

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, haylage, green-chop, or ensilage.

PURPOSES

- Optimize the yield and quality of forage at the desired levels
- Promote vigorous plant re-growth.
- Manage for 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 THIS PRACTICE APPLIES

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

CRITERIA**General criteria applicable to all purposes stated above**

Harvest forage at a frequency and height that optimizes the desired forage stand, plant community, and stand life. Follow Plant Materials Program, state extension, or state/federal research program 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. Refer to section 600.0507 of the NRCS National Range and Pasture Handbook (NRPH) for additional information. Appendices 1 and 2 show the harvest recommendations and proper cutting heights for forages commonly grown in Florida.

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

Follow Plant Materials Program, state extension, or state/federal research program recommendations 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 needs to 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. Follow Plant Materials Program, state extension, or state/federal research program recommendations for proper stubble height to avoid winterkill of forage species in cold climates.

Contaminants. Stored forage should not contain contaminants (e.g., nitrates, etc.) that can cause illness or death to the animal being fed or rejection of the offered forage. Check

Plant Materials Program, state extension (<http://agronomy.ifas.ufl.edu/foragesofflorida/toxicities.php>), or state/federal research program 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, adjust harvest intervals in a manner that encourage the continued health and vigor of the stand. Follow Plant Materials Program, state extension, or state/federal research program 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 Plant Materials Program, state extension(see Problems sidebar at: <http://agronomy.ifas.ufl.edu/foragesofflorida/index.php>), or state/federal research program 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 Florida Conservation Practice Standard Pest Management, Code 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 Florida Conservation Practice Standard Upland Wildlife Habitat Management, Code 645, and accompanying job sheets.

Reduce pesticide to the maximum extent possible while maintaining the health and vigor of the forage crop. Apply all pesticides in accordance with the label instructions.

Leave a portion of the field (10 to 30%) unharvested to provide nesting, foraging and escape cover for wildlife if possible.

CONSIDERATIONS

Where applicable coordinate this practice with Florida NRCS Conservation Practice Standard Prescribed Grazing, Code 528.

When nutrients or other soil amendments are applied, coordinate forage harvests with Florida NRCS Conservation Practice Standard Nutrient Management, Code 590, and/or Waste Utilization, Code 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 can 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 Florida NRCS Conservation Practice Standard Feed Management, Code 592.

Direct cut grass and legume silage can create silage leachate (seepage) in storage. Consider use of Florida NRCS Conservation Practice Standards Runoff Management System, Code 570, and Waste Storage Facility, Code 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.

Monitor weather conditions before and after cutting and take appropriate action to optimize the yield and quality of the harvested material.. This will optimize forage wilting or curing time to preserve feed quality, prevent forage swaths or windrows from smothering underlying plants, and prevent damage to fields or equipment.

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.

REFERENCES:

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Appendix 1. Hay Harvesting Guide

Forage Species	Harvest	Growth Stage or Height to Harvest	Regrowth Period (days)	Minimum Cutting Height (inches)
Alfalfa ¹	1st cutting	Full bud	30-35	3
	Other cuttings	1/10 bloom	30-35	3
Arrowleaf Clover	Only one cutting	Early bloom	---	2
Alyceclover	All cuttings	Early bloom (or just before flowering) 18-24 inches	---	3
Bahagrass ²	1st cutting	12 inches	28-35	2
	Other cuttings	Every 3 - 4 weeks or when regrowth is 12 inches high	21-28	2
Hybrid Bermudagrass	1st cutting	14 to 16 inches height	28-42	3
	Other cuttings	Every 4 to 5 weeks or when regrowth is 15 inches high	28-35	3
Clovers	All cuttings	Early bloom	35-42	3
Eastern Gamagrass ¹	All cuttings	Boot to early head 16-36 inches	28-42	8
Hairy Indigo	All cuttings	30-36 inches	---	4
Limpograss (Hemarthria)	All cuttings	16 to 24 inches	35-42	8
Lespedeza, Annual	Only one cutting	Early bloom & before bottom leaves begin to fall	---	2
Lespedeza, Sericea ¹	All cuttings	15 to 18 inches high	---	5
Millet, Pearl	All cuttings	Height of 30 to 40 inches	---	6
Digitgrass, 'Pangola'	All cuttings	12 to 18 inches height	28-35	3
Perennial Peanut	All cuttings	Early to full bloom or when regrowth is 10-12 inches	42-56	2
Ryegrass	One cutting	Boot to early head	---	2
Small Grains	One cutting	Boot to early head	---	2
Soybean or Cowpea	All cuttings	Mid- to full bloom	---	
Stargrass	1st cutting	14 to 18 inches height	28-35	4
	Other cuttings	When regrowth is 15 inches tall	28-35	3
Sudangrass & Sorghum-Sudan Hybrids -	All cuttings	Height of 30 to 40 inches	---	6
Switchgrass ¹	All cuttings	Boot	28-35	6

¹The last cutting should be early enough to allow for sufficient regrowth to store carbohydrates within the plant before frost. The regrowth may be cut or grazed, after frost or the dormant period begins.

²Bahagrass is not recommended for hay or haylage due to low quality at recommended harvest height.

Appendix 2. Guidelines for Harvesting and managing Forages Harvested as Silage¹

Crop	Stage of Harvest		Yield Potential (tons DM/ acre/year)	% DM at harvest	WSCHO ² % DM	Management suggestions
	1st harvest	Additional harvests				
Warm-season Annuals						
Corn	Grain in dent, black layer forming	---	4-8	28-35	10-20	Direct cut
Forage Sorghum	Boot or soft dough	---	3-8 per harvest	20-35	10-20	Select varieties with higher dry matter at harvest (>28% DM)
Sudan, Sorghum- Sudan, Millet	36" height to boot	36' height to boot	2-4 per harvest	15-30	10-15	Wilt if <25% DM
Soybeans	Pre-pod to bean fill, before leaf drop	Usually 1 harvest	1-3	25-40	2-4	Wilt if < 30% DM
Cowpea	Pre-pod to pea fill	Usually 1 harvest	1-3	15-30	5-8	Wilt if < 30% DM
Cool-season Annuals						
Rye, Oats, Wheat, Triticale	Boot to soft dough	---	2-4	20-30	8-12	Wilt if <25% DM
Ryegrass	Boot to heading	Every 30 days	2-4	15-30	8-12	Wilt if <25% DM
Warm-season Perennials						
Bermudagrass, Stargrass	Pre-head (12-15" tall)	Every 4-5 weeks	6/10	18-30	2-4	Wilt if < 30% DM
Bahiagrass	Pre-head	Every 4-5 weeks	3-5	20-30	<5	Wilt if < 30% DM
Limpograss (Hemarthria)	12-15" tall	Every 5-7 weeks	4-8	20-30	<5	Wilt if < 30% DM
Perennial Peanut	8-12" tall	Every 5-7 weeks	2-4	18-30	1-4	Wilt if < 30% DM
Cool-season Perennial						
Alfalfa	Bud to 10% flower	Bud to 10% flower	4-6	22-35	4-7	Wilt if < 30% DM

¹ Chambliss, C.G., and M.B. Adjei. 2006. Florida Forages Handbook. Univ. Florida, IFAS. SS-AGR-97
(http://edis.ifas.ufl.edu/topic_book_florida_forage_handbook).

² Water-soluble carbohydrates – sugars fermented to lactic and other acids during ensiling.