

Alfalfa Field Guide

Creative Component Presentation by Lucas Westerman



Introduction

- My background
- CC selection
- CC development
- Research
- Conclusion

My Background

- Chokio, MN
- Family Farm
- County SWCD



My Background

- ◉ University of Minnesota, Duluth
- ◉ Major Selection
- ◉ US Air Force ROTC



My Background

- Environmental Science Degree 2006
- Active Duty Commission
- Off to Tyndall AFB, Florida
- Ground Training
- Flying Training to Tinker, AFB, Oklahoma



My Background

- Started program when settled in OK
- Deployment struggles
- Finishing seminar/selecting CC topic



CC Topic

- Many ideas
- Interest from other organizations
- Chose topic and started formulating plan

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- Initial proposal for TOC
- Coordination with Extension/Pioneer
- Focus on Iowa specific issues
- Overall TOC enabled further subcategories

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- Alfalfa Production
- Integrated Pest Management (IPM)
- Diseases
- Insects
- Disorders
- Stand Evaluation

Alfalfa Production

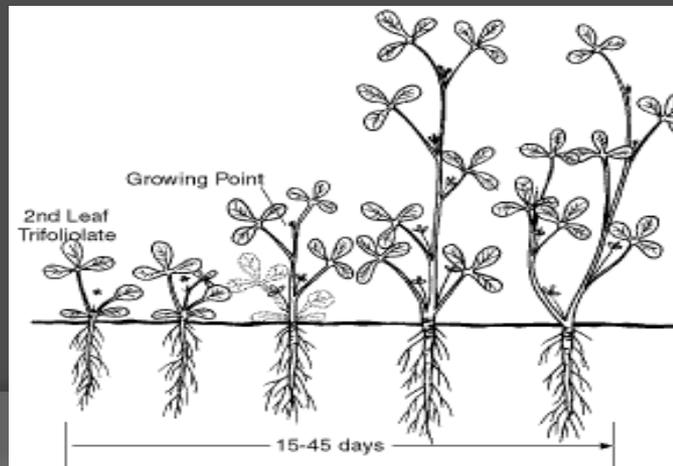
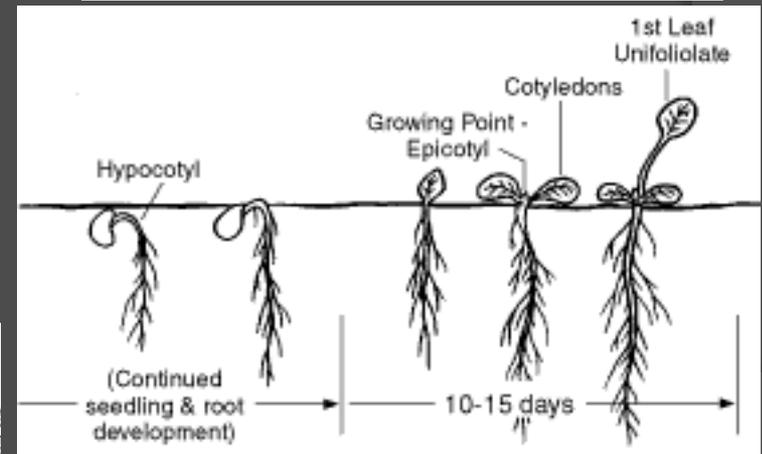
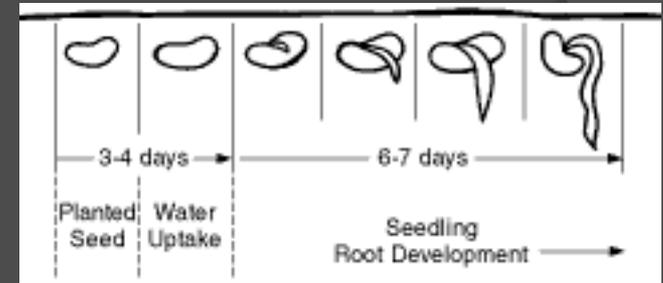
- Introduction to alfalfa development
- Rates and Dates
- PEAQ method for RFV

Alfalfa Production

Development and Growth Stages

Seeds start imbibing water and germination begins soon after planting under adequate soil moisture conditions. Germination will be complete when radicle breaks through seed coat.

Seedling growth now continues as the radicle penetrates the soil to establish a solid taproot. As the taproot grows down in the soil, it pushes the hypocotyl to the soil surface with the cotyledons following.



PEAQ

Step 1: Choose a representative 2-square-foot area in the field.

Step 2: Determine the most mature stem in the 2-square-foot sampling area using the criteria shown in the table at right.

Step 3: Measure the length of the tallest stem in the 2-square-foot area. Measure it from the soil surface (next to plant crown) to the tip of the stem (NOT to the tip of the highest leaf blade). Straighten the stem for an accurate measure of its length. The tallest stem may not be the most mature stem.

Step 4: Based on the most mature stem and length of the tallest stem, use the chart at the right to determine estimated NDF content of the standing alfalfa forage.

Step 5: Repeat steps 1 to 4 in four or five representative areas across the field. Sample more times for fields larger than 30 acres.

HEIGHT OF TALLEST STEM	LATE VEGETATIVE	BUD STAGE	FLOWER STAGE
(from soil surface to stem tip)	Vegetative (>12") No buds visible	1 or more nodes with visible buds. No flowers visible	1 or more nodes with open flower(s)

inches	-----Relative Feed Value-----		
16	237	225	210
17	230	218	204
18	224	212	198
19	217	207	193
20	211	201	188
21	205	196	183
22	200	190	178
23	195	185	174
24	190	181	170
25	185	176	166
26	180	172	162
27	175	168	158
28	171	164	154
29	167	160	151
30	163	156	147
31	159	152	144
32	155	149	140
33	152	145	137
34	148	142	134
35	145	139	131
36	142	136	128
37	138	133	126
38	135	130	123
39	132	127	121
40	129	124	118



Integrated Pest Management

- Overview and importance
- More in-depth scouting techniques
 - Sweep netting
 - Stem and root scouting



Diseases

- Seedling
- Root and crown rots
- Wilt
- Foliar
- Nematodes

Seedling Diseases

- Aphanomyces
- Phytophthora Seedling Blight
- Pythium
- Rhizoctonia



Seedling Diseases

Aphanomyces

Description: This fungal disease, caused by *Aphanomyces euteiches*, slowly causes yellowing and eventual death of seedlings. If seedlings survive, adult plants show discoloration and stunted growth. At least two races exist with race 2 most common in Iowa.

Environment: The pathogen can survive for extended time periods in the soil and wet soil conditions promote seedling infection.

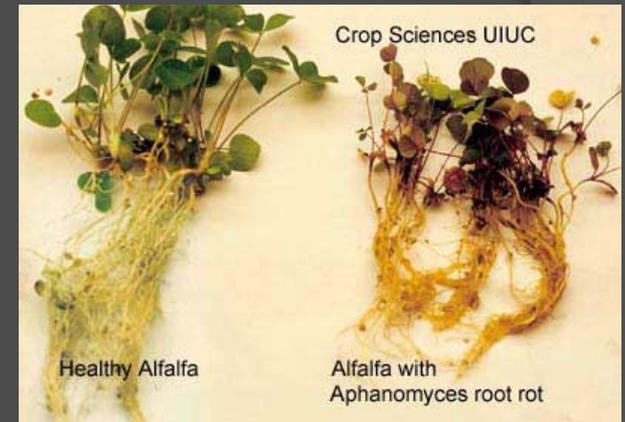
Best time to scout: After periods of increased spring precipitation.

Scouting tip: Stunted plants with yellow cotyledons and chlorotic first leaves. Poor root development with few lateral roots. Infected seedlings remain upright. Roots and stems are grey and water-soaked in appearance.



Root and Crown Rots

- Aphanomyces Root Rot
- Fusarium Wilt
- Phytophthora Root Rot
- Pythium Root Rot



Root and Crown Rots

Phytophthora Root Rot

Description: Caused by soil-borne pathogen, *Phytophthora medicaginis*, that also can cause seedling blight. Look for yellow, red, or purple discoloration of leaves.

Environment: Pathogen favors warm conditions in poorly drained soils and persists in organic debris. Excessive moisture in the soil can activate production of zoospores that begin to infect small lateral roots.

Best time to scout: Post-emergence in areas of the field that frequently have standing water.

Scouting tip: Poorly drained areas of the field will show symptoms of yellow, red or purplish discoloration of leaves. Below ground symptoms are initially reddish-brown rotted areas on roots that will develop into dark brown or black root lesions.



Wilt

- Anthracnose
- Bacterial
- Verticillium



Wilt

Anthracnose

Description: The fungus, *Colletotrichum trifolii*, infects plant crown and ultimately kills the plant.

Environment: Warm, rainy weather

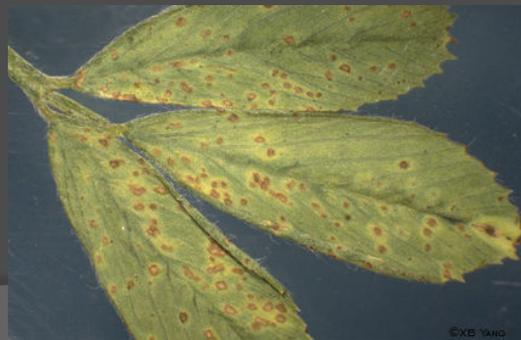
Best time to scout: Regularly post-emergence.

Scouting tip: Stems show diamond shaped lesions with small, black bodies of the fungus sometimes observed in the center of lesions. “Shepherd’s crook” is a symptom where the upper part of stem dies and wilts over. Differentiating characteristics from *Verticillium* and *Fusarium* are normal size upper leaves, but stem is wilted with darker, black lesions.



Foliar

- Downy Mildew
- Common Leaf Spot
- Leptosphaerulina Leaf Spot
- Spring Black Stem
- Summer Black Stem
- Bacterial Leaf Spot



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Foliar

Downy Mildew

Description: Fungal disease caused by *Peronospora trifoliorum* usually affecting stands in the spring for the first cutting.

Environment: Cool, wet conditions in the spring or fall.

Best time to scout: Before first cutting.

Scouting tip: Symptoms are yellowing (chlorotic spots) on leaf surface. Possible downward curling of yellowed leaves. Whitish-gray mold growth may occur on underside of infected leaflets. This fungal growth is mass of spores which serve as inoculum for secondary spread of the fungus.



Nematodes

- Root-lesion
- Stem
- Root-knot



Insects

- ⦿ Insect Pests
- ⦿ Occasional Pests
- ⦿ Beneficial Insects

Alfalfa Insect Scouting Calendar

<u>Insects</u>	March	April	May	June	July	Aug	Sept	Oct
Alfalfa weevil-adult	*****		*****					
Alfalfa weevil-larva		*****						
Potato leafhopper		*****						
Blister beetles			*****					
Grasshoppers			*****					
“Army worms”		*****						
‘Aphids’	*****							
Spittlebugs	*****							

Insect Pests

- Pea Aphids
- Blue Alfalfa Aphids
- Cowpea Aphids
- Alfalfa Weevil
- Clover Root Curculio
- Potato Leafhopper
- Blister Beetle



Insect Pests

Alfalfa Weevil

Description: Primary insect pest responsible for defoliation of alfalfa. Larval populations cause the most damage in a field. Adults are $\frac{1}{4}$ inch in length, have a brown snout, and a dark narrow stripe down their back. Adults lay yellow, oval eggs in alfalfa stems. Hatched larvae are yellowish-green with a white strip down the middle of the back and are $\frac{3}{8}$ inches long when fully grown. Larvae cocoon in fallen field plant debris to complete their life cycle. Adults emerge 1-2 weeks later and feed for a short period of time before entering a rest period and then return to the field to lay eggs. Fall egg laying cause problems in the spring due to egg hatching and larval damage before the first cutting. Larvae can remain after first harvest and feed on developing buds causing slow regrowth.

Damage: Skeletonized leaf defoliation at top of plant

Best time to scout: Mid-May. Most damage occurs before first harvest and feeding tapers off by mid-June.

Scouting tip: Can be confused with the clover leaf weevil larva which is two times larger than alfalfa weevil larva. Clover leaf larva feed at night near the base of the plant while alfalfa weevils feed during the day higher on the plant. Clover leaf weevil larvae also have a white stripe down the back but the stripe is bordered by red smudges.



ET

Economic thresholds based on alfalfa weevil larvae per stem (calculated from a 30-stem sample). Use the smaller threshold if alfalfa is drought stressed or control costs are relatively low (\$7-10 per acre). Use larger threshold if rainfall is abundant, diseased larvae are present or control costs are relatively high (\$11-14 per acre).

Plant Height (inches)	\$40/ton	\$70/ton	\$100/ton	Management Decision
4	1.8-2.8	0.8-1.3	0.6-0.8	
6	2.0-3.0	0.8-1.5	0.6-1.0	Reevaluate in 4 days. If damage and larval numbers are increasing a long residual insecticide is recommended to prevent severe yield loss.
8	2.2-3.2	0.9-1.7	0.7-1.2	
10	2.3-3.5	0.9-1.9	0.8-1.4	
12	2.4-3.8	1.0-2.2	0.9-1.6	If alfalfa is in vegetative stages, a short residual insecticide should be used
14	2.5-4.2	1.2-2.5	1.0-1.8	
16	2.6-4.6	1.5-2.8	1.1-2.0	
18	2.7-5.0	1.7-3.1	1.2-2.3	
20	2.8-5.8	2.0-3.4	1.4-2.6	If > 60 percent of alfalfa is in the bud stage, harvest is recommended. Evaluate stubble after harvest. If not scheduled to be cut within 7-10 days, a short residual insecticide is recommended.
>20	3.0-7.0	2.4-4.0	1.6-3.0	

Occasional Pests

- Alfalfa Caterpillar
- Lygus Bug/Tarnished Plant Bug
- Grasshoppers
- Armyworm
- Alfalfa Webworm
- Variegated Cutworm
- Spittlebug

Occasional Pests

Alfalfa Caterpillar

Description: Adults are butterflies that will infest a field and lay eggs on newly growing alfalfa. Eggs hatch to 1½ inch long caterpillars that cause the most damage to newly growing alfalfa.

Damage: Defoliation. Caterpillars feed on entire leaves.

Best time to scout: Early spring for butterfly (yellows or sulphurs) activity and weekly after regrowth is six inches for early larval activity.

Scouting tip: Caterpillars can be distinguished from other common caterpillars by their velvety-green bodies and white lines along their sides.



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Beneficial Insects

- Seven-spotted Ladybug
- Soldier Beetle
- Nabis Bug
- Green Lacewing
- Spiders
- Parasitic Wasp
- Pollinators

Beneficial Insects

Seven-spotted Ladybug

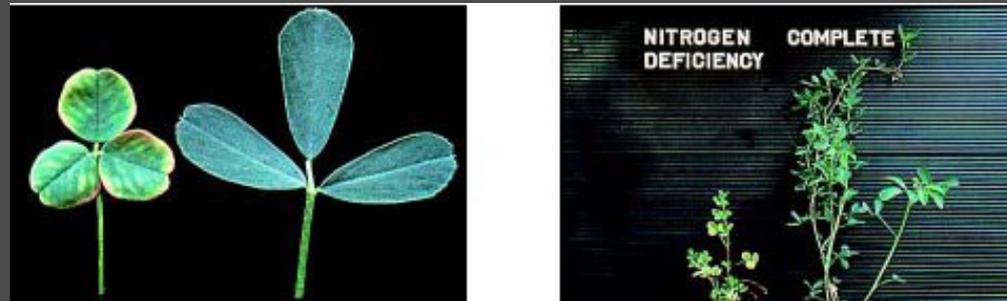
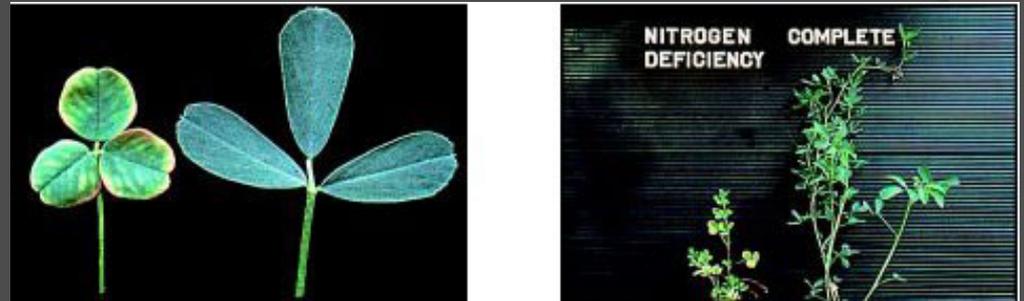
Description: Small, dome shaped insect with reddish-brown, shiny forewings. Adults overwinter in aggregations in debris or around trees and rocks. Adults emerge in the spring to search for suitable feeding locations.

Benefit: Ladybugs feed on aphids and eggs and small larvae of other beetle and bug pests.



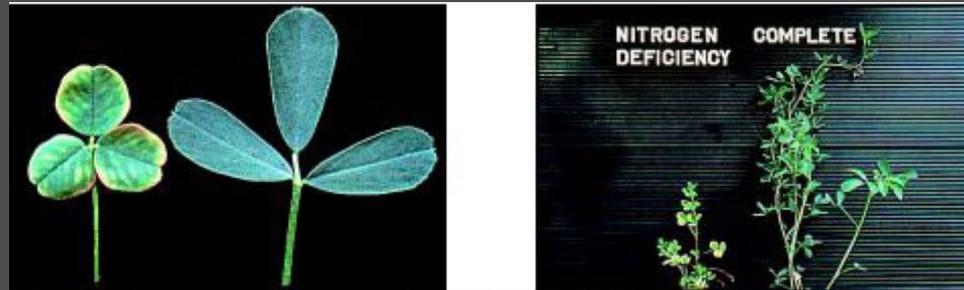
Disorders

- pH
- Nutrient Deficiencies
 - Nitrogen
 - Phosphorus
 - Potassium
 - Boron
 - Sulfur



Disorders

Nitrogen: Soil pH affects nitrogen-fixing bacteria and causes alfalfa to show nitrogen deficiency symptoms consisting of yellowing of edges on older leaves, stunting, and reduced branching. Application of nitrogen fertilizer or raising soil pH is the best corrective action.



Potassium: Small yellow dots on leaf margins of upper leaflets. Further yellowing and lower leaves dropping indicates severe deficiency.



Disorders

⦿ Environmental Stresses

- Autotoxicity
- Drought
- Anoxia
- Frost
- Hail
- Winter Injury



Disorders

Frost: Cold injury risk depends on stage of alfalfa development. At emergence, seedlings have good cold tolerance. At second trifoliate leaf stage that tolerance is lost and 4-6 hours below freezing may cause cold injury and death.

Established stands have less cold tolerance. Short duration of temperatures just below freezing may freeze leaves on established stands but regrowth will generally occur with temperature recovery.

Complete reseeding or seeding into thin emergence areas should be considered for early seedlings that were permanently killed from cold temperatures. Evaluate established stands to determine how far down the plant the frost caused damage and, if warranted, stands with sufficient yield should be cut to avoid further yield loss.



Conclusion

- My background
- CC selection
- CC development
- Research