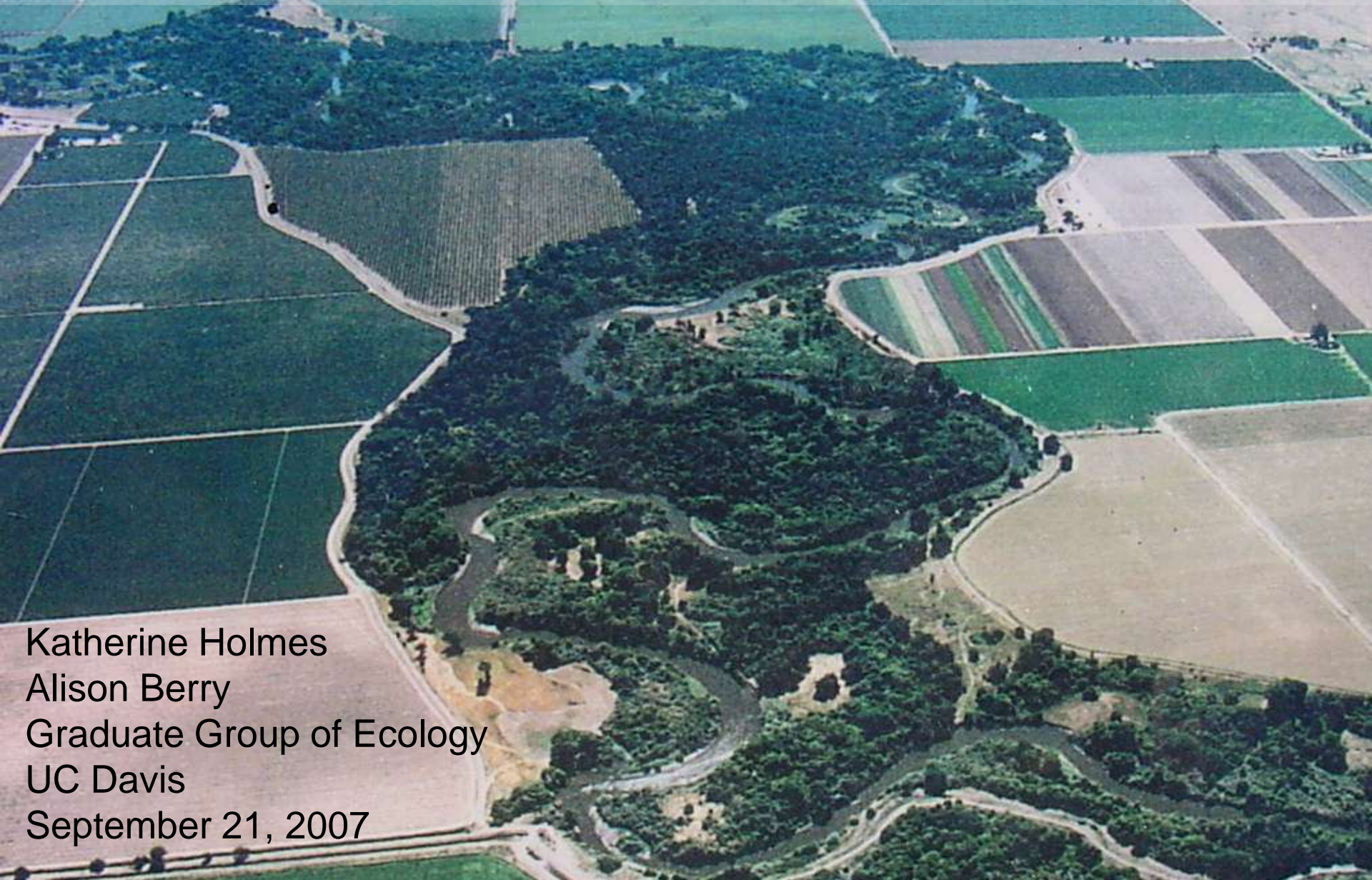


Herbicide control of fig trees in riparian habitats: Evaluation of control efficacy and off-target effects



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September 21, 2007

- Background on invasive fig
 - Why try to eradicate it?
- Control efforts at Caswell Memorial State Park
 - Problems → research question
- Experiment
 - Efficacy results
 - Off-target results
- Management conclusions



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Ficus carica

- Common edible fig → grown in commercial orchards
- Invasive in riparian habitats → exceedingly dense groves
- Series of vegetation surveys:
 1. Reduces community diversity
 2. Simplifies community physiognomy
 3. Area occupied by fig expands rapidly after long lag



Cumulative area under fig canopy: Caswell Memorial State Park

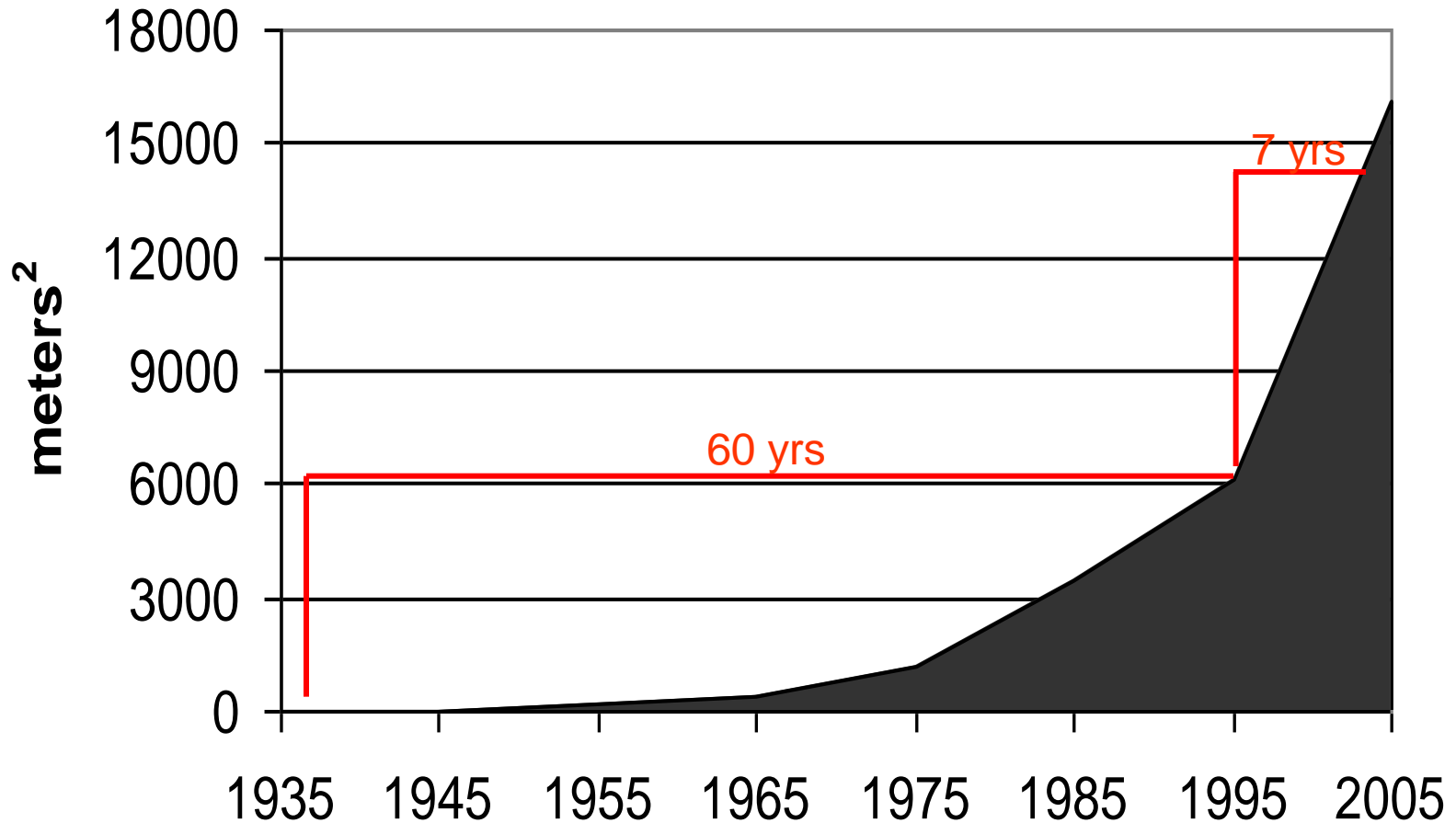


Fig should be eradicated from Central Valley riparian habitats

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Control efforts at Caswell Memorial State Park

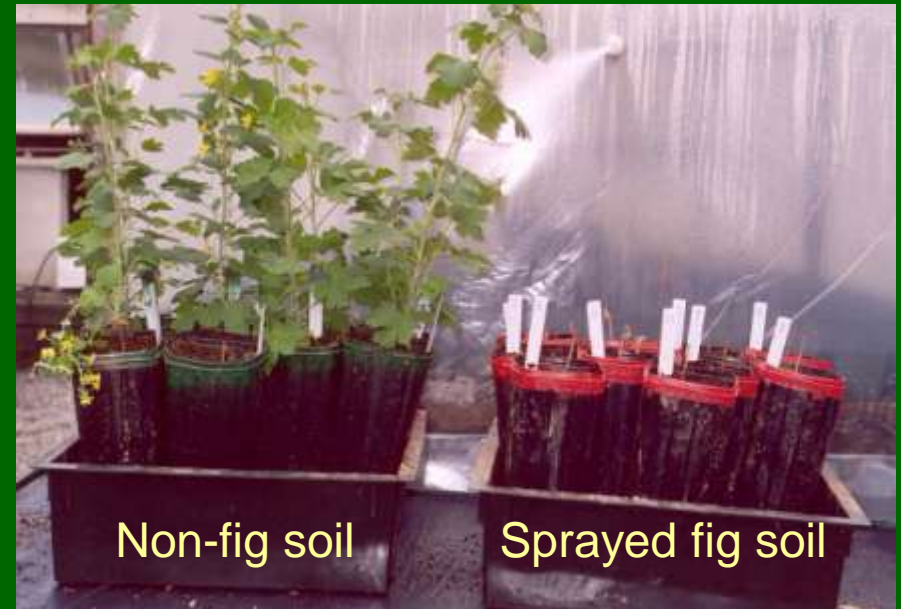


- Basal bark treatment with 25% Garlon 4 (triclopyr)
- Low mammalian toxicity
- Average half-life of 30 days in soil (moderate rate)
- When exposed to sun, has a half-life of 3-4 days due to photolysis

Problems with herbicide residues in soil?



Very little natural regeneration of native plants at ex-fig sites



Soils from sprayed fig sites caused 70-100% transplant mortality

- Soil residues: 3-6 ppm triclopyr 12+ months after spraying
- Sensitive plants affected by triclopyr at 0.03 ppm (vigor) and 0.3 ppm (germination)

Research question: Does basal bark treatment of invasives that have high stem densities result in an over-application of herbicide?



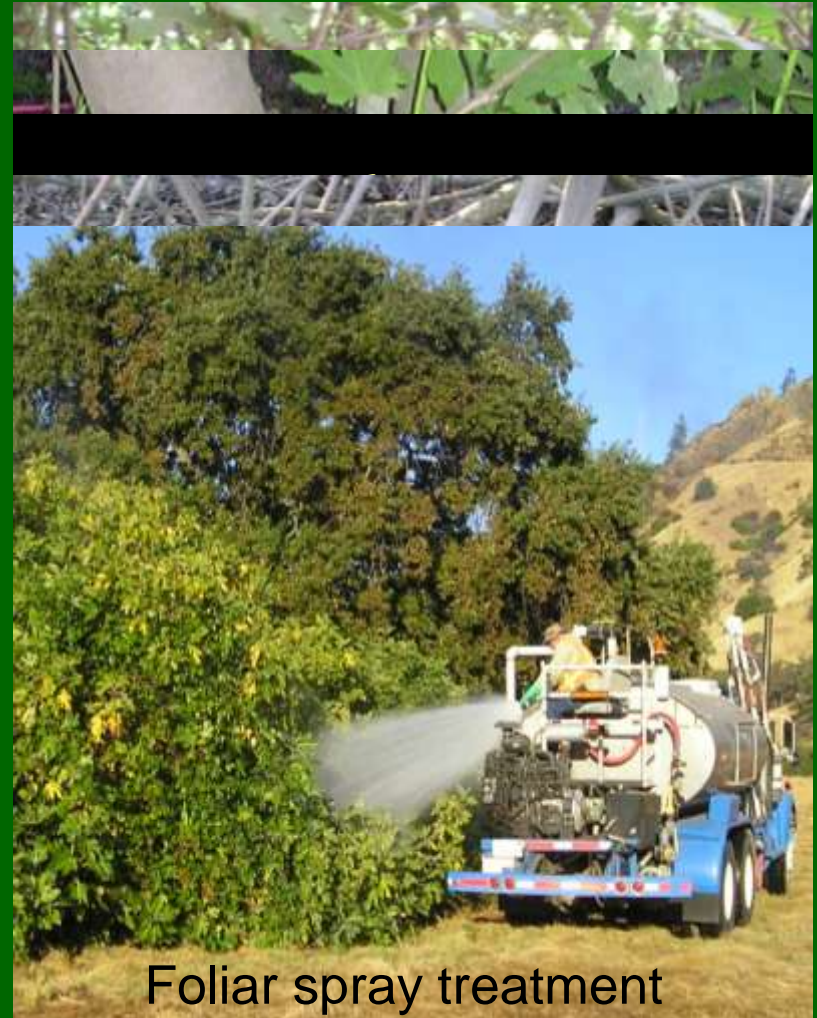
- Few trees per acre → low levels of herbicide
- Many trees per acre → high levels of herbicide

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Experimental Design

1. Six large, dense fig groves
 - Hatfield and McConnell SRAs
2. Basal bark with 25% Garlon 4
 - Amount applied (kg ae/ha)
3. Collected soil six months after spraying
 - Both $<0.5\text{m}$ (near) and $>0.5\text{m}$ (far) from fig stems
 - Tested soil for triclopyr
4. Planted native plants in fig groves and control sites six months after spraying
5. Tested other herbicide treatments – possible to control fig with less herbicide?



Results – control efficacy of other treatments

1. Limited basal bark:

Garlon 4 [25%]

20-40% of stems treated



Killed an average of only 66% of the trees per grove

2. Foliar applications:

Roundup [2%]

Roundup [2%] + Garlon 3a [1%]



Killed only top 1-2 meters of branches



3. Hack and squirt:

Girdled trunks

Roundup [100%]



Killed saplings, but not trees over 3" diameter

Results – control efficacy of basal bark treatment with 25% Garlon 4

Very effective control
99+% reduction in fig grove
canopy cover
Bark sloughing off trees one
year later



Results – off-target effects of basal bark treatment with 25% Garlon 4

1. Application rates:

- **27 - 40** kg ae/ha (34.0 ± 6.4)
- Foliar spray rates usually 3-4 kg ae/ha

2. Triclopyr residues 6 months after spraying:

- Near stems (<0.5 m) = **1.38 - 6.64** ppm (3.2 ± 1.9)
- Far from stems (>0.5 m) = **0.06 - 0.60** ppm (0.28 ± 0.2)

Garlon 4 translocating off of fig trunks

- Overspray
- Release from roots
- Stem flow during precipitation

Photolysis not occurring



Results – off-target effects of basal bark treatment with 25% Garlon 4

1. Application rates:

- **27 - 40** kg ae/ha ($xx \pm xx$)
- Foliar spray rates usually 3-4 kg ae/ha

2. Triclopyr residues 6 months after spraying:

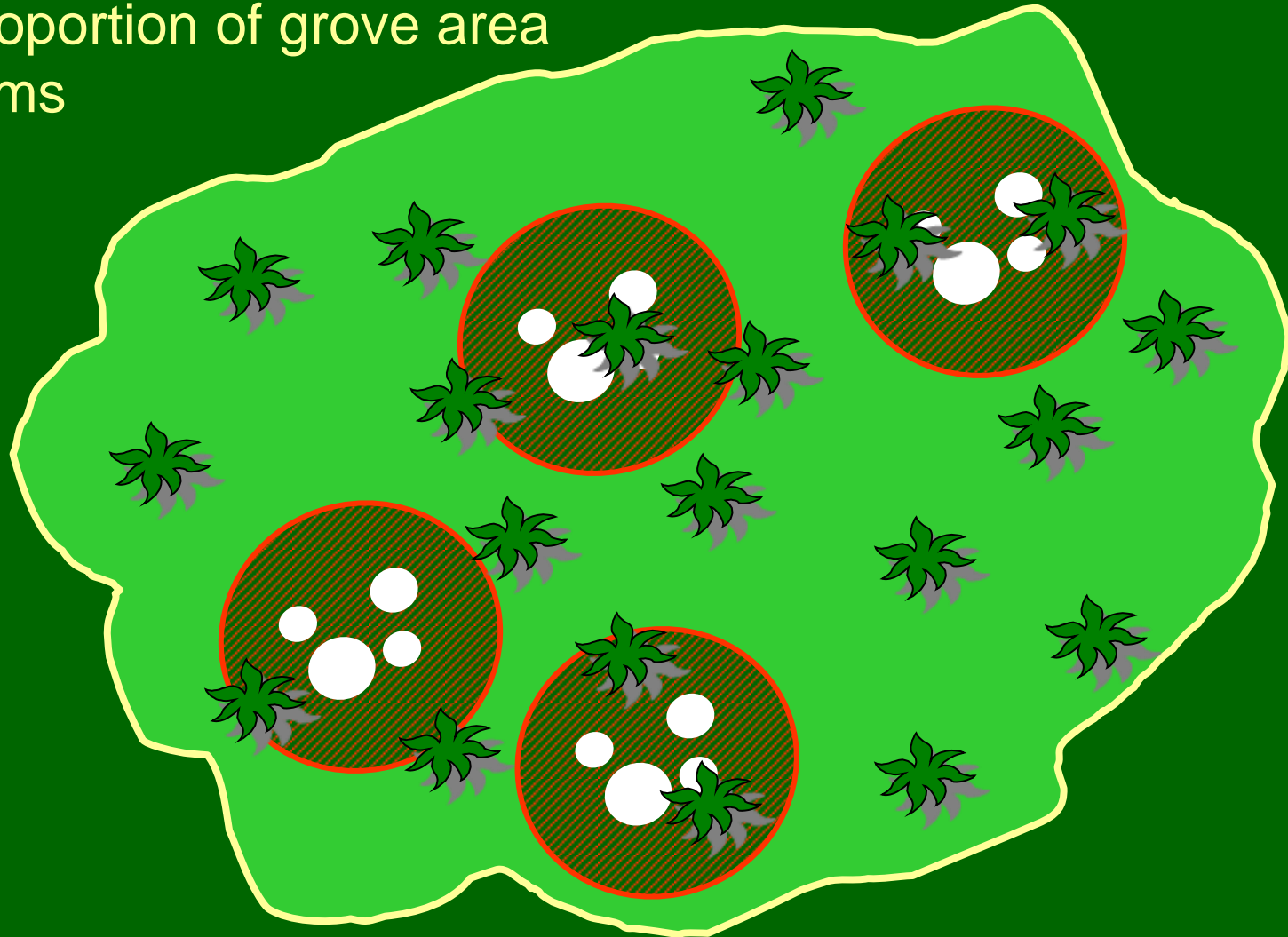
- Near stems (<0.5 m) = **1.38 - 6.64** ppm ($xx \pm xx$)
- Far from stems (>0.5 m) = **0.06 - 0.60** ppm ($xx \pm xx$)

3. Native plant mortality:

- **0 - 16%** (6.2 ± 6.3)
- Not significantly different from controls
- All dead plants were near (<0.5 m) multiple stems
- Much lower mortality than we observed at Caswell
 - Floods; warm and wet winter
 - Stem density?

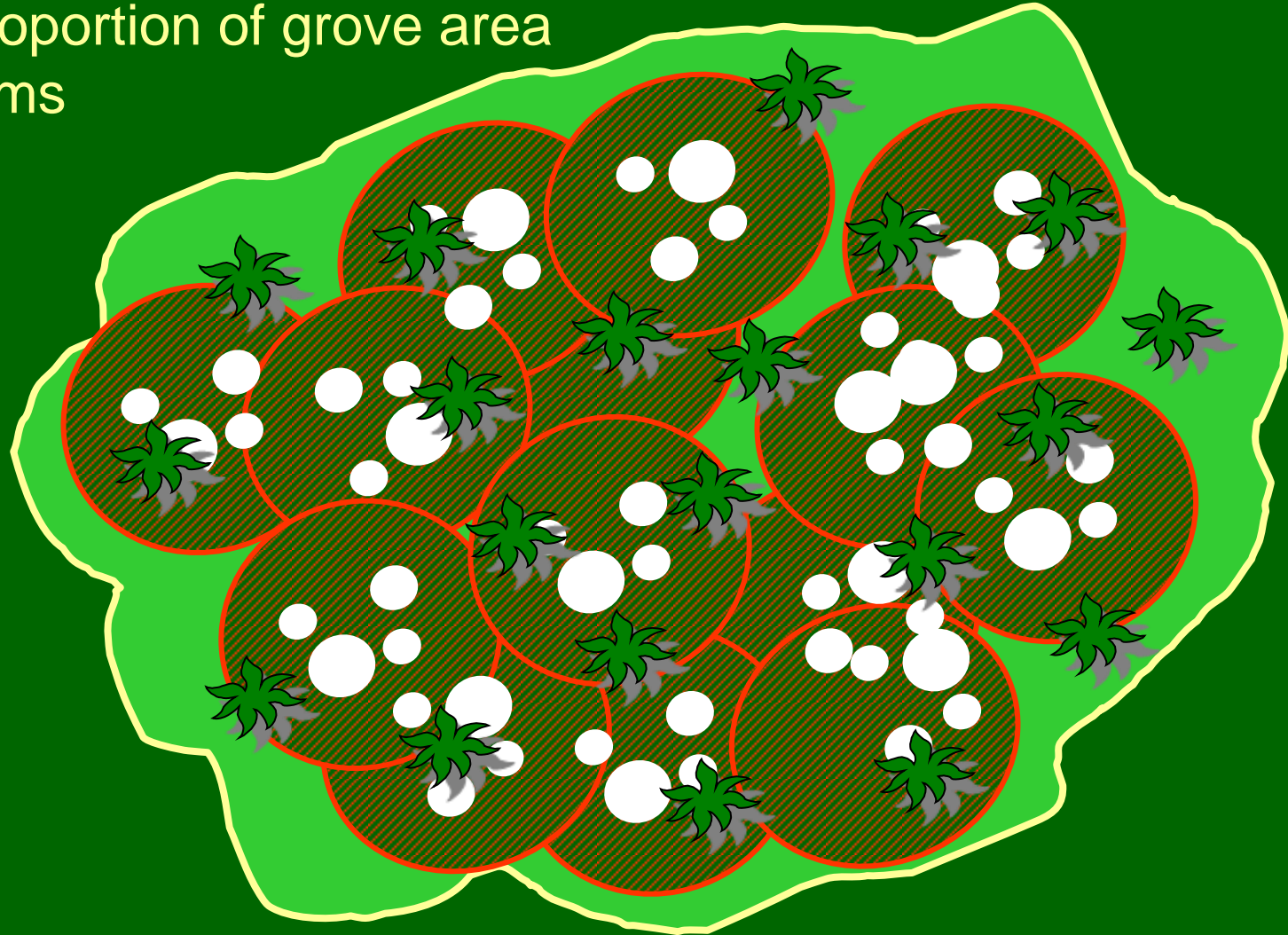
Lower density fig invasions

- Less herbicide applied
- Small proportion of grove area near stems



Higher density fig invasions

- More herbicide applied
- Large proportion of grove area near stems



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Management Conclusions

- 1. Fig needs to be eradicated from riparian preserves**
 - Inflicts detrimental impacts
 - Eventually spreads rapidly
- 2. Alternate herbicide treatments were not effective**
 - Other potential options - stem injection, basal bark but with lower herbicide concentration
- 3. Basal bark treatments with 25% Garlon 4 effective**
 - But use a lot of herbicide
 - Can create high soil residues many months later
- 4. Garlon 4 residues can affect restoration efforts**
 - Damage depends upon amount of herbicide used, which in turn depends upon stem density
 - Apply with caution!



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