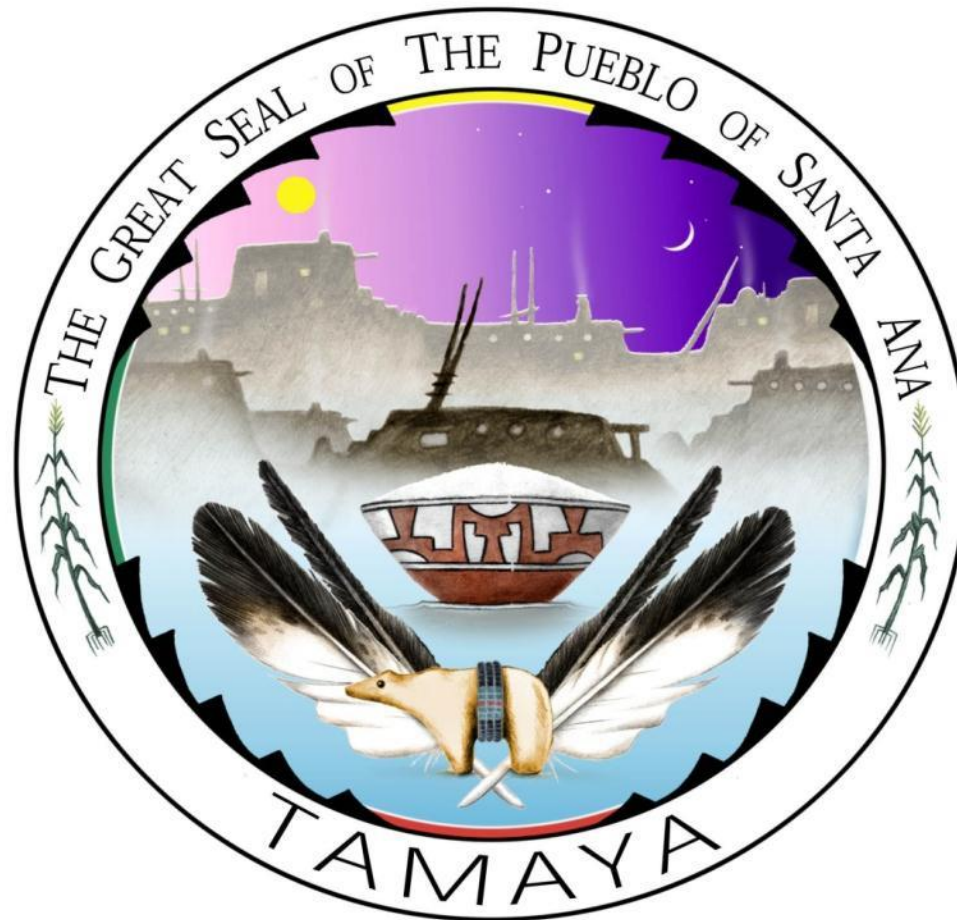


PUEBLO OF SANTA ANA: ENVIRONMENTAL VARIABLES ASSOCIATED WITH THE RIO GRANDE AND RIO JEMEZ RIPARIAN CORRIDOR

Nathan Schroeder – Presenter, Cathy Nishida – Lead Investigator



**Middle Rio Grande Endangered Species Collaborative Program
December 3-4, 2019**

Willow Flycatcher Biological And Habitat Survey

Objective: While the Pueblo continues to restore riparian habitats on its land, it has little information regarding the value of these restoration efforts to the willow flycatcher. Therefore, the Pueblo and the Bureau of Reclamation's Middle Rio Grande Endangered Species Collaborative Program collaborated on a project to learn about the value of the Pueblo's restoration efforts to the willow flycatcher.



Study Design

Four Location Types: 1) flycatcher high use, 2) flycatcher no use, 3) passive restoration, 4) active restoration



High use and no-use were determined using 2001, 2005-2009 flycatcher survey data.

Study Design

Four Location Types: 1) flycatcher high use, 2) flycatcher no use, 3) passive restoration, 4) active restoration



Active restoration sites were focused around willow swales constructed in early 2000's.

Study Design

Four Location Types: 1) flycatcher high use, 2) flycatcher no use, 3) passive restoration, 4) active restoration

1999

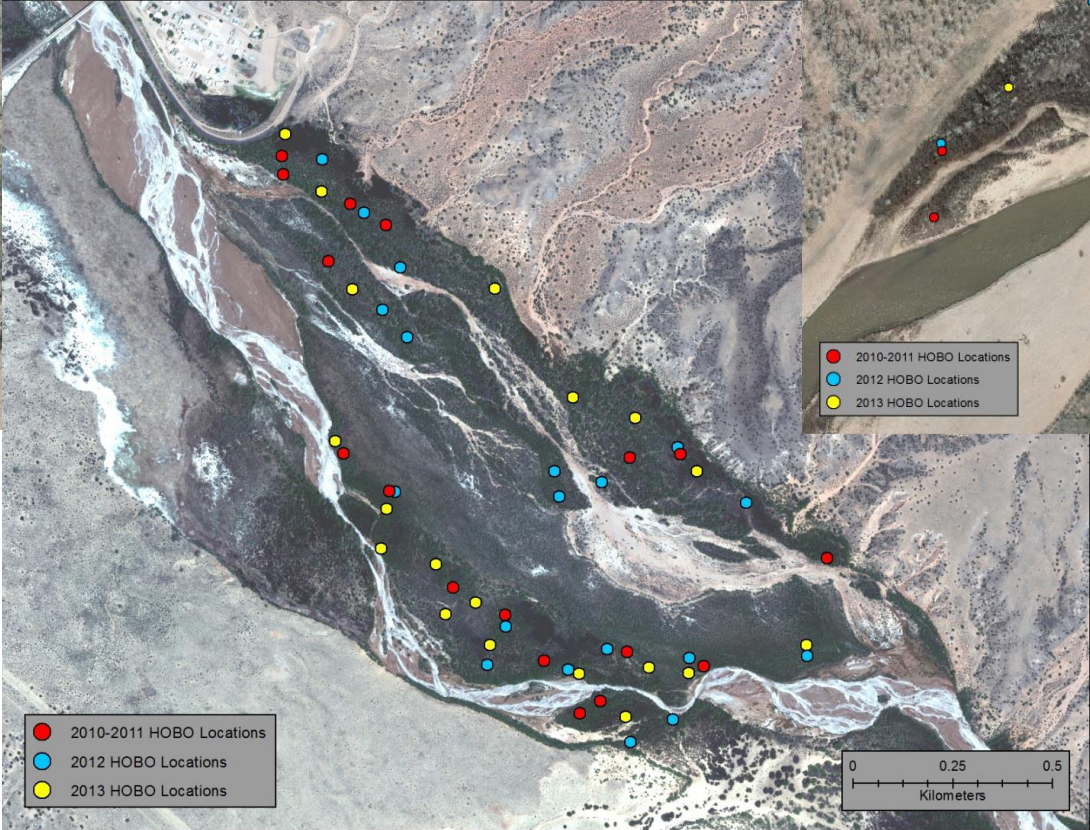


2009



Passive restoration sites had some construction work done, but were left to revegetate naturally

Sampling Locations along the Rio Grande



● 2010-2011 HOBO Locations
● 2012 HOBO Locations
● 2013 HOBO Locations

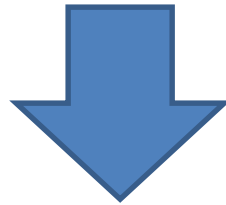
● 2010-2011 HOBO Locations
● 2012 HOBO Locations
● 2013 HOBO Locations

● 2010-2011 HOBO Locations
● 2012 HOBO Locations
● 2013 HOBO Locations

Environmental Data Collection



Hobo U23 Probes measure temperature, relative humidity
15 minute measurement



Five soil moisture measurements below each Hobo every two weeks

Vegetation Data Collection

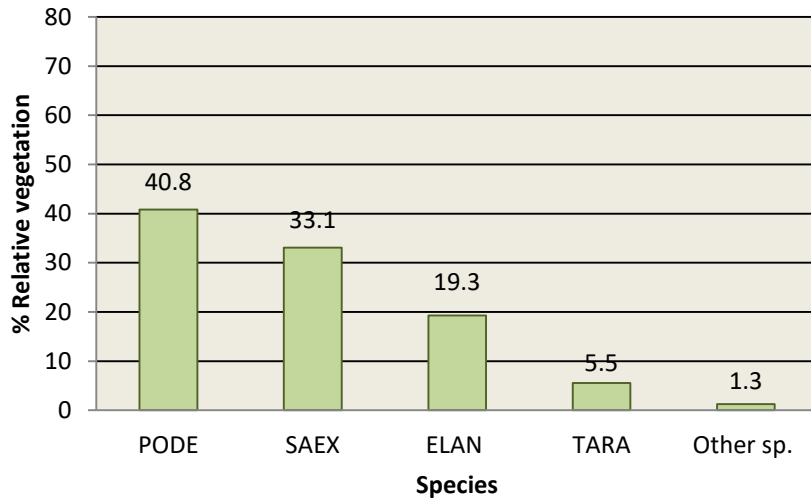
Composition and Structure:

- Spherical densitometer to measure canopy closure (average of five measurements)
- average canopy height within each plot by selecting representative trees in two different quadrants
- using a 10.5-m telescoping pole, at each point, measured vegetation coverage within a decimeter radius of the pole at: 0-1 m, 1-2 m, 2-3 m, 3-4 m, 4-5 m, 5-6 m, 6-7 m, 7-8 m, 8-9 m, 9-10.5 m, 10.5+
- counted stem density within belt transects
- grouped data by species: cottonwood, coyote willow, Goodding's willow, peach willow, saltcedar, Russian olive, snag, and "other"

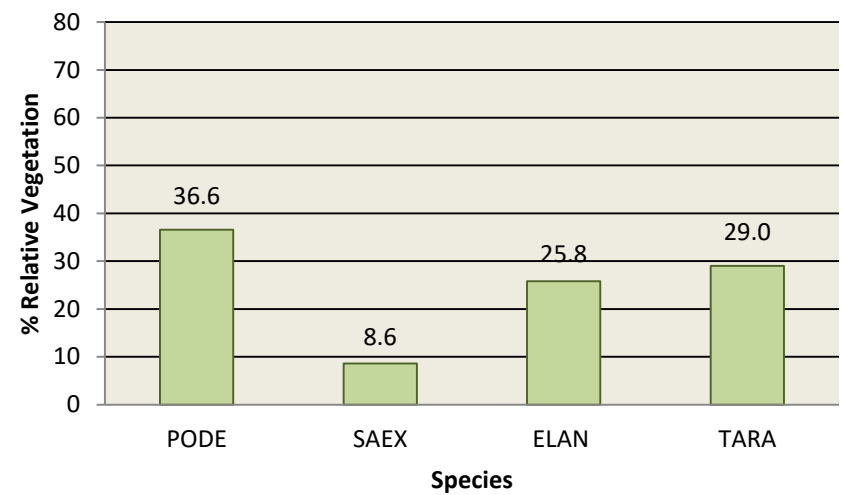


Vegetation Composition

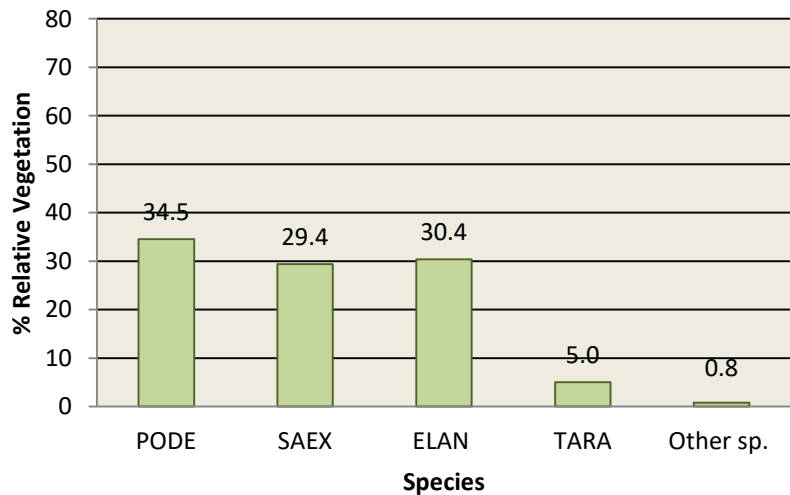
High Use



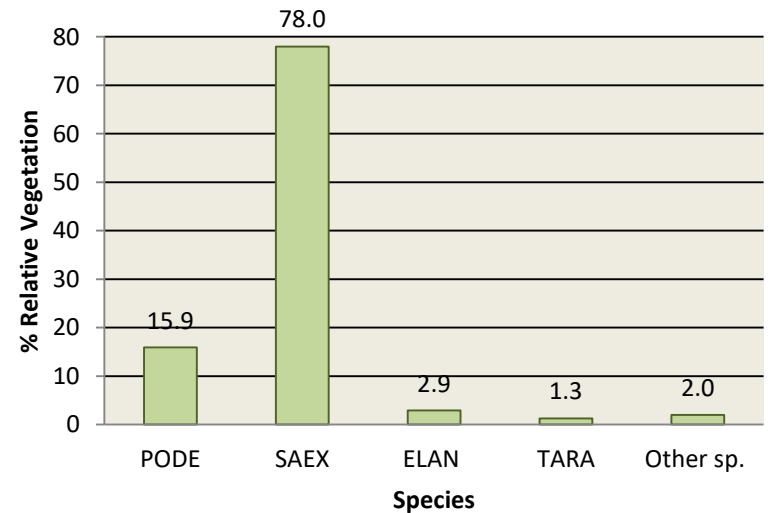
Non-use



Passive Restoration



Active Restoration



2007

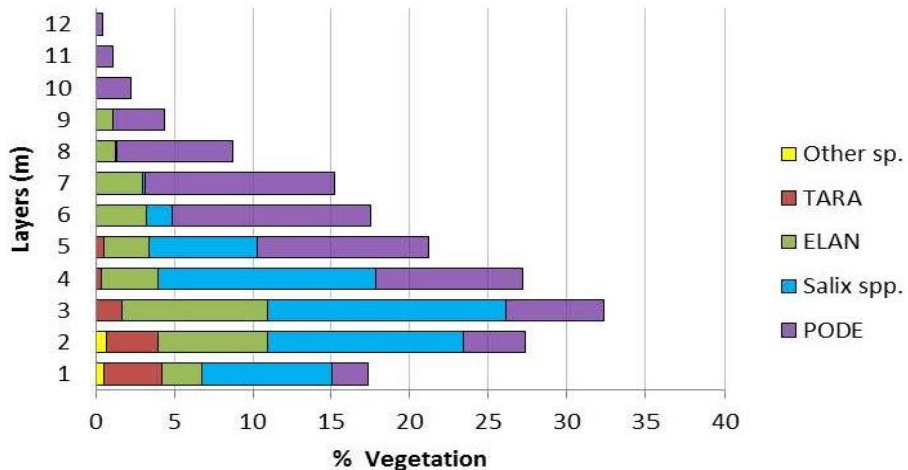


2019

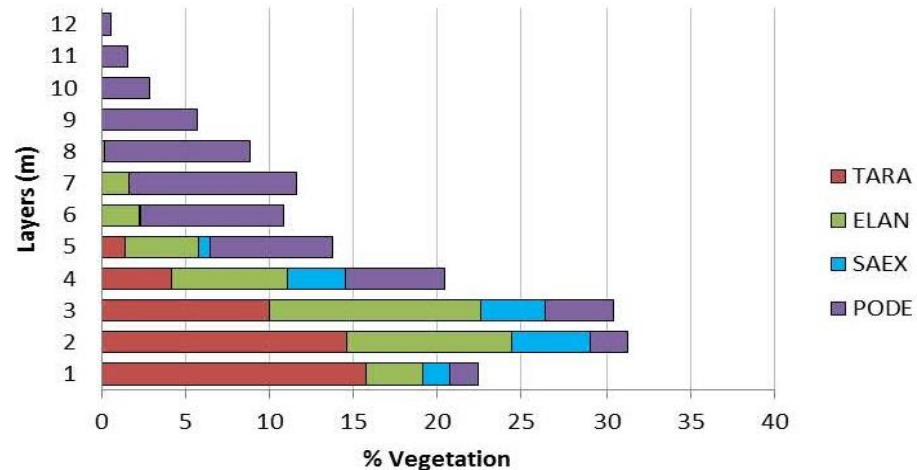


Vertical Composition and Structure (Foliage Volume)

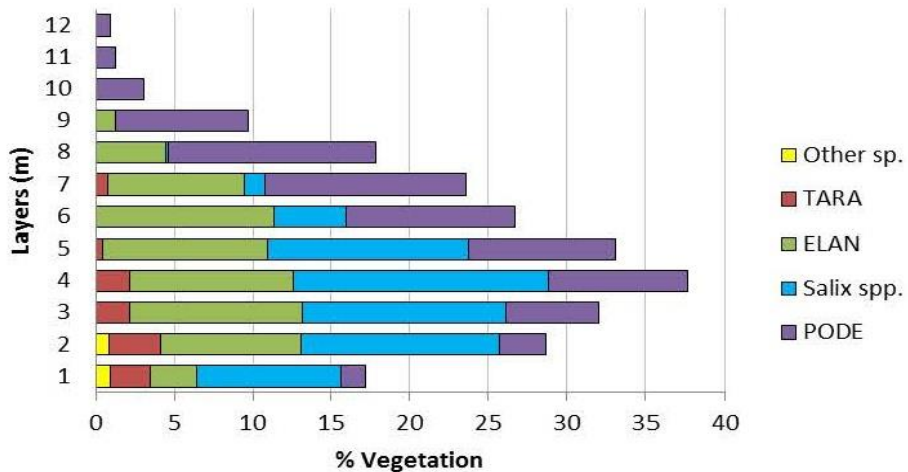
High Use



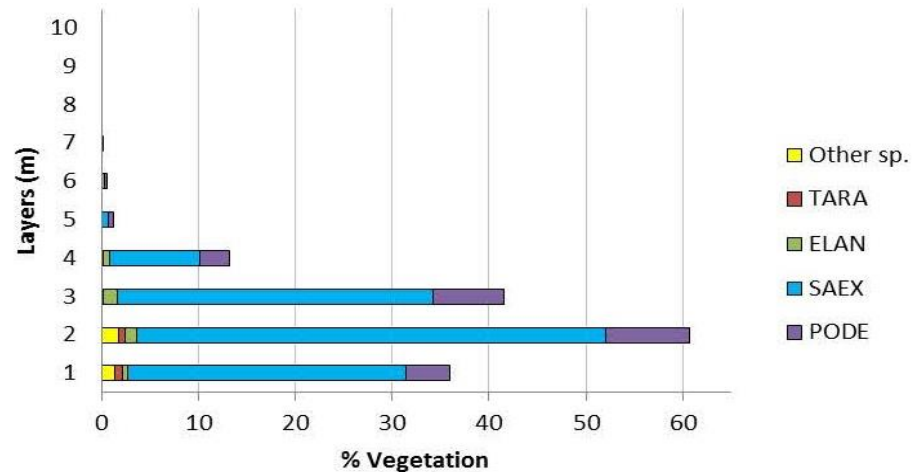
Non-use



Passive Restoration

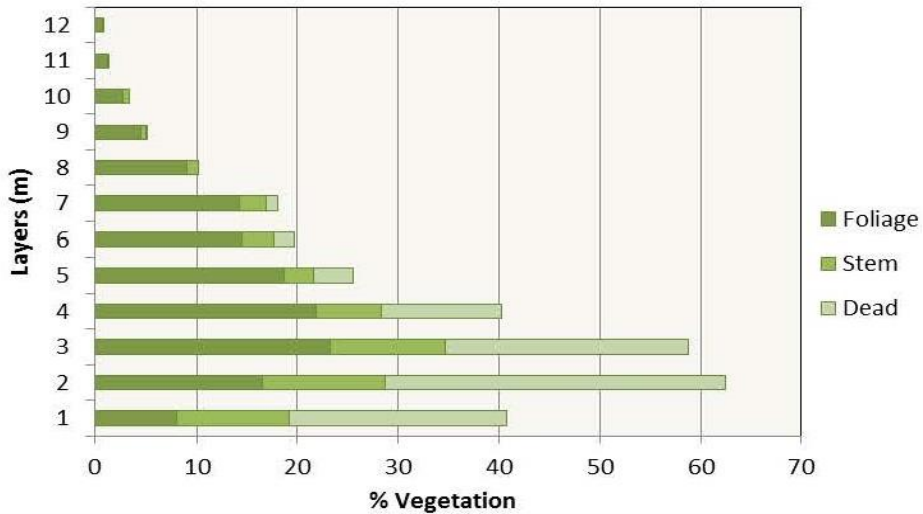


Active Restoration

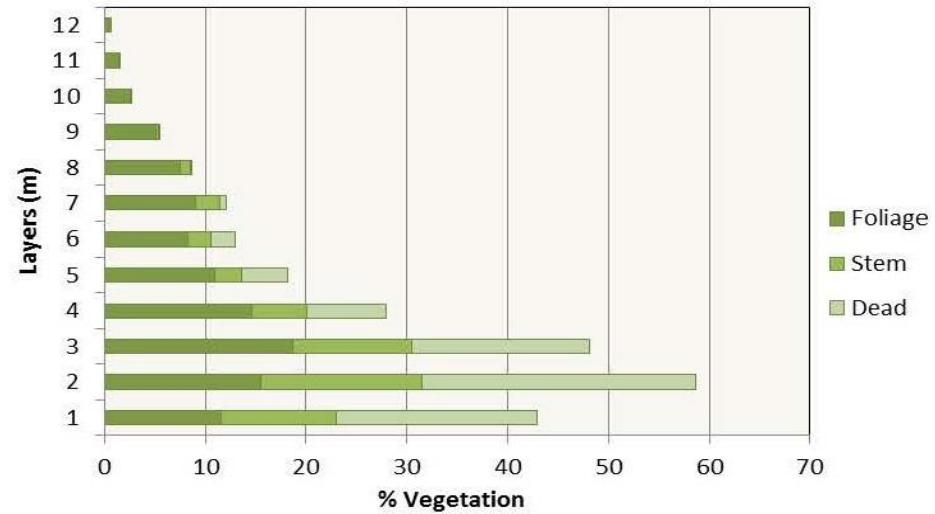


Vertical Architecture (Volume)

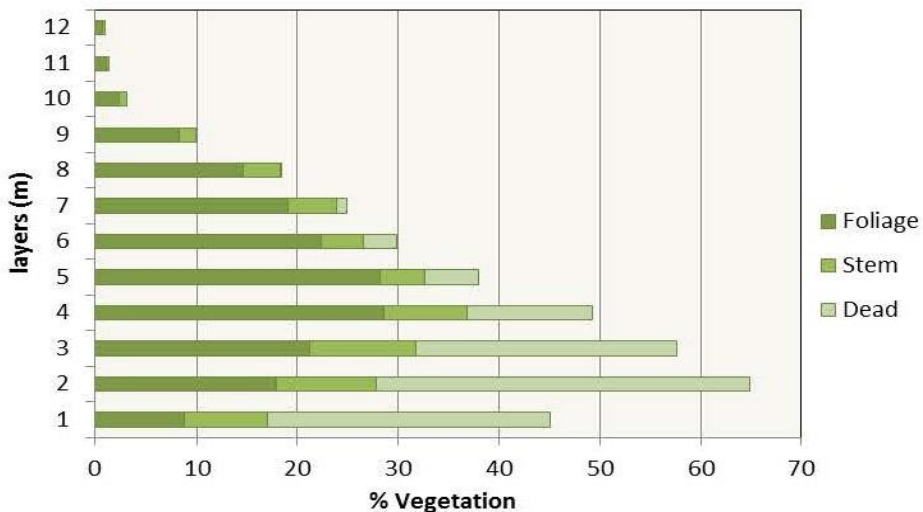
High Use



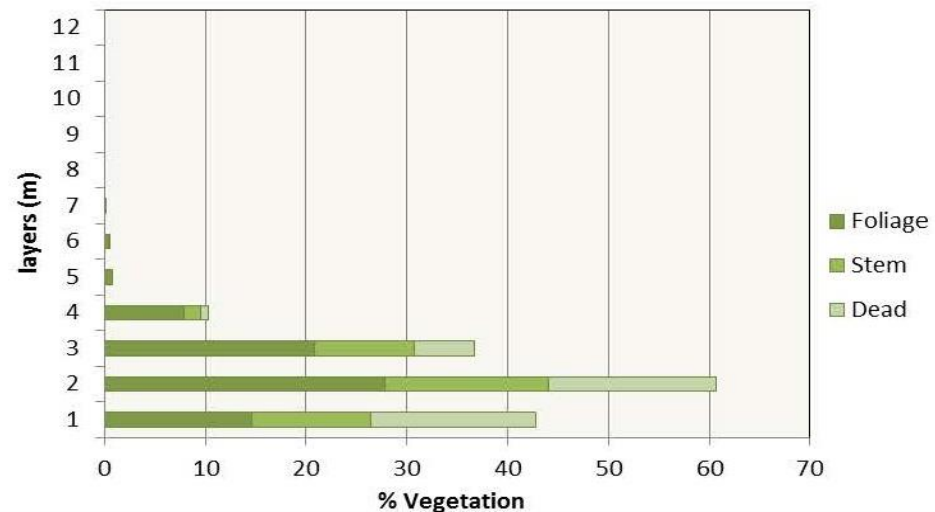
Non-use



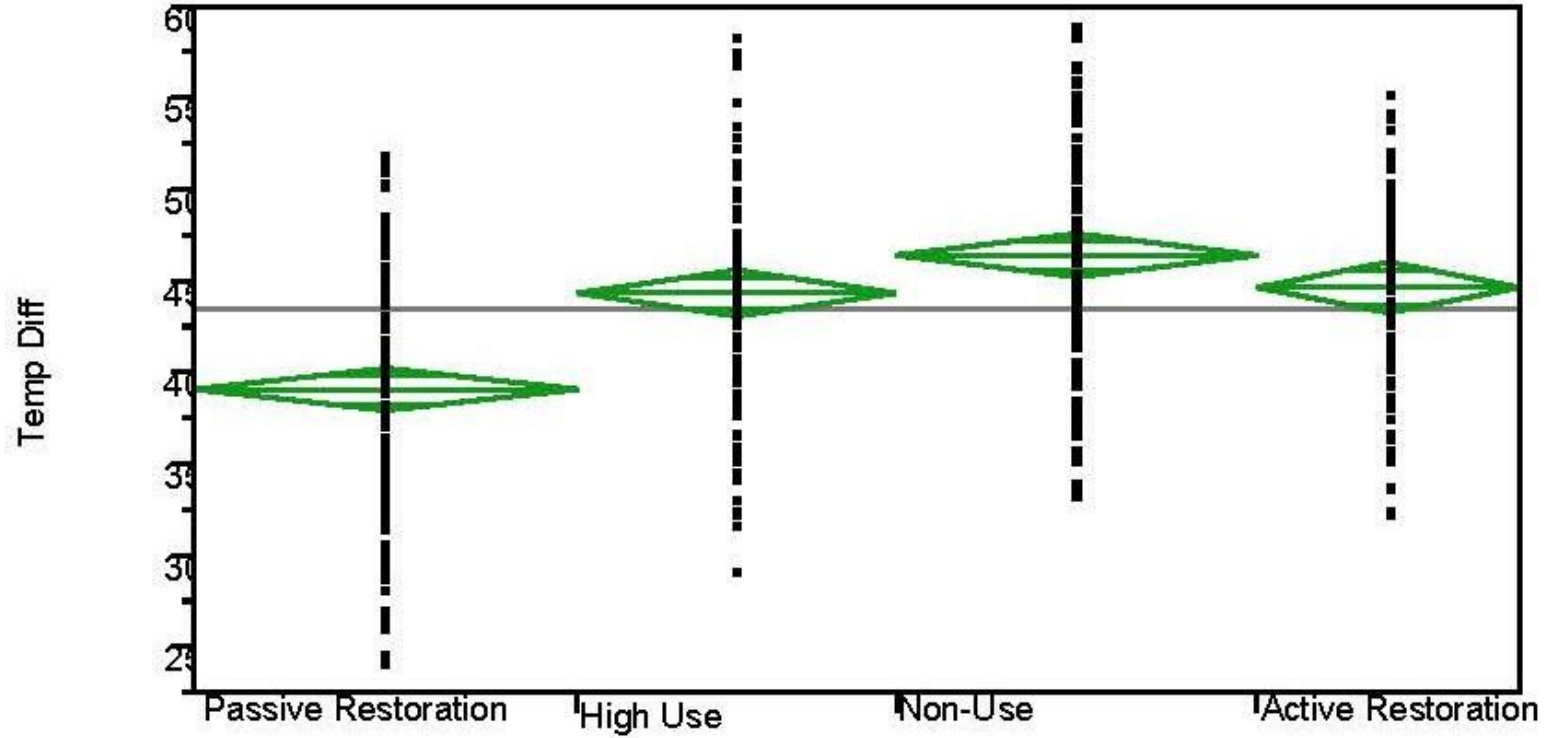
Passive Restoration



Active Restoration

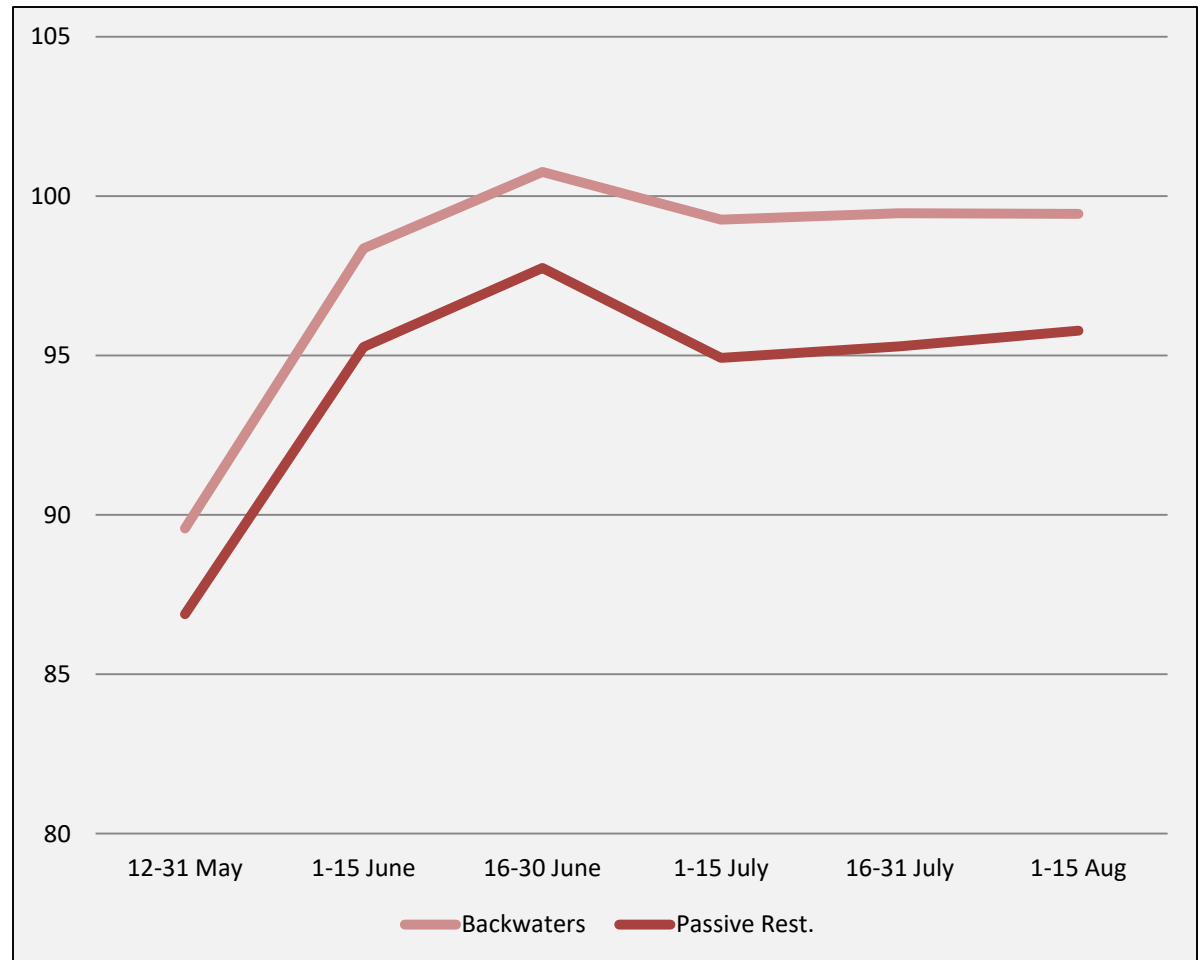


Daily Temperature Variation



Maximum Daily Temperature

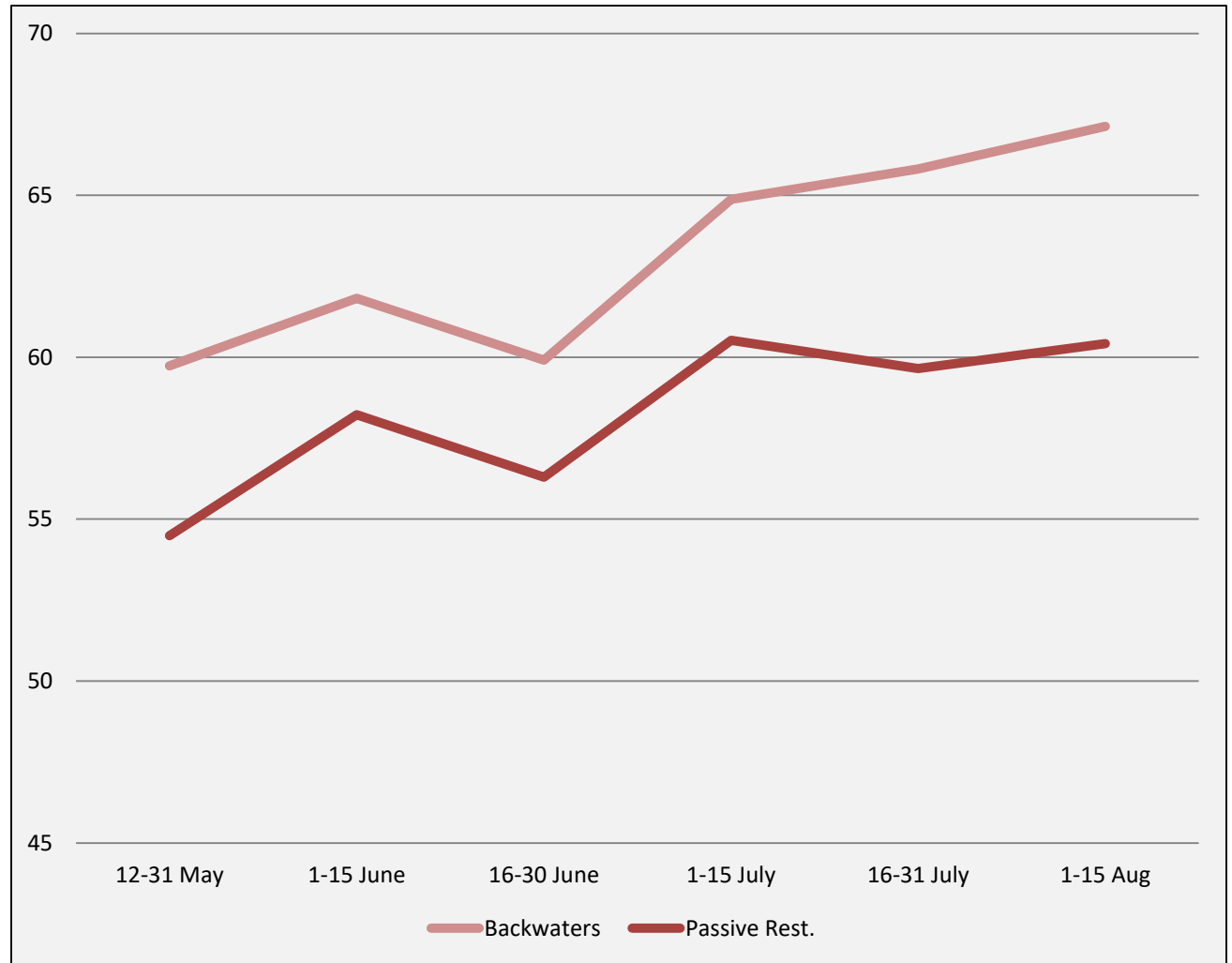
passive vs. active restoration (backwaters)



- Daily Temp Variation
- Min Daily Temps
- Max Daily Temps
- Max temp difference
 4.3 ± 0.4 SE

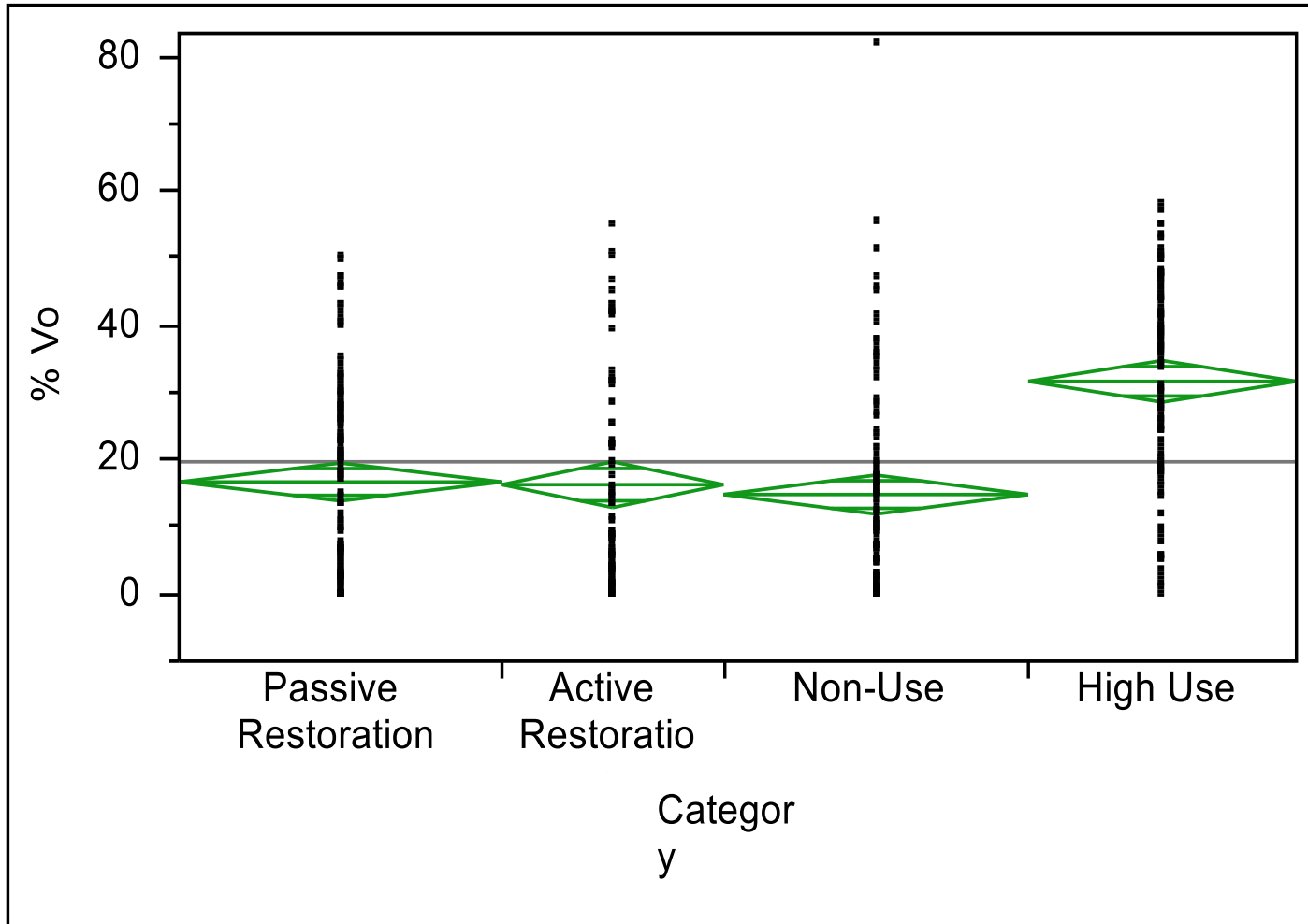
Relative Humidity Daily Variation

passive vs. active restoration (backwaters)



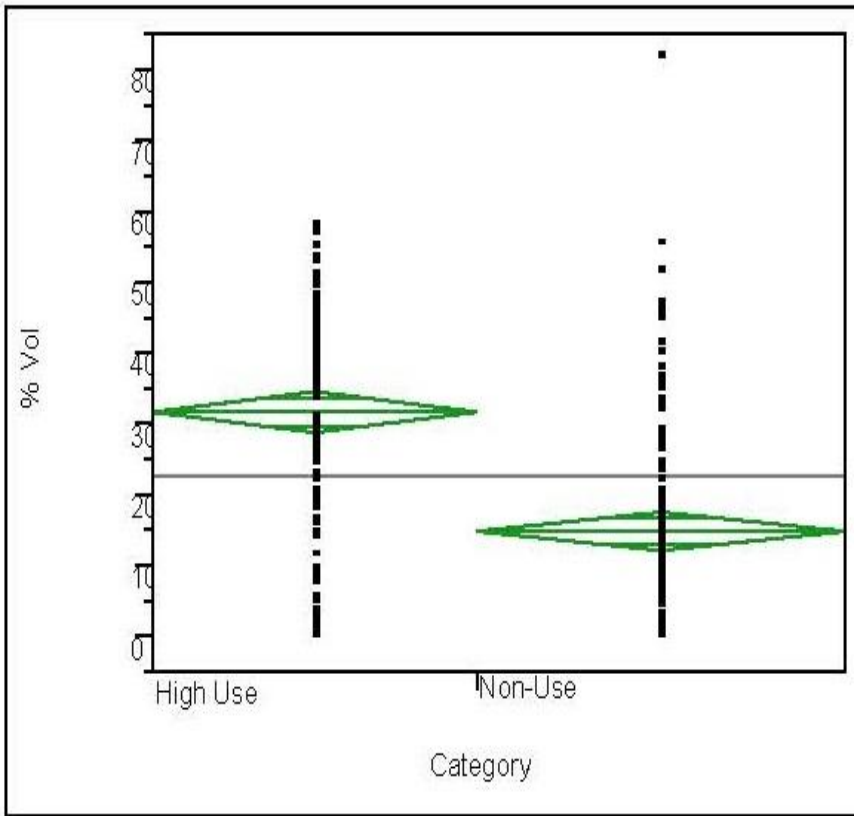
- ~~Maximum RH~~
- ~~Minimum RH~~
- RH daily variation
- % relative humidity in 24-hr period

Soil Moisture

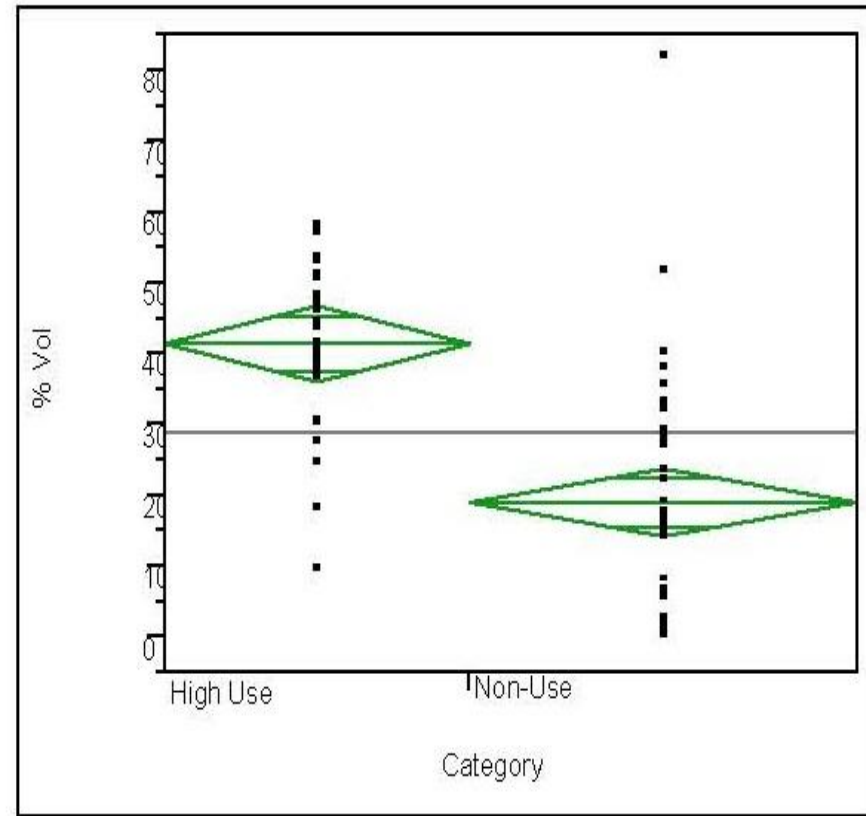


Soil Moisture

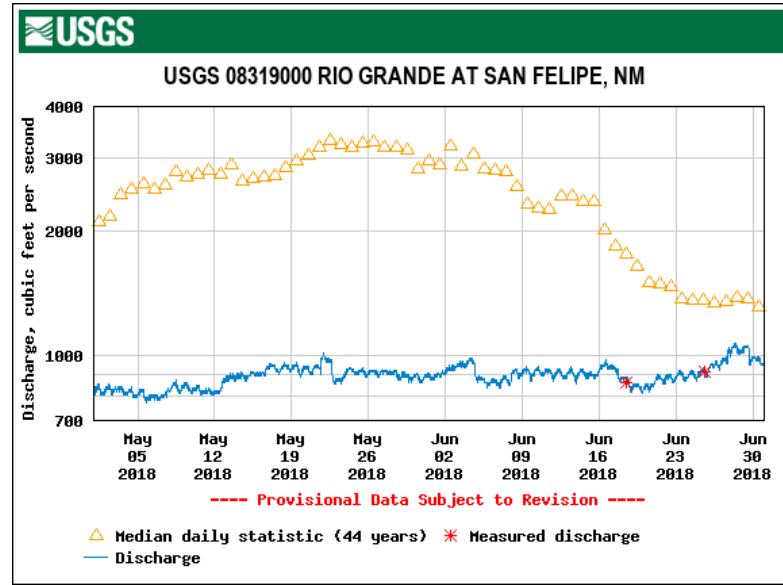
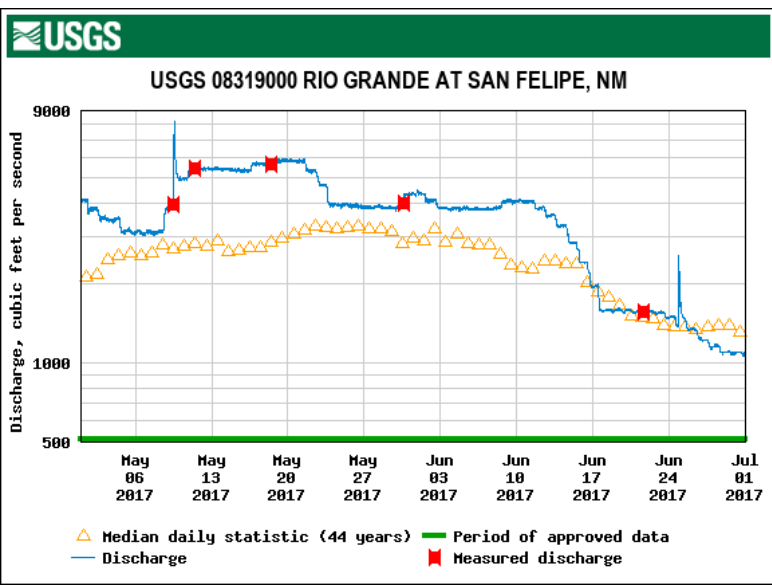
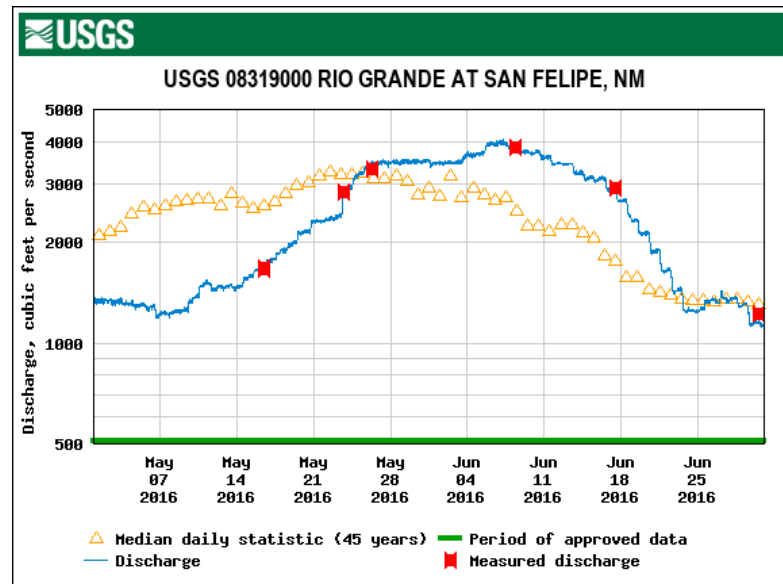
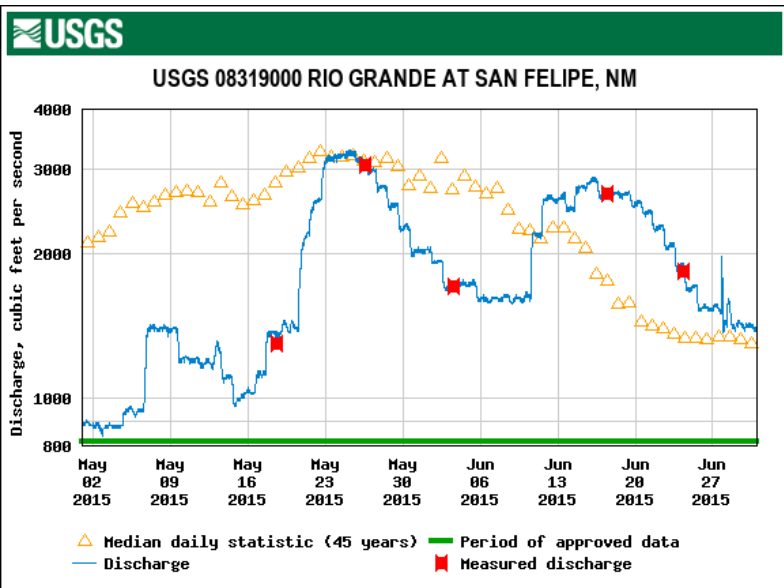
May to August



May 12 to June 15



Rio Grande River Flow Comparison



In Summary

- Passive restoration sites are similar to high use areas in both structure and composition of vegetation
- Passive sites are able to regulate temperature better than high use areas.
- Despite our habitat measurements indicating that our passive restoration sites are likely providing the structure required by willow flycatchers, water is a key component of willow flycatcher habitat. Soil moisture conditions of passive restoration sites over the duration of the study were no different than non-use areas. High use areas retained 16.8% more soil moisture content.
- In order to attract more males to setup territories and encourage females to build nests, more water early in the season and higher soil moisture retention throughout the breeding season is required.

Tamarisk Leaf Beetle Monitoring at Santa Ana

Objective: examine several aspects of the tamarisk leaf beetle infestation that began at the Pueblo in 2011.



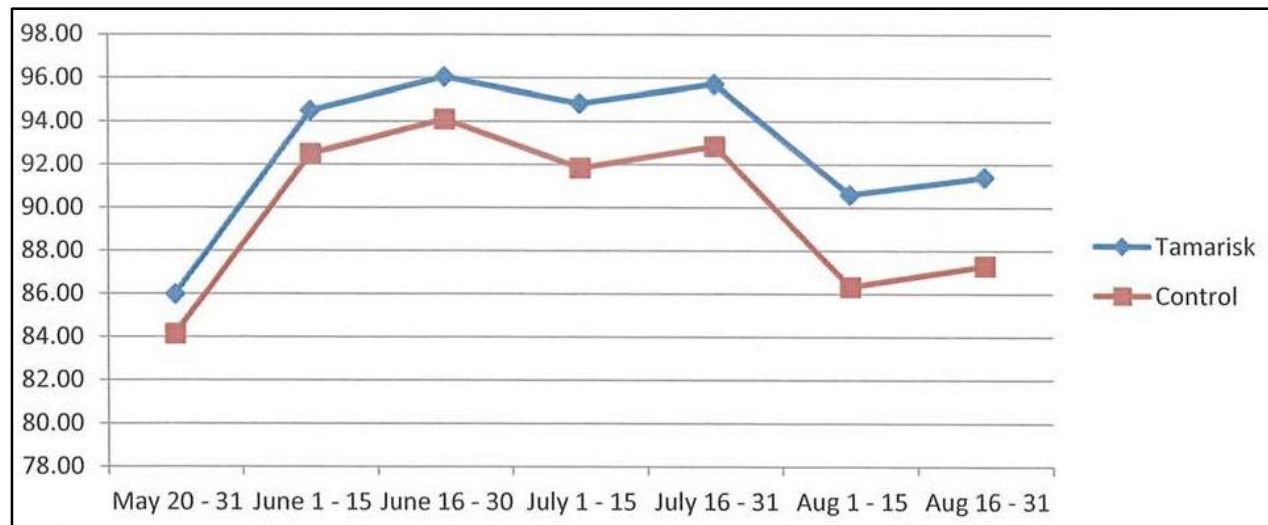
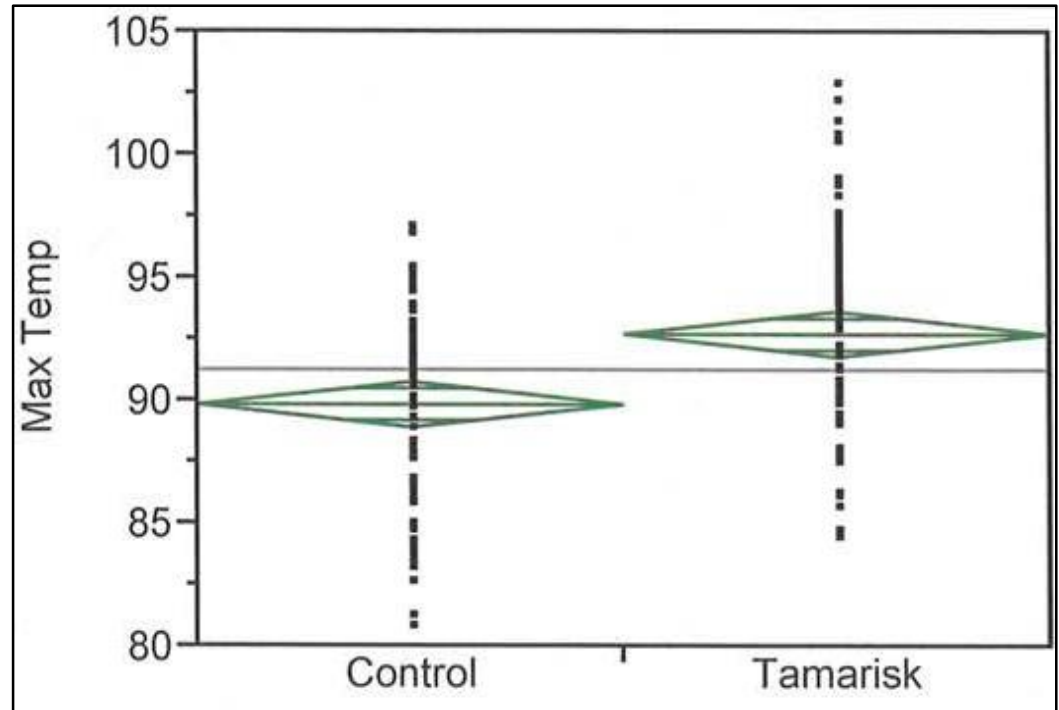
Site Locations

Targeted site selection



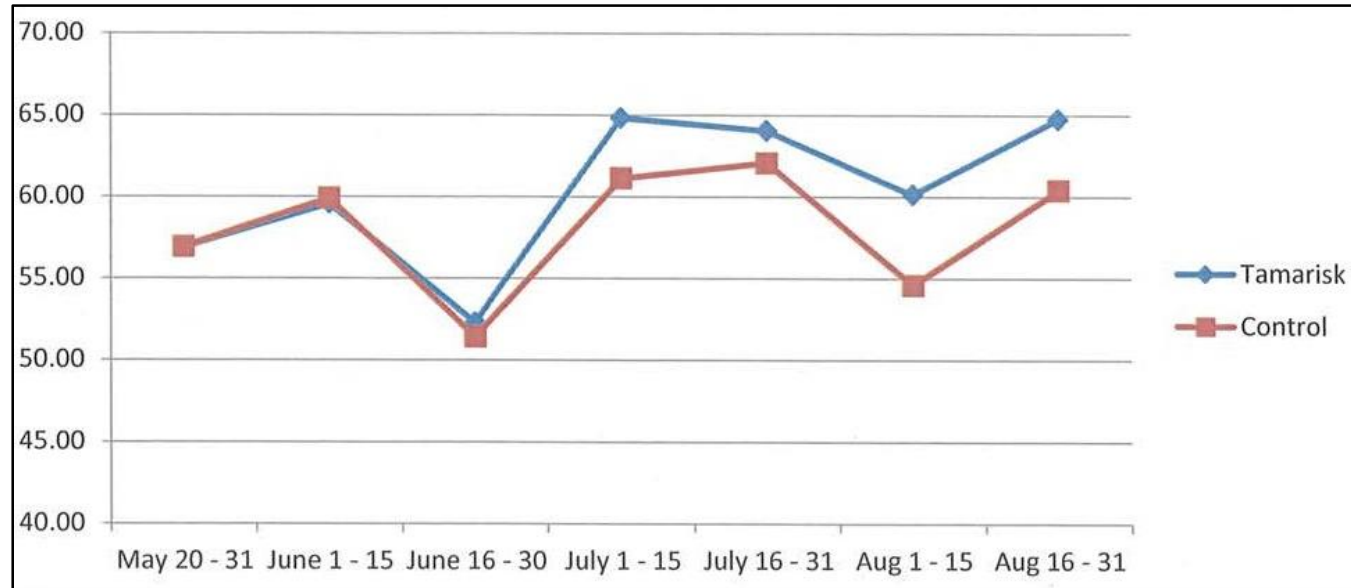
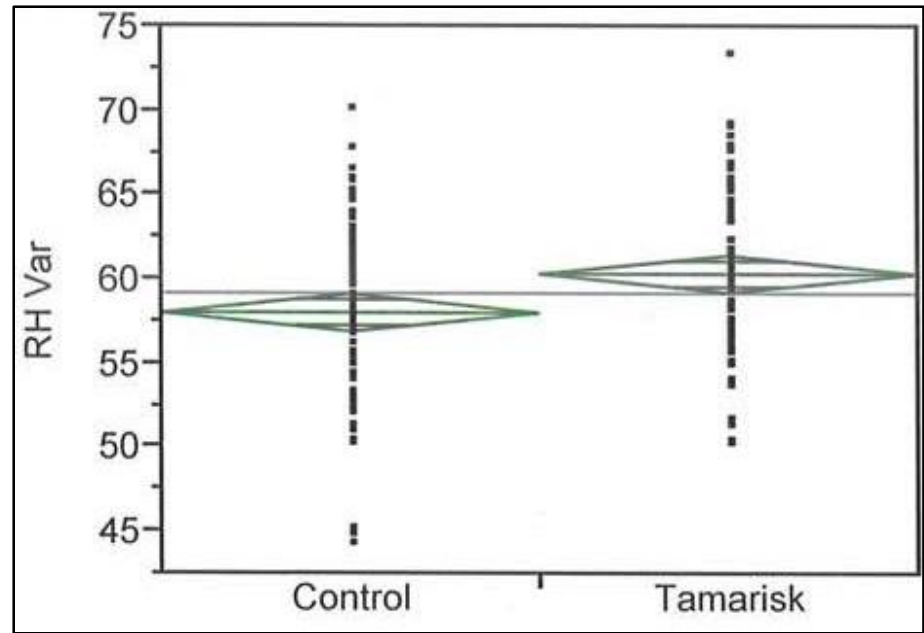
Daily Temperature

- ~~Min Daily Temps~~
- Max daily temp were higher in tamarisk sites by 2.9 ° F (5/20 – 8/31)
- Month by month: T>C 2.5 ° F (6/16-7/15)
- Increases to 3.6 ° F during (7/16 - 8/15)
- Increases to 4.1 ° F (8/16 - 8/31)



Relative Humidity Variation

- ~~Max daily relative humidity~~
- Minimum daily relative humidity was lower in tamarisk sites. Daily RH variation was more extreme in tamarisk sites.
- Differences were significant from July 16 – Aug 31.



In Summary

- Defoliation occurs during some of the hottest months.
- Daily temperature and is higher and daily relative humidity variation is more extreme when foliage is removed.
- This process should be seen as analogous to some of our work in restoration when we rapidly remove acres of saltcedar.