Weed Biology
Kristine Moncada

Module Outline

I. Weed Effects on Crops
II. Weed Biology
III. Cultural Weed Management
IV. Prevention

Weed Effects

- Reduce yields
  - Compete with crops for nutrients, light and moisture
- Interfere with harvest
- Reduce crop quality

Weed Effects on Yield

Crop	Weed species	% Yield loss – 1 weed per ft²
Corn	Wild buckwheat	10
Corn	Wild mustard	18
Corn	Common ragweed	21
Soybean	Green foxtail	8
Soybean	Lambsquarters	25
Soybean	Eastern black nightshade	40

Source: Moncada & Huerd, 2010

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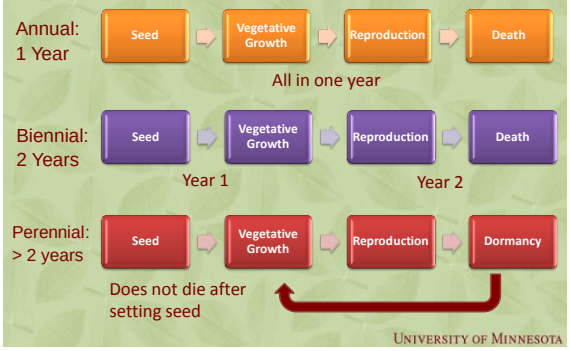
Weed Biology

A. Weed life cycles
B. Weed reproduction
C. Weed emergence

Weed Life Cycles



Annual Weeds

Foxtail

- Completes its life cycle in one season
- Produce many seeds
- Examples velvet leaf, pigweeds, waterhemp, lambsquarters, foxtails

Waterhemp

Velvetleaf

Lambsquarters

Biennial Weeds

- Completes life cycle over two growing seasons
- 1st year as rosette, 2nd year flowering
- Examples are musk thistle, burdock and mullein

Burdock flowers

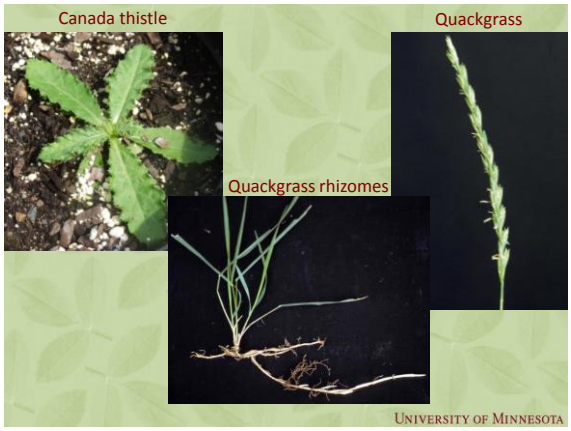
Musk thistle and burdock rosettes

Plumeless thistle flower in 2nd year

Perennial Weeds

Canada thistle in winter wheat

- Can live for years
- Spread not just by seed, but vegetatively through rhizomes and other specialized structures
- Examples: Canada thistle, quackgrass



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Weed Biology

A. Weed life cycles
B. Weed reproduction
C. Weed emergence

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Weed Seed Production

- Weeds produce large amounts of seed
- Seed remains in soil until conditions are right for germination

Weed species	Seeds/plant
Redroot pigweed	117,400
Lambsquarters	72,500
Giant ragweed	10,300
Velvetleaf	7,800
Yellow foxtail	6,500

Source: Renner, 2000

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Weed Seed Banks

Weed species	Number of years
Quackgrass	1-6
Wild oat	4-7
Cocklebur	16
Foxtail	20
Canada thistle	21
Lambsquarters	40
Redroot pigweed	40
Velvetleaf	40

Source: Ross and Lembi, 1999

- The viable weed seeds present in the soil
- One strategy to reduce the weed seed bank is by not allowing weeds to set seed

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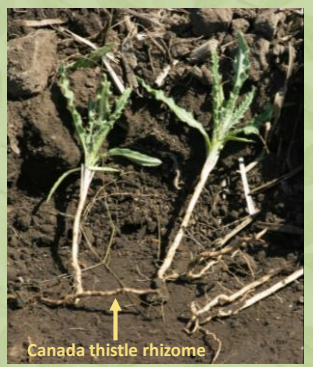
Rhizomes

- Underground stem that produces roots and shoots
- Can generate new plants
- Avoid spreading of rhizomes



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Weed Biology

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Weed Emergence – General

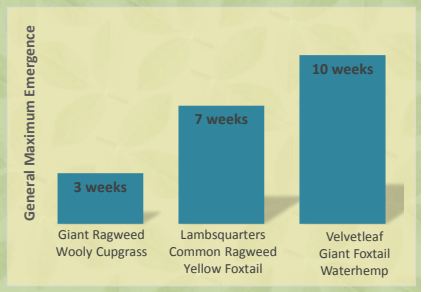
- Depends on soil conditions
  - Temperature
  - Moisture
  - Field operations
- Varies by weed species

Time of Emergence – Species

April		May		June	
Early to Mid	Mid to Late	Early to Mid	Mid to Late	Early to Mid	Mid to Late
Wild Mustard	Lambs-quarters	Common Ragweed	Foxtails	Black nightshade	Crabgrass
Kochia	Giant Ragweed	Wooly cupgrass	Redroot pigweed	Water-hemp	Jimson-weed
		Velvetleaf	Cocklebur		

Duration of Emergence

Some weeds have a short window of emergence, others emerge over a longer time span



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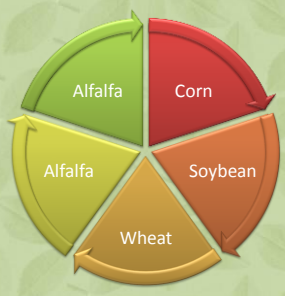
Cultural Weed Management

- Managing production practices to control weeds
- Examples include:
  - Rotation
  - Crop variety selection
  - Delayed planting
  - Planting rate
  - Prevention

Rotation

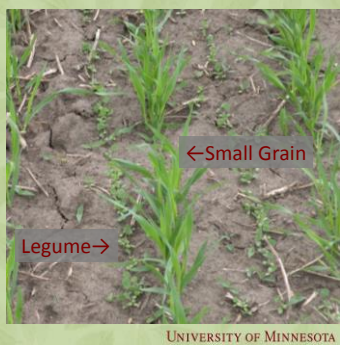


5-year Rotation

- Diversifying rotation = strongest tool
- Include:
  - Perennials such as alfalfa
  - Small grains
  - Cover crops

Benefits of Small Grains

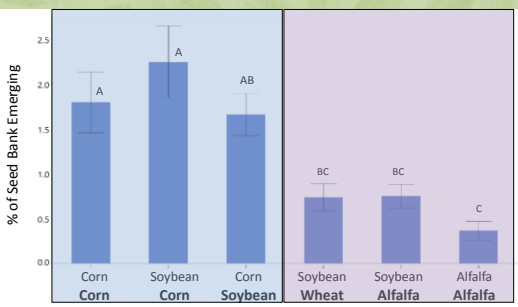
- Early competitive growth suppresses early weeds
- Can be underseeded with red clover for even more weed control



Benefits of Alfalfa

- Weeds are suppressed by continuous cover
- Repeated mowing:
  - Depletes energy reserves of weeds
  - Can prevent them from setting seed

Weed Seed Emergence in Rotations



Unpublished data, Jared Goplen, 2015

Winter Cover Crops in Rotations

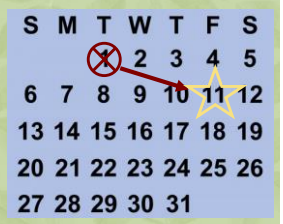
- Inhibit fall and early spring germinating weeds
- Residue can have some short-term allelopathic (impedes germination) effects on weeds

Crop Variety Selection

- Crop varieties vary in their competitiveness
- Some have:
  - Faster emergence
  - Greater growth rate
  - More rapid canopy closure
  - Better tolerance to weeds

Delayed Planting

- Allows for more weeds to germinate to be controlled with mechanical weed control
- Can benefit corn and soybean production
- Crop seed emerges faster
- Drawback can be reduced yields



Delayed Planting

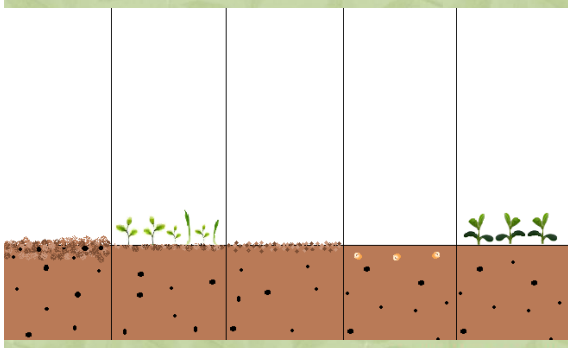
Lambsquarters

NOTE: This strategy is effective on early-emerging weeds and not on later-emerging ones or ones with prolonged emergence times

False Seedbed

- "Fools" weeds into germinating
- Operations prior to crop planting
- 1st tillage operation leads to weed flush
- 2nd tillage kills weed flush
- Crop is immediately planted

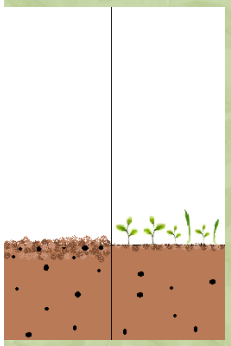
False Seedbed Steps



False Seedbed Steps

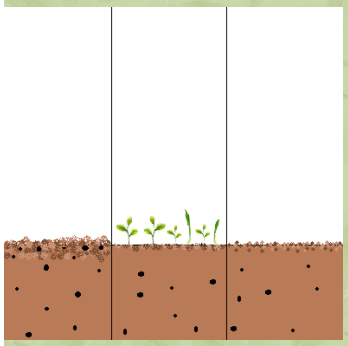
Step 1
- 1st tillage
- 3-4" deep
- Soil temp 60-65 late afternoon to minimize compaction
- Late April for MN

False Seedbed Steps



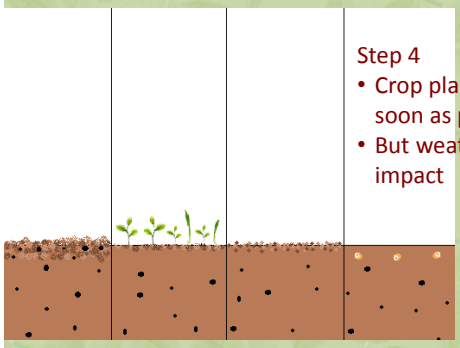
Step 2
- Wait for weed flush
- About 3 weeks time to grow to mid May

False Seedbed Steps



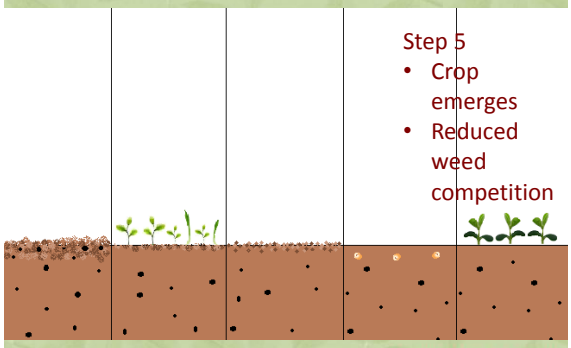
Step 3
- 2nd tillage
- 2-3" more shallow than first tillage operation
- Weeds killed

False Seedbed Steps



Step 4
- Crop planted as soon as possible
- But weather can impact

False Seedbed Steps

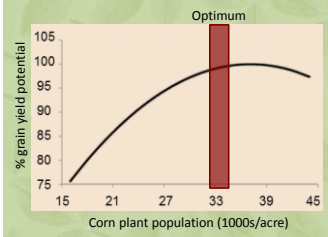


Step 5
- Crop emerges
- Reduced weed competition

False Seedbed Tips

- Best when soil is warm for germination
- Shallow operations are more effective to not bring new weed seeds to the surface
- Crop will need to be planted immediately after last operation

Planting Rate



Source: Coulter, 2009

- Planting at the optimum rate will increase crop competitiveness
- Higher planting rates can compensate for stand losses due to mechanical weed control

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Prevention

- Plant weed-free seed
- Don't allow weeds to go to seed
- Manage weeds in ditches, buffers and CRP land
- Be aggressive about new weeds

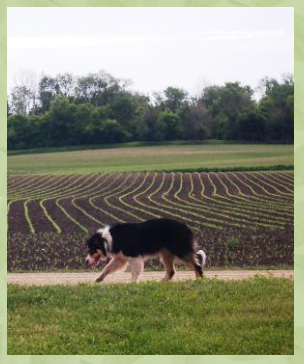
Mowed buffer

Weeds in Manure

- Weed risks in manure will depend on manure storage, livestock species, feed type and weed species
- Be careful where you apply potentially weedy manure!

Scouting

- Detection of weeds is critical
- Note which weed species are prevalent
- Note patterns in weed emergence
- Keep weed maps and records on operation effectiveness



Scouting Schedule

Early Spring

Early Summer

Early Fall

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Funding

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Thanks!