Bean leaf beetle and bean pod mottle virus – double trouble in soybean

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A Fork in the Road

Which path do you take?

- bean leaf beetles (late season)
  - manage beetles to prevent physical injury and economic damage

or

- bean pod mottle virus (early season)
  - manage bean leaf beetles to prevent transmission of virus and subsequent economic damage


black
triangle
bean leaf beetle
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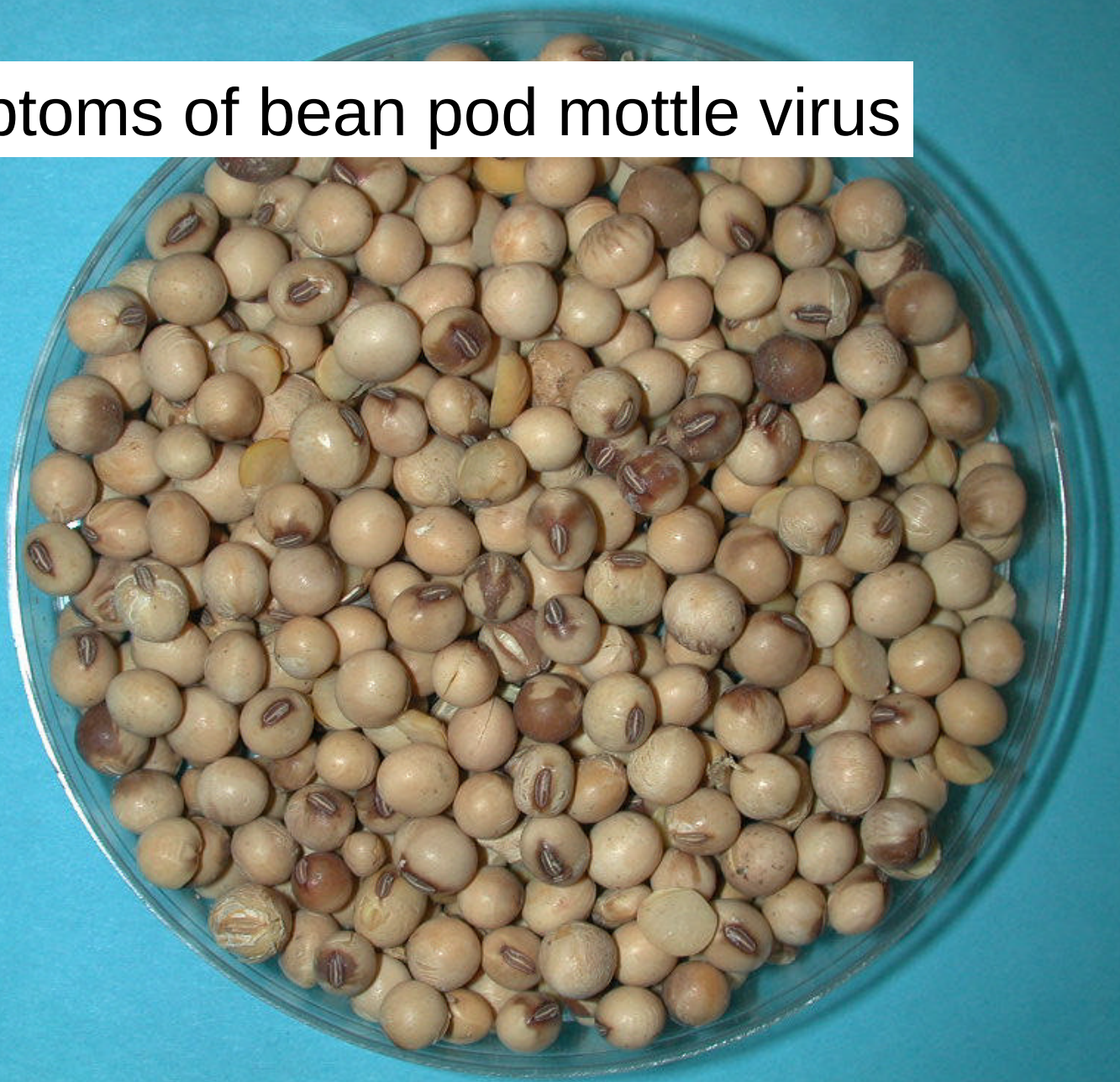
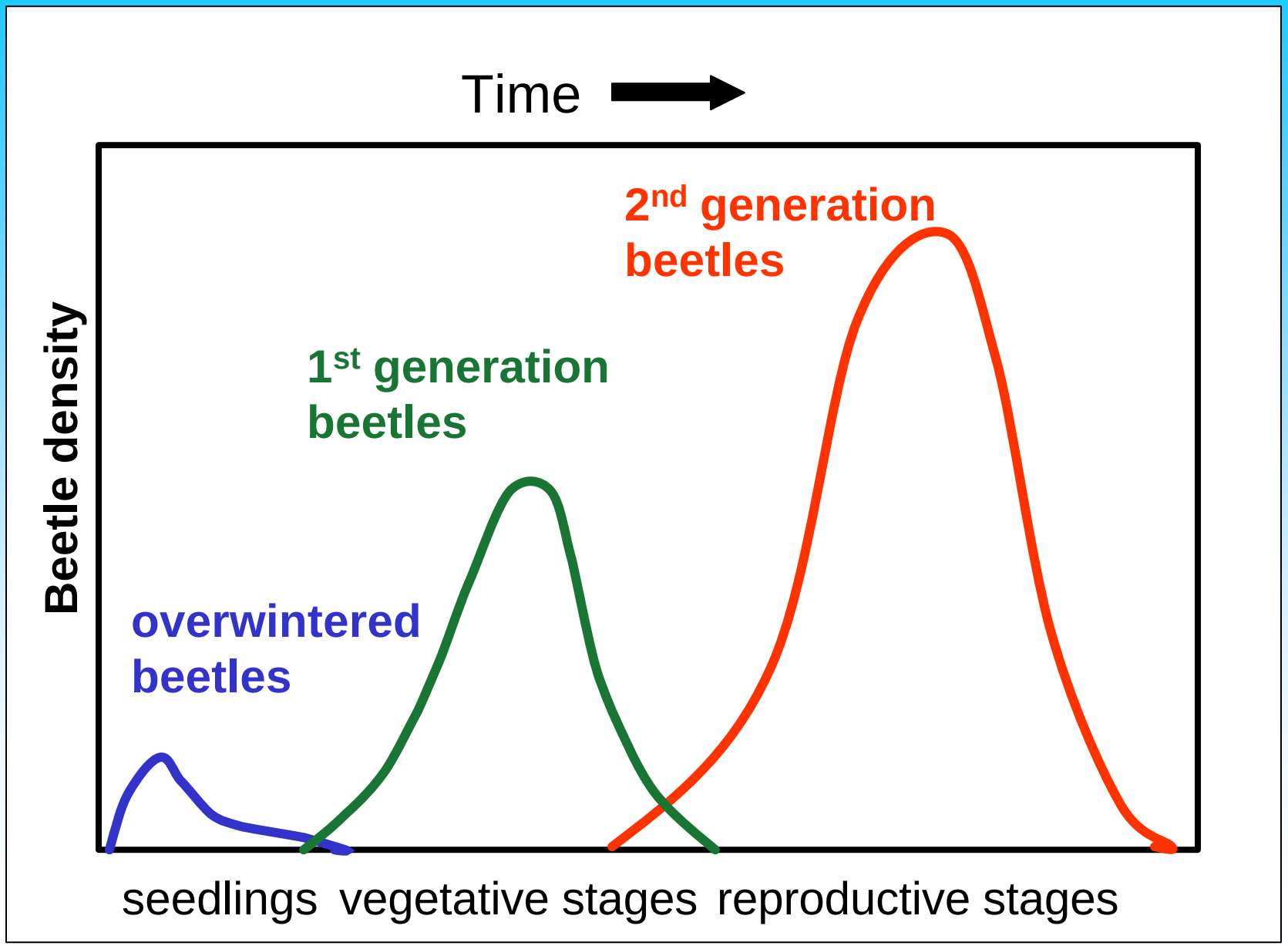
bean leaf beetle
red phase

Bean leaf beetle – the first half of the problem

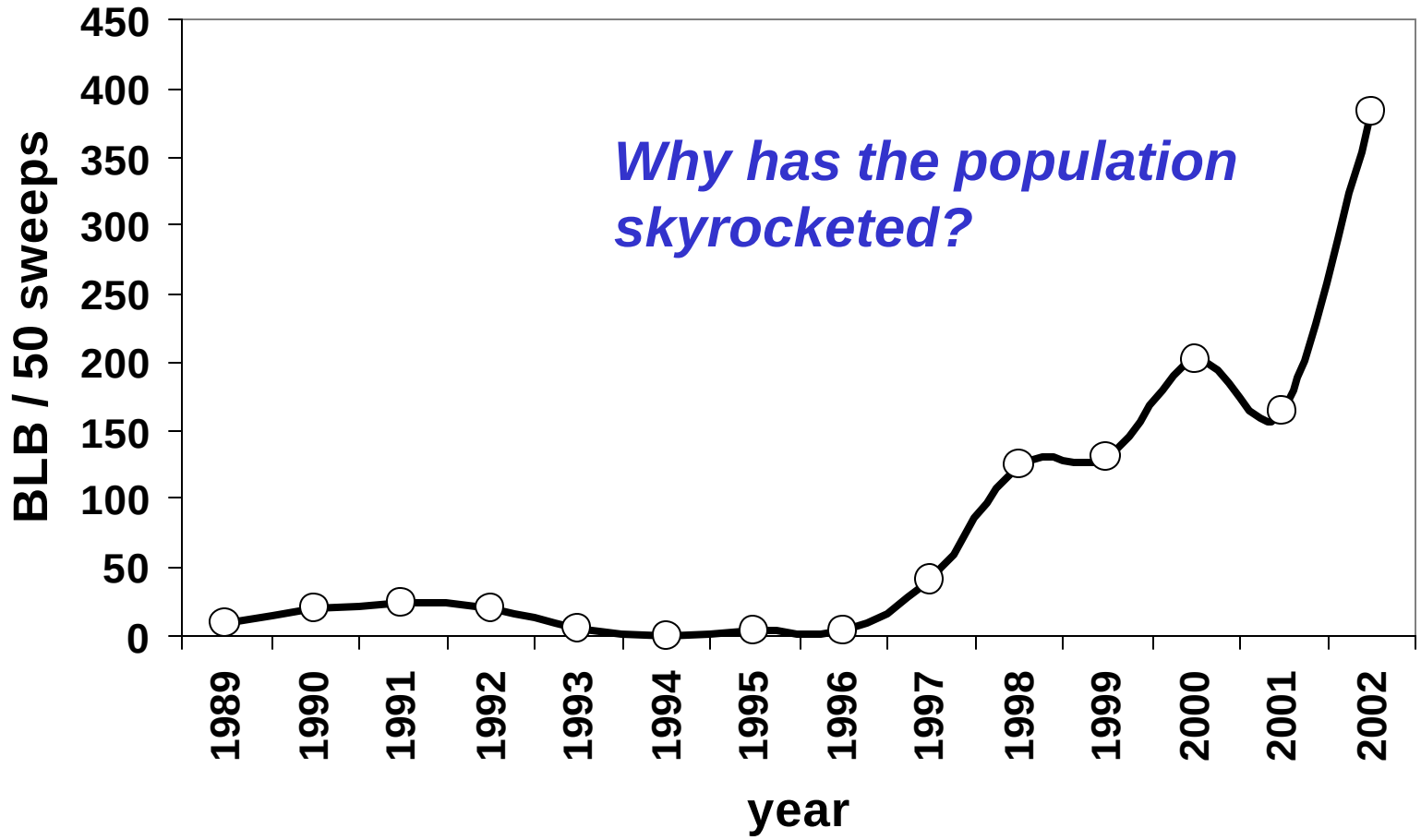
- adults feed on above ground plant parts
  - stems, leaves, especially pods
- larvae feed on soybean nodules
  - impact on yield unknown
- adults transmit bean pod mottle virus
  - confirmed in Iowa in 1999

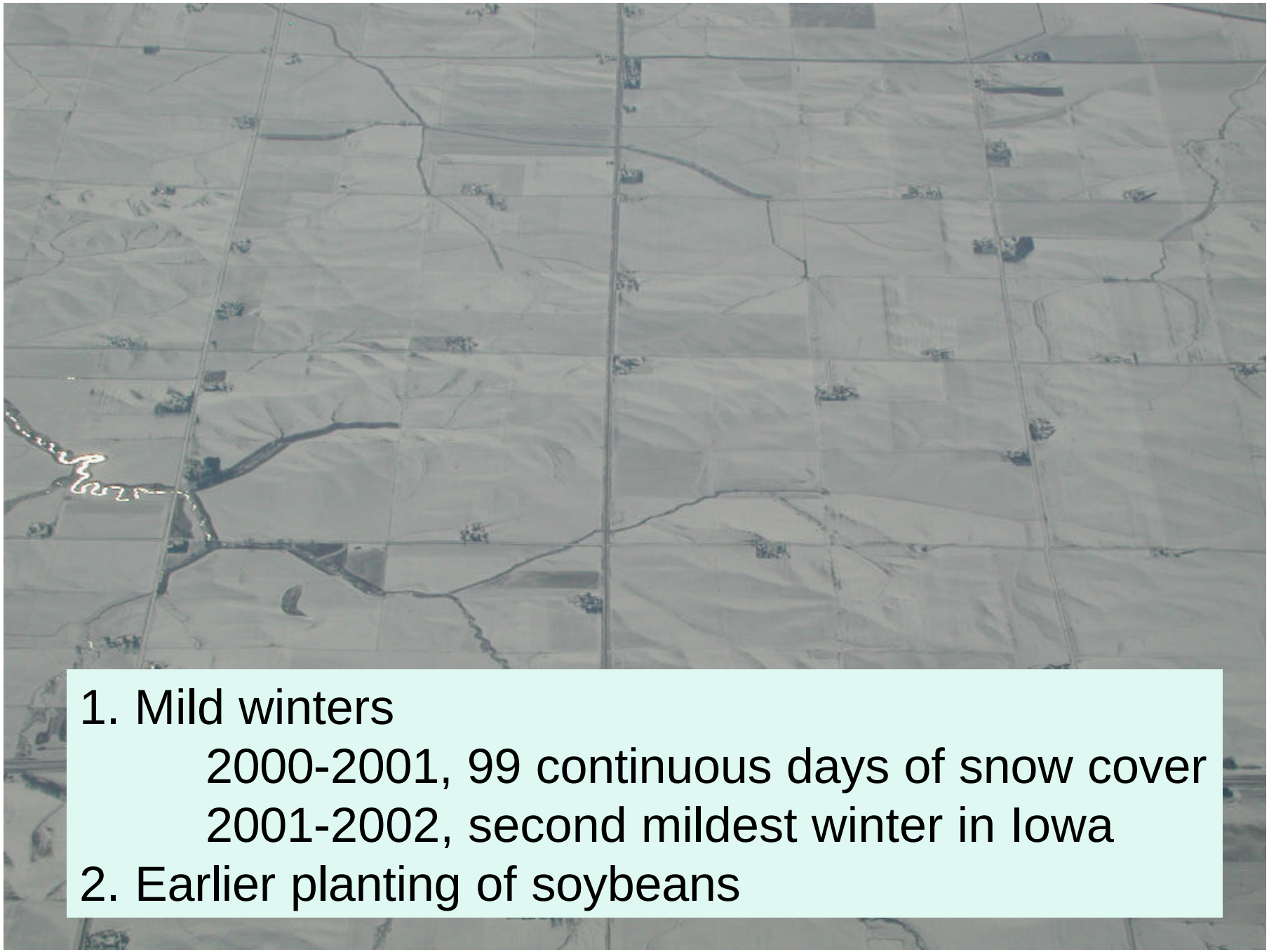
Symptoms of bean pod mottle virus




Time
Beetle density
2nd generation beetles
1st generation beetles
overwintered beetles
seedlings
vegetative stages
reproductive stages

Second generation bean leaf beetle abundance
Ames, IA (1989-2002)





1. Mild winters
    - 2000-2001, 99 continuous days of snow cover
    - 2001-2002, second mildest winter in Iowa
2. Earlier planting of soybeans

economic thresholds –
they can be used to make
management decisions,
however, they
do not take into account
any possible disease
transmission by beetles

Economic thresholds overwintered beetles

crop value ($/bushel)	treatment cost per acre (insecticide + application)		
	$8.00	$10.00	$12.00
	beetles per plant		
$5.00	5.0	6.2	7.4
	beetles per foot of row		
$5.00	38.0	47.1	56.2

Economic thresholds first generation beetles

- soybean plants can tolerate 30-40% defoliation during vegetative growth stages
- adult densities must be extremely large to justify insecticide application
- fields in Iowa are rarely sprayed for first generation beetles

Second generation economic thresholds

- pod feeding reduces seed quality and quantity
- beetles feed on pods for several weeks before reaching economic threshold
- some yield loss occurs before insecticide normally can be justified
- challenge is to prevent economic damage before it occurs

Predict first generation peak beetle emergence using degree days

Date soybeans emerge	northeast Iowa	southwest Iowa
May 1-7	July 7	June 24
May 8-14	July 15	July 1
May 15-21	July 20	July 6
May 22-28	July 24	July 11

Scouting procedures

1. determine week soybeans emerged
2. consult table and match dates
3. sample fields 1 week after peak beetle emergence
4. if below threshold, scout next week
5. if below threshold, scout 1 more wk
6. if 1st generation below threshold then field unlikely to develop economic 2nd generation


using a drop cloth to count first generation bean leaf beetles

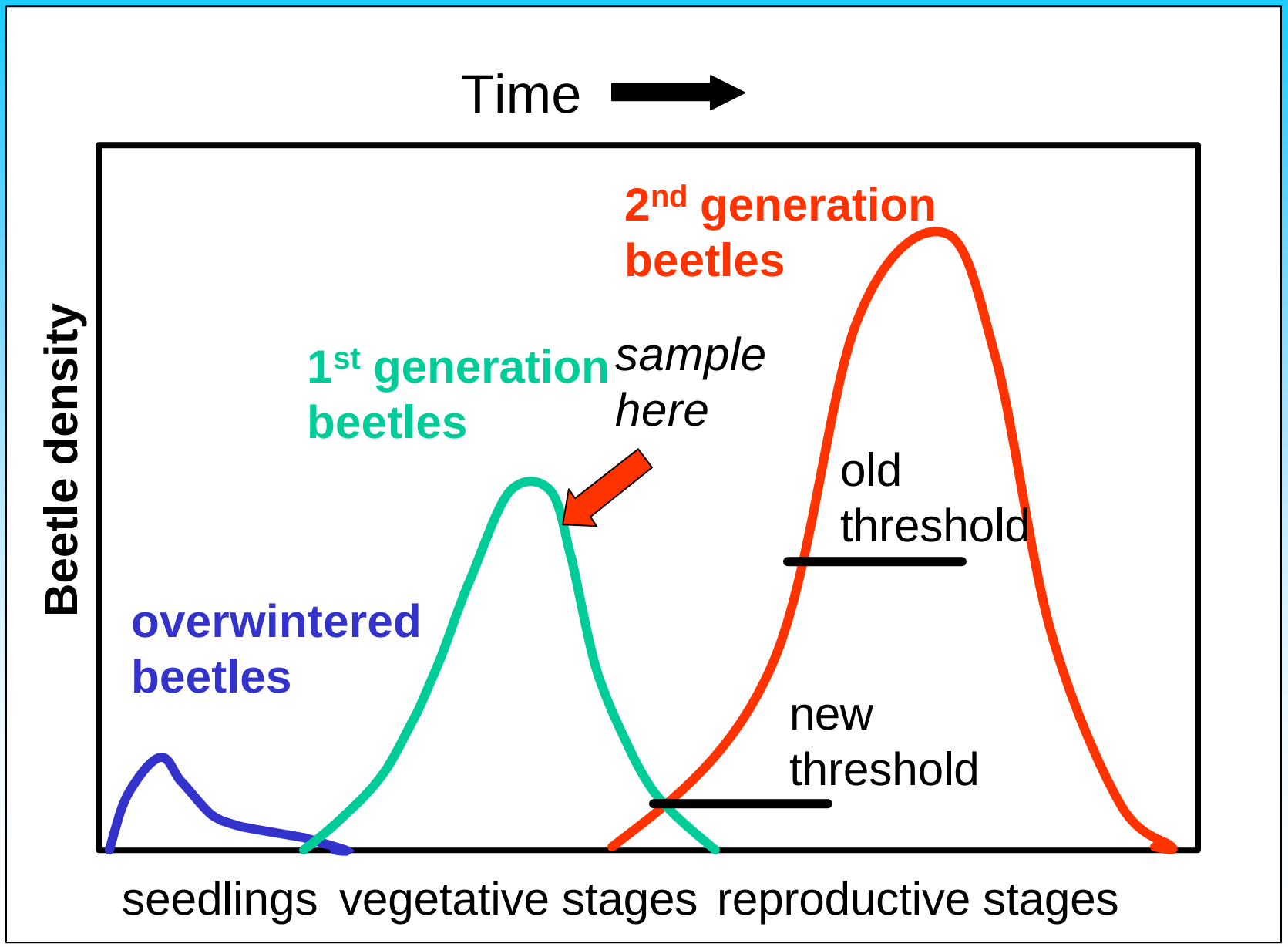
sweep down the row for bean leaf beetles

1st generation economic thresholds necessary to spray 2nd generation beetles

crop value ($/bushel)	treatment cost per acre (insecticide + application)		
	$10.00	$12.00	$14.00
	beetles per 3 row feet		
$5.00	7.9	9.5	11.0
	beetles per 20 sweeps		
$5.00	32.6	39.0	45.4

Based upon a low density of first generation beetles, it is expected that the second generation will not exceed the economic threshold.

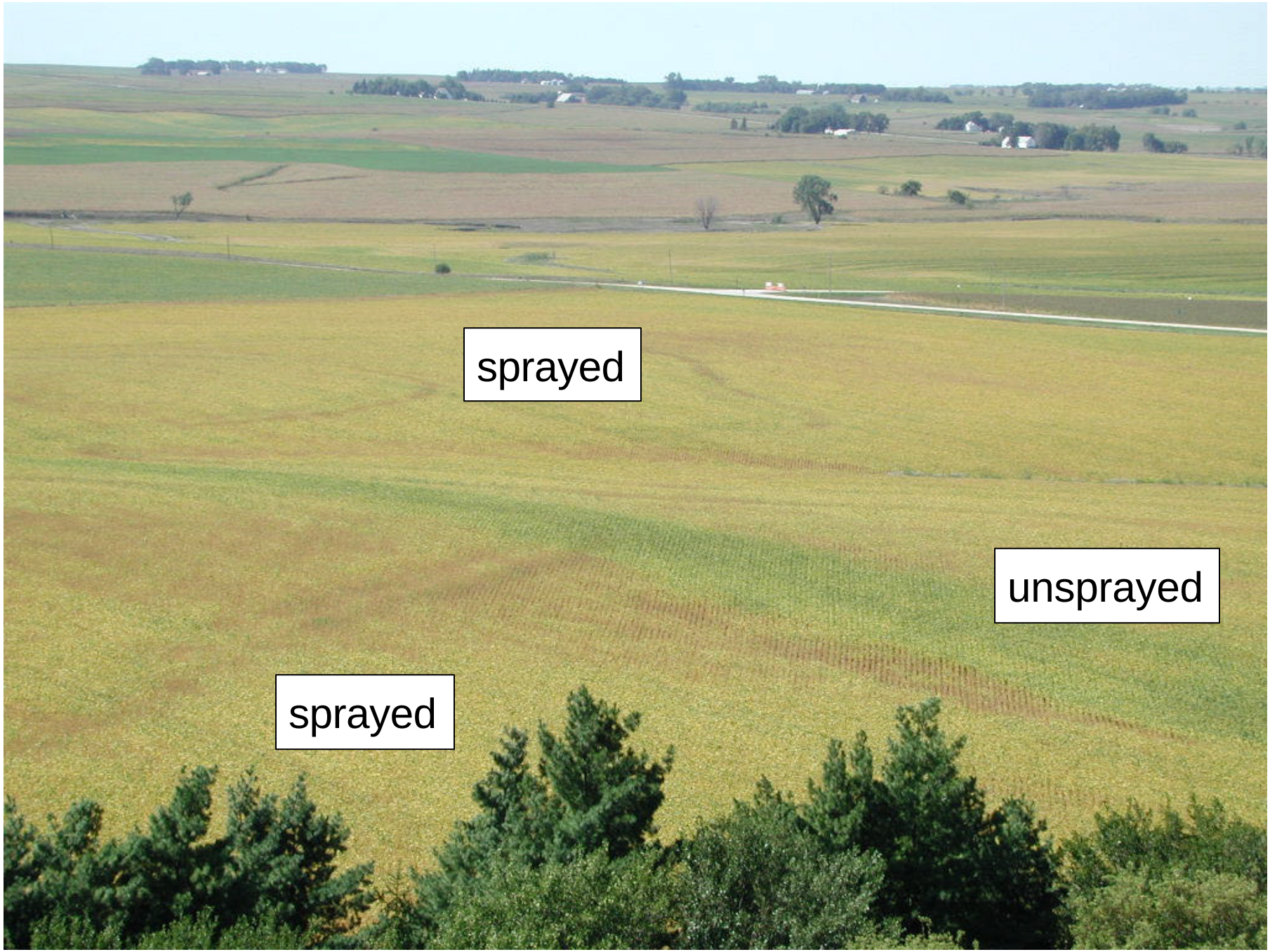
This new management concept predicts the damage potential of the second generation prior to the susceptible crop stage.


Time
Beetle density
2nd generation beetles
1st generation beetles
sample here
old threshold
overwintered beetles
new threshold
seedlings
vegetative stages
reproductive stages

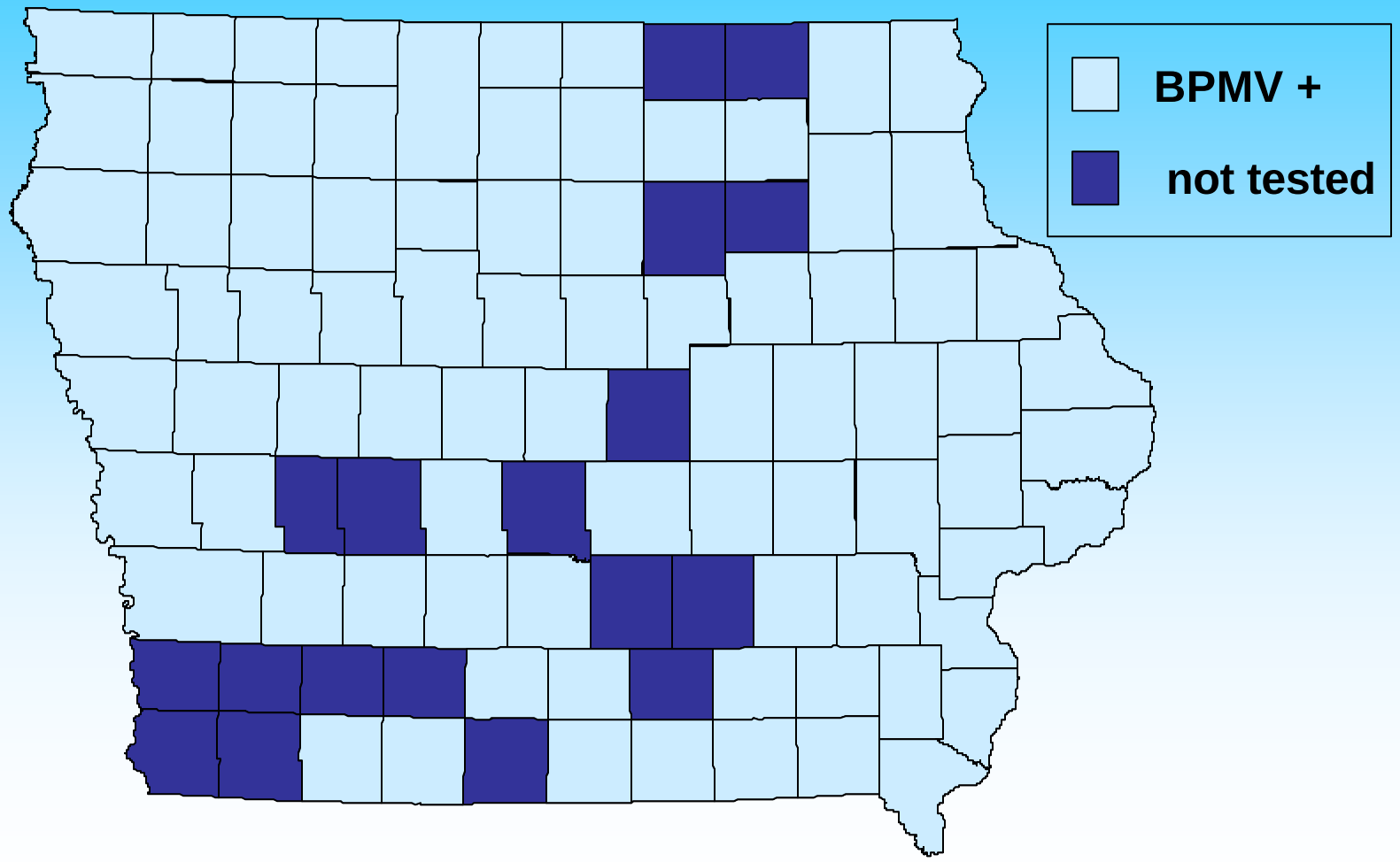
Bean pod mottle virus – the second half of the problem

- 1999 many reports of soybean green stem and discolored seed
- bean pod mottle virus was suspected
- confirmed in western Iowa near Sioux City in 1999


Bean pod mottle
virus symptoms


sprayed
unsprayed
sprayed

BPMV in Bean Leaf Beetles
2000



Northwest Iowa Field Unsprayed Control 9/05/00

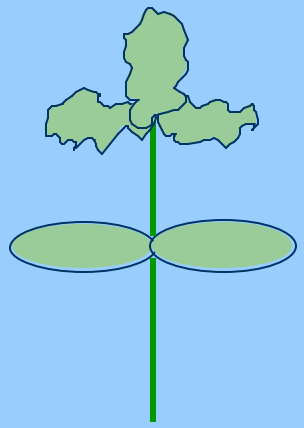
Bean pod mottle virus

- infects soybeans and other legumes
- reduces yield quality & quantity (50%)
- symptoms resemble herbicide drift or soybean mosaic virus
- symptoms: crinkled leaves, plants may be stunted, mottled seed
- can occur in combination with soybean mosaic virus, causing greater losses

Infected Seed?

Overwintered BLBs?

Infected Soybean



Alternate host plant?

Other vectors?

Seed Transmission?

0.037% = 66 of 180,000

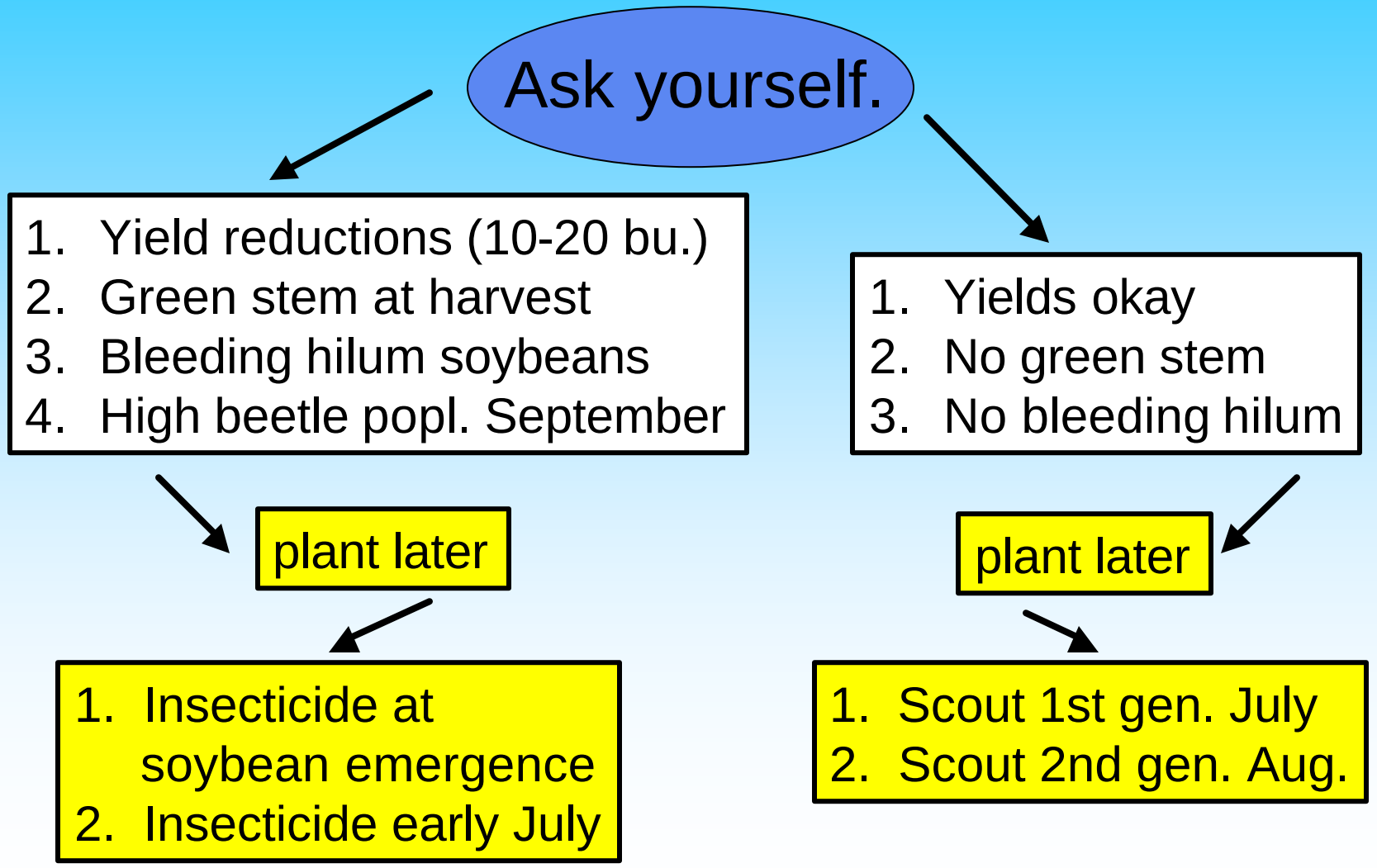
Virus & beetle management

- manage virus by controlling beetles
- planting date is first tactic
  - later planting
    - reduces beetle populations
    - reduces disease incidence in crop
- insecticides are second tactic
  - spray at plant emergence (OW popl.)
  - spray early July (1st gen. popl.)

Management options based on damage potential

Population	*Beetle injury*	*Virus infection*
Overwintered beetles	Rarely sprayed	Spray
First generation	Never sprayed	Spray
Second generation	More commonly sprayed	No spray

How do you decide?



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