

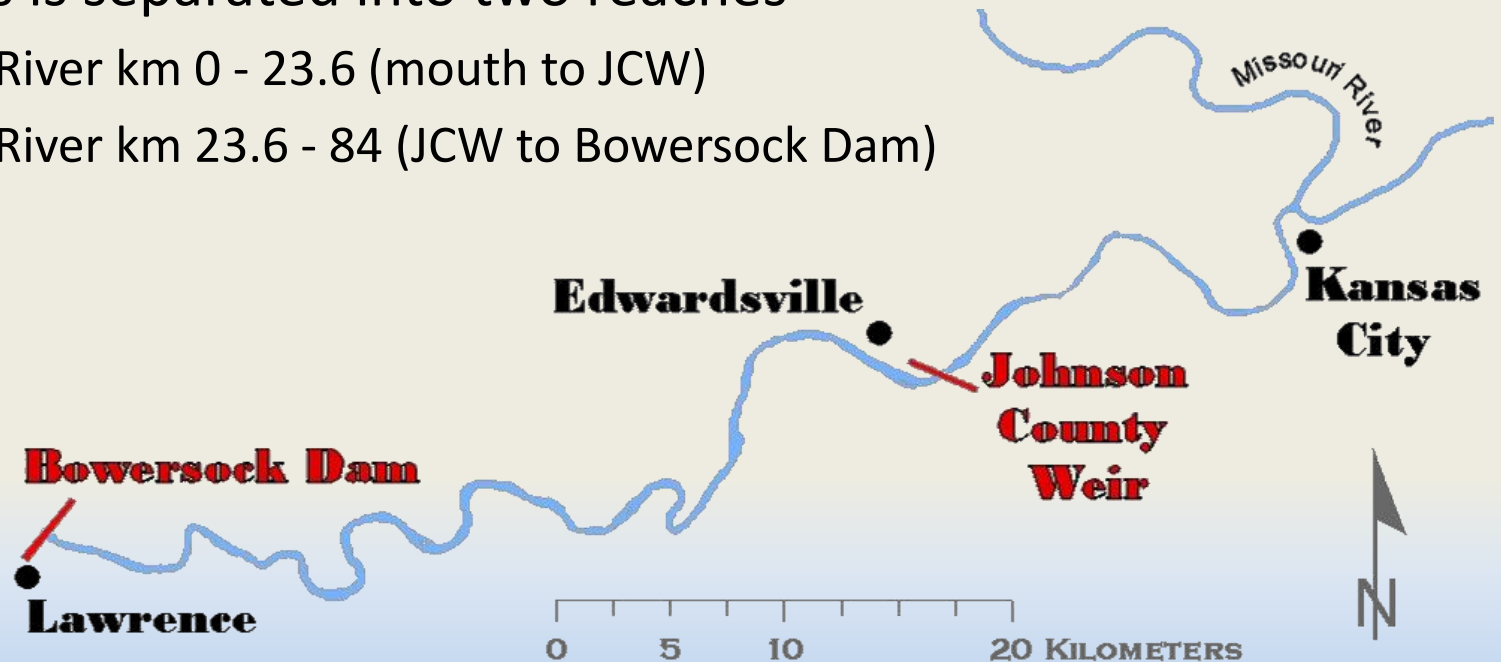
# Fish community in the Kansas River: occupancy modeling to estimate richness

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# Kansas River Sampling Area

- MDC samples the lower 84 km
  - This is separated into two reaches
    - River km 0 - 23.6 (mouth to JCW)
    - River km 23.6 - 84 (JCW to Bowersock Dam)



# Fish Sampling

- Gill Net
- Otter Trawl
- Mini-fyke
- Trotline
- Trammel Net



All subsamples pooled for presence or absence by species



# Questions and Hypotheses

## Questions

1. Can occupancy modeling be used to estimate community richness?
2. Does community richness vary above vs. below the Weir?

## Hypotheses

- Program PRESENCE can be used to estimate community richness via occupancy modeling.
- Community richness is not statistically different above vs. below the Weir.



# Q1: Program PRESENCE

- Useful analogy- importance in running model

Species Richness Modeling	Occupancy Modeling
Individual species	Individual sites
Proportion of species present	Proportion of sites occupied
Local persistence (extinction)	Local persistence (extinction)
Colonization	Colonization

- Detection probability is relevant in both cases
  - Non-detection does not necessarily mean absence



# PRESENCE to Estimate Richness

The screenshot shows a software window titled "Data Input Form" with a menu bar (File, Edit, Simulate, Help) and a toolbar. Below the toolbar, there are input fields for "rows" (23), "cols" (8), "No. Occ/season" (4, 4), "No. Site Cover" (0), and "No. Sampling Cover" (0). The main area is a "Presence/Absence data" table with the following structure:

data	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4
Acipenseridae	1	1	1	-	1	1	1	1
Amiidae	0	0	0	-	0	0	0	0
Anguillidae	0	0	0	-	0	0	0	0
Atherinidae	0	1	1	-	0	0	0	0
Catostomidae	1	1	1	-	1	1	1	1
Centrarchidae	1	1	1	-	1	1	1	1
Clupeidae	1	1	1	-	1	0	1	1
Cyprinidae	1	1	1	-	1	1	1	1
Cyprinodontidae	0	0	0	-	0	0	0	0
Esocidae	0	0	0	-	0	0	0	0
Gadidae	0	0	0	-	0	0	0	0
Gasterosteidae	0	0	0	-	0	0	0	0
Hiodontidae	1	1	1	-	0	0	0	0
Ictaluridae	1	1	1	-	1	1	1	1
Lepisosteidae	1	1	1	-	1	1	1	1
Osmeridae	0	0	0	-	0	0	0	0
Percichthyidae	1	1	1	-	1	0	1	0
Percidae	0	1	0	-	0	0	0	1
Percopsidae	0	0	0	-	0	0	0	0
Petromyzontidae	0	0	0	-	0	0	0	0
Poeciliidae	0	1	1	-	0	1	0	1
Polyodontidae	0	0	0	-	0	0	0	0
Sciaenidae	1	1	1	-	1	1	1	1

INSTEAD, for richness estimates:

- Our targets become our “sites”
- Our sites become our “observations”
- Our reaches become our “seasons”

So now:

- Occupancy = the proportion of targets occupying each reach
- Detectability = the probability of detecting a target given that target is present



# Q2: Community Richness

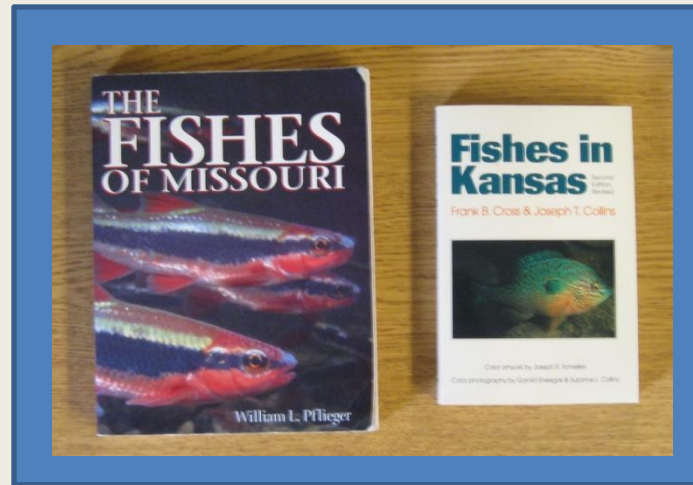
- Occupancy estimates are always a percentage
  - So, we have to have a full list of possible targets



# Species List

Created from historic captures

- Species Level
  - 119
- Genus Level
  - 59
- Family Level
  - 23





# Captures by Taxonomic Level

Year	Reach	Family (23)	Genus (59)	Species (119)
2009	Above JCW	11 (-2)	26 (-5)	40 (-5)
	Below JCW	13	31	45
2010	Above JCW	11 (-2)	26 (-2)	34 (-14)
	Below JCW	13	28	48



# Families not Found Above JCW

- 2009
  - Hiodontidae (Goldeye)
  - Polyodontidae (Paddlefish)
- 2010
  - Atherinidae (Brook silverside)
  - Hiodontidae (Goldeye)



# Detection Probabilities

Year	Reach	Family (23)	Genus (59)	Species (119)
2009	Above JCW	0.84	0.67	0.59
	Below JCW	0.95	0.85	0.78
2010	Above JCW	0.82	0.85	0.65
	Below JCW	0.90	0.72	0.70

\* Detectability is very influential on occupancy estimate



# Community Richness

Year	Reach	Family (23)	Genus (59)	Species (119)
2009	Above JCW	11.0 (.84)	26.1 (.67)	40.5 (.59)
	Below JCW	13.0 (.95)	31.1 (.85)	45.5 (.78)
2010	Above JCW	11.0 (.82)	26.2 (.85)	34.5 (.65)
	Below JCW	13.0 (.90)	28.1 (.72)	49.4 (.70)



# Community Richness

## Observed vs. Modeled

Year	Reach	Family (23)	Genus (59)	Species (119)
2009	Above JCW	11 (11.0)	26 (26.1)	40 (40.5)
	Below JCW	13 (13.0)	31 (31.1)	45 (45.5)
2010	Above JCW	11 (11.0)	26 (26.2)	34 (34.5)
	Below JCW	13 (13.0)	28 (28.1)	48 (49.4)

\* Detectability was always high (>0.59)



# Discussion

## Using occupancy modeling to estimate richness

- Estimate of occupancy or richness is very reliant on detectability estimate
  - Crucial to have an accurate estimate of detectability
- With PRESENCE we define a list of possible non-detections
  - This puts a cap on false absences
  - Detectability estimate may be more accurate





# Discussion

## Community richness

- Community richness was always greater below the Weir
  - Possible causes are numerous:
    1. The Weir is a barrier, or at least an obstruction, to fish passage
    2. Habitat differences between the reaches
    3. Connectivity to Missouri River

