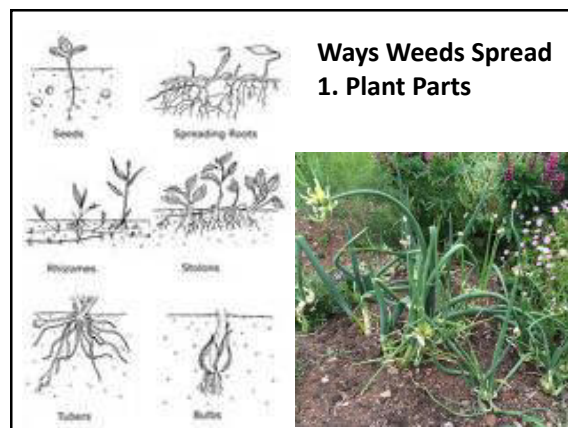


What weeds are problematic on your farm?

Weed	Movement	Life Cycle	Strategy	RESOURCES	WHO	WHEN	Check-in
Use weeds that are problematic for you	How are they moving?	Summer Annual Winter Annual Biennial Single Perennial Creeping Perennial	Describe the strategy you plan to implement. Is it affecting: Seed Bank Susceptible Crop - If Environment	What tools, supplies or knowledge need to be gathered? Where will they be stored?	Who is responsible?	When will they do this?	Done By



**3. Water Dispersal**



**3. Water Dispersal**



**4. Animal Dispersal:**



**4. Animal Dispersal:**



**4. Animal Dispersal:  
Contaminated seed/feed**



**4. Animal Dispersal:  
Manure**



Thoroughly compost animal manures to kill off weed seeds, or avoid using manure altogether.

#### 4. Animal Dispersal: Mulch



#### 4. Animal Dispersal: Equipment & Tools



#### 5. Explosions

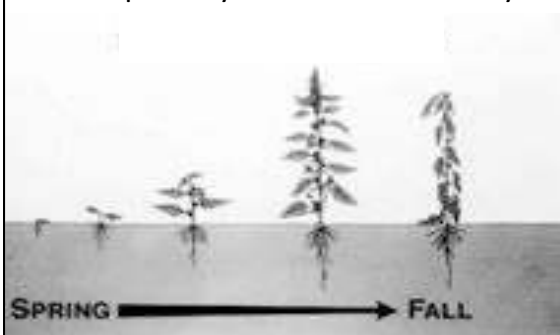


How are they moving around?

Weed	Movement	Life Cycle	Strategy	RESOURCES	WHO	WHEN	Check-in
Use weeds that are problematic for you	How are they moving?	Summer Annual Winter Annual Biennial Simple Perennial Creeping Perennial	Describe the strategy you plan to implement. Is it affecting: - Seed Bank - Surrounding Crop - Environment	What tools, supplies or knowledge need to be gathered? Where will they be stored?	Who is doing it? BIO	When will they do this?	Done By By

#### Know Your Weeds: Summer Annuals

Annuals complete life cycle from seed in less than one year.



#### Know Your Weeds: Winter Annuals

Winter Annuals start from seed in the autumn, develop a low rosette of leaves before winter, produce flowers and ripen their seeds the following spring and then die.



## Know Your Weeds: Biennials

Biennials start from seed in spring and produce a rosette with a fleshy tap-root. The 2<sup>nd</sup> spring the tap-root sends a flowering shoot, then dies after the seeds ripen.



## Know Your Weeds: Biennials



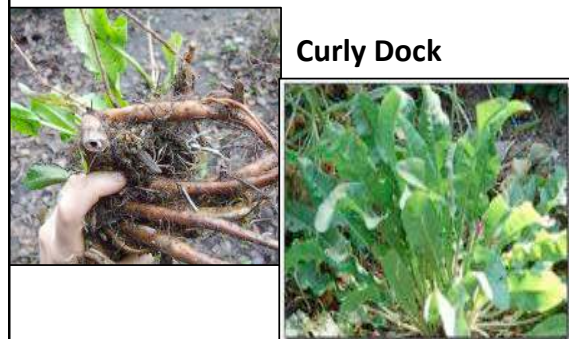
## Know Your Weeds: Simple Perennials

Simple perennials spread only by seed. However, cut pieces may clone new plants. Ex. dandelion or dock root cut in half may produce two plants.



## Know Your Weeds: Simple Perennials

Perennials live for more than 2 years and may live almost indefinitely.



## Know Your Weeds: Creeping Perennial

Creeping Perennials reproduce by creeping roots (above ground stems, stolens, or creeping below ground stems, rhizomes)



## Know Your Weeds: Creeping Perennial



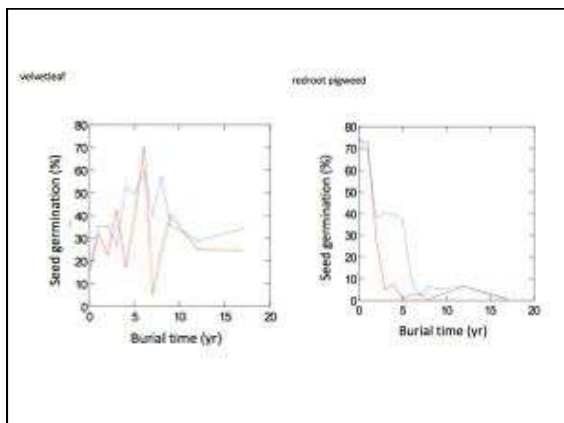


**Prevention**  
**Primary Tillage**

- Seeds deep in the soil are "stored" below the germination zone.
- 130 million seeds per "plow" acre found in a MN. study.

**WEED SEED BANKS**

System Design	
PREVENTION: Key to long-term management	
Many weed seeds retain their viability when buried deep in the soil.	
Length of time	Number of species that germinated
1 year	71 species
6 years	68 species
10 years	68 species
20 years	57 species
30 years	44 species
38 years	36 species



**0" to 1" deep:** Weed seeds in the top inch of soil are most able to germinate and will do so very rapidly

**1" to 2" deep:** Weed seeds can germinate, but are slow to emerge

**2" to 4" deep:** Weed seeds are mostly dormant and few species will germinate at this depth

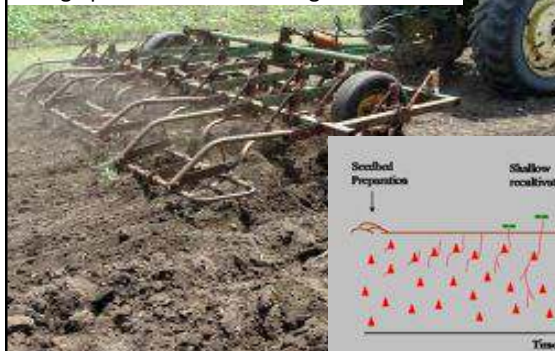
**4" and deeper:** All the seeds are dormant. Only bulbs and tubers will sprout and grow at this depth.

### Depth of Weed Emergence

Species	Optimum depth	Maximum depth
Common Chickweed	0.4	0.8
Lambsquarters	0.2	2.0
Shepherd's Purse	0.2	0.8
Wild Mustard	0.4	2.3
Common Purslane	0.1	0.8

### Fallow: Reduce The Seed Bank Before Crop Planting.

-Tillage promotes weed seed germination



### "Firming" for germination



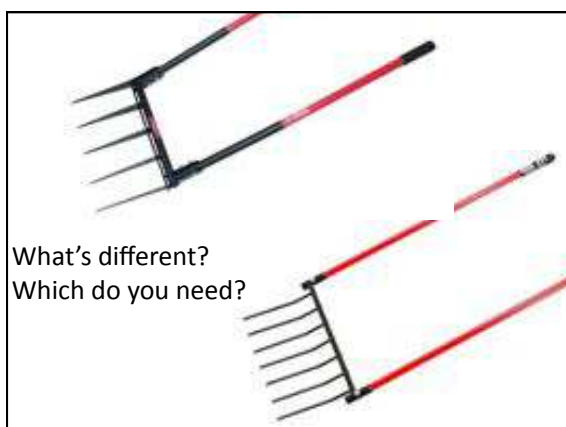
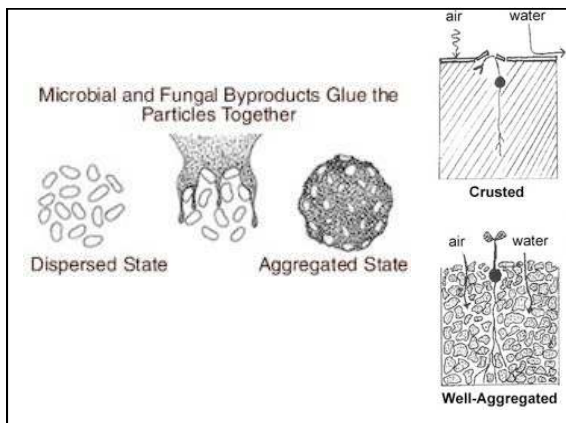
### Weeds and Soil Conditions

- **Docks:** indicates waterlogged or poorly drained soil, acid.
- **Foxtail:** calcium deficiency, compaction.
- **Mustards:** indicates hardpan or crusty surface, dry often with thin topsoil.
- **Shepherd's Purse:** indicates saline soil.
- **Yarrow:** indicates low potassium.

Weeds and What They Tell, Pfeiffer E. E.


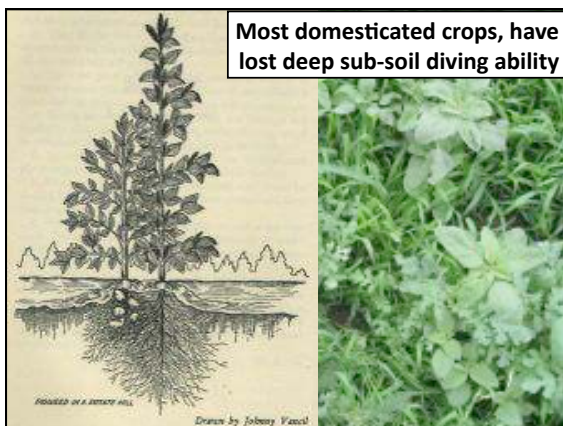
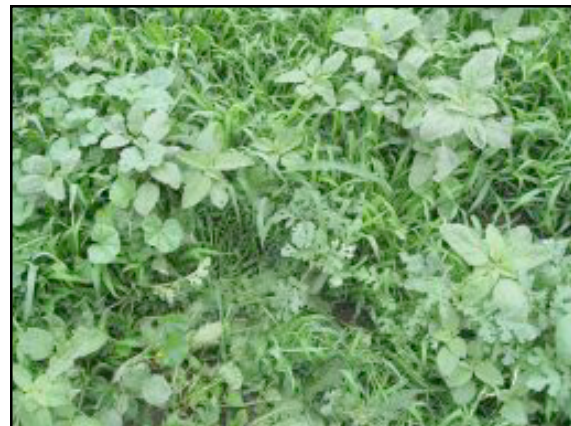
Weeds and Why they Grow, Jay L McCarman







- Allelochemicals can hurt some vegetables, particularly small seeded crops that are direct sown too soon.
- Large-seeded and transplanted vegetables are generally more tolerant.
- Lettuce seedlings are especially sensitive to allelochemicals.

**System Design: Do Not Allow Weeds To Seed**



- Weather conditions can interfere with timely incorporation
- Improperly incorporated plants can interfere with planting and cultivation



Turning in a cover crop by hand is a tedious job. Top mowing or use of a garden tiller can facilitate the process.





**Hairy Vetch seed is POISONOUS to chickens.**  
**Food safety considerations**





### Combined Soil Preparation 1 + Years

**1st Season**

- Apply turkey compost: 2 tons per acre
- April - mid June: **reduce weed seed bank**
- Mid-June: Sudan grass, soybeans, buckwheat
- August: Hairy vetch and rye over winter.

**2nd Season**

- Incorporate hairy vetch and rye in late May at blossom
- Reduce weed seed bank until mid- June** And/Or
- Summer crop of sudan grass, soybeans or buckwheat
- Fall crop of hairy vetch or oats

**3rd Season**

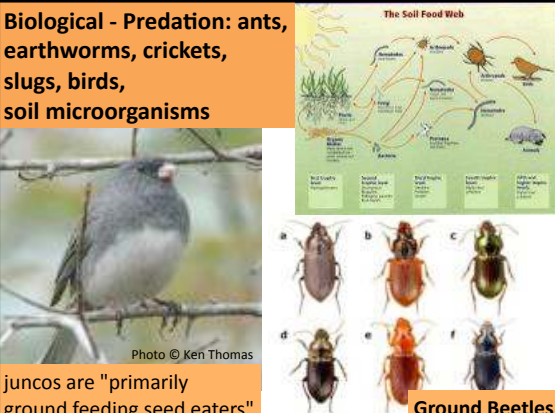
- Ready for crop production

### System Design: Do Not Allow Weeds To Seed



HOW MANY SEEDS?

### Biological - Predation: ants, earthworms, crickets, slugs, birds, soil microorganisms




juncos are "primarily ground feeding seed eaters"

**Ground Beetles**

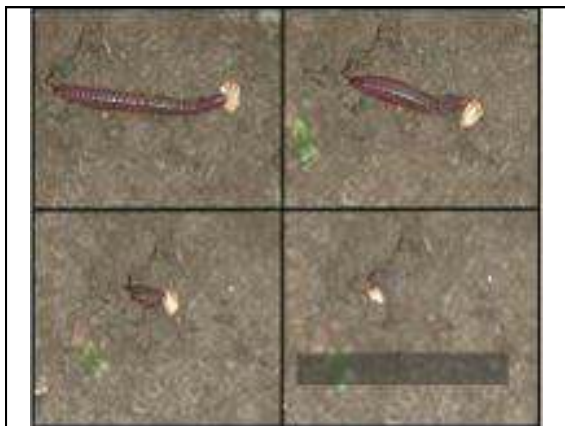
### Free weed-control service: Mice

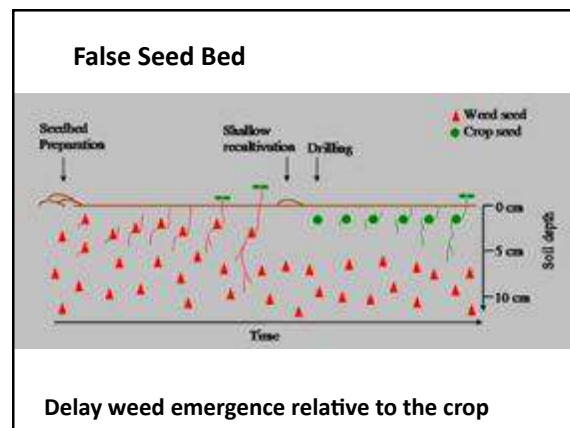
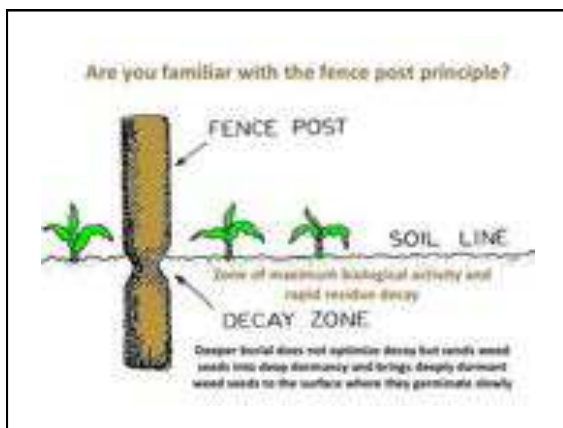
Prairie deer mice tag and white-footed mice eat 70 to 90% of the surface weed seeds.



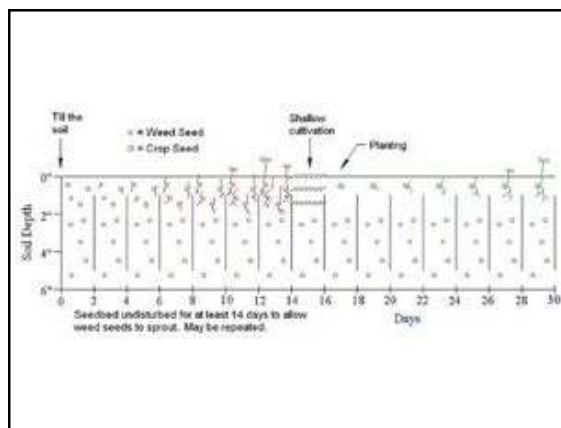
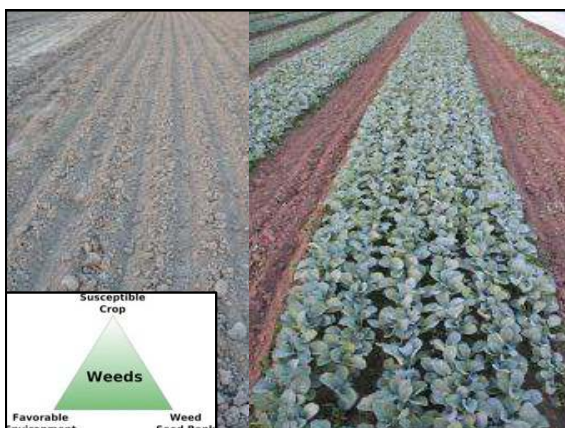
"When rodents are allowed to forage for weed seeds, they can consume more than 40 percent of the seed in a single night,"  
Brent Danielson

Enhance seed predation by keeping weed seeds on the soil surface as long as possible by delaying tillage.

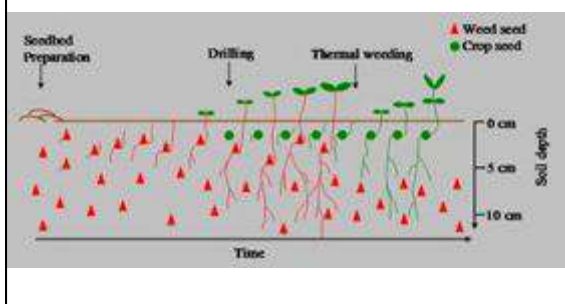


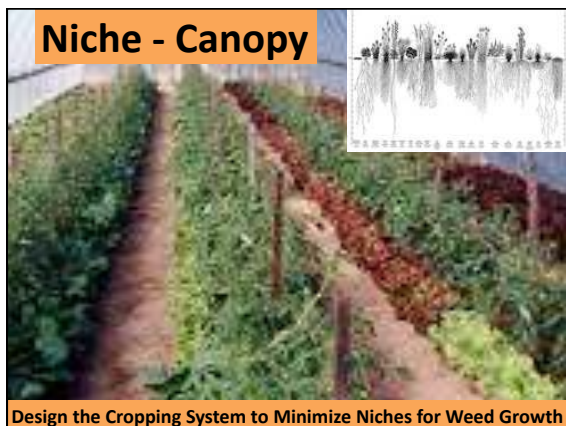


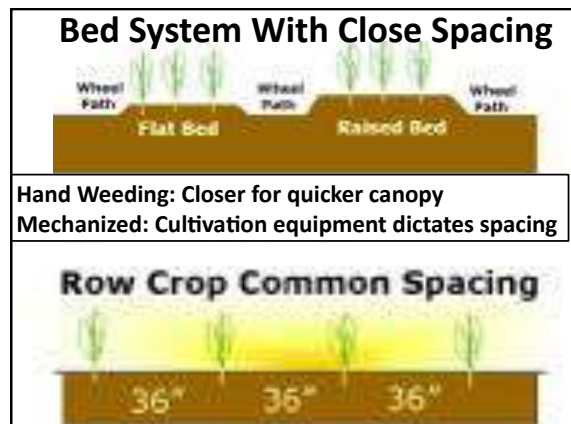
Harbor Freight Tools \$19 torch and a propane tank



Stale Seed Bed





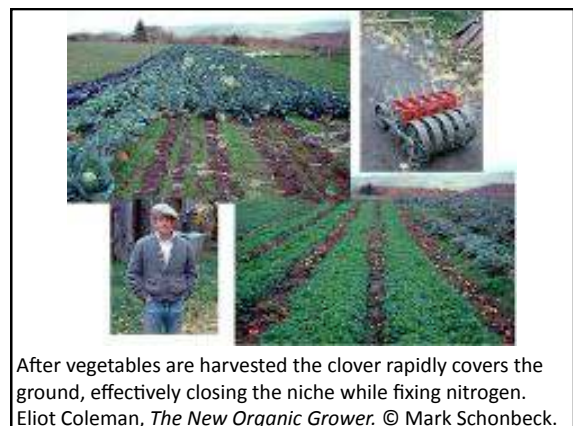




Summer fallow AFTER onions, to clear weeds.  
Or summer fallow before onions?



Plan management for  
maximum gross income per acre  
or  
cost-effective weed and pest control,  
rapid harvest and packing?



After vegetables are harvested the clover rapidly covers the ground, effectively closing the niche while fixing nitrogen.  
Eliot Coleman, *The New Organic Grower*. © Mark Schonbeck.



**Pre-Plan  
Management**

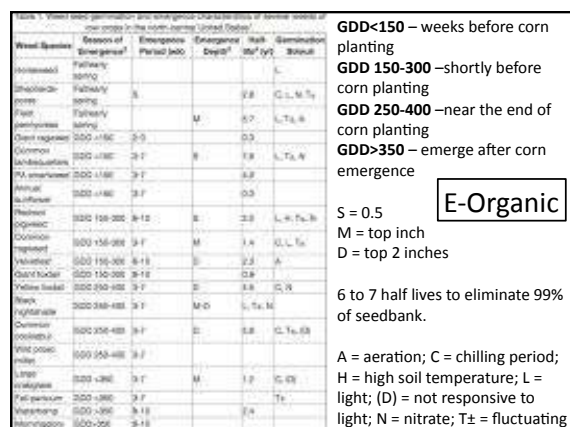


Annual Rye That Did Not Winter Kill

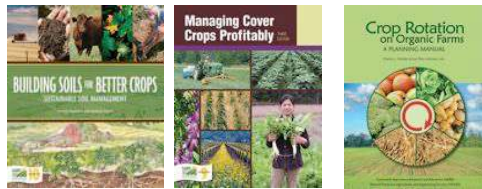


Beneficial and Pest Insects Cover Crops can Harbor		
Cover Crop	Beneficial	Pests
Oats	Ladybugs	Leafhoppers, thrips, armyworms
Rye	Ladybugs, hover flies	Armyworms
Buckwheat	Parasitic wasps, ladybugs, flowerbugs, various flies	Tarnished plant bugs
Crimson Clover	Ladybugs, big-eyed bugs	Thrips, plant
Hairy Vetch	Lady bugs, flowerbugs	Cutworms, tarnis





# Sustainable Agriculture Research and Education



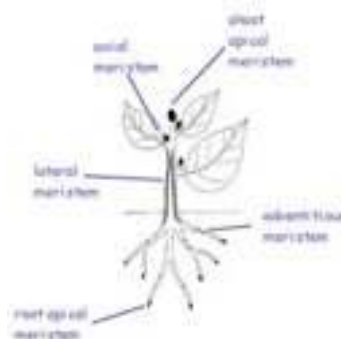
[www.atinadiffley.com](http://www.atinadiffley.com)



*Pseudomonas syringae* pv. *tagetis*

## Main Ways To Kill Weeds By Cultivation

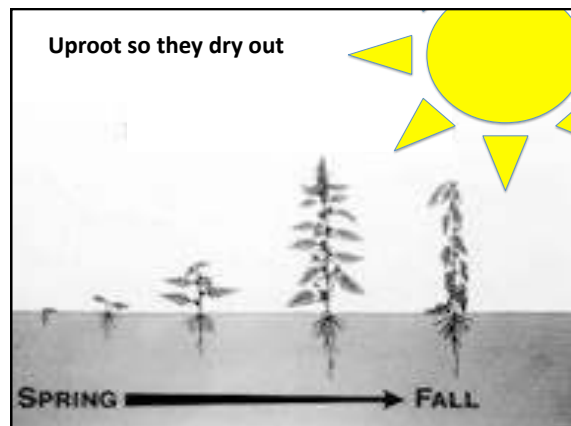
- Bury
- Uproot so they dry out
- Damage the weed enough so neither part can re-grow

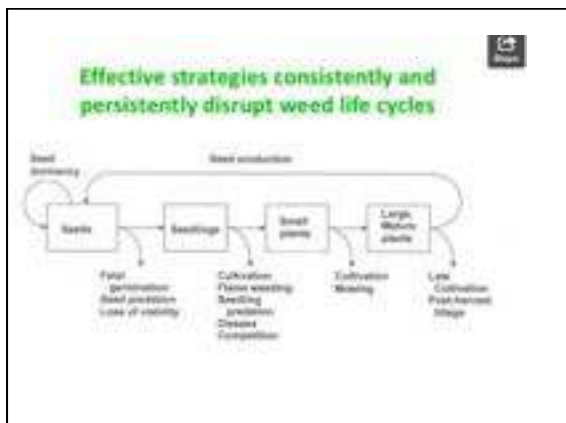


↑ ↑ ↑ WEED THE SOIL - NOT THE CROP ↑ ↑ ↑  
 ↓ ↓ ↓ After The Crop Is Planted ↓ ↓ ↓  
**Mechanical - Cultivation - CONTROL**



In the "benign stage" NOT!





**Bury the meristem**



**Uproot and Bury**

