

# **Effectiveness of Biocontrol with Tamarisk Beetles** *(Diorhabda carinulata)*

Impacts on Tamarisk  
In Grand County Utah 2004 – 2013

By

Wright Robinson & Tim Higgs

Support from:  
Private Foundations  
Forestry, Fire and State Lands 2012  
A Utah NRCS Sponsored Research Project 2008-2011  
National Park Service sponsor 2009 – 2010

# Special Thanks!

- ◆ John Hartley
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- ◆ Dave Vaughn

# Presentation Order

- I. Plant facts
- II. Beetle facts
- III. Species interactions
- IV. Tamarisk mortality surveys
- V. What replaces the tamarisk?
- VI. The 'new' weevil arrives

I

***The Plant:***  
***A few basic facts***

# Quick Facts

- ◆ 90 to 100 species of tamarisk worldwide
- ◆ 10 species in United States

- ◆ 2 species are causing problems, primarily in:

Utah

Colorado

Arizona

Texas

Wyoming

Kansas

Montana

New Mexico

Nevada

California

Washington

Oregon

# Quick Facts #2

- ◆ All U.S. tamarisks are non-native
- ◆ The plants found locally are fast growing
- ◆ They had no natural enemies in U.S. when introduced
- ◆ Mature tamarisks can release over 500,000 tiny seeds / year

# The Flower



# Final Facts

- ◆ Seeds can travel by air and water
- ◆ The root systems can penetrate over 100 feet down into the soil
- ◆ Surface roots may reach out 50 feet
- ◆ Tamarisk can deplete available water for other species





# Tamarisk Control

How to stop „em...

# We Can Cut them Down



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After about 2 weeks - height > 12 inches

# Cutting & Nurse Logs





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# We Can Burn them



BLM Photo 2009

**But, after a few weeks ...**



# 1 Year later - 7 to 8 feet tall



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After about 13 months

# Fire as a Tool for Controlling *Tamarix* spp. Seedlings

Not often used in southwestern riparian ecosystems because:

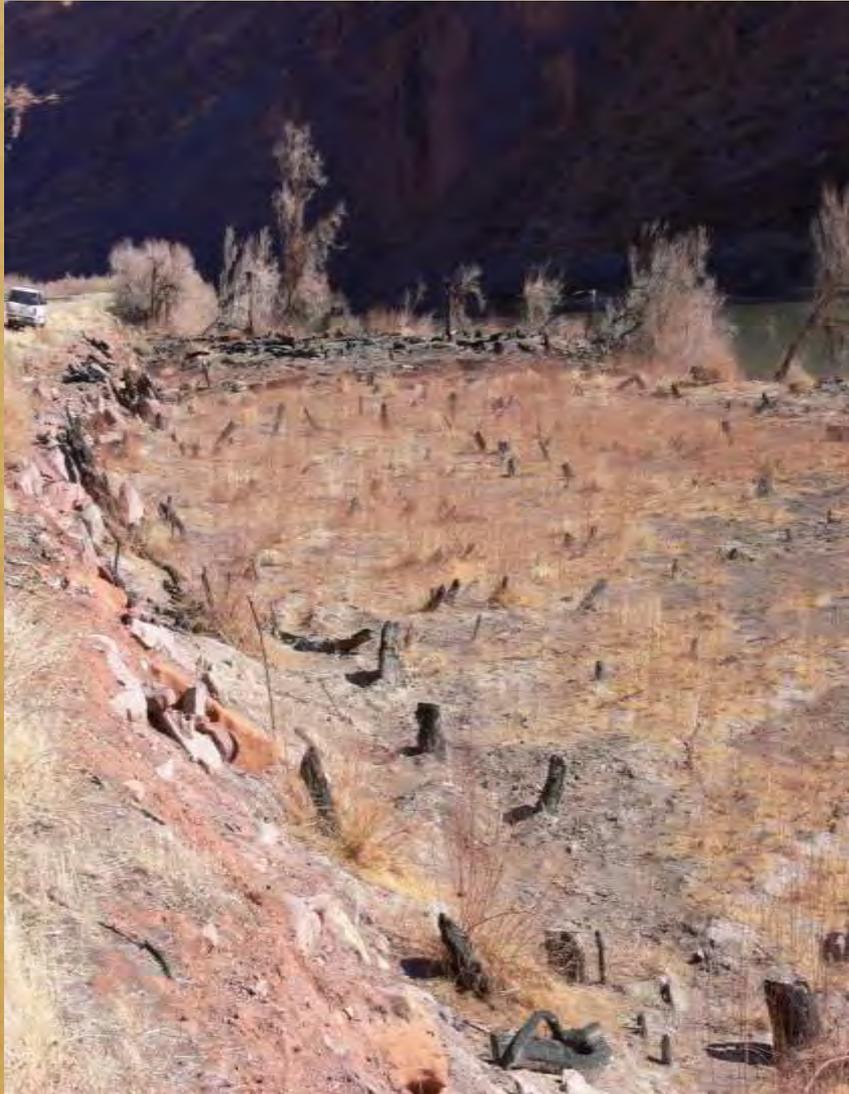
- ◆(1) *Tamarix* can recover rapidly from fire with new shoots from root crown.
- ◆(2) High soil moisture reduces chances that fire intensity is sufficient enough to kill mature *Tamarix*.
- ◆(3) Desired native woody vegetation often slow to recover from fire leaving behind *Tamarix* infestations.

*From: Invasive Plant Science and Management 2012 Volume 5 (pages 139 – 147).*

# Best Burn: Brown or Green?

- ◆ Both burn well.
- ◆ “... the plant is also a fire hazard, as it is highly flammable even when green and healthy.”
- ◆ Quote from Tom Dudley, UC Santa Barbara, in a press release from UCSB Office of Public Affairs 7/12/2012.

# We Can Cut and Burn them...



Tim Higgs Fall 2008



Wright Robinson June 2009



Wright Robinson Aug. 2009

# We Can Use Toxic Spray



# We Can Use Biocontrol



- ◆ *Diorhabda carinulata*
- ◆ The tamarisk beetle
- ◆ The saltcedar beetle
- ◆ That little beetle

([www.chihuahuandesert.org](http://www.chihuahuandesert.org))

**II**

***The Beetle:***  
***A few basic facts***

# Beetle Quick Facts

- ◆ Beetles over-winter as adults in leaf litter
- ◆ Eggs – hatch in 5 to 6 days
- ◆ Larvae – three stages (called instars), 21 days
- ◆ Pupa – out of sight in the leaf litter, 7 days
- ◆ Adults – can live 2 – 4+ weeks in nature

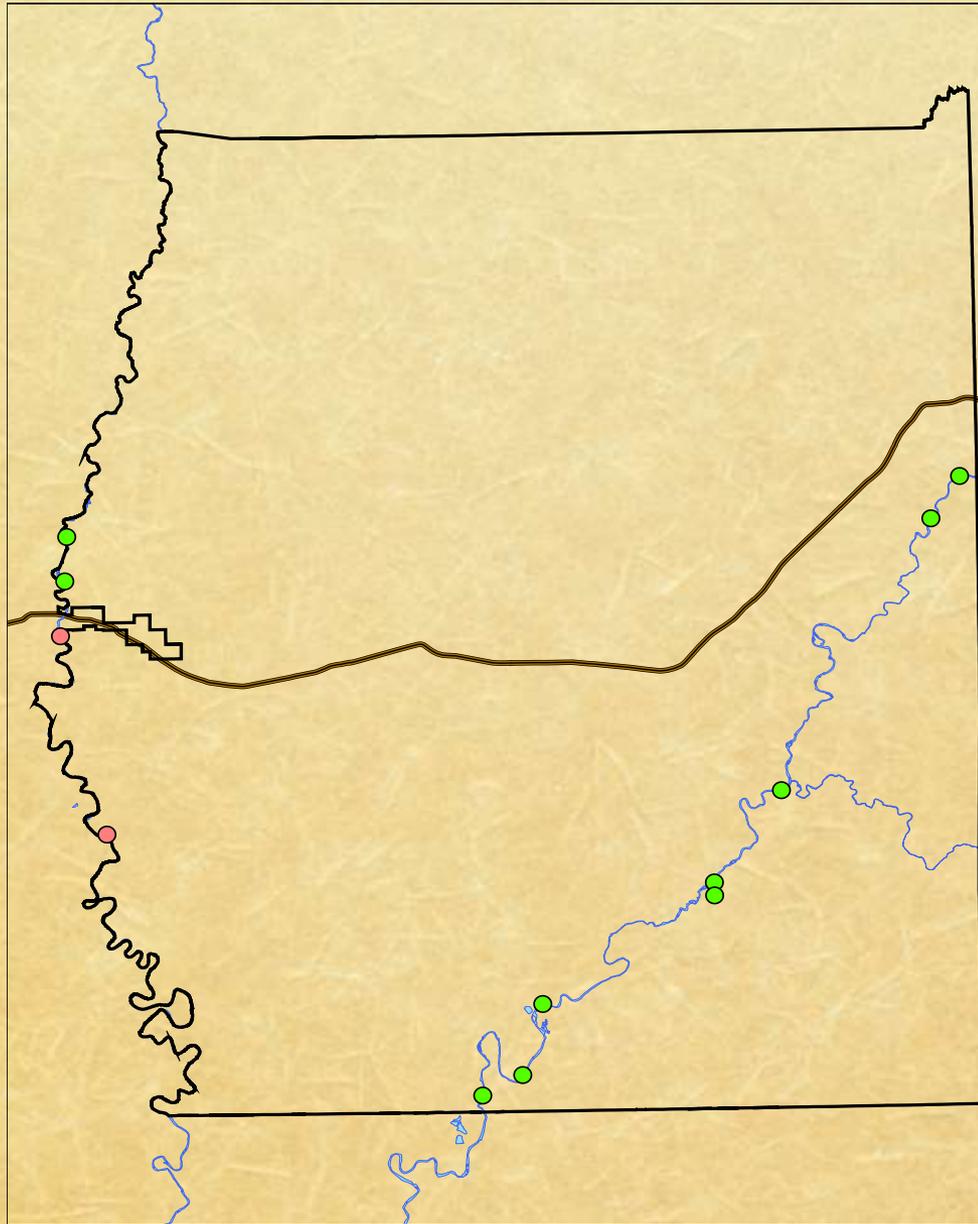
# The Stages You See



# Releasing the Beetles

- ◆ 2004 beetles were first released to control tamarisks in Grand County
- ◆ Release years: 2004, 2005, 2006
- ◆ Release numbers: about 10,000 adults each time
- ◆ Releases /site: 1 to 3

# Release Locations

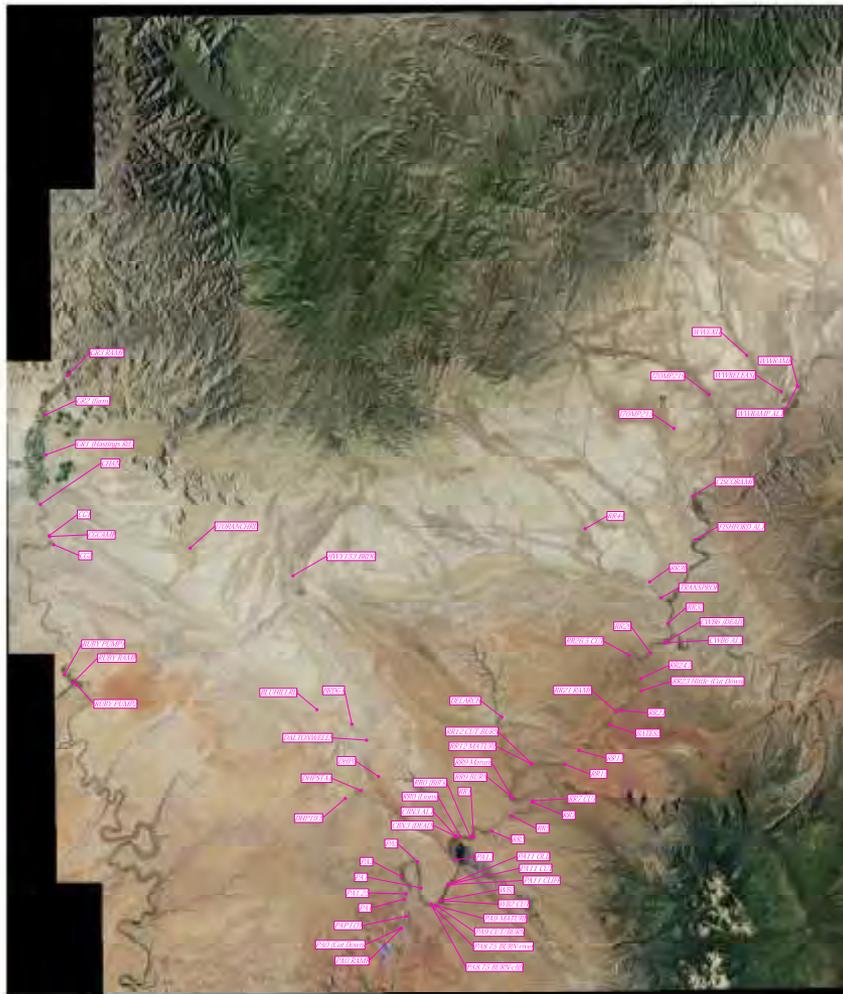


# Project Background

- ◆ 2004 - 2006 limited observations
- ◆ 2007 - 2012 systematic observations
- ◆ 71 sites routinely monitored in 2012
- ◆ Other sites monitored less frequently (ex. Blue Hills Road, Mineral Bottom, Floy and Nash Washes)

# Field Monitoring Techniques

- ◆ Select random target trees
- ◆ GPS the location of each tree
- ◆ Record condition of tree over time
- ◆ Record beetle stages found over time



# Beetles on the Move

Grand County

Browning by Year

# Browning 2005 (< 2 ha)



# William's Bottom 2005



Jerry Shue (2005)

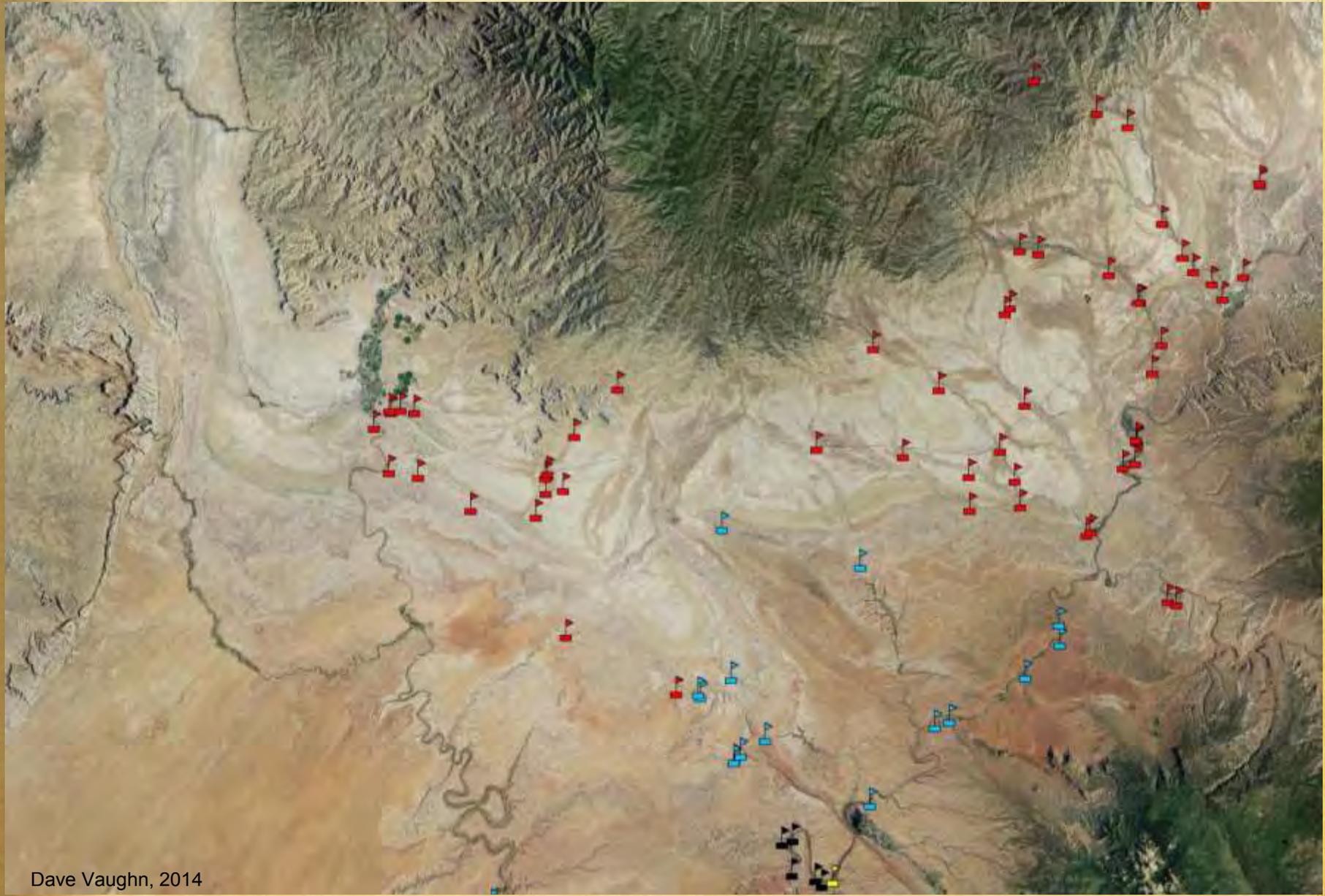
2006 (400 ha)



2007 (4000 ha)



2008 - 2013 (> 650,000 ha)



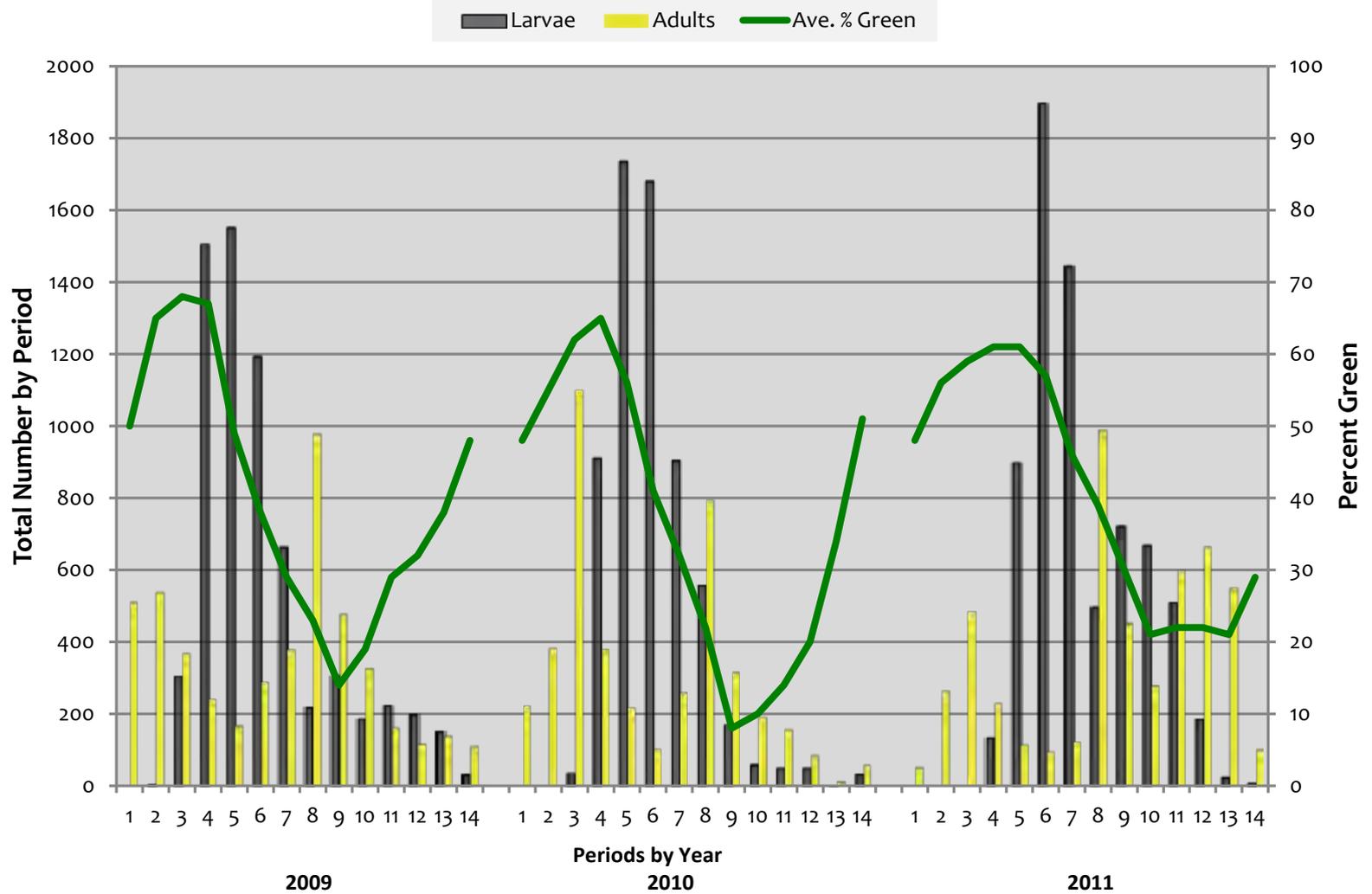
# Williams Bottom August, 2008



# III

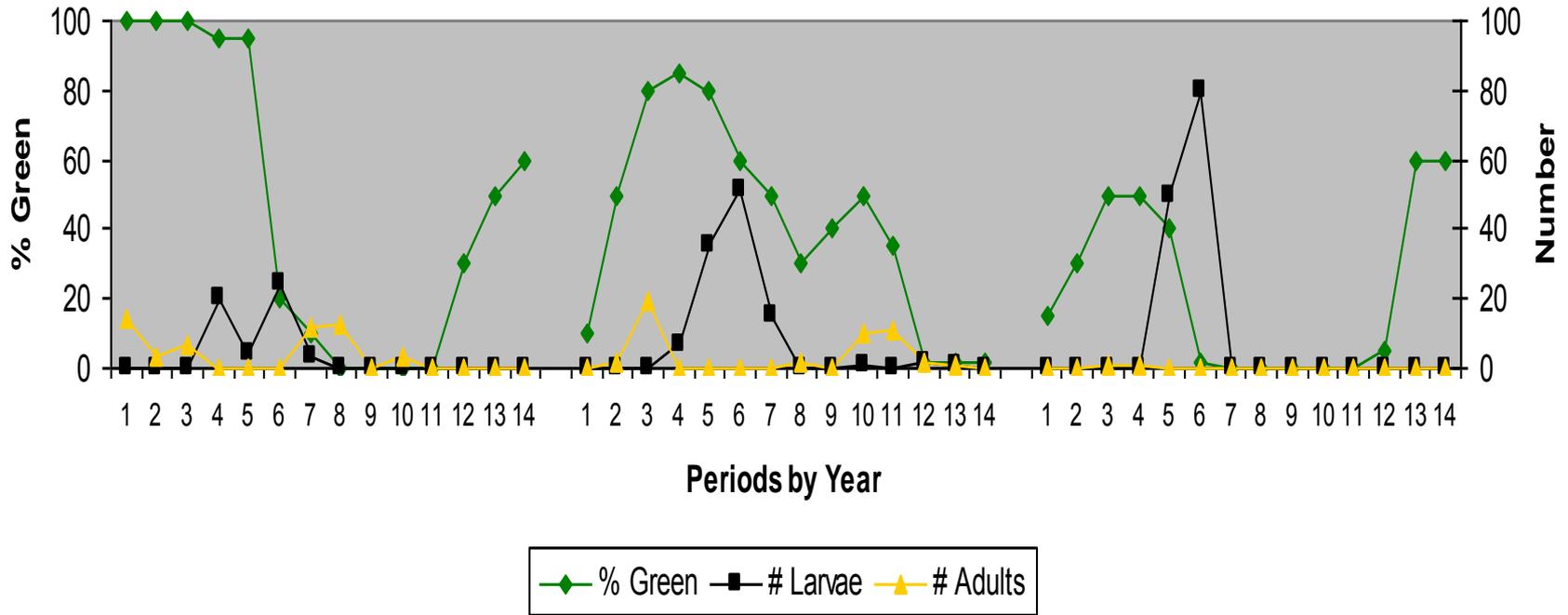
*Beetles & Tamarisk Plants :*  
*How do they interact?*

# Green to Brown 2009 - 2011



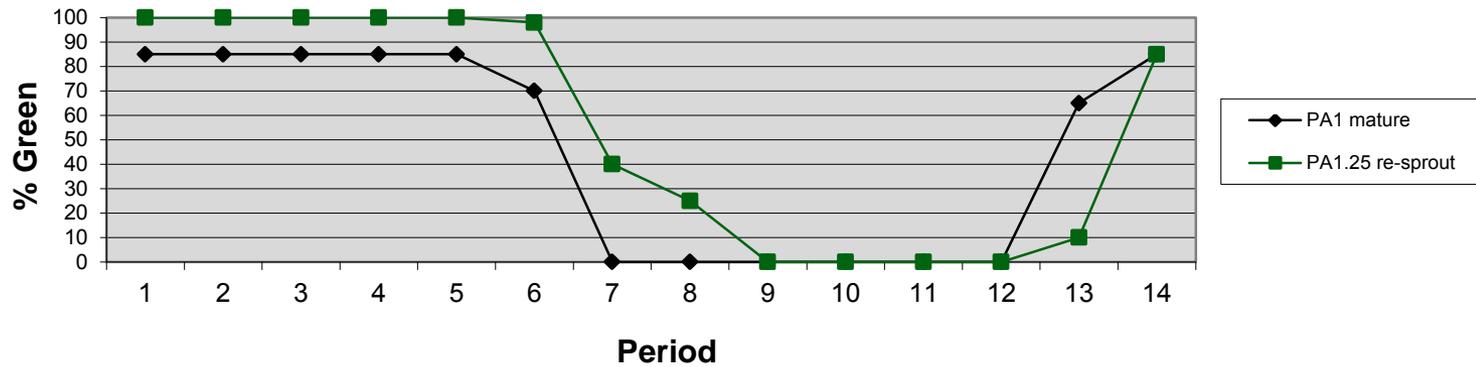
# Beetle Numbers and %Green

WB Adults & Larvae vs. % Green by Year: 2008 - 2010

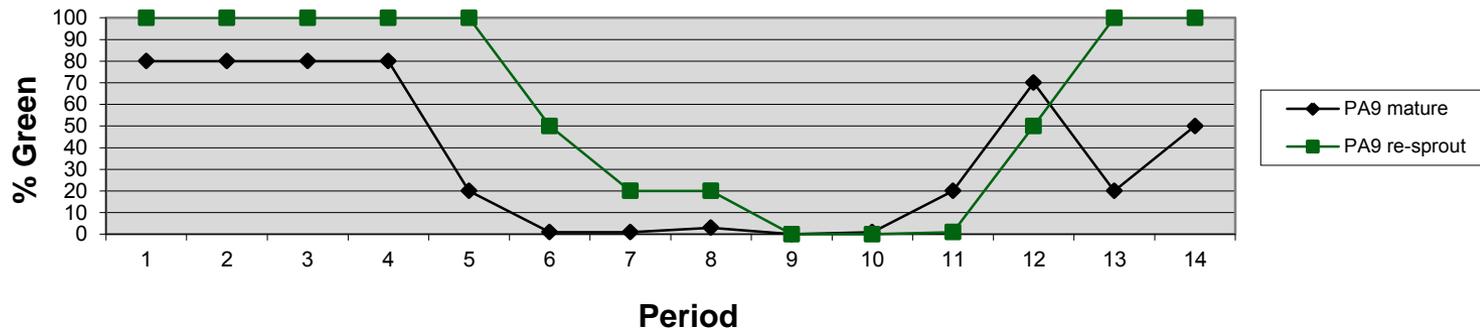


# Young vs. Old Plants ...

## PA1 - Mature vs. Re-sprout 2010



## PA9 - Mature vs. Re-sprout 2010



# IV

***Tamarisk Mortality:***

***Are the beetles doing their job?***

# What Tamarisk Colors Tell Us

- ◆ Green leaves mean all is well, the plant is healthy.
- ◆ Yellow & brown leaves - no photosynthesis is taking place, the plant is stressed.
- ◆ The plant must draw on food reserves to survive.
- ◆ Brown leaves do NOT always mean the plant is dead!

# Beetle Math ... *Diorhabda carinulata*



## + Green Tamarisk (2005)



= Standing Dead Tamarisk (2008)



# Even > Standing Dead (2010)









# Mortality Surveys

*2008 - 2012*

# Survey Methods

- ◆ Conducted in October
- ◆ Transect 100" X 13"
- ◆ % green for each tamarisk
- ◆ S, M, L for each tamarisk
- ◆ Surveyed 21 sites in 2012

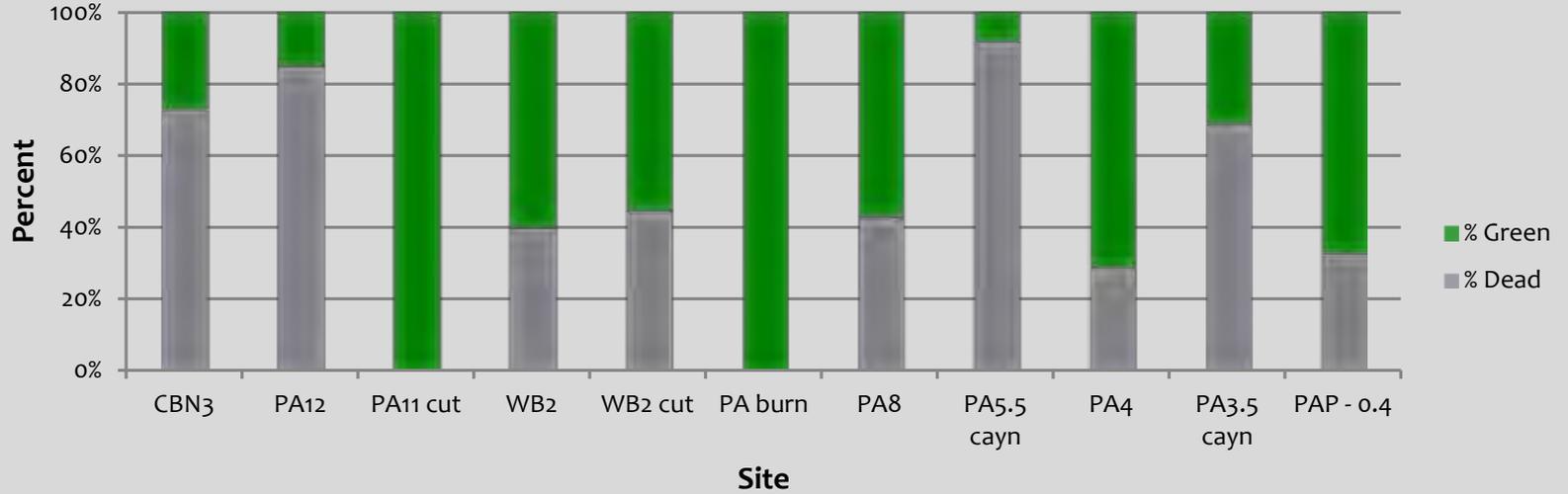
# Establish 100" Transect Line



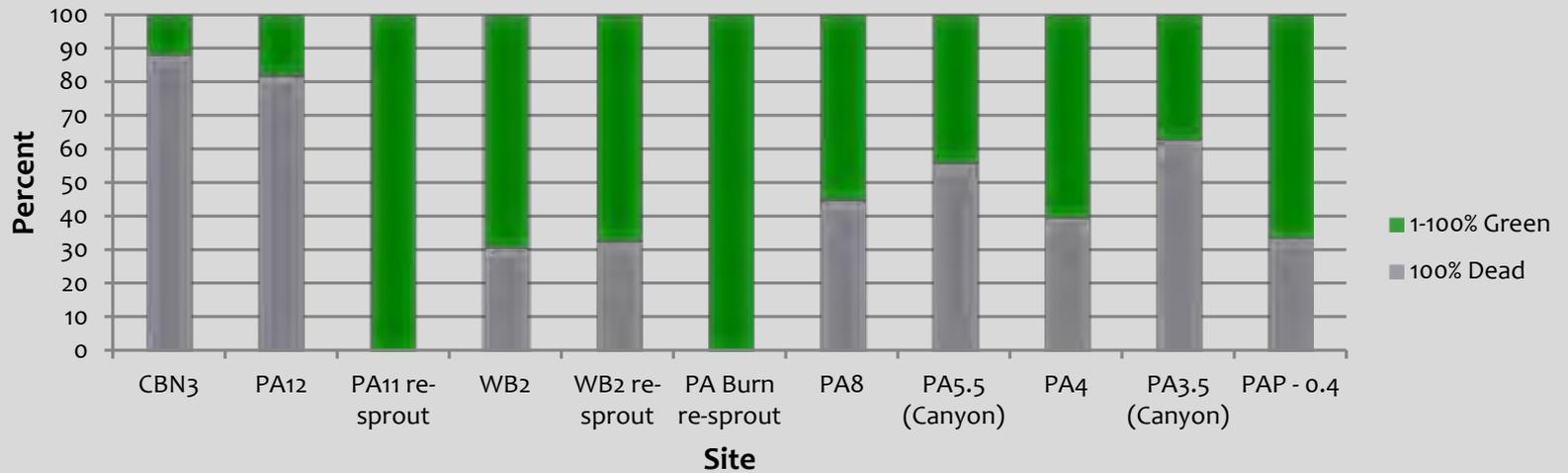
# 13" Wide to Get an Area



## 2012 Colorado R. 100% Dead vs. Green



## 2011 Colorado R. Trees - 100% Dead vs. Green



# ***Mortality Surveys***

**2013**

# Survey Methods 2013

- Used line-intercept method
- Total survey length 160 meters:  
(baseline + random sampling transects)
- Options:     100 m base with 6 X 10 m transects  
                  80 m base with 4 X 20 m transects  
                  60 m base with 5 X 20 m transects
- Reading every 0.10 m
- Surveyed 80 suitable sites



### Tamarisk Study Locations

*Descriptions Noted on Table*

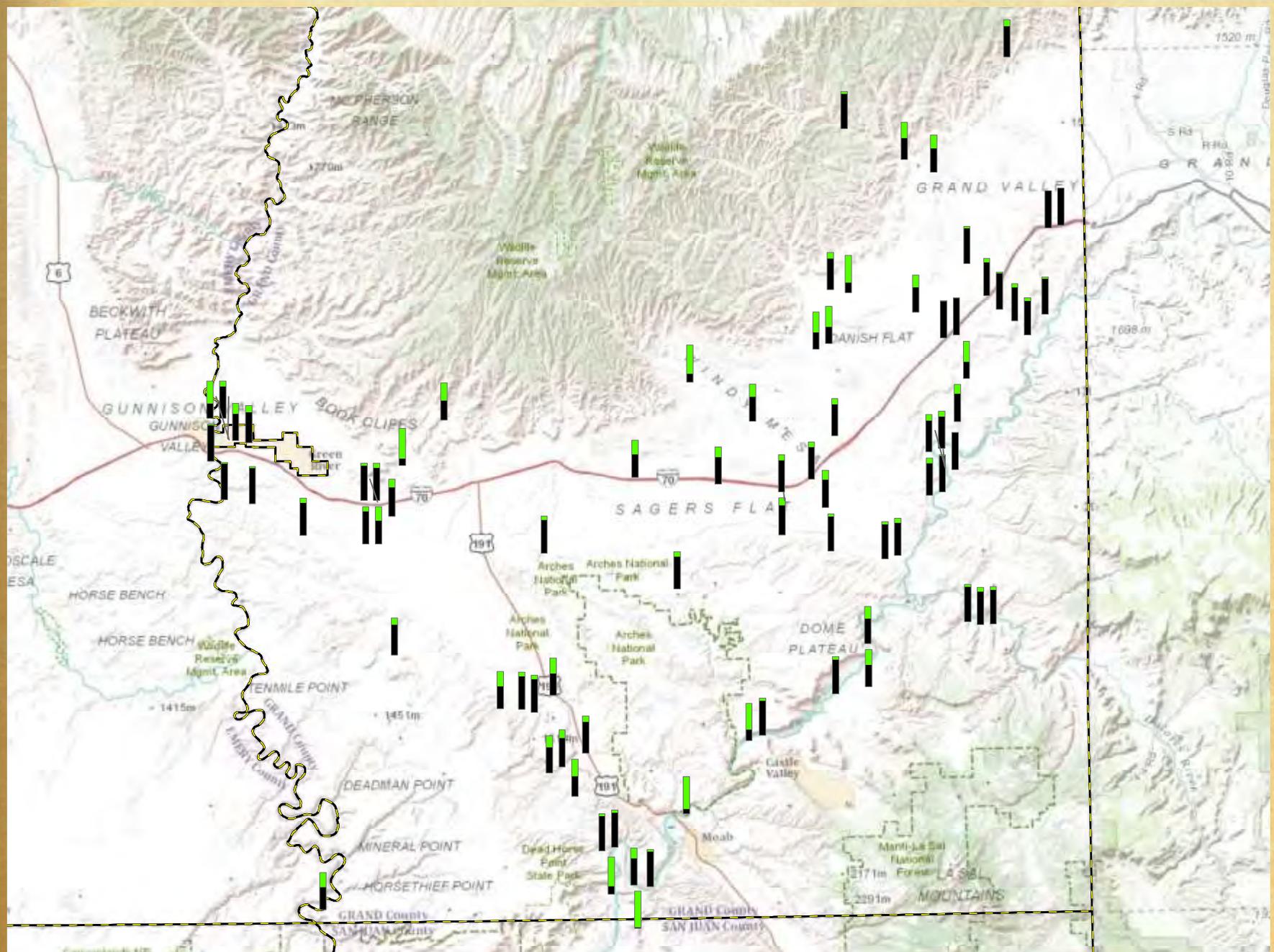


• Tamarisk Site  
 County Boundary

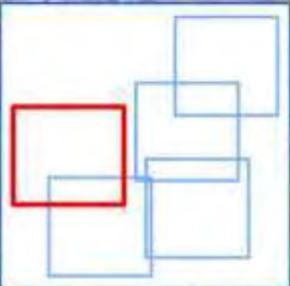
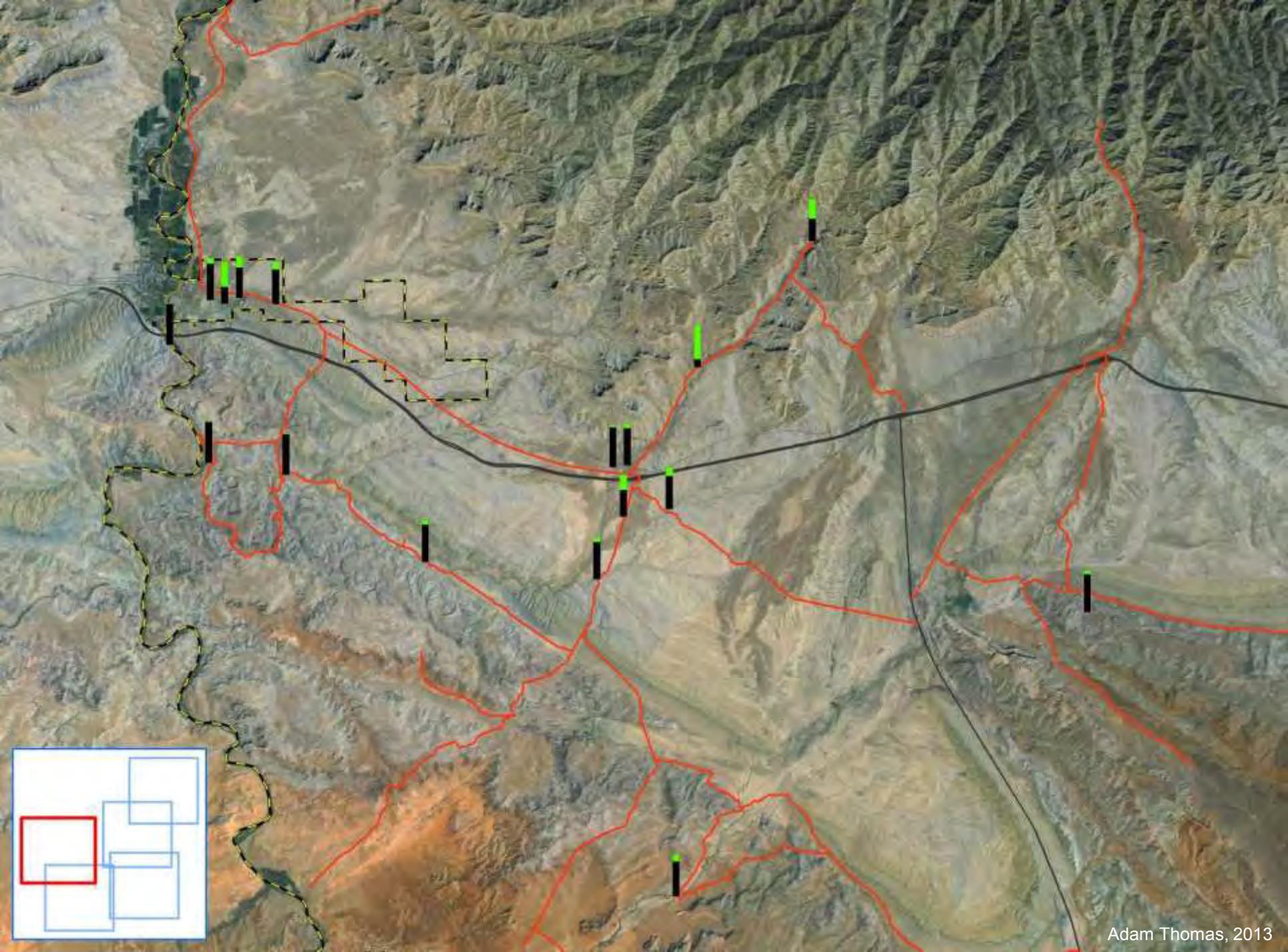


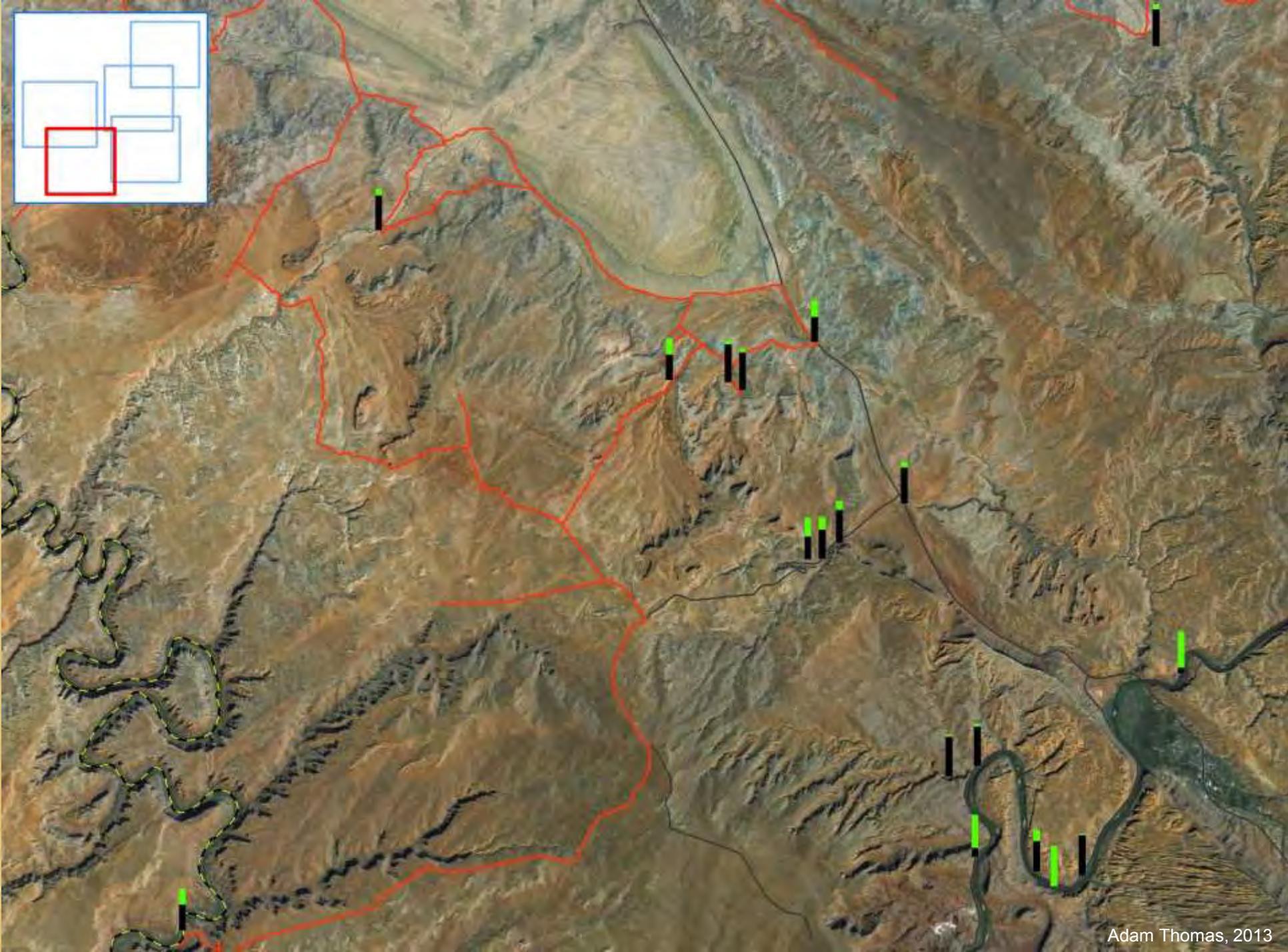
# The 80 Site Locations

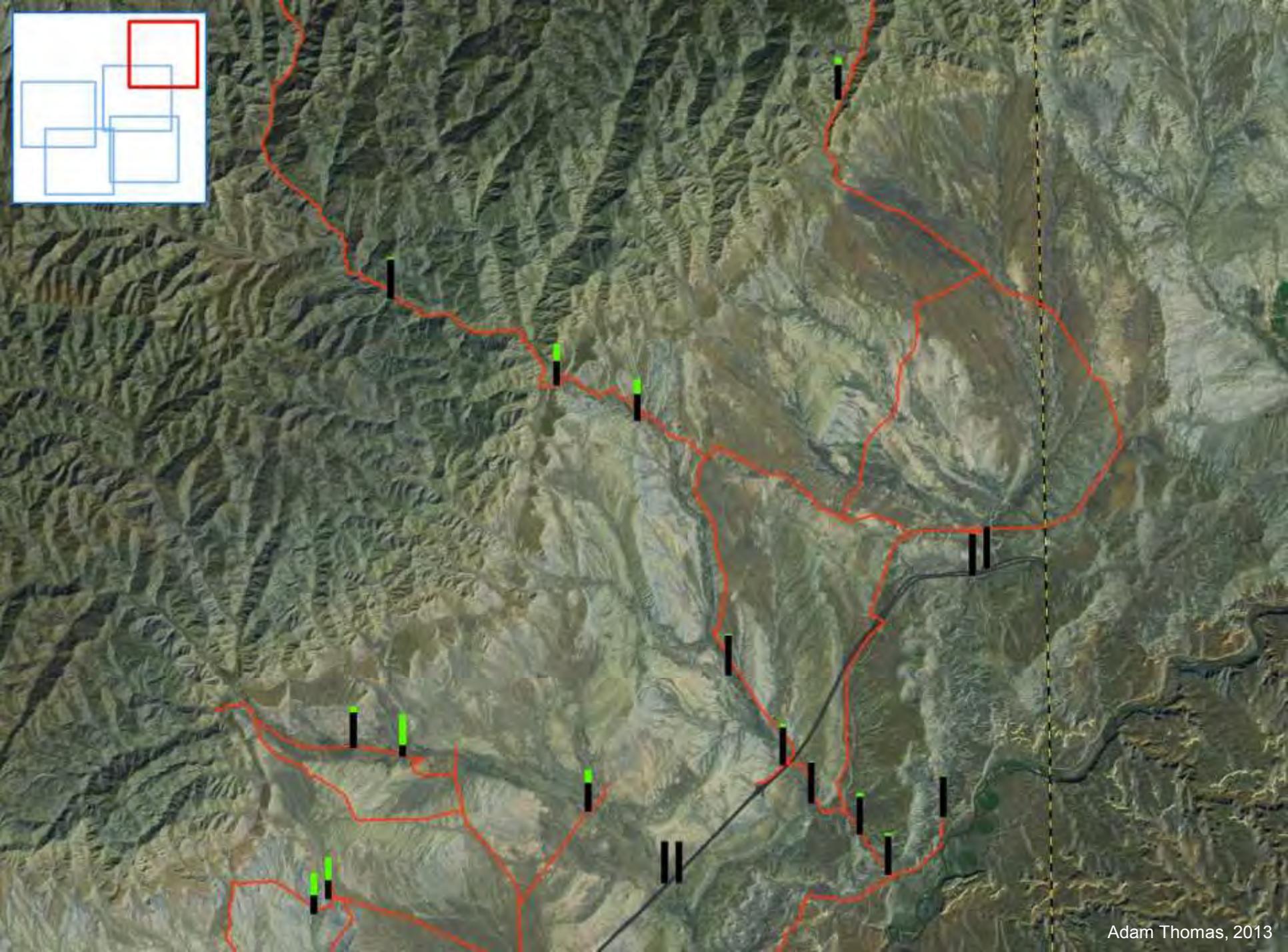
- ◆ 23 on riverbanks
- ◆ 53 along drainages
- ◆ 3 at pools where rain collects
- ◆ 1 at an oasis
- ◆ Drove > 500 off highway miles

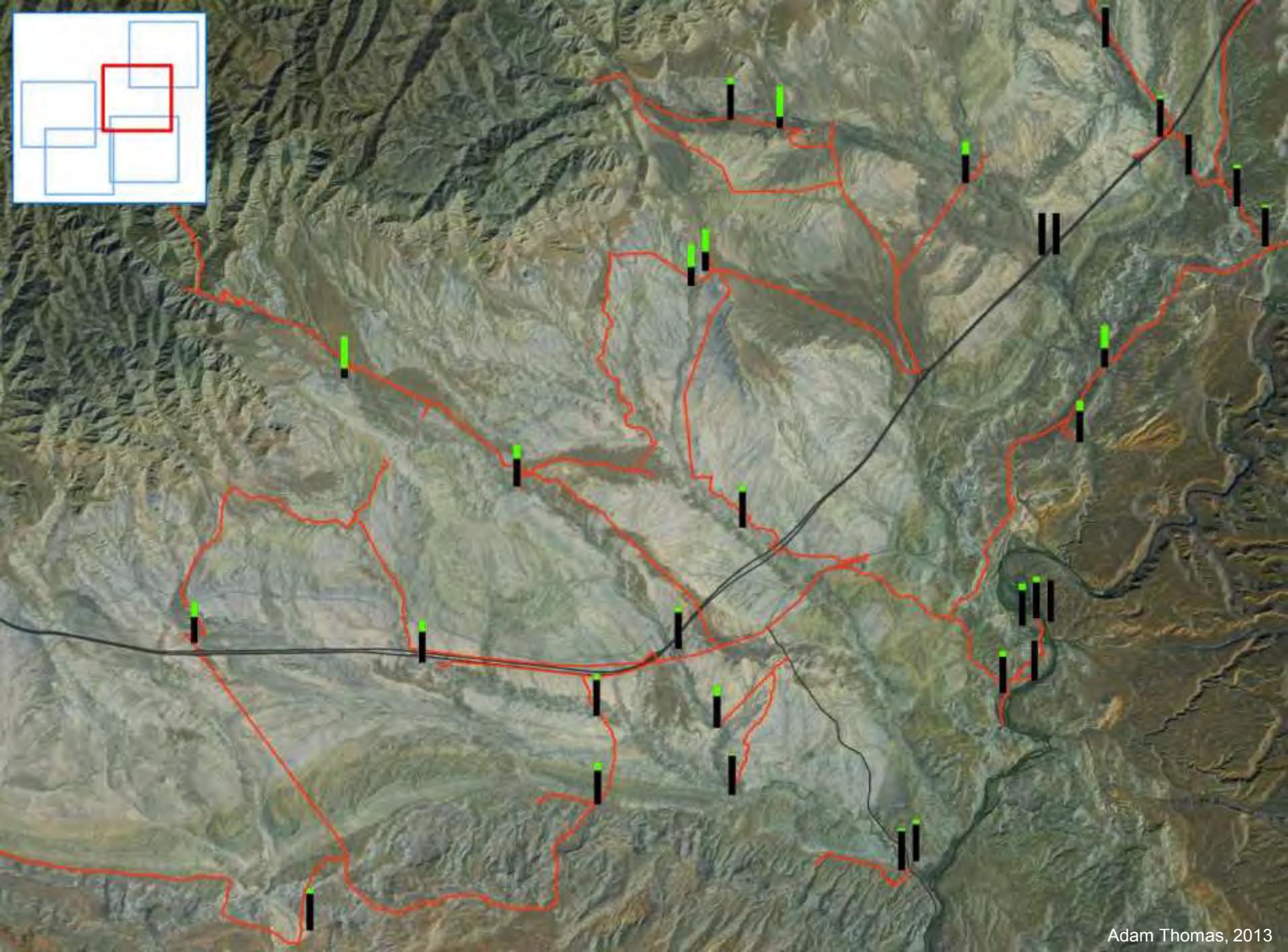


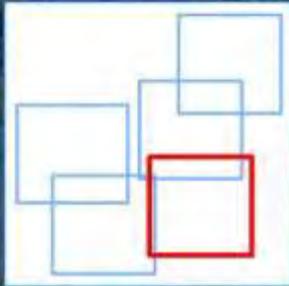
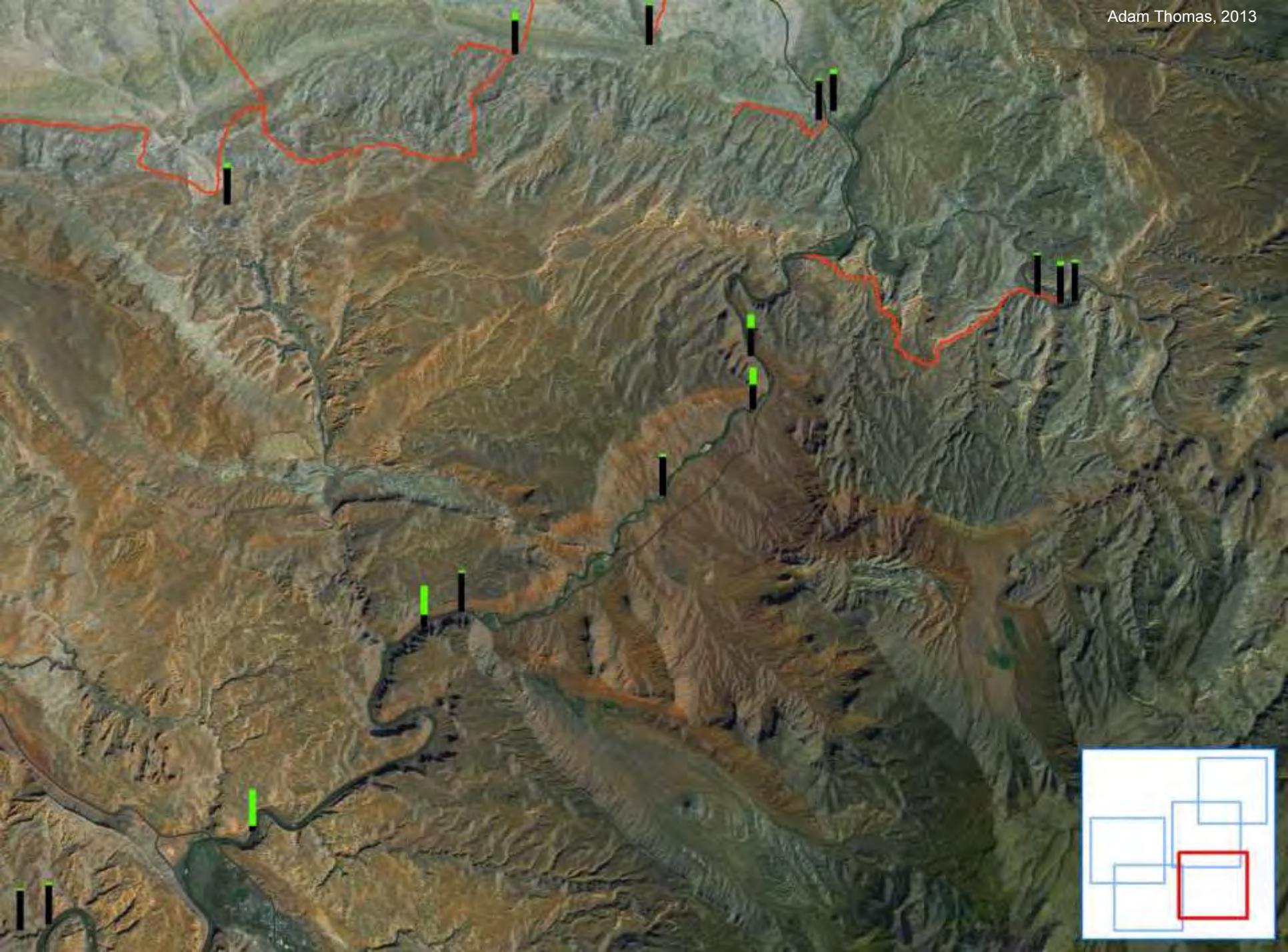












# % Green by Location

Loc. \ % Green	0 – 24.9%	25 – 49.9%	50 – 74.9%	75 – 100%
River (23)	15 (65%)	4 (17%)	1 (5%)	3 (13%)
Drainage (53)	32 (60%)	15 (28%)	4 (8%)	2 (4%)
Pool (3)	3 (100%)	0	0	0
Wet (1)	0	0	1 (100%)	0
Total (% of all 80 sites)	50 (62%)	19 (24%)	6 (8%)	5 (6%)

# The “Most Green” Sites

- ◆ 7 of 80 sites were  $\geq$  70% green
- ◆ 3 sites near base of Book Cliffs
- ◆ 1 site cut in early 2000s
- ◆ 3 sites recent cut and burn locations
- ◆ Average green: 4 cut/burn areas = 83%

**V**

***Tamarisk Competition:***

***Here comes the sun;***

***who's taking advantage?***

# Tamarisk vs. Skunkbush



# Tamarisk vs. Willow



# Tamarisk vs. False Willow



# Tamarisk vs. Greasewood



# Tamarisk vs. Rabbitbrush



# Quantitative Method



# Reading Transect Tape



# Abundant Groundcover



Wright Robinson

Wright Robinson

# Mixed Groundcover



# Leaf Litter Only Cover



# Leaving a Thicket



# Plants in Thickets: 2012 vs. 2013

- ◆ Surveys in September
- ◆ Survey sites: 10 vs. 15
- ◆ Species observed: 54 vs. 41
- ◆ Native plants: 29 (58%) vs. 28 (68%)
- ◆ Exotic plants: 21 (42%) vs. 13 (32%)

# 2013 Dominant Plants

Goosefoot – 11 sites (N)

Kochia / bassia – 11 sites (E)

Tamarisk seedlings – 8 sites (E)

Cheatgrass – 5 sites (E)

Rubber rabbitbrush – 4 sites (N)

Russian thistle – 4 sites (E)

Skunkbush sumac – 4 sites (N)

# 2013 Dominant Plants cont.

Tall whitetop – 4 (E)

Greasewood – 3 (N)

New Mexico olive – 3 (N)

Western goldenrod – 3 (N)

Score: Natives 6    Visitors 5 (we win!)

**VI.**

The “new” tamarisk weevil  
has arrived  
in Grand County!!!!

Now what?

How much is this guy browning?



From: <http://bugguide.net/node/view/415564>

# A Few Weevil Facts

- ◆ *Coniatus splendidulus*
- ◆ Found 2 adults in litter - January, 2012
- ◆ We saw first pupa cases - June of 2012
- ◆ By September cases at 60% of 71 sites
- ◆ In 2013 cases at **86%** of our 71 sites
- ◆ Cases at very remote desert locations

**And that brings us to .....**

