

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

FORAGE HARVEST MANAGEMENT

(Acre)

CODE 511

DEFINITION

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

PURPOSES

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

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 healthy plant community for the desired species throughout its life expectancy. Cutting and harvesting should be based on the species and the species needs for adequate food reserves, basal or axillary tillers or buds for re-growth, and for the forage quality needed for the animals being fed.

Stage of Maturity

See Table 1 – Harvesting Guide.

If harvested at a later stage of maturity, use for livestock that have lower nutritional needs, or balance feed ration using supplements.

If a foliar disease or insect infestation will lower forage quality, harvest before excessive leaf loss or other damage.

Moisture Content

See Table 2 – Optimal Forage Dry Matter Levels

This will be used to determine the ideal dry matter content of haylage and corn for various harvest/storage methods.

Direct cut hay crop silage (moisture content > 70%) may need to be treated with chemical preservatives to avoid dry matter losses from fermentation and/or seepage.

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 and 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 Optimize The Economic Yield of Forage

Fertility Management

Use standard 528 *Appendix 4 Prescribed Grazing and standard 590 Nutrient Management* to determine fertility needs and nutrient application rates.

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 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.

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

See Table 1 – Harvesting Guide.

Additional Criteria for use as a Nutrient Uptake Tool

For fields with one or more nutrients testing in high or excessive amounts, harvest as needed to bring accumulated soil nutrients within the agronomic optimum soil test range. Also, when practical and in line with the producer's objectives, consider introducing species that require high levels of particular nutrients.

It is recommended that forage testing be done on forages that are harvested from over-fertilized fields. When needed, balance feed ration by using the actual nutrient content of the forage in lieu of "assumed" or "average" values.

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. (*Consult the West Virginia University Extension Service to determine the best pesticide combination and application time.*) Evaluate pest management options by planning conservation practice standard *Pest Management (595)*.

Additional Criteria To Maintain Or Improve Wildlife Habitat

Refer to the *West Virginia Wildlife Habitat Evaluation Technique (WVWHET) handbook* for specific information concerning, grassland element size, composition and distribution for various wildlife species. Apply these strategies to manage and maintain grassland habitats in open meadows, pasture, hayland or other similar settings. Harvesting may take place by the following methods or combinations of methods:

Mow no more than 1/3 of an entire grassland stand in any given year. This can be done by harvesting only 1/3 of a single field; or no more than 1/3 of the entire acreage of a stand in a year

Mowing should occur in 2-4 year cycles with field(s) or portions of a field(s) to remain undisturbed for a period of time (fallow). A longer rotation yields greater diversity in composition and structure. However, rotation cycles that are 5 years or longer may allow significant woody invasion to occur in some instances.

Where feasible utilize a strip mowing method. Mow in strips of 35-100 feet wide avoiding more narrow strips that can lead to increased predation of desirable wildlife. Each strip may have variable widths.

Rotate mowed strips across and/or throughout the field and along the natural contour of the land if possible. It is desirable and beneficial if the strips are irregular in shape.

Whenever possible, mowing should be performed in the spring or late summer outside the primary nesting season (March 15 – July 15). However some wildlife management techniques may require mowing during the primary nesting season. If harvesting a portion of a stand for livestock forage, it may be necessary to harvest during this period. For example, if you are harvesting 1/3 of a field for livestock forage, and leaving the remaining 2/3 fallow; the harvested 1/3 must be cut during the nesting season.

Mow cool season grasses no shorter than 4 inches and native warm season grasses no shorter than 6 inches.

Mowing/harvesting of warm season grasses should occur a minimum of 30 days prior to the first killing frost to allow for sufficient regrowth and provide habitat over winter.

To maintain the health and vigor of grasslands it may require the periodic application of lime and/or fertilizer. This should be done according to recommendations from a soil test that is performed on a regular basis. Nutrients should be applied outside the primary ground nesting season (March 15 – July 15).

Also refer to (647) *Early Successional Habitat Development/Management* standard.

CONSIDERATIONS

Insects and Diseases

When insect and disease outbreaks exceed economic thresholds, and are uncontrollable by harvest management, pesticide applications may be needed. The producer should be advised to contact the local WVU extension agent or private consulting firm to determine economic threshold limits and to provide pesticide recommendations.

Leachate Control

Where forages are ensiled, silage leachate may occur. Provisions for control of this leachate need to be considered. Refer to Waste Management Standard and Specification.

Delays in Harvesting

Where rainfall and humidity levels cause unacceptable forage quality loss in at least one harvest during the year, consider ensiling the forage to reduce or eliminate field drying time.

Other options are: the use of desiccants, preservatives, conditioners, barn curing, baleage, green chopping, or grazing. If grazing is used as a quality control method, follow recommendations in *Standard 528, Prescribed Grazing*.

Special Considerations:

When pastures produce forage in excess of livestock demand, consider preserving forage quality by machine harvesting a portion of the standing crop. Coordinate this with *Standard 528 Prescribed Grazing*.

Well fertilized plants withstand more intense harvest schedules and may produce a higher quantity and quality of forage. However, it is important to balance fertility levels with economic considerations. Coordinate this practice with *Standard 590 Nutrient Management*.

Select cultivars that are suitable for the harvest regime, species mix, geographic location, soils, and forage quality desired.

Utilize a forage analysis to determine nutrient content and digestibility.

Specifications

All detailed planning information will be prepared in a format that is easily understood by the producer, and in accordance with current technology and policy. Information can be obtained from any reliable source with approval from the State Resource Conservationist.

Specify the following by forage crop:

- Purpose of forage production
- Stage of maturity for harvest
- Harvest intervals
- Stubble height
- Number of harvests per year
- Storage method

Use of existing job sheets, fact sheets, or other information sheets is encouraged. The conservation plan narrative should reference these sheets or contain the aforementioned specifications.

Operation and Maintenance

Maintenance

To insure the plant species remain productive for the expected life span, the following measures should be used:

Grazing will be regulated to limit damage to the forage plant. This is especially critical during periods where the field is wet (compaction), in the early fall, and in early spring.

To insure adequate root reserve, the plants will be allowed to reach the heights shown in Table 1 prior to first killing frost.

All livestock will be removed from the fields before plants begin spring growth. Although this varies across the state, a general guideline is removal by mid February for elevations less than 2000 feet and by mid March for all other areas.

When the desired quantity and quality of the forage decreases to unacceptable levels, renovation may be necessary. Although not usually needed, a complete seedbed preparation may be the best economic and environmental alternative. Other options to consider include interseeding by no-till methods, tromp seeding, and frost seeding. Refer to *Standard 512, Pasture and Hayland Planting* for recommendations.

References

1. WV e-FOTG, SECTION IV
http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WV
2. Penn State Agronomy Guide, 2005 - 2006
<http://agguide.agronomy.psu.edu/>
3. Virginia Cooperative Extension 2000 Agronomy Handbook
<http://www.ext.vt.edu/pubs/agronomy/>
4. Ball, D. M., C. S. Hoveland, & G. D. Lacefield. Southern Forages. 1991. Potash & Phosphate Institute, Norcross, GA.
5. Hanson, A. A., D. K. Barnes, & R. R. Hill, Jr. Alfalfa and Alfalfa Improvement. 1988. American Society of Agronomy, Madison, WI.
6. Ishler, V. A. Et al. Harvesting and Utilizing Silage. 1991. Penn State University Circular 396. University Park, PA.
7. Matches, A. G. Anti-Quality Components of Forages. 1973. Crop Science Society of America Special Pub. No. 4, Madison, WI
8. Pitt, R. E. Silage and Hay Preservation. 1990. Northeast Regional Agricultural Engineering Service. Ithaca, NY.
9. Taylor, N. L. Clover Science and Technology. 1985. American Society of Agronomy, Madison, WI.

TABLE I – HARVESTING GUIDE

General

Harvest **new** seedlings when sufficient growth is present and the plant roots are established well enough to assure adequate food reserve storage for overwintering and vigorous spring growth. It is usually desirable to allow a new seeding to go to seed before first harvest. Fall harvest of late season seedlings should be discouraged unless adequate re-growth will occur before first killing frost.

Harvest **established** stands according to the following general guidelines. For grass-legume mixtures, harvest at the time to favor the desired species.

SPECIES	PERIOD	GROWTH STAGE	HEIGHT AT FIRST KILLING FROST
Alfalfa or Birdsfoot	1 st cut	Alfalfa – full bloom Birdsfoot – ¼ bloom	Final harvest of legumes should have at least 45 <u>days</u> of re-growth and be harvested just prior to or after the first killing frost
Trefoil	2 nd and successive	¼ bloom	
Ladino	all cuts	¼ to ½ bloom	
Red or Alsike	all cuts	¼ bloom	
Orchardgrass	1 st cut	boot to early head	5 - 6 inches
Fescue, and Other non- jointed grasses	successive cuts	after 8-10 inch recovery	
Smooth brome, Timothy, Reed Canary-grass, and other jointed grasses	1 st cut	Smooth Brome-med. to full head. All others - early to full head	5 - 6 inches
	successive cuts	When basal sprouts appear at soil surface	
Switchgrass, big bluestem, Caucasian bluestem	usually only one cutting per season	Late boot stage. CAUTION: Leave 4 – 6 inch stubble	8 inches
Summer annual Grasses (Sudan Grass or Sudan Sorghum Crosses	all cuts	For hay-typically 24 – 30 inches. Leave 4 – 6 inch stubble for fast recovery. CAUTION: Delay green chopping until grass is 18 inches or taller in height to avoid effects of prussic acid	Frosted forage should not be grazed for a week after frosting to allow prussic acid content to dissipate.

For other hay harvest recommendations, refer to agronomy guides (such as Penn State, Ohio State, VPI) or other recognized references.

TABLE II – Optimal Forage Dry Matter (%) Levels

STORAGE METHOD	HAYLAGE	CORN
Upright or tower, conventional	35 - 40 %	32 - 37 %
Upright or tower, oxygen limit	45 - 60 %	40 - 45 %
Bunker or horizontal	30 - 35 %	30 - 35 %
Bag Silo (plastic tubes)	40 - 50 %	30 - 35 %
Baleage (plastic wrapped round Bales)	40 - 50 %	n/a
Field cured hay	80 - 85 %	n/a
Forced air dried baled hay	65 - 80 %	n/a