Basic principles of weed management

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What is a weed?

- A plant out of place or growing where it is not wanted
- An obnoxious plant
- A plant that is objectionable or interferes with activities and welfare of humans
- etc

Definitions of a ‘weed’ are based on our perceptions of the impact of the plant

Weed classification

Type of plant

Grasses

- One cotyledon
- Leaves narrow, parallel veins, arranged in sets of two
- Stems rounded or flattened

Sedges

- One cotyledon
- Leaves narrow, parallel veins, arranged in sets of three
- Stems triangular in cross section

Broadleaves

- Two cotyledons
- Leaves wide
- Veins branch out in different directions

Weed classification

Life history

Annuals

Completes life cycle in one year

Biennials

Lives more than one but not two years

Perennials

Persist over several years
Short- to long-lived

Harmful aspects of weeds

- Compete with the crop for light, moisture and nutrients
- Reduce crop yield and quality
- Increase crop production and processing costs
- Serve as hosts for disease and insect pests
- Decrease land value and crop choice
- Human hazards and aesthetically unpleasing
- Impede water flow along waterways, canals and ditches

Weed management

- Weed management is a combination of
  - Prevention
  - Eradication
  - Control

Weed prevention

- Stopping weed species from contaminating an area
- Most difficult component, but potentially the most effective
- Accomplished by
  - Preventing new weed seeds into fields in contaminated seed cane, rotational crop seeds, and machinery
  - Preventing weeds from going to seed
  - Preventing vegetative reproduction of perennial weeds
  - **Scouting for new infestations**
  - Spot treatments to prevent patch expansion and large infestations
  - **Education about weeds** (especially **weed identification**)

3.5-inch common lambsquarters producing seed

- **30,000 to 172,000 seeds/plant**
- **7- to 12-year seed longevity**

Spiny amaranth producing seed prior to cultivation

Weed eradication

- Complete elimination of all living plants including their vegetative propagules and seeds
- Persistent roots and seeds are more difficult to eliminate
- More difficult than prevention and control
- Eradication efforts have rarely been successful
- Justified only for the elimination of serious weeds in a limited area
  - Perennial weed in a small area of a field

Napiergrass in a sugarcane field

Weed control

- **Reactive process**
- Limiting weed infestations and minimizing weed competition
  - **Goal**: ensure minimal effect of weeds on crop growth and yield
- Degree of control is a matter of **economics**, balance between **cost of control** and **crop yield loss**
- Methods of weed control
  - Mechanical/physical
  - Cultural
  - Chemical

Mechanical weed control

- Machine tillage
  - Weed control
  - Seedbed preparation
  - Burying crop residue

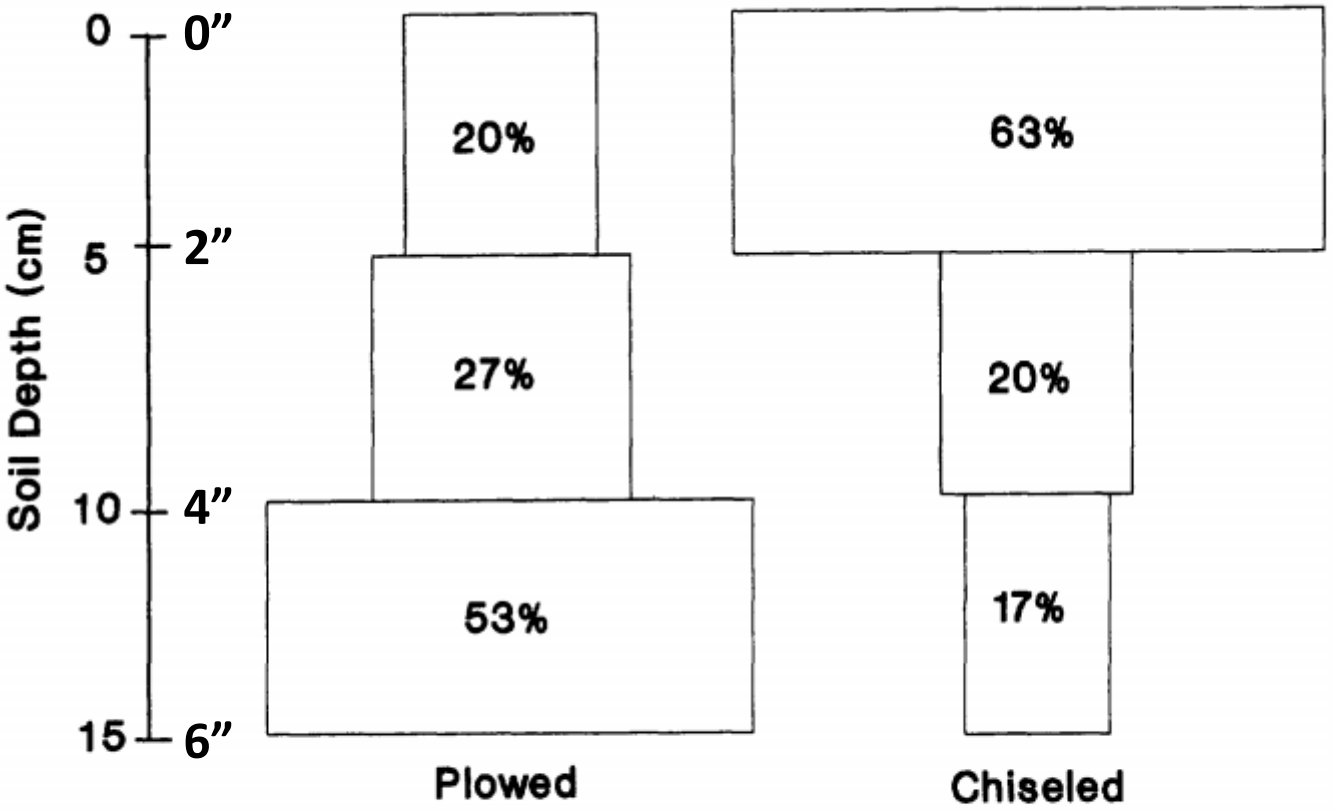
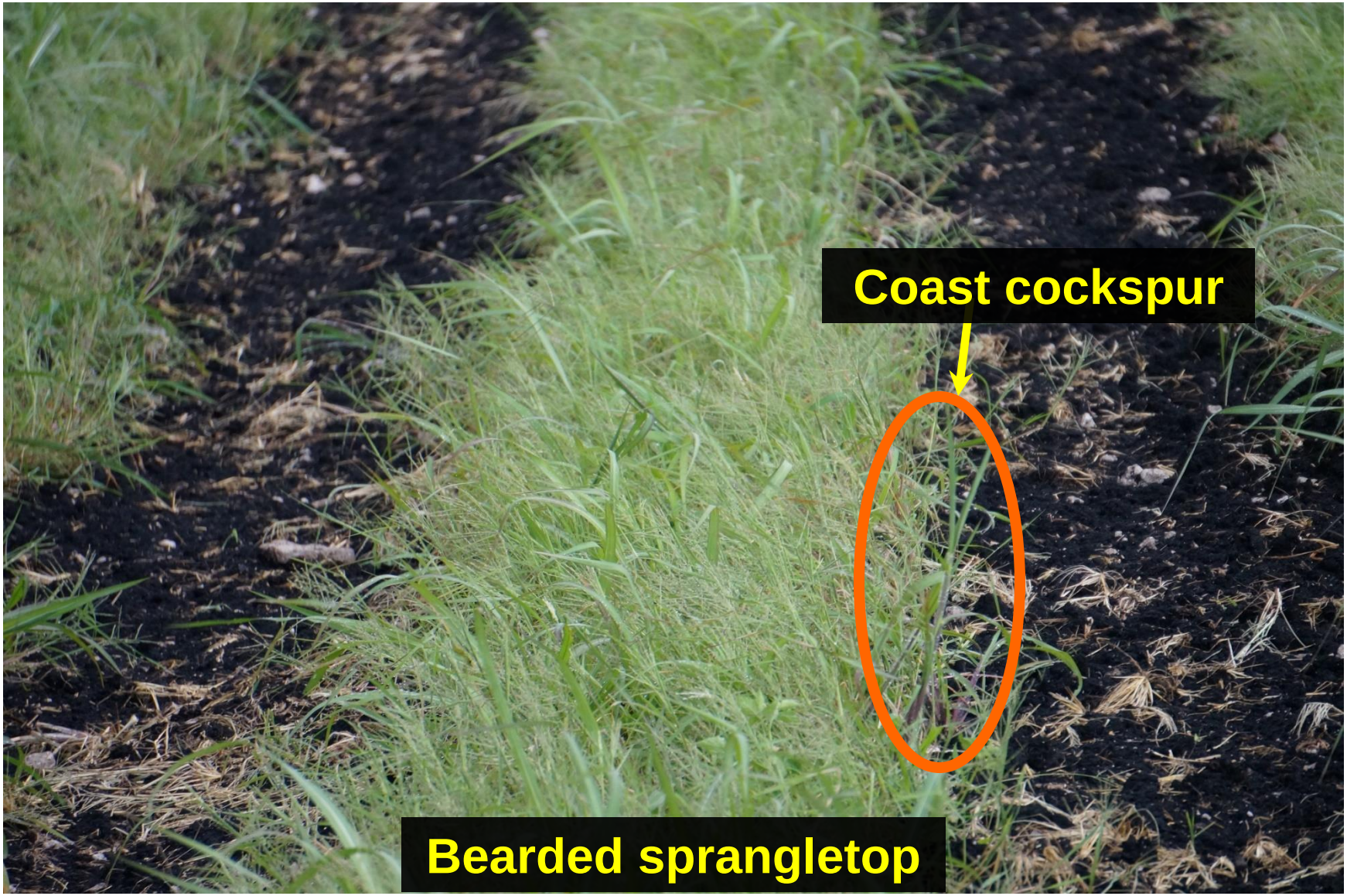


Figure 1. Influence of primary tillage on vertical distribution of total weed seed to a 15-cm depth in the soil after a dry bean crop (1). LSD (0.01) for plow NS and for chisel 34.5%.

D. A. Ball (1992). Weed Science 40:654-659

Mechanical weed control

- Flooding
  - Selective weed control in rice
  - Potentially impacts weed seed viability in flooded fallow fields
  - Can be risky because it may encourage semi-aquatic weed species such as sprangletop, coast cockspur


Coast cockspur
Bearded sprangletop

Physical control

- Mulching
  - Controls weeds by excluding light
  - Green harvested cane mulch
    - Shift to large-seeded weeds such as vines

Cultural weed control

- Usually refers to habitat management
  - Manipulation of the crop-weed relationship in favor of the crop at the expense of the weed
- Describes practices not specifically for weed control that can reduce impacts of weeds

Cultural weed control

- Crop rotation
  - Allows for breaking of life cycles
  - Allows for rotation of herbicides and other weed control programs

Cultural weed control

- Weed-free seed cane
- Crop population/stand

Cultural weed control

- Fertilizer placement
  - Placing the fertilizer where the crop**,** but not weeds, has access allows the crop to be more competitive **- banding**

- Selection of cultivars that have quick canopy closure

Chemical weed control

Preemergence herbicides

- *S*-metolachlor + Atrazine + Mesotrione (Lumax EZ)
- Atrazine (several)
- Metribuzin (Sencor, Tricor)
- Mesotrione (Callisto)
- Pendimethalin (Prowl H_2O)
- Clomazone (Command)

Postemergence herbicides

- *S*-metolachlor + Atrazine + Mesotrione (Lumax EZ)
- 2,4-D amine (several)
- Dicamba (Clarity, Banvel)
- Ametryn (Evik)
- Atrazine (several)
- Metribuzin (Sencor, Tricor)
- Mesotrione (Callisto)
- Topramezone (Armezon)
- Asulam (Asulox)
- Halosulfuron (Sandea)
- Halosulfuron + Dicamba (Yukon)
- Trifloxysulfuron (Envoke)

Remember for chemical weed control

- Do it right
  - Proper herbicide(s)
  - Proper herbicide rate(s)
  - Proper placement of material
  - Proper time of application
  - Proper manner of application
- **READ THE HERBICIDE LABEL, IT'S THE LAW**

Integrated Weed Management (IWM)

- Development of a weed management program using a combination of preventive, cultural, mechanical, and chemical practices
- Applying the principles of IWM
  - Minimize overall economic impact of weeds
  - Reduce environmental impacts of herbicides
  - Provide optimum economic returns
- Development of IWM program is based on a few general rules that can be used on any field

1. Prevent weeds before they start

- Best method of weed control is to keep weeds out of the field
  - Field sanitation
  - Control of volunteer weeds
  - Planting clean seed cane or certified rotational crop seed
  - Cleaning field equipment

2. Help the crop compete against weeds

- Several things can be done to give the crop an advantage over weeds
  - Fertilizer placement
  - Competitive crop varieties

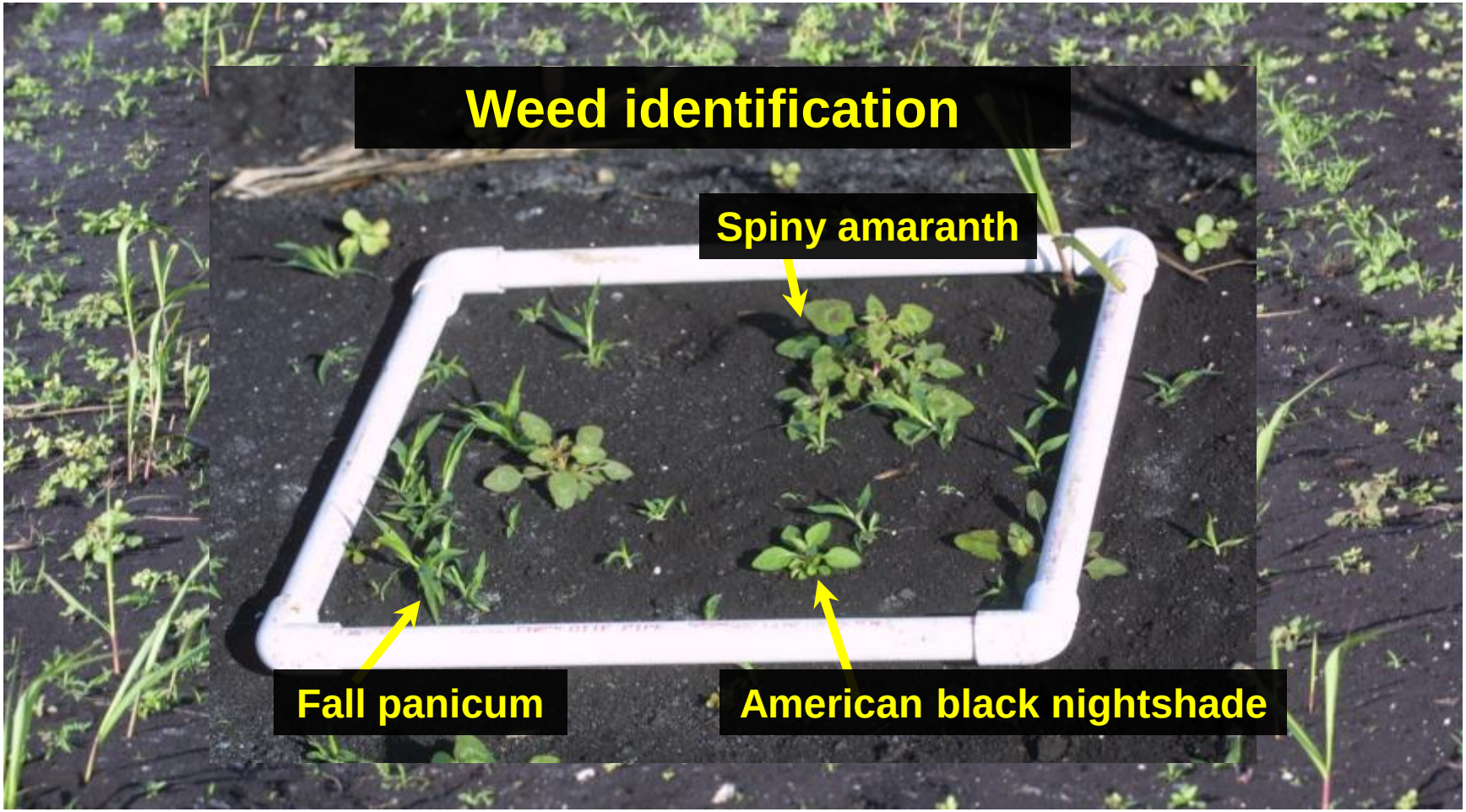
3. Keep weeds off balance

- Don’t give weeds a chance to adopt
  - Crop rotation

4. Making a control decision

- **Scout** your field to assess the type and number of weeds to help determine adequate spray operation and any other control measure
- Economic threshold – level of weed infestation at which the cost of weed control equals the increased return on the crop yield
- Consider the cost of delaying weed control

What constitutes an effective weed management program?



What constitutes an effective weed management program?

- Identify the weed(s)
- Select proper control measure(s)
- Use an integrated approach (use multiple tools)
- Implement the program
- Document and keep records
  - Field history
  - Cropping practices

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