

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE SPECIFICATION

FORAGE HARVEST MANAGEMENT

(ACRE)

CODE 511

I. SCOPE

The work shall consist of furnishing all necessary labor and equipment needed to accomplish the timely machine harvest of forage crops from fields designated in the conservation plan.

II. SPECIFICATIONS

General

Location in Nevada will dictate specific recommendations for management requirements. Consideration must be given to climate, topography, elevation, water availability, quality of irrigation water, soil properties, and other considerations. Refer to Nevada Cooperative Extension/NRCS joint publication BE-91-04 and Nevada Cooperative Extension publication EB-00-03 for information and recommendations regarding management of irrigated forages in Nevada.

Time of Harvest

The stage of maturity at which hay crops are cut affects hay quality. Forage crops that are cut in the early stages of plant maturity are more palatable and have the highest amount of digestible nutrients, however, crop yields are reduced. Low yields and the expense of frequent cuttings obliges the hay grower to accept some lowering of hay quality in the interest of greater production. Accordingly, forage crops are harvested for hay at an intermediate stage where both yield and quality are less than what can potentially be produced.

Hay should be cut in the early stages of maturity to obtain highest quality as the percentage of leaves, and thus protein and minerals, decreases as the plant matures. The proportion of stems and crude fiber content (mainly cellulose) is increased as plants mature. In mature plants, a progressively greater proportion of the crude fiber is made up of less digestible lignin, which lowers the net nutritive value of the plant. Digestible dry matter (DDM) of alfalfa decreases about 0.3 percent per day after the early bloom stage until full bloom. As DDM declines, palatability and,

therefore, consumption, of the forage crop decreases and animal performance can suffer.

The best time to harvest grass, clover, or alfalfa for hay is ordinarily some time between early bloom and full bloom.

- For alfalfa, base the timing of harvest on the growth stage of the stand that will provide the desired forage quality and yield. Alfalfa cut at the early-bud stage can yield 1.5 to 2.5 tons per acre of dairy-quality hay, but when harvested at the early-bloom stage can yield 2.5 to 3.5 tons per acre of hay suitable for non-lactating dairy cows or beef cattle.
- When considering yield, forage quality, and persistence of stand, alfalfa is best harvested at the early-bloom (1/10th bloom) stage of maturity. This stage of growth is when the highest yield of digestible nutrients per acre is usually obtained. Cutting alfalfa at a more immature stage will result in a higher percentage of digestible nutrients at the expense of yield and stand persistence.
- Sweetclover should be harvested in the bud stage to curtail subsequent coarse growth.
- Cereal crops that are heavy producers of seed should be cut for hay when the grain is in the soft- to medium-dough stage.
- With the exception of birdsfoot trefoil, and Ladino and white clovers, time harvest of intermixed grass-legume stands based on legume stage of maturity that gives desired forage quality.
- For birdsfoot trefoil, and Ladino and white clovers, which maintain quality for longer periods than other legumes and flower continually, base harvest on grass stage of maturity that gives desired forage quality.
- Where multiple harvests of an annual grass forage are possible and desired, cut at boot to early head stage.

When green-chopping summer annual grasses containing hydrocyanic acid (HCN), delay harvest until grass height is more than 18 inches. Prior to green-chopping, test Johnsongrass, trefoil, and white clover for HCN if these plants have been stressed by drought or frost.

Conservation practice specifications are reviewed periodically, and updated if needed. To obtain the current version of this specification, contact the Natural Resources Conservation Service.

511-2

For warm season grasses grown in association with winter annual legumes, time the final harvest and cutting height of the grass to enhance germination and establishment of the seeded legumes.

If a foliar disease or insect infestation will lower forage quality below that needed for intended livestock type or class by the time the proper stage of maturity is reached, harvest before excessive leaf loss occurs.

Do not cut forages until dew, rain, or irrigation water on plant leaves has evaporated.

Practical considerations of curing hay typically favor morning cutting of forage crops. However, research has shown that cutting in the late afternoon produces hay with higher palatability. Late afternoon cutting (that allows for a full day of photosynthetic activity) may reduce the amount of food materials (i.e. sugars) lost from plant leaves and stems. Depletion of plant food materials from leaves and stems is the result of translocation of these photosynthetic products to the roots, or by respiration during the night when photosynthesis is suspended.

When managing forage stands for multiple objectives that include use as livestock feed, harvesting at a later stage of maturity is acceptable if needed to meet all stated objectives. Feed lower quality forage crops to livestock type and class with lower nutritional needs or to balance feed rations, or both.

Stubble Height and Harvest Interval

Setting harvest equipment to allow a 3- to 4-inch stubble height generally provides for adequate regeneration of most perennial forage species.

Table I lists the minimum after harvest stubble height and the minimum leaf regrowth or plant height needed at the end of the growing season for major forage species grown in Nevada.

Close mowing shortens stand life and lowers productivity. If a plant is harvested too close to the ground, leaf area available to intercept sunlight is reduced and photosynthetic activity is curtailed. Reduced rates of photosynthesis slow root development, reduce the storage of plant nutrient reserves necessary for plant survival, and limit plant production.

When growing susceptible forage crops on soils that frost heave, leave a stubble or unharvested regrowth that is at least 6-inches high, where a similar depth of snow cover throughout the winter is unlikely.

The number of harvests each growing season is determined based on the forage plant's inherent ability to regrow following defoliation under the prevailing environmental conditions, the plant's end of season minimum height and food reserve requirements, and the length of the growing season.

Rangeland ecological sites that have a water table near the surface (*i.e.*, wet meadows) or that receive supplemental moisture during the growing season may be machine harvested once a year.

During periods of high growth rate when irrigated pasture forage production exceeds livestock demand, forage quality can be preserved by machine harvesting a portion of the standing crop.

Length of Cut

Corn silage and alfalfa silage should be chopped at a theoretical length of cut range of 5/16 to 3/8-inch - allowing for 15 to 20 percent of the chopped forage particles to be 1.5-inches, or more, long.

The theoretical cut is the advance, in inches, made by the feed roll and feeder apron between two successive knives. Grass silage pieces typically average about twice the theoretical settings as the stems of grass do not consistently feed straight.

Contaminants

No viable noxious weed seeds shall be present in the harvested forages.

Irrigation

Irrigation will be based on Nevada NRCS Irrigation Guide design values with local adaptation for soils and climate.

IRRIGATION WATER MANAGEMENT (Code 449) will be applied. Harvesting and irrigation will be timed to avoid detrimental effects of harvesting equipment or livestock traffic on wet soil.

II. SPECIFICATIONS (continued)

Fertilization

Application of fertilizer, if necessary, will be based on recommendations in publication BE-91-04, recommendations from local Cooperative Extension Service or from certified agricultural consultants.

The amount and kinds of fertilizer and soil amendments applied should be based on soil and/or plant analysis.

Application of fertilizer and soil amendments will be in accordance with **NUTRIENT MANAGEMENT** (Code 590) conservation practice standards and specifications.

All fertilizer shall be labeled in accord with applicable state regulations and bear the warranty of the manufacturer for the grade furnished.

Pesticides

Weeds, brush, and animal pests will be managed by cutting, burning, application of chemicals, or other means, as appropriate.

Check with local information sources (local Cooperative Extension Service, certified agricultural consultants, etc.) for recommendations on control of specific pests.

All chemicals used in performing this practice shall be federally, state, and locally registered and shall be applied strictly in accordance with authorized and registered uses and directions on the product label.

Chemical containers shall be properly stored and disposed of in a safe manner.

Application of herbicides and other pesticides will be in accordance with **PEST MANAGEMENT** (Code 595) conservation practice standards and specifications.

Aftermath Grazing

Dormant season grazing, including aftermath grazing of alfalfa following a killing frost, is acceptable. Livestock utilization levels of aftermath forage must be managed to maintain a residue cover sufficient to prevent soil erosion during the critical erosion period. Livestock are removed from hayland prior to initiation of plant growth in the spring.

Grazing of machine harvested forage crop residues will be in accordance with **PRESCRIBED GRAZING** (Code 528A) conservation practice standards and specifications.

III. PLANS AND SPECIFICATIONS

Narrative statements in the conservation plan may be used to record practice specifications for practice application. Separate harvest plans that are filed in the cooperators case file and referenced to in the conservation plan are to be prepared for conditions that require detailed information.

IV. OPERATION AND MAINTENANCE

Maintenance

- Established stands will be reseeded or rotated with other crops when forage quality and/or quantity reach a level that makes production unfeasible or erosion occurs as a result of inadequate plant cover.
- New plantings will not be harvested until stand height averages at least ten inches.
- Ensilage forages that exhibit high levels of nitrates (>2500-ppm). Delay feeding of silage for six to eight weeks.

Windrows left in a field for long periods can significantly reduce yields of the forage plants under the windrow. Wheeled traffic over recently harvested forage crop fields will also result in reduced yields.

Remove baled forage crops from field as quickly as possible to allow forage plant regrowth and prevent production losses to subsequent cuttings.

In areas where excessive digestible dry matter (DDM) loss occurs to hay left to the elements, provide cover from rain and sun.

Operations

Operations shall be done in such a manner that soil erosion is minimized and the impacts on air and water resources do not exceed state air and water quality standards.

The owner, operator, contractor, and other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operations being performed with due regard to safety of all persons and property.

REFERENCES

- Barnes, R.F., C.J. Nelson, M.Collins, and K.J. Moore (eds). 2003. Forages - An Introduction to Grassland Agriculture. Vol. 1, 6th Edition. 2nd Edition. Iowa State Press, Ames, Iowa.
- Launchbaugh, K. Editor. 2001. Anti-Quality Factors in Rangeland and Pastureland Forages. Station Bulletin 73, Idaho Forest, Wildlife and Range Exp. Sta., Moscow, Idaho.
- Martin, J., Leonard, W. and Stamp, D. 1976. Principles of Field Crop Production. 3rd Edition. Macmillian Publishing Co., Inc. New York.
- Nevada Cooperative Extension. 2003. Intermountain Pasture and Hay Meadow Handbook: Pasture, Hay and Profit. EB-00-03, Reno, NV.
- Nevada Cooperative Extension and the Soil Conservation Service. 1991. Management of Irrigated Forages in Nevada. Joint Publication BE-91-04. Reno, Nevada.
- Orloff, S. and Carlson, H. Editors. 1997. Intermountain Alfalfa Management. Univ. of California, Division of Agriculture and Natural Resources, Publication 3366, Oakland, California.

Table I. Guidelines for Forage Harvest

Approximate growth stage for harvest, minimum cutting height, and minimum leaf length at end of the growing season for key forage species in Nevada.

FORAGE PLANT NAME	CUTTING PERIOD	PLANT GROWTH STAGE	MINIMUM CUTTING HEIGHT (inches)	MINIMUM PLANT HEIGHT AT END OF GROWING SEASON (inches)
GRASS				
Altai Wildrye	1 st 2 nd	Early-Head to Full-Head 8-inch to 10-inch height	3	4
Basin Wildrye	1 st 2 nd	Early-Head to Full-Head 8-inch to 10-inch height	5	8
Bermudagrass	1 st 2 nd	Boot to Mid-Head 12-inch to 15-inch height	3	5
Big Bluestem	1 st	Boot to Mid-Head	3	8
Creeping Meadow Foxtail	1 st 2 nd	Early-Head to Full-Head 8-inch to 10-inch height	3	5
Creeping Wildrye	1 st 2 nd	Early-Head to Full-Head 8-inch to 10-inch height	3	4
Crested/Desert Wheatgrass	1 st ; 2 nd	Boot to Early-Head	3	3
Eastern Gamagrass	1 st	Boot to Mid-Head	3	8
Intermediate/Pubescent Wheatgrass	1 st 2 nd	Early-Head to Full-Head 8-inch to 10-inch height	4/3	6
Italian Ryegrass	1 st	Mid-Head to Flowering	3	–
Kentucky Bluegrass	1 st ; 2 nd	Boot to Early-Head	3	3
Meadow Bromegrass (<i>Regar</i>)	1 st ; 2 nd	Boot to Early-Head	3	4
Nevada Bluegrass	1 st ; 2 nd	Boot to Pre-Head	3	8
Orchardgrass	1 st 2 nd	Boot to Early-Head 10-inch to 12-inch height	3	6
Reed Canarygrass	1 st 2 nd	Early-Boot 12-inch to 15-inch height or as basal sprouts appear	3	4
Russian Wildrye	1 st ; 2 nd	Boot to Early-Head	3	4
Siberian Wheatgrass	1 st ; 2 nd	Boot to Early-Head	3	3
Slender Wheatgrass	1 st ; 2 nd	Boot to Early-Head	5	6
Smooth Bromegrass	1 st 2 nd	Boot to Early-Head 8-inch to 10-inch height	4	6
Sudangrass*	All	Early-Head to Full-Head	6	–
Switchgrass	1 st	Boot to Mid-Head	3	10
Tall Fescue	1 st ; 2 nd	Boot to Pre-Head	3	6
Tall Wheatgrass	1 st ; 2 nd	Boot to Early-Head	5	8
Timothy	1 st 2 nd	Full-Head to Flowering 12-inch to 15-inch height	3	6

*Sudangrass regrowth should not be grazed following cutting, within 2 weeks following a frost, or during drought conditions to avoid Prussic acid (HCN) poisoning.

Boot: seed head of grass plants remain in sheath of floral culms (prior to emergence)

Early-Head: tip of grass seed head emerging from boot-sheath on not more than 10 percent of culms (floral stems)

Mid-Head: about 50 percent of grass plant seed heads have emerged from boot-sheath, or are emerging

Full-Head: grass plant seed heads fully emerged from boot-sheath but prior to flowering

Flowering: grass plant seed heads fully formed, anthers evident, seeds with milky juice

Table I. Guidelines for Forage Harvest

Approximate growth stage for harvest, minimum cutting height, and minimum plant height at end of the growing season for key forage species in Nevada.

FORAGE PLANT NAME	CUTTING PERIOD	PLANT GROWTH STAGE	MINIMUM CUTTING HEIGHT (inches)	MINIMUM PLANT HEIGHT AT END OF GROWING SEASON (inches)
LEGUMES				
Alfalfa	All	Early-Bud to 1/10 th Bloom	3	4
Alsike Clover	1 st 2 nd on	Late-Bud to Early-Bloom 10-inch to 12-inch height	3	6
Birdsfoot Trefoil	1 st 2 nd on	Early-Bloom to Mid-Bloom After 7 to 8 weeks regrowth	3	5
Cicer Milkvetch	1 st 2 nd on	Early-Bloom to Mid-Bloom After 6 to 7 weeks regrowth	3	5
Ladino Clover	1 st 2 nd on	Late-Bud to Mid-Bloom 10-inch to 12-inch height	2	6
Red Clover	1 st 2 nd on	Late-Bud to Mid-Bloom 10-inch to 12-inch height	3	6
Sanfoin	All	Mid-Bloom	4	6
Strawberry Clover	1 st 2 nd on	Late-Bud to Mid-Bloom 10-inch to 12-inch height	2	6
Sweetclover**	1 st 2 nd on	Early-Bud to Early-Bloom After 6 to 7 weeks regrowth	4 to 6	5
White Dutch Clover	1 st 2 nd on	Late-Bud to Mid-Bloom 10-inch to 12-inch height	3	4
OTHER				
Small Grains	All	Late-Milk to Soft-Dough	3	–
Grass-Legume Mix (see below for exceptions)	All	Base on Legume	–	–
Grass- Legume ¹ Mix ¹ Birdsfoot Trefoil, or ¹ White Clover, or ¹ Ladino Clover	All	Base on Grass	–	–

**Sweetclover hay having a moisture content over 50 percent can readily spoil, become toxic, and cause hemorrhagic disease (*hypoprothrombinemia*) in cattle.

Early-Bud: *no flower color evident on 80 percent of plants*

Late-Bud: *flower color evident on 80 percent of plants*

Early-Bloom: *plants have 10 percent of flowers exposed (1/10th bloom)*

Mid-Bloom: *plants have 35 to 50 percent of flowers exposed*

Late-Bloom: *plants with all flowers exposed*

Flowering: *plants with all flowers fully formed (full-bloom)*