operations, harvesting and feeding high quality forage such as silage and green chop recycles nutrients on the farm and reduces import of nutrients from purchased forage, which in turn reduces the potential of excessive nutrient build-up in the soil. Forage testing and accurate yield monitoring are encouraged when planning Forage Harvest Management for this purpose.

Hay should be marketed based on forage analysis and weight to better assure production costs are recovered. Hay should be evaluated based on Relative Feed Value (RFV), protein content and physical characteristics. Relative feed value is a calculated as follows: (% Digestible Dry Matter) x (% Dry Matter Intake) x (0.775). DDM and DMI are derived from Acid Detergent Fiber and Neutral Detergent Fiber.

Stockpiling forage in the fall for use in early winter should be considered to reduce hay production and feeding costs. TCE and others have shown that stockpiled bermudagrass and bahiagrass maintain quality as standing forage into mid-January in most years.

To control forage plant diseases, insects, and movement of weeds, clean harvesting equipment after harvest and before storing. Cut forages after dew, rain, or irrigation water on leaves has evaporated.

Care should be taken to produce stored forages of the quality needed for optimum performance of the animal being fed. For instance, immature legume forages can be too low in fiber and lead to metabolic disorders in ruminants and an economic loss to the producer due to lowered animal performance.

Direct cut grass and legume silage can create silage leachate (seepage). Consider the collection, storage, and disposal of this leachate as part of an agricultural waste management system.

In conjunction with harvest options, explore storage and feeding options that will retain acceptable forage quality and minimize digestible dry matter loss. Also consider storage location for large square or round bales/balage with regards to inside vs. outside, along hedgerows, winter/mud considerations etc. Hay feeding areas should be moved periodically to avoid damage and over use of the pasture.

Where weather conditions make it difficult to harvest the desired quality of forage, use mechanical or chemical conditioners and/or ensile.

In regions where rainfall and/or humidity levels cause unacceptable forage quality losses consider green chopping or ensiling the forage to reduce or eliminate field drying time. Other options are: the use of desiccants, preservatives, conditioners, macerating implements, or barn curing techniques to reduce field-drying time. These techniques can improve the timeliness of harvest and preserve forage quality.

To reduce safety hazard, avoid operating harvesting and hauling equipment on field slopes over 25 percent, particularly on cross slope traffic patterns.

To minimize haying operation impact on wildlife, mowing or swathing operation should begin in the middle of the field and work outward.

PLANS AND SPECIFICATIONS

Place the detailed specifications in a site-specific job or design sheet or in the practice narrative in the conservation plan.

These plans and specifications shall be consistent with this standard and shall describe the requirement for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

Before forage harvest, clear fields of debris that could damage machinery or if ingested by livestock, lead to sickness (for example, hardware disease) or death.

Operate all forage harvesting equipment at the optimum settings and speeds to minimize loss of leaves.

Set shear-plate on forage chopper to the proper theoretical cut for the crop being harvested. Keep knives well sharpened. Do not use re-cutters or screens unless forage moisture levels fall below recommended levels for optimum chopping action.

Regardless of silage/haylage storage method, ensure good compaction and an airtight seal to exclude oxygen and mold formation.

REFERENCES BY SECTION:

General:

Ball, D. M., C. S. Hoveland, & G. D. Lacefield. Southern Forages. 1991. Potash & Phosphate Institute, Norcross, GA.

Ball,D.M., M.Collins, G.D. Lacefield, N.P. Martin,D.A. Mertens, K.E.Olson,D.H. Putnam, D.J. Undersander, and M.W.Wolf. 2001. Understanding Forage Quality. American Farm Bureau Federation Publication 1-01, Park Ridge, IL

Barnes, R. F., D. A. Miller, & C. J. Nelson. Forages, The Science of Grassland Agriculture, Fifth Edition. 1995. Iowa State University Press, Ames, IA.

Hanson, A. A., D. K. Barnes, & R. R. Hill, Jr. Alfalfa and Alfalfa Improvement. 1988. American Society of Agronomy, Madison, WI.

Ishler, V. A. Et al. Harvesting and Utilizing Silage. 1991. Penn State University Circular 396. University Park, PA.

Pitt, R. E. Silage and Hay Preservation. 1990. Northeast Regional Agricultural Engineering Service. Ithaca, NY.

Redmon, L. A. Stockpiling Bermudagrass/Bahiagrass for Fall/Winter Grazing. 2000. Texas A&M University Agricultural Research and Extension Center, Overton.

Taylor, N. L. Clover Science and Technology. 1985. American Society of Agronomy, Madison, WI.

TCE Publication, SCS-1997-02, Managing for High Quality Hay

TCE Publication, SCS-2003-11, Corn Silage Production Fact Sheet

Bulter, T, B. Bean. Forage Sorghum Production Guide, 2002. TCE Publication, SCS-2001-09, Marketing Hay by Nutritive Value and Weight

Improve or Maintain Stand Life, Plant Vigor and Forage Species Mix:

TCE Publication, SCS-2003-07, Forage Establishment, Management, and Utilization Fundamentals

Control Disease, Insect, Weed and Invasive Plant Infestations:

TCE Publication, B-1401, Integrated Pest Management Guide for Texas Forage Crops

TCE Publication, B-1466, Chemical Weed and Brush Control Suggestions for Rangeland

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TCE Publication, B-5038, Suggestions for Weed Control in Pastures and Forages

Additional Criteria to Improve Wildlife Habitat Values:

TCE Publication SCS-2000-24, Wildlife Forage Areas for White-tailed Deer

REFERENCES BY SECTION (CONTINUED):

Considerations:

Oklahoma Cooperative Extension Service F-1716 Round Bale Hay Storage
Oklahoma Cooperative Extension Service F-2117 Forage Quality Interpretations

Forage Websites:

Ag. Research and Extension Center at Overton - http://overton.tamu.edu/

Forage Research in Texas - http://forageresearch.tamu.edu/index.html

Forages of Texas - http://stephenville.tamu.edu/~butler/foragesoftexas/

Forages for Wildlife - http://stephenville.tamu.edu/~butler/foragesoftexas/wildlife/wildlife.html

Georgia Forages - http://commodities.caes.uga.edu/fieldcrops/forages/

Oklahoma Forages - http://forage.okstate.edu/index.htm

SFA Soil, Water, and Plant Analysis Lab - http://soils.sfasu.edu/

Texas Adapted Forage Species - http://stephenville.tamu.edu/forages/fot/species/speclist.html

Texas A & M Forages - http://forages.tamu.edu/

Texas A & M Variety Trials (Forages) - http://varietytesting.tamu.edu/forages/index.htm

Texas A & M Crops & Soils Publication Search - http://publications.tamu.edu/

Texas A & M Soil, Water, and Forage Testing Lab - http://soiltesting.tamu.edu/

Texas Forage Yield Data - http://stephenville.tamu.edu/~butler/foragesoftexas/yielddata/yielddata.html

The Nobel Foundation - http://www.noble.org/ag/

APPROVAL AND CERTIFICATION

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PRACTICE SPECIFICATIONS APPROVED:

/s/ Lori Ziehr	**01/19/2007**
State Agronomist	**Date**
/s/ Susan Baggett	**01/11/2007**
State Resource Conservationist	**Date**

NRCS, Texas

January 2007