

# From habitat features to process based floodplain restoration

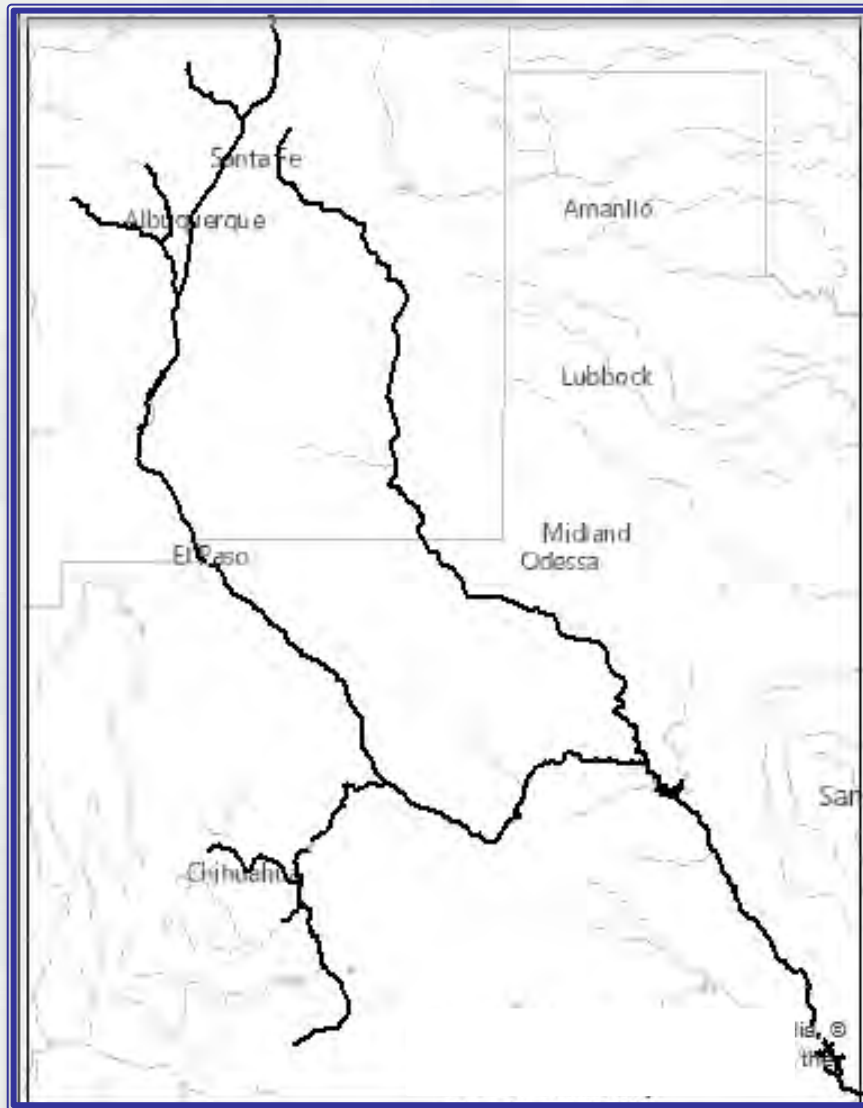
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July 29, 2020



US Army Corps of Engineers  
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# The Rio Grande



Nestedness and interdependence of hydrological, geomorphic, ecological, and biogeochemical processes – Polvi et al. 2020

Heterogeneity of ecosystem function – DeBoer et al. 2020



# Native Americans



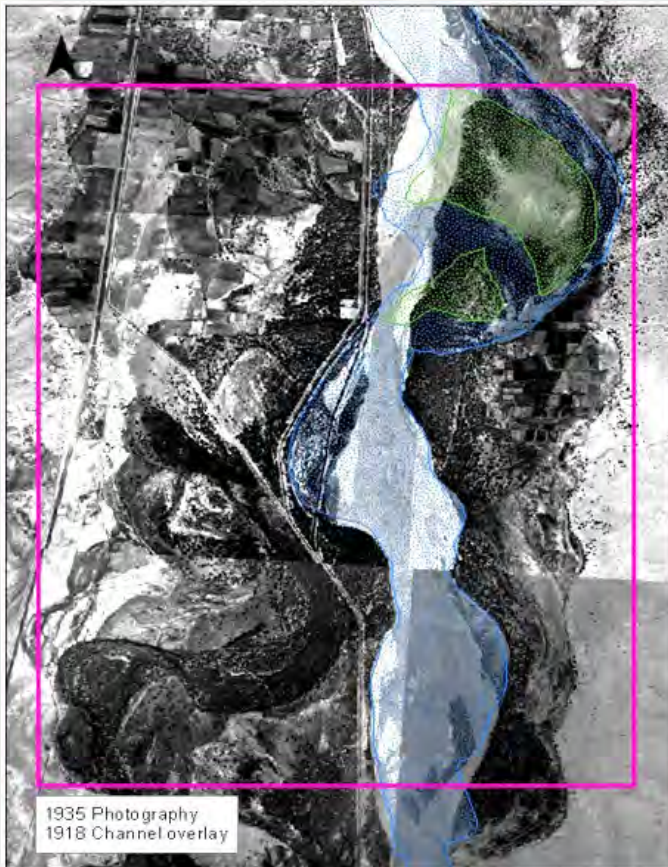
- RG pueblos established ~1300s.  
134 pueblos by 1400s.  
74 active pueblos in 1600s.  
Currently, 19 pueblos in RG Basin.
- 1500s: Navajo, Apache & Southern Ute also settle in basin.
- Cleared vegetation with fire
- Floodplain fields inundated
- Rock-&-brush diversion for irrigation





# What did the floodplain look like a hundred years ago?

“The only thing that is constant is change.” HERACLITUS OF EPHEBUS  
Quoted on the Delta Science Plan (2019)

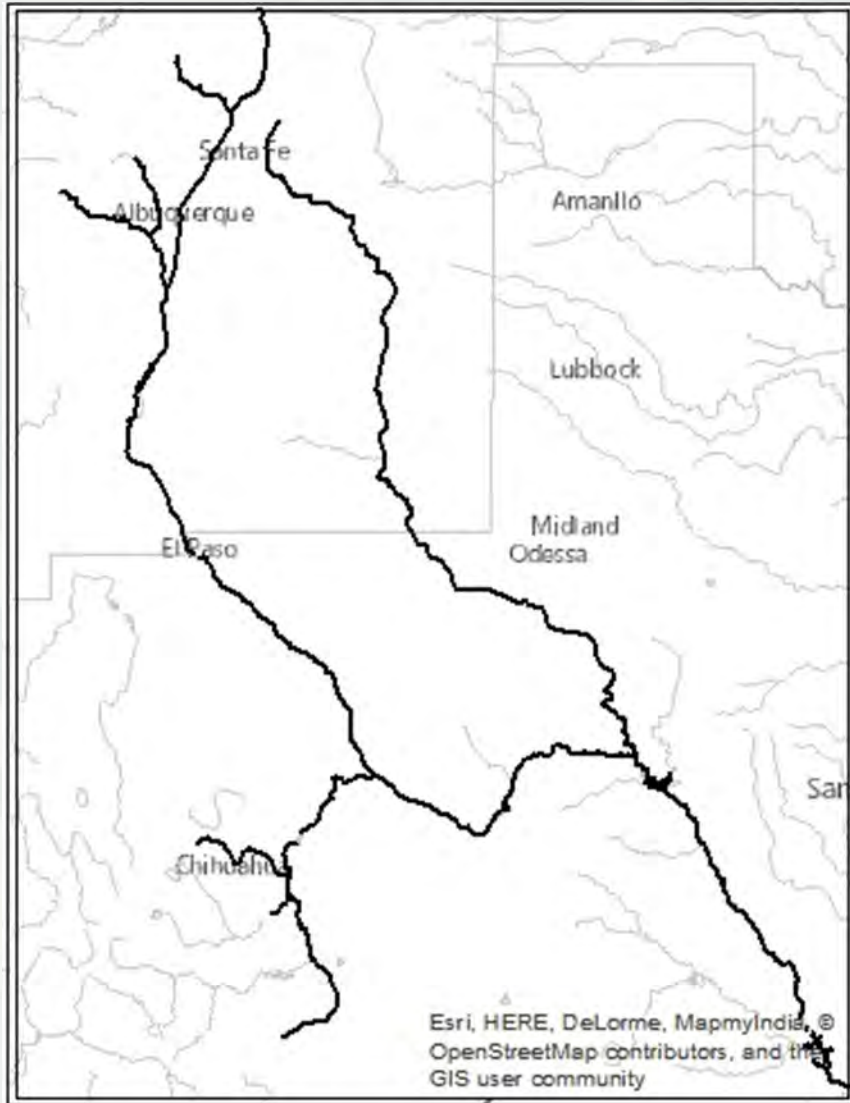




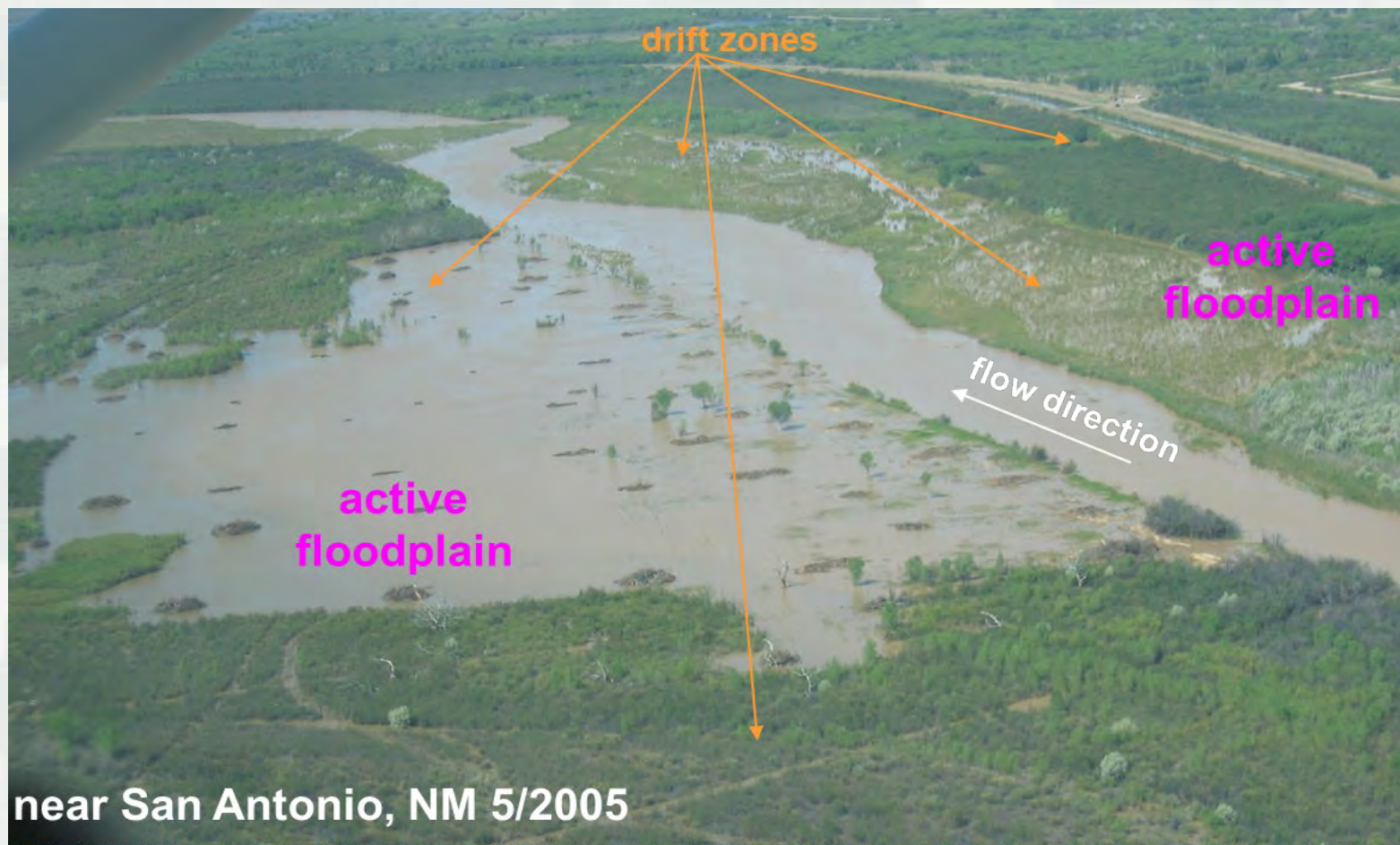




# Rio Grande silvery minnow



# Nursery floodplain habitat





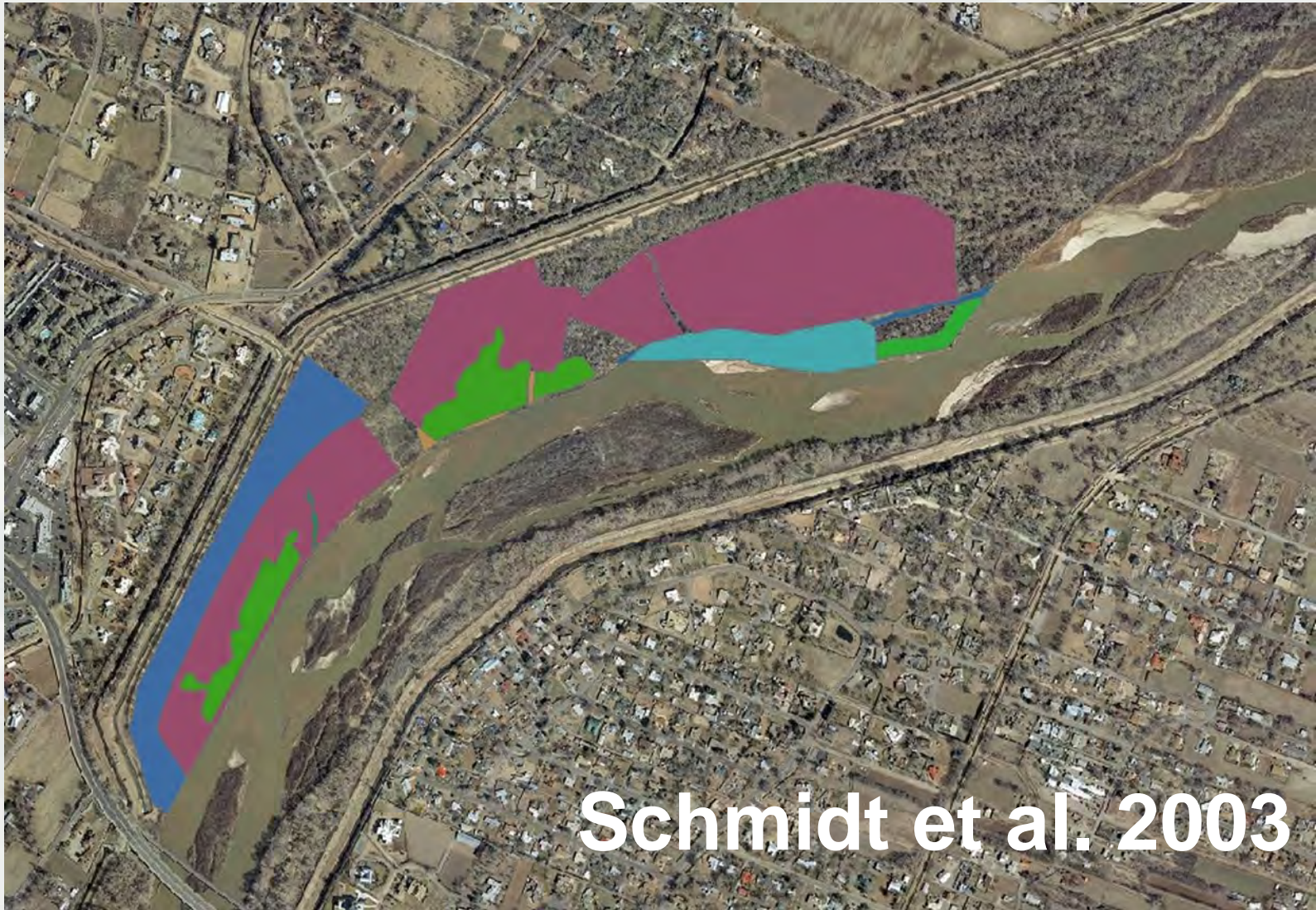
# Current concepts for nursery habitat



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# Fluvial Geomorphology of Rio Grande



Schmidt et al. 2003





# How have geological, fluvial, and ecological processes been modified?





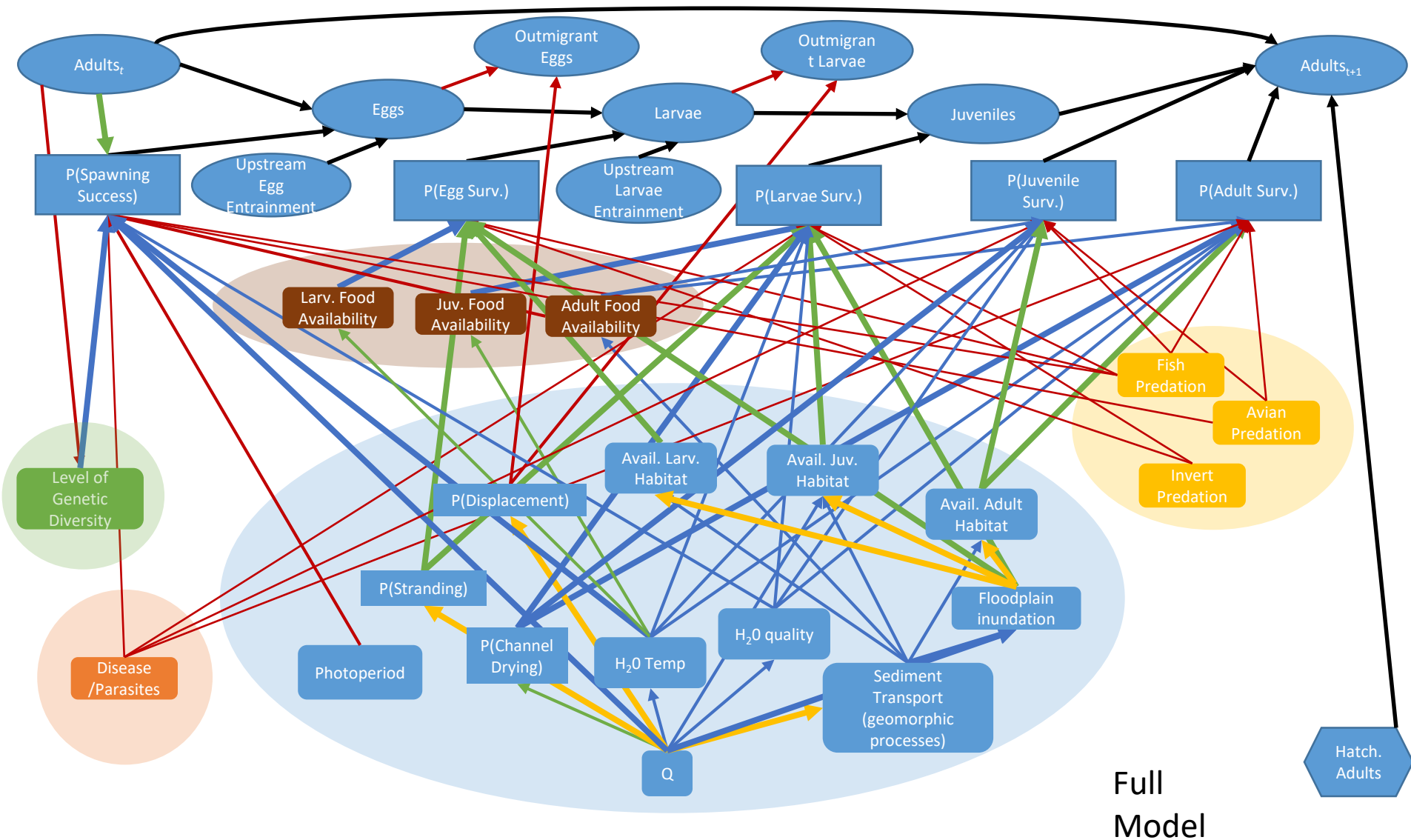
# Adaptive Management



- Design
- Do
- Learn

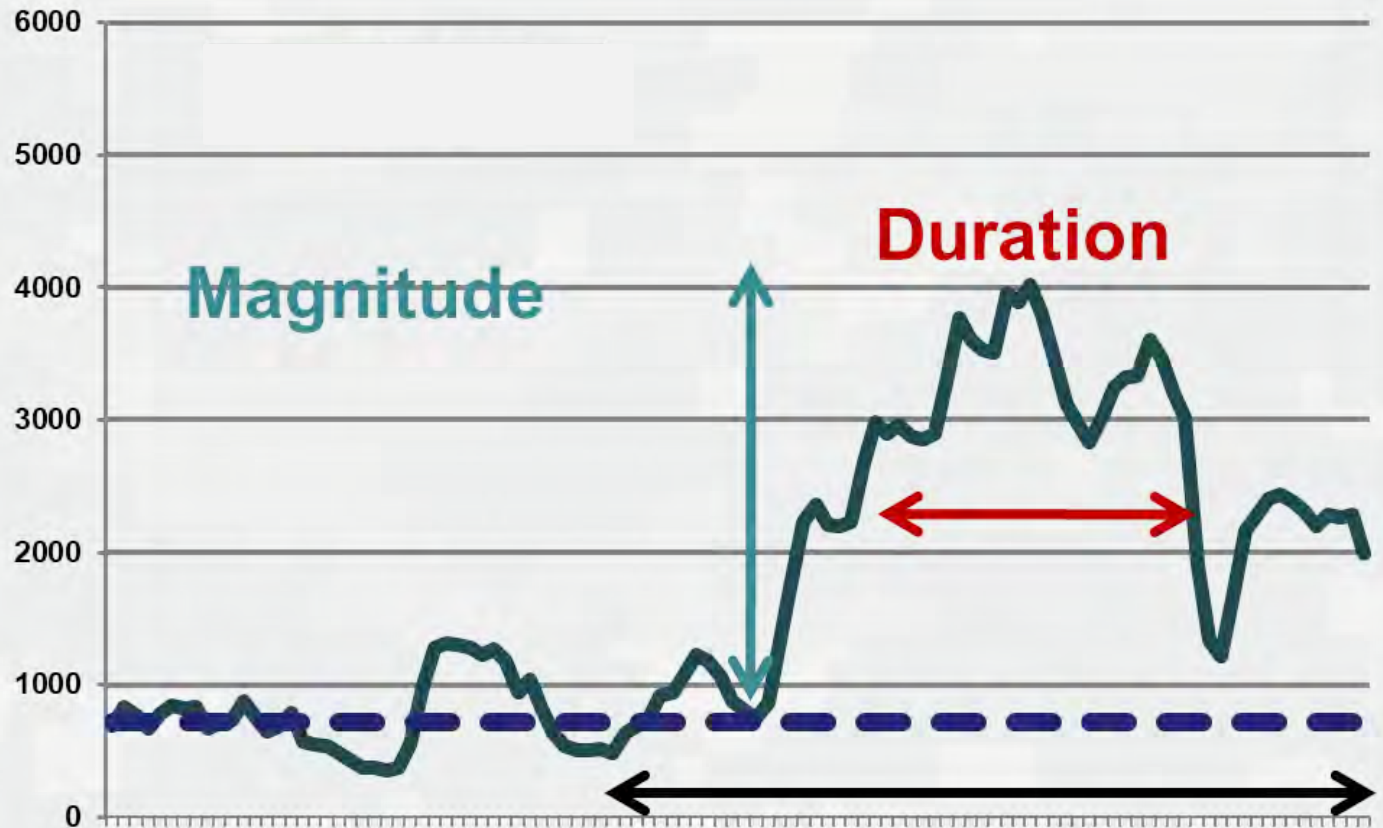


# RGSM Conceptual Model





# Environmental flow, nursery habitat, fish

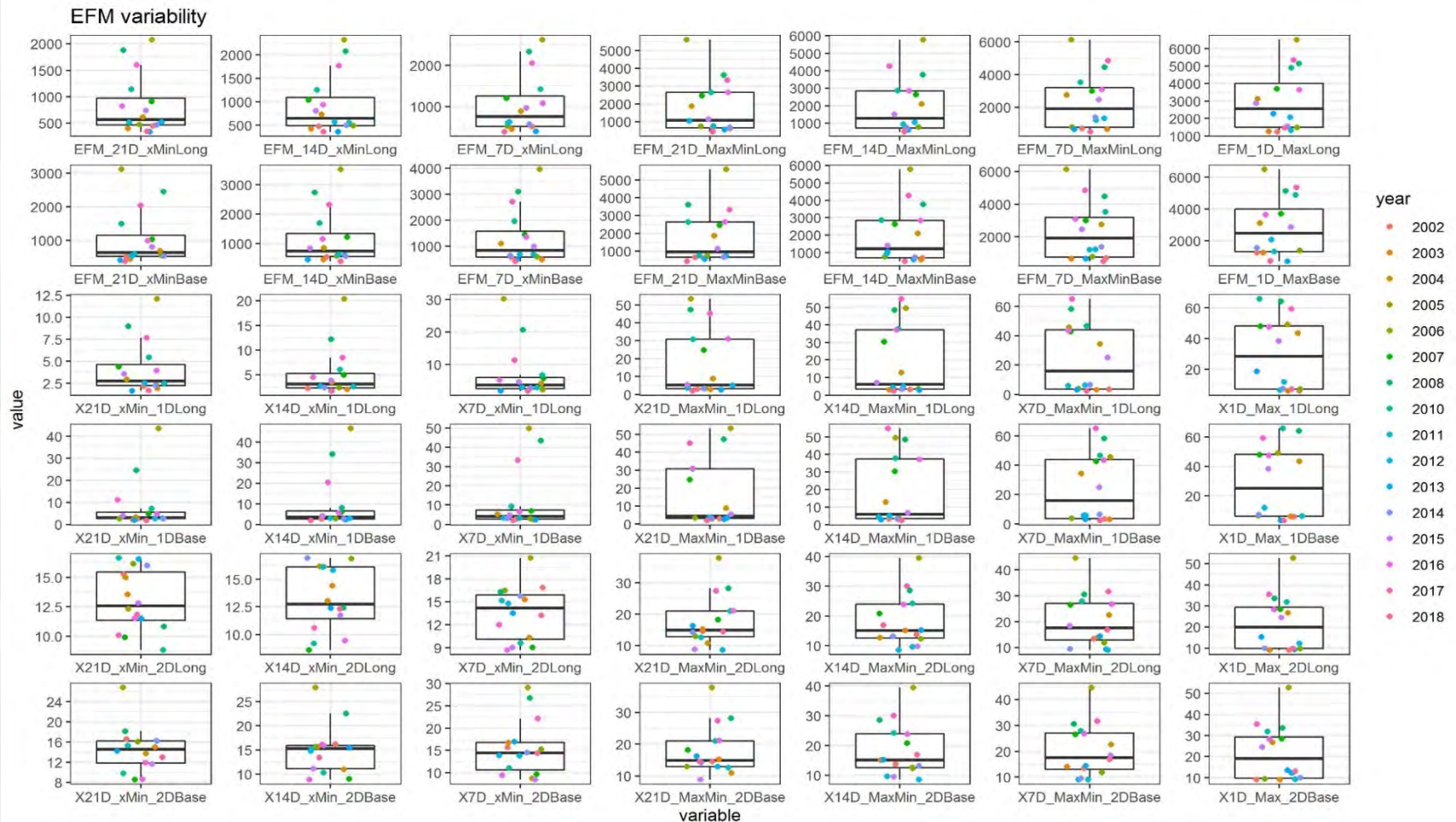


Variables	Formula
Brood stock	$\text{fish/area} \times 100$
Young-of-Year	$\text{mean}(\text{fish/area} \times 100)$
Slope geometric	$(\text{fish/area} \times 100) / \text{Date range}$
Fall Index	$\text{fish/area} \times 100$

**Seasonal Volume**



# Autocorrelation and analysis





# How has infrastructure changed the Rio Grande?





# What to do when silt happens







**Which  
processes  
can we  
imitate?**



# Why habitat is a driver for fish populations.







# Questions?

