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
- 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 optimizes the desired forage stand, plant community, and stand life. Follow State Cooperative Extension Service (CES) recommendations for forage harvest based on stage of maturity, moisture content, length of cut, stubble height and harvest interval. The following criteria must be met:

Stage of Maturity. Harvest forage at the stage of maturity that provides the desired quality and quantity without compromising plant vigor and stand longevity.

Moisture Content. Harvest silage/haylage crops within the optimum moisture range for the type of storage method(s) or structure(s) being utilized.

CES recommendations must be followed for optimum moisture content and levels as well as methods and techniques to monitor and/or determine moisture content and levels.

Avoid fermentation and seepage losses of digestible dry matter from direct cut hay crop silage (moisture content >70%) by treatment with chemical preservatives or add dry feedstuffs.

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 used and optimal effective fiber. The length of chop selected will allow adequate packing to produce the anaerobic conditions necessary to ensure the proper ensiling process.

A shorter chop length on very dry silage may help to ensure good packing and adequate silage density.

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.

See Tables 1 & 2 at the end of this standard for stubble height by species.

Contaminants. Forage shall not contain contaminants that can cause illness or death to the animal being fed or rejection of the offered

forage. Check CES contaminant notices, cautions, and recommendations for the specific harvest site location and area.

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 ample viable seed or carryover of hard seed to maintain desired stand density.

If plants show signs of short-term environmental stress, harvests will be adjusted in a manner that encourages the continued health and vigor of the stand. Follow CES recommendations in these cases.

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. Using this practice for this purpose may require more frequent harvests to increase uptake instead of managing for stand longevity.

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

Follow CES guidelines when available for control of disease, insect, weed and invasive plant infestations to forage.

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) for all forage areas to be harvested. Also plan and schedule removal of invasive plants and noxious weeds.

Lessen incidence of disease, insect damage, and weed infestation by managing harvests to maintain a full, vigorous, dense forage stand.

Cut forages after dew, rain, or irrigation water on the leaves has evaporated.

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 minimum plant heights to provide suitable habitat for the desired specie(s) should be implemented and maintained.

Time harvests to benefit the desired wildlife species by following state guidelines.

Coordinate this practice with conservation practice standard Upland Wildlife Habitat Management (645) and accompanying job sheets.

CONSIDERATIONS

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

When nutrients or other soil amendments are applied coordinate forage harvests with NRCS practice standard 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.

Produce stored forages of the quality needed for optimum performance of the animal being fed. Legume forages too low in fiber and lead to metabolic disorders in ruminants and an economic loss to the producer due to lowered animal performance. Consider analyzing harvested forages for feed quality. Coordinate this practice with NRCS practice standard Feed Management (592).

Direct cut grass and legume silage can create silage leachate (seepage) in storage. Consider use of practice standards Runoff Management System (570) and Waste Storage Facility (313).

In conjunction with harvest options, consider storage and feeding options that will retain acceptable forage quality and minimize digestible dry matter loss.

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

Consider delaying harvest if prolonged or heavy precipitation is forecast that would reduce forage quality.

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, or macerating implements to reduce field-drying time.

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

Consider Harvesting Forages in the afternoon to optimize water soluble carbohydrates and nutritional quality.

PLANS AND SPECIFICATIONS

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

Plans and Specifications must include as minimum for the forage harvest operations:

1. Goals, objectives, specific purpose (such as high forage quantity and quality or nutrient uptake, etc.)
2. Forage species to be harvested

By each dominant forage species harvested show:

3. Method of harvest
4. Stage of maturity
5. Optimal harvest moisture content
6. Length of cut
7. Stubble height to be left
8. Harvest interval including late harvest if applicable
9. Contaminant avoidance recommendations.

These plans and specifications shall be available through appropriate job sheets and other materials 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.

To control forage plant diseases, insects, and movement of weeds, clean harvesting equipment after harvest and before storing.

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.

Follow all agricultural equipment manufacturer's safety measures when operating forage harvesting equipment.

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

Dispose of the plastic wrap or bags used to store forage in an environmentally sound manner.

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Table 1

Approximate growth stage, cutting height (inches), and minimum leaf length (inches), before killing frost.

SPECIES	CUTTING	GROWTH STAGE	CUTTING HEIGHT	REGROWTH BY FROST
GRASSES:				
Bluegrass, big	1st, 2nd	Boot to pre-head	3	8
Bluegrass, Kentucky	1st, 2nd	Boot to early head	3	3
Bromegrass, smooth	1st = 2nd =	Heading to flowering When 12-15” tall	3	4
Bromegrass, meadow	1st, 2nd	Boot to early head	3	4
Canarygrass, Reed	1st = 2nd=	1st head to flower When 12-15” tall	3	8
Fescue, tall[1]	1st, 2nd	Boot to pre-head	3	5
Foxtail, creeping	1st, 2nd	Boot to early head	3	5
Foxtail, meadow	1st, 2nd	Boot to early head	3	5
Needlegrass, green	1st, 2nd	Boot to early head	3	5
Orchardgrass	1st = 2nd =	Heading to flowering When 10 – 12” tall	3	6

Timothy	1st = 2nd =	Heading to flowering When 12 – 15” tall	3	6
Wheatgrass, beardless	1st, 2nd	Boot to early head	3	7
Wheatgrass, bluebunch	1st, 2nd	Boot to early head	3	7
Wheatgrass, crested	1st, 2nd	Boot to early head	3	3
Wheatgrass, Fairway	1st, 2nd	Boot to early head	3	2
Wheatgrass, Fairway x standard	1st, 2nd	Boot to early head	3	3
Wheatgrass, intermediate	1st, 2nd	Boot to early head	3	7
Wheatgrass, pubescent	1st, 2nd	Boot to early head	3	7
Wheatgrass, Siberian	1st, 2nd	Boot to early head	3	3
Wheatgrass, slender	1st, 2nd	Boot to early head	3	6
Wheatgrass, streambank	1st, 2nd	Boot to early head	3	3
Wheatgrass, tall	1st, 2nd	Boot to early head	5	8
Wheatgrass, thickspike	1st, 2nd	Boot to early head	3	4
Wheatgrass, western	1st, 2nd	Boot to early head	3	4
Wildrye, Altai	1st, 2nd	Boot to early head	3	-
Wildrye, beardless	1st, 2nd	Boot to early head	3	-
Wildrye, Russian	1st, 2nd	Boot to early head	3	4

1 – Avoid harvest of tall fescue seedheads to minimize endophyte toxicity problems.

SPECIES	CUTTING	GROWTH STAGE	CUTTING HEIGHT	REGROWTH BY FROST
LEGUMES:				
Alfalfa	1st, 2nd	Mid-bud to 1/10th bloom	2	7
Clover, alsike	1st = 2nd =	Late bud to 1/4th bloom When 10 – 12” tall[2]	2	6
Clover, ladino	1st = 2nd =	Late bud to 1/4th bloom When 10 – 12” tall	2	6
Clover, red	1st = 2nd =	Late bud to 1/4th bloom When 10 – 12” tall	2	6
Clover, white	1st = 2nd =	Late bud to 1/4th bloom When 10 – 12” tall	2	6
Milkvetch, cicer	1st = 2nd =	1/10th bloom End of season	2	5
Sainfoin	All	½ bloom	2	6
Sweetclovers	All	1st to full bloom[3]	2	4
Trefoil, birdsfoot	1st = 2nd =	Early bloom After 6-8 weeks	2	5
Vetch, hairy	No info.			

OTHER:				
Small grains	All	Late milk to soft dough	3	-
Grass – legume mix	All	Base on legume	-	-

2 – Many clovers have moisture contents that limit their usefulness as hay.

3 – Sweetclover hay with a moisture content > 50% can readily mold, become toxic, and cause hemorragic disease in cattle.

Table 2

Recommended

FORAGE PROCESSING METHOD	PERCENT MOISTURE for PROCESSING
Cubes	10-14%
Small Rectangular Bales With Preservative	12-15% 18-20%
Large Square Bales	12-15%
Large Round Bales	12-15%
Hay Loaves	15-20%
Haylage/Silage	50-80%