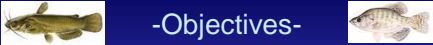


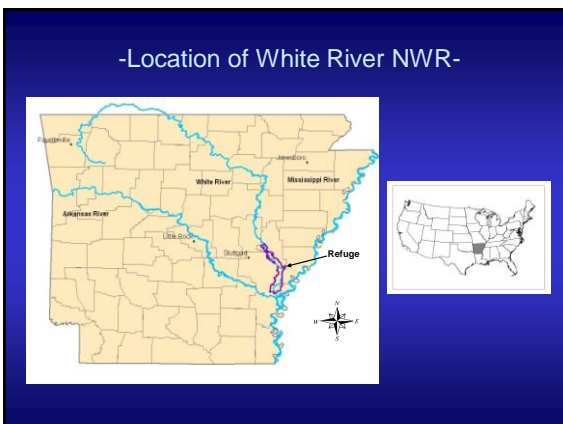
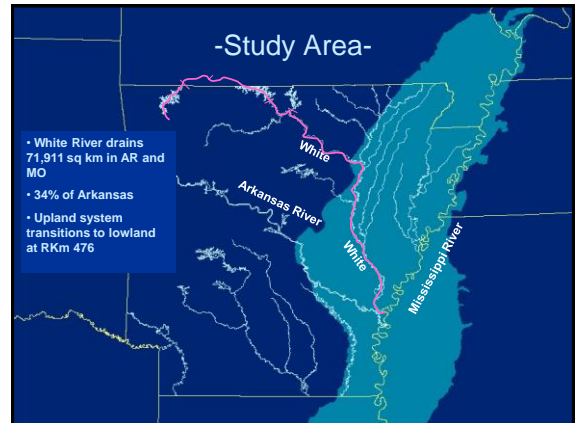

-Background-

- Large river ecosystems
 - Diverse habitats, esp. in floodplains
 - Extreme temporal variability
 - Flows, depths, oxygen >>> fish use
 - Conditions impede collection of representative, or sometimes, even comparable samples
- Multiple gears warranted for fish communities
 - Better target diverse habitats / conditions within



-Objectives-

- 1) Compare different gear types in terms of species richness, diversity, and evenness
 - Do different gears collect comparable samples?
- 2) Characterize fish community-environment relationships using multiple gear types
 - Do different gears depict fish-env relationships differently?
- 3) Assess similarity of community structure depicted by different gear types
 - Are different gears sampling different fish communities?

-White River-

Lower White River (LWR) and Cache River

- RAMSAR "Wetlands of International Significance"
- 22 such sites in US (2002)

Basin contains 150 native fishes (Robison & Buchanan 1988)

- 11 endemic fishes
- 95 fish species in LWR (AGFC, unpublished report)
- 58 mussel species, with three endemic species



-Study Sites-

Lake selection:

- Lake size, location in basin
- Boat / gear access
- Historical data
- 50 of 300 lakes considered
- 16 lakes finally selected

-Methods- Fish collections





-Nighttime boat-mounted electrofishing-
Six 10-minute samples
(3 @ 60-Hz and 3 @ 15-Hz) (Pugh & Schramm 1998)

-Methods- Fish collections








-Mini-fyke nets-
1.2 m wide X 1.8 long X 0.6 m high
Mesh: 3 mm
24-hr sets – 4 per lake
Effort: 64 net nights

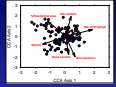
-Experimental gill nets-
38 m long X 2.4 m deep
Meshes: 2.54, 3.81, 5.1, 6.35, and 7.62 cm
3-hr sets – 3 nets per lake
Effort: 144 net-hrs

-Methods- Metrics compared

- Richness as number of species collected
- Diversity
 - Shannon-Weaver H'
$$H' = -\sum_{i=1}^s p_i \log_{10} p_i$$
 - Simpson's 1- D
$$D = \frac{1}{\sum_{i=1}^l \frac{n_i(n_i-1)}{N(N-1)}}$$
- Evenness
$$E = \frac{H'}{H_{max}}$$

-Methods- Community structure



- Canonical Correspondence Analysis (CCA) - used to examine community structure and fish-environment relationships
- Incorporates environmental variables into community structure analysis using a multiple regression algorithm on CA scores
 - 'Direct gradient analysis'
- Ordination is 'constrained' in that sample scores are directly related to observed environmental variation

-Results-
Fish collections



-Results-
Fish collections

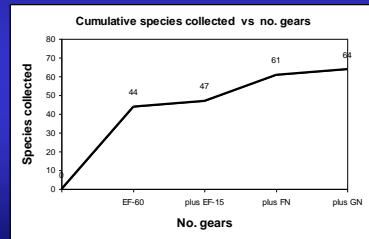


- 42,065 fishes collected
- 64 species collected
- 20 families collected



-Results-
Objective 1

-Results-
Species Richness



-Results-
Richness, Evenness, and Diversity





Gear	Rich.	Even.	H'	D
60-Hz EF	21.3 A	0.707 B	0.934 B	5.57 B
15-Hz EF	21.6 A	0.786 A	1.082 A	7.87 A
Fyke nets	18.8 B	0.028 C	0.631 C	3.50 C
Exp. gill nets	8.5 C	0.716 B	0.652 C	3.87 C



-Results-
Richness, Evenness, and Diversity



Gear	Rich.	Even.	H'	D
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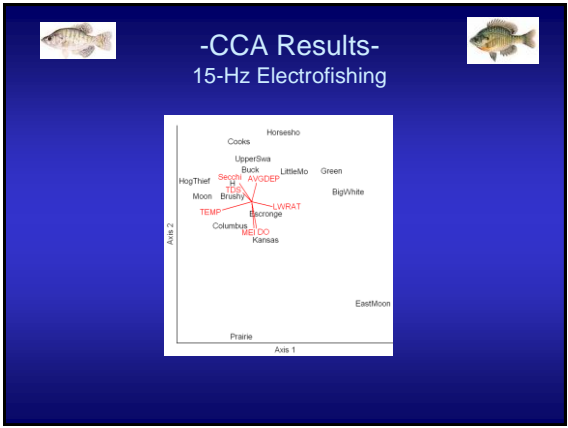
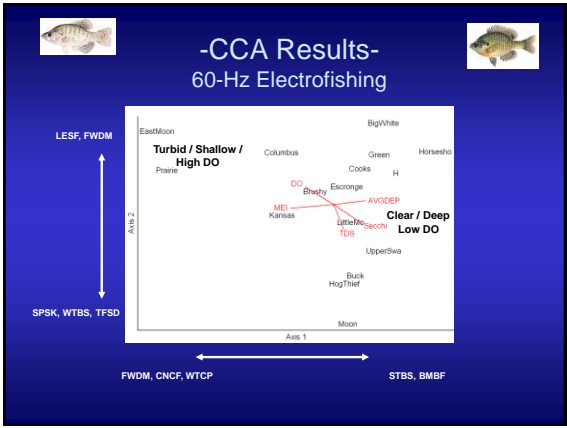
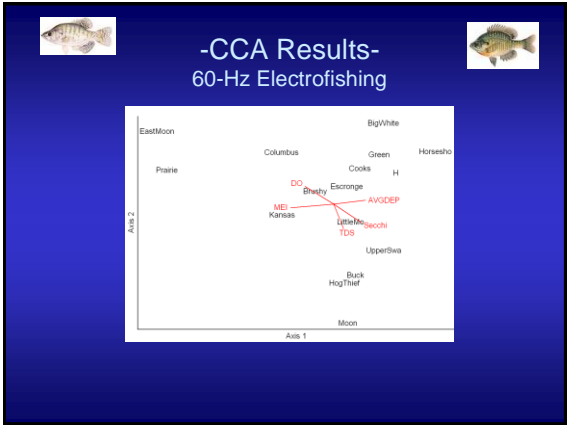
 **-Results-**
Richness, Evenness, and Diversity 

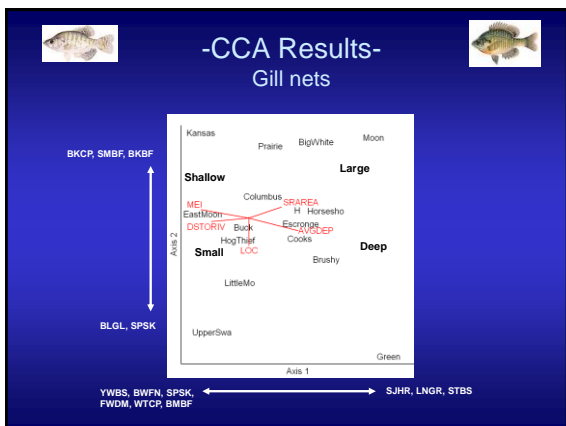
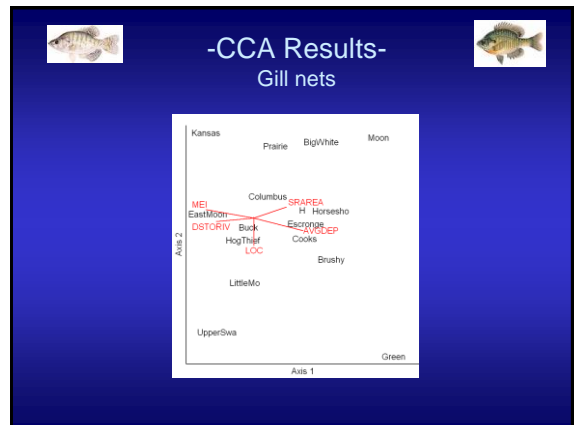
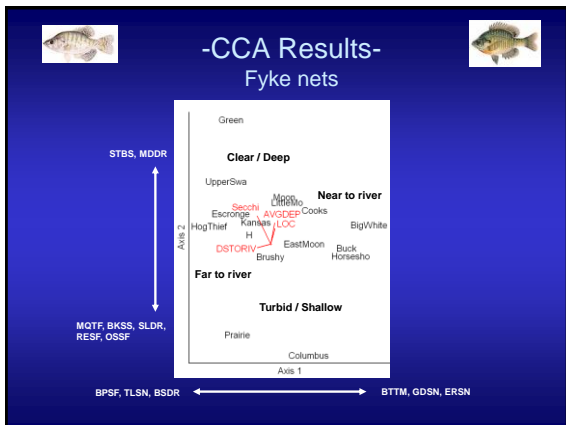
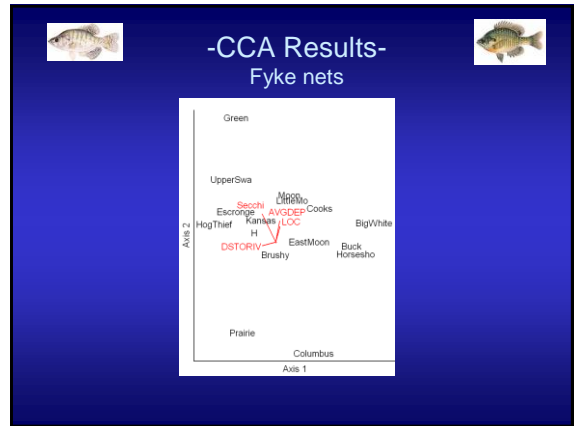
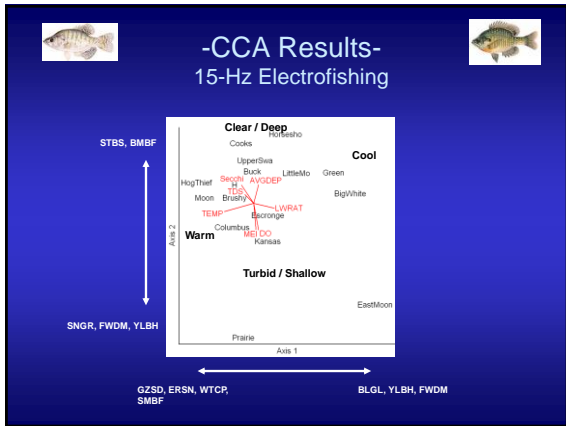
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 **-Results-**
Richness, Evenness, and Diversity 

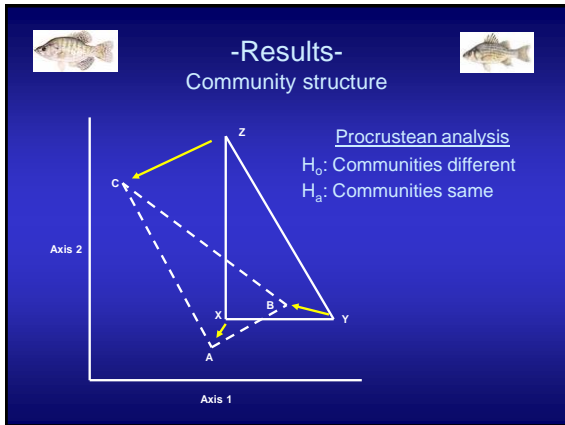
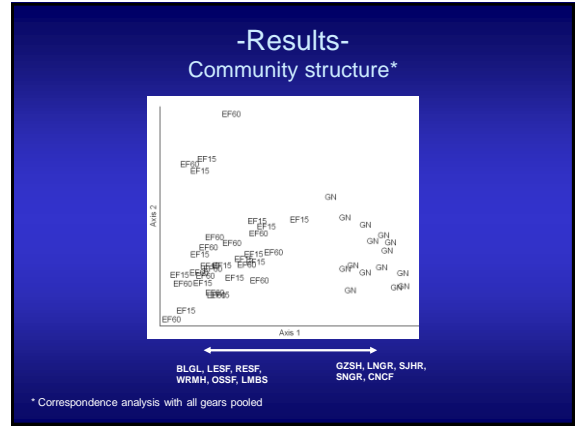
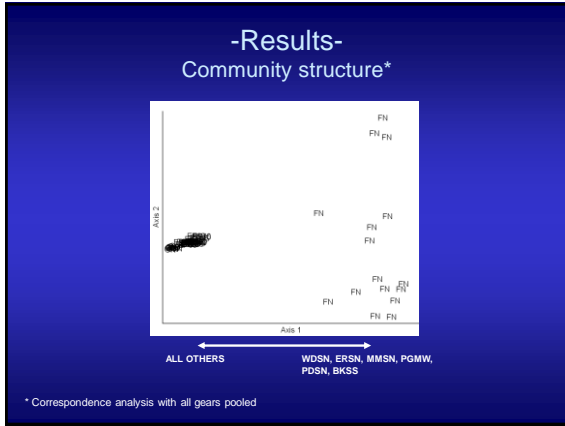
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-Results-
Fish-environment relationships
Objective 2





-Results-
Objective 3



-Results- Community structure – Procrustean analysis

Gear pair	M ²	P	Conclusion
EF60 – EF15	0.3347	<0.0001*	(same)
EF60 – FN	0.8866	0.5764	(diff)
EF60 – GN	0.8217	0.2577	(diff)
EF15 – FN	0.7938	0.1509	(diff)
EF15 – GN	0.7734	0.1093	(diff)
FN – GN	0.8060	0.2185	(diff)

-Discussion-

- ### -Discussion- Richness, Evenness, and Diversity
- Electrofishing (15-Hz and 60-Hz) consistently collected the most species
 - Samples were more even and diverse than other gears
 - High selectivity of centrarchids
 - Fyke nets also tended to collect many species
 - Samples dominated by a few species
 - Lower diversity and very low evenness
 - High prevalence of small-bodied species (many cyprinids and rare species)
 - Gill nets
 - Low catches, lower richness, lower diversity
 - Tended to catch some species (e.g., shads, gars, catfishes) in much greater abundances than e-fishing



-Discussion- Fish-environment relationships



- Mean lake depth, water clarity, and MEI consistently constituted primary and/or secondary gradients regardless of gear type
- Deeper lakes had greater water clarity, larger surface areas, and tended to be closer to the river
- Shallow lakes had lower water clarity, smaller surface areas, and tended to be further from the river channel
- Water temperature, DO, distance to river marginally important



-Discussion- Community structure



- 60-Hz and 15-Hz electrofishing sampled communities that were not significantly different
 - 60-Hz twice the abundance
- Fyke and gill nets sampled significantly different communities
- Multiple gears were worthwhile in this study
 - Could omit 15-Hz electrofishing w-out major loss of information
 - Fyke nets added 14 species, many small-bodied and "rare" forms
 - Gill nets still useful (maybe catch larger sizes?), esp. for management purposes, but are labor intensive



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