

**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 and quality of forage at the desired levels
- 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 through its life expectancy. State Cooperative Extension Service (CES) 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 when available. Table 1 will serve as a guide for recommendations in lieu of CES recommendations.

**Stage of Maturity.** Harvest forage at the stage of maturity that provides the desired quality and

quantity.

Early cuttings will result in the higher quality hay although quantity may not be at its highest. Harvest can be delayed in order for yields to be increased, but quality will then be sacrificed. Lower quality forage is still appropriate for some classes of livestock. A forage test is the most reliable method to determine forage quality and insure that the nutritional needs of the animal being fed are met.

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. Typical moisture ranges include:

Crop	Moisture Percent Range
Green Chop	70 - 85
Silage	60 - 70
Haylage	40 - 60
Hay	10 - 20

State Cooperative Extension Service 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 if available.

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

For optimal dry hay quality, rake hay at 30 to 40 percent moisture and ted or invert swaths when moisture is above 40 percent.

To preserve forage quality and quantity, bale field cured hay at 15 – 20 percent moisture and bale force air dried hay at 20 – 35 percent moisture.

**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 that can cause illness or death to the animal being fed or rejection of the offered forage.

**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. (Refer to Table 1)

Harvesting early will improve quality but may reduce stand life if done continually. Delaying or resting from harvest in some years or on portions of the area harvested will allow for yield increases, build food reserves, allow basal buds to break dormancy and increase stand life.

In order to allow for food reserves to be replenished, end of season harvesting intervals should be at least 40 days for legumes and 35 days for perennial grasses before the first killing frost. After a killing frost, excess regrowth may be grazed or harvested if needed. Grazing will be planned according to the Oklahoma NRCS practice standard, Prescribed Grazing (528). Depending on location and severity of winters, regrowth can be left to provide soil insulation and reduce chances for winter killing.

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 encourages the continued health and vigor of the 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.

Excess re-growth at the end of the cutting season may be left to provide cover for wildlife.

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

Refer to Table 1 for guidance on optimum cutting times, intervals and stubble heights.

**Soil Fertility.** Adequate amounts of lime, nitrogen, phosphate, potash and certain minor elements are needed for intense forage harvest schedules (primarily with introduced pastures with multiple cuttings); to increase forage quantity and quality; and to maintain stand life. Harvested forage removes large amounts of nutrients per acre. A soil test should be used as a guide in determining the amount of fertilizer and lime needed for sustainable hay production. Care should be taken to insure nutrients are returned back on these lands in nearly the same proportion and amount as were removed. Refer to Oklahoma NRCS practice standard, Nutrient Management (590).

**Additional Criteria for Use as a Nutrient Uptake Tool**

Employ a harvest regime that utilizes the maximum amount of available or targeted nutrients.

Refer to Oklahoma NRCS practice standard, Nutrient Management (590).

**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 using the Oklahoma NRCS 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 in order to prevent harvesting and spread through feeding operations.

### **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.

Unharvested field edges, corners or odd areas provide habitat for ground nesting wildlife within fields that are harvested in spring or early summer. Leaving unharvested areas throughout the growing season can provide brood rearing habitat for a variety of wildlife.

Refer to appropriate Wildlife Habitat Appraisal Guides for species of concern. Harvest operations that begin in the center of the field and work toward the outside will flush wildlife species outward.

### **CONSIDERATIONS**

When pastures produce forage in excess of livestock demand during high growth rate periods, consider preserving forage quality by machine harvesting a portion of the standing crop. Coordinate this practice with the Oklahoma NRCS practice standard, Prescribed Grazing (528).

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.

For native hay meadows that are in poor condition due to multiple cuttings or prolonged harvests over many years, one or more years of deferment during the growing season should be practiced. The addition of nutrients may be considered but should be evaluated based on economic return.

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.

Avoid conducting harvesting operations when the soil is wet to reduce soil compaction and rutting. Also avoid following in the same wheel tracks so that soil compaction can be minimized.

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 hazards, avoid operating harvesting and hauling equipment on field slopes over 25 percent, particularly on cross slope traffic patterns.

### **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.

Requirements for Documentation and Certification of Forage Harvest Management are contained in GM 450, Part 407.

### **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.

Monitor weather conditions and take action accordingly before and after cutting to optimize forage wilting or curing time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.

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.

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### **REVIEWERS:**

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**TABLE 1 - Forage Harvest Requirements for Plant Species**

<b>FORAGE SPECIES</b>	<b>STUBBLE HEIGHT 1/ (inches)</b>	<b>OPTIMUM CUTTING TIMES OR HARVEST INTERVAL 2/ 3/ 4/</b>
<b>GRASSES</b>		
Bahiagrass	3-4	1 <sup>st</sup> Cut: Boot to early bloom; thereafter at 28 day intervals or when 12" regrowth
Bermudagrass	2-3	Boot to early heading; thereafter at 25-35 day intervals or when lower leaves start turning brown
Big and sand bluestem	4-6	Boot to early heading or when 24-30 inches tall. Cut prior to July 20 <sup>th</sup> .
Crabgrass	2-3	Boot to early head; thereafter at 28 day intervals
Eastern gamagrass	6-8	Early boot; thereafter at 40-45 day intervals
Fescue, tall	3-4	Boot to early bloom stage; thereafter at 4 - 6 week intervals or 8" regrowth. <b>5/</b>
Indiangrass	4-6	Prior to boot or when 18-30 inches tall. Cut prior to July 20 <sup>th</sup> .
Johnsongrass	6	Pre-boot to boot; thereafter at 25 - 30 day intervals
Native hay meadow	4 - 6	Only one Cutting, prior to July 20 <sup>th</sup> : At boot to pre-heading
Old world bluestems	3-4	At or prior to boot; thereafter at 30 - 35 day intervals or 12-16" regrowth
Orchardgrass	3-4	Boot to early bloom stage; thereafter at 4 - 6 week intervals or 8" regrowth. <b>5/</b>
Ryegrass, perennial	4	Boot to soft dough; thereafter at 25-30 day intervals. <b>5/</b>
Smooth brome grass	3-4	Early to mid-bloom; thereafter, when regrowth is 8" or new basal sprouts appear at soil surface. <b>5/</b>
Summer Annuals: Sudangrass, millet, sorghum-sudan hybrids	6-10	At pre-boot stage or about 24-36 inches tall; thereafter when regrowth is 24"
Switchgrass	4-6	Early boot. Cut prior to July 20th
Weeping lovegrass	3-4	Pre - Boot to early heading; thereafter at 25-35 days
Wheatgrass, Western and Tall	3-4	Early to full head; thereafter when regrowth reaches 8-10" <b>5/</b>

FORAGE SPECIES	STUBBLE HEIGHT 1/ (inches)	OPTIMUM CUTTING TIMES OR HARVEST INTERVAL 2/ 3/ 4/
Wheatgrass, Intermediate/pubescent	3-4	Early boot to full head; thereafter when re-growth reaches 8-10" 5/
Winter Annuals: wheat, barley, rye, triticale	2-4	Boot to early dough stage
<b>LEGUMES</b>		
Alfalfa	4	1 <sup>st</sup> cutting: Bud stage to ¼ bloom; thereafter when 1/10 to 1/4 bloom and last cutting 6 weeks before first killing frost
Arrowleaf clover, berseem clover, birdsfoot trefoil, crimson clover, 'Ladino' clover, red clover	3	Early to 1/4 bloom, if with companion grass, cut at correct stage for the grass
'Cicer' milkvetch	3	1/10 - 1/4 bloom
Cowpeas	3	early to mid-bloom
Hairy vetch	3	Early to ¼ bloom
Lespedeza (common, 'Kobe' 'Korean')	3	pre-bloom to early bloom
Lespedeza, sericea	3-4	Cut when plant reaches 12-15" height
Sweetclovers	3	When first blooms appear

1/ Stubble heights are considered minimum cutting heights. If a forage plant is harvested below the recommended minimum cutting height regrowth will be slowed, opportunities for weed encroachment will increase, subsequent productivity will decline, and the stand may die.

2/ Allow sufficient time for plant recovery after last cutting before first frost date. Generally, this will be generally 40 days for legumes and 35 days for perennial grasses.

3/ Cutting times are based on growth stages and are for OPTIMUM quantity and quality. Later harvest usually yield more forage of lower quality.

4/ Some forage crops may not achieve needed regrowth except under irrigation and fertility; therefore subsequent cuttings may not be possible

5/ Do not harvest June - August.

#### GROWTH STAGE DEFINITIONS

Boot – Seedhead in upper sheath but prior to emergence, top of stem swollen

Early Head / bloom – Tip of seedhead (flowers) begins to emerge

Medium Head / Mid-bloom – About 50% of the seedheads emerged or emerging

Full head / bloom – Seedheads fully emerged but prior to flowering, peak pollen shed

Early Bud – Bud begins to swell and become apparent at a few nodes

Late Bud – Several nodes with buds; buds more swollen

Dough – Seed becoming harder and have a dough-like consistency

Late bloom – All flowers out

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