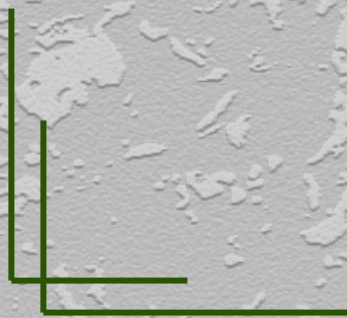




Rates of harvest and compliance with regulations in natural populations of ginseng

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Part 1. Questions

- What percent of natural populations and individuals within those populations are harvested?
- How frequently are they harvested?
- How intense is the harvest?
- How often are plants harvested illegally?
 - Wrong time
 - Wrong place
 - Wrong size



Warning!



- If you fear knowing the answer to these questions, you may wish to leave the room!

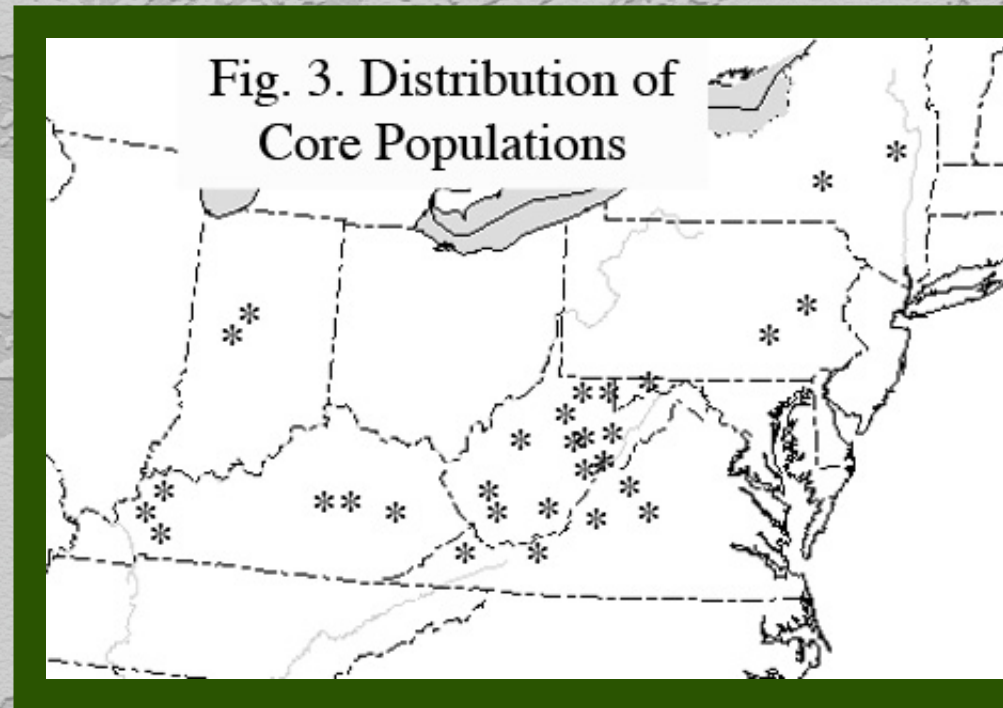


Part 2

- Case study of a directly observed illegal harvest in 2008

The Populations

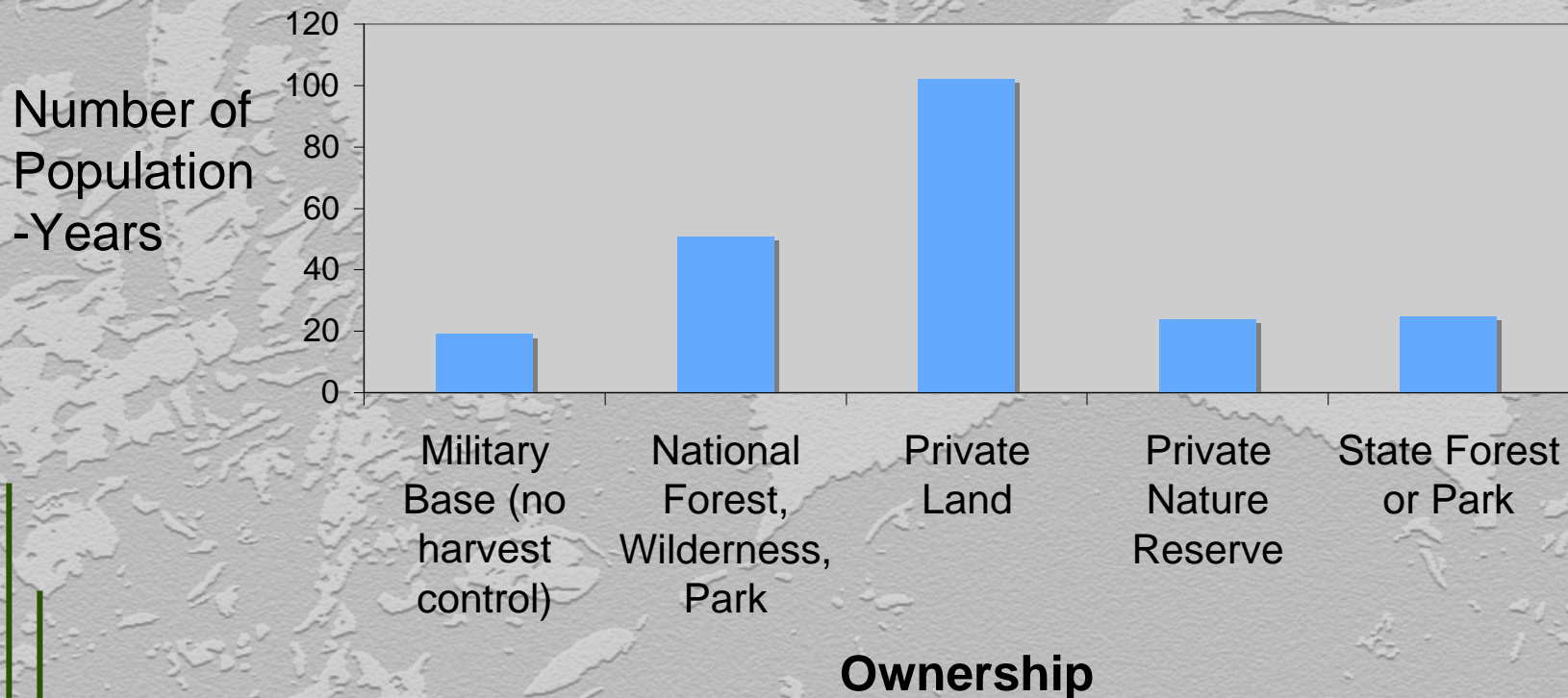
- 7 states
- 30 populations
- 4552* individuals
- 5 - 11 seasons
- 221 'population years'
- 28,688 observations
- 31,871 seeds



*number censused in 2008 (varies by year)

Populations 'Representative'

Censuses On Various Land Ownership Types



How Was Harvest Recognized?

- Plant missing
- Evidence of digging; loose soil & moved plant markers
- Root absent
- Plant confirmed missing in the next yr
- Supplemental: discarded tops, multiple plants gone in vicinity

What percent of populations have been harvested?

■ **43%***

*over 5 - 11 years (mean; 7.4 y), depending on the population

Breakdown

- What percent of populations are harvested each year?

■ **15.4%***

*34 harvest events observed in 221 population-years

Breakdown

- What percent of plants are harvested?

■ **9.45%***

*Mean over entire study period. = percent of all sizes

Breakdown

- What percent of plants are harvested each year?

■ **1.28%***

*only 'confirmed harvested' plants included; therefore this underestimates true rate; elsewhere we estimate the rate at closer to 5% (McGraw et al. 2003. *Journal of the Torrey Botanical Society* 130(2): 62-69)

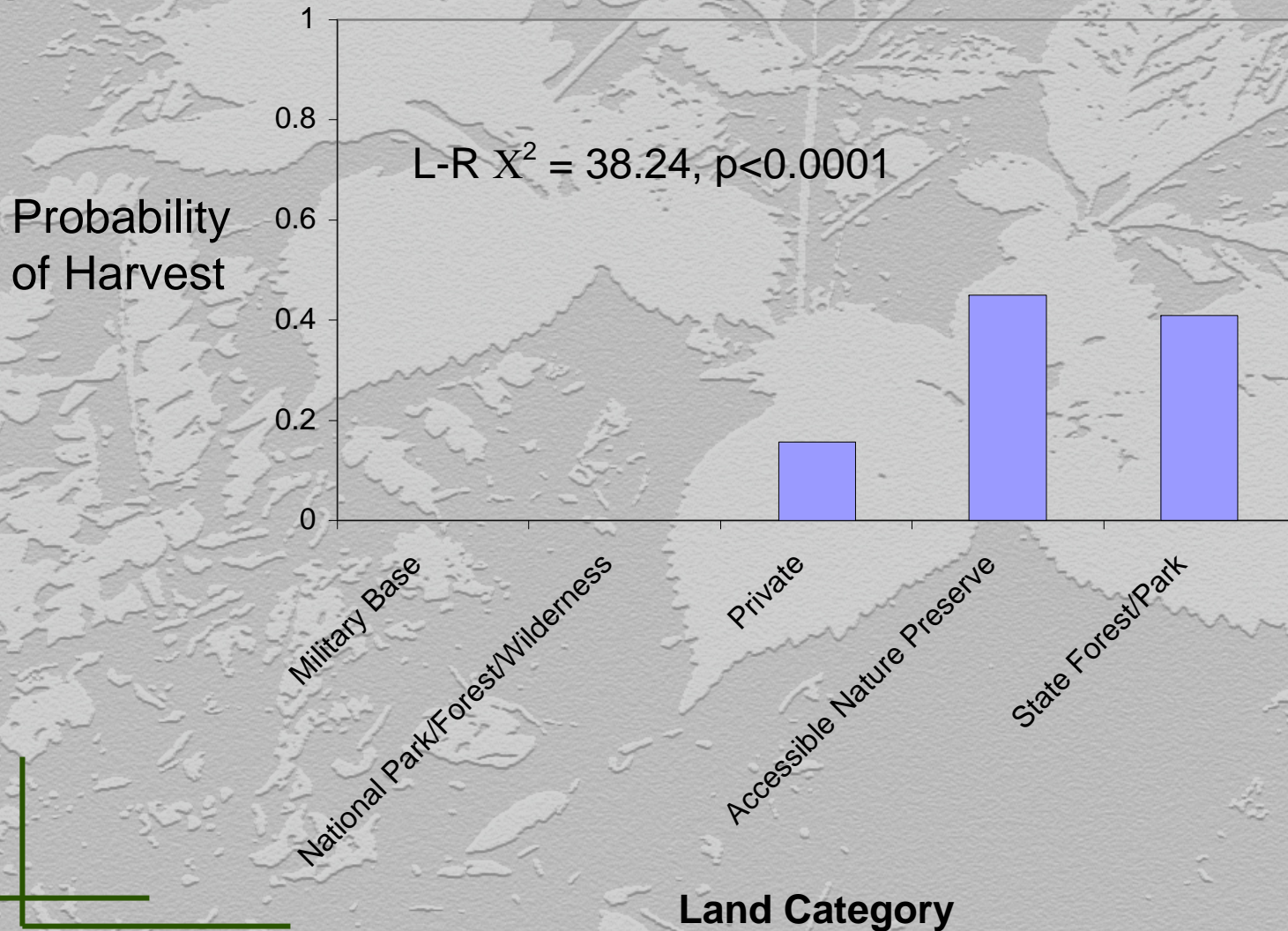
Breakdown

- In populations where harvest occurs, what percent of plants are removed?

■ **7.26%***

*again, underestimate of true rate

Does harvest vary among land categories?

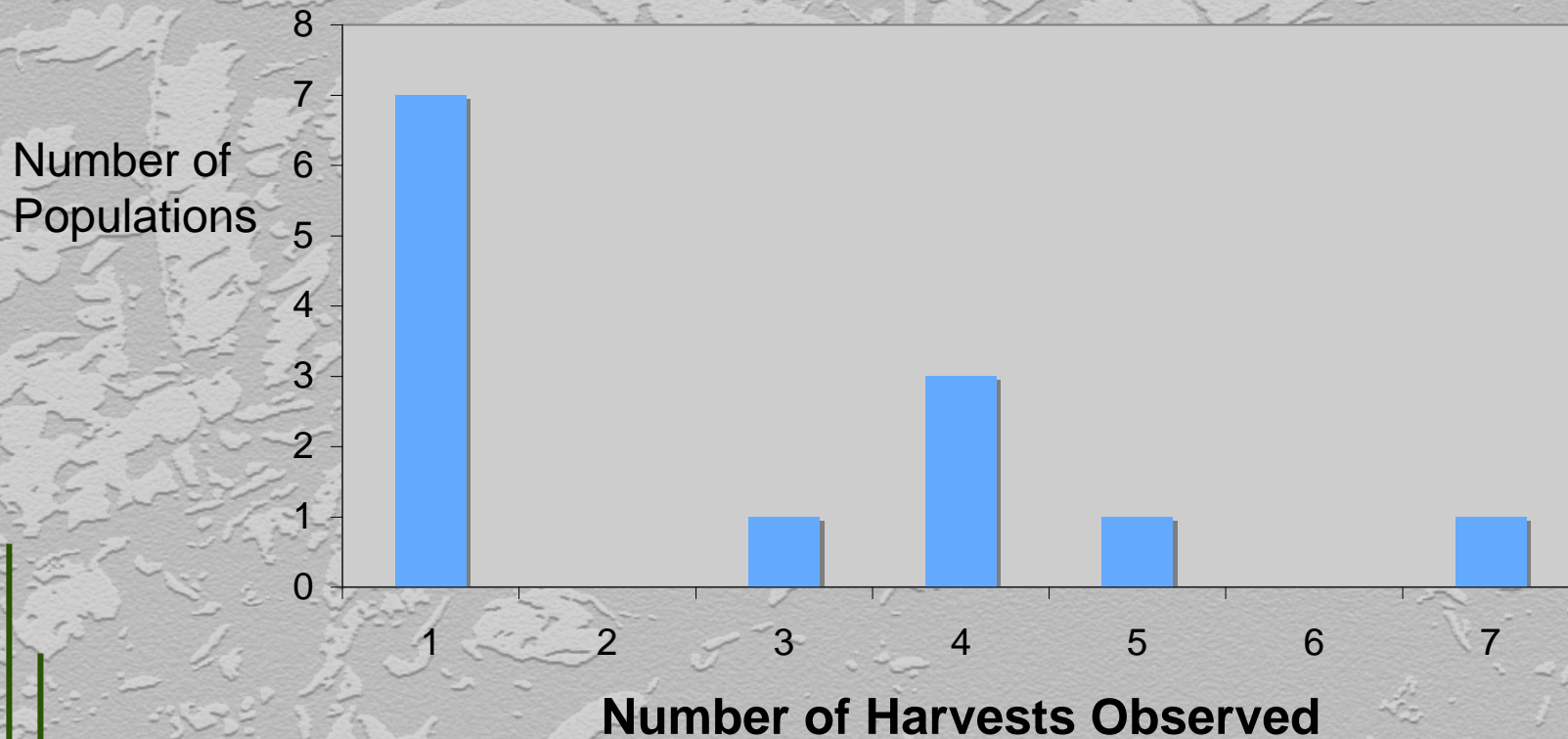


Summary - Percent Harvest

- A large percent (nearly 1/2) of the censused populations experienced harvest over the study period, though the annual rate was only 15%
- The chance that an individual plant would be harvested over the study period was fairly low (~10%), translating into a low annual rate (~1%); however this is an underestimate
- On average, harvesters remove a relatively small portion of the population when they harvest
- Nature preserves/state forest/parks particularly vulnerable

How frequently are populations harvested?

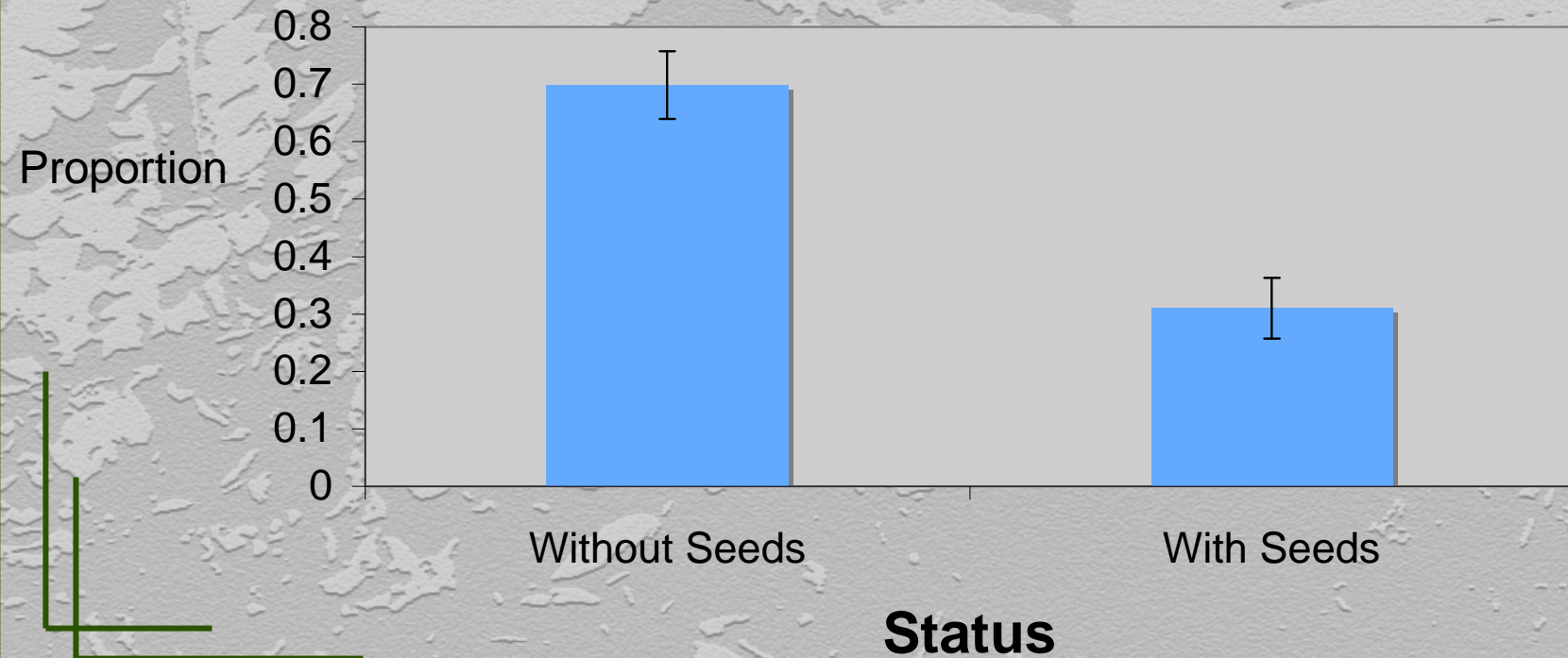
Frequency of Harvests



How 'intense' is the harvest?

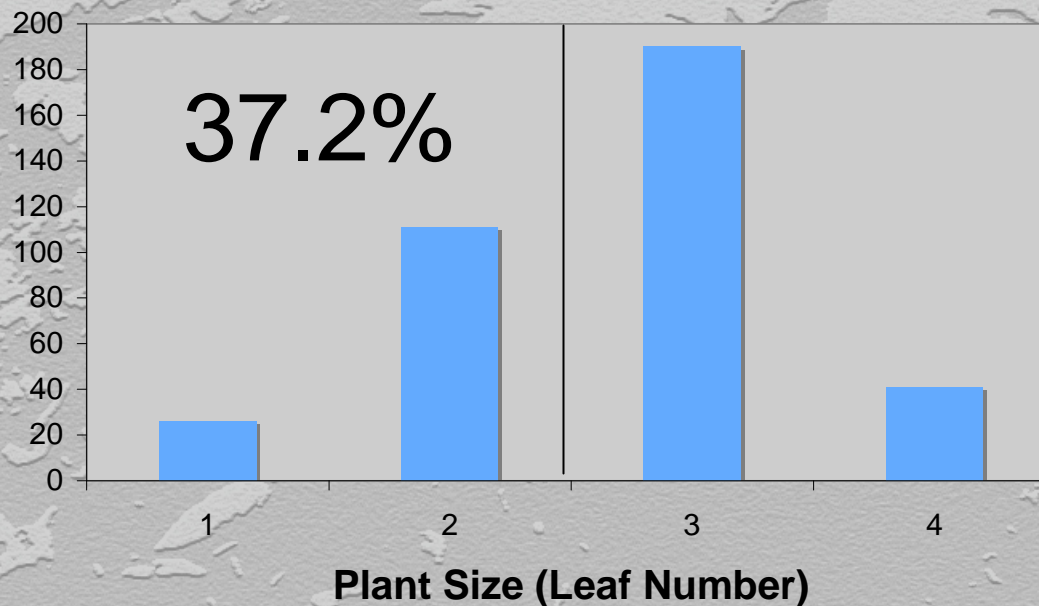
- Components of 'intensity'
 - Proportion of population taken (7.26%)
 - Proportion of non-reproductive plants taken (more = more intense)
 - Proportion of small plants (<3 prong) taken (more = more intense)

Reproductive Status of Harvested Plants



- What percent of harvested plants were undersized (either 1 prong or 2 prong)?

Number of Plants Harvested

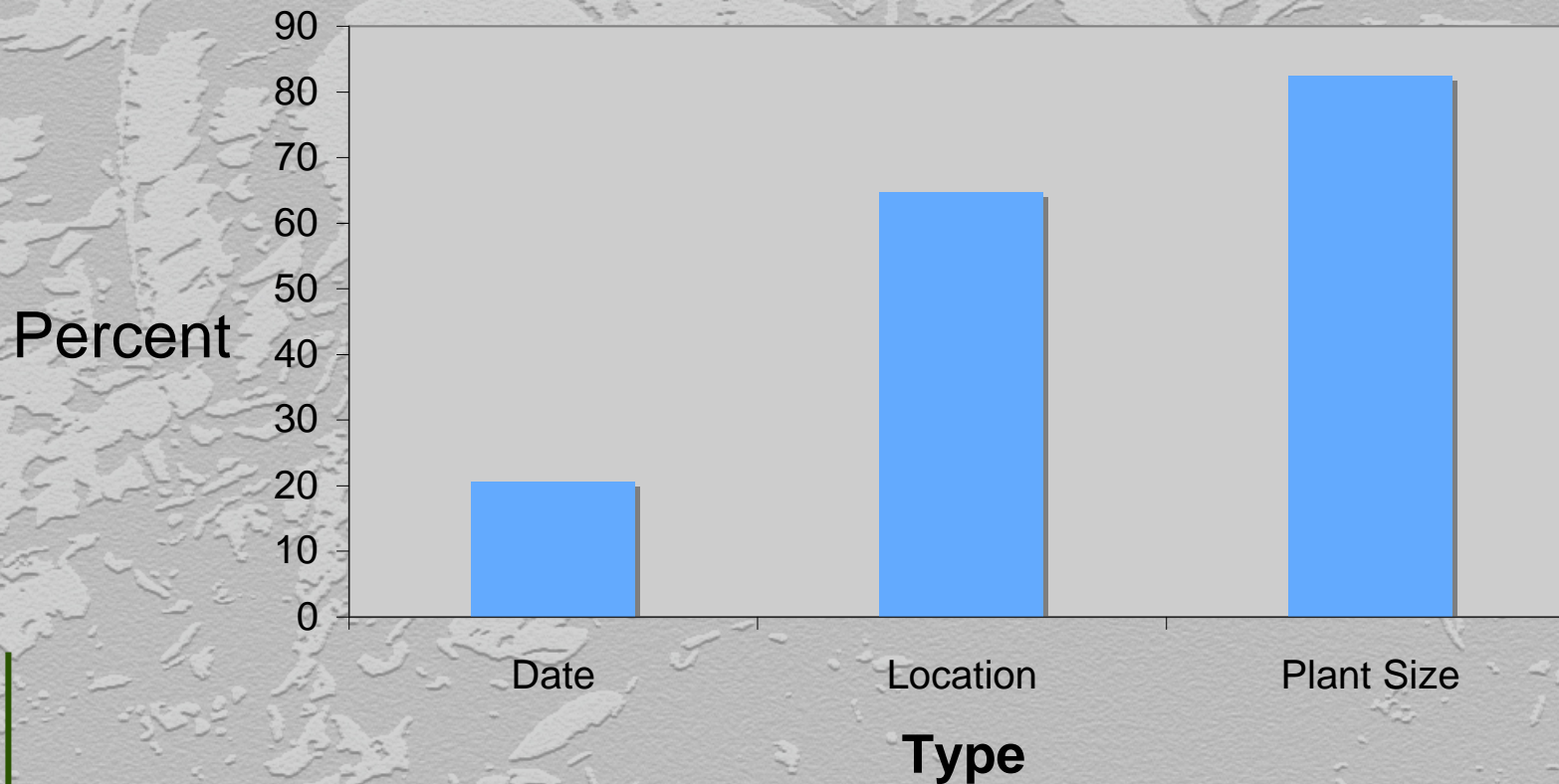


Summary - Frequency & Intensity

- Almost half of the harvested populations were harvested more than once during the study period
- Although harvesters find and remove only a small percent of plants, they frequently take nonreproductive and small plants

What percent of harvests were illegal?

Illegal Harvest



What percent of harvests were
legal (in all 3 respects)?

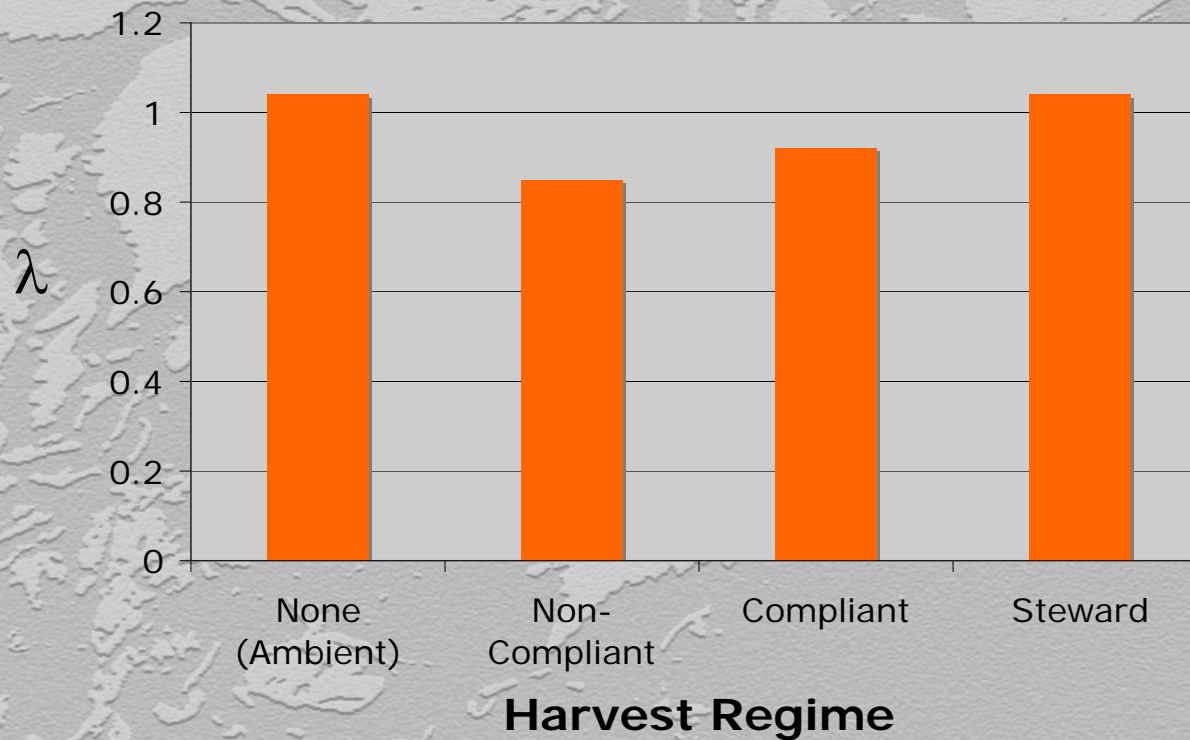
- 5.88% of harvests
- 5 plants were legally harvested (out of 368)!

Summary - legality of harvesting

- Compliance with harvest regulations is extremely low (season>place>size)

Effects of Non-Compliance

Effect of Harvester Behavior



Case Study of An Illegal Harvest



- 48 plants
- Nature preserve
- Harvest directly observed

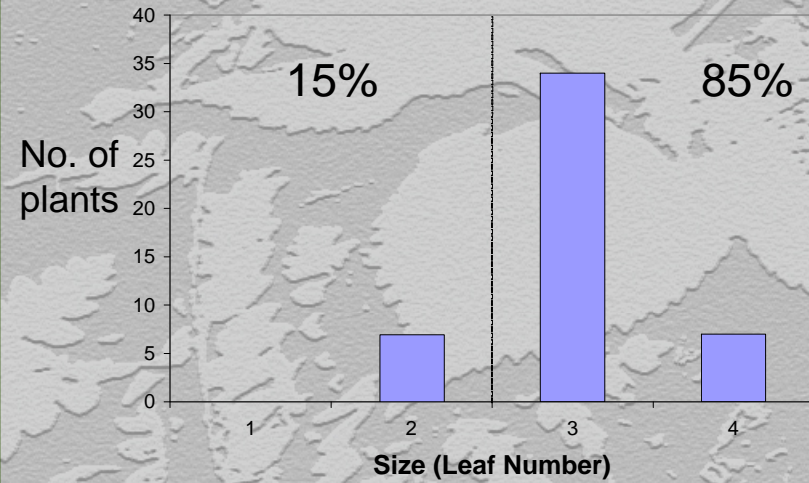
■ *August 22, 2008*



Illegal Harvest in KY

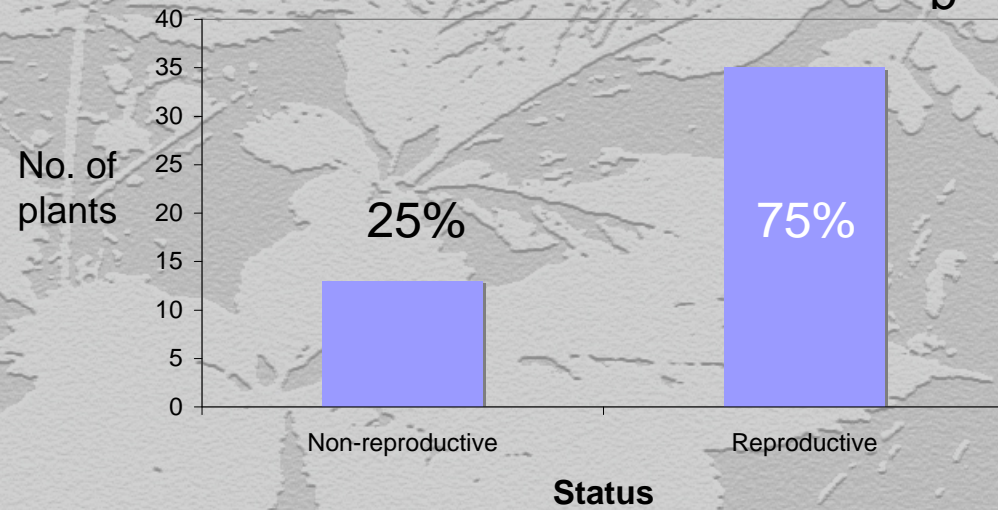
Size Distribution

a



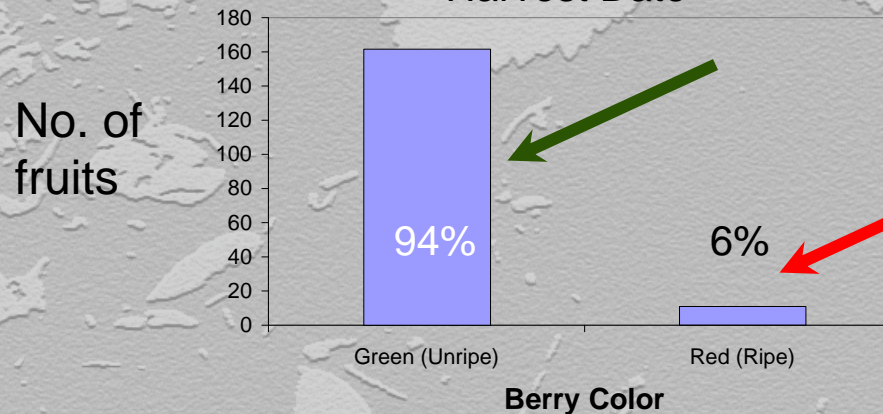
Reproductive Status of Harvested Plants

b

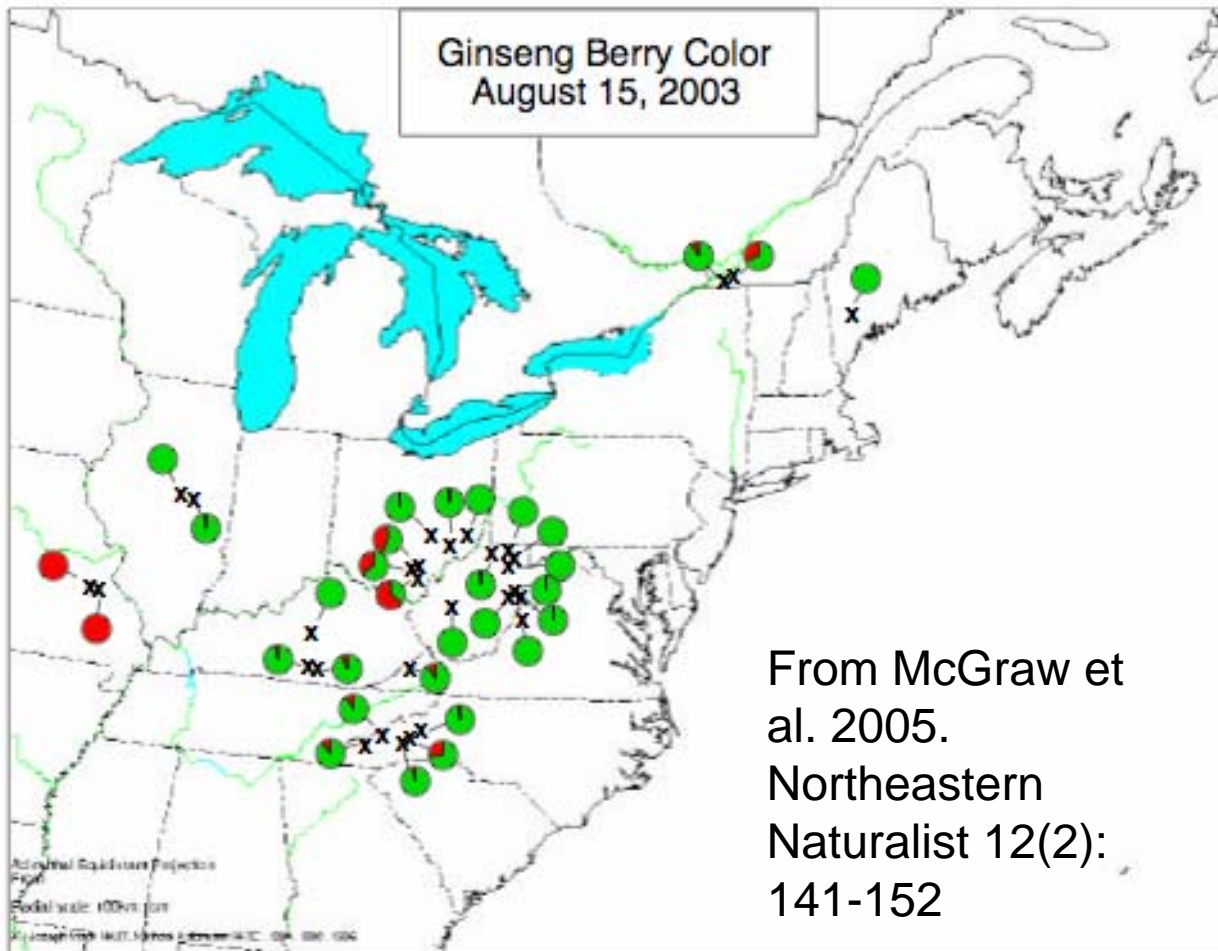


Berry Ripening Stage On Harvest Date

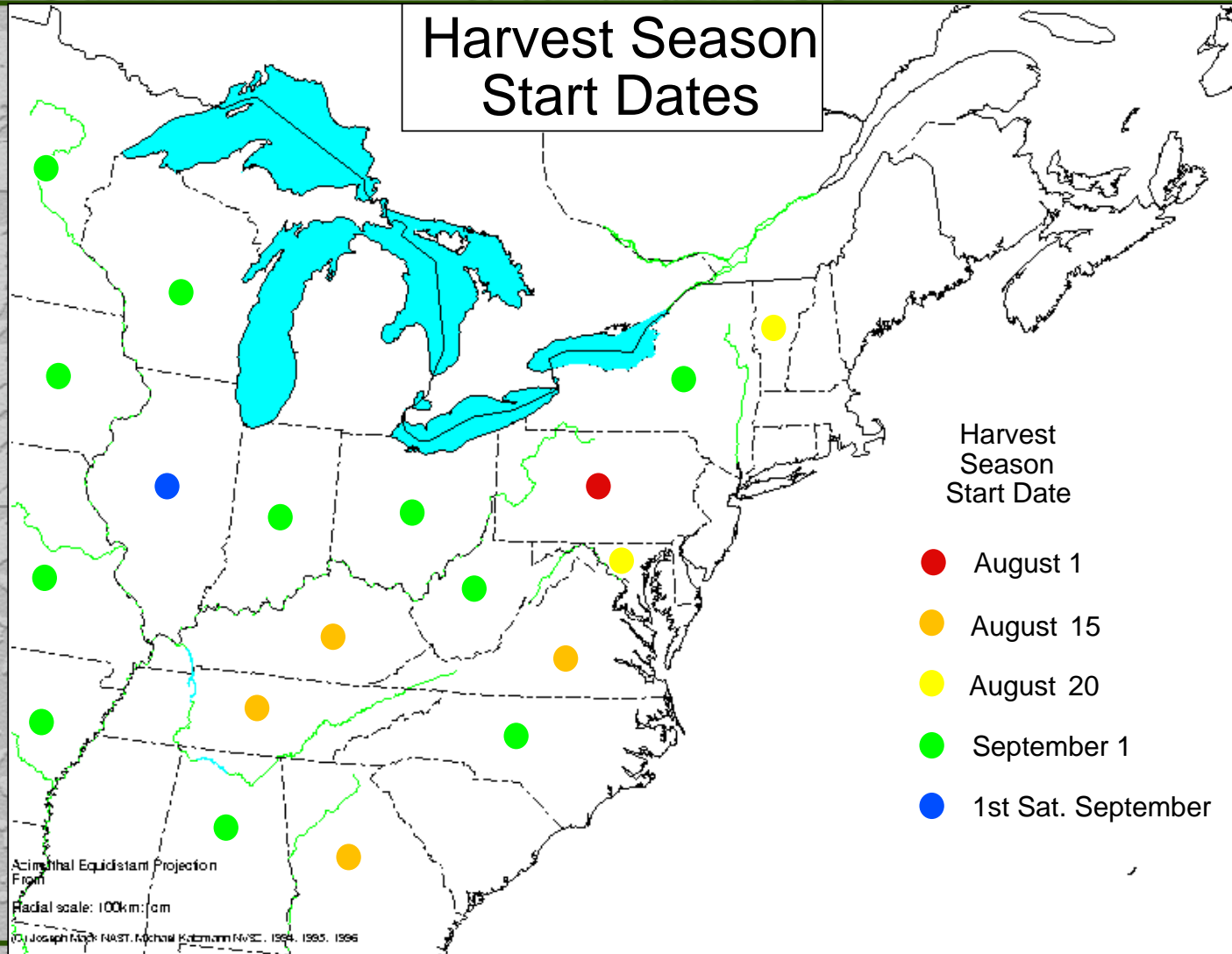
c



Berry Ripening Across the Range



Harvest Season Start Dates



Summary & Conclusions

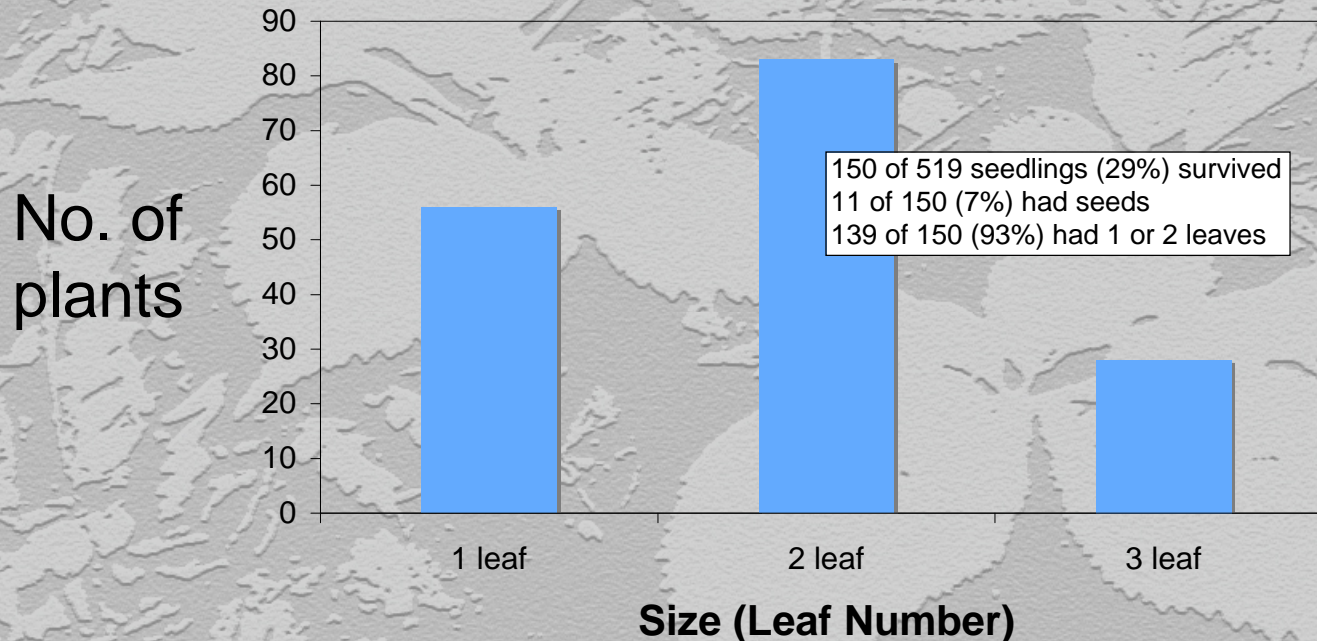
- ✓ Harvest rates are relatively low
- ✓ Managers of nature preserves, state parks, and state forests have a particularly difficult time preventing harvest:
 - ✓ -the land is accessible
 - ✓ -surreptitious harvest is difficult to detect
 - ✓ -the small size of roots makes concealing them easy
- ✓ Harvest frequency and intensity are high

Summary & Conclusions

- ✓ Compliance with regulations is low
- ✓ Continued low-level, non-compliant harvest is unsustainable
- ✓ Harvest seasons in seven states remain out of sync with the timing of seed ripening:
PA, KY, TN, VA, GA, MD, VT

Summary & Conclusions

Size of Ginseng Plants at Age 5



- ✓ Five year old plants in wild populations are immature, nonreproductive, and cannot be sustainably harvested
- ✓ Age is a poor criterion for determining when harvest should occur

Summary & Conclusions

- ✓ Size is a better criterion for harvest, but restrictions need to be verifiable and enforceable; they currently are not (exception - Wisconsin)



“The long fight to save wild beauty represents democracy at its best. It requires citizens to practice the hardest of virtues - self-restraint.”

Edwin Way Teale, Circle of the Seasons, 1953

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