History of Restoration Along the Middle Rio Grande

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Rio Grande Basin

Area of Map

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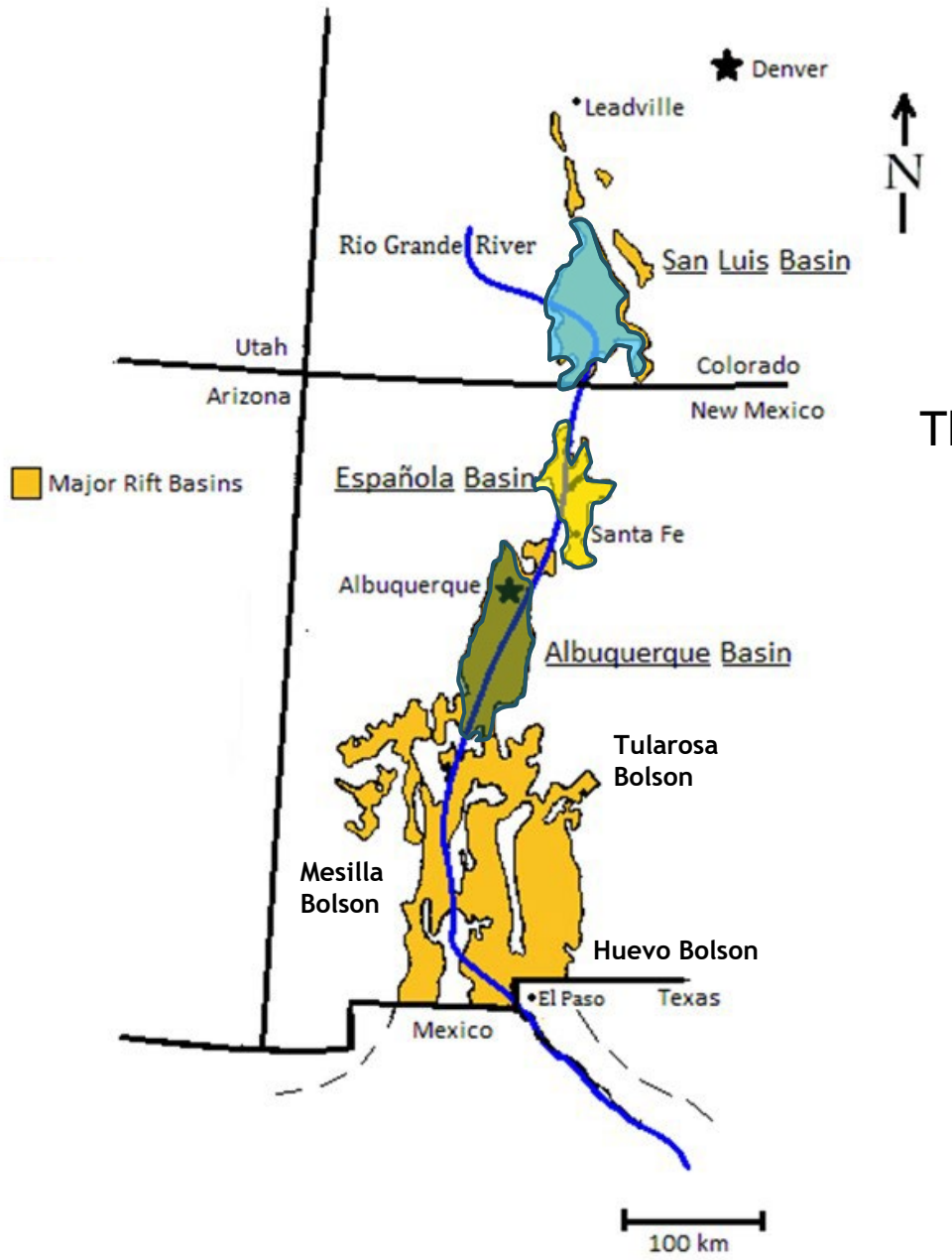
Rio Grande Rift



The three major basins (bolsones) are:

- San Luis,
- Española, and
- Albuquerque.

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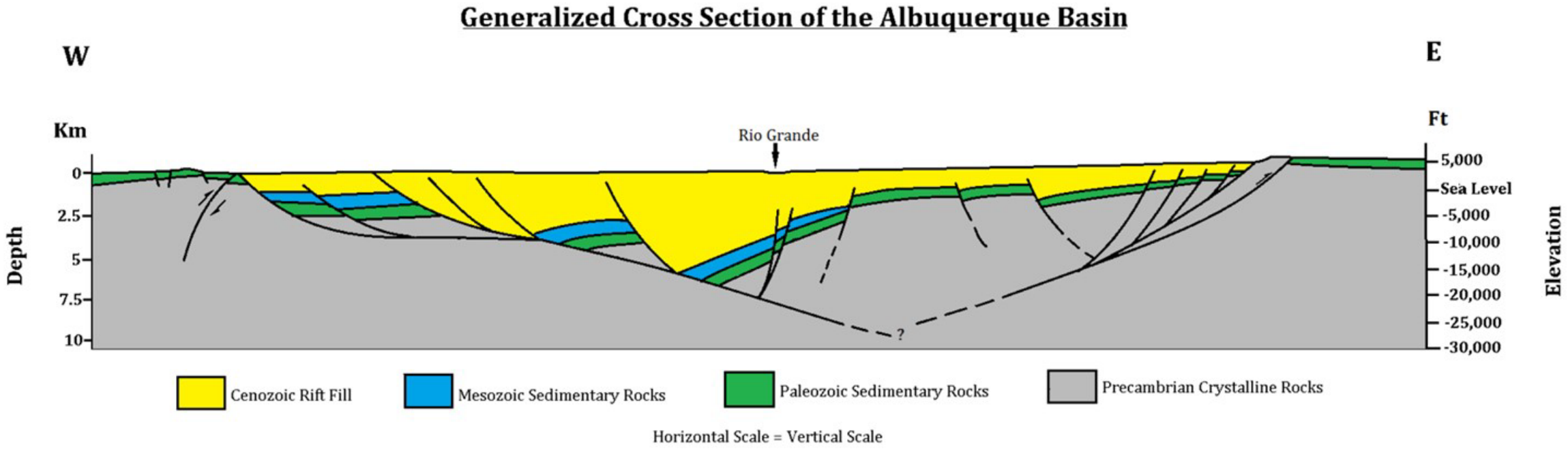

- The Middle Rio Grande is within the Albuquerque Basin.
- The Albuquerque basin is the largest of the three basins, spanning 99 mi north–south and 53 mi east–west at its widest points.
- The relatively flat contours of the basin show a high potential for floodplain inundation and sedimentary basin fill provides rich soils.

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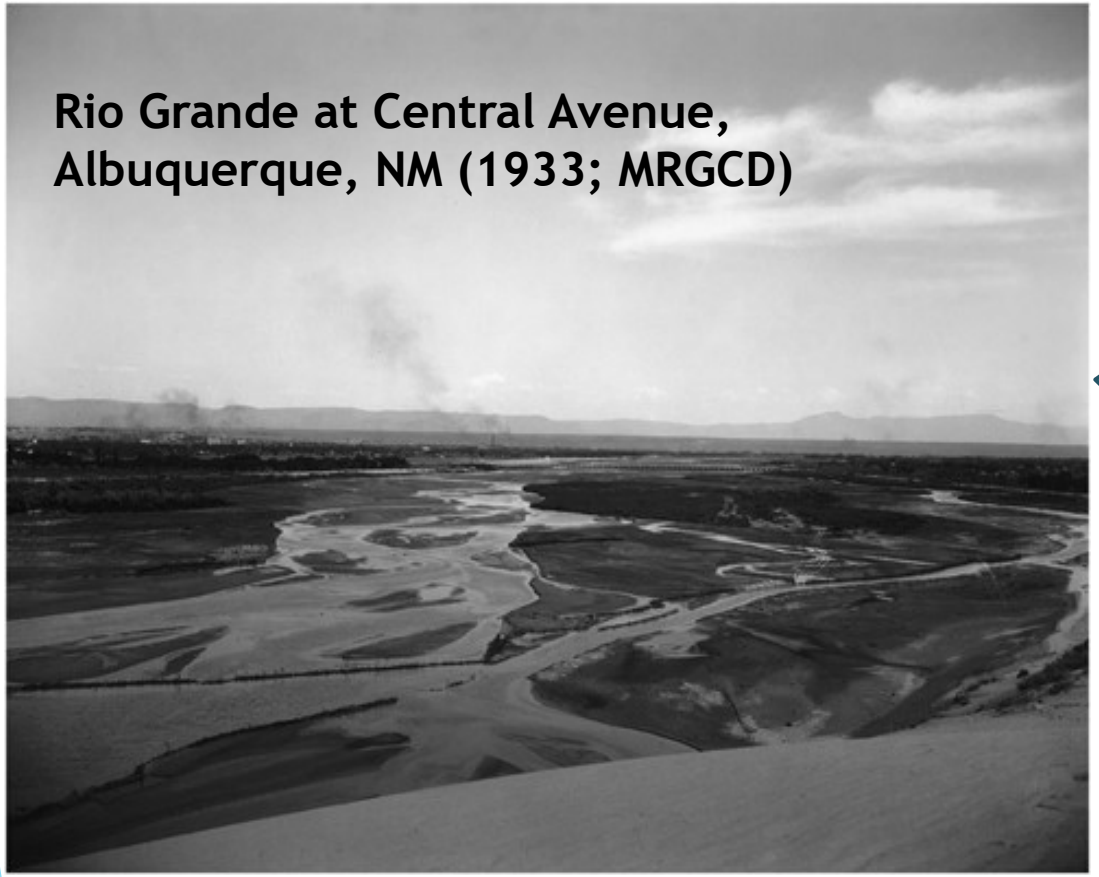
The Transformation of a River



Historically, the Middle Rio Grande often flooded laterally with snow-melt runoff and inundated nearby communities like the City of Albuquerque.

Extensive water use, threats of floods and a desire to gain more control of river flows prompted the construction of hundreds of miles of levees in the 1930s, 40s, and 50s and installation of jetty jacks that confined the river channel, effectively delinking the river from its historic floodplain.

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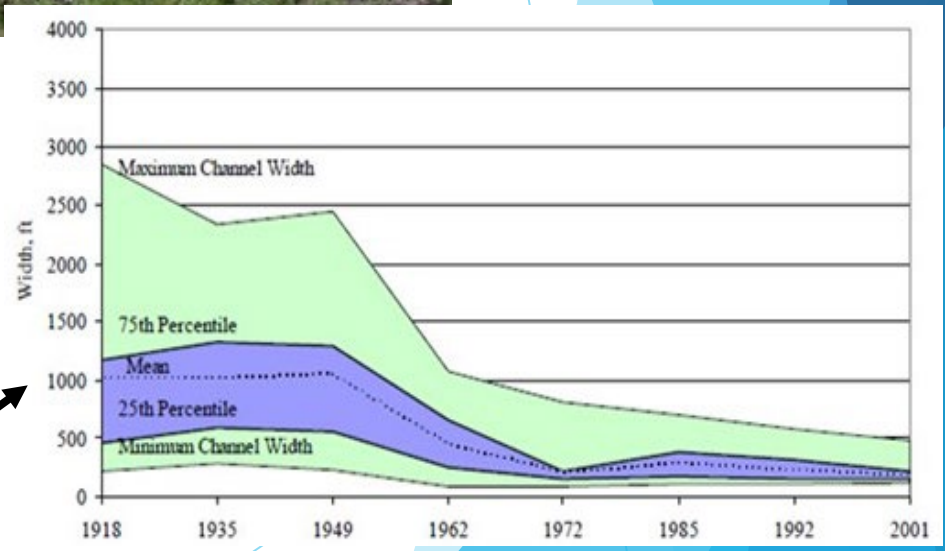
Kellner Jetty Jacks

- Under the Middle Rio Grande Project, over 100,000 steel jetty jacks were installed in the 1950s and 1960s to protect the levees and trap sediment and debris and further narrow the channel, causing downcutting and further floodplain disconnection.
- Maximum channel width decreased by ~82% from 1918 to 2001 (Holmquist-Johnson 2004).



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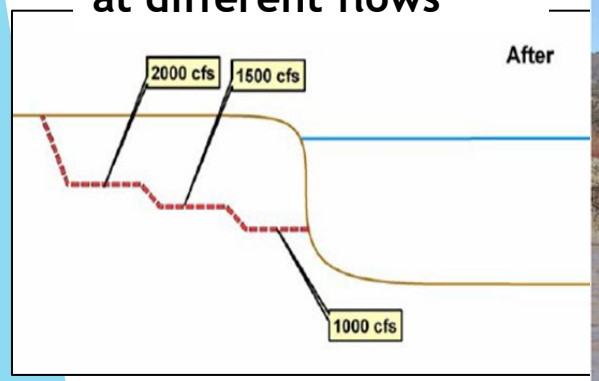
Middle Rio Grande Habitat Restoration

- Habitat restoration began in 2003 in response to 2003 USFWS BO.
- Ten Program partners constructed ~300 sites totaling ~1,600 ha (each 0.4-5 ha).
- Sites were designed to establish diverse habitats at a range of flows—500-3,500 cfs.


NDC-5i embayment after construction

Terracing to inundate at different flows



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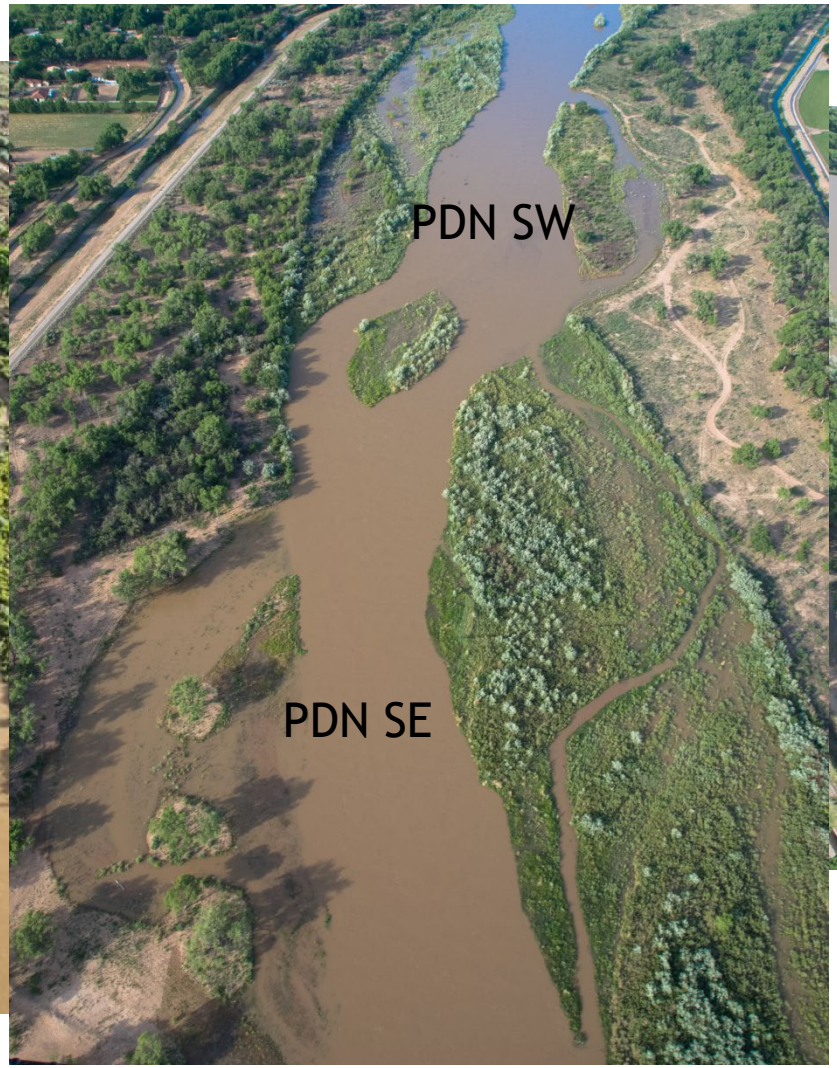
Inundated Restoration Sites
2016 Modified Spring Flow



Aerial photos courtesy of Todd Caplan and Ondrea Hummel

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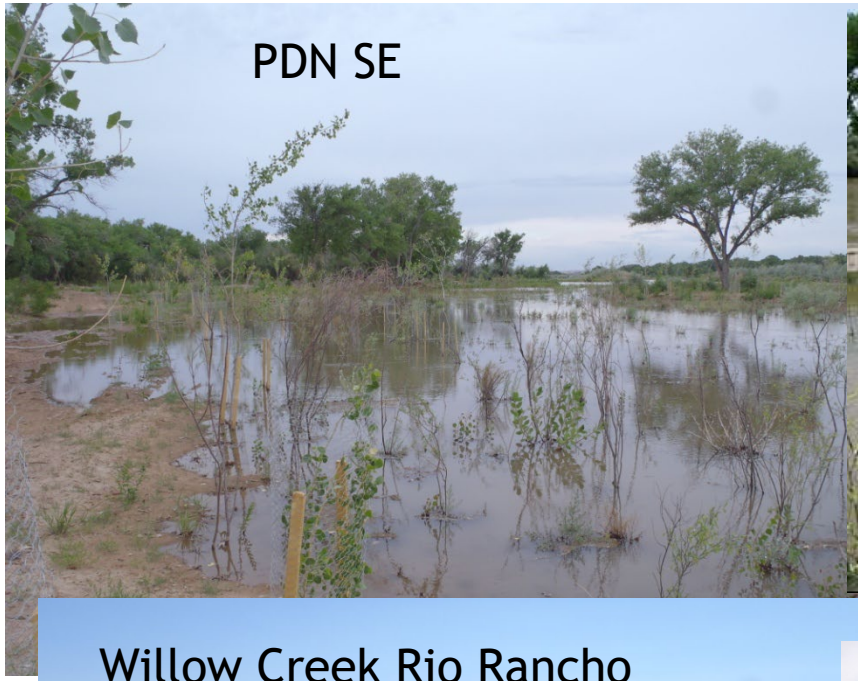
Inundated Restored Sites (2016)



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Findings:

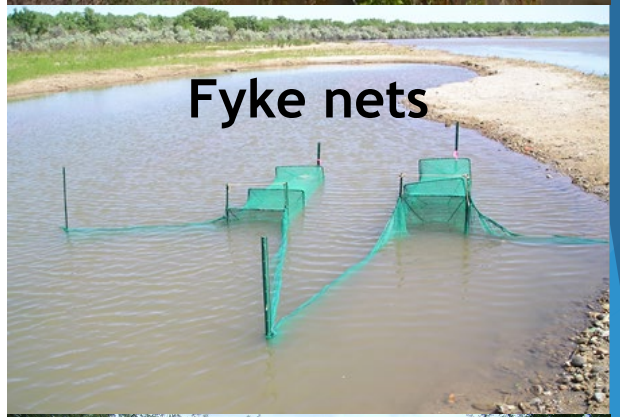
- 55% of all MRG fish species were found in floodplains

black bullhead		longnose dace	✦
blue catfish		red shiner	✦
bluegill	✦	Rio Grande silvery minnow	✦
channel catfish		river carpsucker	✦
common carp	✦	smallmouth buffalo	✦
fathead minnow	✦	western mosquitofish	✦
flathead catfish		white crappie	
flathead chub	✦	white sucker	✦
green sunfish		yellow bullhead	
gizzard shad		yellow perch	
largemouth bass			

✦ Found in Floodplains

Findings: Adults

- Extensive use of constructed and natural sites.
- Moved onto and from HR sites; 1st or 2nd most common species.
- Large proportion ripe and gravid.
- Spawning in floodplains indicated by abundance of adults, eggs, larvae.
- Compelling evidence that RGSM is a Floodplain Dependent Species.



Valdez, R.A., G.M. Haggerty, K. Richard, and D. Klobucar. 2019. **Managed spring runoff to improve nursery floodplain habitat** for endangered Rio Grande silvery minnow. Ecohydrology 12(7).

Valdez, R.A., S.A. Zipper, S.J. Kline, and G.M. Haggerty. 2020. **Use of restored floodplains** by fishes of the Middle Rio Grande, New Mexico, USA. Ecohydrology 14(2).

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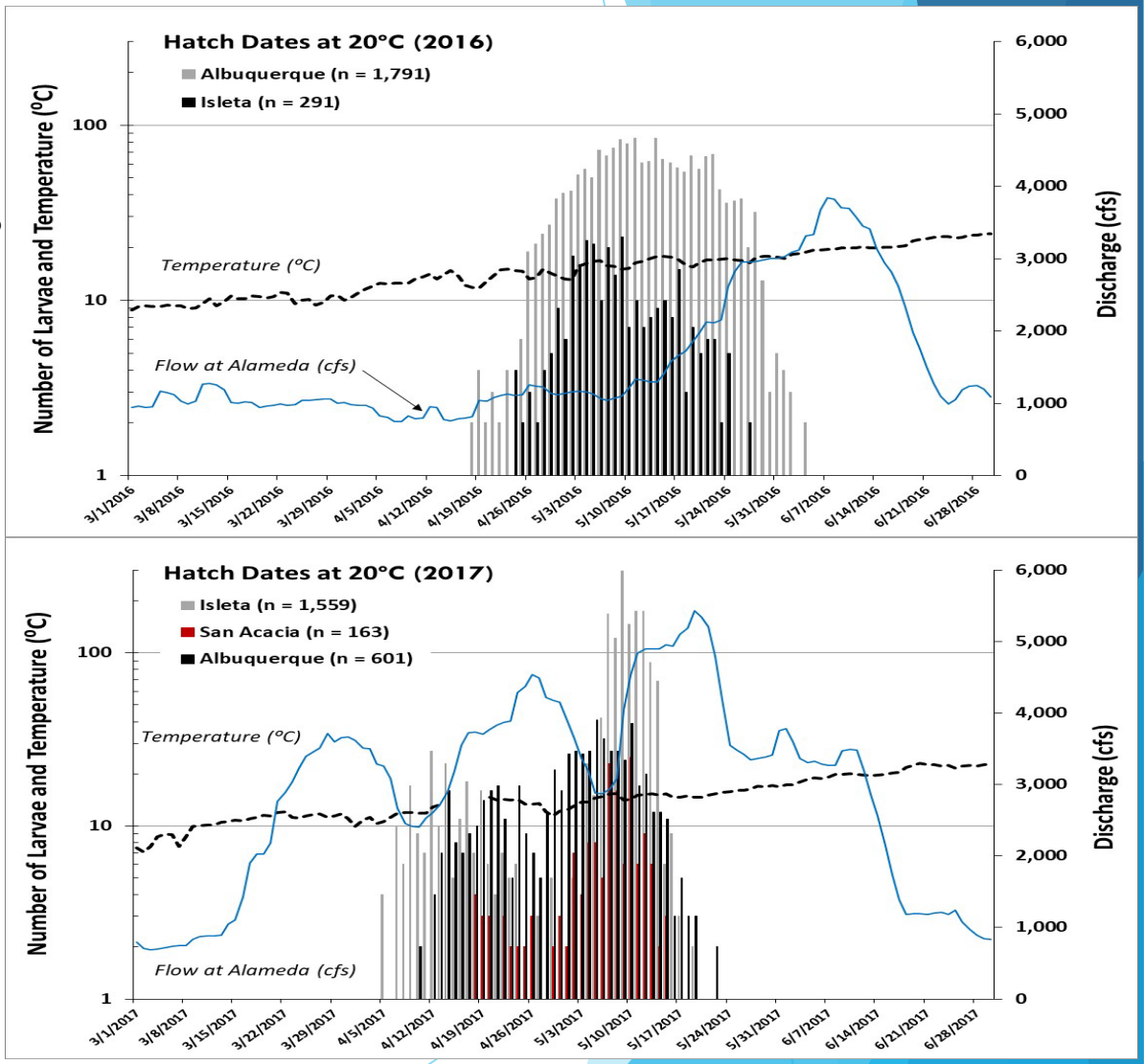
Findings: Spawn/Hatch

- Strong year-class when spawn and runoff are synchronous



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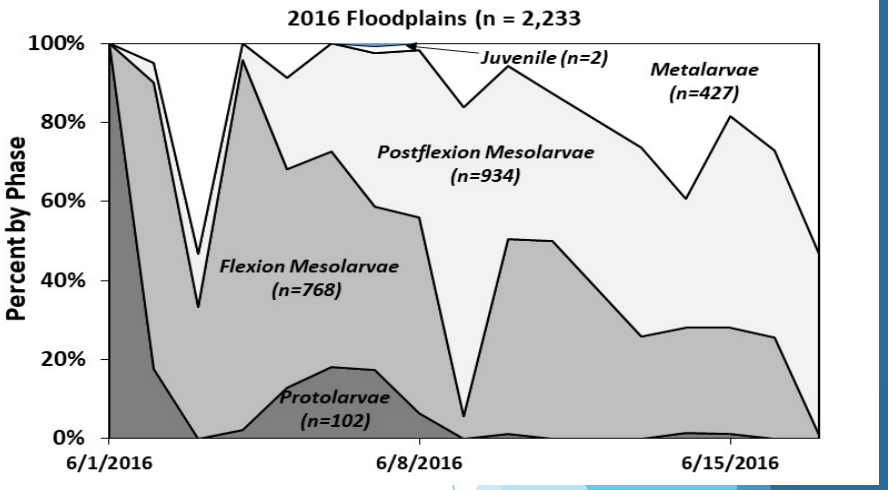
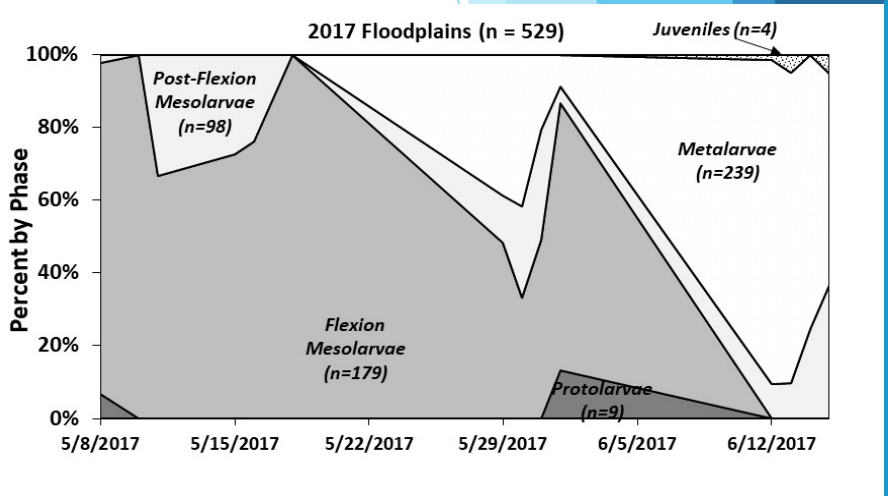
Findings: RGSM Larvae

- Stay in floodplains 20-40 days (leave by juvenile stage)

Larvae hatch ~50 hrs





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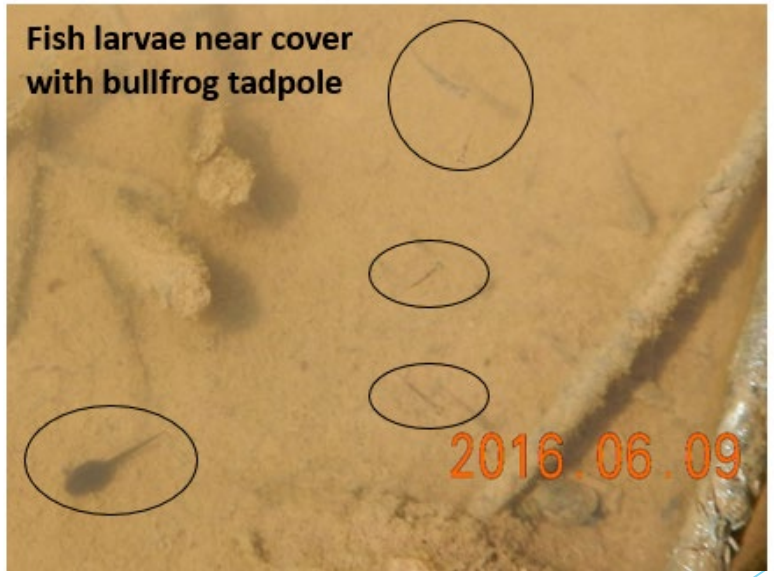
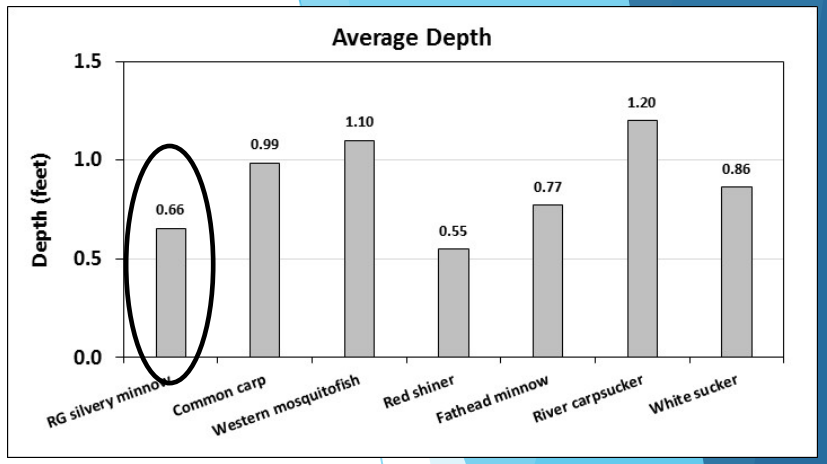
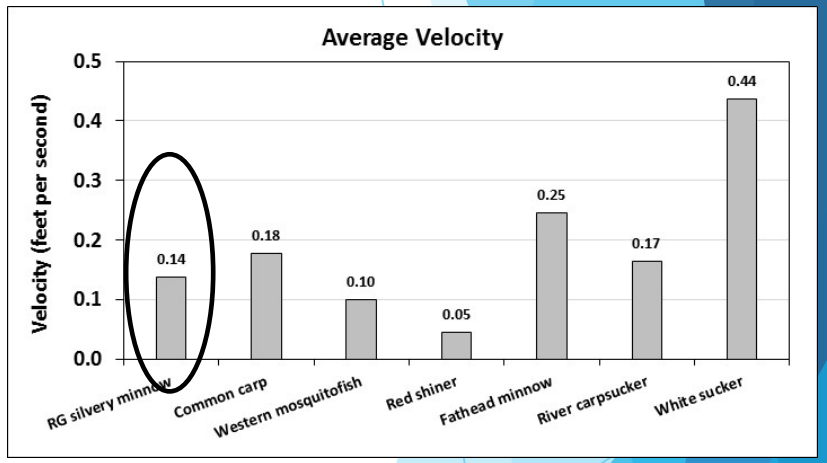
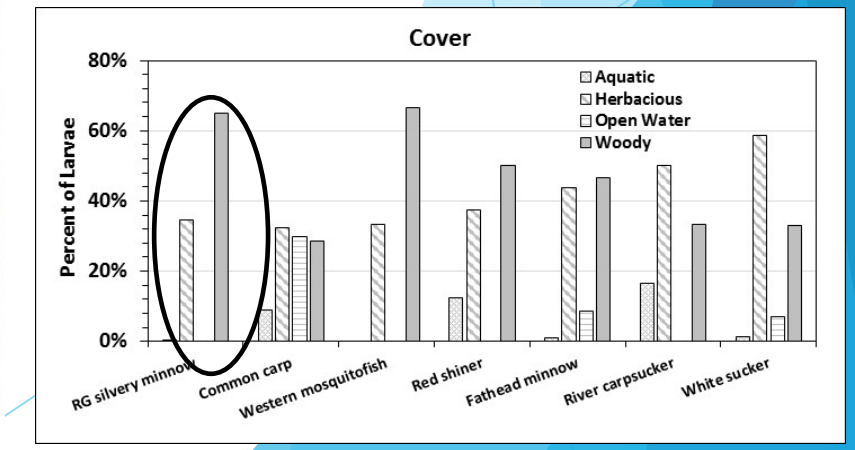
Findings: RGSM Larvae

- 72-90% of all fish larvae are RGSM
- Warm, shallow (8-20 cm), low velocity
- Moderate cover (3-25%)
- Near water's edge; "bathtub ring"









Conclusions

- MRG restoration program has had limited success.
- Dynamic sand-bed has changed floodplain geomorphology.
- Geomorphic and biologic monitoring have been limited.
- Ongoing drought exacerbates floodplain delinkage.

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