



Can tamarisk beetle pheromone lures lead to reduced re-growth of tamarisk following tree cutting?

Using 'beetle herding' to increase efficacy of herbicide treatment

- Hannah Ertl , Farley Ketchum & Team
Environmental Department, Ute Mountain Ute
- Emily Swartz, Samantha Lauth & Team
Trees, Water and People
- Dan Bean, PhD
Palisade Insectary Colorado Department of Agriculture
- Cynthia (Cini) S. Brown, PhD
Department of Agricultural Biology, CSU



COLORADO
Department of Agriculture

Tamarisk (aka salt cedar)

Tamarix spp.

- Invasive tree along rivers and on flood plains
- Forms extremely dense stands and prevents regeneration of native trees such as cottonwood and willow
- Cottonwood are important for cultural activities
- The tribe needs to have a sustainable source of cottonwood trees of various ages to sustain their cultural practices and ecological integrity of their watersheds





Challenge: Tamarisk resprouts from treated trees



Tamarisk leaf beetles - *Diorahbda* spp.



Slide courtesy of Dan Bean, Alex Gaffke, Tom Dudley

Defoliation at the Cibola NWR, third generation larvae (2019)



1. Adults emerge from the leaf litter and feed
2. Adults aggregate on larva-free trees
3. They mate and lay eggs
4. Adults move on, larvae feed and defoliate
5. Mature larvae drop to the ground and pupate
6. The next generation adults emerge from the leaf litter



Naturally occurring chemicals attract beetles

Chemical compounds produced by growing tamarisk

- Green leaf volatile compounds (GLV)

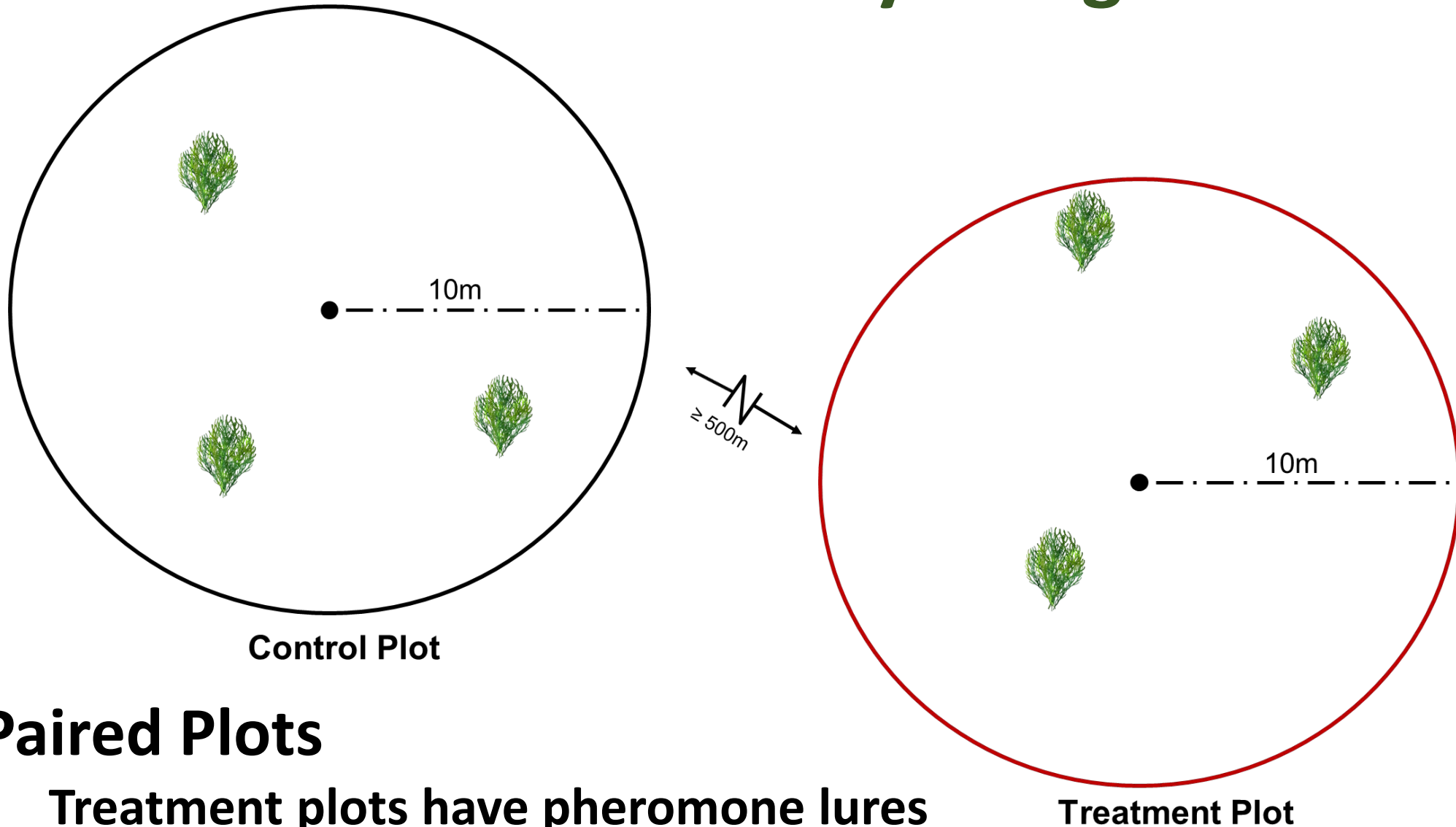
Chemicals produced by male beetles that cause them to aggregate

- Pheromones (PHE)

Can GLVs and PHEs be used to attract beetles to tamarisk trees regrowing after treatment and result in defoliation of the trees?



Pilot Study Design



Paired Plots

- Treatment plots have pheromone lures
- Control plots have no lures



Mastication



Cut stump



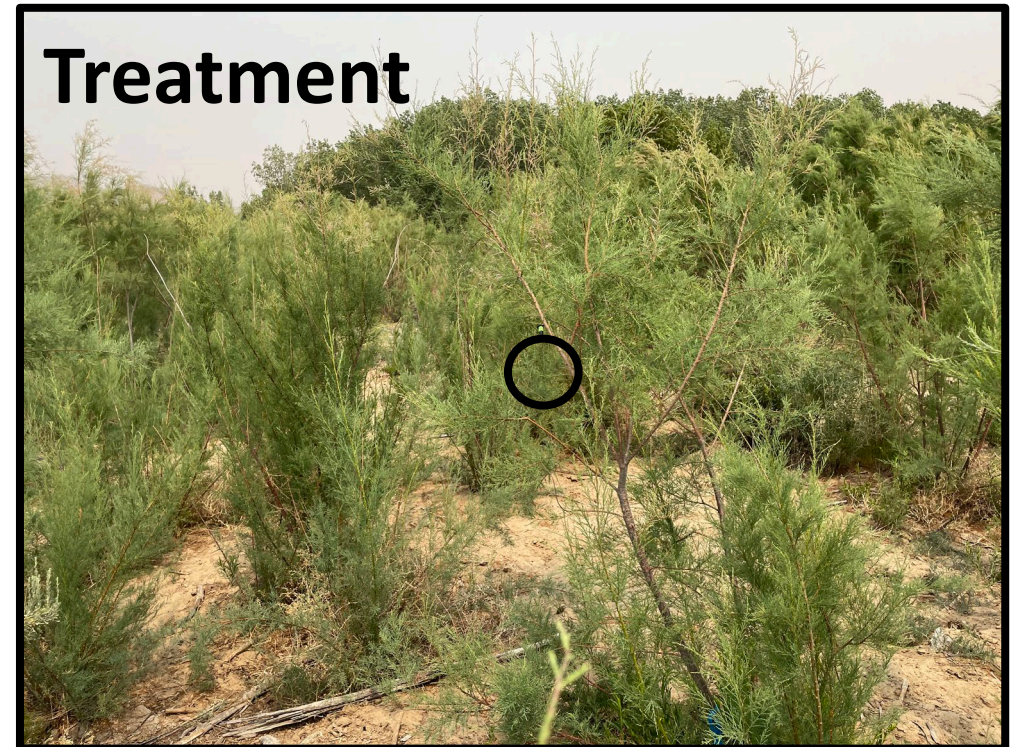


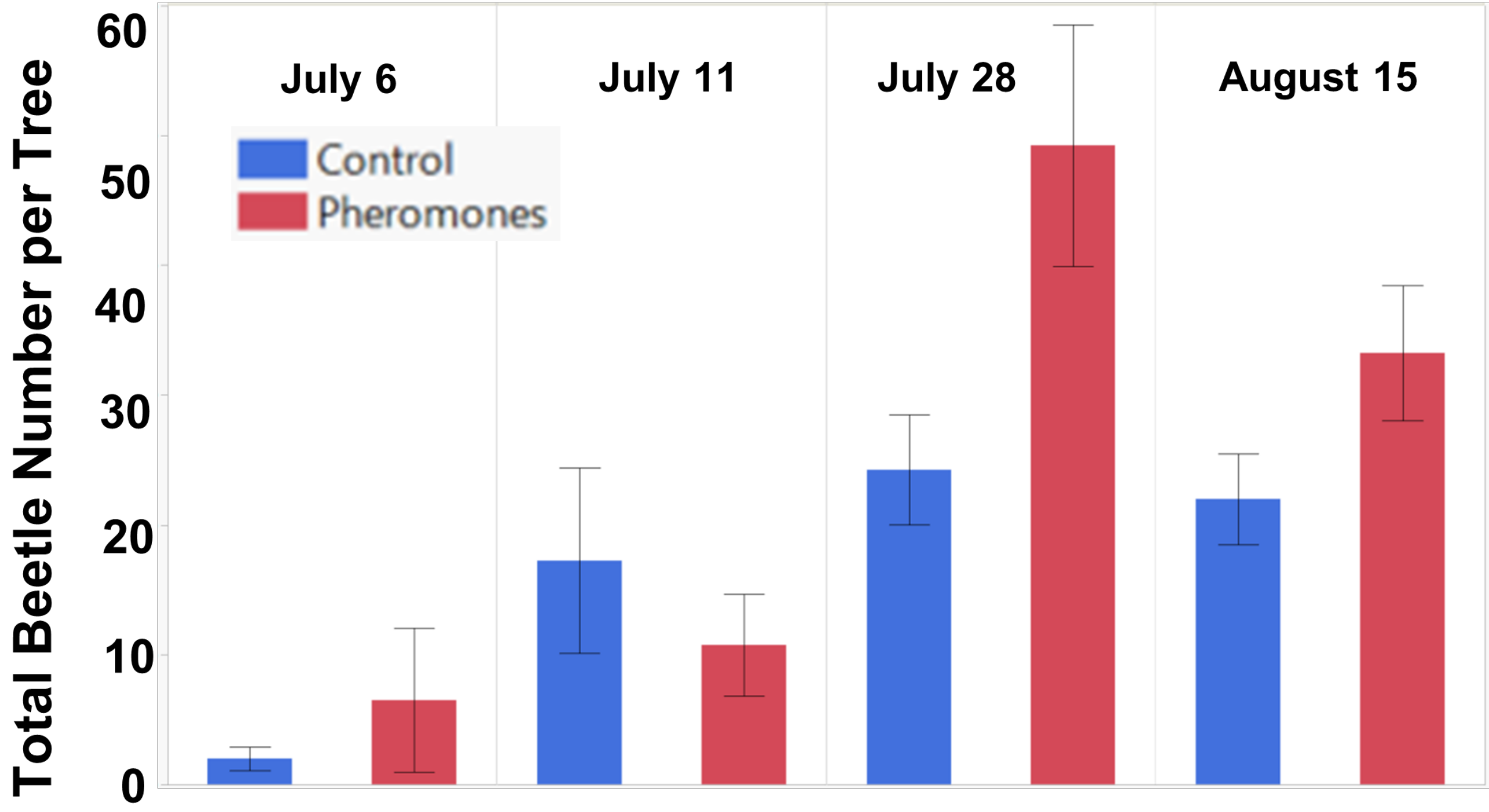
Expected Results

Trees with pheromone lures (GLV and PHE) will

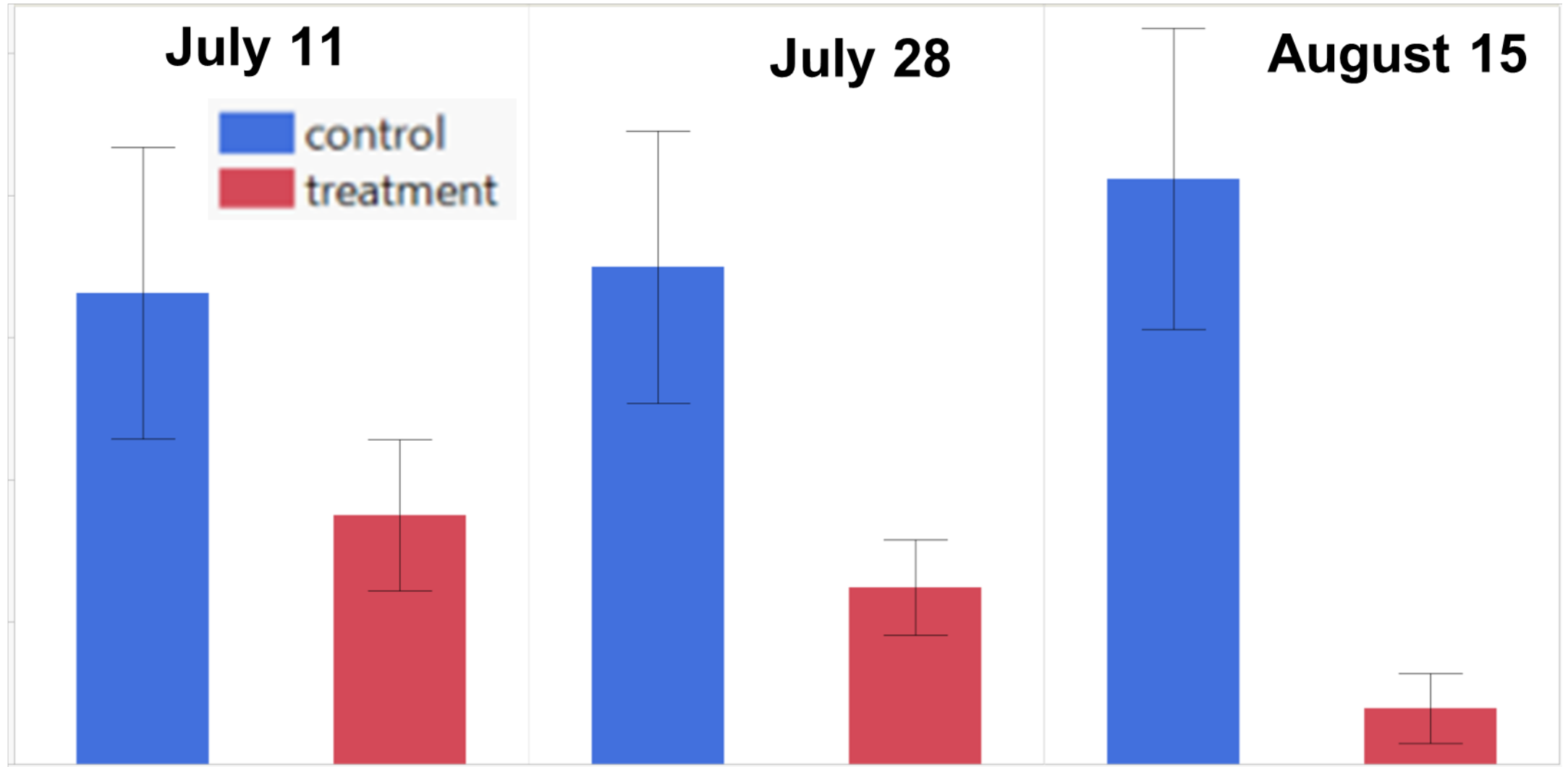
- **have more beetles and**
- **be more defoliated**

than trees without lures





Tamarisk Tree Canopy Volume (m³)



**Can tamarisk beetle pheromone lures
lead to reduced re-growth of tamarisk
following tree cutting?**

- Tree defoliation indicated reduced growth due to pheromone lures.
- Decreasing size of trees with lures over time suggests beetles were defoliating them more than the trees without lures.
- Statistical power to detect treatment effects was low in this small, pilot study.
- Movement of beetles between treatment and control plots likely occurred because distance between them was shorter than beetle flight ranges.
- We did not measure tree volumes before applying pheromone treatments, thus, we cannot be certain differences in tree volumes were due to beetle defoliation. But the trend of greater defoliation over time in plots with lures suggests beetle defoliation caused the difference.
- **There is enough evidence supporting our hypothesis to repeat and expand the study.**

Future Plans

- **Expand current study to more sites and replications with greater distance between treatment and control areas**
- **Conduct studies to refine the use of pheromones as a management tool and answer new questions**

Will beetle defoliation of regrowth after cutting or cut-stump treatment result in tamarisk death?





How much regrowth is needed to provide sufficient habitat for beetles without trees being so large that they suppress growth of native plants?



What are the economic trade-offs between beetle herding and re-treating with mechanical (cutting) and chemical (herbicide) methods?

Can pheromones be used to lure
beetles **away from**
Southwestern Willow Fly
Catcher habitat or habitat of
other sensitive species?



What questions about this approach would you like to have answered by future research?



Do you know of tamarisk, treated or untreated, that could be part of future studies to develop our understanding of how best to use pheromones in an integrated management program?

Questions?



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