Module 5: Turfgrass Establishment and Management

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Chapter 10 of the INLA ICNP Training Manual

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DEPARTMENT OF HORTICULTURE

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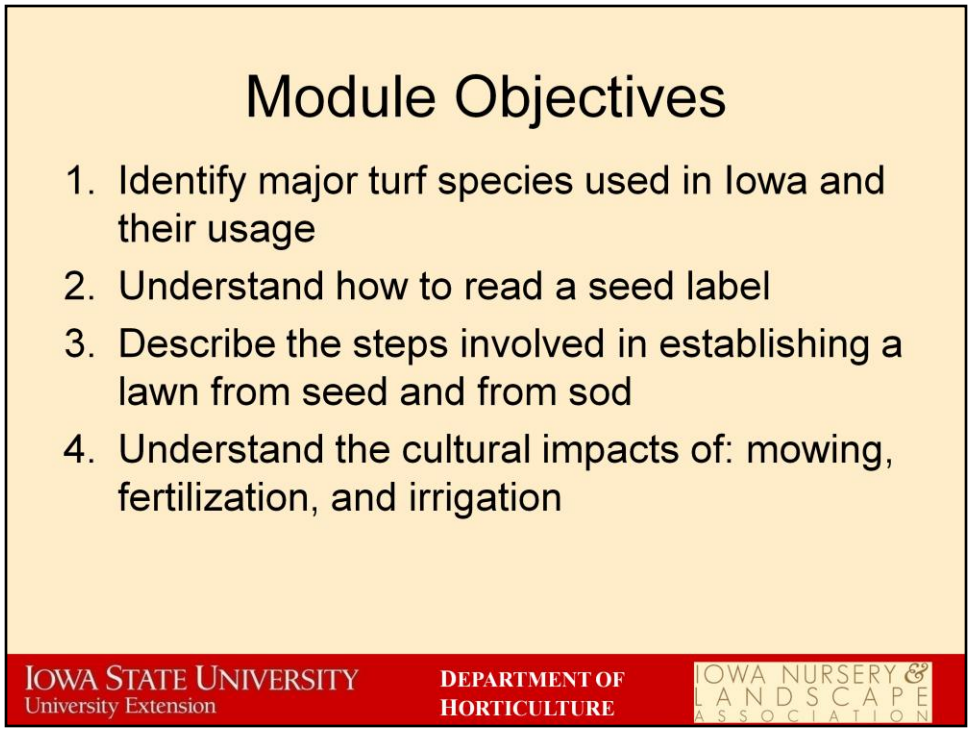
Welcome to the Iowa Certified Nursery Professional Training program Module 5: Turfgrass Establishment and Management.



Turfgrass is one of the most important components of home and commercial landscapes, and municipal park areas.

To develop and maintain an attractive turf area it is important to start with the right turfgrass species, install it correctly and then manage it well by using the proper mowing, fertilizing and irrigation practices.

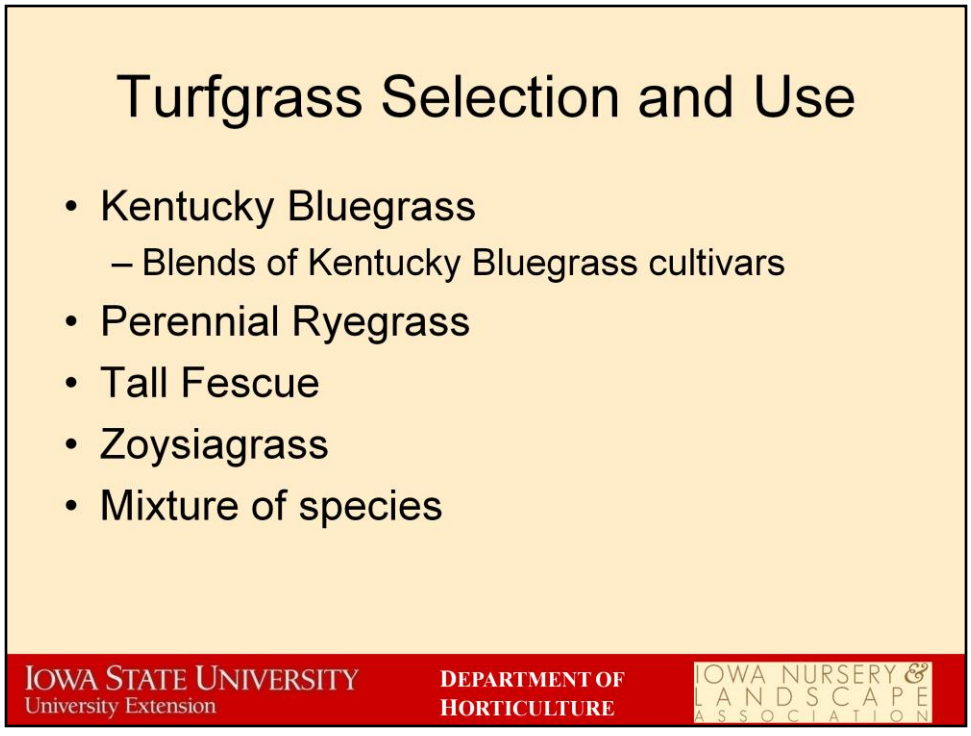
This module has 4 objectives, and as a result of completing this module you should be able to:

Identify major turf species used in Iowa and their usage

Understand how to read a seed label

Describe the steps involved in establishing a lawn from seed and from sod

Understand the cultural impacts of: mowing, fertilization, and irrigation



The careful selection of turfgrass species and varieties is an important first step in developing turf that will serve its intended purpose. The cost of grass seed and sod is low, considering how long the turf will be in existence and how much time and money will be spent on its maintenance. Cool-season grasses such as Kentucky bluegrass, perennial ryegrass and tall fescue are commonly grown in Iowa. To a much lesser degree, Zoysiagrass which is a warm season grass is used.

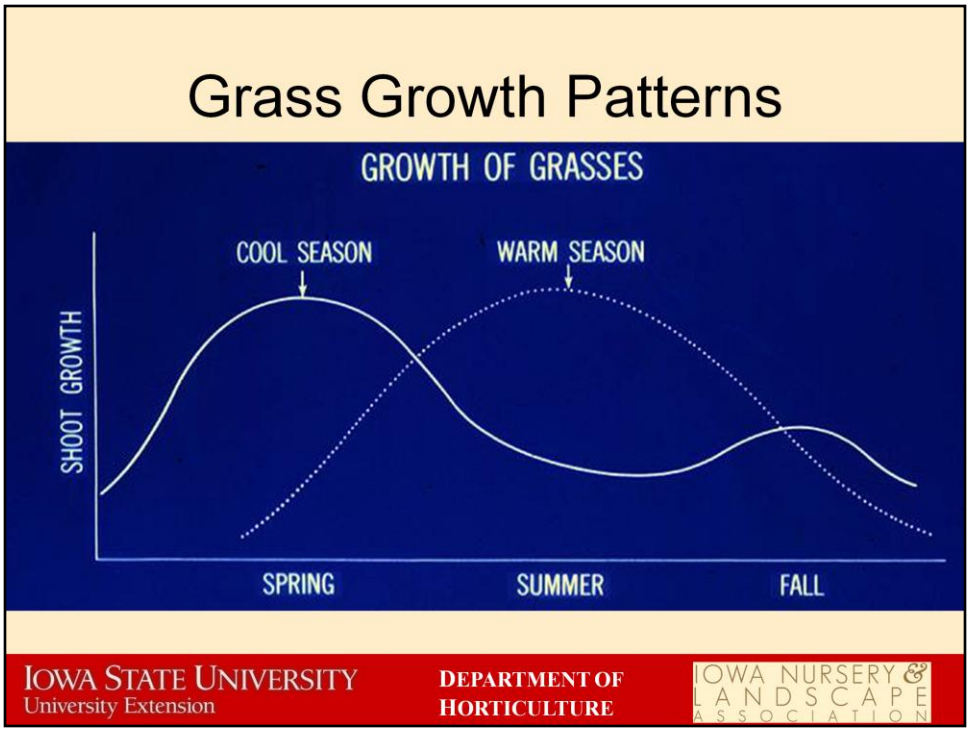
The species listed on this slide are all suitable selections for Iowa, and each has its own benefits and drawbacks. The table on the following slide summarizes these species.

Turfgrass Species Comparison

Grass Blends or Mixtures	% by weight	Potential Lawn Quality	Condition	Cultural Intensity (lb./1,000 ft.^{2})	Seed
Improved Kentucky bluegrass blends[1]	100	Excellent	sunny, well drained soil	medium to high	1 - 2
Common Kentucky bluegrass[3]	100	Fair	sunny, well drained soil	low to medium	1 - 2
Improved K. blue grass/per ryegrass	80/20	Good to excellent	sunny, well drained soil	medium to high	2 - 3
Imp. K. bluegrass / fine fescue[2]	30-50% 50-70%	Good	dry, shaded	medium	3 - 4
Common K. bluegrass / fine fescue[3]	50-70% 30-50%	Fair	dry, sunny or shaded	low to medium	3 - 4
Improved tall fescue[4]	100%	Fair to good	sunny or shaded	low to medium	6 - 8
Zoysiagrass[5]	100%	Good to excellent	sunny	medium	vegetative

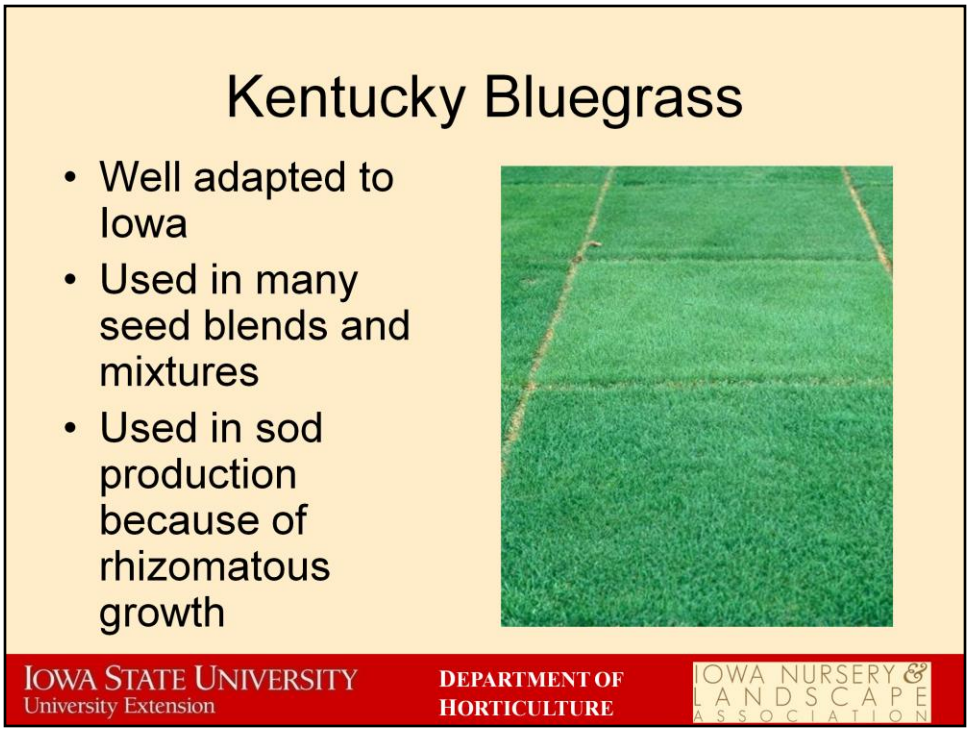
[1]A blend is a combination of 2 or more cultivars of a single species
[2]It is recommended that at least 2 varieties of each species be used in mixtures (combination of 2 or more species)
[3]Used for low maintenance lawns
[4]Use only improved, turf-type tall fescue varieties
[5]Zoysiagrass is usually established by vegetative plugs or sprigs

From INLA ICNP Training Manual, Chapter 10.



Cool season grasses grow rapidly in the spring as the weather warms up; slow down in the heat of the summer; and then increase their growth rate again in the fall as temperatures cool down but while the days are still adequately long.

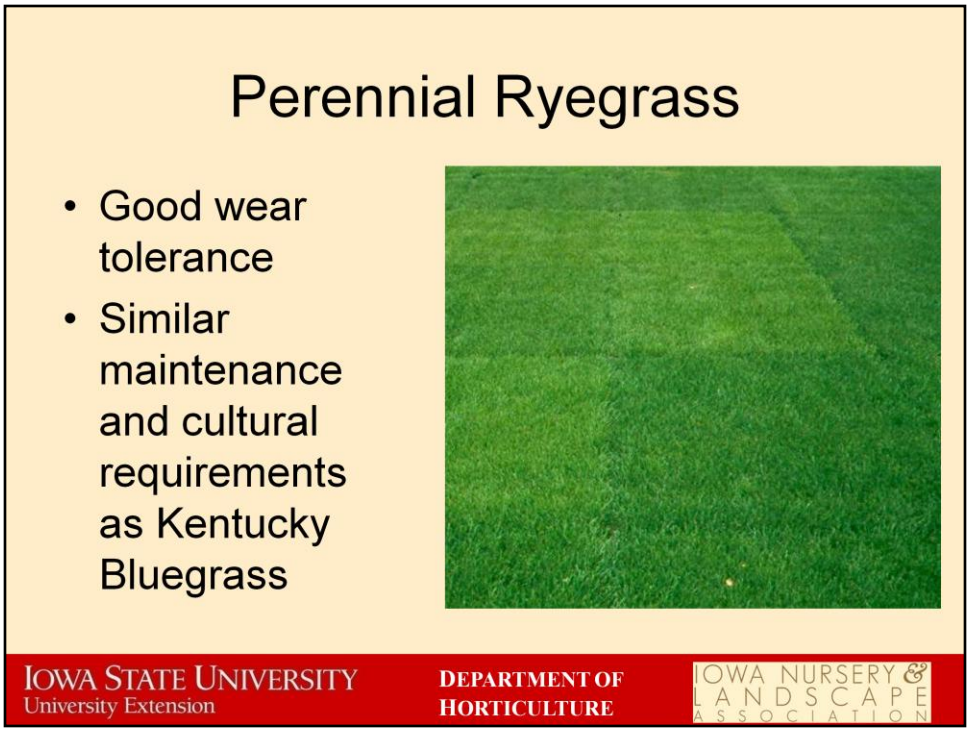
Warm season grasses are slow to start growing in the spring, but their growth rate increases rapidly as the temperature increases. When temperatures cool down in the fall, their growth rate begins to decline again as they go into dormancy for winter.



Kentucky Bluegrass is a cool-season grass the principal turfgrass used in most of Iowa. It is adapted to a wide range of environmental conditions, and it makes an attractive turf when it is properly maintained. Kentucky Bluegrass performs best in open sunny areas where soils are moist but well-drained and fertile. It is winter hardy and capable of surviving extended periods of drought, however it tends to become dormant during droughty periods unless water is provided. Optimum mowing height is 2-2½ inches.

Many varieties of Kentucky Bluegrass are available. The image on this slide shows plots in a Kentucky Bluegrass cultivar trial. The different varieties differ widely in characteristics such as the shade of green, leaf texture and density, environmental and cultural adaptability, and disease resistance. Look for newer varieties which have more disease resistance when you are planning to install a new Kentucky Bluegrass turf area. Newer varieties to consider include: Adelphi, Baron, Blacksburg, Bristol; Cheri, Columbia, Eclipse, Glade, Majestic, Midnight, Parade, Touchdown and Victa. All of these perform best under medium to high cultural intensity.

It is best to use a blend of Kentucky bluegrass varieties for establishing a turf in Iowa. Using a blend of several different varieties provides greater genetic variability which improves disease resistance and the adaptation of turf grassed under different environmental conditions. Refer to the references at the end of this module for additional information on management strategies for Kentucky bluegrass and other turfgrass species.



Perennial ryegrass is a cool-season grass and is another suitable grass species for Iowa. And just as with the Kentucky bluegrass, many cultivars are available. The image on this slide shows a plots of a perennial ryegrass trial which highlights the differences in color and density between varieties.

Perennial ryegrass has a rapid germination and seedling establishment rate which makes it an ideal grass to install when:

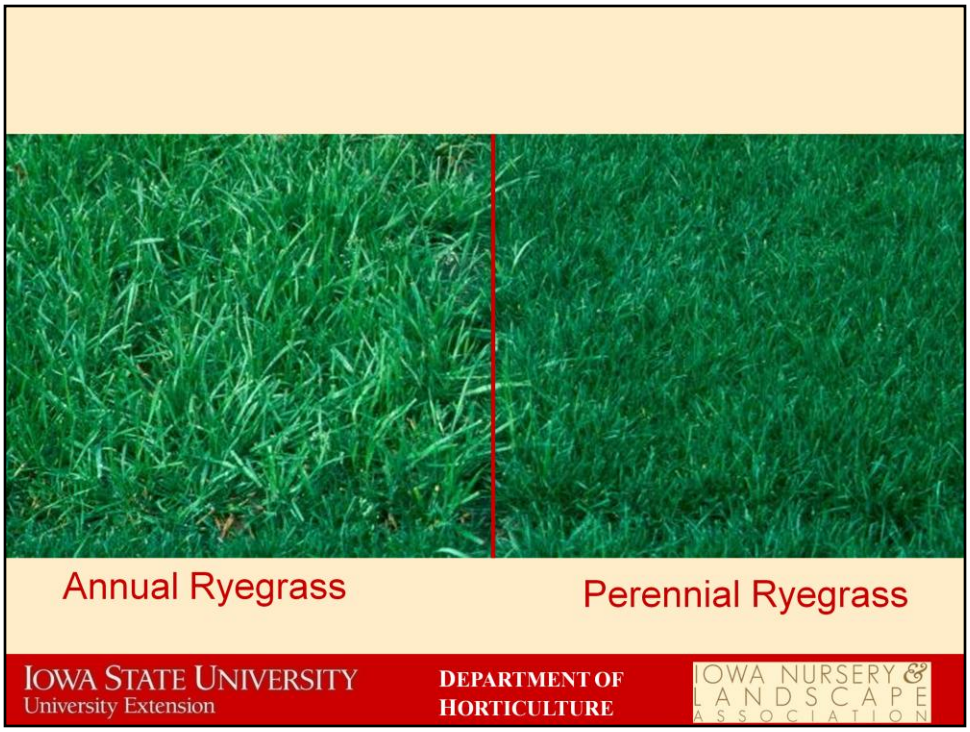
quick cover is needed;

seeding occurs at an undesirable time when another species such as bluegrass would be slow to establish;

or when irrigation is not available.

Perennial ryegrass is generally combined with Kentucky bluegrass into a seed mixture that is well suited to high traffic, drought tolerance and cold hardiness. Perennial ryegrass needs irrigation during extended dry periods. Optimum mowing height for a Kentucky bluegrass/ryegrass stand is 2-2½ inches, although Perennial Ryegrass alone can be mowed slightly lower.

Improved perennial ryegrass cultivars to look for include: Birdie, Blazer, Brighstar, Majesty, Derby and Fiesta, plus many others.



Annual ryegrass usually only persists for one season in Iowa. Many of the inexpensive 'rapid green' seed mixtures available on the market today contain annual ryegrass. This works well as a temporary cover but not as a long term turfgrass.

By itself Annual Ryegrass does not make an acceptable turfgrass because of its upright growth habit and coarse texture.

Tall Fescue

- Coarse texture
- Good heat, drought and wear tolerance
- Low maintenance

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Tall fescue is a cool-season grass and is know for its ability to grow under relatively harsh environmental conditions. However, historically it hasn't been used much as a lawn turfgrass because of its coarse leaf texture and bunch type growth habit. Newer varieties of tall fescue such as Rebel, Finelawn, Jaquar 3, Genesis, Apache, Titan 2, and Arid, are suitable selections for lawn areas. It is still recommended to use a blend of these varieties rather than just one single variety.

Zoysiagrass

- Infrequently used in Iowa
- Only green June through September
- Established using plugs

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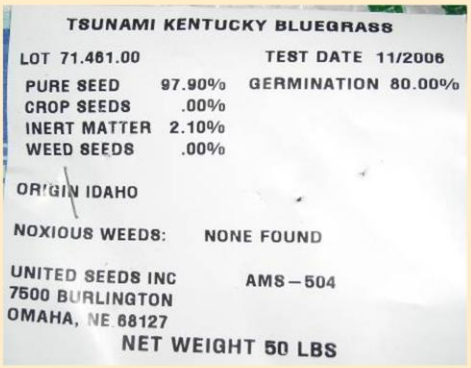
Zoysiagrass is a warm-season turfgrass that can tolerate Iowa winters. However, because it is only green about 4 months of the year (during the summer) it is not used very often. The picture on this slide shows zoysiagrass plots adjacent to plots of cool-season species in early spring. In addition to the limited amount of time the zoysiagrass is green and looks good, it is slow to establish, often requiring 2-3 years, and must be established vegetatively using plugs or sod. This species also requires significantly different maintenance practices than the cool-season species. The cultivar ‘Meyer’ is the most common one used in the Midwest.

Seed Label

1. Lot Number
2. Species and Variety
3. Pure Seed (% by Wt.)
4. Germination
5. Date Tested
6. Weed Seed (% by Wt.)
7. Inert Matter (% by Wt.)
8. Other Crop (% by Wt.)
9. Noxious Weeds



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The seed label is an important part of purchasing grass seed. There are rules, regulations and laws that relate to agriculture seed production and selling, and these help insure product quality. The categories for the seed label shown on this slide are essentially self-explanatory.

The percentages for Numbers 3, 6, 7 and 8 should add up to 100%.

Number 3 and number 4 are extremely important because they will relate directly to how much actual turfgrass species seed will germinate.

The pure seed (also called pure live seed or purity) is the percentage by weight of pure turfgrass seed in the container. It is important for this number to be very high in order to achieve a pure stand of the turf species you selected.

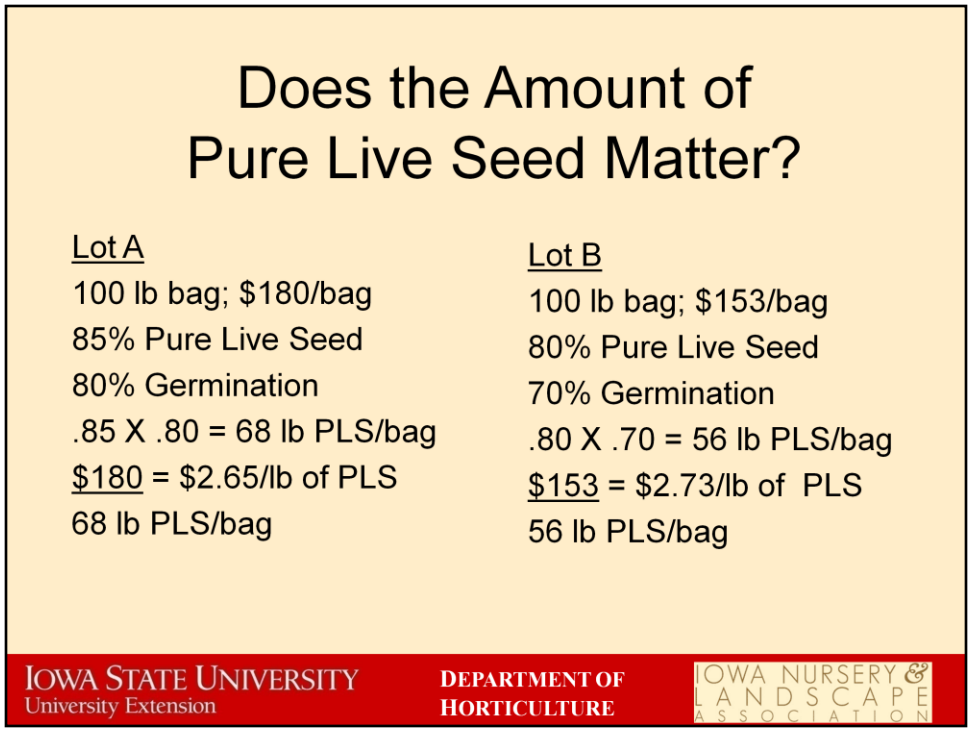
The germination rate is the percentage of pure seed that is alive and that will germinate. This is tested by the seed company and I s verified by state seed laboratories. It is also important to have a high germination percentage as well.

All purity and germination figures listed on a label are checked by seed labs in each state in the which the seed is sold.

The percentage of weed seeds is listed on the label, but how many types of weeds are present and what those weeds are, are not listed. The exception are noxious weeds (which are listed in number 9). These are weeds that are particularly undesireable however, ‘undesireable’ is a relative term and is not used uniformly from state to state. For example, Annual Bluegrass can be a major problem in turfgrass stands, but not all states classify it as a noxious weed.

Inert matter includes items like chaff, soil, stem pieces and non-viable seeds.

Other crop amount includes other plant species grown as agricultural crops other than the turfgrasses already listed. This can include other grass species such as tall fescue, timothy or orchardgrass, just to name a few. It is important that this percentage be low.



The amount of pure live seed (PLS) combined with the germination percentage are extremely important when it comes to establishing a high quality, dense stand of turfgrass. The two examples on this slide show the impact of these two factors.

Although Lot A is slightly more expensive $180/100 lb bag compared to Lot B at $153/100 lb bag, the actual cost of the pure live seed is less. To determine the cost of the pure live seed, multiply the percent of pure live seed by the germination percentage. That gives you the amount (in pounds) of pure live seed in the bag. When you divide the cost of the bag by the pounds of pure live seed in the bag, you get the actual cost per pound of pure live seed. When you compare the cost of Lot A to Lot B using the cost per pound of pure live seed, you can see that Lot A is a better deal at $2.65/lb of pure live seed, compared to the $2.73/lb of pure live seed for Lot B.

It pays to spend a little extra time reading the seed label!

Lawn Establishment

1. Planning
2. Preparing the site
3. Planting
   - Seeding
   - Sodding

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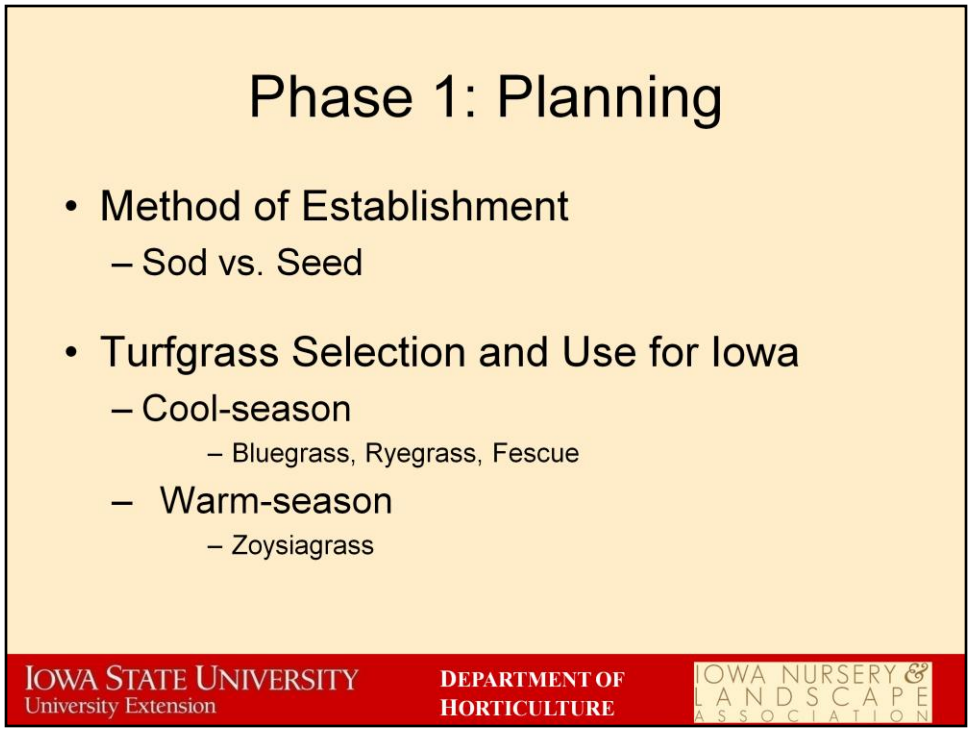
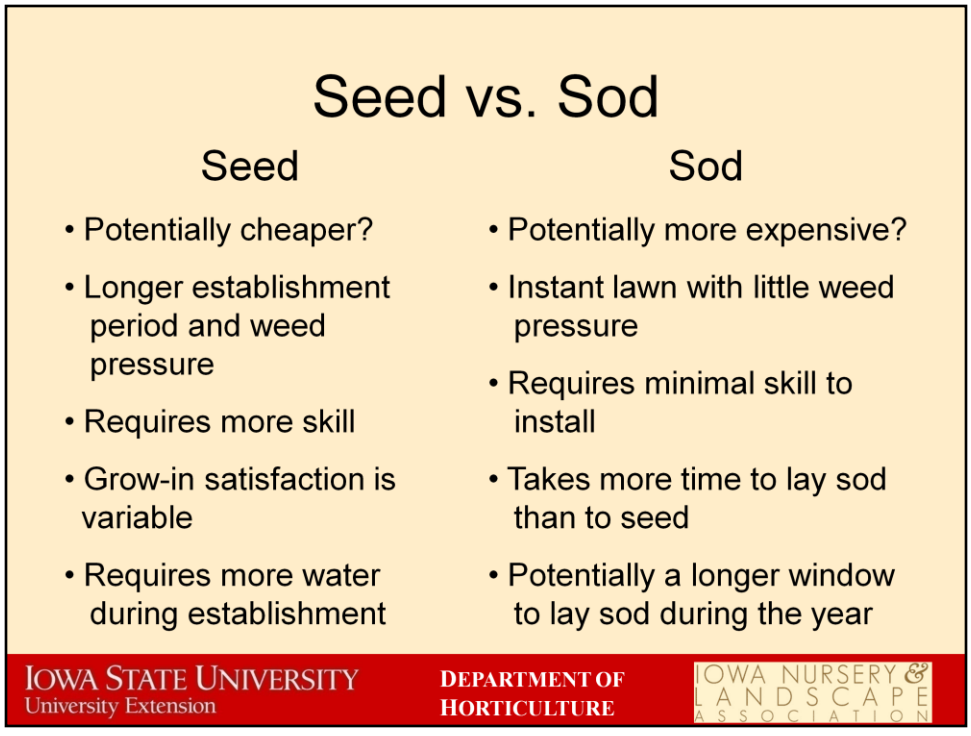
Establishing a lawn is a relatively easy process. However, to achieve the best results it is important to follow a procedure that includes planning, preparing the site and specific planting steps which differ for seeding and sodding.



During the planning phase you will want to consider the method of establishment, as well as what turfgrass to select.

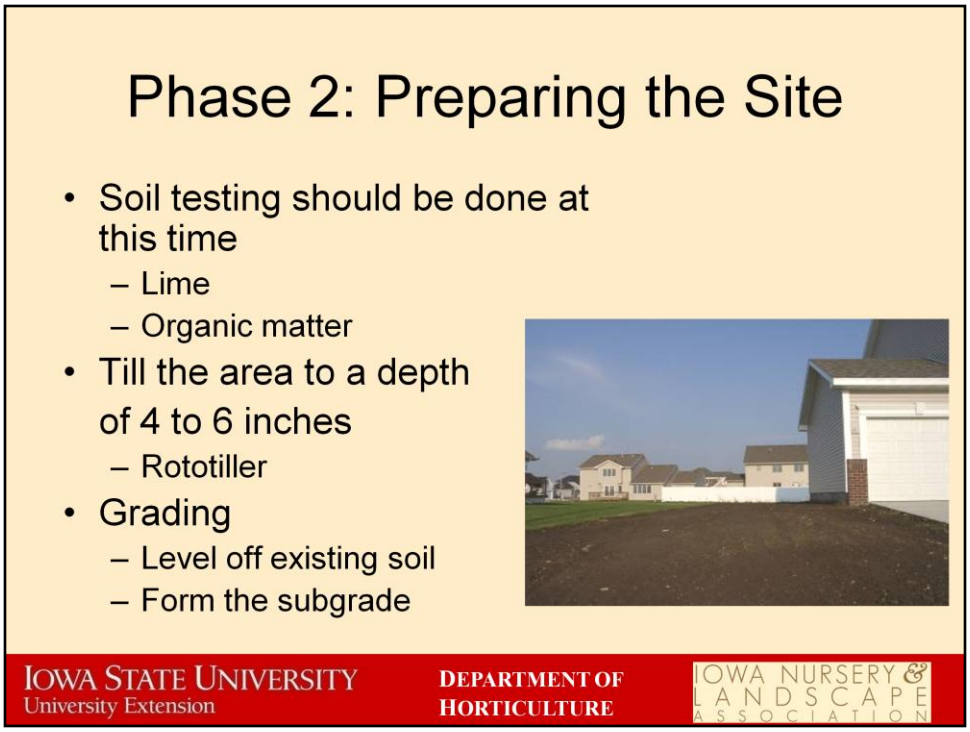
The following slides will highlight the benefits and drawbacks of establishing a turf area using seed or sod.

Turfgrass selection has already been covered earlier in this module.



There are a number of comparisons to make when deciding whether or not to seed a new turf area or to sod it. In some cases it may depend on cost, in other cases the timing may be more important. Both can result in an acceptable stand of turf in the long run.

If you are looking for quick results or the ‘instant lawn’ then this picture illustrates the benefit of using sod over seed.



When possible use soil that is already existing on the site. Although most soils in Iowa provide adequate nutrition and pH, it may be helpful to do a soil test to determine if lime and or organic matter should be added to the site.

Till the soil between 4-6” deep to loosen the soil.

At this point the planting area should be level and raked to form the subgrade. The subgrade should have the same slope as is desired in the final grade.

Grading the Site

- Make sure planting area is free from debris before additional topsoil is placed

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Remove any debris, including construction debris and rocks, from the subgrade before additional topsoil is placed

Other Items to Consider During Grading Phase

- Addition of starter fertilizer
- Finish raking
- Firming the soil surface

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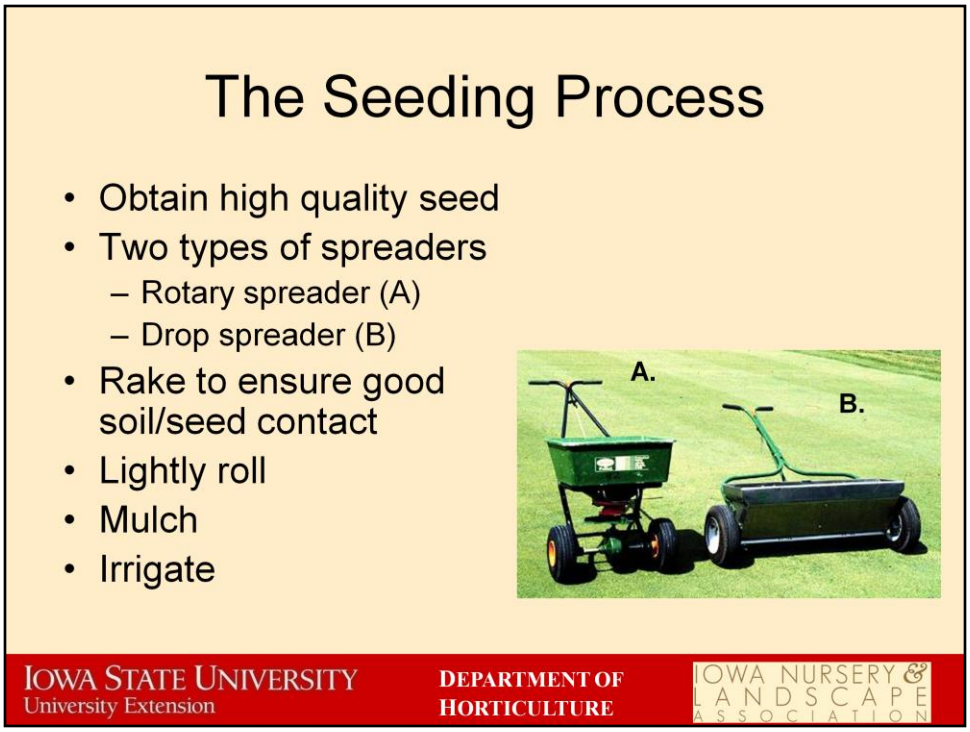
Before the final grading is done, you can add a starter fertilizer to ensure good establishment.

Creating a firm, smooth seedbed allows surface drainage and eliminates low spots that may collect water. The seedbed can be rolled using a water filled roller as seen in the image.

Fall, generally August 15- September 15 is the best time to establish a lawn from seed in Iowa. This timeframe allows the seed to germinate and get established during cooler growing conditions compared to summer, and before the cold winter weather arrives. There is also less pressure from annual weeds during this time so those weeds will not need to be controlled.

If seeding is done in the spring, it is important to apply a pre-emergent herbicide to control crabgrass.



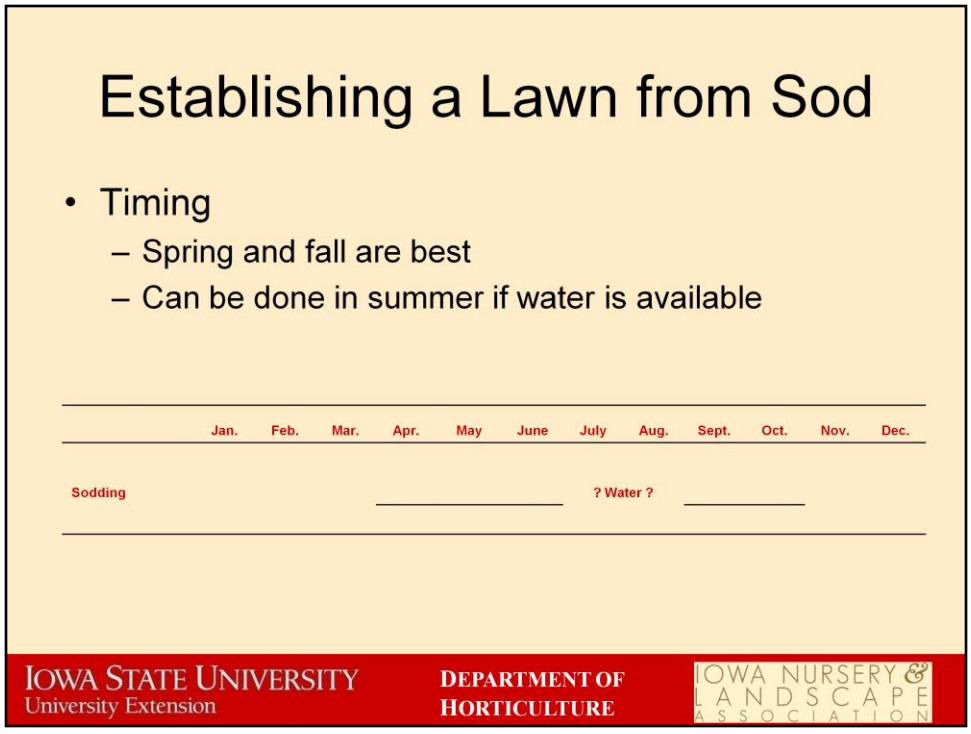
To achieve the best lawn possible it is important to start with high quality seed. Refer to the earlier slides on how to read a seed label and the importance of having a high percentage of pure live seed.

Two types of spreaders are commonly used to apply grass seed. The rotary spreader (A in this image) disperses seed out in a circular pattern as it drops from the hopper. A drop spreader (B in this image) drops the seed in a row and makes a swath of seed. When using both types of spreaders it is imperative that they are calibrated correctly in order for the correct amount of seed to be applied. It is also important to apply half of the seed in one direction (for example while walking North and South) and the other half in a direction perpendicular to the first (while walking East and West). This will ensure adequate overlap of the seeding process and create a dense, uniform stand of turf.

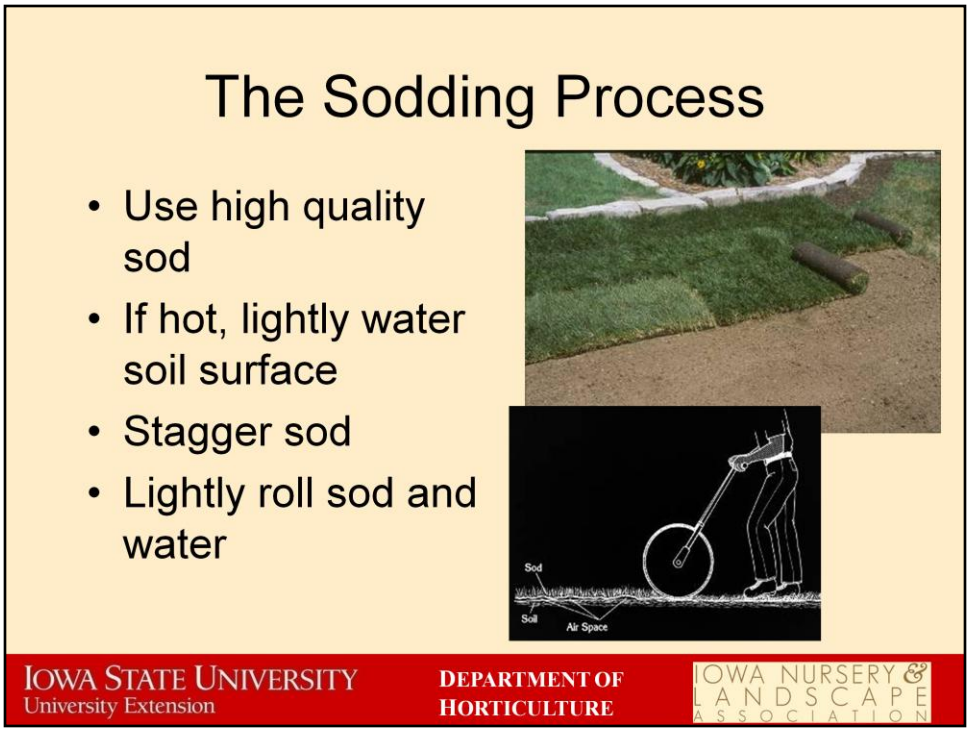
After the seed has been applied, rake the area lightly to ensure good soil to seed contact. This contact can also be enhance by lightly rolling the area using a water filled roller as shown earlier on the site preparation slide.

A light layer of mulch such as straw or peat moss will help keep the new planting area uniformly moist and prevent the seed for washing or blowing away.

Finally, it is necessary to irrigate the area and to continue regular and frequent light irrigations through germination and establishment.



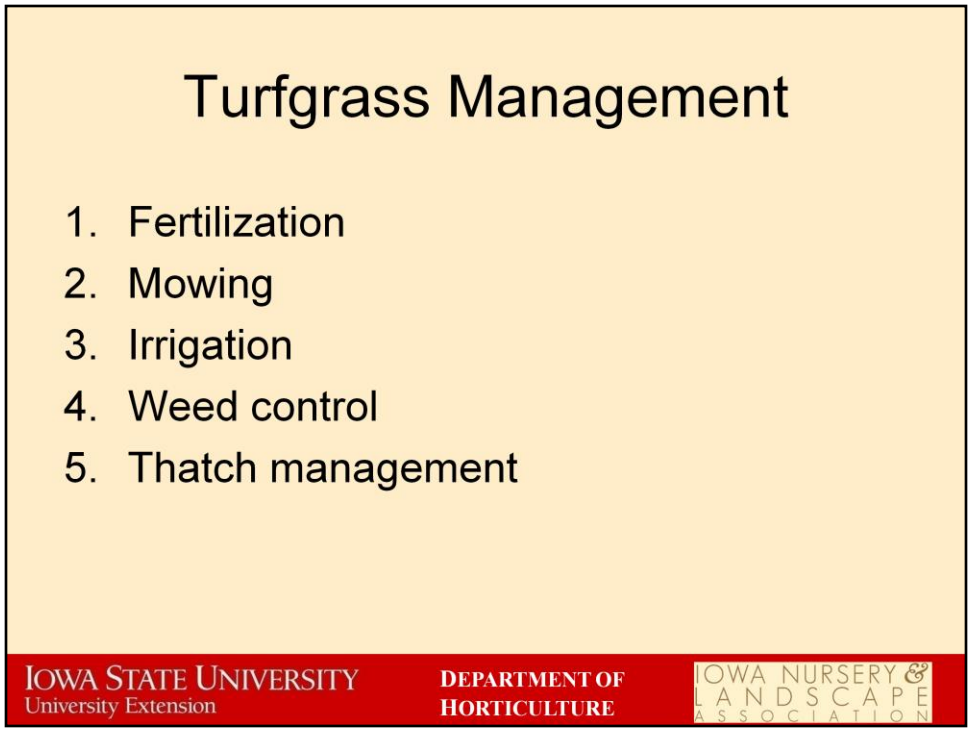
There is more flexibility in the timing of establishing a lawn from sod. Although spring and fall are the best times to sod, it can also be done during the summer provided the new sod receives adequate irrigation while the roots are getting re-established.



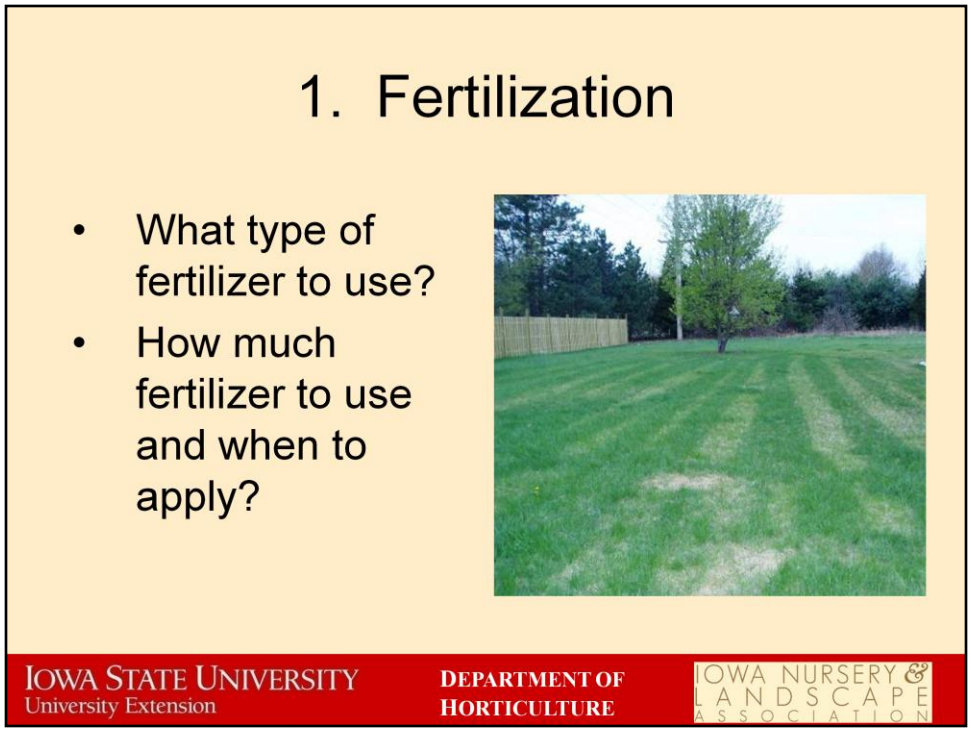
When the conditions are particularly hot, lightly watering the soil surface before laying the sod will cool the soil and new roots.

It is important to stagger the sod pieces, as seen in the picture. If there is a slope on the site it is important to lay them perpendicular to the slope so they won't slide off. It is also necessary to stake the sod pieces on slopes greater than 10%.

Lightly rolling the sod using a water filled roller after it has been laid will remove air pockets and insure good soil to root contact.



Once a new lawn has been established, it is important to implement turfgrass management strategies to keep the turf looking its best. The strategies discussed in this module include: fertilization; mowing; irrigation; weed control; and thatch management.



A regular lawn fertilization program is necessary to maintain a high quality lawn. Dollar for dollar, fertilization will do more to improve poor-quality lawns than any other single management practice.

Two of the most common fertilizer questions are:

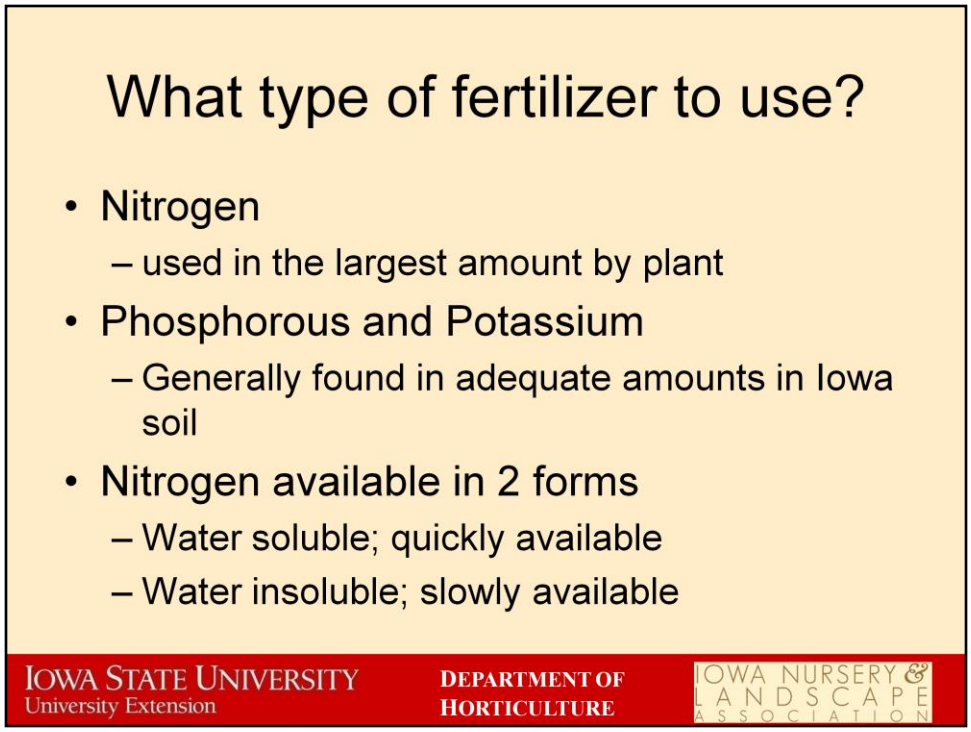
What type of fertilizer to use?

How much fertilizer to use and when to apply?

Answering both of these questions depends on the type of turfgrass being grown and the analysis (amount of N, P and K) of the fertilizer being used.

Slide number 4 in this presentation compared different turfgrass species commonly used in Iowa. One of the comparisons is “cultural intensity”. This is compared on a pounds/square foot level and includes the average amount of fertilizer these different turfgrasses require.

The next two slides will address the how much fertilizer to use and when to apply questions.

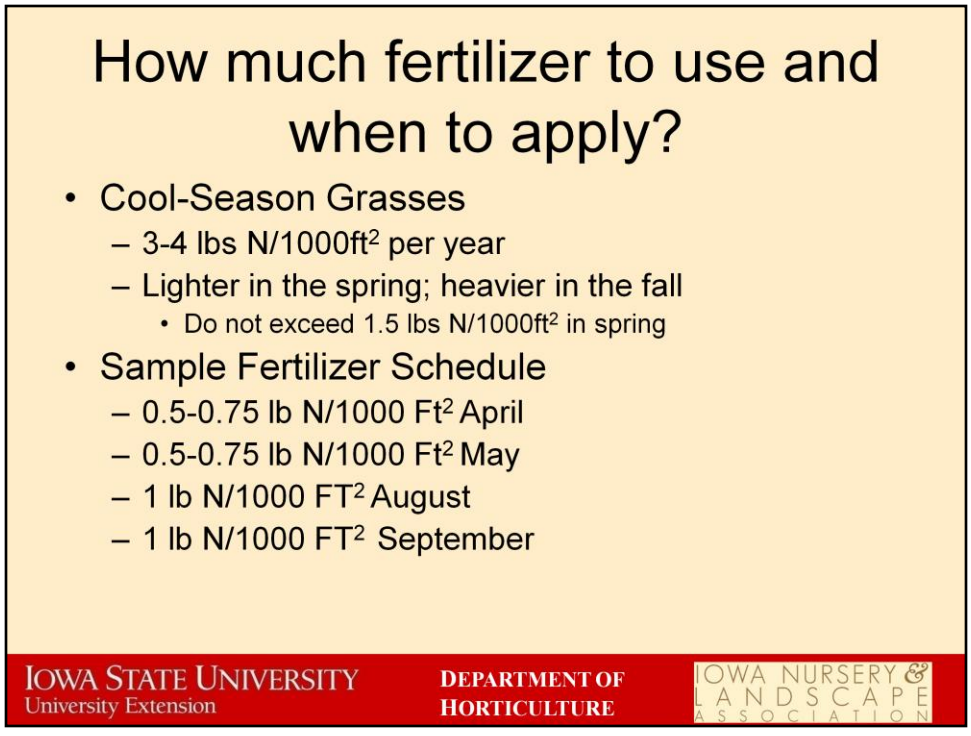


Nitrogen is the mineral element to which trufgrasses are most responsive. It is also used in the largest amount by a plant. Nitrogen produces the green color and plant density necessary for good-quality lawns.

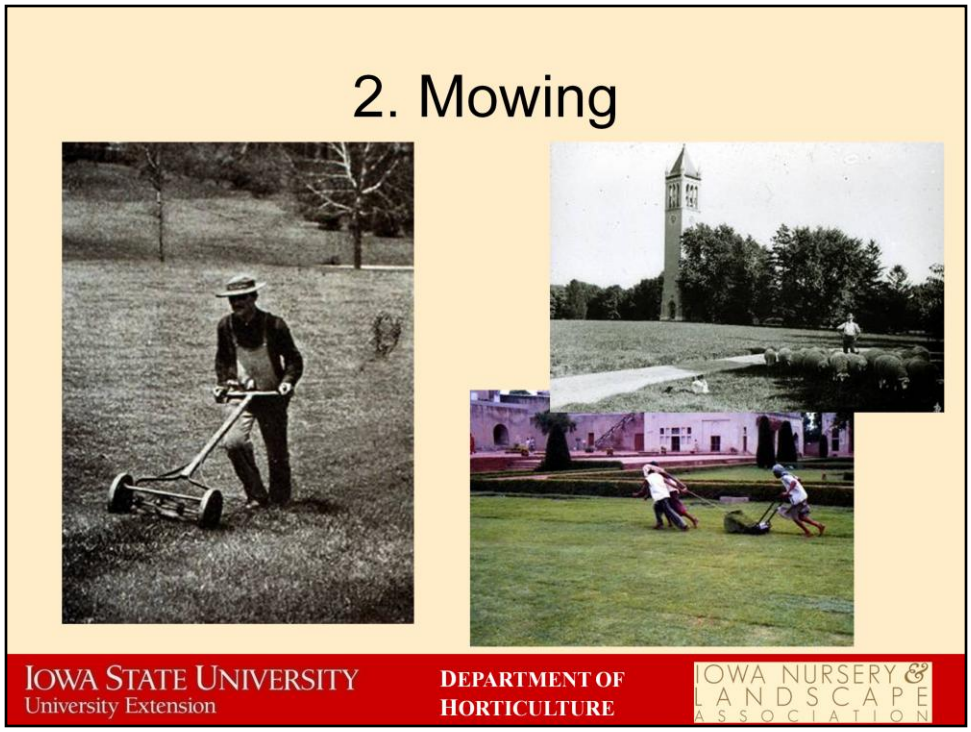
Most soils in Iowa have adequate amounts of Phosphorous and Potassium, so it is not as important, or even necessary, to use fertilizers which include these nutrients.

The ideal fertilizer program should provide uniform growth over the entire growing season. In order to achieve this it is important to use fertilizers that have a mix of fast and slow release nutrients. Nitrogen that is water soluble is quickly available to the plant. There will be a quick 'green-up' of the grass and also a rapid depletion (within 4-6 weeks) of the nitrogen.

Nitrogen that is water insoluble is made slowly available (over a period of a few months) and results in a more moderate color and growth response. To ensure uniform growth over the entire growing period it is recommended to fertilize every 8-10 weeks using a fertilizer that contains 30-50% slow release nitrogen and the remainder in a fast release formulation.

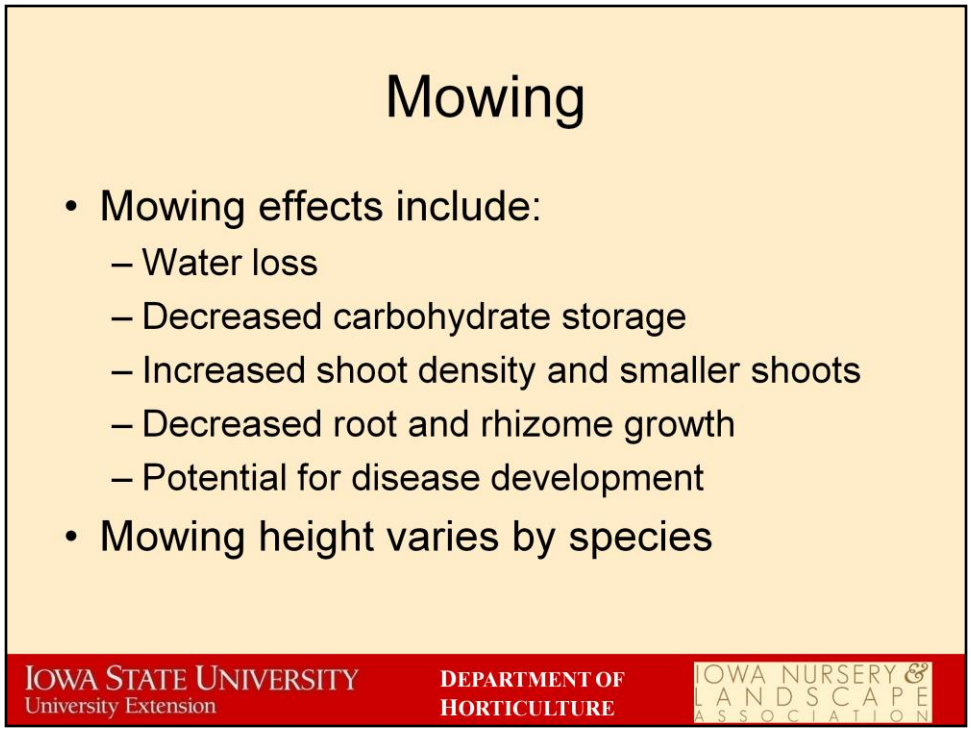


Most cool season grasses such as Kentucky bluegrass, perennial ryegrass and fine fescue grow best when they receive 3-4 pounds of nitrogen/1000 square feet each year. The sample fertilizer schedule shows how to distribute this 3-4 pounds of nitrogen over the growing season.



A quality lawn requires regular mowing. For best results the lawn needs to be cut to the correct height and the right equipment needs to be used. (Mowing equipment has evolved significantly since the first models in the mid-1800s!)

Proper mowing is essential to developing and maintaining a dense, uniform stand of turfgrass. This dense and uniform stand is able to effectively reduce the number of weeds that might otherwise invade a sparse stand of turfgrass.



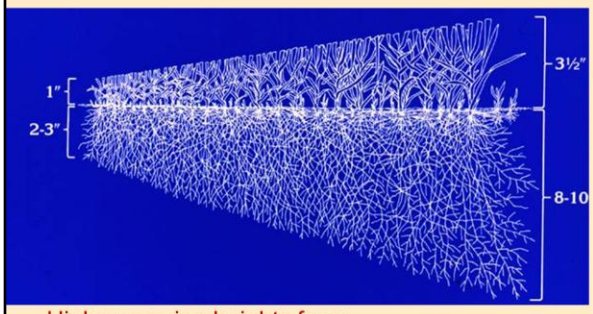
Although mowing is necessary it is a stress to the plant. The effects of mowing include:

Water loss
Decreased carbohydrate storage
Increased shoot density and smaller shoots
Decreased root and rhizome growth
Potential for disease development

To minimize the stress experienced by the turfgrass plant it is essential to mow the turf at the correct height. The mowing height varies by species and time of year. During the summer it is best to raise the mowing height slightly in order to increase the leaf surface area available for photosynthesis. This will allow the plant to produce and store more carbohydrates. Further, a taller mowing height will provide an insulating or shading effect on the lower portion of the turf plant and the soil. The shading effect will reduce heat stress during the hot summer months.

A good rule of thumb to follow when mowing is: remove no more than 1/3 of the shoot length at each mowing. This will limit the stressful effects of mowing on the plant.

Shoot and Root Relationship



Higher mowing heights favor root and rhizome growth

Appropriate Mowing Heights	
Species	**Height**
Kentucky bluegrass	1 ½ - 2 ½"
Perennial ryegrass	1 ½ - 2 ½"
Tall Fescue	2 ½ - 3"
Zoysiagrass	½ - 1"

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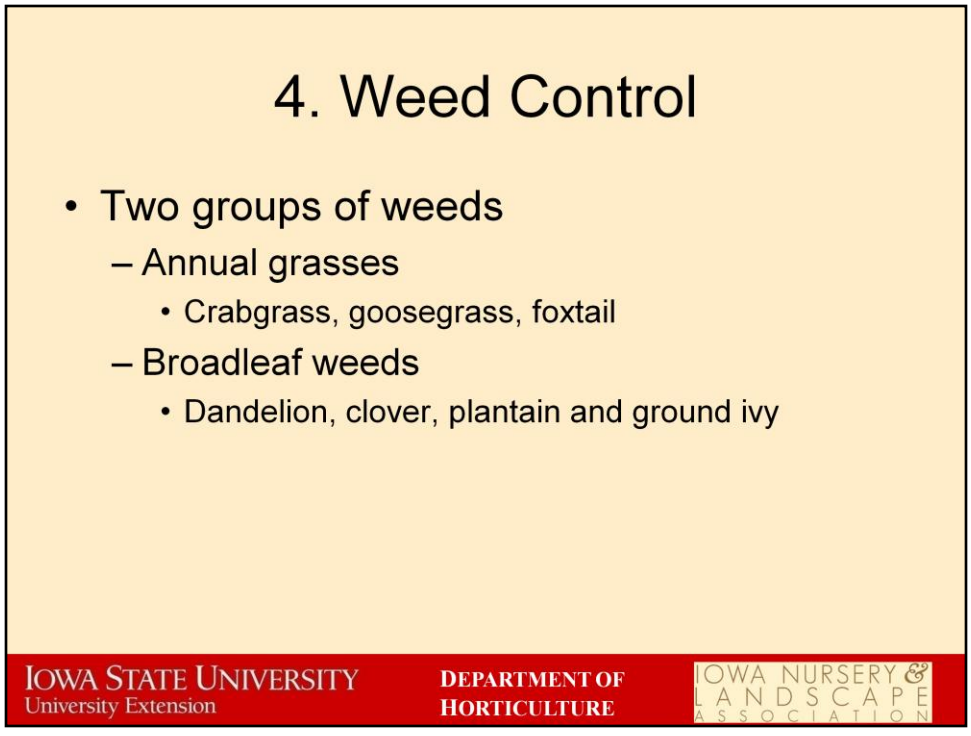
The image on this slide shows the effect that mowing height has on root and rhizome growth. As you can see, shorter mowing heights are associated with significantly reduced root growth. The taller the shoots are allowed to grow, the longer the roots and more extensive the root system. This means that when grass is maintained at a slightly taller height, the roots are also longer and able to grow into a larger volume of soil. This larger volume of soil may have more water in it so the plants will be less drought stressed than when they have a much shorter root system.

The table on this slide shows appropriate mowing heights for common turfgrass species used in Iowa.

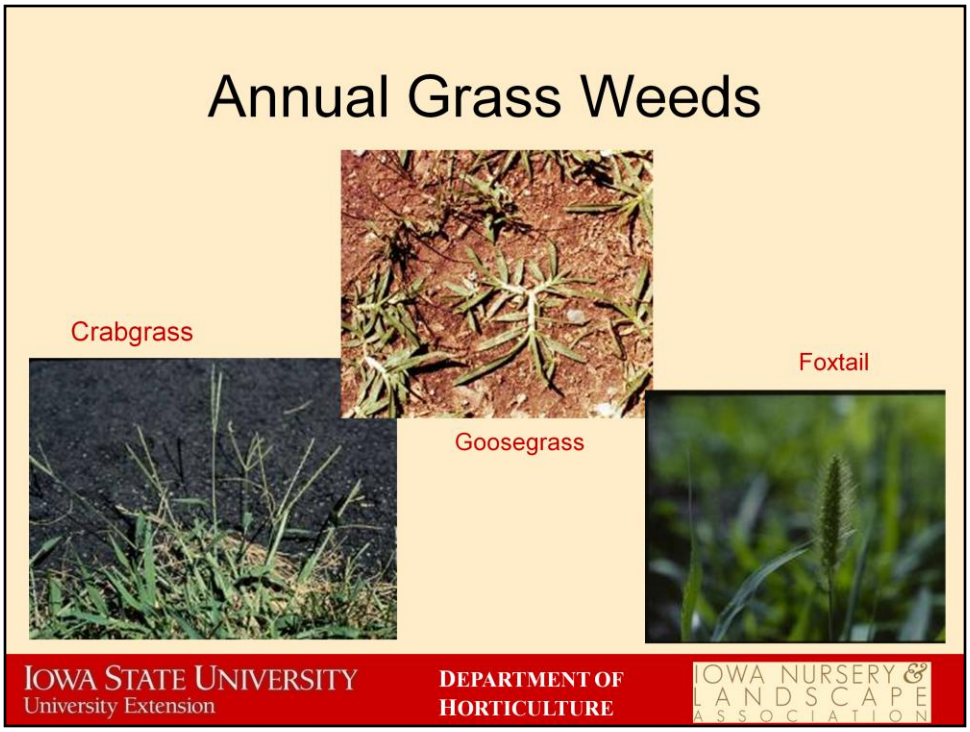
In Iowa natural rainfall is usually adequate for good turf growth in the spring and fall. However during the summer or periods of extended drought it may be necessary to irrigate a lawn. The alternative to irrigating during this time is to allow the turf to go dormant. It will turn brown, but once the cooler and wetter weather in fall arrives it will recover.

If irrigation is necessary, lawns should be watered infrequently and deeply. This means apply enough water to moisten the soil to a depth of 6-8 inches at each watering, which is roughly equivalent to applying 1 inch of water.

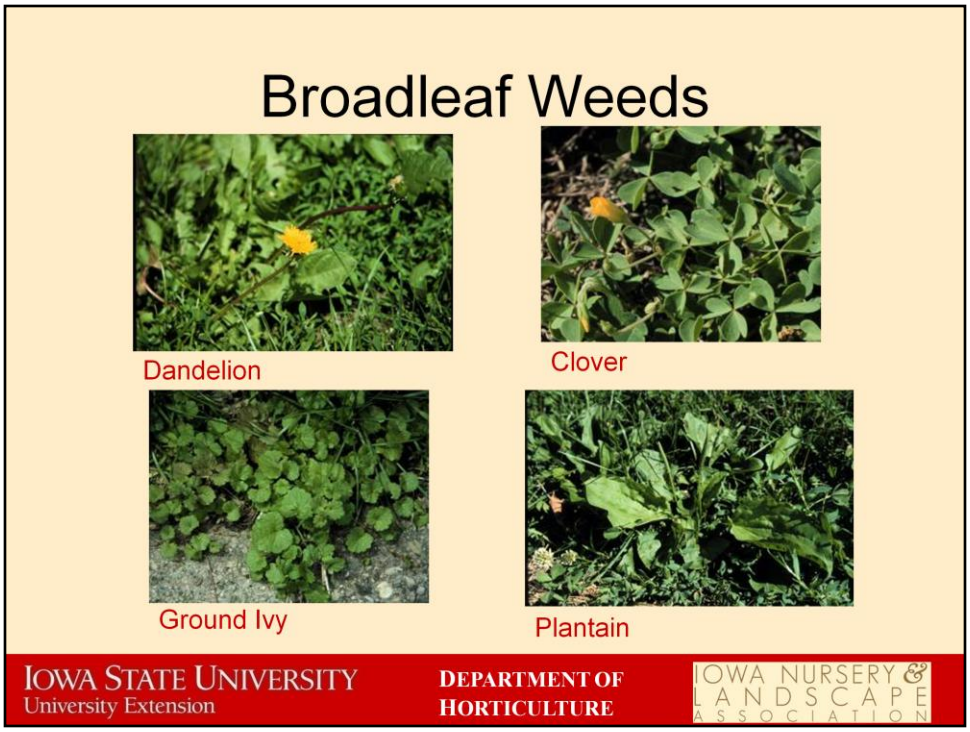


Many weed issues in turfgrass can be avoided by selecting the right turfgrass species or variety, and by mowing, fertilizing and watering the turf correctly.

When weeds do occur, most can be controlled by using chemical herbicides. The two major weed groups that can be effectively controlled by herbicides are annual grasses and annual and perennial broadleaf weeds.



Annual grasses include: crabgrass, goosegrass and foxtail. These grasses germinate in the spring and die out with the first frost in the fall. The best control method for these annual grasses is to apply a pre-emergent herbicide in the spring before they are able to germinate. Pre-emergent herbicides form a chemical barrier at the soil surface where they are applied. The new shoots and root of germinating weed seeds absorb the herbicide and are killed.



Broadleaf weeds include: Dandelion, clover, plantain and ground ivy. Most broadleaf weeds can be controlled selectively in lawns with post-emergent herbicide applications. The chemical is applied to the growing weed and is absorbed into the leaf and moved throughout the plant. Many broadleaf herbicides contain a mixture of chemicals effective in killing different weed species. Refer to the herbicide label to determine which weeds it will control.

5. Thatch Management

- Thatch Definition
  - An intermingled layer of living and dead stems, stolons, roots and rhizomes between the green vegetation and the soil surface

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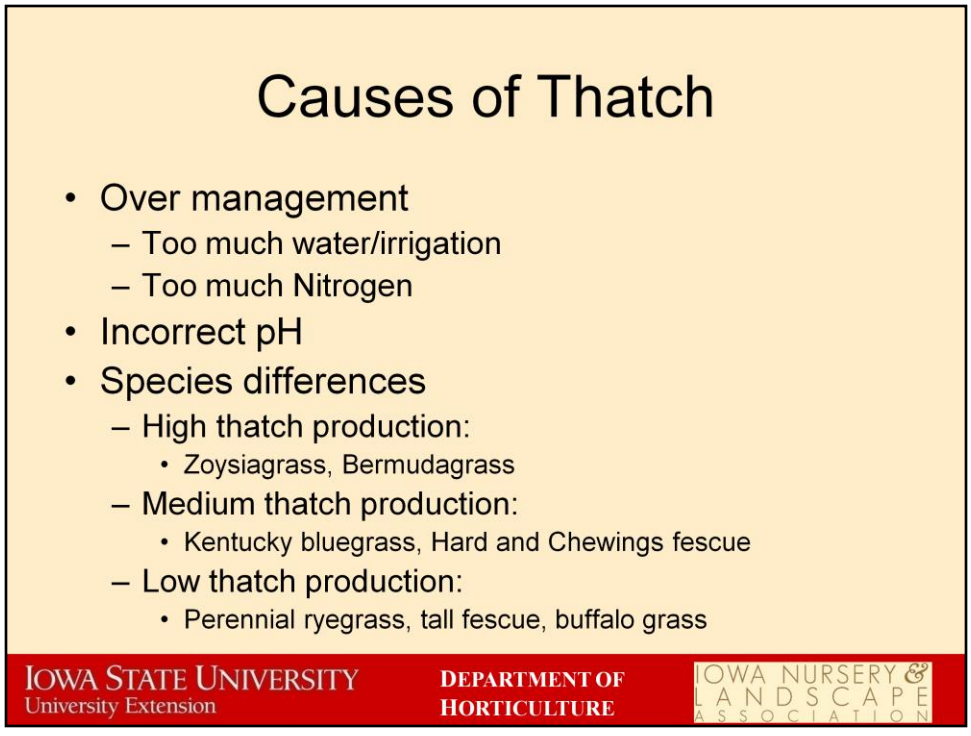
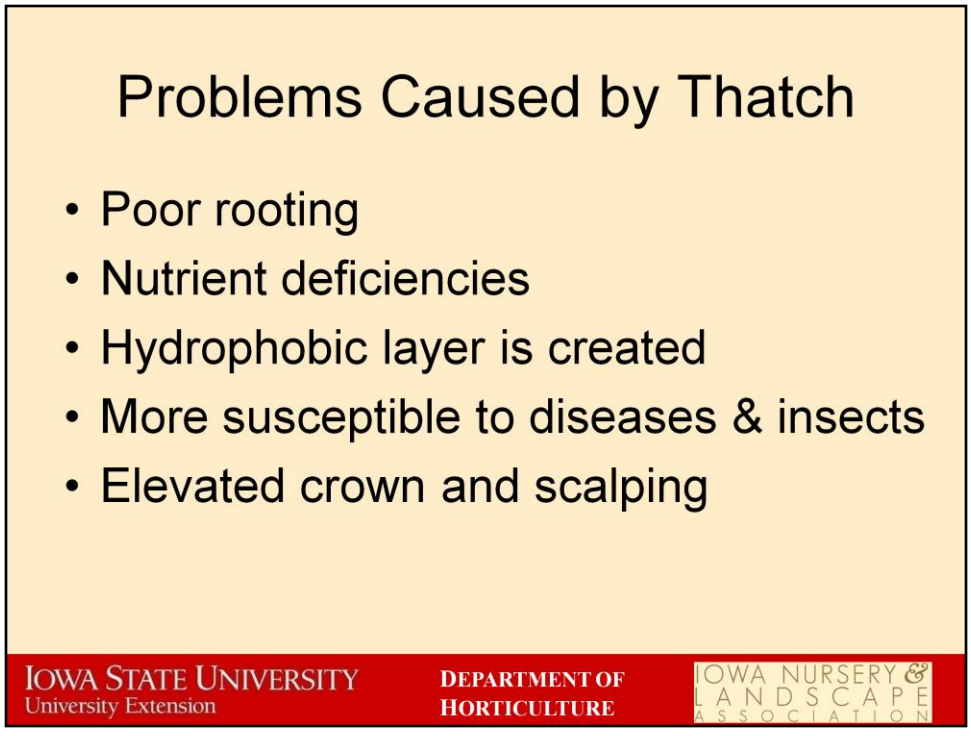
Thatch is an intermingled layer of living and dead stems, stolons, roots and rhizomes between the green vegetation and the soil surface. Thatch will develop more quickly on a high-quality lawn than on a low-quality lawn. There are a number of factors that contribute to thatch development.



Over management including too much water/irrigation combined with too much nitrogen can result in increased thatch accumulation. When the grass is growing very vigorously excess thatch accumulation can occur.

If the soil pH is incorrect, the microbes that normally help breakdown thatch are not as active and are unable to keep the thatch to an acceptable level.

Some species are known to be high thatch producers. Selecting species that produce a limited thatch will reduce the amount of problems associated with thatch.



Thatch accumulation is undesirable because of the following reasons:

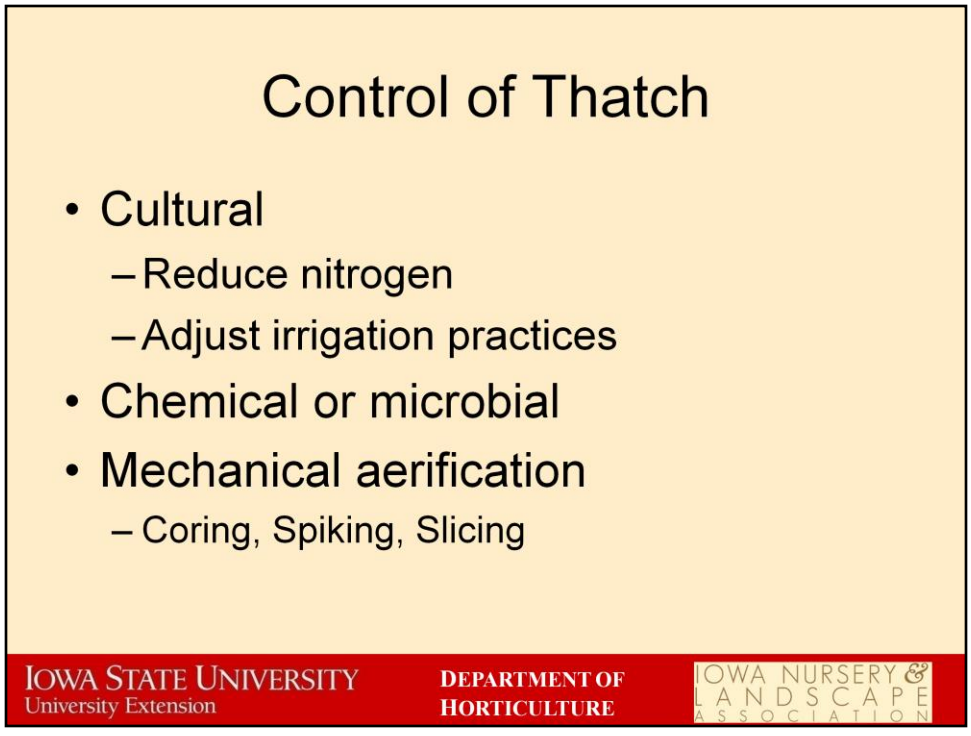
It results in poor rooting since the thatch layer makes it difficult for turf roots to reach the soil.

It results in nutrient deficiencies because it is difficult for some fertilizers to reach the soil and be absorbed by the plant.

The hydrophobic layer created by the thatch reduces the ability of water to reach the soil surface. This layer can also impede pesticides from reaching the soil surface as well.

The turfgrass is more susceptible to disease and insect attack because the thatch reduces the turfgrass' vigor.

The thatch layer creates an elevated crown which is prone to being scalped during mowing.



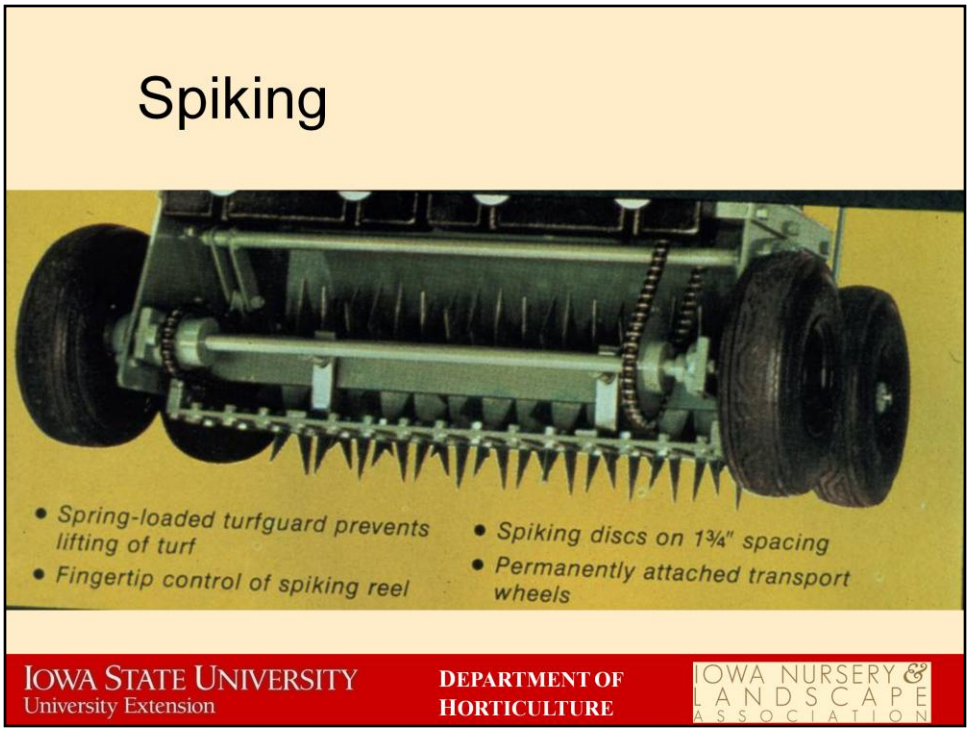
Thatch can be controlled through a number of strategies.

Cultural strategies include reducing the amount of nitrogen applied to the turf, and adjusting irrigation practices to reduce the amount of water applied.

The soil pH can be adjusted chemically to insure it is at the correct level to maximize microbial activity.

Mechanical aerification can be used to remove the thatch and to break up the thatch layer to allow for water and air infiltration.

Here are a couple mechanical core aerifiers that are used to pull plugs of grass, thatch, and soil out of the ground. See how big those plugs are compared to ball-point pen?



This is a mechanical spiking machine.

Slicing

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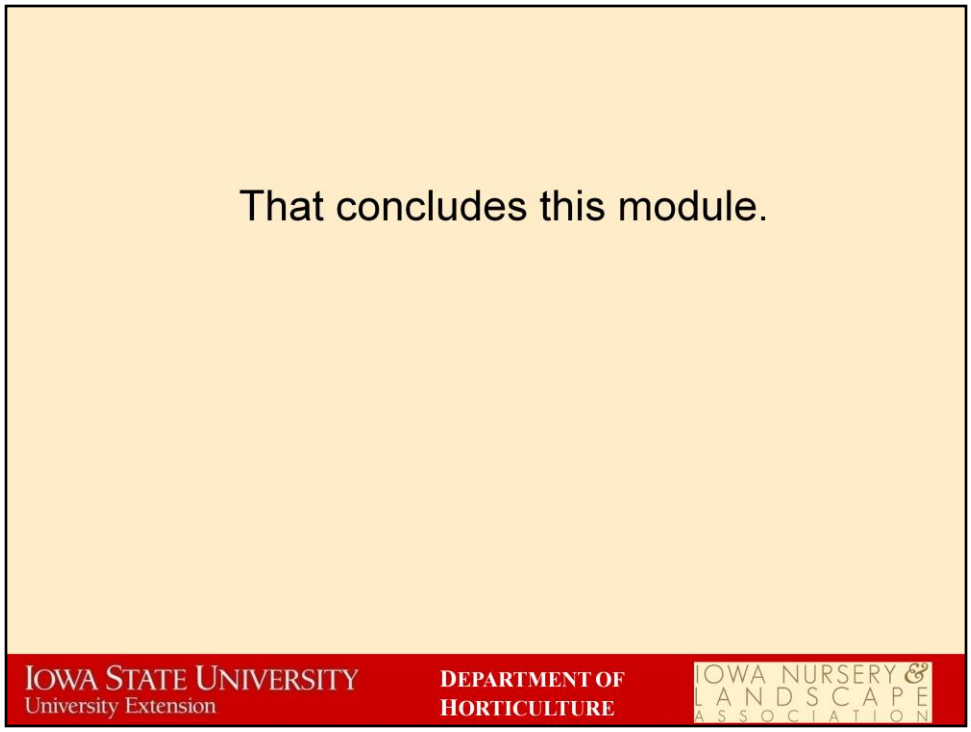
This is mechanical slicing machine attached to lawn tractor.



This concludes the turfgrass establishment and management module.