Hay, Baleage, and Forage Quality School
Aaron Gabriel, Cornell Cooperative Extension
March 2014

1. Improving a hay field
    A. Weed Management
    B. Frost-seeding
    C. No-till interseeding

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

Managing Weeds

Aaron Gabriel
Capital Area Agriculture & Horticulture Program

Images are from the University of Missouri Extension

What Type of Plant?

Broadleaf

Grass

Sedge

Summer Annual

Winter Annual

Perennial

Bienniel

Chickweed – winter annual

Ragweed - annual

Burdock, Queen Anne's Lace – biennial

Milkweed, Horsenettle – rhizomatous perennial

http://agron-www.agron.iastate.edu/~weeds/

http://www.ediblewildfood.com/

Univ. of Delaware

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

- **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.**

Types of Herbicides

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

- Residual (active in the soil for weeks/months/ year) or
- 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

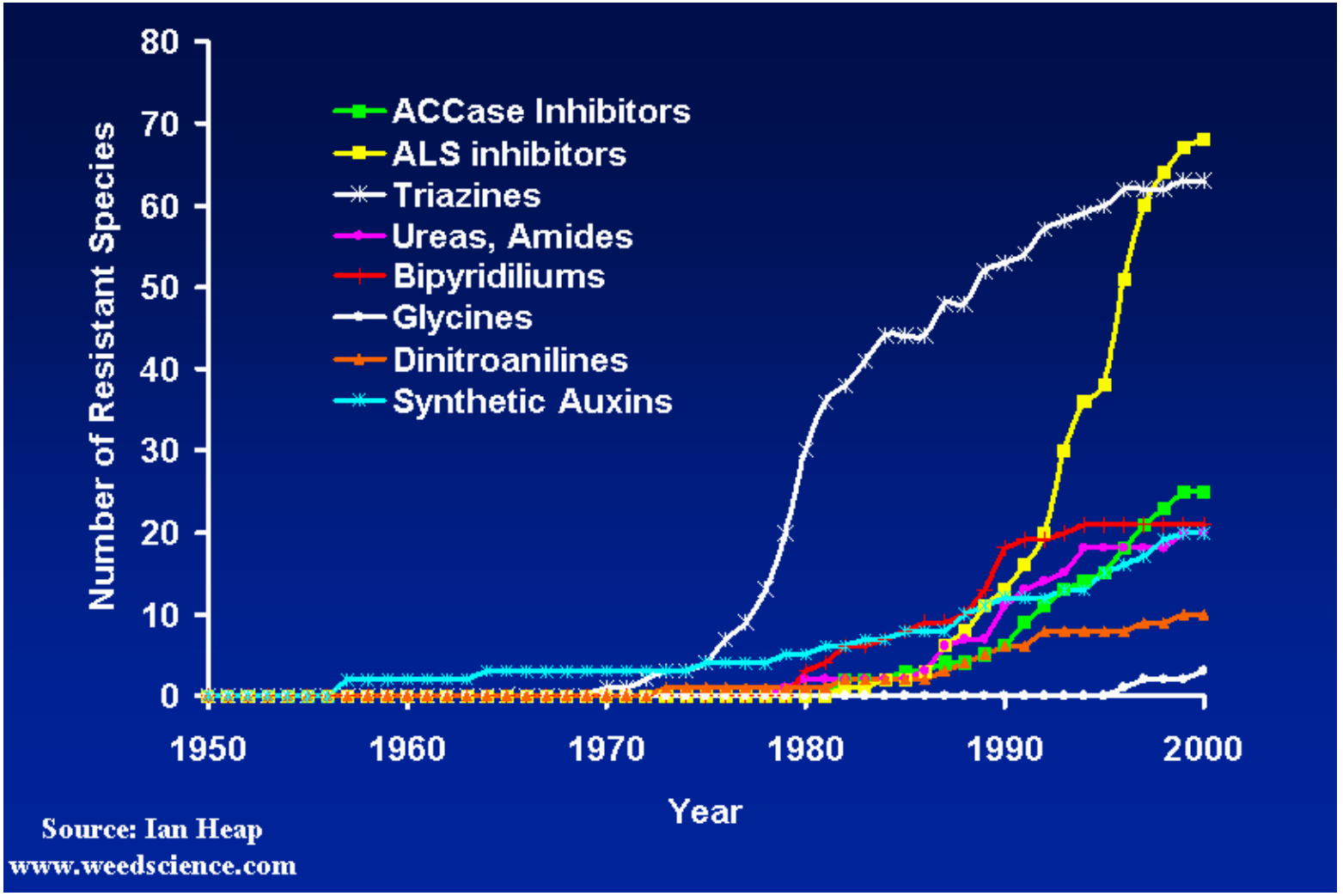
Cell membrane disruptors

Pigment inhibitors

SITE OF ACTION CLASSIFICATION

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

Resistance to Glyphosate is Possible…
But is Known to be a Rare



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

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.

Frost Seeding

Bare ground is needed & reduced plant competition for frost seeding.

Tillage improves seed establishment.

Broadcast

Aerway before seeding


No-till seeding into an existing stand – use a species with a vigoro
reduce the plant competition.

Starting a new hay field

1. Crop Rotations
2. Forage Species Selection
3. Tillage
4. Seeding Rates
5. Nurse Crops
6. 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.,

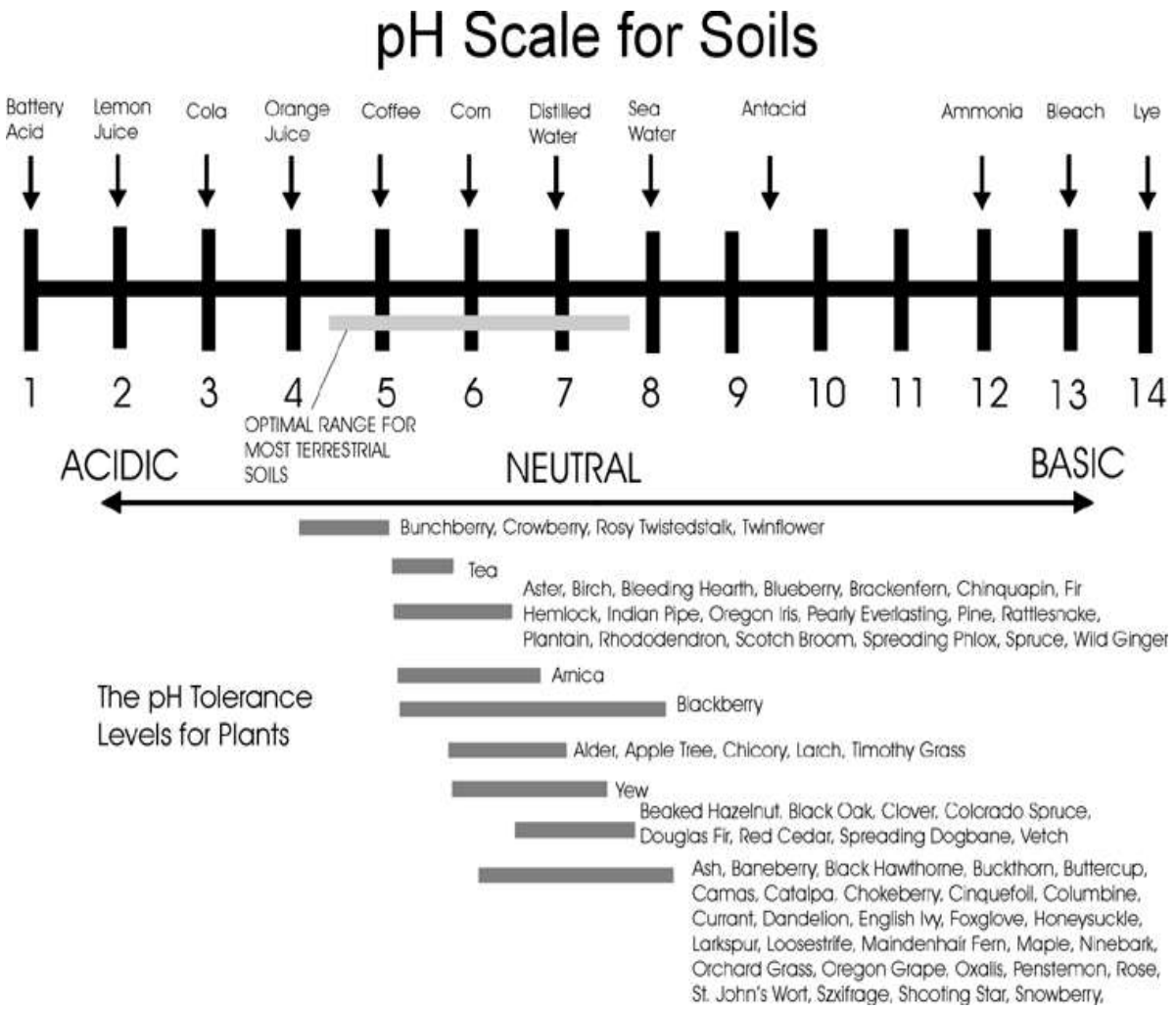
Spring Annuals: oats, spring grains, field pea, brassicas (radish/rape/swede), annual ryegrass

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

Alfalfa Autotoxicity

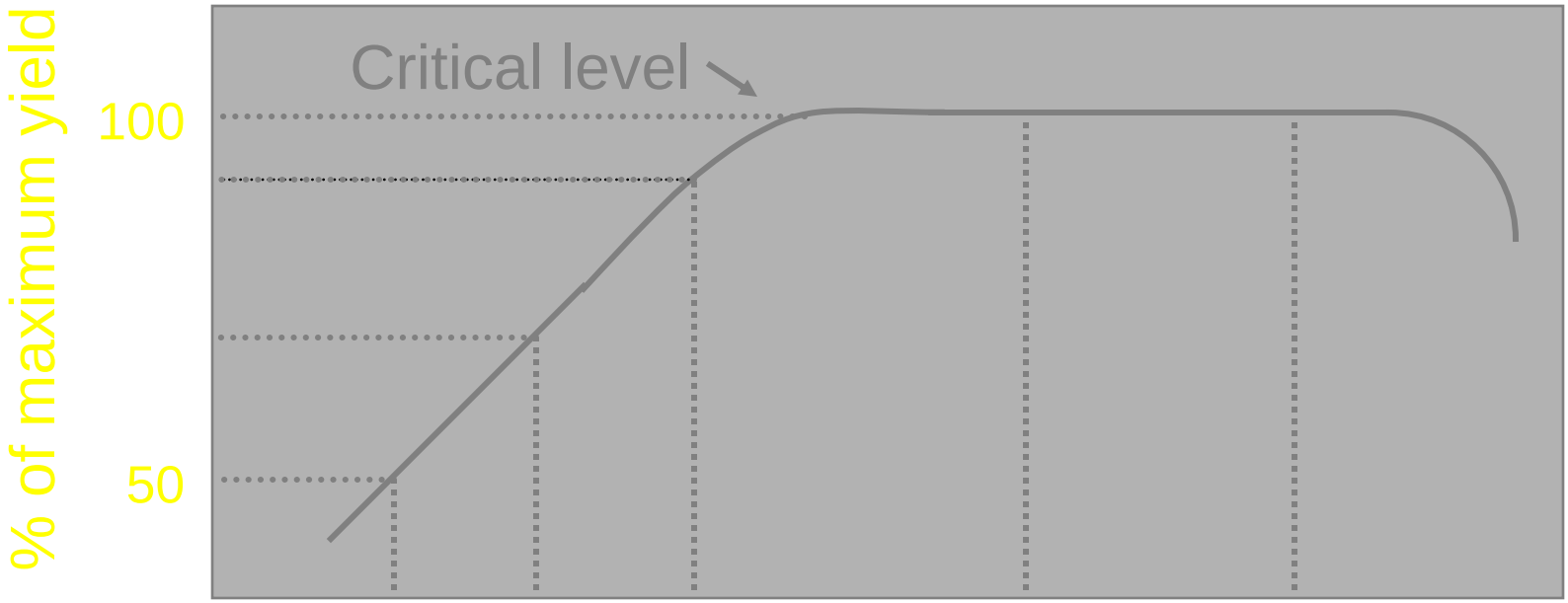
Herbicide residues from previous crops can cause herbicide injury in new plantings.

Plan Ahead - Lime requires 1 year to neutralize soil.



Soil Test Interpretation

Soil tests classifications indicate whether or not adding a nutrient is likely to result in a yield increase.



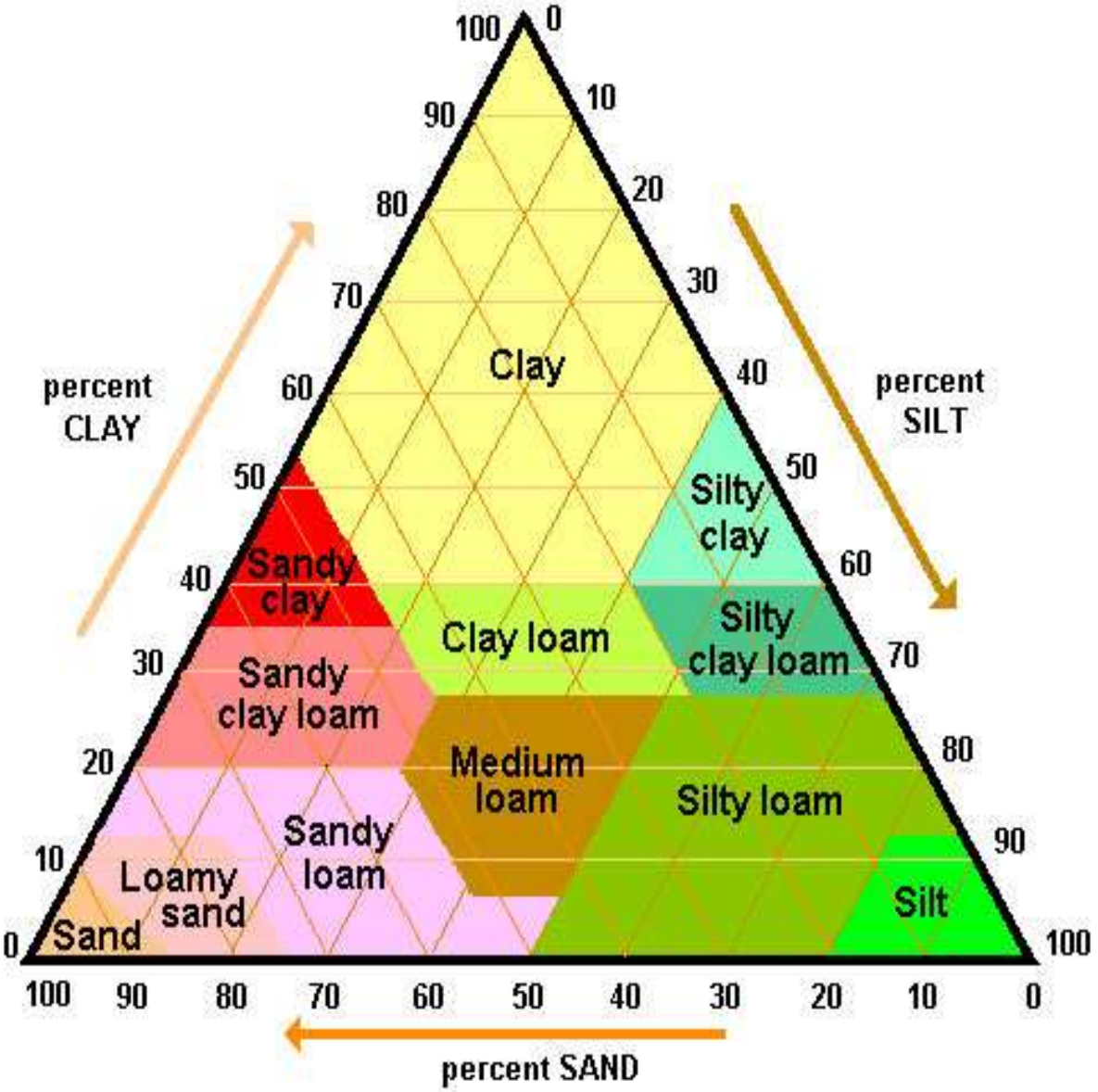
Soil test: Very low low medium/optimum high very high

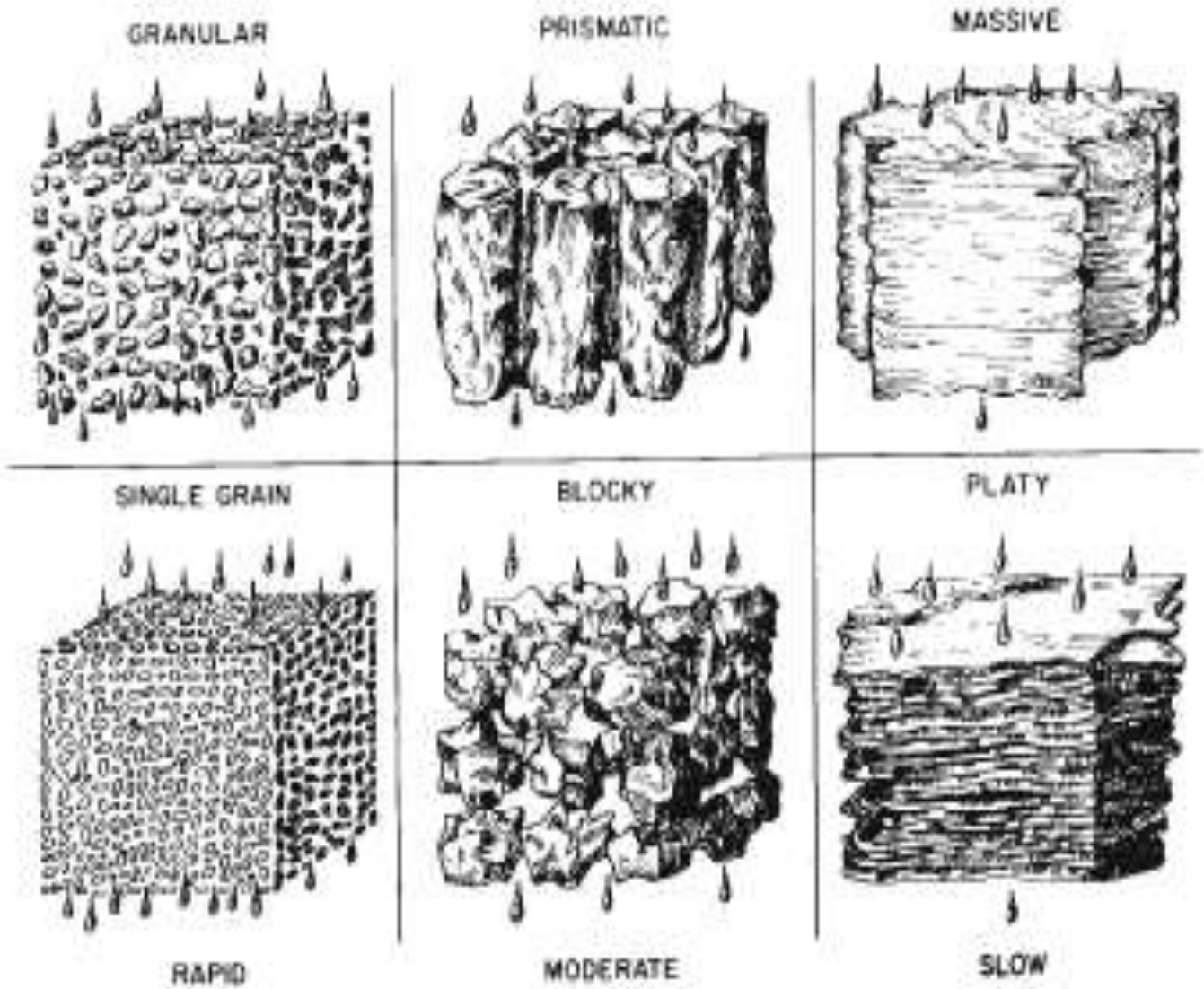
Fertilizer response likely. Response to fertilizer not likely.

Alfalfa – 0 lbs nitrogen at planting

Pure Grasses – 30 – 50 lbs nitrogen at planting

Select a forage adapted to the soil and climatic conditions.




GRANULAR
PRISMATIC
MASSIVE
SINGLE GRAIN
BLOCKY
PLATY
RAPID
MODERATE
SLOW

	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				

	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							

Tillage

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/m00183art03.jpg


JAVA FARM SUPPLY
SUNFLOWER

Primary Tillage

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


Great Plains

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	12–15
	Alfalfa and	8–12
	timothy or	4–6
	bromegrass or	5–8
	orchardgrass or	4–6
	reed canarygrass	6–8
Moderately to well-drained soils, 2 to 3 cuttings	Alfalfa	12–15
	Alfalfa and	8–12
	timothy or	4–6
	bromegrass	5–8
Variable drainage with spots in field too wet for alfalfa, 2 to 3 cuttings	Alfalfa and	6
	birdsfoot trefoil and	4
	timothy or	6
	reed canarygrass	6–8
Poorly to well-drained soils, short-term hay, 1 to 2 years	Red clover and	6–8
	timothy	6
Moderately to well- drained soils, grasses, 3 to 4 cuttings	Timothy or	8
	orchardgrass or	10
	reed canarygrass	8–10

COMPANION SEEDINGS

+ SAVE SOIL
+ DISPLACE WEEDS
+ PROVIDE STRAW
-- COMPETES WITH LEGUME
-- 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.