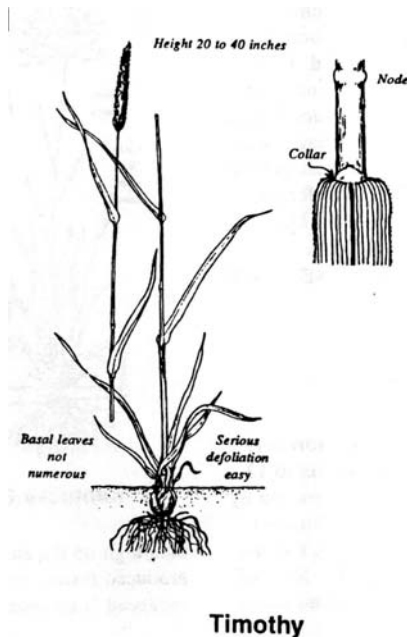


Plant Species Selection

Lesson 2

Introduction



The proper selection of plant species is the first step in long-term pasture production. Selecting the appropriate species for specific pastures where they will be grown for their intended use is practical and cost effective. The species mixture should be adapted to the pasture soil and management criteria. Knowing your objectives and criteria for pastures will make the selection much easier.

Producers can be divided into two groups when it comes to species selection. The first group is those who stay with the traditional cool season grasses and legumes species such as smooth brome grass, bluegrass, timothy and orchardgrass in combination with the various legumes.

The second group of producers is made up of those looking for more variety and experiment with unconventional pasture crops such as chicory, turnips, winter annuals, summer annuals and rape (canola). Each producer will have to determine what best fits his/her livestock and pasture goals.

Renovation

Before ripping up existing pasture or hay ground, consider the potential of the current stand. Evaluation of the current stand is covered in Lesson 1. Review as needed. Probably the most common renovation method is seeding legumes into cool season grass stands. This can increase yield and quality, plus stretch the peak production periods into the summer. Improved grazing management can also greatly improve desirable species in a forage stand.

The choice of renovation method will depend on current pasture condition, along with the amount of time and money available for renovation. The choices from most to least aggressive are conventional tillage, reduced tillage, no-till, frost seeding, and livestock seeding, respectively. Generally, as you move from conventional seeding down to livestock seeding, weather becomes more of a factor.

Frost seeding is a “low tech” method that can work well for seeding legumes into existing cool season grass stands if all the conditions are right. A spin spreader is all that is needed. Seed is broadcast on the soil in mid spring when daytime temperatures are above freezing and nighttime temperatures are below freezing. The frost seeding method does not appear to work very well for grasses. See Appendix B for details on how to frost seed and what has to go right for frost seeding to work

Selecting Forage Species

Generally forages in Maine are divided into three groups: cool-season grasses, legumes, and alternative forages. The mix of these will depend on soil type, drainage, pH, fertility, and personal preference. All are capable of successfully producing feed for the grazing animal. Ideally, the production cycle of the forages will match the stage of production of the grazing animals. In other words, maximum forage production and quality should coincide with the herd’s maximum nutritional requirements, such as during the calving and breeding season.

Appendix A describes the characteristics of different forages, and can be used as a reference for deciding which forages to include in a pasture program. When quality is of concern, legumes provide the highest quality forage followed by cool season perennial grasses, and cool season annual grasses.



Ladino or White Clover

Cool Season Grasses

Most of the perennial grasses growing in Maine are cool season grasses. Cool season grasses produce the majority of their production in the spring, followed by a slump period during the hot summer months and a second growth spurt in the fall. The most common cool season grasses are smooth brome grass, timothy, orchard grass, and bluegrass. Reed canarygrass has gained a lot of popularity with the new low-alkaloid varieties. Although the natural habitat of reed canarygrass is poorly drained and wet areas, it is as drought tolerant as the other cool-season grasses. In addition, the digestibility of reed canarygrass is equal to or greater than that of other perennial cool season grasses if managed properly. Reed canarygrass can be difficult and slow to establish. Although quackgrass is considered a weed in row crops, lawns, and gardens, some graziers are including it in their pasture mixtures because of its durability and persistence. Kentucky bluegrass is generally a low yielding species unless heavily fertilized. Bluegrass has a tendency to become more prominent in pastures that are over-grazed. However, well managed bluegrass can be productive. Another grass worthy of trial is perennial ryegrass. Ryegrasses have generally not been recommended in the past because they lack winter hardiness. With the introduction of more winter hardy varieties, perennial ryegrasses should be tried in southern and coastal counties of Maine to see if they have a place in your system. Ryegrasses can be highly competitive with forage legumes under frequent cuttings or grazings.

Another characteristic of grasses that a producer can take advantage of is the range of maturity of different species, i.e. orchardgrass is much earlier maturing than reed canarygrass. The rationale is similar to planting corn hybrids or soybean varieties with different maturities, they are not all ready to graze at the same time.

Advantages grasses have over legumes include the ability to grow well under less fertile soils and to tolerate mismanagement better. Grasses also tolerate livestock trampling better than legumes. A major disadvantage of cool season grasses is the need for nitrogen fertilization if you wish to achieve high yields. Another disadvantage of cool season grasses is the “summer slump”, a period of slow growth during the hot summer months.

Warm Season Perennial Grasses

Warm season perennial grasses usually out perform cool season grasses in summer months and have a high value for wildlife. For these reasons, they have received much attention in areas south of Maine. Warm season perennial grasses only occur naturally on sandy soils in southern Maine and in isolated patches along the coast and along the major river systems. Warm season grass seed is very expensive and stands are difficult and slow to establish. Cool season grasses will easily out compete warm season grasses given the soils and rainfall in Maine. Because of this competition, warm season grass plantings usually result in failure except on sandy soils. Successful plantings require good weed control of the cool season grasses. There have been very few successful plantings in Maine. Consideration of warm season perennial grasses for grazing or forage in Maine will probably be limited to managing them where they do occur.

Annual Warm Season Grasses

Annual warm season grasses, such as sorghum/sudangrass and pearl millet, can be used to complement cool season pastures, and can also provide a site for manure utilization. Annual warm season grasses can work well as an emergency pasture or hay crop and to provide feed during the “summer slump”. These grasses have the ability to produce high quality forage during summer and early fall. However, the high cost associated with annual establishment and high fertility requirements usually result in higher costs of gain compared to perennial cool season forages. The high cost of annual establishment along with the potential for nitrate poisoning and prussic acid or cyanide poisoning have limited the use of annual warm season grasses in Maine. These should be considered on a trial basis to see if they have a place in your system.

Adding Legumes to the Mix

Adding legumes to forage mixtures will often increase forage quality. Legumes, like cool season grasses, have the majority of growth in the spring, but the summer slump is not as drastic. Alfalfa is the most widely used legume in perennial hay stands and where good soil conditions, such as proper drainage and a pH of 6.6 to 7.0, are present. Alfalfa does not tolerate grazing as well as clover. Clovers are generally easy to establish, and can tolerate wetter soils and soils with a lower pH than alfalfa. However, some clovers usually have a short stand life. Birdsfoot trefoil is

difficult to establish due to its inability to compete with companion crops, grasses, and weeds. However, with careful management trefoil is an ideal pasture species due to its quality and absence of bloat potential.

The major advantages which legumes have over grasses include the ability to fix nitrogen from the air, higher protein content, higher intake potential, drought tolerance, and a slower decline in maturity. However, legumes usually require higher soil pH, have a lower tolerance to wet soils, and are less persistent than most adapted grasses. Bloat is a concern with some legumes, but bloat incidence can be reduced by including grasses in the mix and proper grazing management. Lesson 6 of this home study course offers some recommendations for managing animals that are grazing legume pastures.

What kind of mixtures

Mixtures should be kept simple. Keep in mind that you are trying to match forage species with the soil characteristics of a particular field. Persistent species are often not as competitive during the seedling stage as less persistent species. Excessive competition of complex mixtures (more than 4 species) can result in the persistent and desirable species not surviving during the establishment period.

Advantages of Mixtures

Mixtures will provide more uniform seasonal production and are higher yielding than pure stands. The desirable traits of grasses and legumes are combined in mixtures:

- Legumes provide nitrogen for grasses in a mixture.
- Legumes improve forage quality and reduce the potential for nitrate poisoning.
- The fibrous root system of grasses helps in stabilizing slopes and reducing erosion.
- The stand life of forages is lengthened with grasses.
- Grasses reduce bloat potential when included with legumes.
- Grasses compete better with weeds than legumes.

Seeding Rates

Table 1 gives recommendations for seeding rates of legumes, grass and grass-legume mixtures for pastures in Maine.

Table 1. Seeding rates for pasture in Maine

<u>For sod seeding into grass pasture</u>			
Species	lbs./ac	Species	lbs./ac
Ladino/White Clover	4	red clover	5
with smooth brome	10	with smooth brome	10
with orchardgrass	4	with orchardgrass	4
with timothy	3	with timothy	3
with reed canarygrass	7	with reed canarygrass	5
with smooth brome & orchardgrass	6	with smooth brome & orchardgrass	6
with perennial ryegrass	4	with perennial ryegrass	4
birdsfoot trefoil, pure ¹	10-14	reed canarygrass	8
		smooth brome	10
		smooth brome with orchardgrass	10
			3

¹Best results with a clear seeding of birdsfoot trefoil
See Appendix B; Frost Seeding: Low-Tech Wonder or Wishful Thinking?

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Converting to Pasture or Hay-Forage Seeding Mixtures, Iowa State University, CRP-13/ October 1994

Most of these publications are available through the respective state university.

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Adapted by Dee Potter, Paul Hughes, Richard Brzozowski, Gary Anderson, Ken Andries, Donna Lamb, and Rick Kersbergen from Plant Species Selection - Lesson 2, University of Minnesota, Beef Education Series, Pasture Management Home Study Course - Jerry Tesmer, Minnesota Extension Educator, Livestock Systems Russ Mathison, North Central Research and Outreach Center

Visit the UMCE Web Site at www.umext.maine.edu
Maine Natural Resources Conservation Service Web Site at
www.me.nrcs.usda.gov
The Northeast Grazing Guide
Your source of Grazing Information in the Northeast
<http://www.umaine.edu/grazingguide>

Forage yield trial information available on the Internet

California

agronomy.ucdavis.edu/alfalfa.wg/subpages/variety.htm

Colorado

www.colostate.edu/Depts/SoilCrop/extension/CropVar/alfalfa/alfalfa1.html

Illinois

www.cropsci.uiuc.edu/vt/forage98/index.html

Indiana:

www.agry.purdue.edu/ext/forages/

Iowa:

www.agron.iastate.edu/icia/

Kansas:

www.ksu.edu/kscpt
www.stocker.org

Kentucky:

www.uky.edu/Agriculture/Agronomy/files/aboutfvt.htm

Maine grazing site:

www.umaine.edu/grazingguide/

Michigan:

www.css.msu.edu/VarietyTrials/Index.html

Minnesota:

www.maes.umn.edu/maespubs/vartrial/vt-cntnt.html

Mississippi:

www.aac.msstate.edu/mafes/Variety/

Montana:

maes.msu.montana.edu/alfalfa97/default.htm

Nebraska:

www.ianr.unl.edu/ianr/agronomy/varitest2.htm

New Mexico:

taipan.nmsu.edu/aght/alfalfa/alfalfa.html

North Dakota:

www.ag.ndsu.nodak.edu/fargo/98data/index.htm

Ohio:

www.ag.ohio-state.edu/~perf

Oklahoma:

clay.agr.okstate.edu/alfalfa/var-test/alf-var.html

Oregon:

<http://www.primenet.com/~mesosu/crops/alfalfa.htm>

Pennsylvania:

www.cas.psu.edu/docs/casdept/agronomy/forage/docs/species/species.html

South Dakota:

www.sdstate.edu/~wpls/http/forage1.html

Wisconsin:

www.uwex.edu/ces/forage/index.html

Alberta, Canada:

www.agric.gov.ab.ca/agdex/100/2003200k.html

Ontario, Canada:

www.oac.uoguelph.ca/www/CRSC/ofcc/ofcc.htm

APPENDIX A

Characteristics of forages

Species	Regrowth Potential	Legume Compatibility	Winter Hardiness ^a	Ease of Establishment	Drought Tolerance	Flooding Tolerance	Persistence
Cool-season grasses							
Kentucky bluegrass	Good	Poor	Excellent	Good	Fair	Fair	Good
Orchardgrass	Excellent	Poor	Good	Good	Fair	Fair	Good
Perennial ryegrass	Good	Fair	Poor	Excellent	Fair	Fair	Fair
Quackgrass	Excellent	Good	Excellent	N/A*	Good	Fair	Excellent
Reed canarygrass	Good	Poor	Excellent	Poor	Good	Excellent	Excellent
Smooth bromegrass	Fair	Good	Excellent	Good	Fair	Fair	Good
Tall fescue	Excellent	Good	Fair	Excellent	Fair	Fair	Fair
Timothy	Fair	Good	Excellent	Good	Poor	Poor	Poor
Warm-season annual grasses							
Sorghum/sudan	Good	Poor	N/A	Excellent	Excellent	Fair	N/A
Japanese Millet	Good	Poor	N/A	Excellent	Excellent	Fair	N/A
Alternative forages							
Winter Rye	N/A	Good	Good	Good	Good	Poor	N/A
Oats	N/A	Good	Poor	Good	Good	Poor	N/A
Corn	N/A	Fair	N/A	N/A	N/A	N/A	N/A
Brassicac	Good	Good	N/A	Good	Fair	Poor	N/A
Legumes	Regrowth Potential	Bloat Problem	Winter Hardiness ^a	Ease of Establishment	Drought Tolerance	Flooding Tolerance	Persistence
Alfalfa	Good	yes	Excellent	Good	Good	Poor	Good
Alsike clover ¹	Poor	yes	Good	Excellent	Poor	Good	Poor
Birdsfoot trefoil	Fair	no	Excellent	Poor	Poor	Fair	Excellent
Ladino clover	Poor	yes	Good	Excellent	Poor	Good	Poor
Red clover	Fair	yes	Good	Excellent	Poor	Fair	Fair
Sweet clover	Fair	yes	Good	Fair	Good	Fair	Poor
Dutch White	Good	No	Excellent	Good	Good	Fair	Excellent

Source: Pastures for profit

N/A = not applicable

^aWinter hardiness assumes use of adapted varieties

*No seed available

¹Not recommended for equines

APPENDIX B

FROST SEEDING: LOW-TECH WONDER OR WISHFUL THINKING?

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Tim Griffin
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Hayfields and pastures don't always have everything we would like them to have. It is common to establish a grass—legume mixture, like timothy and red clover, only to see the clover disappear over a period of two or three years. It might die out because of the weather, soil drainage, fertility, or harvest management. While it is important for you to know why it disappeared, you might want to have it back. The important question is: do you need to destroy the whole thing to get back the missing piece?

To add a forage to an existing hayfield or pasture is called supplementation (if you tear up everything and start over, it is called replacement or renovation). There are a couple of methods for doing this. One is to seed a new forage species into the existing sod using a no—till seeder. This technology has improved quickly over the last ten years, and can be quite successful if you know how to manage competition with the new forage.

Another method is Frost—Seeding. The principle behind frostseeding is quite simple. Seed is broadcast on the soil in mid- spring, when daytime temperatures are above freezing but nighttime temperature are below freezing. This daily freezing and thawing, which shrinks and swells the soil, works the seed into the soil. When temperatures become warm enough, the seed can germinate in the soil, and begin the process of establishment. This seeding method might be called “low-tech” because all that is needed is something to apply the seed (usually some type of spin spreader). It is relatively inexpensive for the same reason; you pay for the seed and the time on the equipment.

Sound simple? It is not as easy as it sounds.
Foolproof seeding method? Not at all;

What Has to Go Right for Frost—Seeding to Work:

1. The seed has to reach the soil surface. For the new forage to have a chance at establishment, it must germinate in the soil. If the seed doesn't reach the soil...end of story. For this reason, this method is not recommended for old hayfields which tend to have thick vegetation, or for abandoned fields with a lot of litter.
2. The seed must work its way into the soil. This is where the frost (or freezing-thawing) goes to work. Timeliness is critical. Seed too early and the seed may die. Seed too late and there is no

frost to do the work. In addition, the weather changes from one year to the next, so we can't predict when the right conditions will end.

3. The new seedling must be able to compete with the plants already in place. If the first two steps fall into place, you aren't done yet. Say you frost—seed red clover into a timothy-bluegrass pasture. In mid—May, you can locate the new clover seedlings. Notice that they are much smaller than the established grasses. Do you have a plan for controlling this competition? Grazing pressure and clipping are both options but have an idea beforehand to manage this part of the season.

4. You must be seeding the right plant into the right field or pasture. This is why you need to know why something disappeared the first time. For example, if continuous grazing wiped the clover out of the pasture, the same management will wipe it out again. Likewise, clover may have died out because soil pH was dropping; unless you applied lime lately, the frost-seeded clover is not likely to live anyway. For this reason, frost-seeding should be viewed as one component of improving a hayfield or pasture. It should not be seen as the only practice needed to renovate these fields.

Remember, all of these pieces have to fall into place for this seeding method to be successful. Frost-seeding is a low-tech method and a low-cost method of forage improvement. It is also a high-risk method of forage improvement, so don't depend just on frost-seeding. Make it part of the system.

What to Frost-Seed:

Most frost—seeding is done using legumes, either clover or alfalfa. Birdsfoot trefoil is used occasionally, but it is a poor competitor as a seedling, reducing the likelihood that the seeding will be successful. Seeding rates are variable for legumes. Some people will seed normal rates (12-14 pounds of alfalfa or clover) as an insurance policy (“more seed equals better chances”). However, if all of the pieces don't fall into place, it doesn't matter how much seed you use. If you are trying to add a little clover, use a lower rate (6—8 pounds).

The frost-seeding method does not appear to work very well for grasses. Grass seed may not be able to tolerate the cold temperatures (freezing to death instead) or it may mold in late spring. If you are interested in adding a grass to a pasture or hayfield, no-till seeding is a more realistic option.

Notes

Lesson 2 Quiz

Plant Species Selection Questions

1. (T or F) Wise choice of forages is the first step in successful forage production

2. List three traditional cool season grasses.
 - A. _____
 - B. _____
 - C. _____

3. (T or F) Legumes tolerate livestock trampling better than grasses.

4. (T or F) Warm season grasses are easy to establish

5. (T or F) Emergency crops include pearl millet and sorghum-sudangrass.

6. (T or F) Prussic acid or cyanide poisoning is not a concern in sorghum-sudangrass.

7. When seeding red clover with orchardgrass, how many lbs./acre of each species would you plant?

8. What do legumes provide for grasses in a mixture?

9. Summer slump is mainly a concern with which category of forages?

10. (T or F) Birdsfoot trefoil may cause a bloat problem.

Name _____ Phone _____

Address _____

(Optional) Fax _____ E-mail _____