Hay, Baleage, and Forage Quality School
Aaron Gabriel, Cornell Cooperative Extension
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1. Improving a hay field
   A. Weed Management
   B. Frost-seeding
   C. No-till inter-seeding

2. Starting a new hay field
   1. Crop Rotations
   2. Fertility
   3. Forage Species Selection
   4. Tillage
   5. Seeding Rates
   6. Nurse Crops
   7. Harvest in the seeding year

Images from several sources

What Type of Plant?

Broadleaf

Grass

Sedge

Summer Annual

Winter Annual

Perennial

Bienniel

- **Mowing can be effective for many weeds if you mow at the correct time, height, and frequency.**
- **A sickle bar or haybine can be as effective as a rotary mower.**

Mowing Strategies depend on the weed

Milkweed

Queen Anne's Lace

Chickweed

Ragweed

Smooth Bedstraw - Know your enemy

- Perennial with a large rootsystem
- Seed viable for only one year
- Yr 1 prevent seed formation; Yr 2 use Crossbow
- or tillage & rotate to a winter & summer annual

<u>Keep Poisonous plants out of hay</u>

***Snakeroot *Hemp Dogbane**
*** Milkweed *Jimsonweed**

<u>Types of Herbicides</u>

READ THE LABEL (3 times)

- Pre-emergent (relative to the weed)
- Post-emergent (relative to the weed)

- Residual (active in the soil for weeks/months/ year)
- Non-residual (not soil active)

- Apply before crop emergence, while dormant, or to actively growing crop?

Herbicide Modes of Action

Growth regulators
Benzoic acids (Banvel, Clarity, Distinct, Status)
Phenoxy acetic acids (2,4-D, 2,4-DB)

Amino acid synthesis inhibitors
Amino acid derivatives
Glyphosate (Roundup and others)
Lipid synthesis inhibitors

Seedling growth inhibitors

Photosynthesis inhibitors

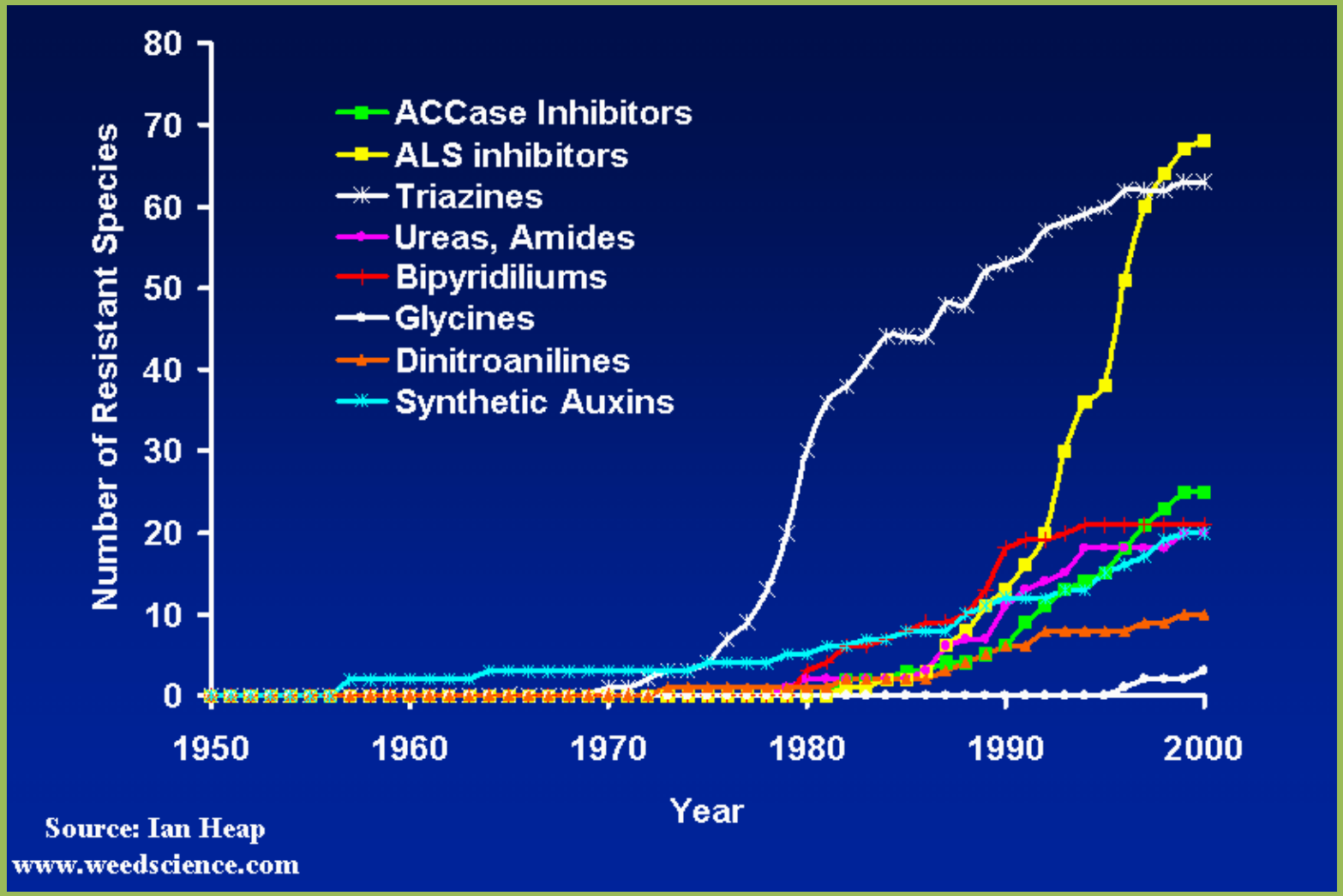
Cell membrane disruptors

Pigment inhibitors

SITE OF ACTION CLASSIFICATION

	Site of Action	Family	Product
3	Microtubule assembly inhibition (10)	Dinitroaniline	Balan Pendimax Prowl
4	Synthetic auxin (24)	GROUP	2,4-D Butyrac
		Benzoic acid	Banvel Clarity
		Carboxylic acid	Stinger

Resistance to Glyphosate is Possible… But is Known to be a Rare (8 in 2006); Now 28 resistant weeds (2014)



- The historical rate of development for glyphosate resistance is much slower than most all other herbicide families.


Observe to find unusual plants – the outliers.

Commonly Used Herbicides in Hay

2,4-D / Banvel / Crossbow

Growth regulators that kill all broadleaf weeds (and young grasses). Apply near bud stage when plants are actively growing in late-spring through summer. *Only Crossbow is effective on smooth bedstraw.*

Glyphosate (RoundUp)

Must be taken in by leaves and transported to roots. Apply to actively growing plants with plenty of foliage (grasses 8" tall). Works best in the fall as perennials store energy in roots. Will not kill annuals that are nearing the bud stage.

Good Management is needed to fill the holes left by dead weeds

- pH and fertility
- Cutting management
- Inter-seeding if needed

Frost Seeding

- From December through mid-March if no snow cover
- Need spots of bare soil, freeze-thaw cycles, rain
- Only vigorous seedlings w/dense small seeds:
  - Red Clover, Ladino Clover, Ryegrasses, Orchard grass (grasses are less reliable)

- **Bare ground**
- **Graze or clip close in the fall**

Seed/soil contact is important for tillage an non-tillage systems. establishment.

Broadcast

Aerway before seeding

Inter-seeding with a no-till drill to improve a thin field

- No-till seeding into an existing stand
- Use a species with a vigorous seedling
- Reduce the plant competition
- Rented drills may be in better condition early in the year, than in August

No-till Drill

- Multiple seed boxes
- Double disk openers
- Press wheels to close the seed furrow
- Heavy machine

Soil must be crumbly with good tilth for successful no-till seeding.

Starting a new hay field

1. Crop Rotations
2. Fertility
3. Forage Species Selection
4. Tillage
5. Seeding Rates
6. Nurse Crops
7. Harvest in the seeding year

Crop Rotation Calendar				
	Dec / Jan / Feb	**Mar / Apr /May**	**Jun / Jul / Aug**	**Sep / Oct / Nov**
Perennial Forages	Perennials			.
Summer Annuals			Summer Annuals	
Spring Annuals		Spring Annuals .		
Winter Annuals	Winter Annuals .			Winter Annuals
	Crops Grown Out of Their Natural Season			
			Oats	
	Annual Ryegrass			Ann. Ryegrass

Perennials: alfalfa, red & ladino clover, timothy, brome, orchard, fescue, P. rye, reed canary, chicory

Summer Annuals: BMR sorg/sudan, sudangrass, teff, cowpeas, soybean, crimson c.,

Spring Annuals: oats, spring grains, field pea, brassicas (radish/rape/swede), annual ryegrass

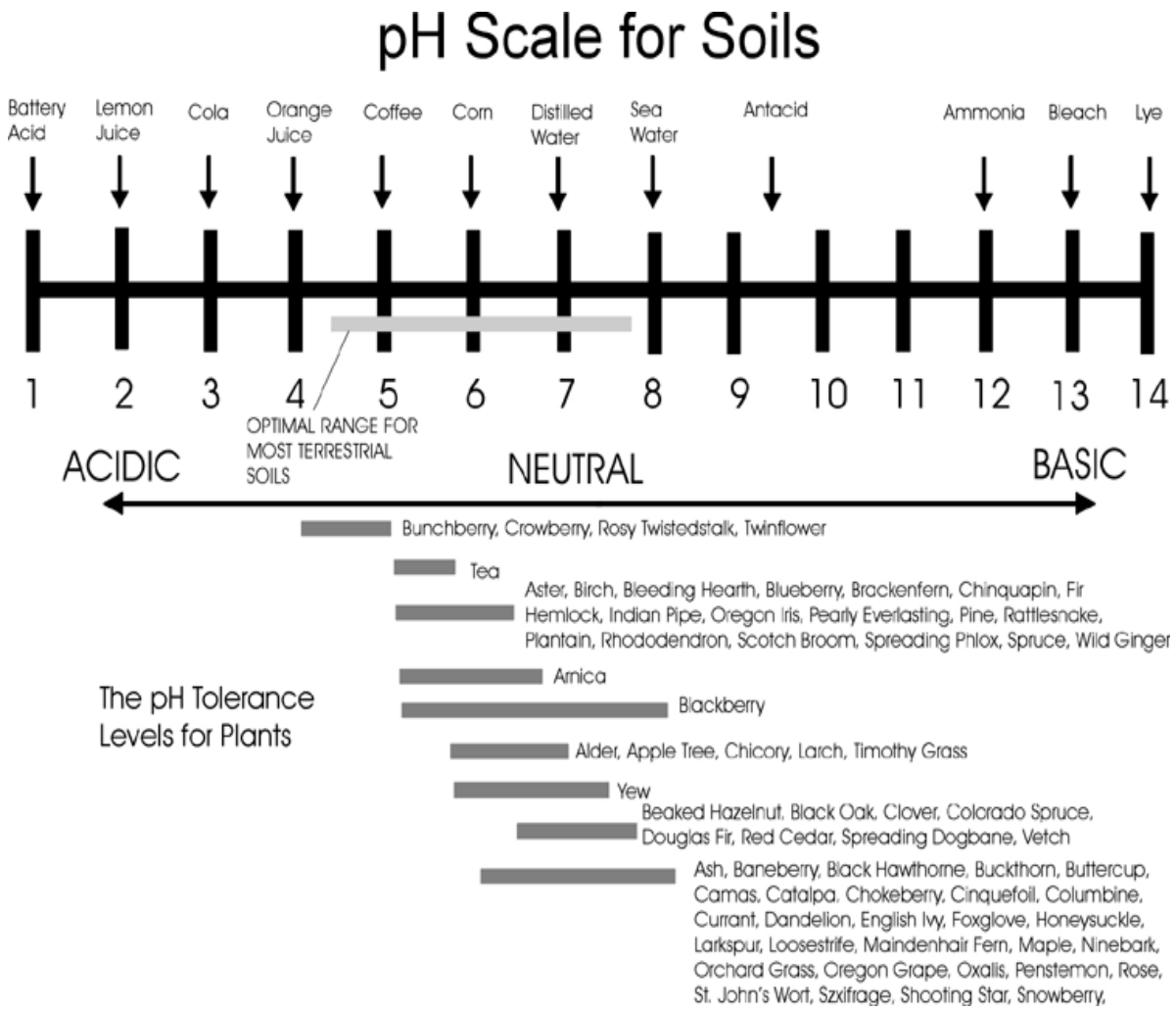
Winter Annuals: winter rye & winter grains, hairy vetch,

<u>Alfalfa autotoxicity</u> prohibits planting alfalfa within one year of a previous alfalfa crop

Herbicide residues from previous crops can cause herbicide injury in new plantings.

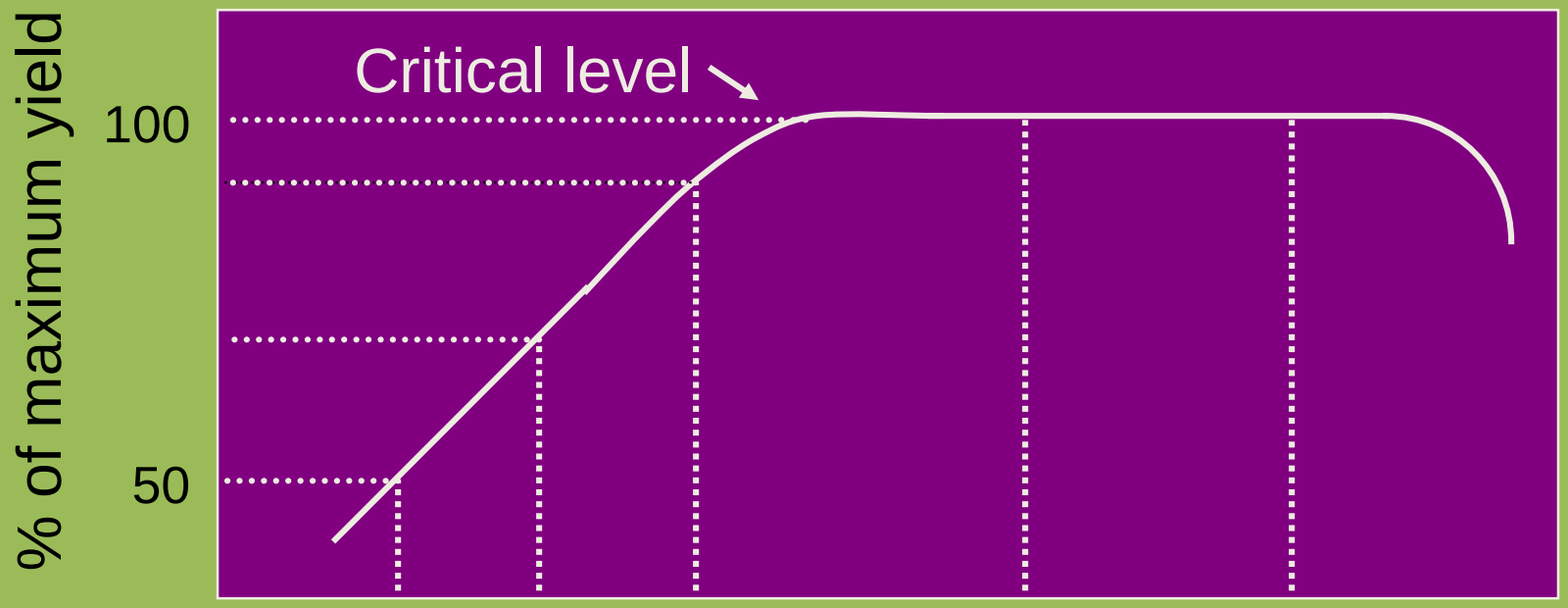
0 days to 2 year "rotation intervals"

FERTILITY - Plan Ahead
Lime requires 1 year to neutralize soil.



Soil Test a year before seeding

Spend money on lime before buying fertilizer.



Soil test: Very low low medium/optimum high very high

Fertilizer response likely. Response to fertilizer not likely.

Alfalfa – 0 lbs nitrogen at planting
Pure Grasses – 30 – 50 lbs nitrogen at planting

Boron Deficiency


http://extension.cropsci.illinois.edu


http://extension.udel.edu/kentagextension/

Sulfur Deficiency

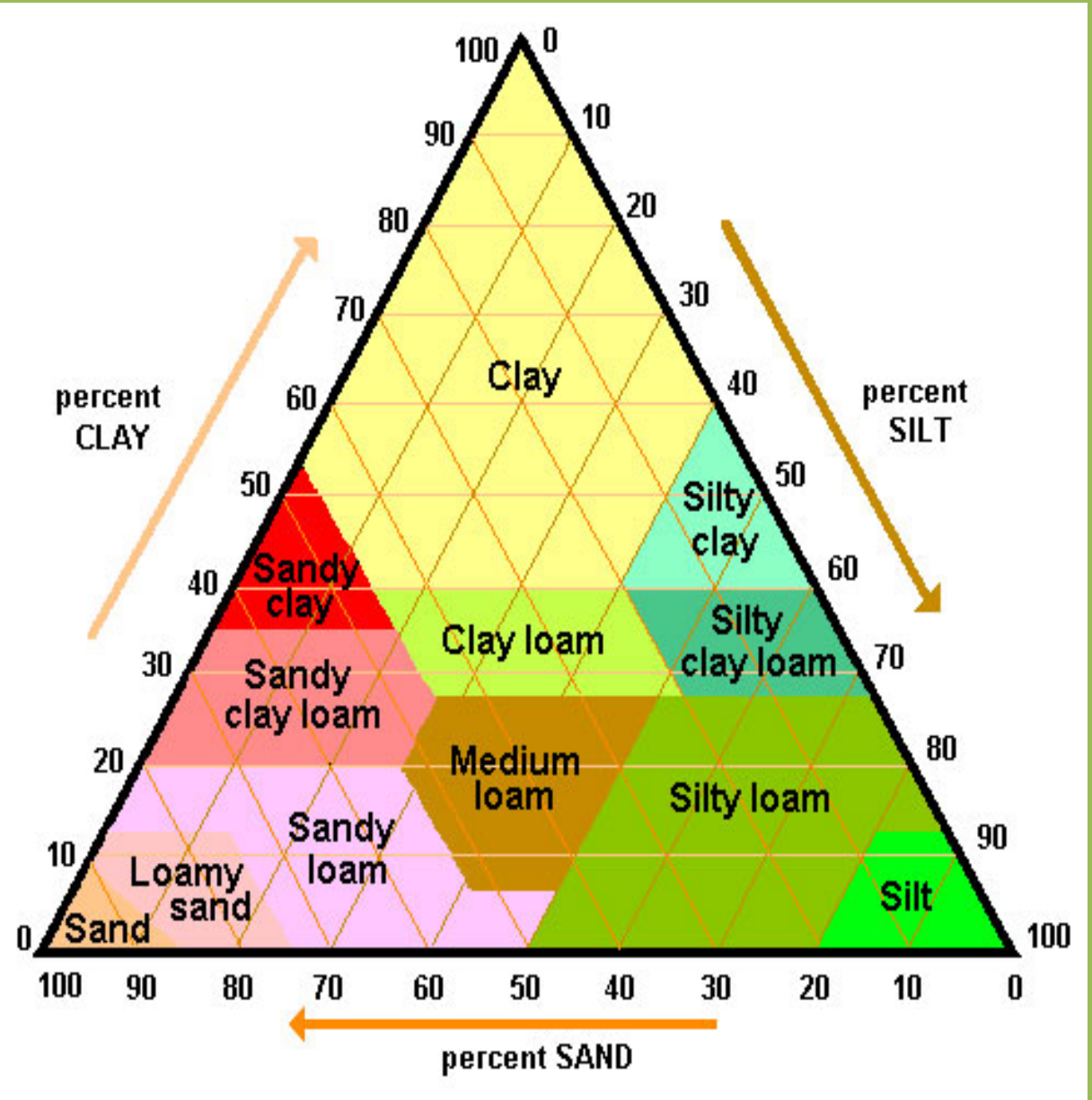
http://landresources.montana.edu/

http://www.agronext.iastate.edu/

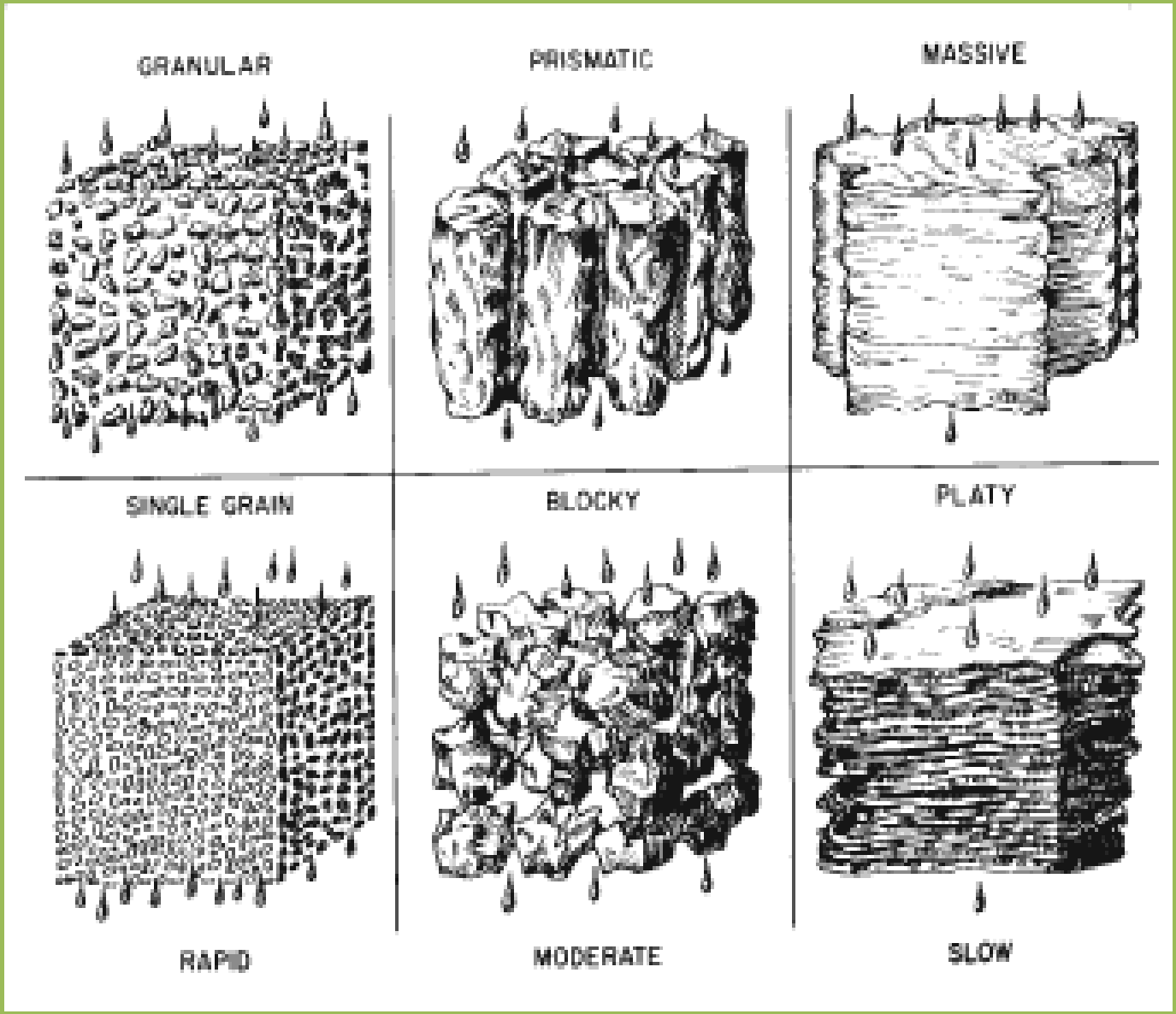
Access to manure is key to organic field crop production.

- **3- 5000 gal (10 ton) per acre topdress**
- **Spread within 2 days of harvest, on firm ground only**
- **Traffic will crack alfalfa crowns**
- **Nitrogen in manure stimulates weed seed germination**

FORAGE SPECIES SELECTION: choose a forage adapted to the soil and climatic conditions.



Drainage is the major factor in selecting forage species



Legume Characteristics

	Alfalfa	Red Clover	Ladino or White Clover	Birdsfoot Trefoil
Drainage	Moderate to well drained	Moderate to imperfect	Mod. to poorly drained; avoid droughty soils	Imperfect to poorly drain.
Drought Tolerance	Excellent	Good	Poor	Poor
Flood Tolerance	Poor	Poor	Poor	Poor
Winterhardiness	Good, variable	Fair	Fair; variable	Good
Soil pH Range	6.2–7.5	6.0–6.7	5.5–6.5	5.0–6.5
Seedling Vigor	Medium	High	Low	Low
Cuttings/Year	2 to 4	1 to 2*	1, usually grazed	1 to 2,usually grazed

Modified from Timothy Griffin, U of Maine, Bulletin 2261

Where Does RR Alfalfa Fit?

- In fields with perennial weed problems
- Where glyphosate is not being used for other crops
- Apply glyphosate at the 3 – 5 leaf stage alfalfa to remove 5 – 10% of glyphosate-susceptible individuals
- Grass can be inter-seeded after weed-free alfalfa is established

Grass Characteristics

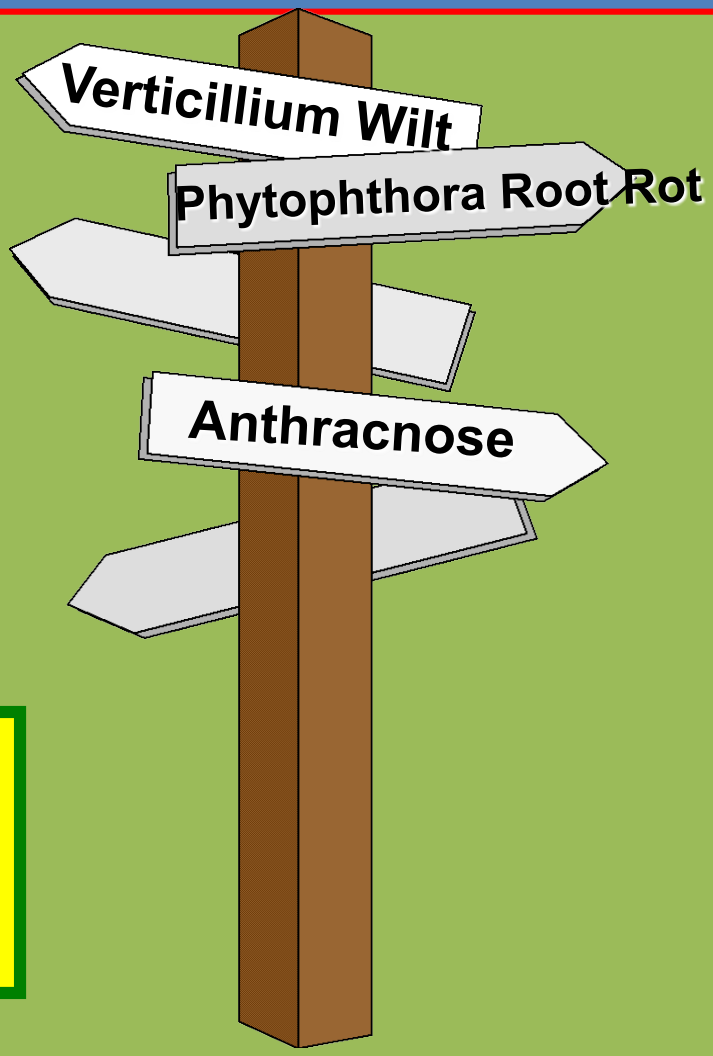
	Kentucky	Timothy	Orchard	Smooth Brome	Reed Canary	Tall Fescue	Perennial Ryegrass
Plant Type	Sod	Bunch	Bunch	Sod	Sod	Bunch	Bunch
Heading date	E. May	E. June	Mid May	L. May	L. May	L. May	M/L May
Drainage	Poor to well	Mod. to imperfect; not dry	Mod. to well; gd srfc	Well drained	Poor to well drained	Mod. Poor to well dr.	Mod. Well to well dr.
Flood Tol.	Good	Poor	Poor	Poor	Exc.	V. gd	Poor
Drought Tol.	Poor	Poor	Good	Exc.	Exc.	Exc.	Poor
W. hardiness	Good	OK w/ ice	Fair	Good	Good	Good	Fair
Seed. Vigor	Mod.	Mod.	Good	Good	Poor	Good	V. Good
N. Response	Fair	Fair	Good	Fair	Good	Good	Good
Cuts/Year	1	1 to 2	2 to 3	2	2 to 4	2 to 4	2 to 4
Sum.Growth	Fair;	Fair	Good	Fair	Good	Good	Moderate

Modified from Timothy Griffin, U of Maine, Bulletin 2261

Selecting a Forage Variety

Test results from many years and locations are more predictive

Remember the Big Picture…

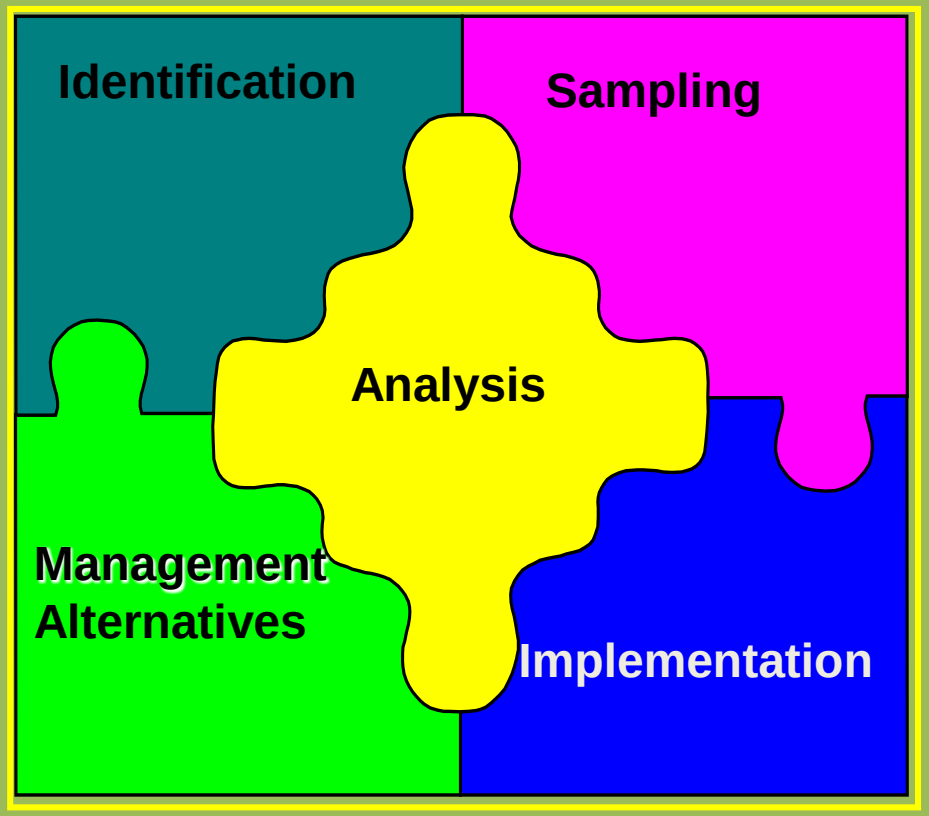


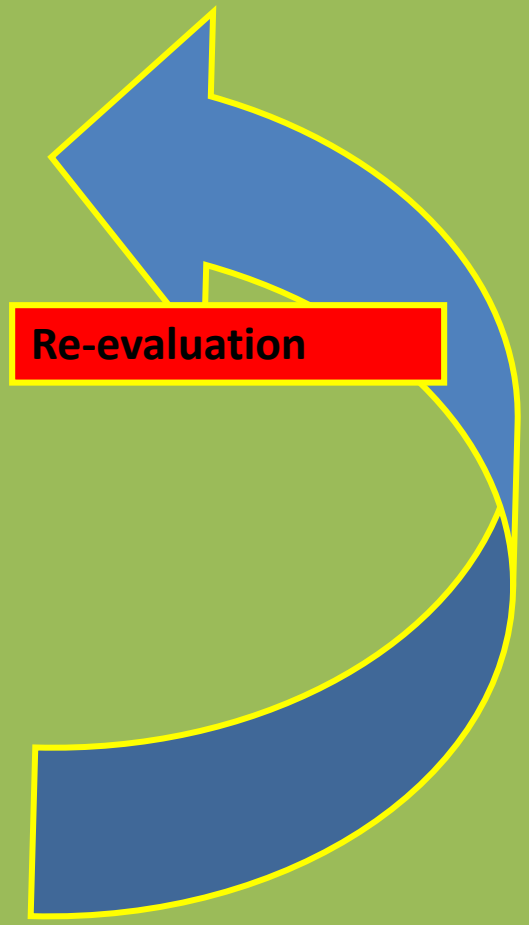
Look for the best "package" of traits when selecting an alfalfa variety:

"agronomics, disease resistance, fall dormancy rating, yield, etc."

Integrated Pest Management

Proper species and variety selection are the first line of defense in IPM





ALFALFA IPM SCOUTING CALENDAR

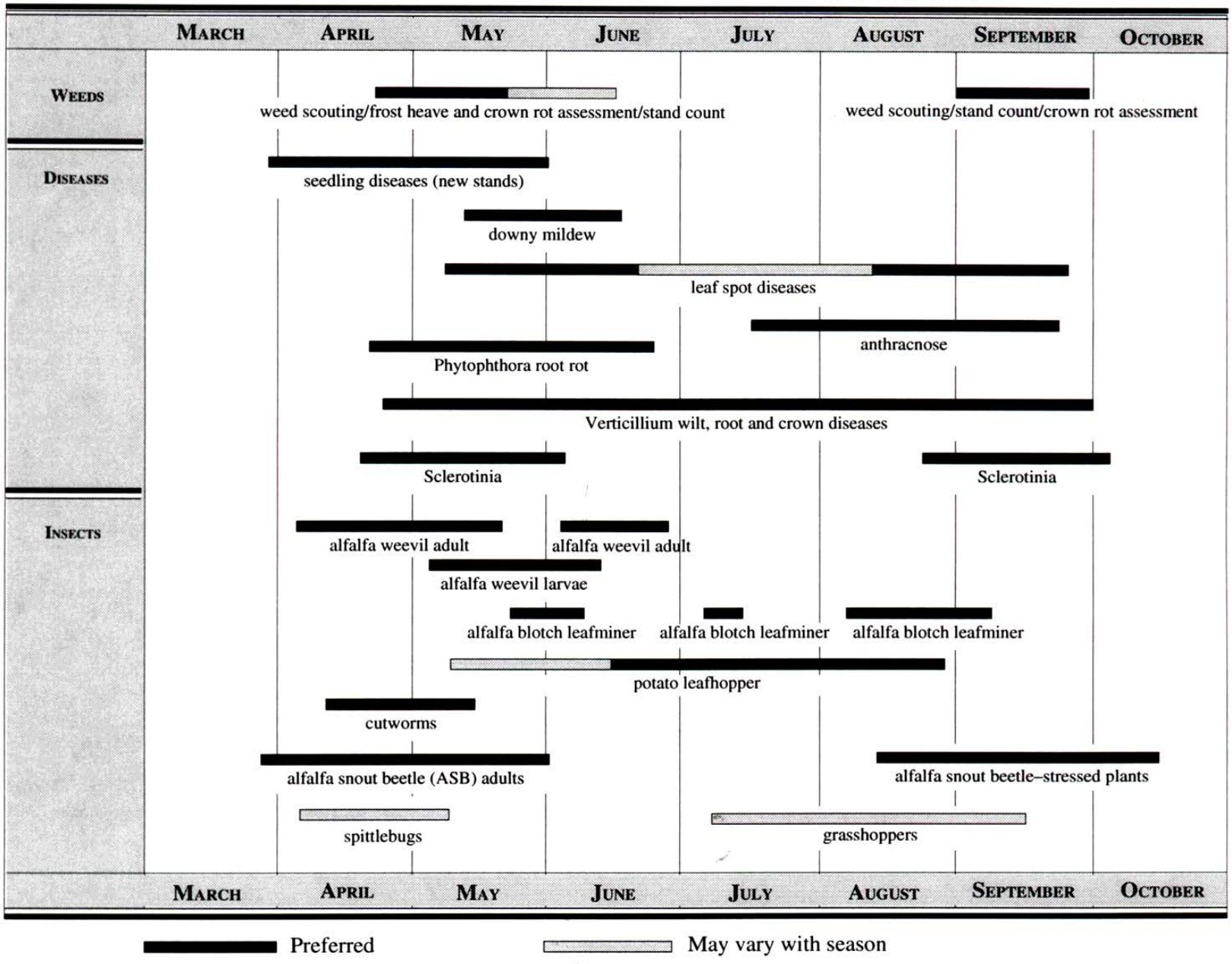


Fig. 13. Key periods for monitoring alfalfa pest problems in New York.

Varietal Resistance is a major IPM strategy in field crops

PLH Resistant Alfalfa Cultivars

Alfalfa Disease Ratings

Susceptible: 0-5% resistant plants
Low Resistance: 6-14% resistant plants
Moderate Resistance: 15-30% resistant plants
Resistant: 31-50% resistant plants
High Resistance: >50% resistant plants

Alfalfa Fall Dormancy Ratings

very dormant [index 1]
dormant [2]
moderately dormant (3]
Semi-dormant [4,5,6]
moderately non-dormant [7]
Non-dormant [8]
very non-dormant [9]

Tillage

WANTED: Friable, porous, well-structured soil

What is your purpose for tillage???

- **Relieve compaction?**
- **Weed control?**
- **Smooth out ruts?**
- **Incorporate lime or other amendments?**

Which soil may have had too much tillage?

No-till seeding into a killed sod

http://extension.missouri.edu/explore/images/m00183art08.jpg

Primary Tillage

Completely invert to kill old sod

Secondary Tillage

Primary or Secondary Tillage?

Primary or secondary tillage?

A fine seedbed is needed for small seeded crops and a smooth field is more efficient and more fun to work.

Primary or secondary tillage?

http://www.vinetechequipment.com/hay_renovator_aerator.jpg

A regular grain drill with a hay seed box can be used in a prepared seedbed. A firm seedbed allows moisture to wick upward to the seed. You should barely leave a foot print in it. This seedbed is too loose.

Brillion-type seeders drop seed between two sets of rolls that press the seed into the soil.

<u>Seeding depths</u>

- Birdsfoot Trefoil & Teff: 1/8”
- Sudangrass: 1/2”
- Other grasses & legumes: 1/4”
- Small Grains: 1 to 1 1/2”

Seeding Rates

Table 4.2.1. Forage for hay or silage.

Soil Conditions and Desired Management	Crop[1]	Seeding Rate (lb./A)
Well-drained soils, early first cut, 3 to 4 cuttings	Alfalfa Alfalfa and timothy or bromegrass or orchardgrass or reed canarygrass	12–15 8–12 4–6 5–8 4–6 6–8
Moderately to well-drained soils, 2 to 3 cuttings	Alfalfa Alfalfa and timothy or bromegrass	12–15 8–12 4–6 5–8
Variable drainage with spots in field too wet for alfalfa, 2 to 3 cuttings	Alfalfa and birdsfoot trefoil and timothy or reed canarygrass	6 4 6 6–8
Poorly to well-drained soils, short-term hay, 1 to 2 years	Red clover and timothy	6–8 6
Moderately to well- drained soils, grasses, 3 to 4 cuttings	Timothy or orchardgrass or reed canarygrass	8 10 8–10

Coated Seed:

- Clay & glue possibly with rhizobia, fungicides, micro-nutrients, biological inoculants
- Makes tiny seeds easier to manage
- May flow faster than raw seed
- May be 1/3 heavier than raw seed
- Check bag for rhizobia expiration
- Calibrate the seeder
- Research results are mixed on its benefits

Fluffy Seed

- Mix with oats or phosphorus fertilizer to prevent bridging

Nurse-Crop Seedings

- + SAVE SOIL
- + DISPLACE WEEDS
- + PROVIDE STRAW
- -- <u>COMPETES WITH LEGUME</u>
- -- LESS HARVESED LEGUME IN SEEDING YEAR

- +- OATLAGE IS A COMPROIMISE

Erosion always takes the best soil. A nurse crop can hold the soil.

http://i41.photobucket.com/albums/e288/dbltree/AlfalfaandOats2.jpg

Oats seeded at a reduced rate is the typical nurse crop used to reduce weeds, control erosion, & provide more forage, but it may also compete with the hay crop and cause moisture stress.

Allow alfalfa to flower to at least 10% before harvesting the very first time. Grasses should be at 12 inches tall before the very first harvest. (Mow grasses at 4 inches.)

Ahh! The smell of fresh-cut hay!

Mission Statement

- Get one and write it down
- Its all about YOU – why you are in business based on your values
- Also describes the products/services of the business and their purpose.

Problem Diagnosis

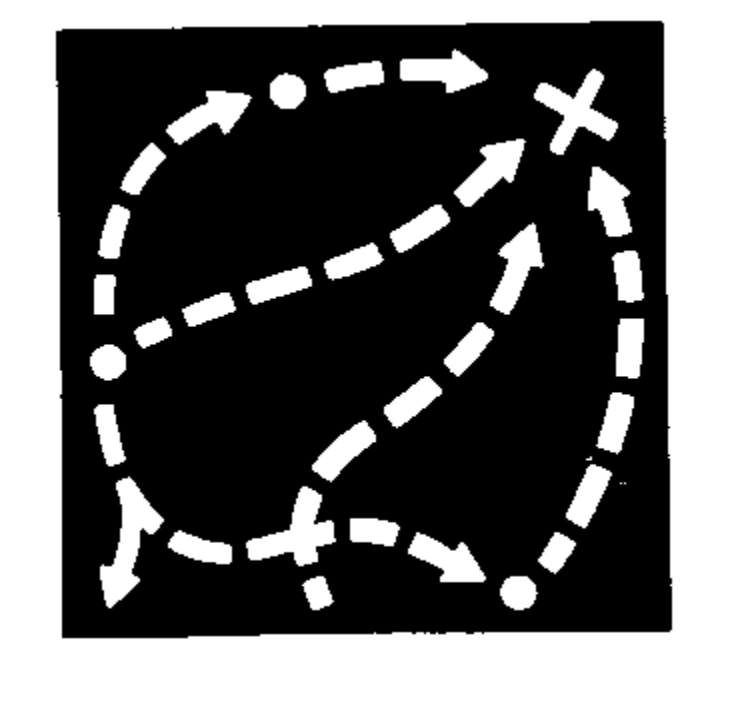
- **Determine the root cause of a problem**
  - **Technical reasons**
  - **Management reasons**

The root cause of a problem can always be traced to what a *person* did or did not do.

Tactical Planning

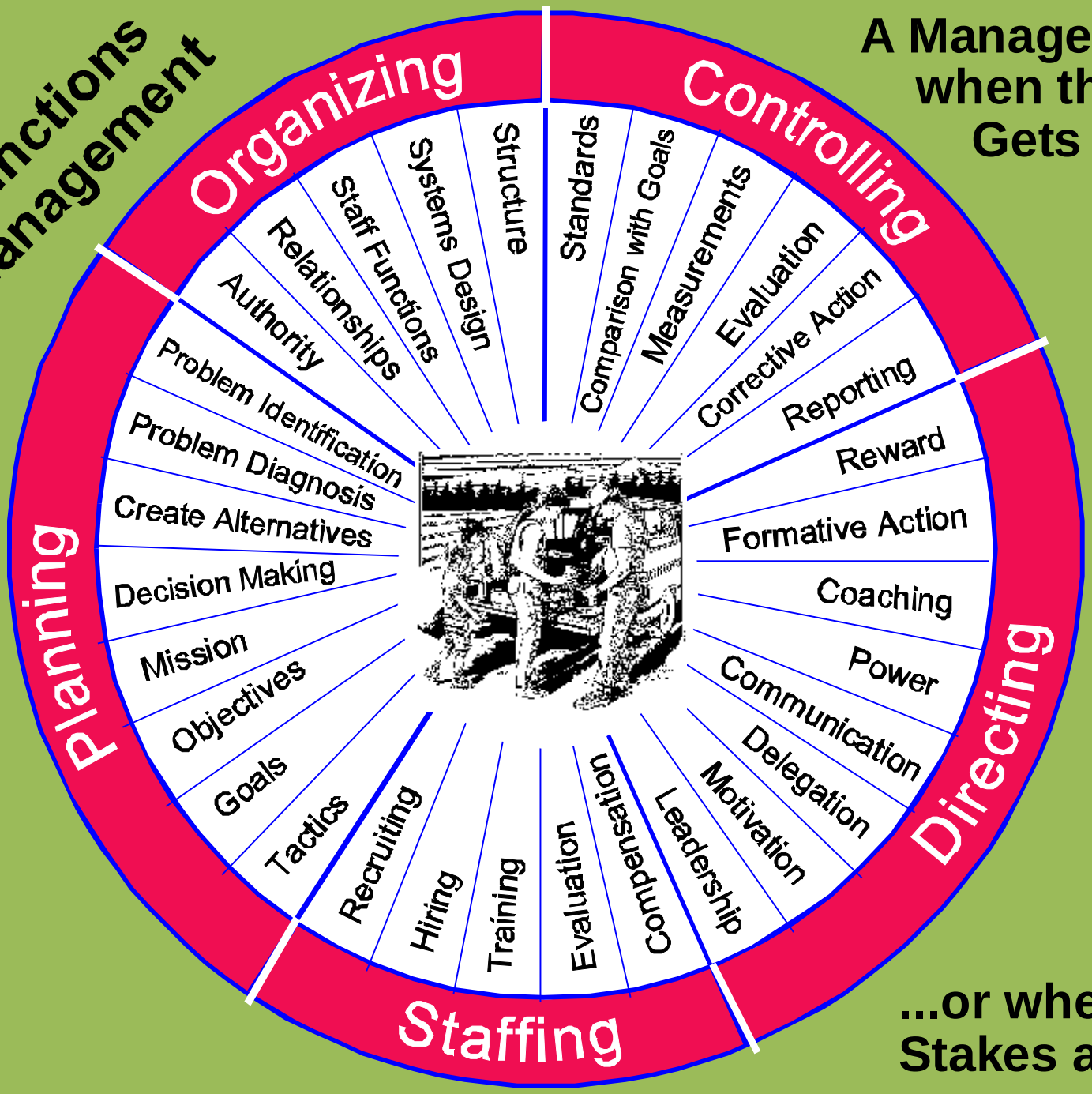
- Precise, individually itemized action plan.

- Who, What, Where, When, and How activity will take place to reach a goal



The Functions of Management

A Manager's Guide - when the Going Gets Rough...



...or when the Stakes are High