Establishment and Maintenance Of Buffers in Organic Systems

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OREGON TILTH

THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

NRCS Natural Resources Conservation Service

Photo: Carmelita Nelson

Presentation Outline

- Organic Overview
- Organic Standards
- Buffers in Organic Systems
- Installation Overview
- Maintenance Overview
- Payment Schedule Considerations

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NRCS Natural Resources Conservation Service

Photo: Carmelita Nelson

Organic Defined:

- Positive definition: 'A production system that is managed . . . by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity' *(7 CFR 205.2)*

"…maintain or improve soil and water quality…"

- Negative definition: Food produced and handled without synthetic substances (with specific, limited, well-defined exceptions), and excludes genetically modified organisms, sewage sludge, and irradiation *(7 CFR 205.105)*

-- Organic Food Production Act, 1990

Organic Production Standards

- Organic System Plan (OSP)
- Land requirements
- Soil fertility and nutrient management
- Seeds and planting stock
- Crop rotation
- Crop pest, weed, and disease management
- Livestock
- Biodiversity

Reminder: Not NRCS planner's responsibility that producer complies with NOP

Organic System Plan

- Description of practices performed, including frequency which they are performed.
- List of each substance to be used as a production or handling input, indicating its composition, source, & location it will be used.
- Description of the monitoring practices and procedures to be performed and maintained, to verify the plan is effectively implemented.
- Description of the record keeping system implemented to comply with the requirements
- Description of the management practices and physical barriers established to prevent commingling and contamination.

Farm Map	
8) Please attach a current map of your farm. The Map layout MUST INCLUDE:	☐ Attached
☐ Adjoining land uses ☐ Location, description, size of buffer zones ☐ Your field I.D. or numbering system ☐ Indication of north ☐ Location of buildings and other useful landmarks (e.g. streams, distinctive features, roads, etc.)	

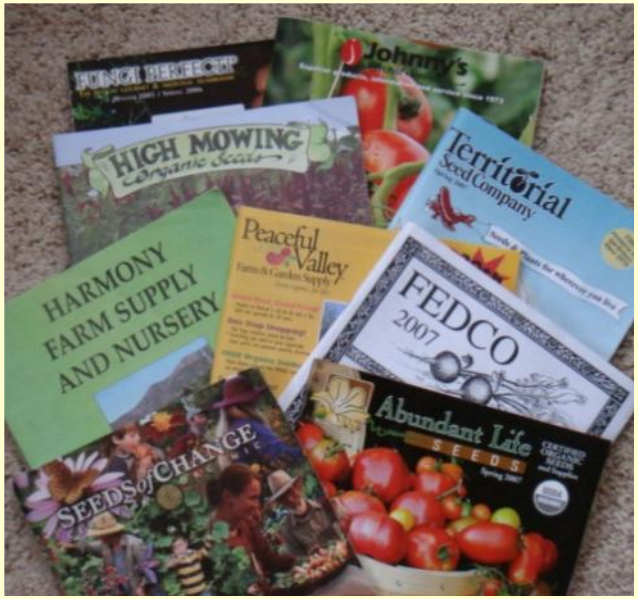
Land Requirement

Land used for organic production must be free from prohibited materials for 3 yr before organic harvest.

Transition effect: 3 years for certification, more years for biological shift and improved economic performance

Organic Farming Overview

- Must use organic seeds and planting stock when commercially available
  - Commercial availability: The ability to obtain a production input in an appropriate form, quality, and quantity …
- Non-organic seed cannot be treated with prohibited substance or GMO
- Non-organic planting stock must be managed organic for 1 year prior to sale as organic
- Must use organic annual seedlings an emergency



NOP Approved Materials

- Basically, synthetic materials cannot be used unless they are specifically approved, and natural materials can be used unless they are specifically prohibited.
- Third party sources that review materials for compliance with the NOP regulation:
  - OMRI, Organic Materials Review Institute

    http://www.omri.org/home
  - WSDA Materials List

    http://agr.wa.gov/foodanimal/organic/materialslists.aspx

§ 205.202 NOP Buffer Requirement

Any field or farm parcel from which harvested crops are intended to be sold, labeled, or represented as "organic," must:

(c) Have distinct, defined boundaries and buffer zones, such as runoff diversions, to prevent the unintended application of a prohibited substance to the crop or contact with a prohibited substance applied to adjoining land that is not under organic management.

USDA ORGANIC

§ 205.202 NOP Buffer Definition

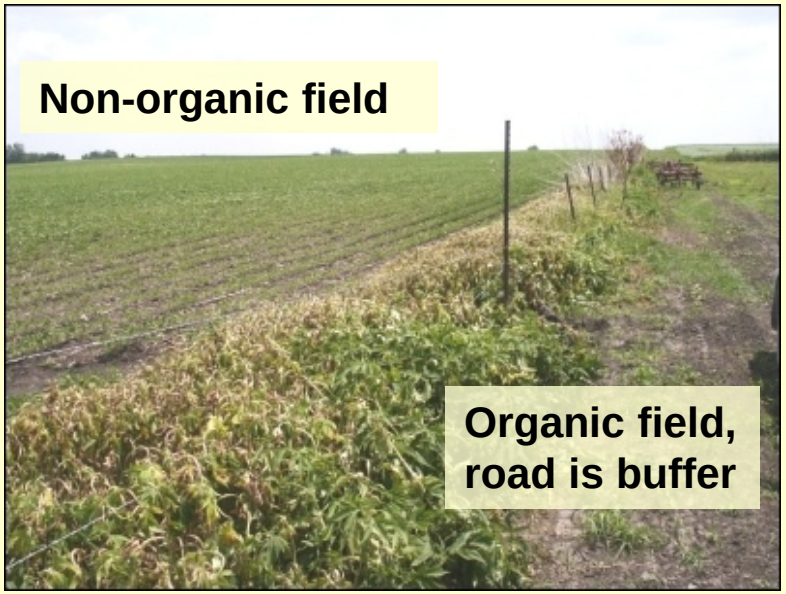
Buffer zone. An area located between a certified production operation or portion of a production operation and an adjacent land area that is not maintained under organic management. A buffer zone must be sufficient in size or other features (e.g., windbreaks or a diversion ditch) to prevent the possibility of unintended contact by prohibited substances applied to adjacent land areas with an area that is part of a certified operation.

Howell Hedgerow separating Sauvie Island Organics (right) from Metro's conventionally managed prairie (left)

Role of Buffers in Organic Systems

Common size: 25-30 feet
Common buffers: Roads, grass, hay, trees, hedgerow

Size of the buffer is directly related to the risk posed by use of prohibited substances on neighboring lands



Photos courtesy of MOSES
www.mosesorganic.org

Role of Buffers in Organic Systems:

- Prevent contamination from adjacent pesticide use
- Biodiversity
- Provide habitat for beneficial insect (pollination and pest management)
  - Preventative practices are required

Biodiversity

Organic Production (definition): 'A production system that is managed . . . by integrating …practices that …promote ecological balance, and conserve biodiversity' (7 CFR 205.2)

- **5 year study by Oxford University, British Trust for Ornithology & the Center for Ecology and Hydrology**
- **180 farms across England**

Organic Farms have:

- **85% more plants**
- **33% more bats**
- **17% more spiders**
- **5% more birds**

Key reasons:

- **Exclusion of synthetic pesticides and fertilizers**
- **Organic had smaller fields, more grasses & hedges that are taller, thicker and on average 71% longer**

Photo credit: Gardens of Eagen

Types of natural enemies associated with habitat conservation:

Predators of insect pests

Parasitoid wasps and flies

The Xerces Society
for Invertebrate Conservation

Wide Diversity of Pollinators





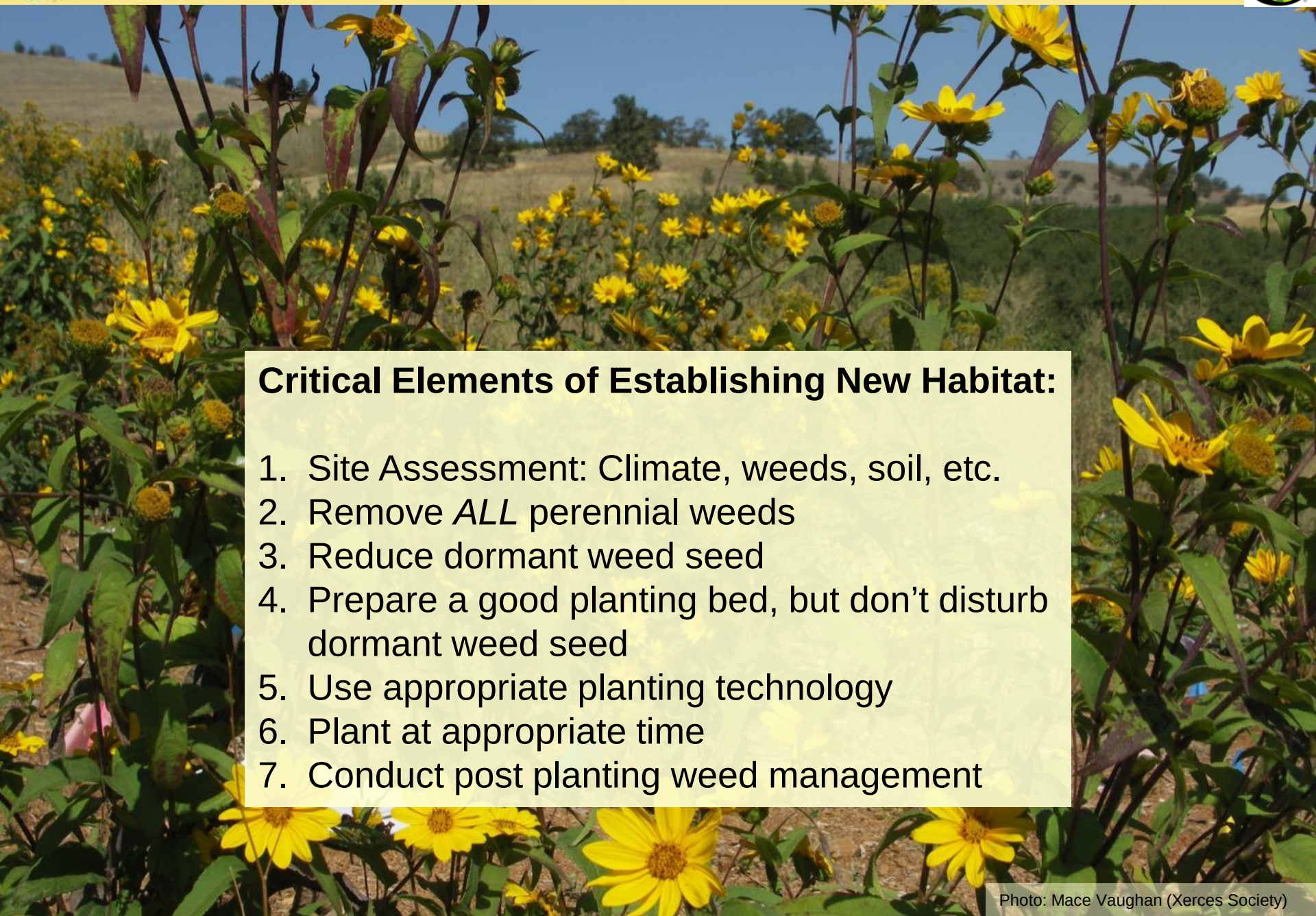

Photos: Mace Vaughan, Bob Hammond, David Inouye, Bruce Newhouse

Wide Diversity of Pollinators: Bees

Wide Diversity of Pollinators: Honey Bee

Photo: Rollin Coville

Establishing New Habitat: Keys to Success



Critical Elements of Establishing New Habitat:

1. Site Assessment: Climate, weeds, soil, etc.
2. Remove *ALL* perennial weeds
3. Reduce dormant weed seed
4. Prepare a good planting bed, but don't disturb dormant weed seed
5. Use appropriate planting technology
6. Plant at appropriate time
7. Conduct post planting weed management

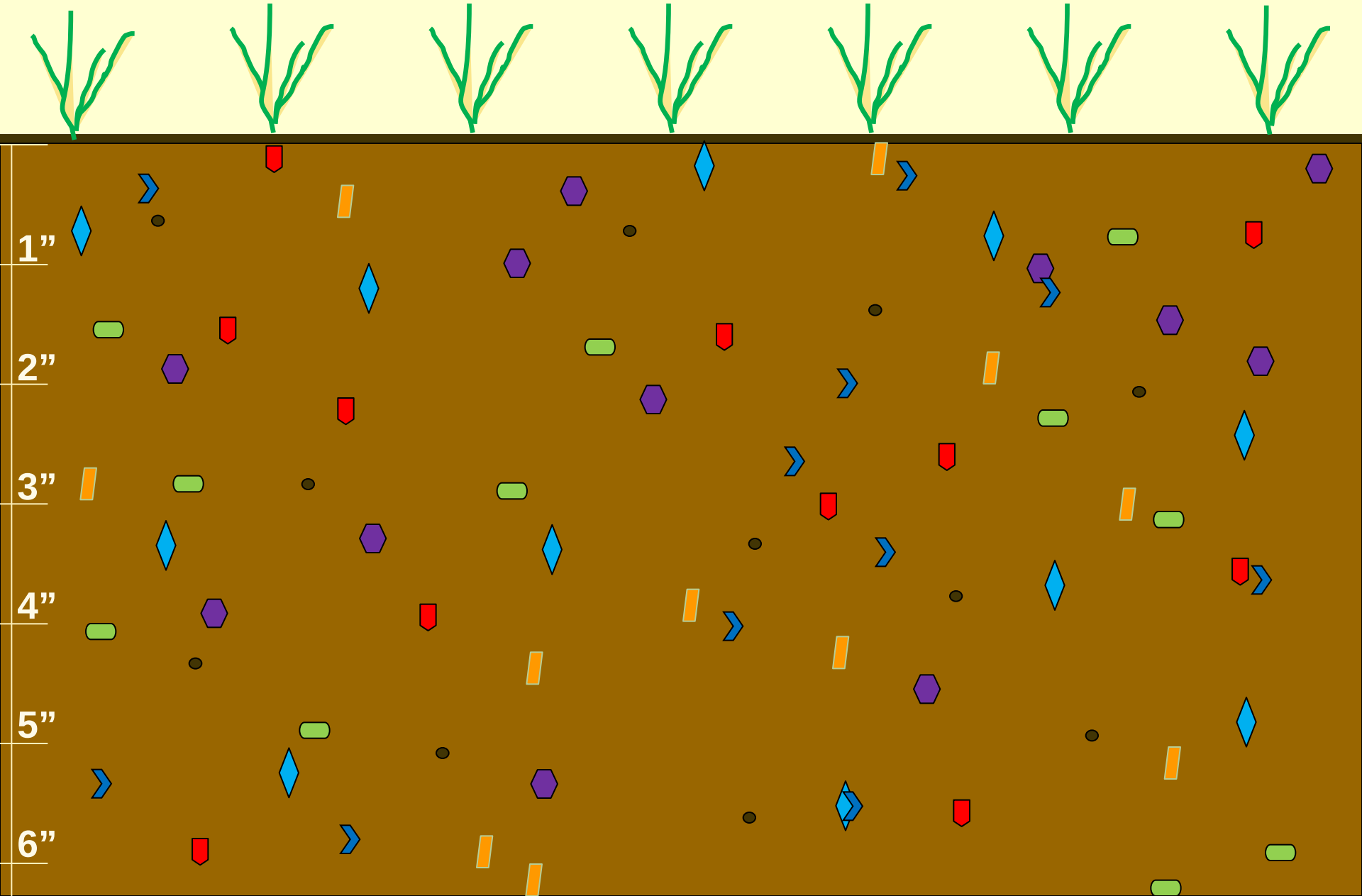
Photo: Mace Vaughan (Xerces Society)

The Basic Buffer Establishment Process*

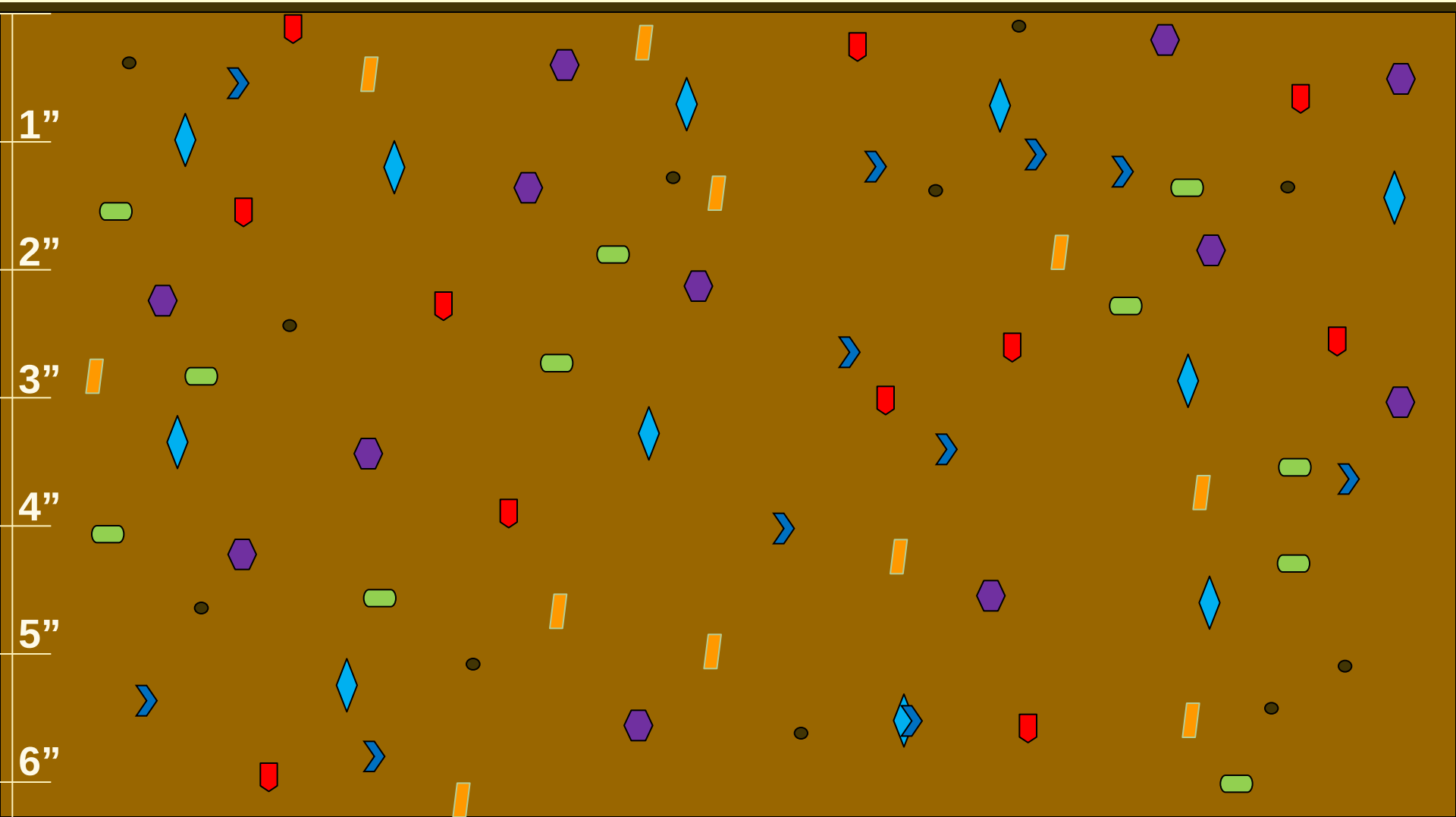
	Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 1	Perennial and Annual Weed Abatement												
	Seed Bed Creation												
	Dormant Fall Seeding												
Year 2	Annual Weed Control (mowing)												
	Spot Treatment of Perennial Weeds												
Year 3	Biennial Weed Control (selective mowing)												
	Spot Treatment of Perennial Weeds												
Ongoing	Spot Treatment of Perennial Weeds												
	Mowing or Burning for Woody Plant Control												

*Exact task dates vary depending on region (e.g. CA or FL may require earlier annual weed control).

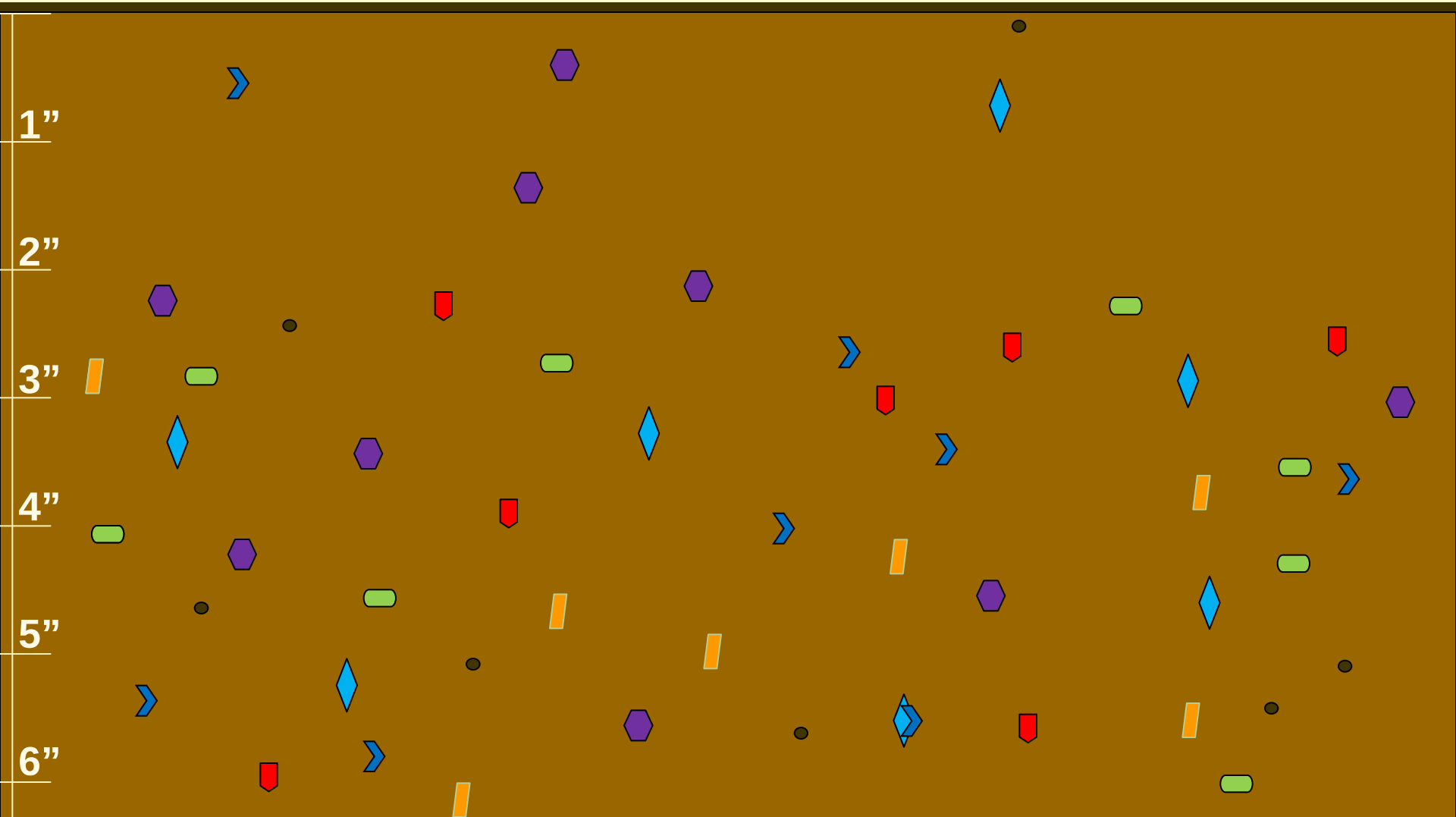
Establishing New Habitat: Keys to Success



Eliminate woody plants and perennial weeds and create a nice bed



Significantly reduce weed seed in top inch of soil



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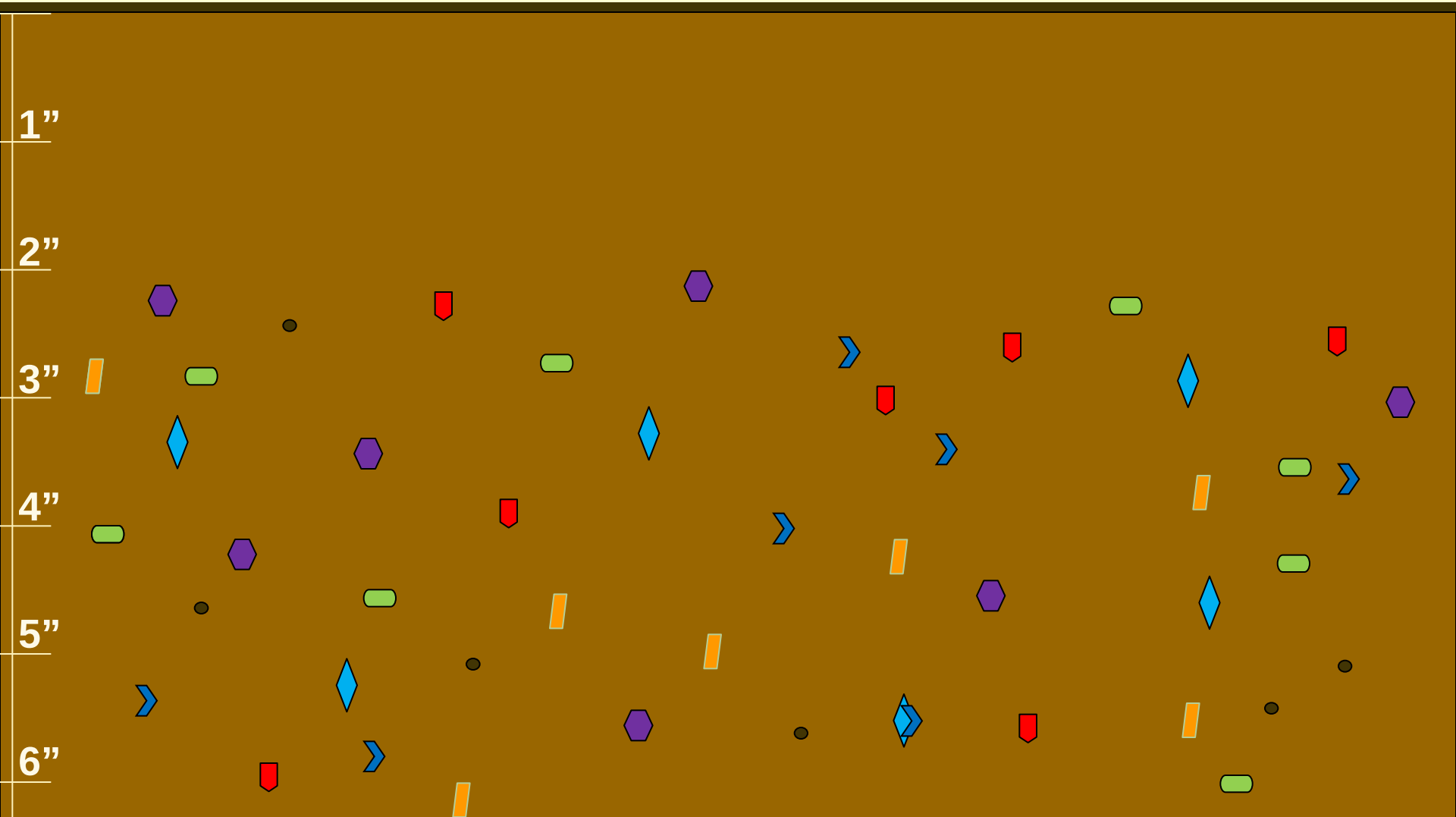

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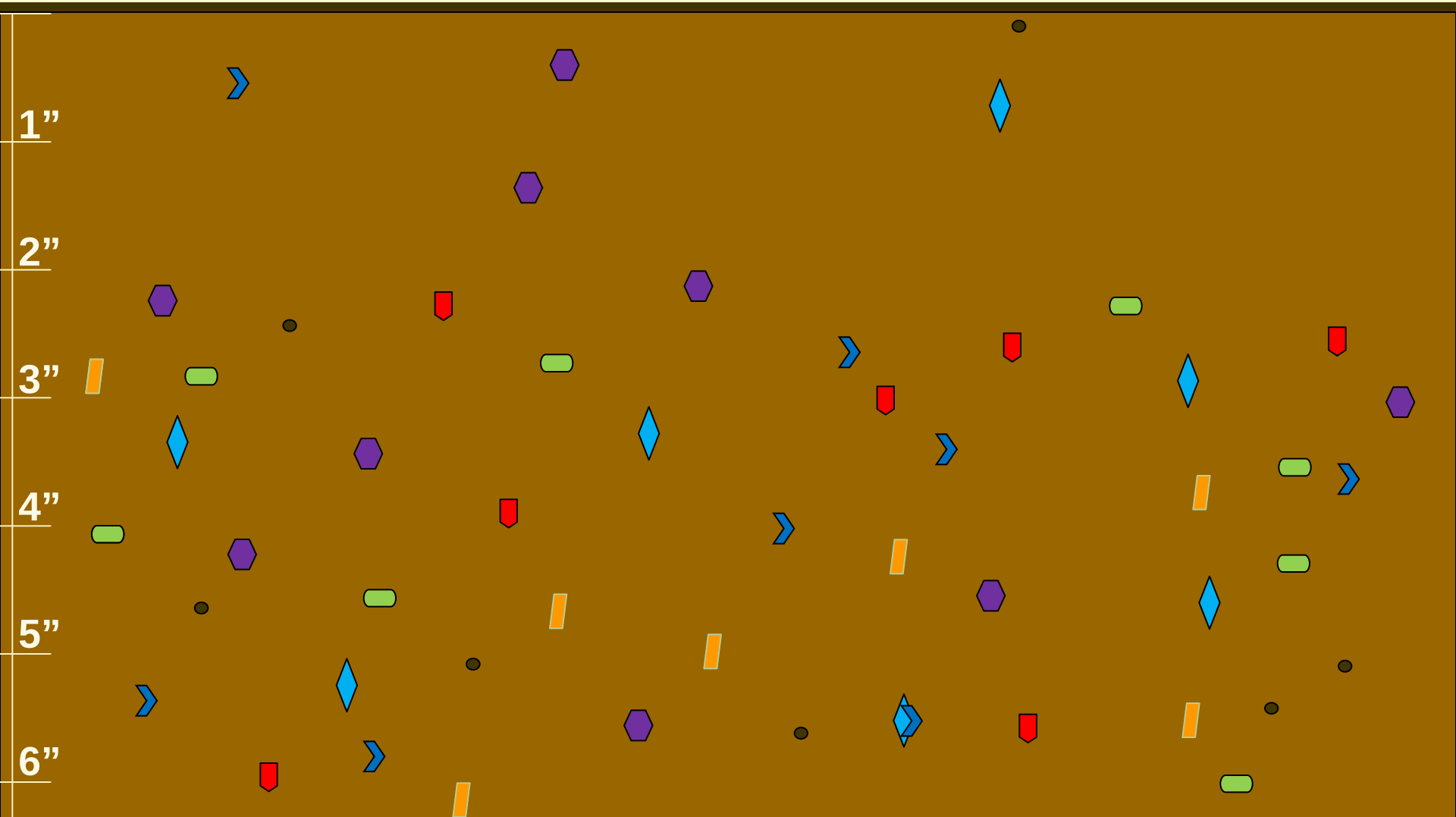


Weed Abatement: Shrubs and Transplants

Rigorous site preparation also important for woody hedgerows and transplanted forbs:

- Removal of perennial weeds
- Knocking back annuals

Photos: Stanislaus, CA

Site Preparation: Woody Plants

Year 1: Organic tree and shrub removal

- Brush hogs
- Chain saws
- Weed wrenches
  - Buckthorn, Scotch broom
- Girdling

Brush Hog (rotary mower)

Weed Wrench (root pulling lever)

Photos: Matthew Shepherd, Whatcom County Washington

Site Preparation: Weed Abatement

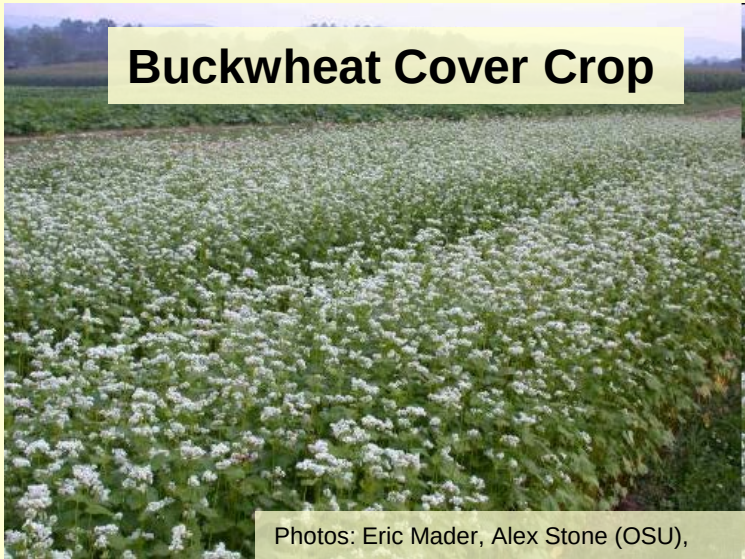
Year 1: Organic weed abatement

- Repeat shallow cultivation (4 to 6 week intervals)
- Cultivation followed by a smother crop (at least 1 year on previously cropped land):
  - Buckwheat
  - Sudan grass (needs mowing before maturity – also allelopathic!)
  - Phacelia and partridge pea???
- Solarization (clear UV stabilized plastic): At least 1 year on previously cropped land

Chisel Plow: Primary Tillage

Disk Harrow: Secondary Tillage

Buckwheat Cover Crop



Photos: Eric Mader, Alex Stone (OSU),

Site Preparation: Weed Abatement

Year 1: Organic weed abatement

- Repeat shallow cultivation (4 to 6 week intervals)
- Cultivation followed by a smother crop (at least 1 year on previously cropped land):
  - Buckwheat
  - Sudan grass (needs mowing before maturity – also allelopathic!)
  - Phacelia and partridge pea???
- Solarization (clear UV stabilized plastic): At least 1 year on previously cropped land

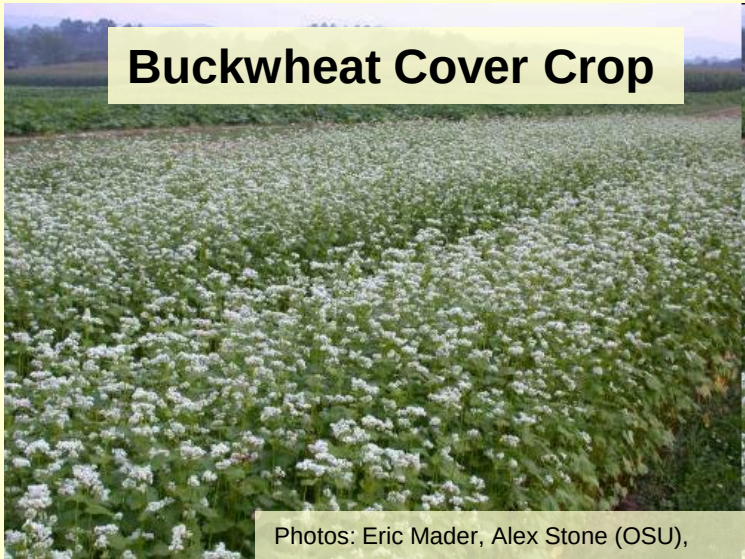
Also…

- Flame weeding
- Horticultural vinegar (expensive)
- Citrus oil (e.g. BurnOut) (expensive)

Chisel Plow: Primary Tillage

Disk Harrow: Secondary Tillage

Buckwheat Cover Crop



Photos: Eric Mader, Alex Stone (OSU),

Site Preparation: Weed Abatement

Year 1: Organic weed abatement

- Repeat shallow cultivation (4 to 6 week intervals). ALWAYS before weeds to go seed.
- Irrigation can help increase weed germination

Photos: Eric Mader, Alex Stone (OSU),

Site Preparation: Weed Abatement

Year 1: Organic weed abatement with smother crop

- Shallow cultivation followed by a smother crop (at least 1 year on previously cropped land):
  - Buckwheat
  - Sudan grass (needs mowing before maturity, or it can be burned off)
  - Phacelia and partridge pea???

Photos: Commons

Goal: Quick growing 'smother crop' to out-compete weeds with high biomass

Buckwheat 15 days after planting (DAP)

Pearl millet 42 DAP

Figure credits: Mark Schonbeck, Virginia Association for Biological Farming.

Site Preparation: Weed Abatement

Year 1: Organic weed abatement with smother crop

Timing

- Spring: Till field as soon as soil can be worked, ideally before winter/spring annuals go to flower

Photo: Mace Vaughan (Xerces Society)

Site Preparation: Perennial Weed Abatement

Year 1: Organic weed abatement with smother crop

Timing

- Spring: Till field as soon as soil can be worked, ideally before winter/spring annuals go to flower
- Two weeks later: Harrow or sweep

Photo: Mace Vaughan (Xerces Society)

Site Preparation: Weed Abatement

Year 1: Organic weed abatement with smother crop

Timing

- Spring: Till field as soon as soil can be worked, ideally before winter/spring annuals go to flower
- Two weeks later: Harrow or sweep

Photo: Mace Vaughan (Xerces Society)

Site Preparation: Weed Abatement

Year 1: Organic weed abatement with smother crop

Timing

- Spring: Till field as soon as soil can be worked, ideally before winter/spring annuals go to flower
- Two weeks later: Harrow or sweep
- Two weeks later: Harrow again and seed

Photo: Mace Vaughan (Xerces Society)

‘Smother Crop’ Seed Bed

Final tillage minutes or hours, NOT days before seeding.

(A) Seedbed prepared 5 days prior to this photograph, looked fairly "clean" at a glance

(B) Light stirring of the soil surface reveals numerous tiny weed seedlings

(C) Cover crops (soybean shown here) become infested with weeds when planted in a seedbed prepared 5 days before planting

Credit: Mark Schonbeck, Virginia Association for Biological Farming.

Site Preparation: Weed Abatement

Year 1: Organic weed abatement with smother crop

Timing

- Spring: Till field as soon as soon as soil can be worked, ideally before winter/spring annuals go to flower
- Two weeks later: Harrow or sweep
- Two weeks later: Harrow again and seed
- Six weeks later: Mow and replant. Rake off debris and rebroadcast OR drill seed.

Photos: Commons

Site Preparation: Weed Abatement

Year 1: Organic weed abatement with smother crop

Timing

- Spring: Till field as soon as soon as soil can be worked, ideally before winter/spring annuals go to flower
- Two weeks later: Harrow or sweep
- Two weeks later: Harrow again and seed
- Six weeks later: Mow and replant. Rake off debris and rebroadcast OR drill seed.
- Six weeks later: Mow or crimp and leave debris on surface.

Photos: Commons

Summer 'smother' crops & weed control

Cover Crop (Seeded July 9, 2010)	Biomass Yield 48 DAS Wt/a	Weed Biomass As percent of Weedy control
Mustard, Buckwheat, Rape, oil seed radish	4.8-8.2	0.6-6.5
Sudan Grass, oats, millet, lana vetch	3.1-7.9	20-29
Sunn hemp, soybean, chickling vetch, white, yellow and red clover	0.5-5.7	42-71
Weedy check	-	100

Bary and Benedict, WSU

Year 0: Winter Cover

	Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 0	Plant Winter Cover									■			
Year 1	Perennial and Annual Weed Abatement		■	■	■	■	■	■	■	■	■		
	Seed Bed Creation										■	■	
	Dormant Fall Seeding											■	■
Year 2	Annual Weed Control (mowing)				■	■	■	■	■	■			
	Spot Treatment of Perennial Weeds			■	■	■	■	■	■	■	■	■	
Year 3	Biennial Weed Control (selective mowing)				■	■	■	■	■	■			
	Spot Treatment of Perennial Weeds			■	■	■	■	■	■	■	■	■	
Ongoing	Spot Treatment of Perennial Weeds			■	■	■	■	■	■	■	■	■	
	Mowing or Burning for Woody Plant Control											■	■

Year 0: Winter Cover Considerations

Winter Cover Considerations:

- Cover crop mix
  - Legumes add extra nitrogen, so grass may be better
- Harvest date has greatest effect on weeds
  - Late harvest increases biomass but decreases N concentration
- Incorporation timing
  - Do not allow to go to seed
- Species to consider
  - Rye, barley and oats (depending upon location)

Photo: Ted Kornecki (USDA ARS)

Winter Cover Crop Effectiveness

The Effect of Winter Cover Crops on Winter Weed Suppression

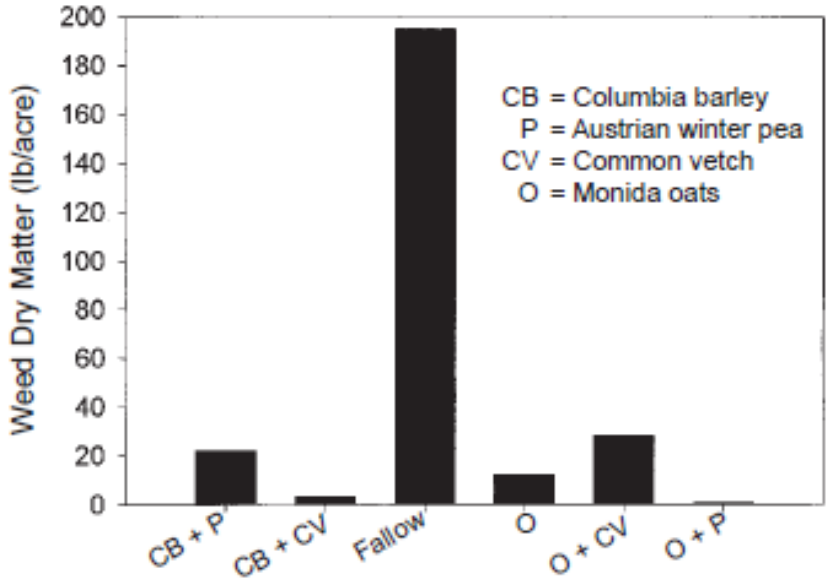


Figure 1.—Winter weed suppression by cover crops in the Willamette Valley. Cover crops were planted in the fall of 1994, and weed dry matter was measured April 18, 1995. All cover crops significantly reduced weed dry matter. Cover crop dry matter was 1 to 2 tons per acre by April 18 (Luna, McGrath).

The Effect of Incorporated Winter Cover Crops on Summer Weed Emergence

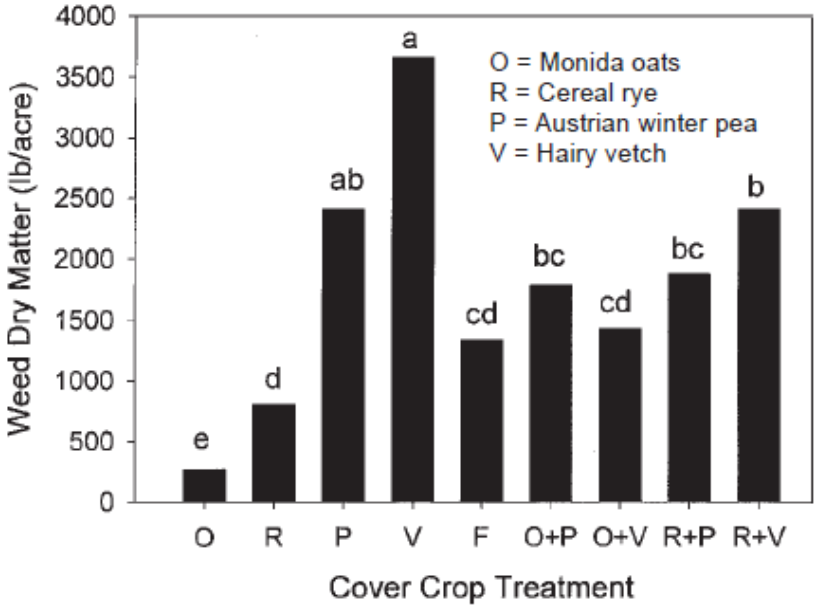


Figure 2.—Effect of incorporated cover crops on summer weed dry matter accumulation measured July 11, 1994 in broccoli. Cover crops were planted the previous fall and incorporated May 2; broccoli was planted May 24. Bars with different letters above indicate significant differences (F-protected LSD, $\alpha = 0.05$).

Cover crop-weed interactions are specific to the cover crop and the weed species

Peachy, Luna, Dick, & Sattell, Oregon State

EM 8725

Cover Crop Allelopathy

Table 1. A summary of research on the allelopathic effects of cover crops

Cover Crop	Weeds Suppressed	Investigator and Publication Date
Hairy vetch	Lambsquarters, yellow foxtail, yellow nutsedge, pitted morningglory	Teasdale et al., 1993 White et al., 1989
Crimson clover	Pitted morningglory, wild mustard, Italian ryegrass	Teasdale et al., 1993 White et al., 1989
Cereal rye	Lambsquarters, redroot pigweed, common ragweed	Barnes and Putnam, 1986 Schilling et al., 1985 Masiunas, 1995
Wheat	Morningglory, prickly sida	Liebl and Worsham, 1983
Velvetbean	Yellow nutsedge, chickweed	Hepperly et al., 1992 Fujii et al., 1992
Sorghum sudangrass	Annual ryegrass	Forney and Foy, 1985

Cover Crops for Organic Farms, Baldwin & Creamer, NCSU

Weed Abatement: Solarization

Soil Solarization

Weed Abatement: Solarization

Soil Solarization

Use UV Stabilized plastic

- Consult with certifier

Getting Ready to Plant

Photos: Don Keirstead

Site Preparation: Final Tillage

Year 1: Seed Bed Creation

Do not to bring more weed seeds to the surface!

- Rolling harrows
- Basket weeders
- Soil conditioners
- Spike toothed harrows
- Tine weeders

Tine Weeder (scratches out weed seedlings before planting)

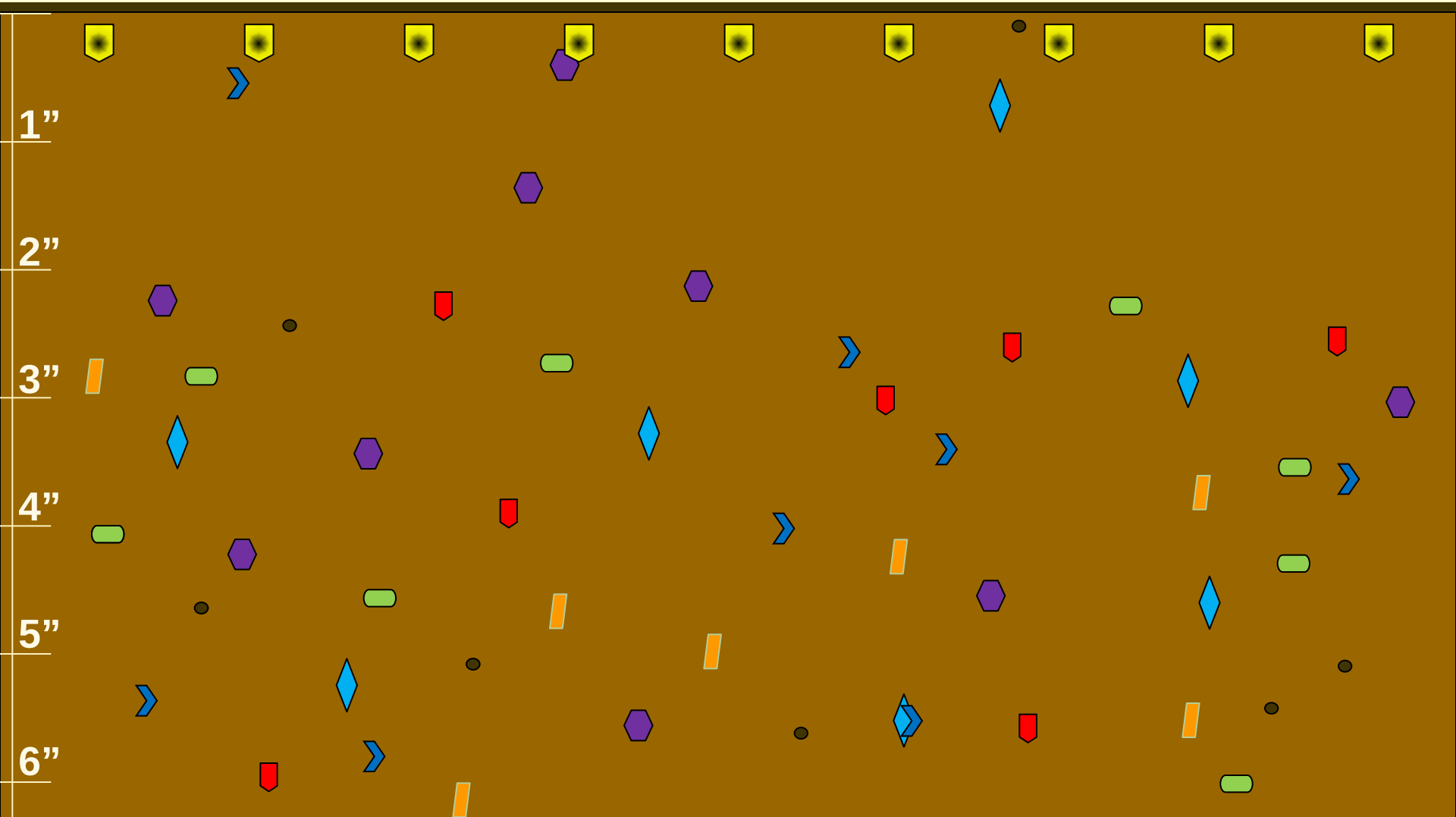
Rotary Harrow (till up only the top inches of soil)

Spike Tooth Harrow (breaks up soil clods)

Photo: Eric Mader, Jessa Guisse, Farm Journal

Establishing New Habitat: Keys to Success

Plant new seed, ensuring proper depth and seed-soil contact



Seeding Rates

Target seeding rate should be in seeds per square foot

- Drill seeding: 25-35 seeds/ft2
- Broadcast: 35-50 seeds/ft2

Photos: Don Keirstead

Planting Equipment: Seed Drills

Native Seed Drills:

- Multiple seed sizes
- Plant directly in stubble (no till)
- Tye, Truax, Great Plains (common manufacturers)

Photos: Eric Mader, Jessa Guisse

Planting Equipment: Seed Drills

Native Seed Drills:

- Multiple seed sizes
- Plant directly in stubble (no till)
- Tye, Truax, Great Plains (common manufacturers)

Vegetable Seed Drills:

- Multiple seed sizes (one species at a time!)
- Manual and tractor toolbar versions
- Requires smooth seedbed
- Earthway and Planet Junior (common manufacturers)

Planting Equipment: Drop Seeders

Brillion Drop Seeders:

- Made for sowing turf and pasture grasses, also alfalfa and clover
- Works with native seed (change seed box agitators)
- Requires smooth, cultivated seed bed (not like this photo!)

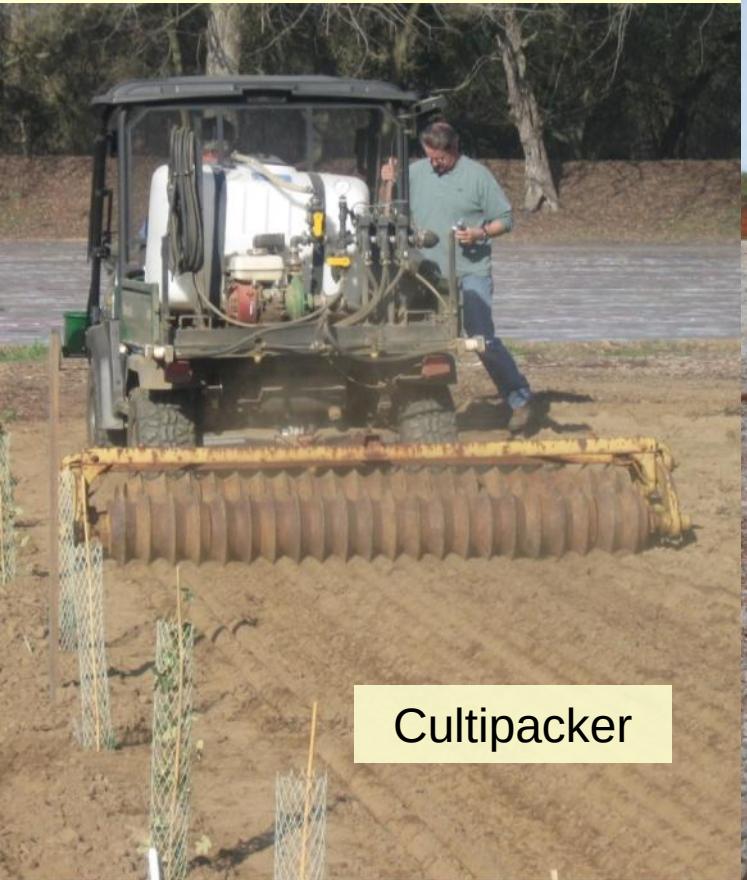
Broadcast Seeders and Broadcast By Hand:

- Mix seed with sand for even distribution
- Requires clean, exposed seed bed

Post Planting: Seed Soil Contact

Post Seeding:

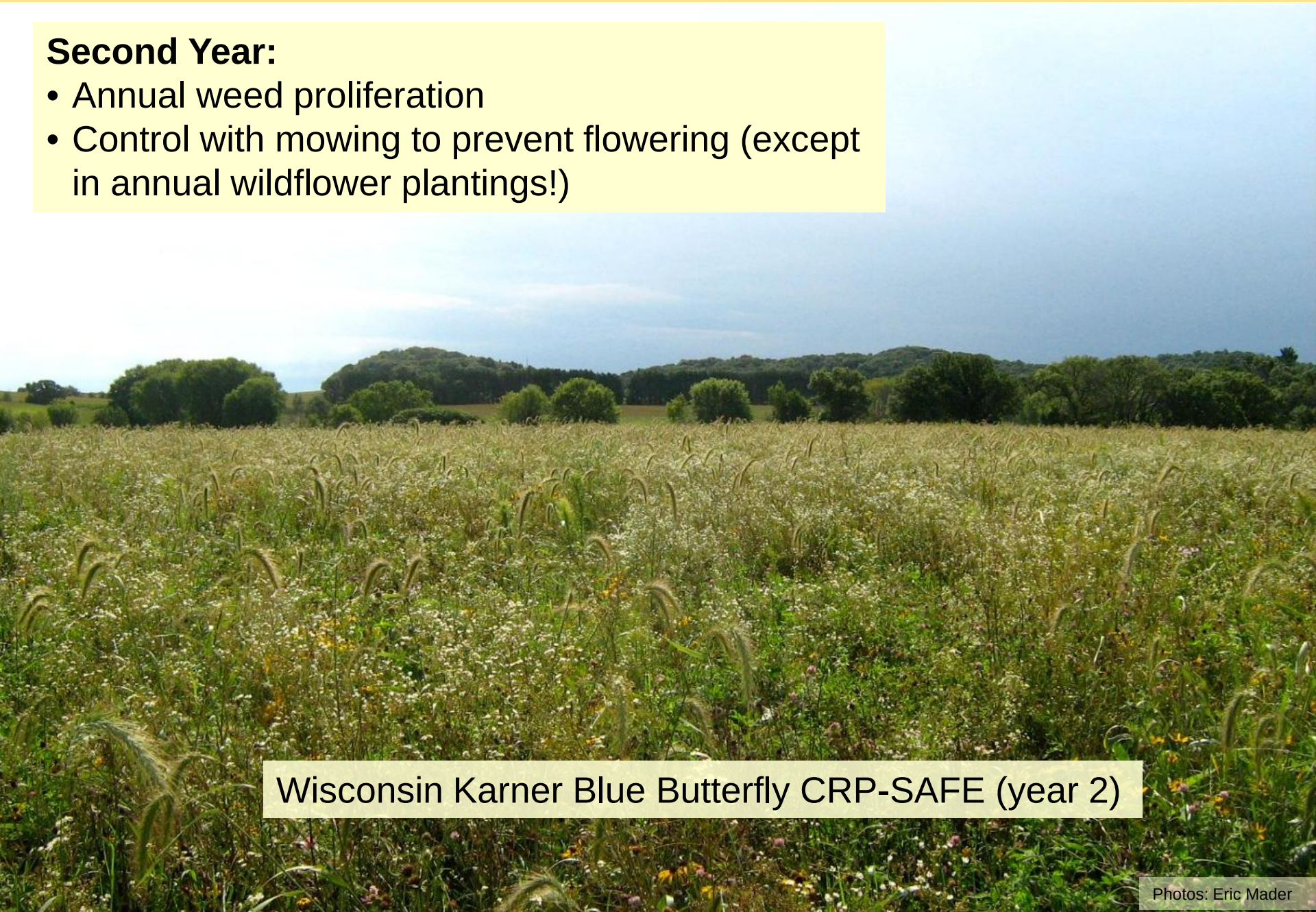
- Roll with cultipacker, lawn roller
- Chain harrow or lawn rake
- Optional straw mulch



Post Planting Weed Management

Second Year:

- Annual weed proliferation
- Control with mowing to prevent flowering (except in annual wildflower plantings!)

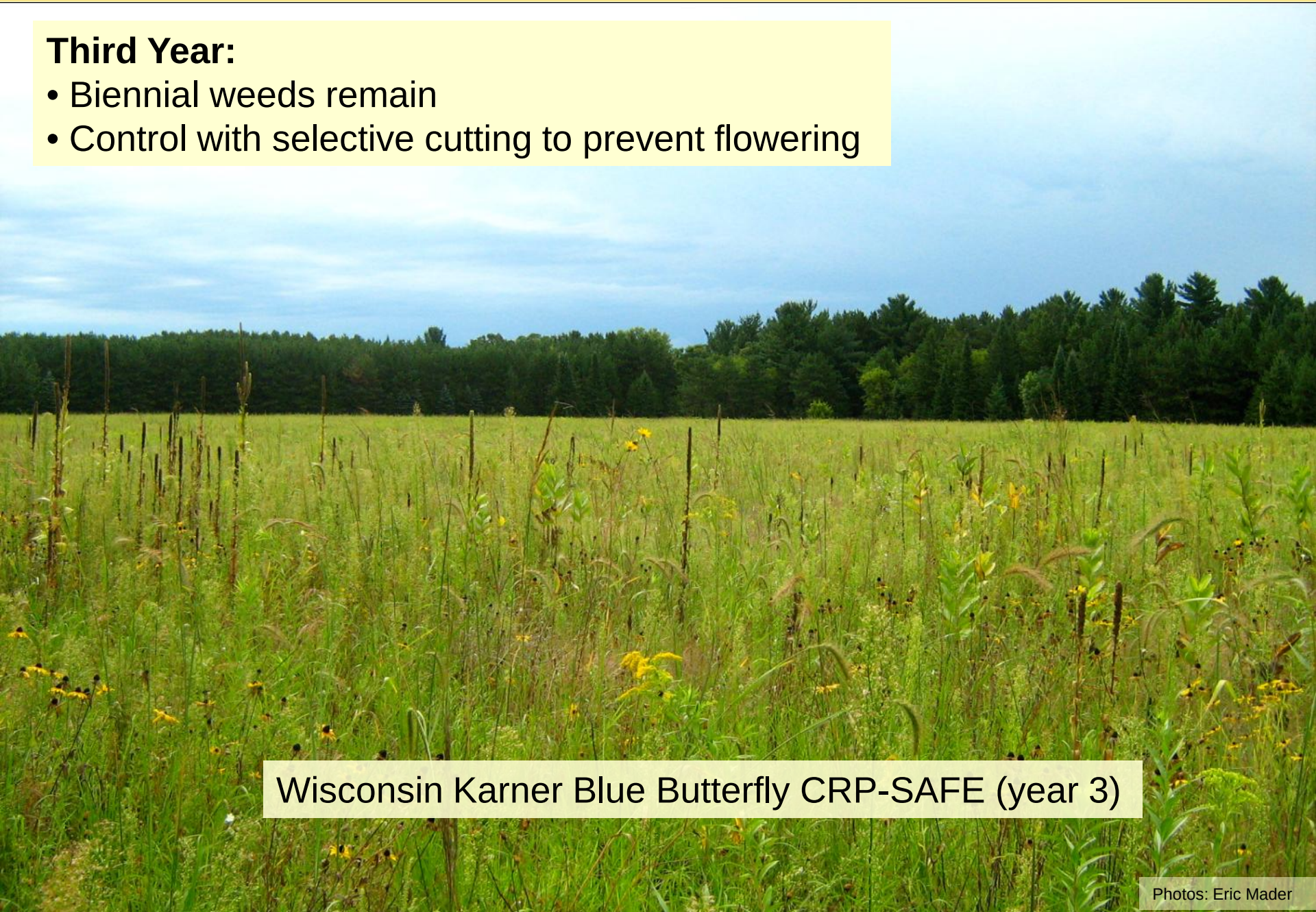


Wisconsin Karner Blue Butterfly CRP-SAFE (year 2)

Photos: Eric Mader

Post Planting Weed Management

Third Year:
- Biennial weeds remain
- Control with selective cutting to prevent flowering



Wisconsin Karner Blue Butterfly CRP-SAFE (year 3)

Photos: Eric Mader

Post Planting Weed Management

Forth Year:
- Largely weed-free
- Selective weed control

Wisconsin Karner Blue Butterfly CRP-SAFE (year 4)

Photos: Eric Mader

Post Planting Weed Management

Star Thistle Case Study

Photos: Claudia Street (Glenn County RCD)

Post Planting Weed Management

Photos: Mace Vaughan (Xerces Society)

Post Planting Weed Management

May 2010

Photos: Claudia Street (Glenn County RCD)

Post Planting Weed Management

June 2010

Photos: Claudia Street (Glenn County RCD)

Post Planting Weed Management

August 2010

Photos: Claudia Street (Glenn County RCD)

Post Planting Weed Management

August 2010

Photos: Claudia Street (Glenn County RCD)

Post Planting Weed Management

April 2011

Photos: Claudia Street (Glenn County RCD)

Organic Mulches

- Newspaper: Glossy paper and colored inks are prohibited.
- Cardboard: Cardboard that is not waxed or impregnated with synthetic fungicide.
- Straw: May be from nonorganic sources. Must be from non-genetically modified plants.
- Plastic or other synthetic mulches: *Provided,* That, they are removed from the field at the end of the growing or harvest season.

The Finished Product!

Photo: Katharina Ullmann, Xerces Society

The Finished Product!

Photos: Jessa Guisse, Xerces Society

Payment Schedule Considerations

- Materials must comply with NOP
  - Seeds, fertilizers, amendments, any chemicals, lumber
- Wage rate should be similar to ‘conventional’
- Organic is typically more labor intensive (hours) but depends on crop
  - Hand cultivation, laying mulch, hand harvest
- Without use of synthetic herbicides there should be increased labor hours

Summary

- Buffers are required for organic systems
- Buffers can serve multiple functions
  - Beneficial insects, pesticide drift, biodiversity
- Proper site preparation (especially weed abatement) can prevent future headaches
- ‘Smother’ cover crops are an integral part of organic site prep
- Costs and payment can vary in organic systems
- Not NRCS planners responsibility that producer complies with NOP

The End!

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