Tamarisk Control & Desert Fish

Daniel Keller

Utah Division of Wildlife Resources

Native Aquatics Biologist

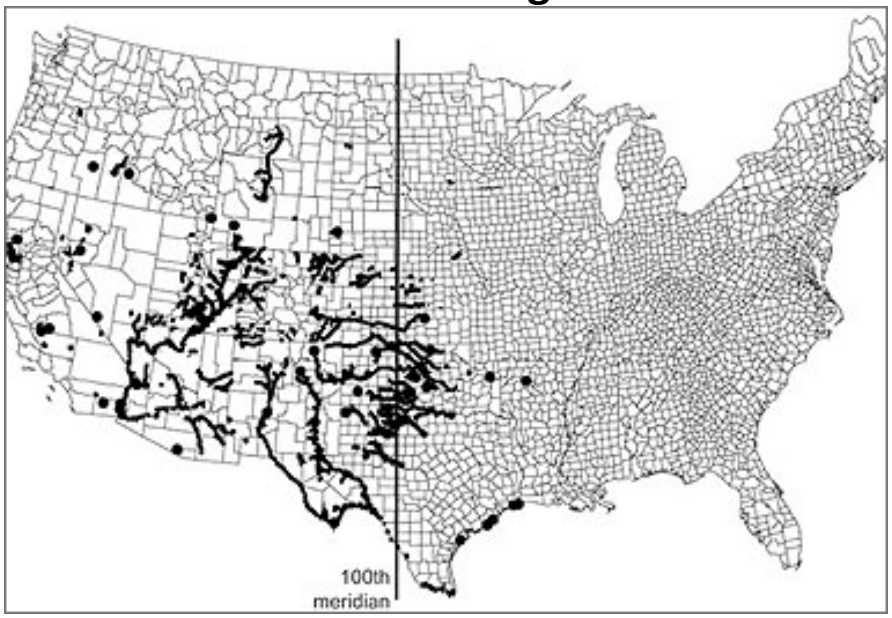
Price, Utah

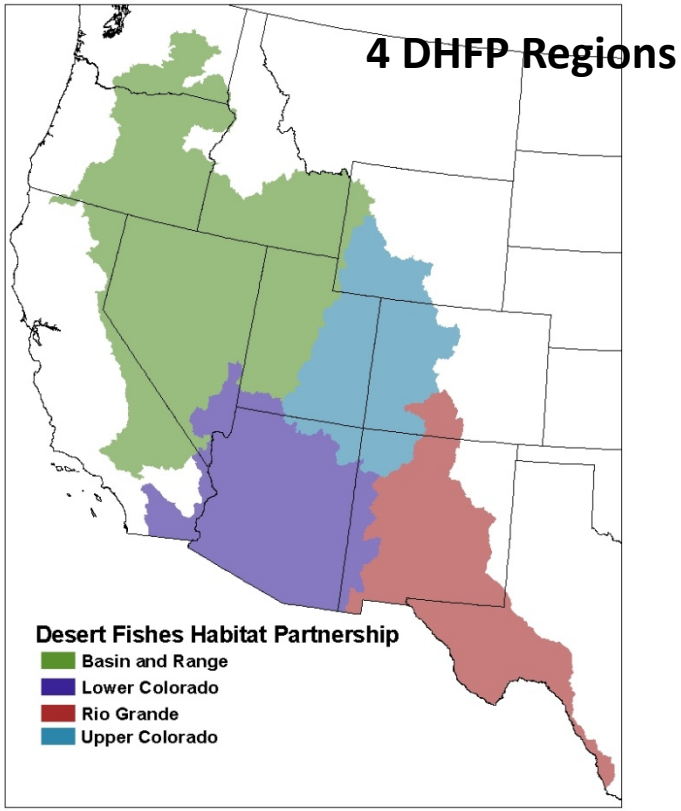
Desert Fish Habitat Partnership

Why is there a need for DFHP?

- **50% of U.S. T&E fish species** occur in the Arid West
- 54 freshwater fish species listed under ESA occur within the DFHP
- Desert aquatic habitats within the DFHP support over 179 at risk, non-salmonid fish species
- 8 of the top 10 states within the U.S. with at –risk freshwater fish species are DFHP partner states (AZ, UT, NV, CA, NM, TX, OR, and ID)

Tamarisk Range

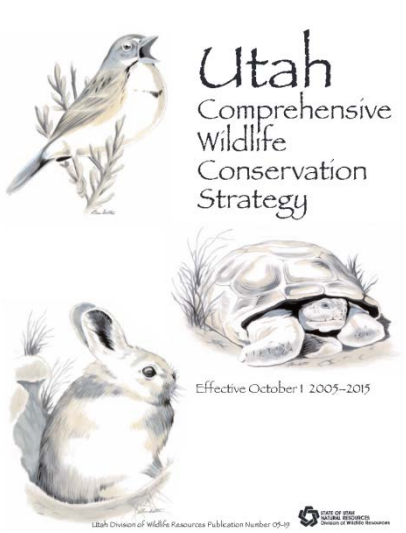


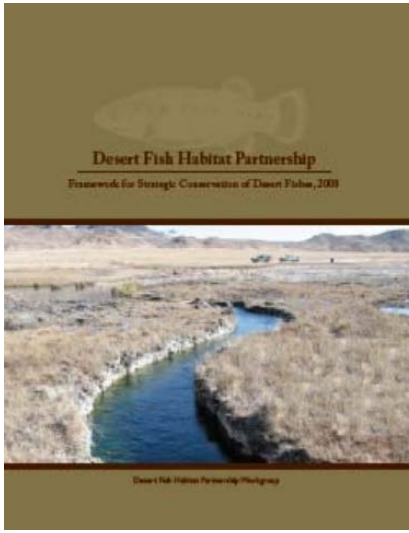


5 Goals of Desert Fish Habitat Partnership

"Reverse declines in the quality and quantity of desert fish habitats to improve the overall health and resiliency of arid aquatics ecosystems, desert fish and other aquatic organisms"

Tamarisk/Riparian Projects certainly meet this goal, however, Connection between such projects and Native Fish can be hard to quantify





Supporting Research: Connecting Tamarisk to Desert Fish

- **ERADICATION OF INVASIVE *TAMARIX RAMOSISSIMA* ALONG A DESERT STREAM INCREASES NATIVE FISH DENSITY (Kennedy et al 2005, Ecological Applications 15:2072-2083)**

- **BACKGROUND**
  - Jackrabbit Spring, a springbrook in Nevada that supports populations of two endangered fish (Ash Meadows pupfish and Ash Meadows speckled dace)
  - Spring ecosystems have high conservation value , due to highly endemic, often endangered, fauna they support
  - The impact of saltcedar invasion on these ecosystems, or ecosystem response to its removal, have rarely been quantified

- **PROJECT/METHODS**
  - **Project removed dense stands of saltcedar that surrounded the spring and monitored effects of removal to aquatic biota**


Photo: Cyndi Souza, USFWS

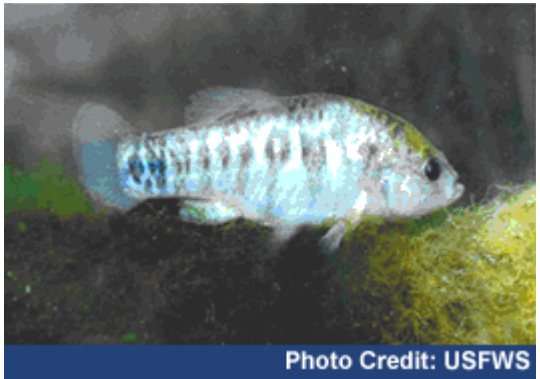


Photo Credit: USFWS

- **RESULTS**
  - Clearing saltcedar from the riparian zone increased densities of native pupfish and decreased the density of exotic crayfish
  - Positive effects of saltcedar removal on pupfish occurred because saltcedar heavily shades the stream, greatly reducing the availability of algae for herbivores
  - This was confirmed by analyses of potential organic matter sources and consumer ^{13}C
  - Pupfish and snails, along with native dace and exotic mosquitofish, relied heavily on algae-derived carbon and not saltcedar-derived carbon

    By contrast, crayfish $\delta^{13}C$ values mirrored algae $\delta^{13}C$ during summer, but in winter indicated reliance on saltcedar litter

Effects of flooding and tamarisk removal on habitat for sensitive fish species in the San Rafael River, Utah: Implications for future restoration efforts.

Submitted to: Journal Environmental Management

Daniel Keller, Brian Laub, Paul Birdsey, David Dean

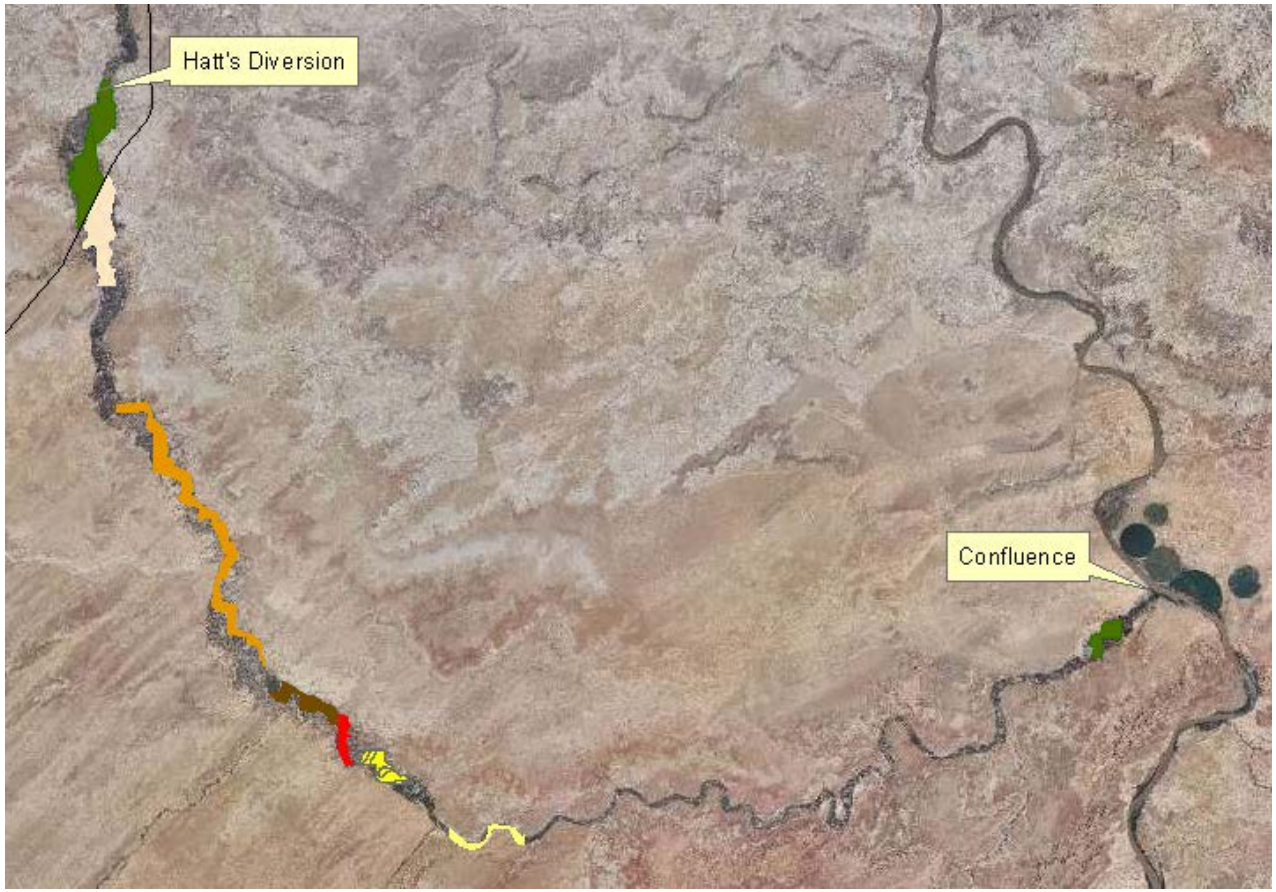
Taken by Geology Teacher & principal Floyd Kelly about 1921–1924

Flow alterations have reduced habitat complexity (ditch like river)

The bank stabilizing effects of the tamarisk prevent floodplain access and limit the creation of complex habitat (split channels, backwaters, pools, and riffles)

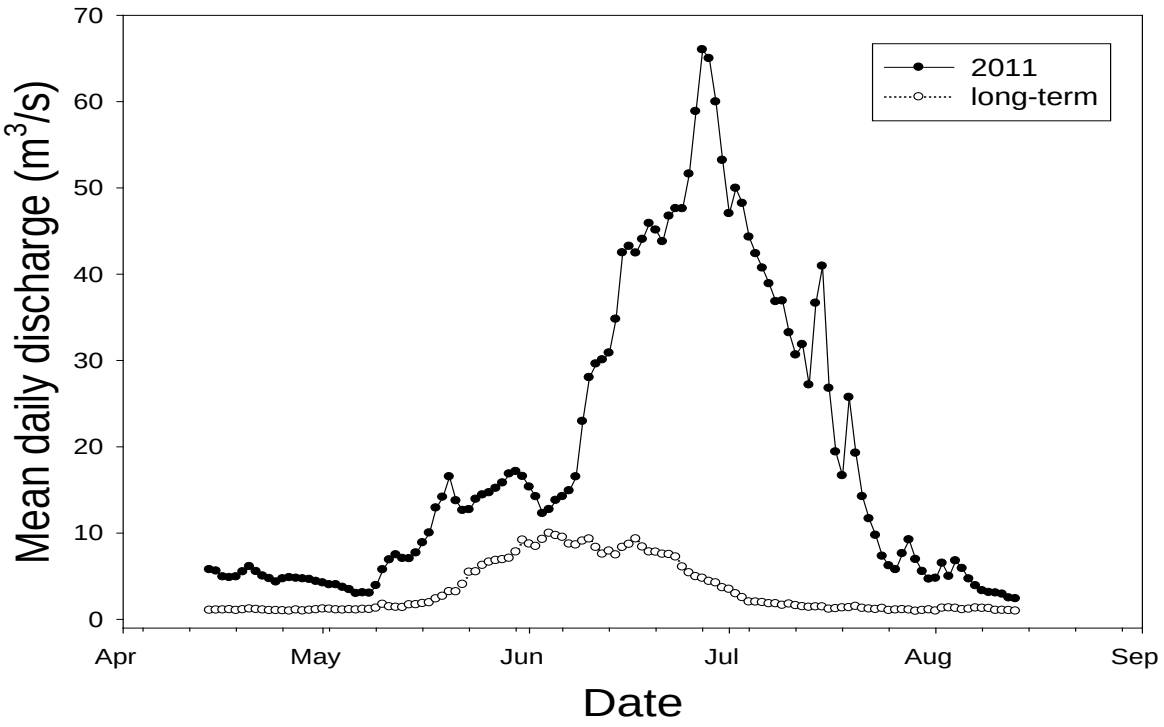
Pros of the San Rafael

- Despite poor condition of River, All “3 species” maintain populations (bluehead, flannelmouth, roundtail chub)
- Colorado Pikeminnow, use well documented (Budy et al, 2010)
- UDWR and BLM primary land owners
- Funding availability (NRCS, WHIP)
- In 2007 the lower San Rafael was chosen for a large scale restoration project

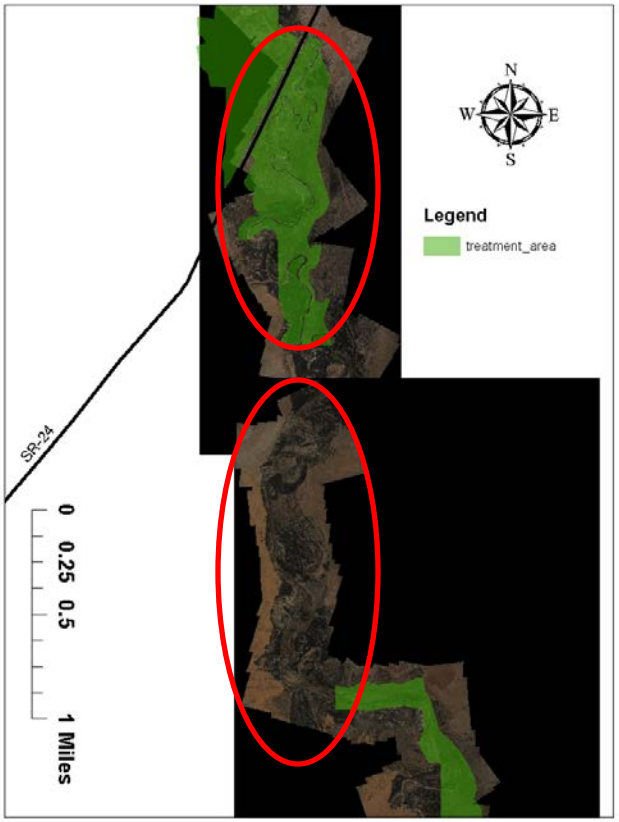


- ~ 39 miles between Hatt's diversion and confluence
- We have completed removal of 15 river miles (39%)

- Large Flood in 2011 provided opportunity to assess channel changes
- DATA, Imagery
  - 2010 (10cm) pre flood imagery
  - Obtained 2011 post flood imagery



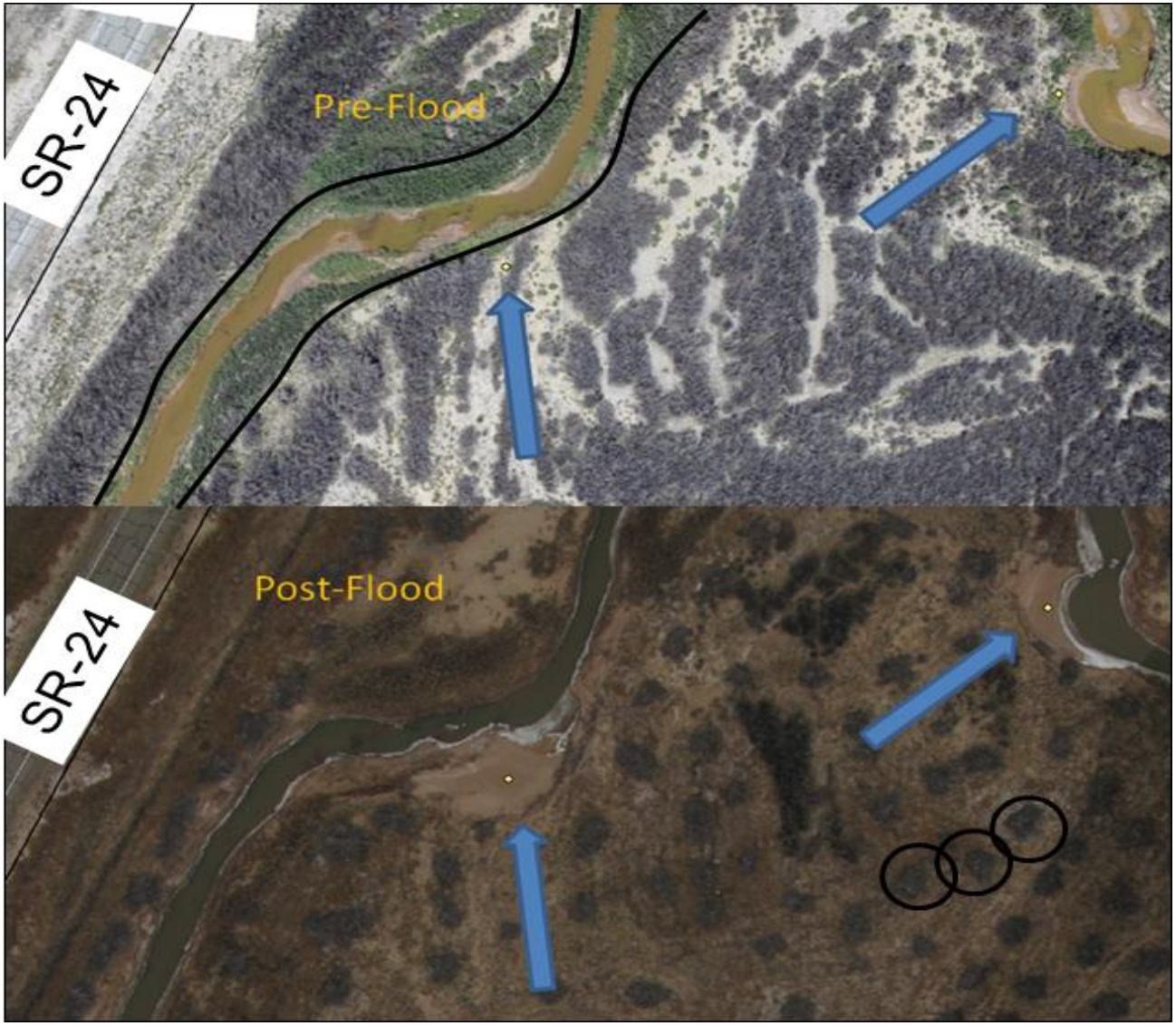
Study ? Did the 2011 flood result in more change (Lateral Movement) within tamarisk removal site compared to Un-treated site



TOP
2010 Pre-flood

Tamarisk
removed Sep-Dec
2010

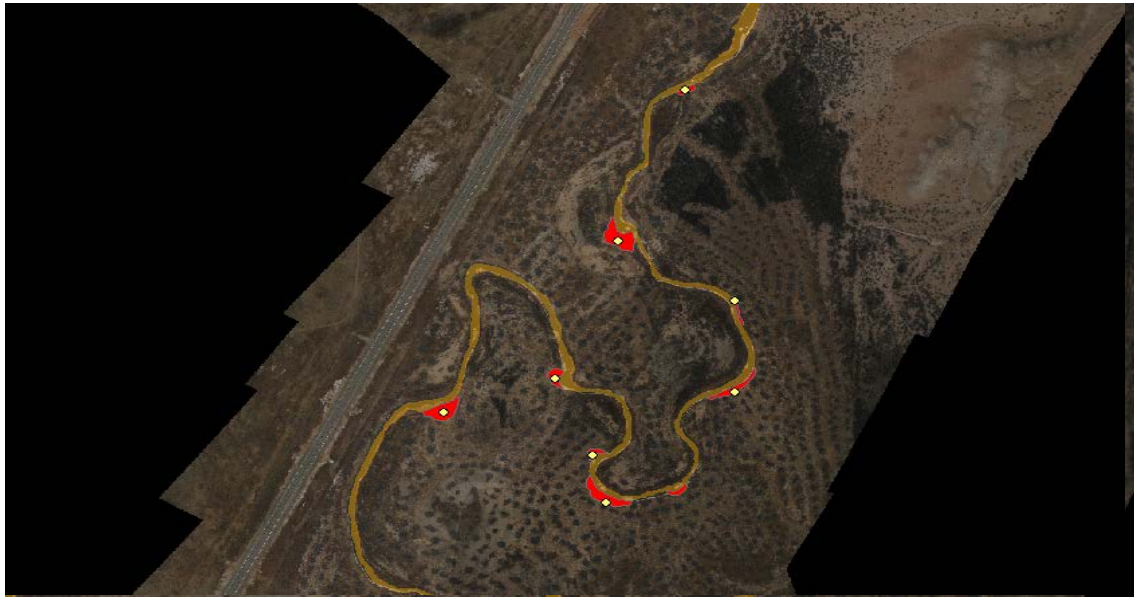
Bottom
2011 Post-flood

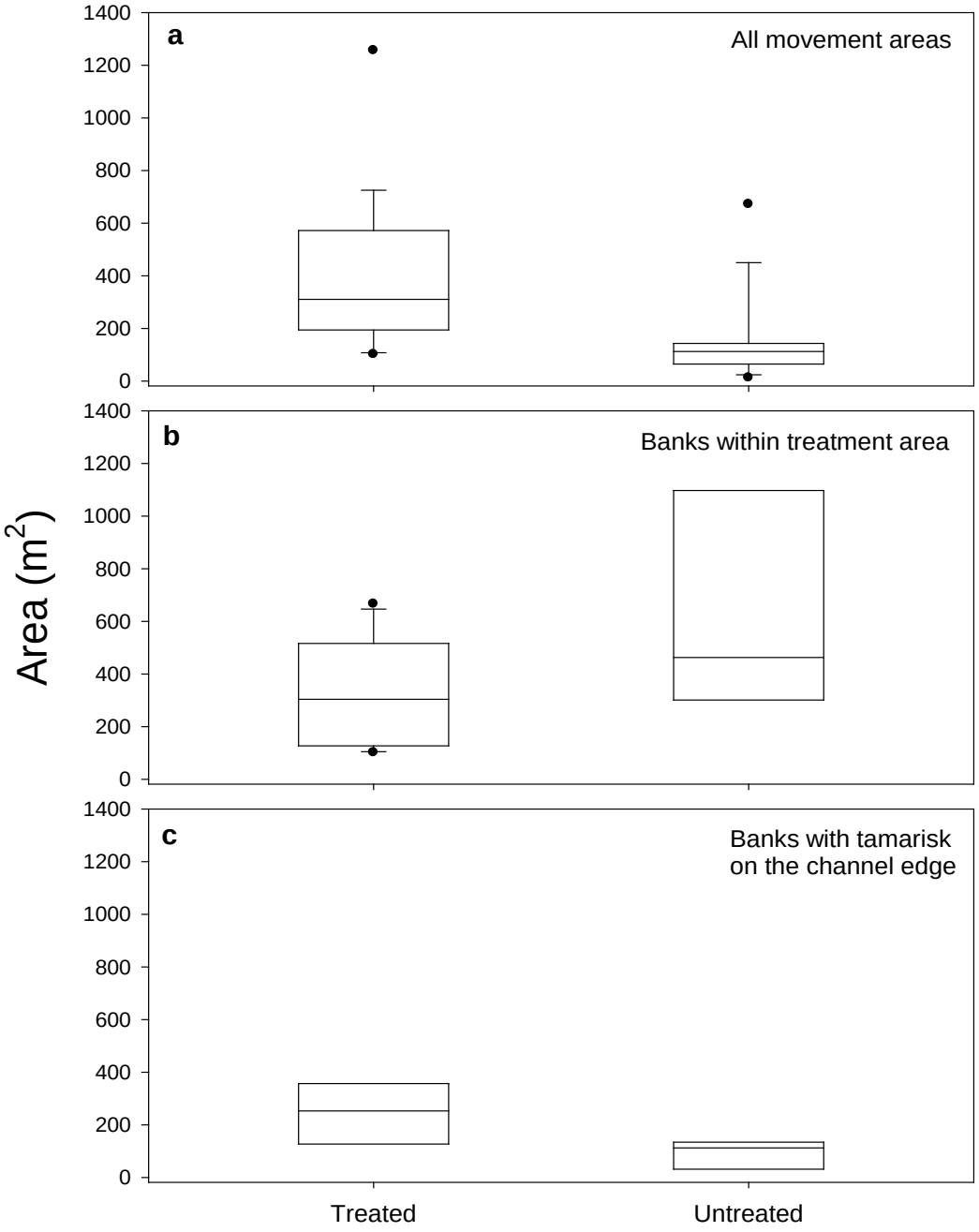


Digitize the active channel (2010)

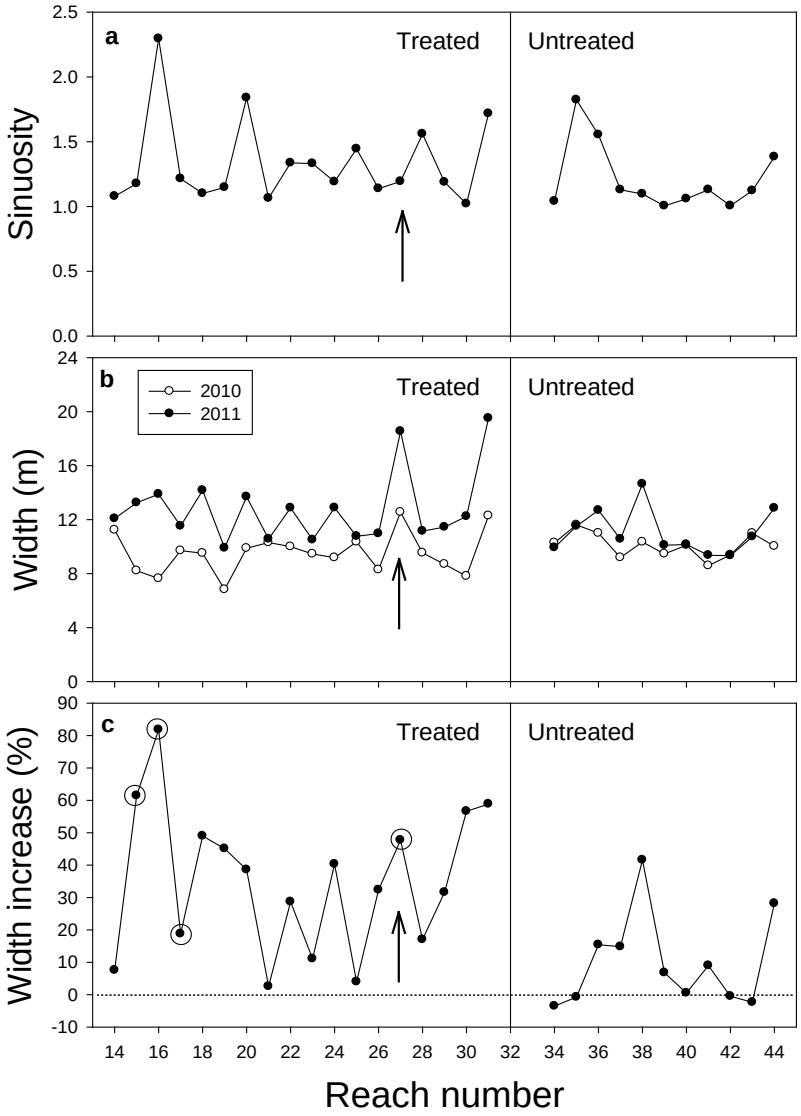
Overlay 2010 channel with 2011 imagery

Digitize lateral movement (often small backwaters, pools)




a
All movement areas
b
Banks within treatment area
c
Banks with tamarisk
on the channel edge
Area (m2)
0
200
400
600
800
1000
1200
1400
Treated
Untreated

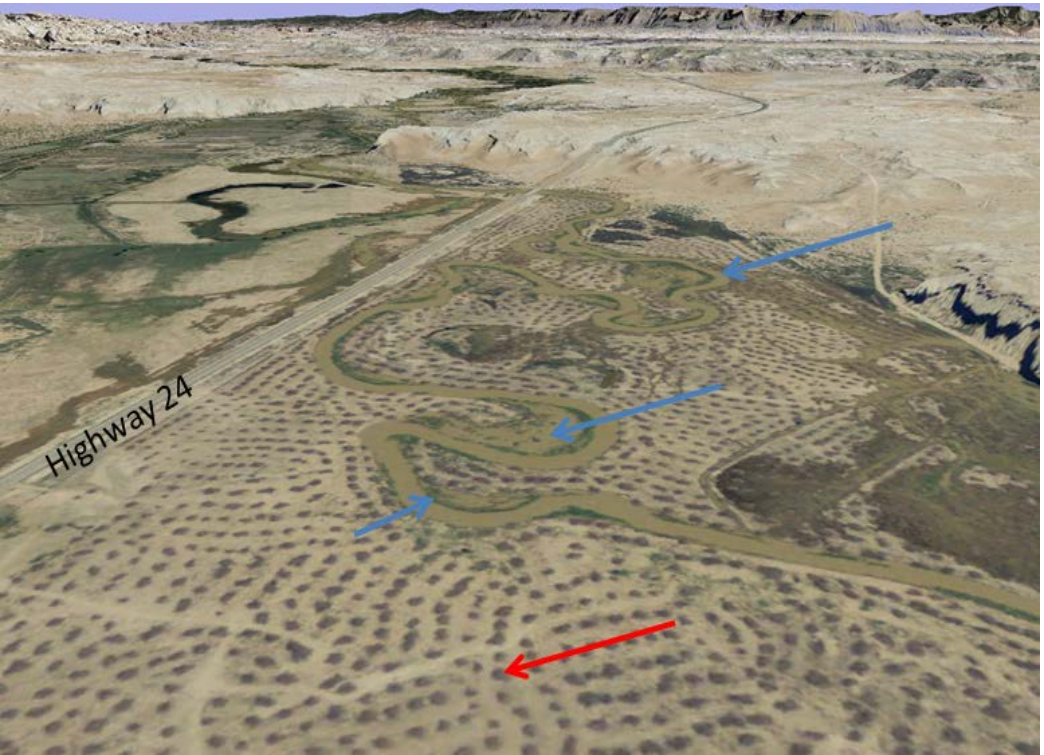
Seeing positive changes in River



➢Our tamarisk removal project increased the potential for spring floods to diversify river habitat

Question? How does wood debris impact river dynamics and complex habitat formation

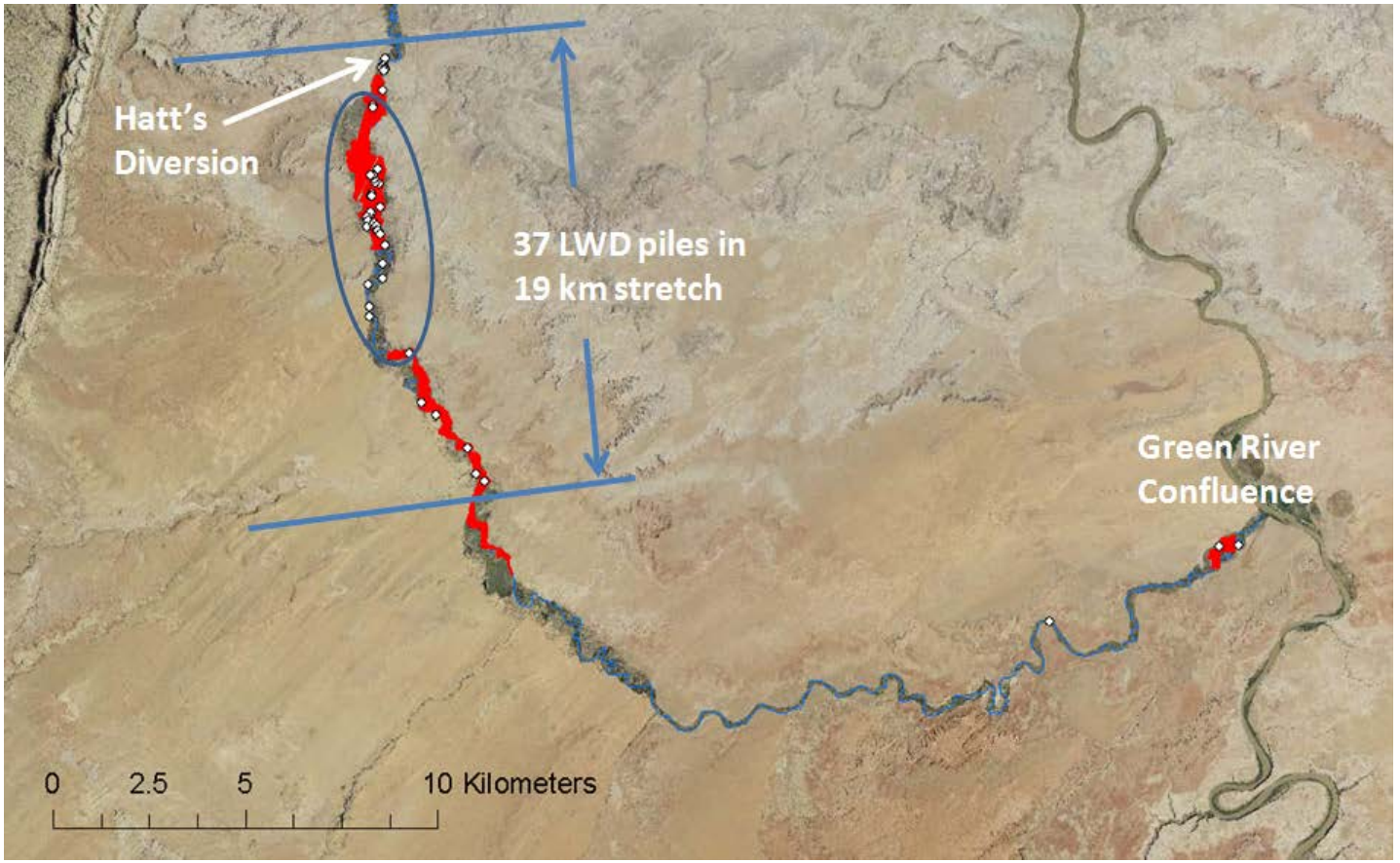
- Is there more wood debris within treatment area then outside treatment area?
- Used imagery to map wood piles and complex habitat near piles then compared that to random points



	Accumulation Buffers	Random Buffers	*P*-value
Mean number per buffer	2.5 (0.20)	1.1 (0.17)	< 0.001*
Pool	1.2	0.5	
Riffle	1.0	0.5	
Backwater	0.23	0.15	
Mean area (m^2)	46 (6)	47 (10)	
Pool	38 (8)	12 (2)	0.002*
Riffle	61 (12)	95 (19)	0.14
Backwater	12 (2)	13 (4)	0.94

* indicates significant differences (Student's *t* test, $\alpha = 0.05$) between accumulation buffers and random buffers

Wood debris distribution



- Piles concentrated near our first removal area, Hatt's Ranch 2008-09

- Tamarisk removal in combination with flooding appeared to enhance fish habitat by allowing greater amounts of wood to enter the channel

Conclusions/Recommendations

- Piles of tamarisk within removal sites appear to be a source of wood for the San Rafael
  - Instead of burning all piles, we now leave some in floodplain and ephemeral washes to contribute wood material

Future Tamarisk Removal

- The promotion of channel movement and bank erosion processes during flooding through targeted tamarisk removal should be directly beneficial for creation of fish habitat on the San Rafael River
- Working with water users to create “habitat forming flows” important to long term success


Questions?