NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE SPECIFICATION

FORAGE HARVEST MANAGEMENT

(Acre)
CODE 511

Nutrient management: Adequate amounts of nitrogen, phosphate, potash, lime, and certain minor elements are needed for intense forage harvest schedules to increase forage quantity and quality and to maintain stand life. A soil test should be used as a guide in determining the amount of nutrients needed for sustainable hay production. Refer to Agricultural Waste Management Field Handbook, Section 651.0606, Nutrient Removal by Harvesting of Crops.

Companion legumes typically result in reduced nitrogen fertilizer needs, but nitrogen additions, even where legumes are present, are often required to maintain production goals.

Weed/brush control: Coordinate pesticide applications with harvest schedules to allow no adverse effects to livestock from herbicide residue in sprayed forages being fed. Follow all herbicide label directions for harvest or grazing restrictions.

Harvesting: Stage of maturity and harvest interval: Stage of maturity at harvest is the most important factor affecting forage quality. Therefore, harvest management is the primary method by which managers can influence the nutritional quality of the forage, as well as forage yield and stand life.

Table 1 reflects harvest timing and height for optimum quality and quantity of the more common forage species. A forage test is the most reliable method to determine forage quality and ensure the needs of the animal being fed are met.

If higher **quality** is desired, a slightly **earlie**r harvest date is needed.

If higher **quantity** is desired, a slightly **later** harvest date is needed.

The specified number of harvests per year shall be based on the forage species' ability to grow after harvest. Factors that influence the number of harvests per year include harvest height, available nutrients, climatic conditions, length of the growing season, and the minimum stubble height required at the end of the growing season.

A harvest regime that results in forages being harvested too frequently or continuously too early or too late tends to decrease overall yield, reduce plant vigor, and leads to a progressive stand decline.

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.

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

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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.

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

For optimal forage quality, rake, ted, or invert swaths, and bale when hay has sufficient moisture to prevent leaf loss.

Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

Bale field cured hay at 15 to 20 percent moisture.

Bale forced air-dried hay at 20 to 35 percent moisture.

Rake hay at 30 to 40 percent moisture.

Ted or invert swaths when moisture is above 40 percent.

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. Follow CES recommendations for proper stubble heights to avoid winterkill of forage species in cold climates.

Harvesting at an appropriate stubble height generally will allow for adequate regeneration of most perennial species. When weather or circumstances necessitate harvesting at a later date than indicated in Table 1, it is advisable to mow at a slightly higher cutting height than the recommended harvest height.

Table 1 lists minimum plant height by species needed before frost.

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.

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.

Wildlife: If 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.

Animal Health: When nutrients or other soil amendments are applied, 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.

Storage Management: 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.

Fertilizing

Well-fertilized plants withstand more intense harvest schedules and may produce a higher quantity and quality of forage. Coordinate this practice with the Nutrient Management (590).

Fertilize to meet the needs of the plant and to produce the amount of forage needed by the operator.

Use soil tests or tissue analysis to determine fertilizer needs. Experience and local tests can serve as a rule of thumb, but soil tests provide accurate information, which can prevent under or over fertilization.

Research has shown that on the tighter soils, there is no difference in total production between a single large nitrogen application and split applications. When a single application of N is applied, about half of the total production is made at the first cutting, and the other half is distributed over the remaining cuttings. For hay production, a single application would be best. Protein levels in the last half of the growing season are slightly higher when split applications of N are made on the sandier soils, it is also better to apply split applications to prevent loss of the nitrogen through leaching.

Varying the ratio between nitrogen and phosphorous fertilizers can help maintain a balance between grasses and legumes in mixtures. Nitrogen increases grasses and phosphorus increases legumes.

NMSU Guide A-128 Fertilizer Guide for N.M." provides guidance on fertilizer requirements, application, and soil testing.

http://aces.nmsu.edu/pubs/_a/a-134.html

Irrigation Water Management

Establish rate, duration and frequency of irrigation that will be required to maintain soil moisture above 50 percent available water holding capacity during months of peak water use.

When practical, use the established frequency during the entire season in combination with time of harvest (either by grazing or cutting).

When possible, irrigate immediately after harvesting if needed.

Amounts of water applied at each irrigation will be adjusted to match the designed use rate and the operator's objectives. (See Local Irrigation Guide)

http://www.nm.nrcs.usda.gov/technical/fotg/section-1/irrigationguide.html

Irrigation frequency and amount will be adjusted when soil and/or irrigation water is high in soluble salts depending on the specific situation.

Adequate surface drainage should be provided. Allowing excess water to stand on fields can drown plants.

The resulting open areas allow weeds and undesirable grasses to increase. The excess water also provides a breeding ground for insects and disease.

It is recognized that in many parts of the state, water must be applied when it is available and not when it is desired, and that water may NOT be available for part of the season. However, the operator should be aware of these factors so that water can be properly applied when it is available. We should also be as concerned here with OVER watering as we are with UNDER watering.

See Practice Standard – 449 – Irrigation Water Management.

http://efotg.sc.egov.usda.gov//references/public/NM/449std.pdf

Harvesting (Irrigated or Dryland)

Do not mow grasses and/or legumes for hay until well established. (See Standards and Specifications for Pasture and Hayland Planting.)

Harvesting should be based on stage of growth and the objectives of the operator. Harvesting at various stages of growth has an influence on protein content, total dry matter, percentage of leaves vs stems, total fiber, and total available carbohydrates in roots.

Continuously cutting alfalfa at an immature stage, such as the prebud or bud stage, will reduce total yield and cause the stand to deteriorate prematurely. Stand thinning is due primarily to a continuous reduction of food reserves in the roots. Alfalfa with low root reserves is especially susceptible to winter killing.

However, alfalfa cut at an immature stage has higher protein content and higher feeding value per pound than when cut at later stages. Thus, it becomes a question of very high quality feed vs total forage and stand longevity. Cutting at about 1/10th bloom stage gives you the highest total protein per acre and also the highest Total Digestible Nutrients. The most damage to stand vigor occurs when alfalfa is cut at an immature stage shortly before frost in the fall.

Following establishment, perennial grasses and/or legumes should be cut for hay as follows:

Grasses all cuttings—harvest between the time the seed head begins to emerge from the boot to early bloom. Cutting earlier will result in higher protein levels but lower yields. Cutting later will increase total yields, but protein levels drop.

Minimum harvest heights for both grasses and legumes are shown in Practice Standard-528a-Prescribed Grazing (Table 1 & 2).

Suggested harvest for alfalfa harvest heights are as follows:

Alfalfa first cutting – at or near ½ bloom. All other cuttings after development of one-tenth to one-fourth bloom. Cut at 1-1/2 to 2 inches.

Harvesting of regrowth after the last full cutting should be done at or following date of the last killing frost if adequate forage is available.

The last full harvest of hay should not be done within three to four weeks of the average date of the first killing frost to allow time for replenishment of root reserves.

Avoid mowing when the soil is so wet that excessive compaction or damage to plants will result.

The values in the Table I below are indicative of changes, with maturity, of alfalfa. Other legumes would be similar. This data reflects only the relative changes, which occur, with changes in harvest frequency. It is not indicative of yields, which could be expected in any area of New Mexico.

Alfalfa Harvest Frequency and Maturity of Alfalfa

Harvest Frequency (days)	16	21	28	35	42
Percent Bloom	0	5	15	75	100
Percent Leaves	55	47	45	34	34
Percent Stems	45	53	55	66	66
Percent Protein (leaves)	30	29	27	27	23
Percent protein (stems)	15	13	11	12	12
Percent protein (forage)	23	21	18	17	16
Dry matter (tons/yr.)*	3.0	4.0	4.3	5.7	6.6
Relative Root Weights	2	3	4	7	9
Percent Total Available Carbohydrates in Roots	23	25	28	36	29
Basal Shoot Rating**	1	3	4	5	8

* These yields were converted to tons from small samples. Yield differences from cutting at various growth stages may be less from larger samples.

**The basal shoot rating is based on a scale of 1 to 10. Alfalfa should always be cut before the basal shoots are tall enough that cutting removes the tops (growing point). When the growing point of basal shoots is removed, rapid regrowth is delayed until new basal shoots develop.

☐ **Dormant season grazing:** Refer to Conservation Practice 528, Prescribed Grazing, for dormant-season grazing

Grazing Alfalfa Hayland (irrigated & dryland)

Grazing alfalfa fields during the winter period is detrimental to the next season's growth and production. In northern areas, the danger of stand thinning due to the loss of insulation and/or crown damage by trampling is much more likely in grazed fields than in ungrazed ones. In the southern part of the state, where nondormant alfalfa is grown, and the plant remains green throughout the winter, grazing is very damaging. Grazing removes the green top growth, a warm spell occurs, and the alfalfa plant draws on its root reserves and makes additional top growth. Again, this is grazed off, and the cycle is repeated. This continuous drain on the root reserves results in a slower start when spring finally arrives. Stand thinning has again occurred due to the trampling plus many plants die because they have expended all of their root reserves before spring and have "starved" to death. The thinner stand results in lowered overall production the summer following the winter grazing.

Organic producers: If this practice has the potential to effect land managed under the USDA standards for Organic production, then treatment alternatives must be included that meet standards for the National Organic Program (NOP):

http://www.ams.usda.gov/AMSv1.0/nop

Ultimately each Cooperator is responsible for selecting and implementing an alternative that meets management objectives, including adherence to NOP standards or other guidelines that may apply.

These plans and specifications shall be consistent with this standard and shall describe the requirement 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.

REFERENCES:

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New Mexico Integrated Water Management Handbook (AGRO - 76)
http://www.nm.nrcs.usda.gov/technical/handbooks/iwm/nmiwm.html

NEW MEXICO AGRONOMY TECHNICAL NOTE NO. 75 - ALFALFA
http://www.nm.nrcs.usda.gov/technical/tech-notes/agro/ag-75.pdf

NEW MEXICO AGRONOMY TECHNICAL NOTE NO.66 Water Conservation Through Drip Irrigated Alfalfa Cropping Systems

http://www.nm.nrcs.usda.gov/technical/tech-notes/agro/ag66.pdf

NEW MEXICO AGRONOMY TECHNICAL NOTE NO.41 New Mexico Guide for Carrying Capacity

http://www.nm.nrcs.usda.gov/technical/technotes/agro/AG41.pdf

BIOLOGY TECHNICAL NOTE NO. 52 - WILDLIFE HABITAT APPRAISAL GUIDES FOR PASTURE IN NEW MEXICO http://www.nm.nrcs.usda.gov/technical/technotes/bio/bio52.doc

Anti-Quality Factors in Rangeland and Pastureland Forages. 2001. ftp://ftp-fc.sc.egov.usda.gov/GLTI/technical/publications/anti-quality-bulletin.pdf

Guide to Pasture Condition Scoring 2001 ftp://ftp-fc.sc.egov.usda.gov/GLTI/technical/publications/pasture-score-guide.pdf

References Continued:

NMSU-College of Agriculture & Home Economics

Cooperative Extension Service-Agricultural Experiment Station

Publications

Publication Number	Series	Title	Author
A-309	GUIDE	Alfalfa Weevil or Clover Leaf Weevil	Durkin
A-311	GUIDE	Sanfoin Production	Glover
A-313	GUIDE	Alfalfa Weevil or Clover Leaf Weevil	Glover
A-314	GUIDE	Is Hay Storage Profitable?	Clevenger
A-316	GUIDE	Structure of a Hay Bale	Glover
A-317	GUIDE	Alfalfa Fertilization in New Mexico	Glover
A-318	GUIDE	Reducing Alfalfa Harvest Losses	Glover
A-322	GUIDE	Alfalfa Hay Grading	Glover
A-323	GUIDE	Alfalfa Variety Selection in New Mexico	Glover
A-324	GUIDE	Sampling Small Bales of Alfalfa Hay	Currier
RR-590	Research	Evaluation of Six Legumes Under Different Irrigation and Nitrogen Fertilization Levels in North-Central New Mexico	Tapia
RR-595	Research	Fall Growth of Alfalfa and Cultivar Adaptation	Field
RR-677	Research	Performance of Warm & Cool Season Perennial Grasses under Irrigation	Kirksey
RR-678	Research	Economic Evaluation of Alfalfa Production under Less than Optimum Irrigation Levels	Libbin
RR-684	Research	Grazing Alfalfa and Winter Annual Small Grains with Angora Goats	Kiesling
RR-695	Research	Alfalfa Variety Trials in New Mexico	N/A

Moisture Content
Crop Moisture Percent Range

Green Chop 70-85%
Silage 60-70%
Haylage 40-60%
Hay 10-20%

3. Definitions

☐ Boot – Seed head in upper sheath, but prior to emergence.

☐ Early Head - Tip of seed head emerging on not more than 10 percent of the stems.

☐ Medium Head - About 50 percent of the seed heads emerged or emerging.

☐ Full Head – Seed heads fully emerged but prior to any flowering.

☐ Early Bud - No flower color showing on 80 percent of plants.

☐ Late Bud - Shows flower color on 80 percent of plants.

☐ Early Bloom - 10 percent flowers out.

☐ Late Bloom - All flowers out.

FORAGE PLANT NAME	CUTTING PERIOD	PLANT GROWTH STAGE	MINIMUM CUTTING HEIGHT (Inches)	MINIMUM PLANT HEIGHT AT END OF GROWING SEASON (Inches)
Alfalfa-N	First cutting Second cutting Last cutting	Late bud to ¼ bloom Early bloom - ¼ bloom Six weeks before last killing frost	4	8
Alfalfa-S	All	Early-Bud to 1/10th Bloom	3	4
Alsike Clover-N	First cutting	¼ bloom to ½ bloom	2	6
Alsike Clover-S	1st, all others	Late-Bud to Early-Bloom; 10-inch to 12-inch height	3	6
Altai Wildrye	1st; all others	Early-Head to Full-Head; 8-inch to 10-inch height	3	4
Arrowleaf clover	First cutting	Early to ¼ bloom	3	6
Basin Wildrye	1st; all others	Early-Head to Full-Head; 8-inch to 10-inch height	5	8
Bermudagrass-N	1st; all others	Boot to Mid-Head; 12-inch to 15-inch height	3	5
Bermudagrass-S	All cuttings	Boot to early heading	3	6
Berseem clover	First cutting	Early to ¼ bloom	3	5
Big and Sand bluestem	One cutting prior to July 20	Boot to medium head	4	8
Big Bluestem	1st	Boot to Mid-Head	3	8
Birdsfoot trefoil -N	1st; all others	Early-Bloom to Mid-Bloom; After 7 to 8 weeks regrowth	3	5
Birdsfoot trefoil-S	All cuttings	Early to ¼ bloom	3	5
Cicer milkvetch-N	1st; all others	Early-Bloom to Mid-Bloom; After 6 to 7 weeks regrowth	3	5

FORAGE PLANT NAME	CUTTING PERIOD	PLANT GROWTH STAGE	MINIMUM CUTTING HEIGHT (Inches)	MINIMUM PLANT HEIGHT AT END OF GROWING SEASON (Inches)
Cicer milkvetch-S	All cuttings	Early to ¼ bloom	3	5
Cowpeas	First cutting	Early to ½ bloom	3	Annual
Crabgrass	All cuttings	Boot to early heading	2	Annual
Creeping Meadow Foxtail	1st; all others	Early-Head to Full-Head; 8-inch to 10-inch height	3	5
Creeping Wildrye	1st; all others	Early-Head to Full-Head; 8-inch to 10-inch height	3	4
Crested/Desert Wheatgrass	1st; all others	Boot to Early-Head	3	3
Crimson clover	First cutting	Early to ¼ bloom 4/	3	5
Eastern gamagrass-N	1st	Boot to Mid-Head	3	8
Eastern gamagrass-S	All cuttings	Early boot	8	8
Grass- Legume1 Mix 1Birdsfoot Trefoil, or 1White Clover, or 1Ladino Clover	All	Base on Grass	–	–
Grass-Legume Mix (see below for exceptions)	All	Base on Legume	–	–
Hairy vetch	First cutting	Early to ¼ bloom	3	5
Indiangrass	One cutting prior to July 20	Boot to medium head	4	8
Intermediate/Pubescent Wheatgrass	1st; all others	Early-Head to Full-Head; 8-inch to 10-inch height	4/3	6
Italian Ryegrass	1st	Mid-Head to Flowering	3	–
Kentucky Bluegrass	1st; all others	Boot to Early-Head	3	3
Ladino Clover-N	First cutting	Early to ¼ bloom	3	5

FORAGE PLANT NAME	CUTTING PERIOD	PLANT GROWTH STAGE	MINIMUM CUTTING HEIGHT (Inches)	MINIMUM PLANT HEIGHT AT END OF GROWING SEASON (Inches)
Ladino Clover-S	1st; all others	Late-Bud to Mid-Bloom; 10-inch to 12-inch height	2	6
Lespedeza, common, 'Kobe', 'Korean'	First cutting	Pre-bloom to early bloom	4	5
Meadow brome	First cutting; second cutting	Early boot to full head; When 8 to 10 inches tall	3	6
Meadow Bromegrass (*Regar*)	1st ; 2nd	Boot to Early-Head	3	4
Millet, 'Pearl'	All cuttings	Pre-boot	8	Annual
Native prairie (mixed and tallgrass)	One cutting prior to July 20	Boot to medium head for key species	4	8
Nevada Bluegrass	1st ; 2nd	Boot to Pre-Head	3	8
Orchardgrass	First cutting; second cutting	Boot to early head; When 8 to 10 inches tall	3	6
Prairie sandreed	One cutting prior to July 20	Boot to medium head	4	8
Red Clover-N	First cutting	¼ bloom to ½ bloom	2	6
Red Clover-S	1st; all others	Late-Bud to Mid-Bloom; 10-inch to 12-inch height	3	6
Reed canarygrass	First cutting Second cutting	Early boot When basal sprouts appear, about every 4 to 6 weeks 3/	4	6
Russian Wildrye	1st ; 2nd	Boot to Early-Head	3	4
Ryegrass, perennial/annual	All cuttings	Boot to soft dough	4	6
Sanfoin	All	Mid-Bloom	4	6
Slender Wheatgrass	1st ; 2nd	Boot to Early-Head	5	6
Small grains	Only cutting	Milk to soft dough	4	Annual

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FORAGE PLANT NAME	CUTTING PERIOD	PLANT GROWTH STAGE	MINIMUM CUTTING HEIGHT (Inches)	MINIMUM PLANT HEIGHT AT END OF GROWING SEASON (Inches)
Smooth brome	First cutting Second cutting	Early to full head (50 percent head emergence) When 8 to 10 inches tall	3	6
Strawberry Clover	1st 2nd on	Late-Bud to Mid-Bloom 10-inch to 12-inch height	2	6
Sudangrass	All cuttings	Pre-boot, about 30 to 40 inches tall	6	Annual
Sweetclover	1st; all others	Early-Bud to Early-Bloom; After 6 to 7 weeks regrowth	4 to 6	5
Switchgrass	One cutting prior to June 25	Early boot	4	8
Switchgrass	1st	Boot to Mid-Head	3	10
Tall fescue	First cutting; second cutting	Early boot stage; 4 to 6 week intervals	3	4
Tall wheatgrass	First cutting; second cutting	Early to full head; When 8 to 10 inches tall	3	7
Timothy	First cutting; second cutting	Early to full head; when 8 to 10 inches tall	3	6
Western wheatgrass	First cutting; second cutting	Early to full head; when 8 to 10 inches tall	3	5
Wheatgrass Intermediate/Pubescent	First cutting; second cutting	Early boot to full head; when 8 to 10 inches tall	3	7
White Dutch Clover	1st; all others	Late-Bud to Mid-Bloom; 10-inch to 12-inch height	3	4
Wildryes	First cutting; second cutting	Early to full head; When 8 to 10 inches tall	3	4

NOTES: