



PART 1

Timing of Weed Control, Weed Control Failure, and Technology for Weed Management

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Why Control Weeds?



Weed Pressure in Table Beets



Weeds in Corn

Palmer Amaranth in Cotton, Soybean, Corn



Yield Loss, Reduced Harvest Efficiency

Dodder (*Cuscuta* spp.)



Parasitism

Alternate Hosts



Tree of Heaven



**Spotted
Lanternfly**



Groundsel



Nettle



Puncturevine

Hazardous or Toxic

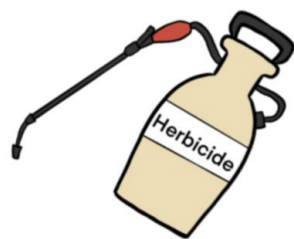
Impacts on Ecosystem Services



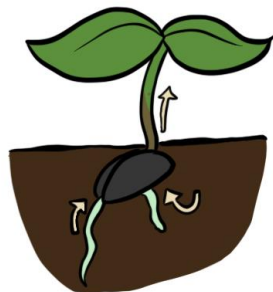
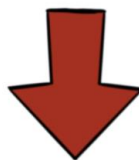
When Should we Control Weeds?

(When Should I Apply Herbicides...?)

Herbicides Defined Based on Timing



Soil Applied



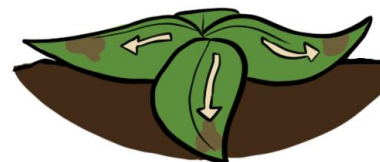
Herbicide is taken up by developing roots and shoots



Systemic Foliar



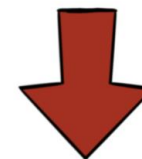
Applied on plant tissues



Herbicide is translocated to the site of action

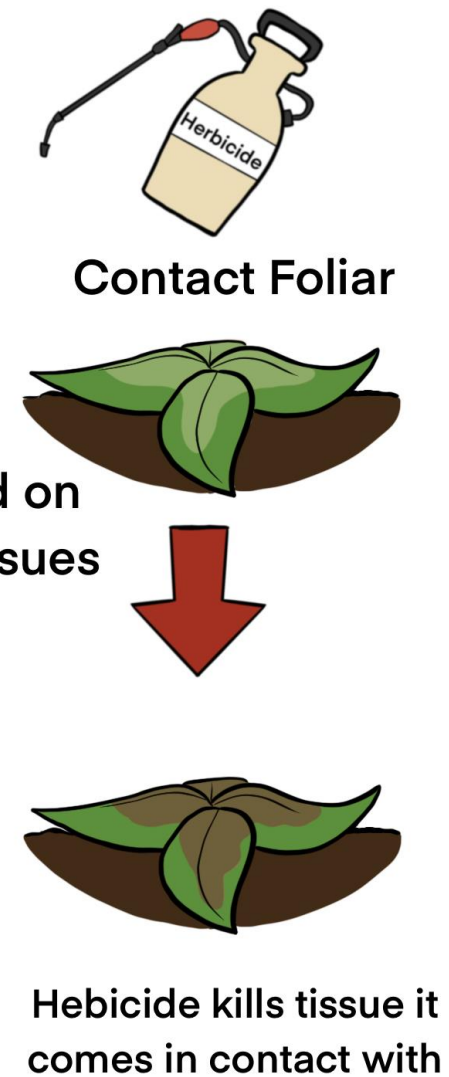
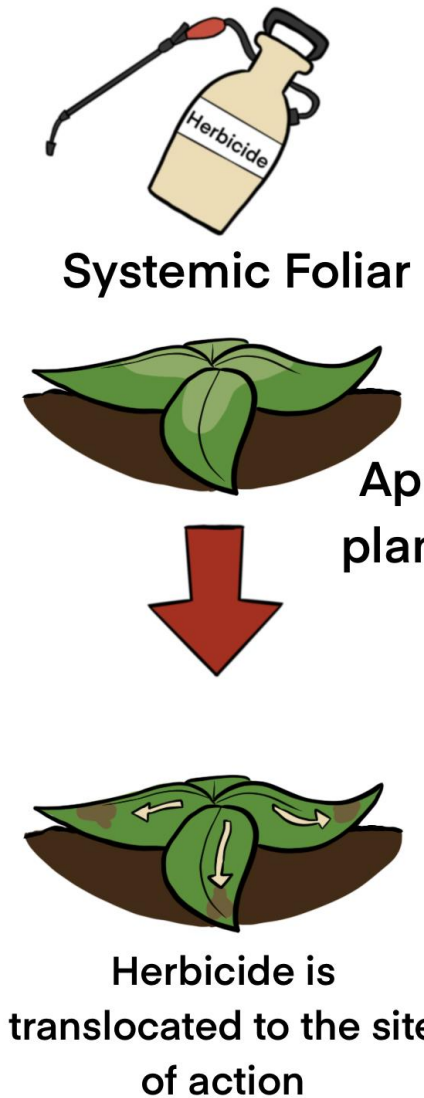
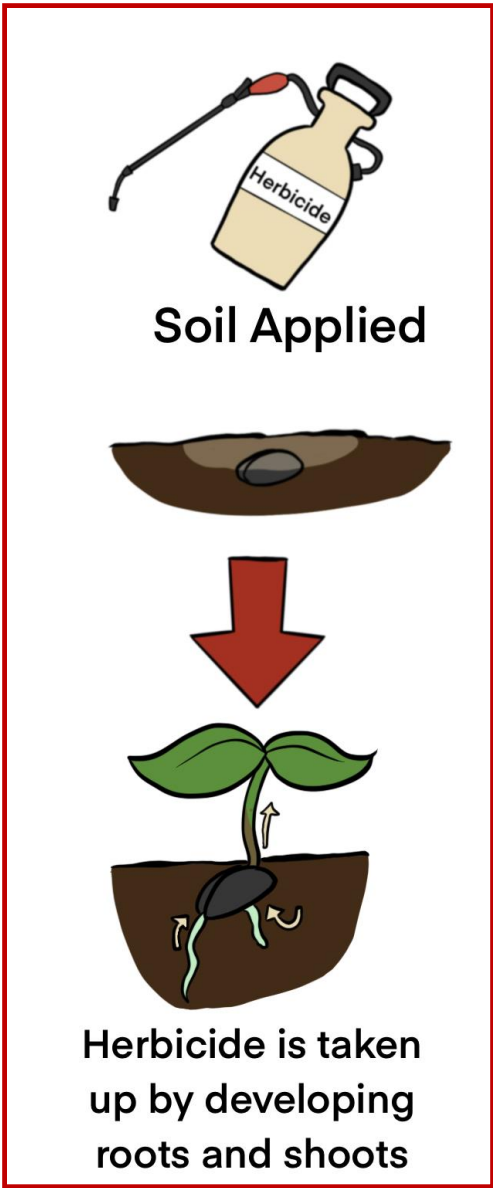


Contact Foliar



Herbicide kills tissue it comes in contact with

Herbicides Defined Based on Timing



Applied on plant tissues

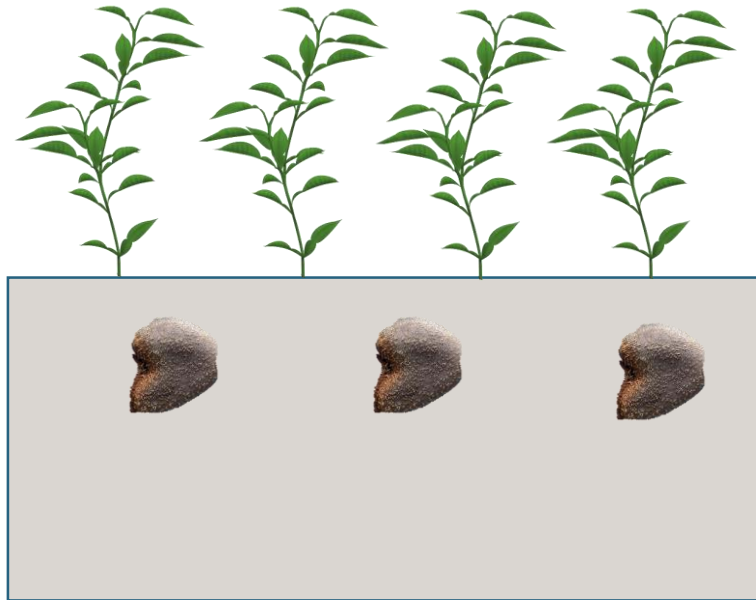
Herbicide Definitions

Pre-emergence to
crops and weeds

Prevent weed establishment

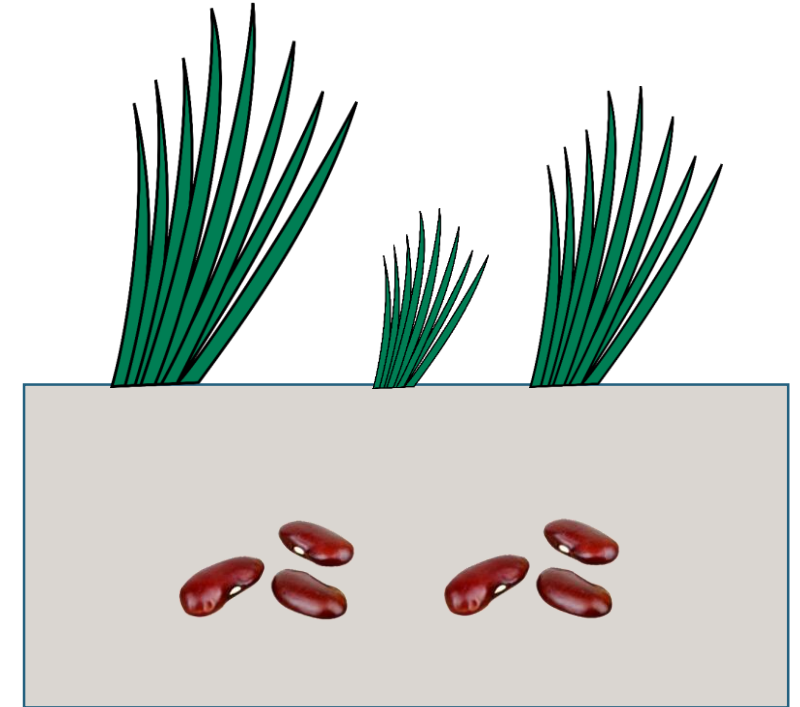


Pre-emergence
to weeds



Pre-emergence
to crop

Control emerged weeds



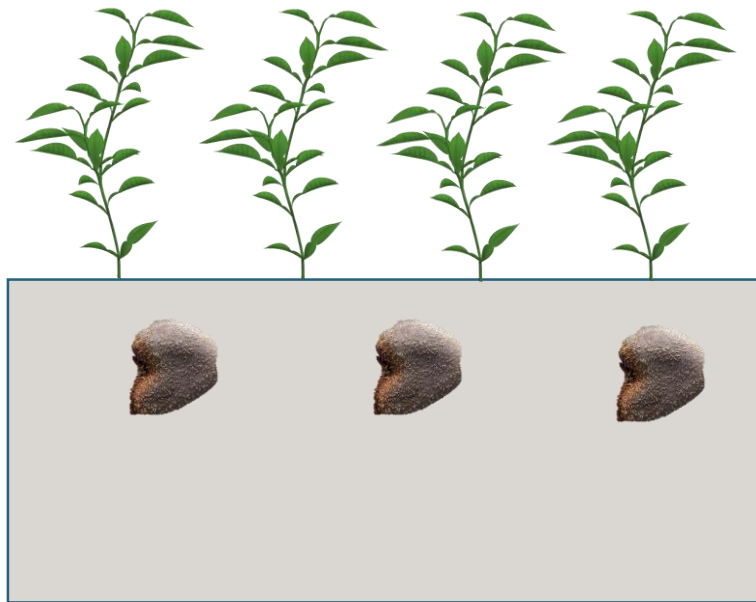
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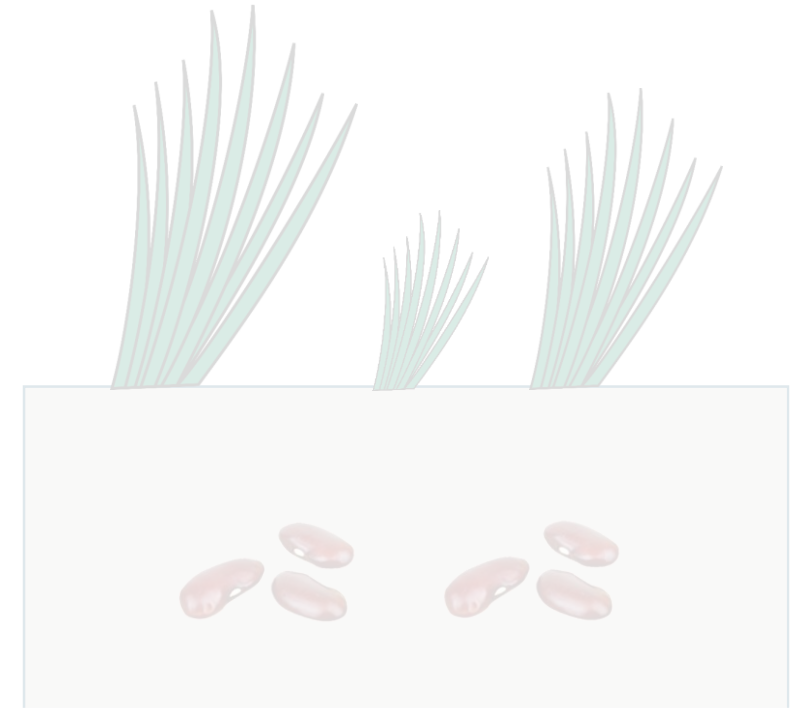


Pre-emergence
to weeds



Pre-emergence
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Control emerged weeds



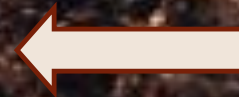
HOW DO PRE-EMERGENCE HERBICIDES WORK?

Applied to the soil surface, moisture (rain or irrigation) dissolves the herbicide in the soil solution where it is absorbed by developing roots, shoots

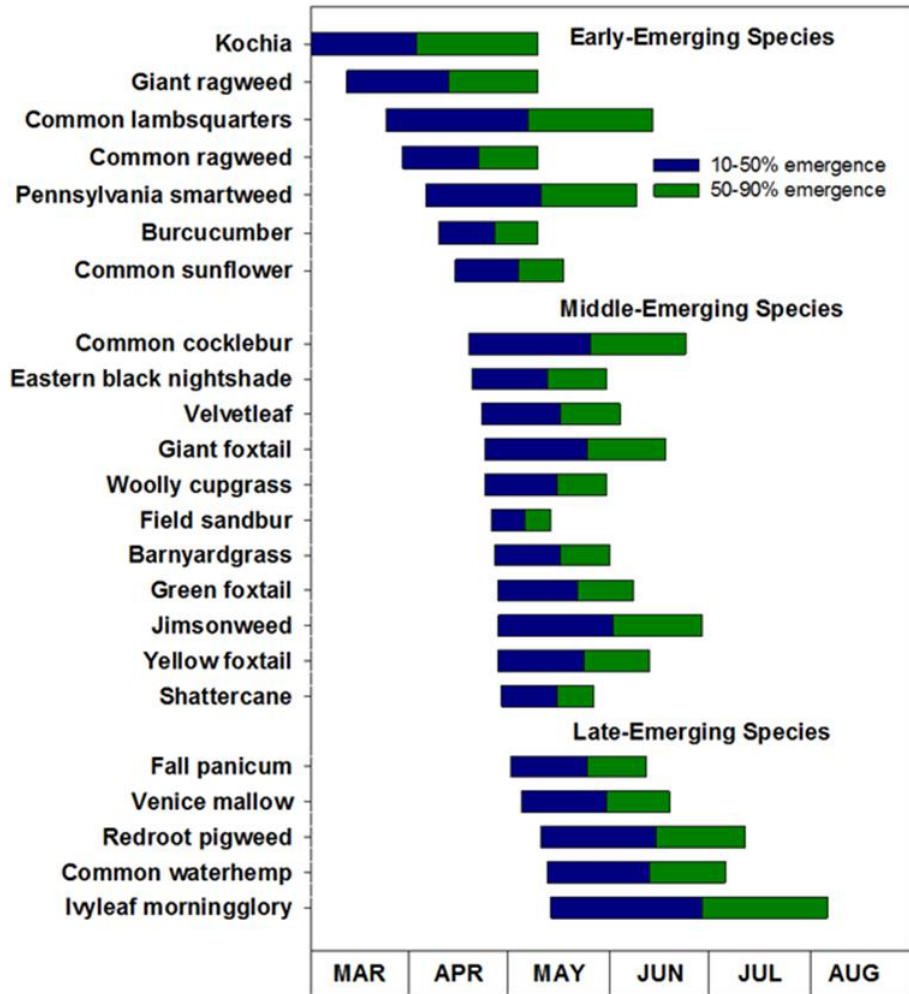
Developing Shoot



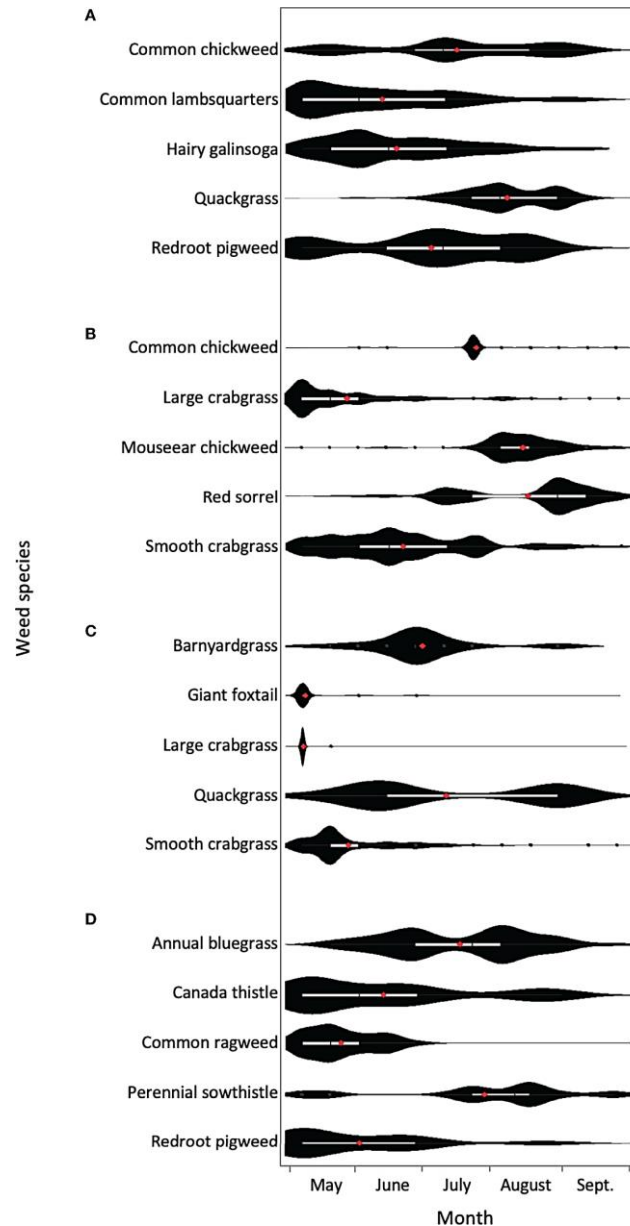
Developing Roots



SUMMER ANNUAL WEED EMERGENCE SEQUENCE



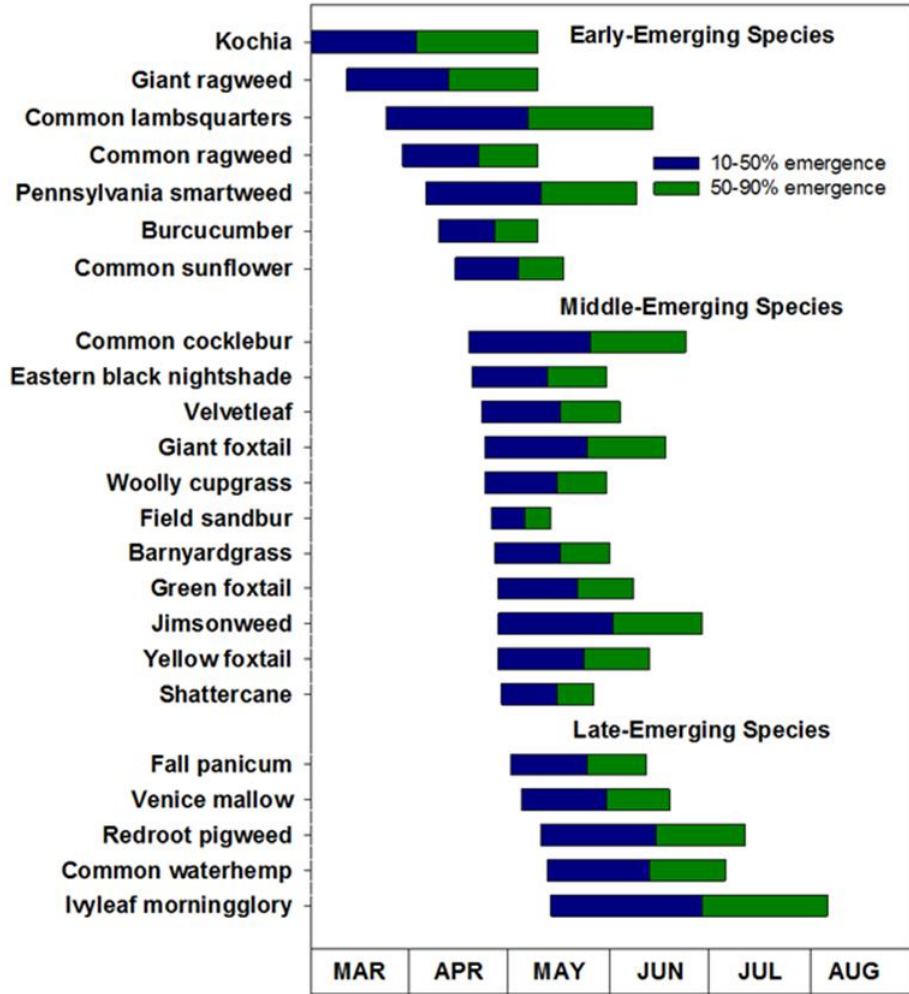
Rodrigo Werle, Lowell D. Sandell, Douglas D. Buhler, Robert G. Hartzler, and John L. Lindquist (2014) Predicting Emergence of 23 Summer Annual Weed Species. *Weed Science*. 62:267-279.



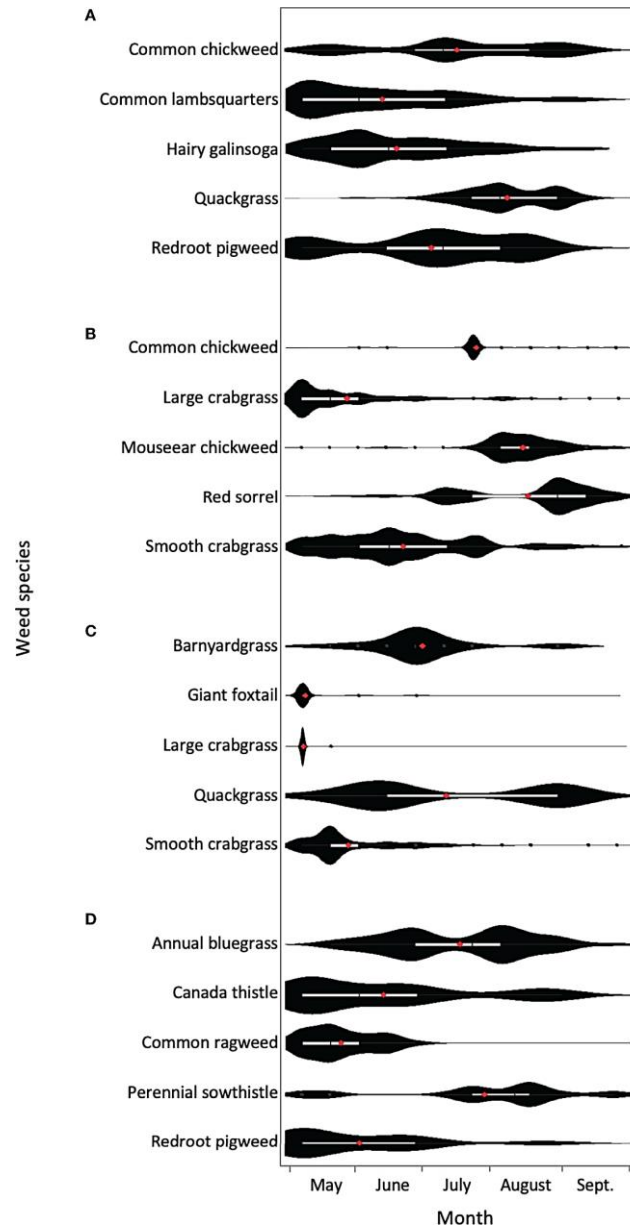
Pre-emergence (“soil”, “residual”) herbicides must be applied before weeds successfully emerge and become established

Some products may also have burn-down capabilities (but weed spectrums may vary by use)

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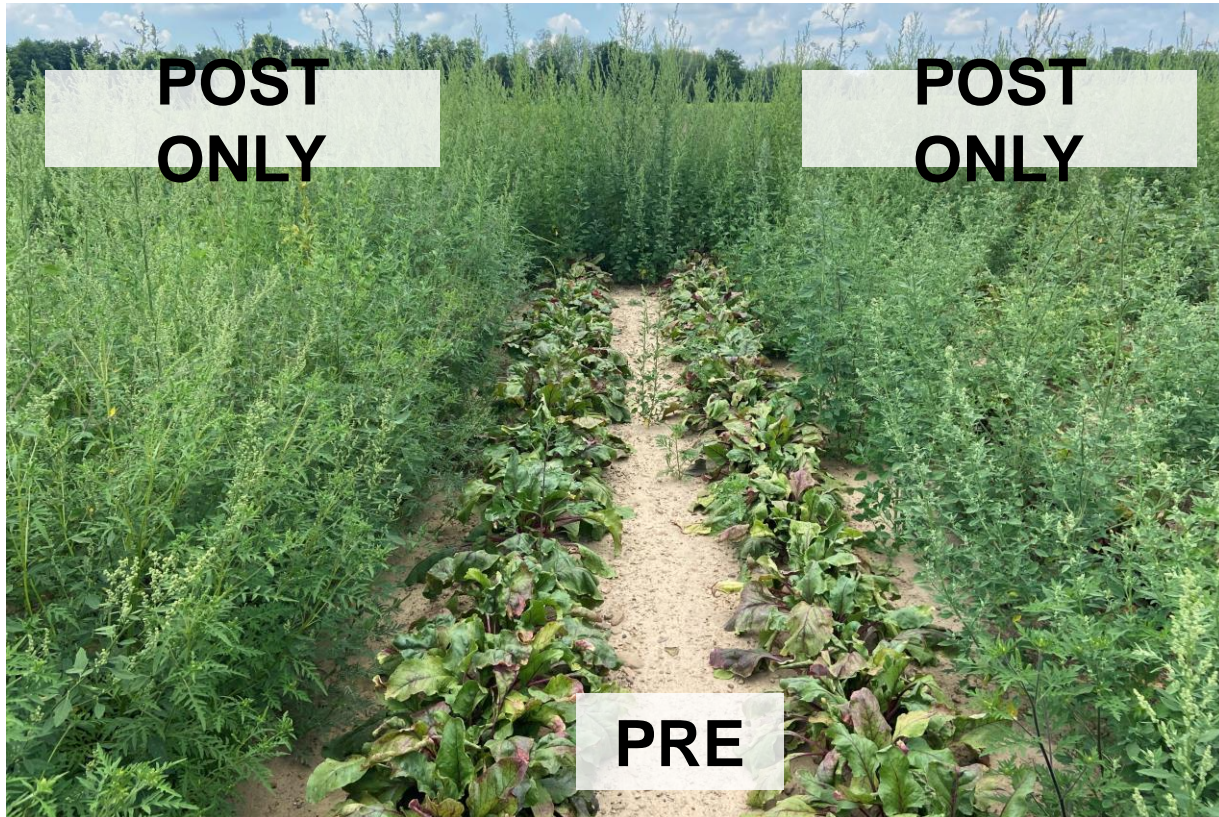
When to apply depends in part on **WHAT SPECIES** you are targeting

What if I have species that germinate at different times or have different germination windows?

Sequential treatments, or the inclusion of other control strategies may be needed

It is also dependent on the crop that you are growing (does the residual herbicide fit into crop at the appropriate timing from safety, efficacy, and residue standpoints)

The Power of PREs in Beets



Pre-emergence herbicides applied at or near planting can help reduced competitive interactions during early crop growth stages



Untreated



POST only



PRE, POST



Untreated

The image shows three vertical panels of a field. The left panel, labeled 'Untreated', shows a dense growth of green weeds and grasses. The middle panel, labeled 'Prowl H2O', shows a field with fewer weeds, mostly small green plants and some grasses. The right panel, labeled 'Dual Magnum', shows a field with very few weeds, mostly bare brown soil with some small green plants. The text 'Note the variability in spectrum' is written across the bottom of all three panels.

Prowl H₂O

**Dual
Magnum**

Note the variability in spectrum

DINITROANILINE SUPPRESSION OF BINDWEED

2 WAT



Treflan

Prowl H2O

UTC

3 WAT



Treflan

Prowl H2O

UTC

4 WAT

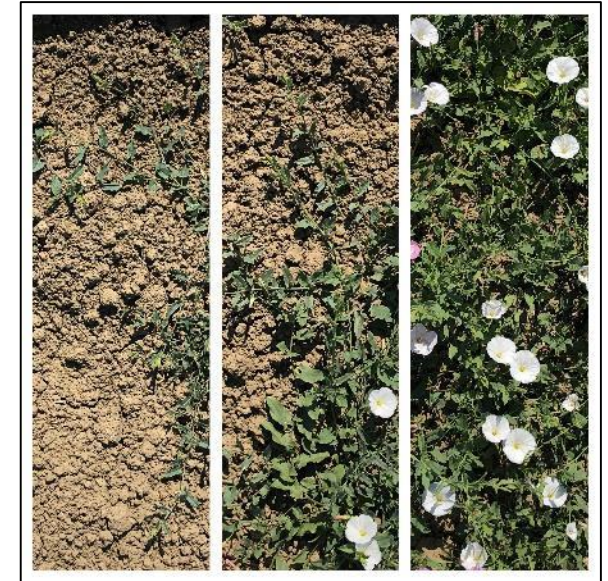


Treflan

Prowl H2O

UTC

5 WAT



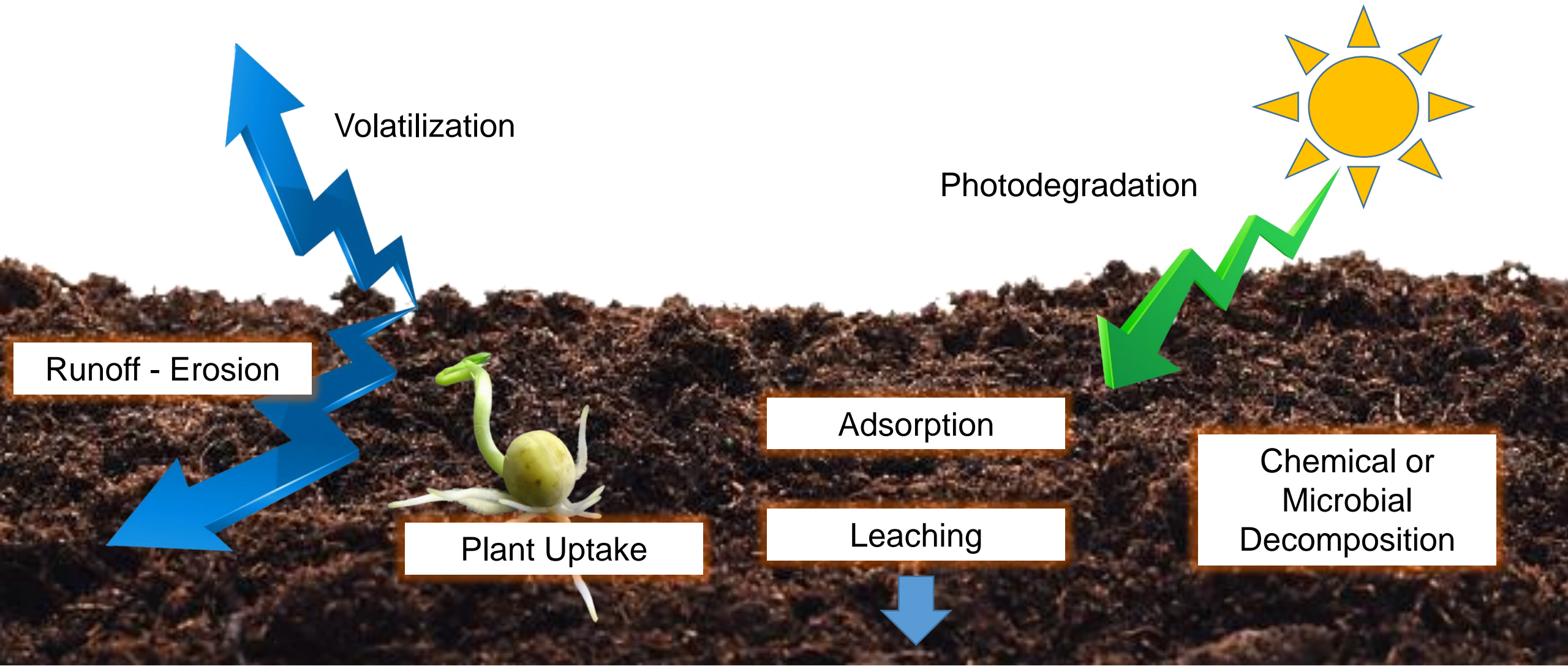
Treflan

Prowl H2O

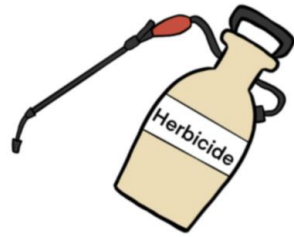
UTC

Herbicide Dissipation

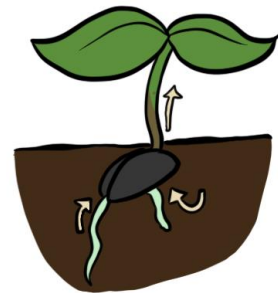
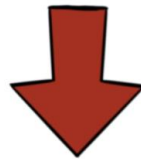
Those herbicides aren't going to last in the soil forever



Herbicides Defined Based on Timing



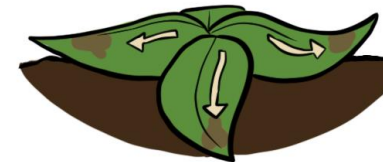
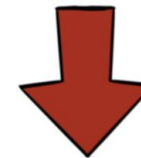
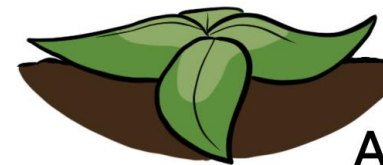
Soil Applied



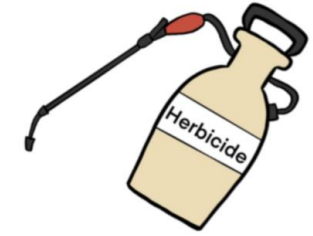
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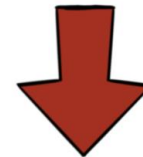
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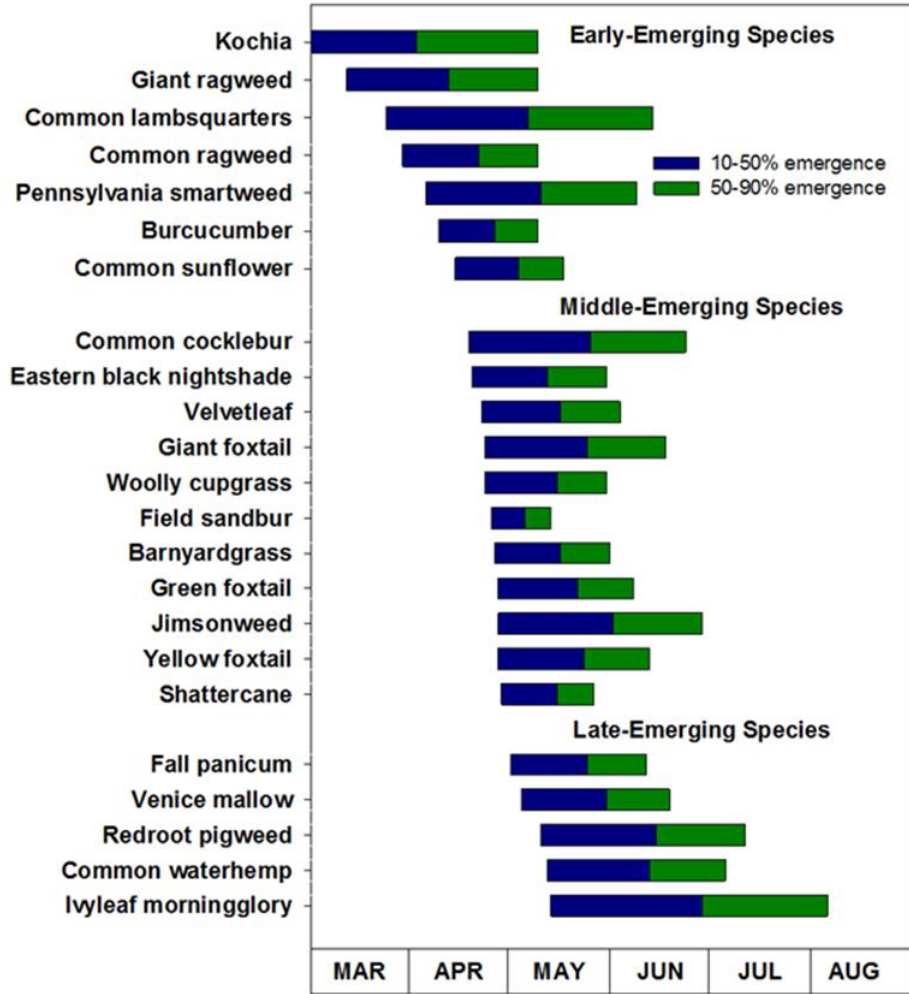
Contact Foliar



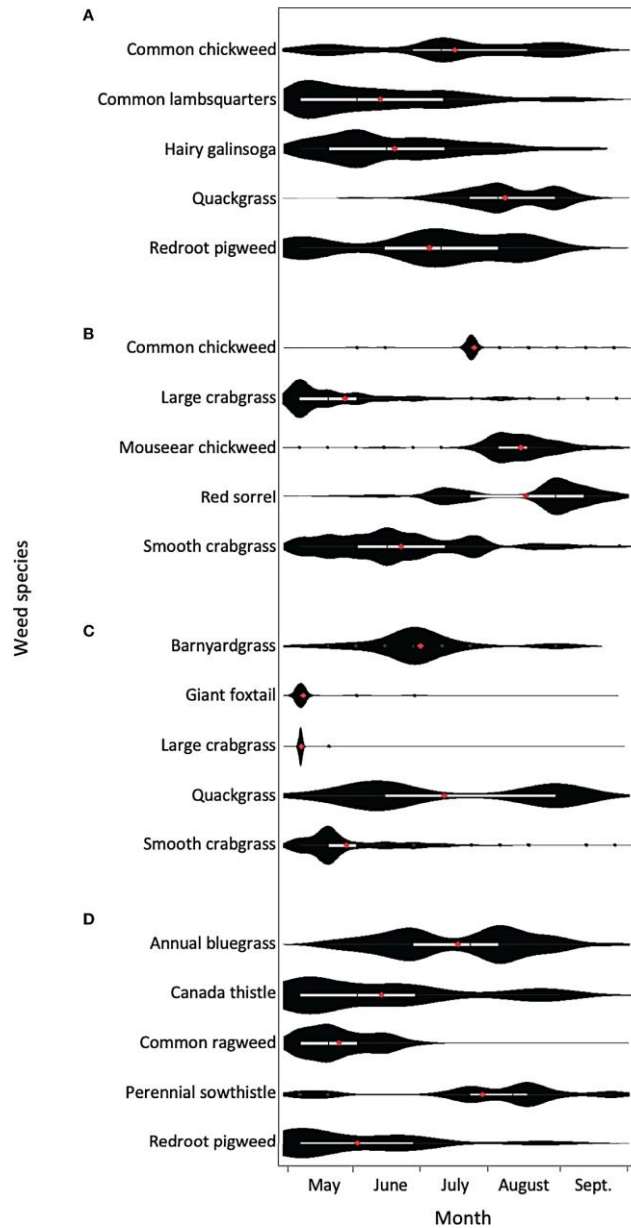
Herbicide kills tissue it comes in contact with

Applied on plant tissues

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Post-emergence herbicide timing is also dependent on **WHAT SPECIES** you are targeting

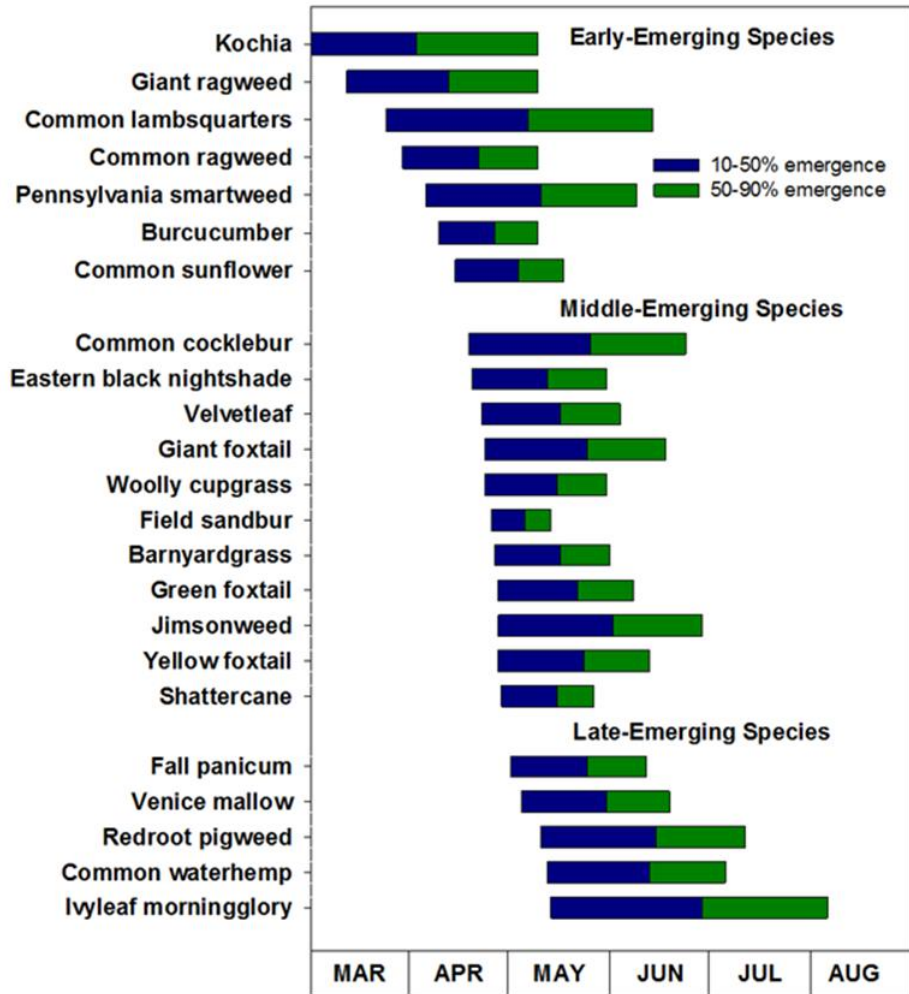
The species needs to physically present to be controlled with foliar-applied post-emergence herbicides

The species also needs to be at a **STAGE OF DEVELOPMENT** where it is sensitive to control

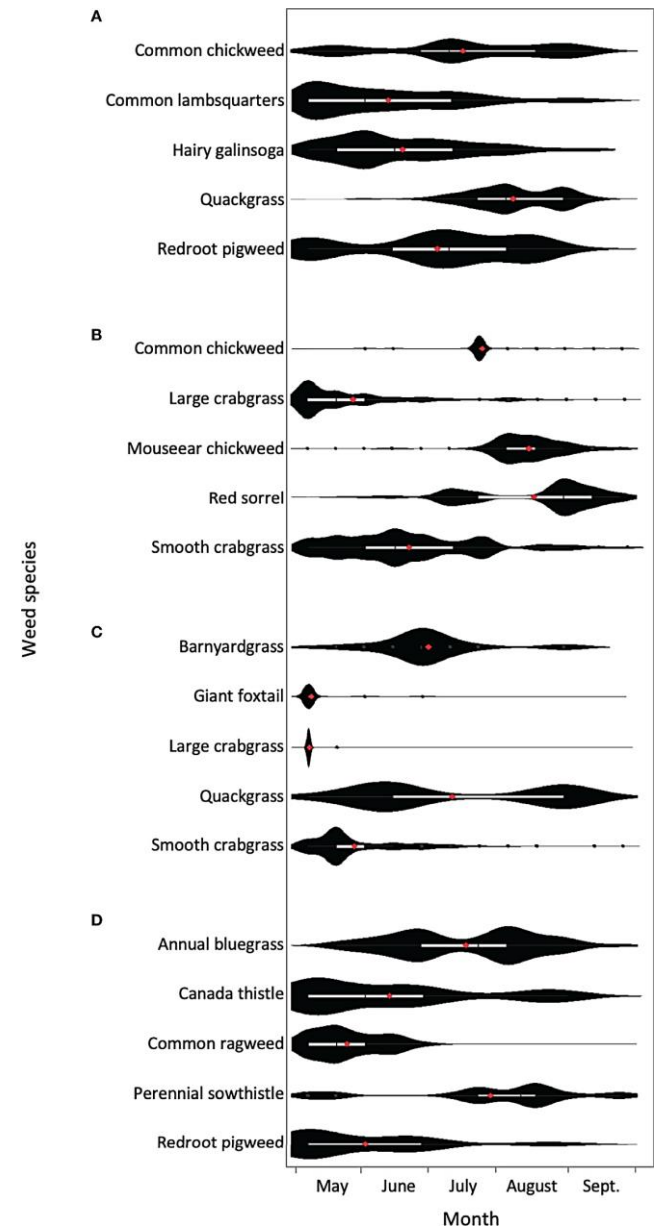
The smaller the better

It is also dependent on the crop that you are growing (does the herbicide fit into crop at the appropriate timing from safety, efficacy and residue standpoints)

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Communities that are a mix of species with different emergence windows (or species with long emergence windows) can be difficult to manage

Sequential POST treatments may be required to ensure that weeds are treated when they are most sensitive

Delaying applications could result in reduced weed control if adequate spray coverage can't be achieved due to shielding, weeds are large enough to regrow following treatments

Selection pressure...

THE PROBLEM WITH “WAITING” FOR POST CONTROL

([HTTP://BULLETIN.IPM.ILLINOIS.EDU/?P=2024](http://bulletin.ipm.illinois.edu/?P=2024))

Time



Volunteer Pea Control in Snap Beans

Treatment	Pea Biomass (% Untreated)
Sandea PRE 0.66 oz/A	45 ↓
Sandea POST 0.66 oz/A 2 nd Trifoliate	40 ↓
Sandea POST 0.66 oz/A 4 th Trifoliate	118



Volunteer Pea Control in Snap Beans

Treatment	Snap Bean Wt (% Untreated)
Sandea PRE 0.66 oz/A	112 ↑
Sandea POST 0.66 oz/A 2 nd Trifoliate	118 ↑
Sandea POST 0.66 oz/A 4 th Trifoliate	77

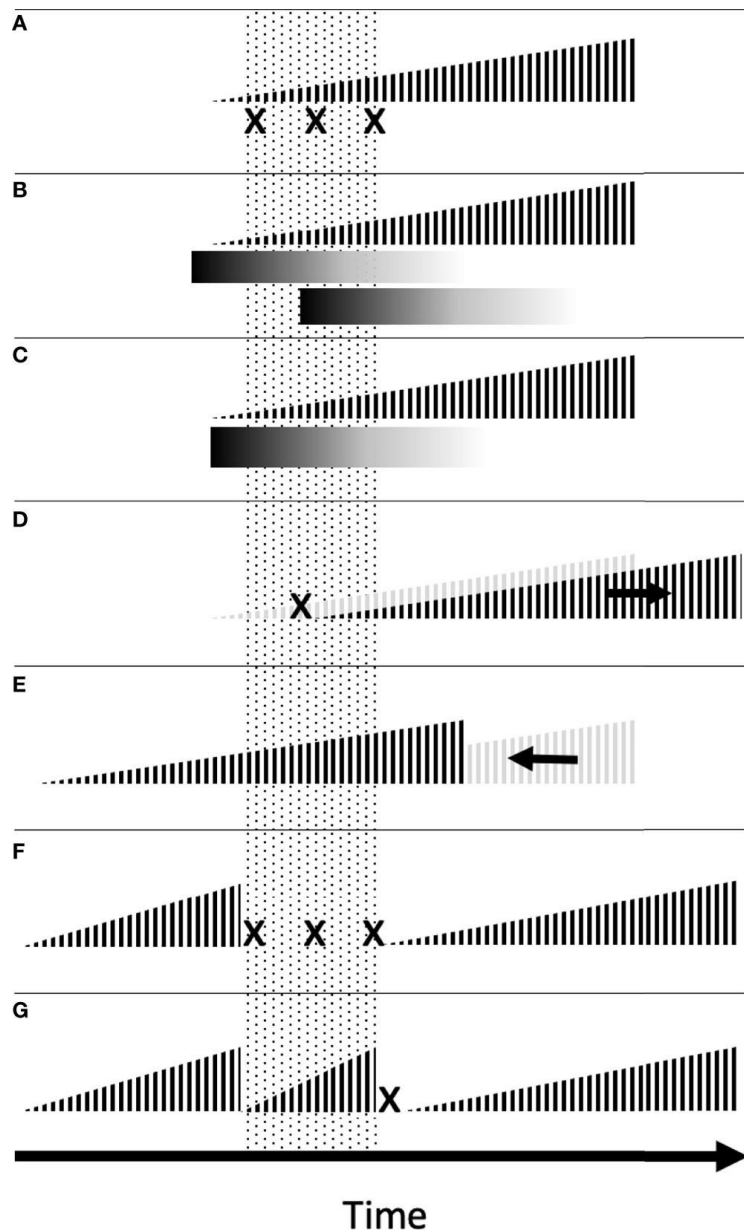


Perennials and the Timing of Weed Control in Apples

Canada thistle – Clopyralid in early spring before budding or in fall on new vegetative tissue before first frost (spring, fall)

Yellow nutsedge – Halosulfuron applications at 3-5 leaf stage (sprouted tubers), sequential applications when new flush (secondary emergence) has 3-5 leaves, glyphosate before nutlet formation (spring, summer)

Field bindweed – Spot treatments of systemic herbicides, like 2,4-D, at flowering through fall (summer, fall)



- A. If the planting date or crop rotation is not flexible, frequent control of weed seedlings
- B. Overlapping residual herbicide applications
- C. Establishment of residue mulch

- A. If the planting date or crop rotation are flexible, the peak emergence period may be targeted by delaying planting to allow pre-plant control of part of the flush
- B. Planting early at high density to expedite crop canopy closure
- C. Adjusting rotation to allow for a bare fallow
- D. Planting a short-season crop that concludes prior to weed seed production

*Height of vertical bars represents the relative crop maturity
Physical, chemical control actions are symbolized with an "x."*

Herbicides are not always completely effective

Wrong herbicide

Incorrect rate or spray volume

Lack or improper use of spray additives

Antagonism, other spray solution issues

Weeds too tall at application

Plant stress

Environmental factors affecting herbicide deposition or activation

Herbicide resistance



Horseweed / Marestalk
(*Erigeron canadensis*)

Horseweed / Marestalk
(*Erigeron canadensis*)



We **USED** to be able to kill this weed with this herbicide at this rate...
...and **NOW WE CAN'T**