



Seedbank dynamics and long term integrated weed management

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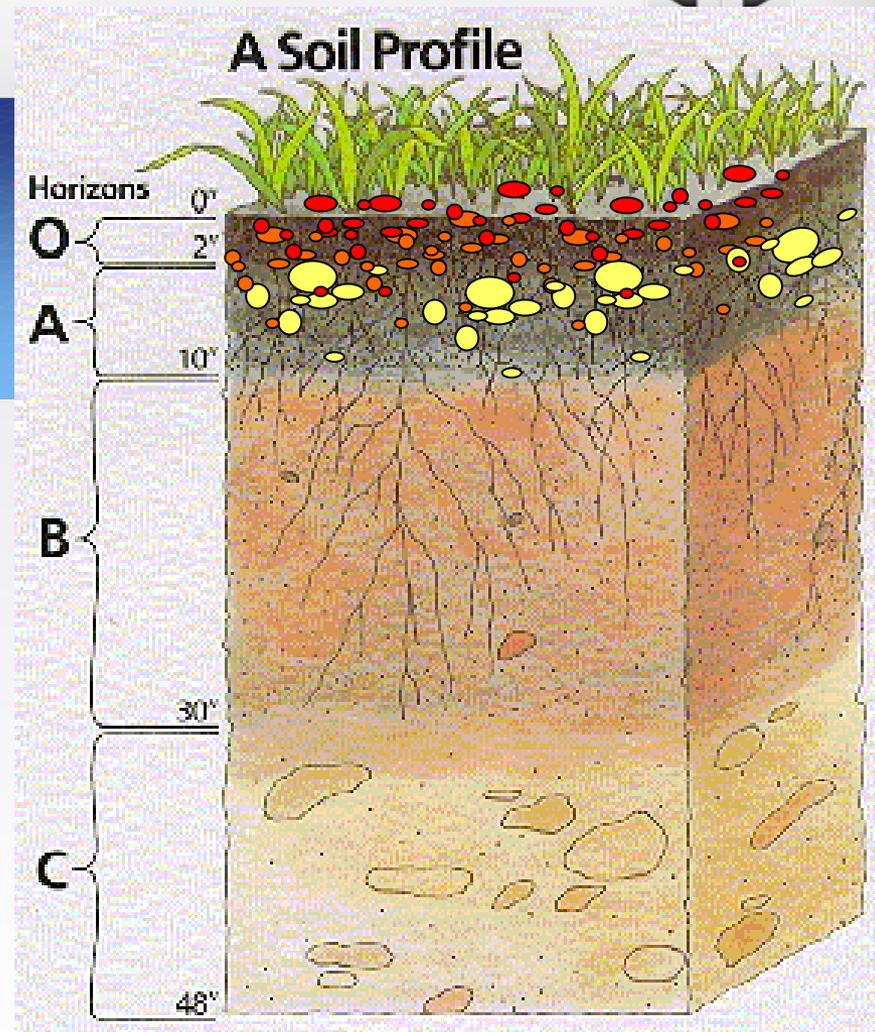


Outline

- What is a seedbank and why should we care about it?
- Environmental signals triggering weed seed germination
- Weed emergence patterns and control timing
- Off season control
- Don't forget...!

What is a seedbank?

- All viable seeds present in the soil
- It is the “real” weed problem in your farm
- Weeds emerging each year are just a fraction of the total number of weed seeds present





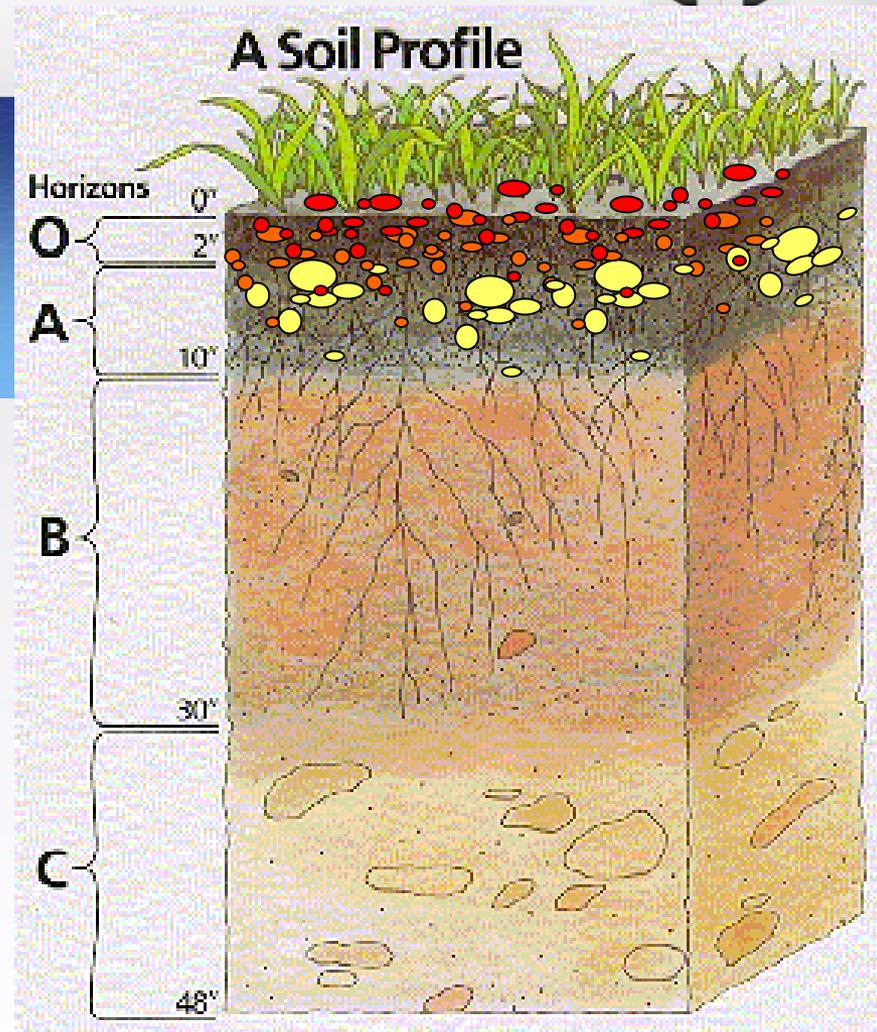
Germinable weed seedbank

Species	# seeds/ft ²	
	Mean	Range
Foxtail	52	0-560
Lambsquarters	219	0-588
Velvetleaf	8	0-115

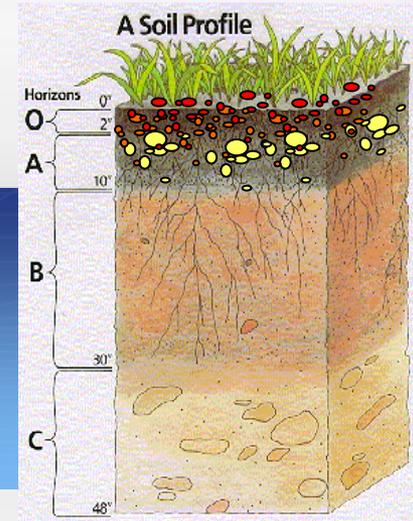
Adapted from Mirsky et al. 2010

What is a seedbank?

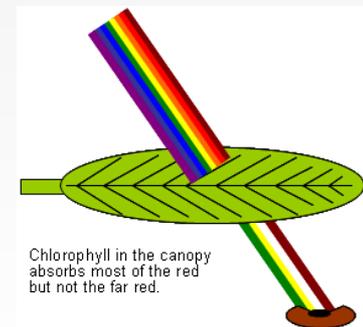
- Unlike your bank account, you want it to be empty!!!!
- What can we do to deplete the weed seedbank?



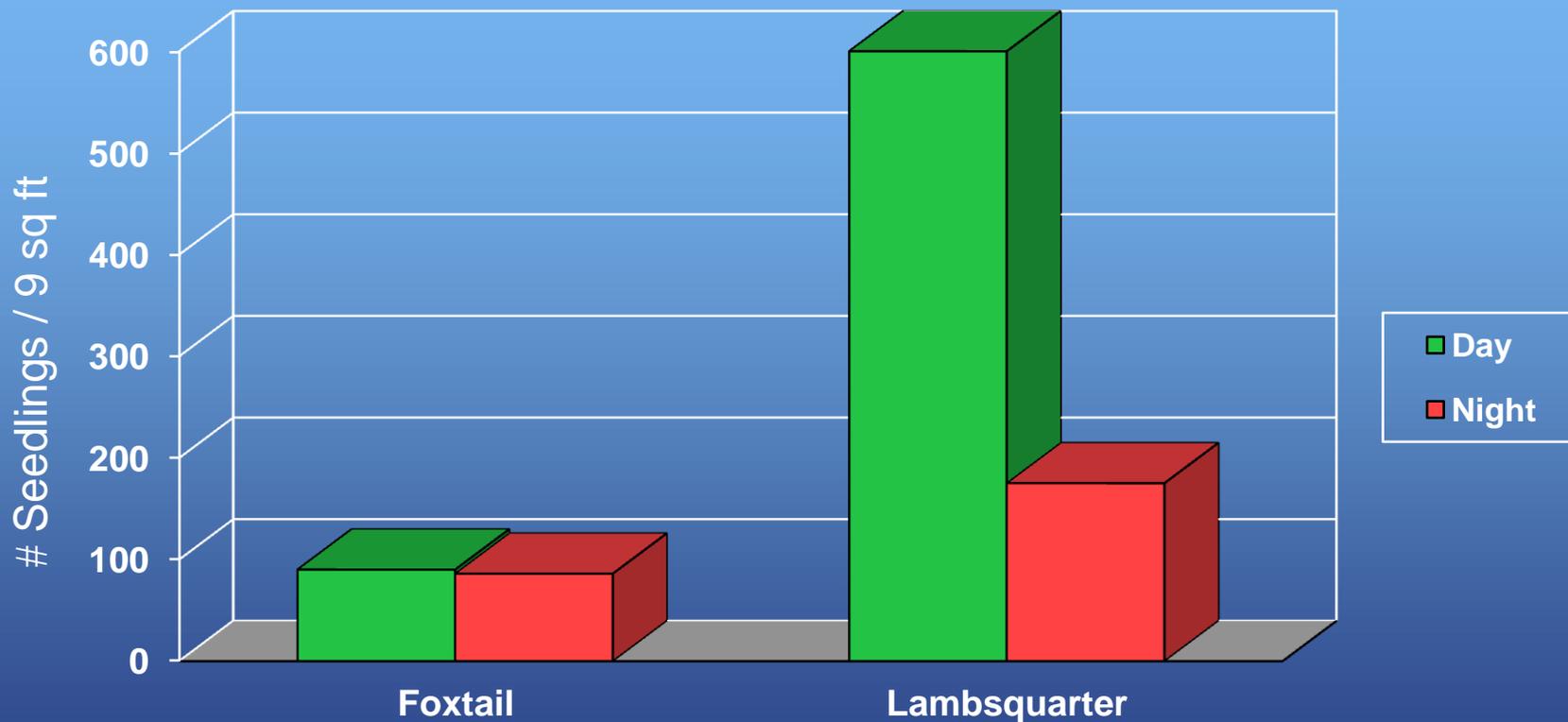
Seed dormancy



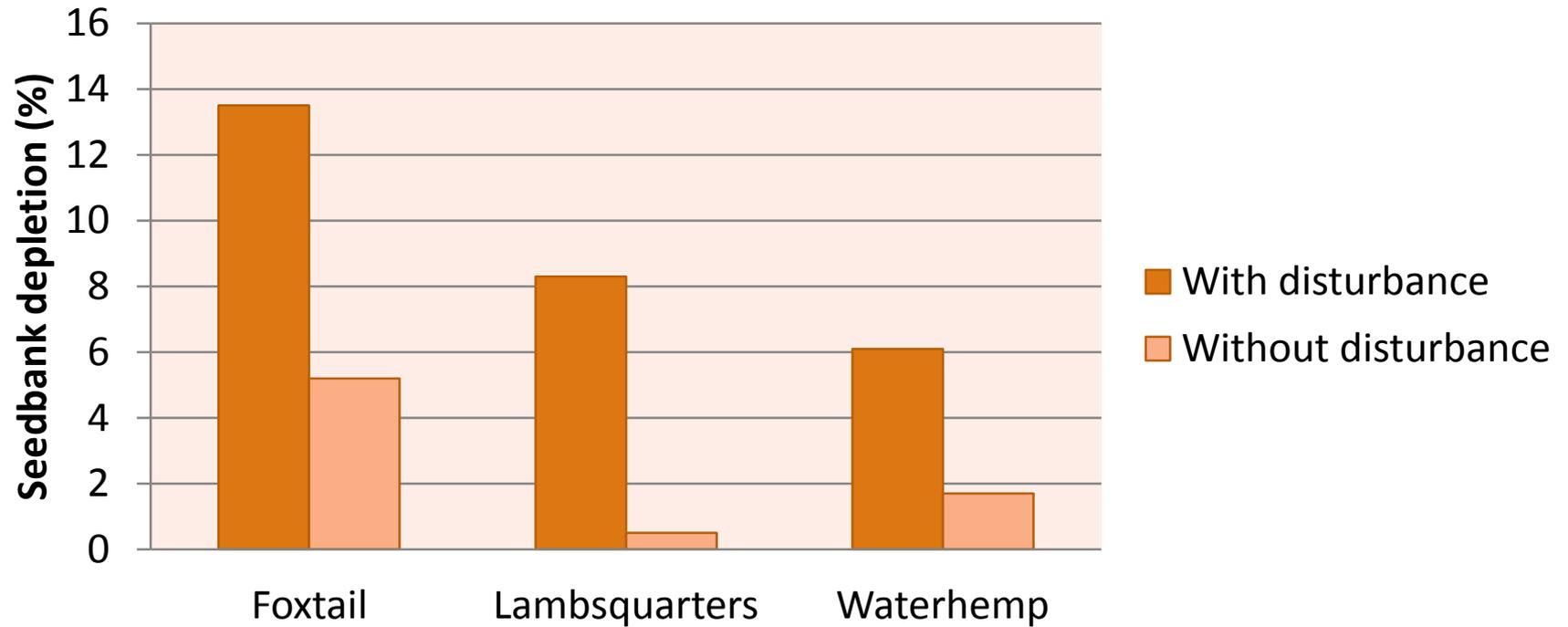
- Seed dormancy is the driving force for seedbank formation
 - Dormant seeds are incapable of germinating under favorable conditions
- Seeds can reduce or eliminate their dormancy and initiate germination in response to environmental signals:
 - Temperature fluctuation (sensing soil depth)
 - Light exposure
 - Proper soil moisture and temperature
- Crop management practices can modify those signals



Effect of light exposure during tillage on weed emergence



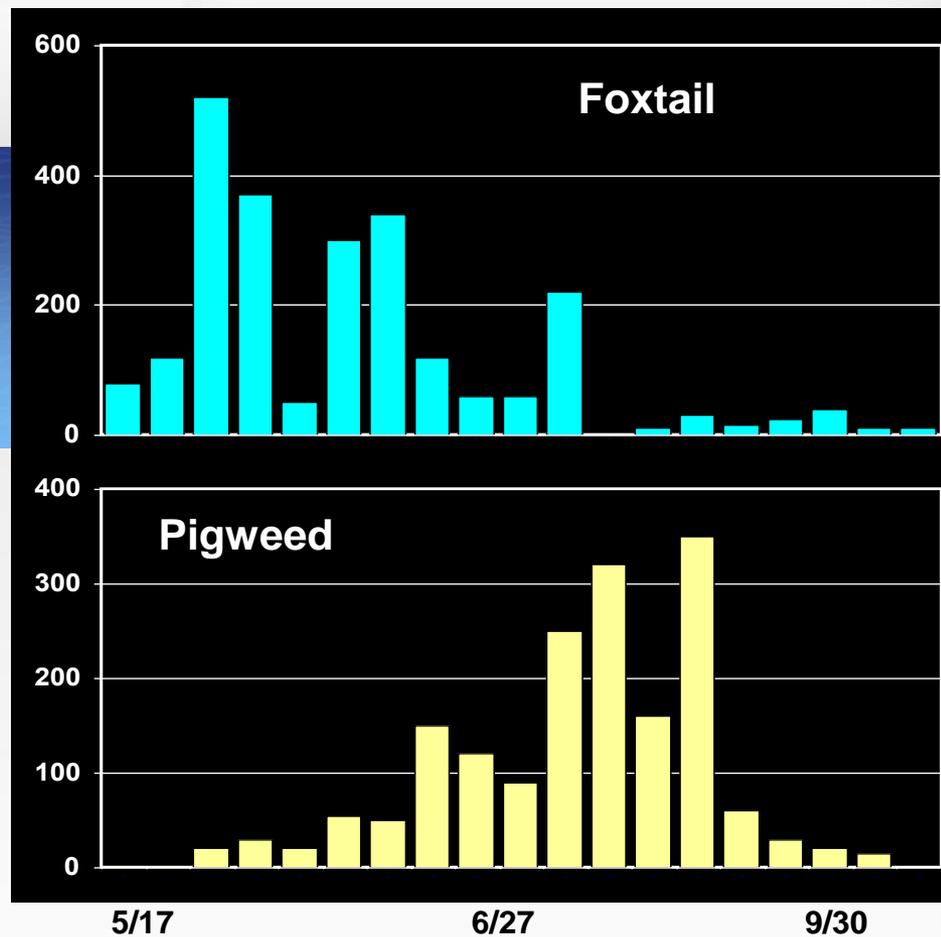
Soil disturbance helps deplete weed seedbank



Emergence patterns

- Most weed species emerge during an extended period of time
 - Differences in dormancy level
 - Soil variability

- Direct impact on weed control timing and success





Tillage modifies weed emergence patterns

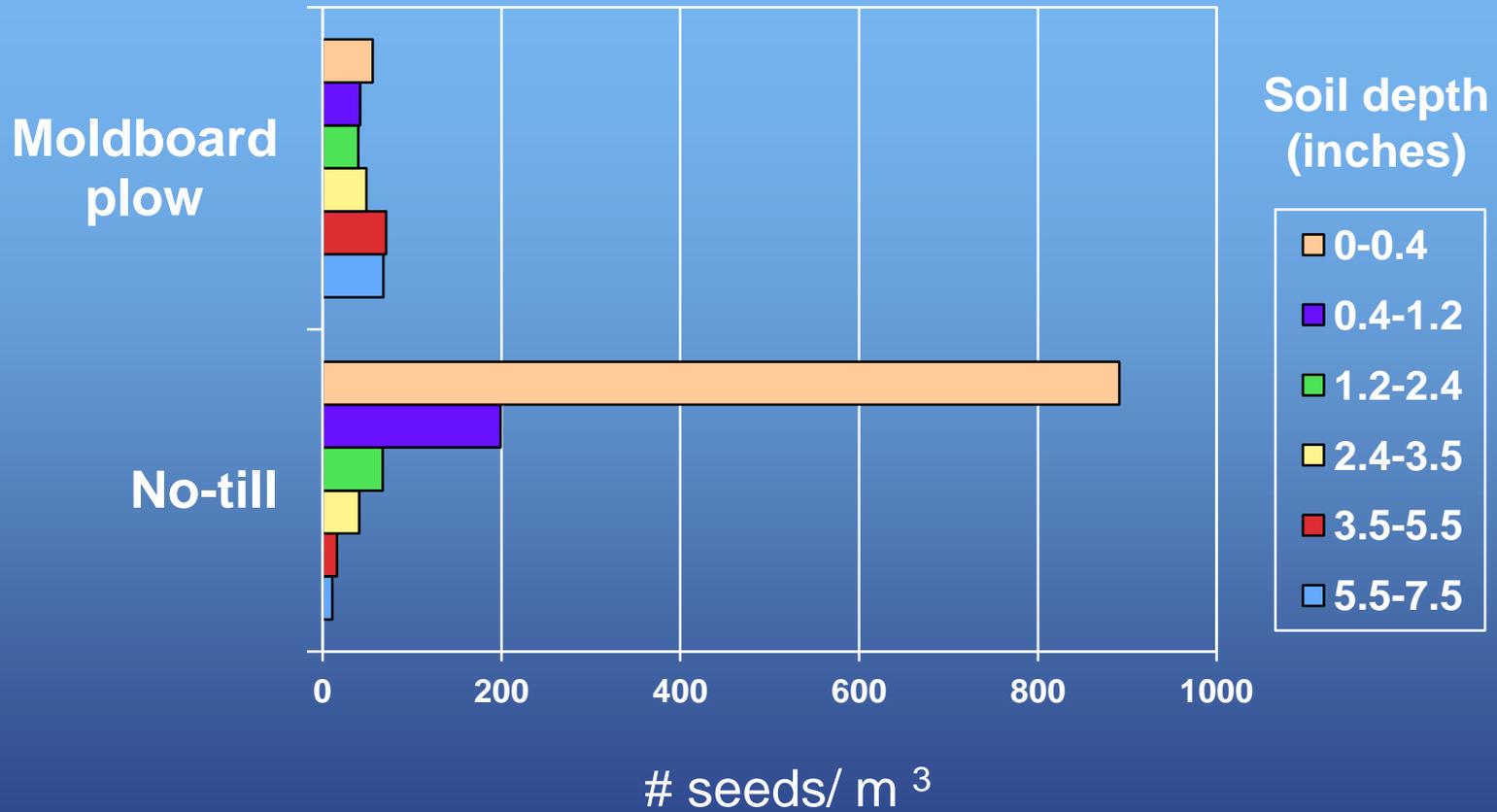
● Tillage:

- More temperature fluctuation
- Weed seed distribution within soil profile
- Fewer seeds in the bank
- More seeds in “safe sites”
- Erosion problems and reduction in organic matter

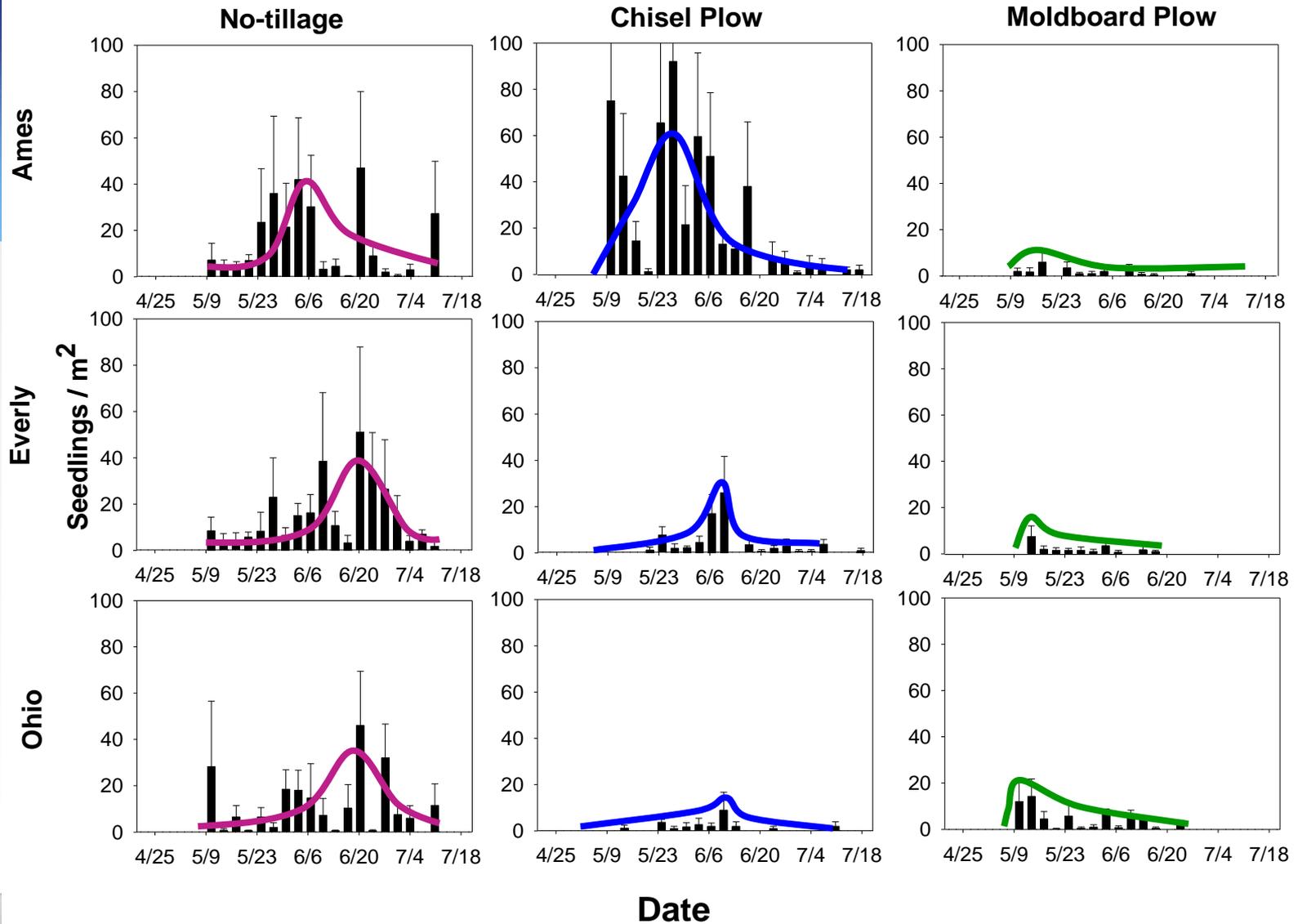
● No-tillage:

- More plant residues
- Delays soil warming during spring
- More soil moisture
- Slower and longer emergence patterns
- More seeds in the bank
- Fewer seeds in “safe sites”

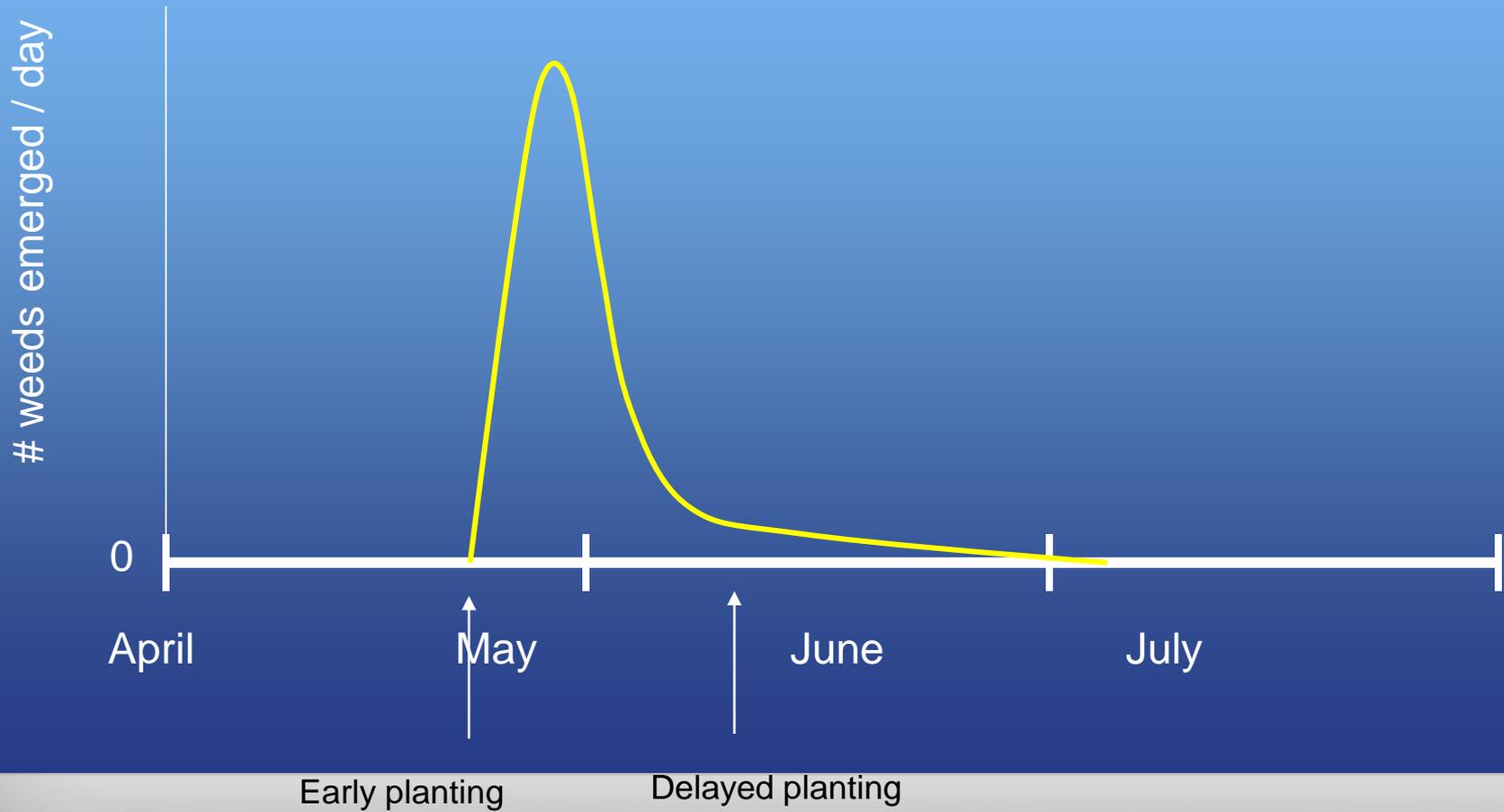
Seed distribution within soil profile



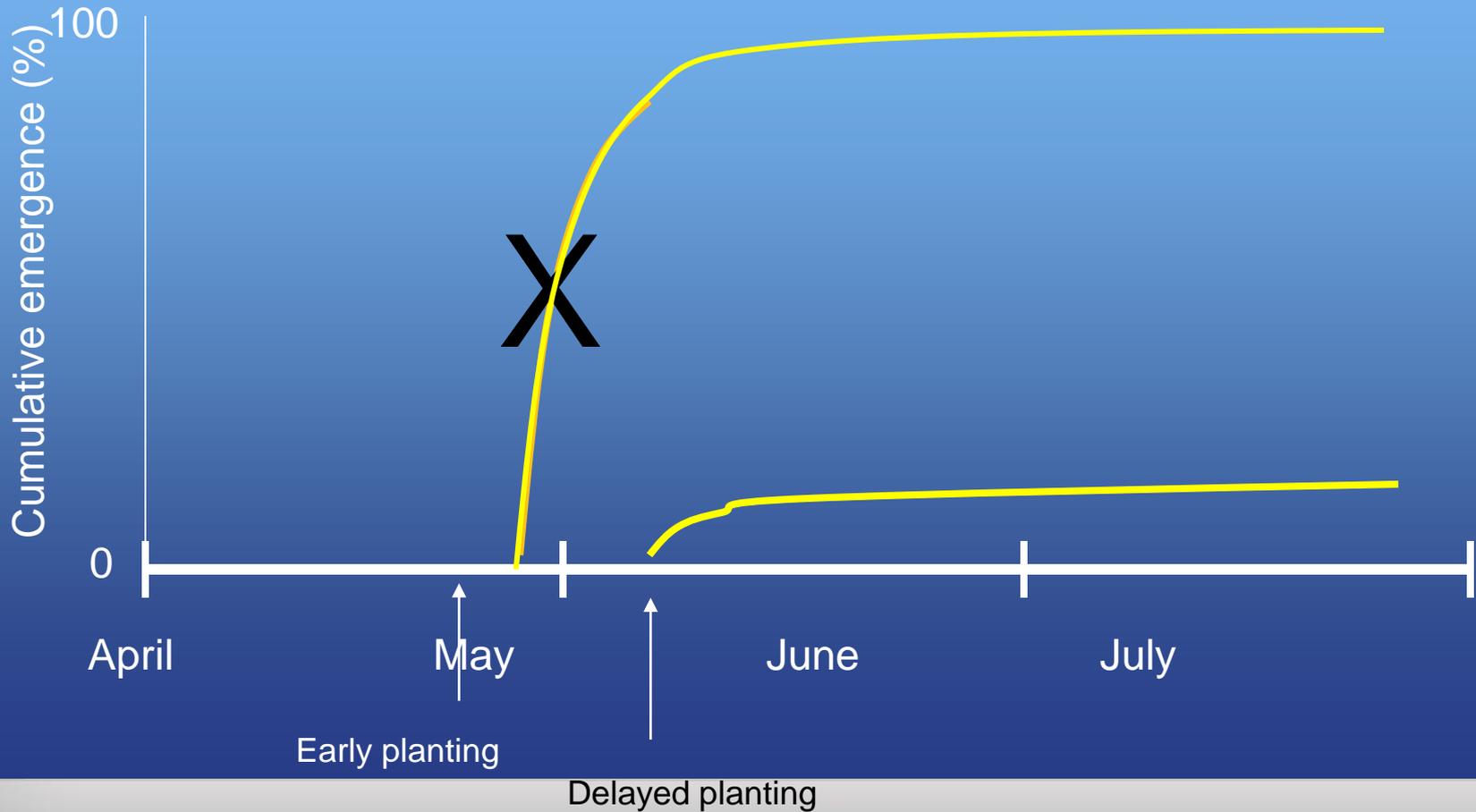
Emergence patterns in waterhemp



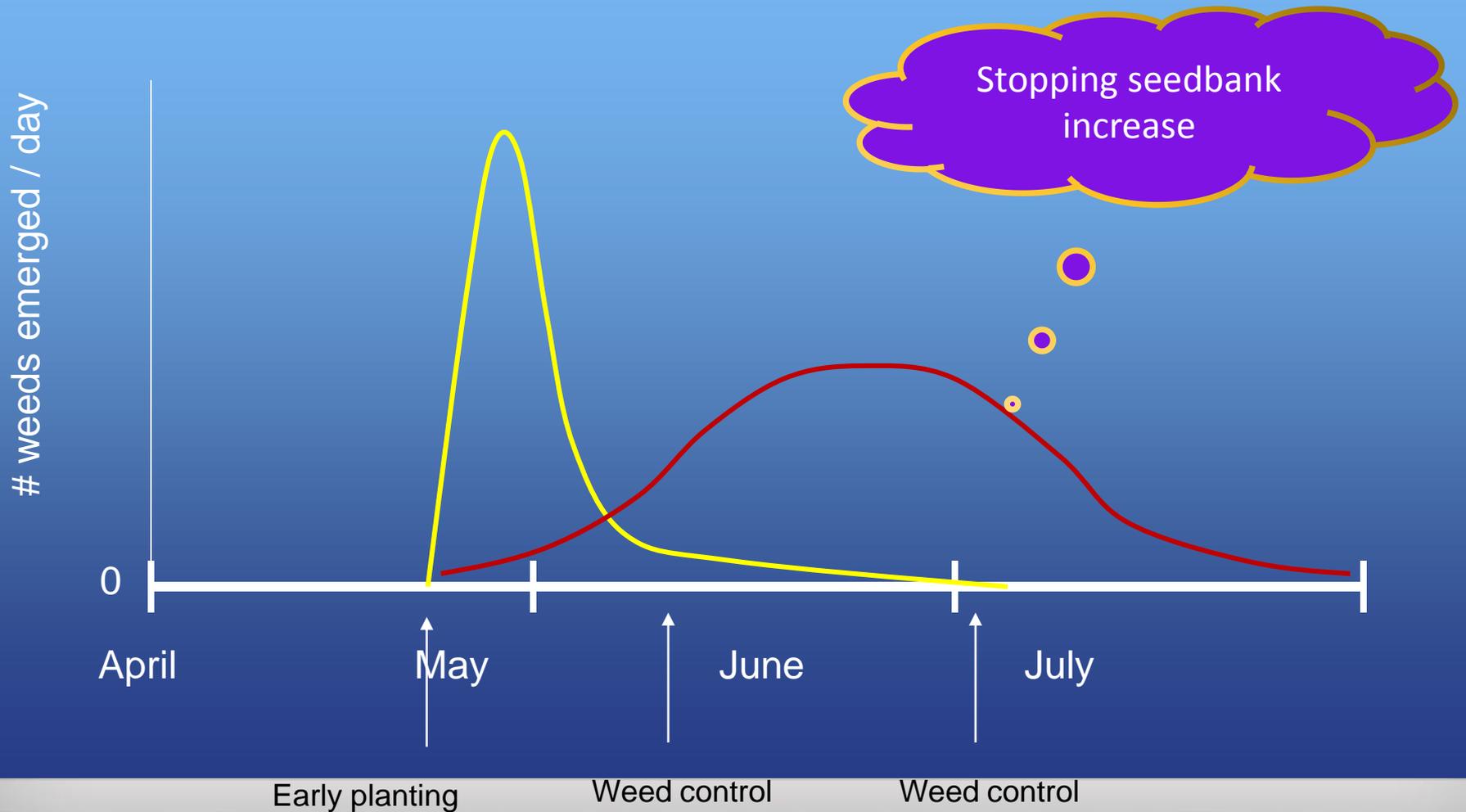
Control timing



Control timing



Control timing





Seedbank increases

- Preventing weed competition is usually the main goal
- For long term weed control, preventing weed seed production should be equally important
- Good early season control does not translate into reductions in weed seedbanks if weeds escaping control are allowed to produce new seeds

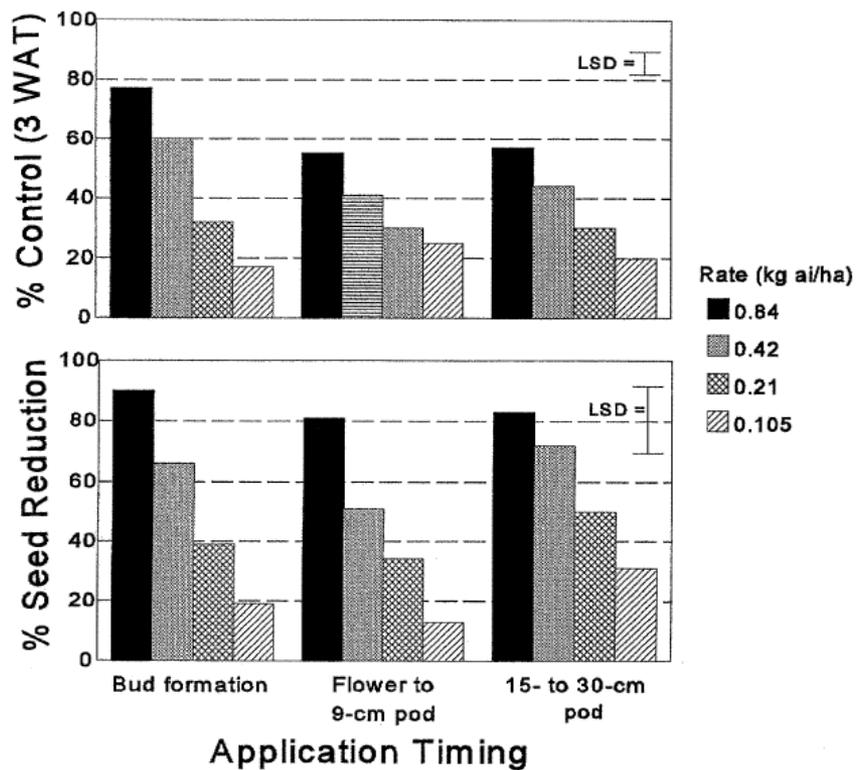


Off season control

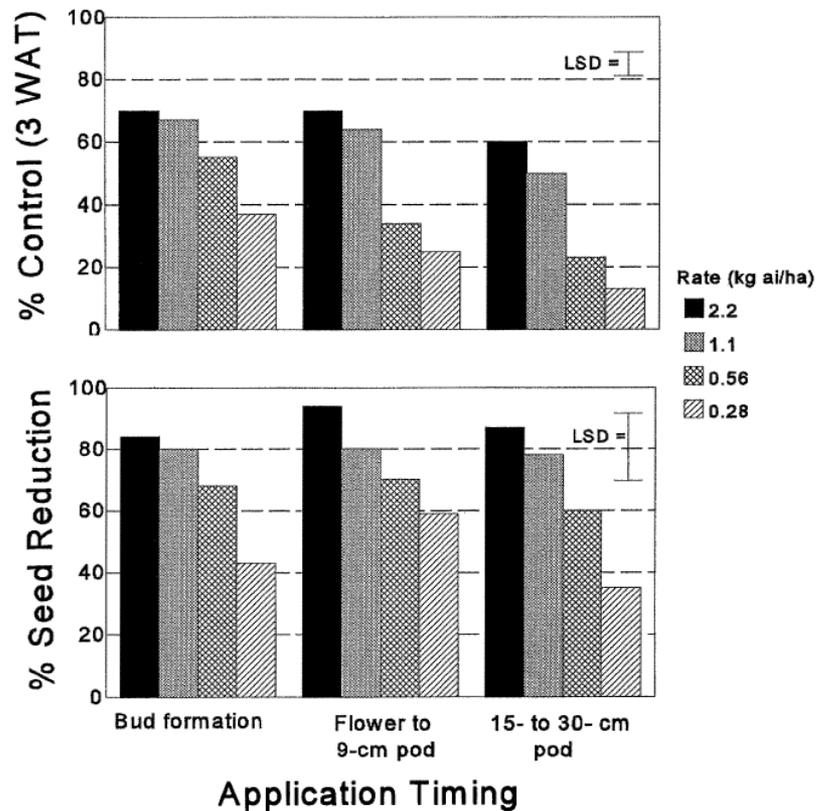
- After harvest weed control
 - Mechanical or chemical
 - Broad spectrum options
 - Be careful with herbicide applications on flowering weeds
 - Likely not to kill the plants, but it might reduce seed production
 - Cost/benefit not clear yet
- Mowing timing considering weed flowering
- Cover cropping
- Dense canopies

Sicklepod seed production after late-season herbicide applications

Glufosinate



Dicamba

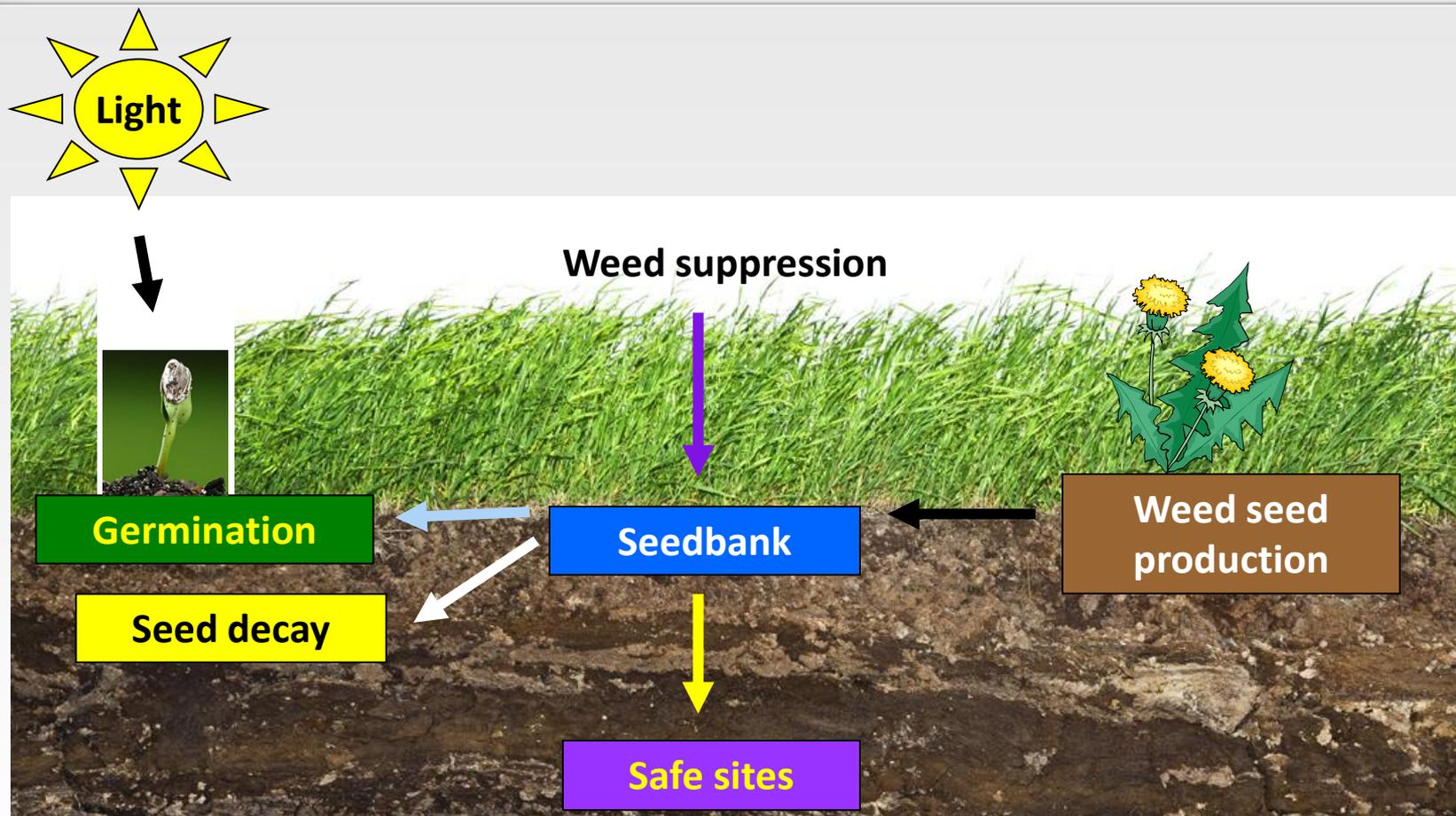




Assessing the success of your weed management

- Weed seedbanks should decrease over time
- The only way to know is to let weeds emerge (no PRE herbicides)
- Make sure that weed populations “look” under control
- Promote early weed emergence if irrigation, tillage or reduced-tillage are part of your production system
- Be ready to control with POST actions

Don't forget, for long term weed management, the goals are:



- Promote “**withdrawals**” (seed germination and decay)
- Prevent “**deposits**” (reduce new seed production)



Conclusions

- The seedbank is the “real” weed problem in your farm
- Agricultural management practices can promote weed seed germination, mortality or persistence
- In order to reduce weed seedbanks it is important to promote germination and especially prevent new seed production
- Reductions in the seedbank should allow reductions in weed control cost in the long run



Questions?