Influence of Stream Restoration on Aquatic Communities

National Stream Restoration Conference

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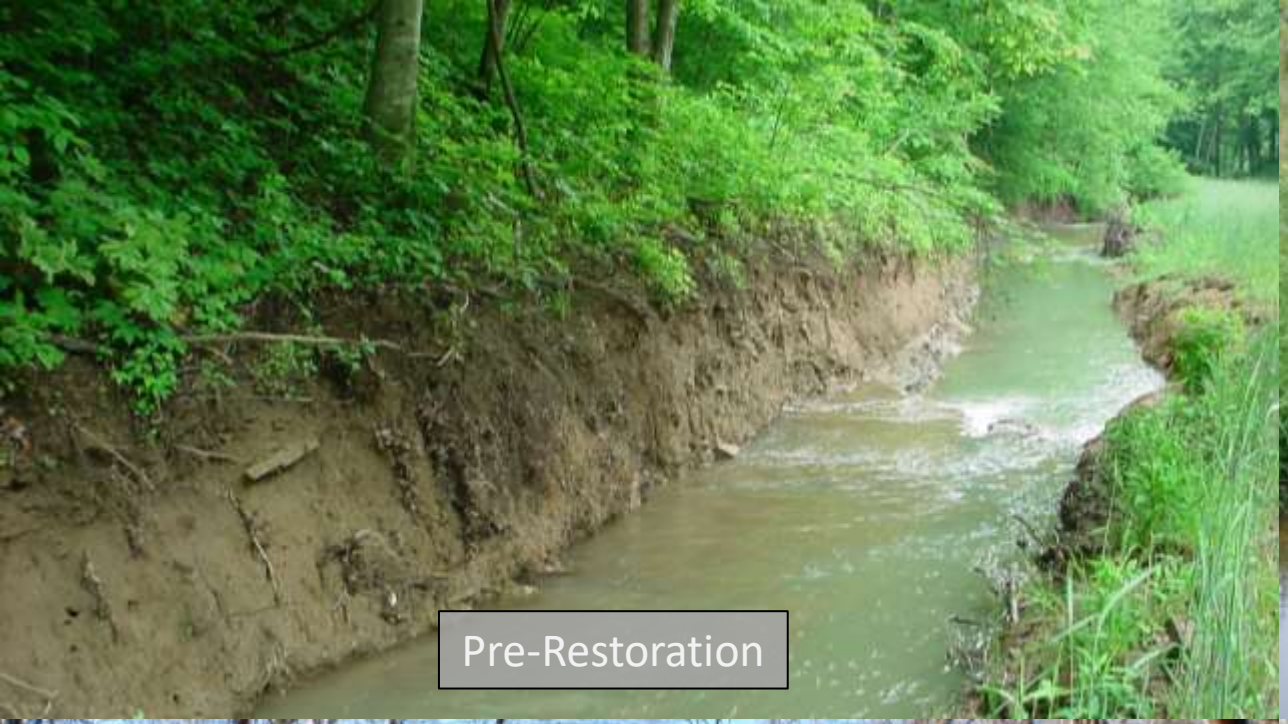
All about us....

- Kentucky Wetland and Stream Fee-in-Lieu-Of Mitigation Fund (FILO)
- Mission: Perform wetland and stream mitigation under the Clean Water Act
- Over 300 million dollars in receipts to date
- 100 Projects
- 11 Service Areas


Pre-Restoration


Post-Restoration

Table 1. Minors Creek Stream Restoration Project Monitoring Schedule

Data Collection		As-Built	Year 1		Year 2		Year 3		Year 4		Year 5	
			Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
Hydrology	Flow type & bankfull flow evidence	X		X		X		X		X		X
Geomorphology	BHR, MWR, and W/D measurements	X			X						X	
	Cross-sections & profiles	X			X						X	
	BEHI evaluation		X		X		X		X		X	
	Visual inspection of channels and structures; photograph and document areas of erosion	X	X		X		X		X		X	
	Photograph project reaches	X	X	X	X	X	X	X	X	X	X	X
Habitat	RBP assessment (high gradient)			X		X		X		X		X
Vegetation	Trees & Shrubs – Stem count and density (including invasive species, volunteers, and planted)		X	X	X	X		X		X		X
	Herbaceous Plants - % ground cover (including invasive species, volunteers, and planted)		X	X	X	X		X		X		X
	Photograph Veg. Plots		X	X	X	X		X		X		X
	Total Plant Species List	X		X		X		X		X		X
Bio	Macroinvertebrate and fish survey										X	

X = Data collection to be completed.

Methods

- KY Division of Water (2009; rev. 2022)
- Modification of the USGS NAWQA Protocol (1998)

Standard Operating Procedure

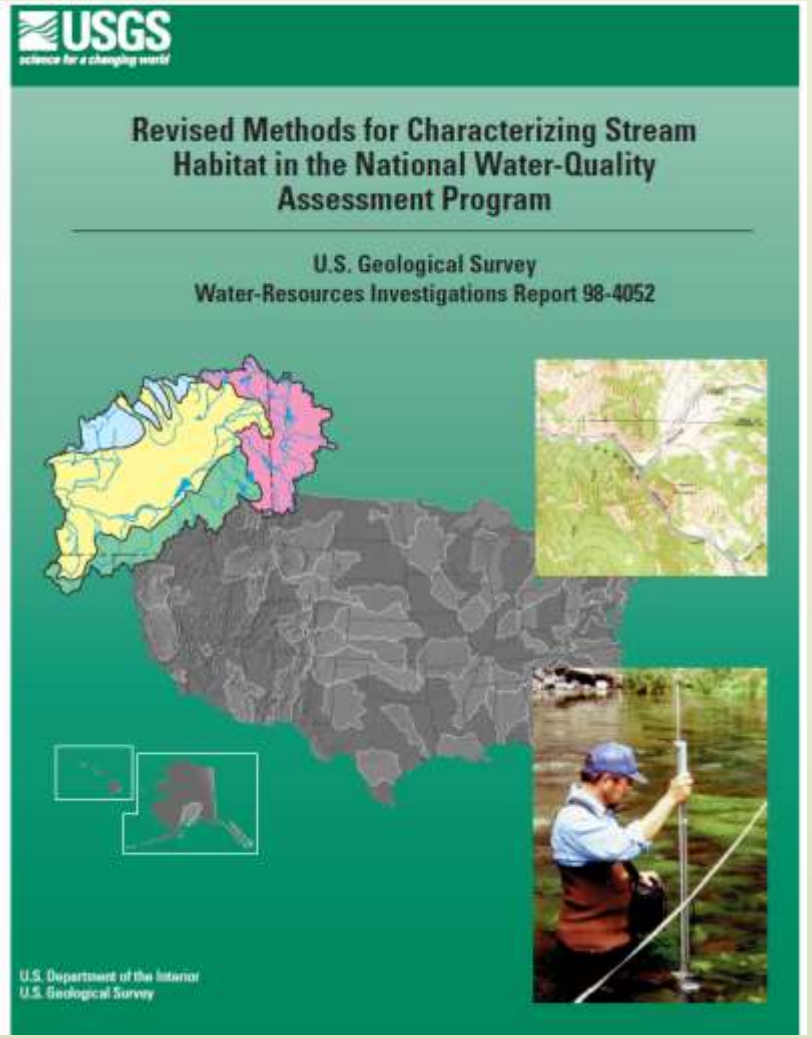
Collection Methods for Fish in Wadeable Streams

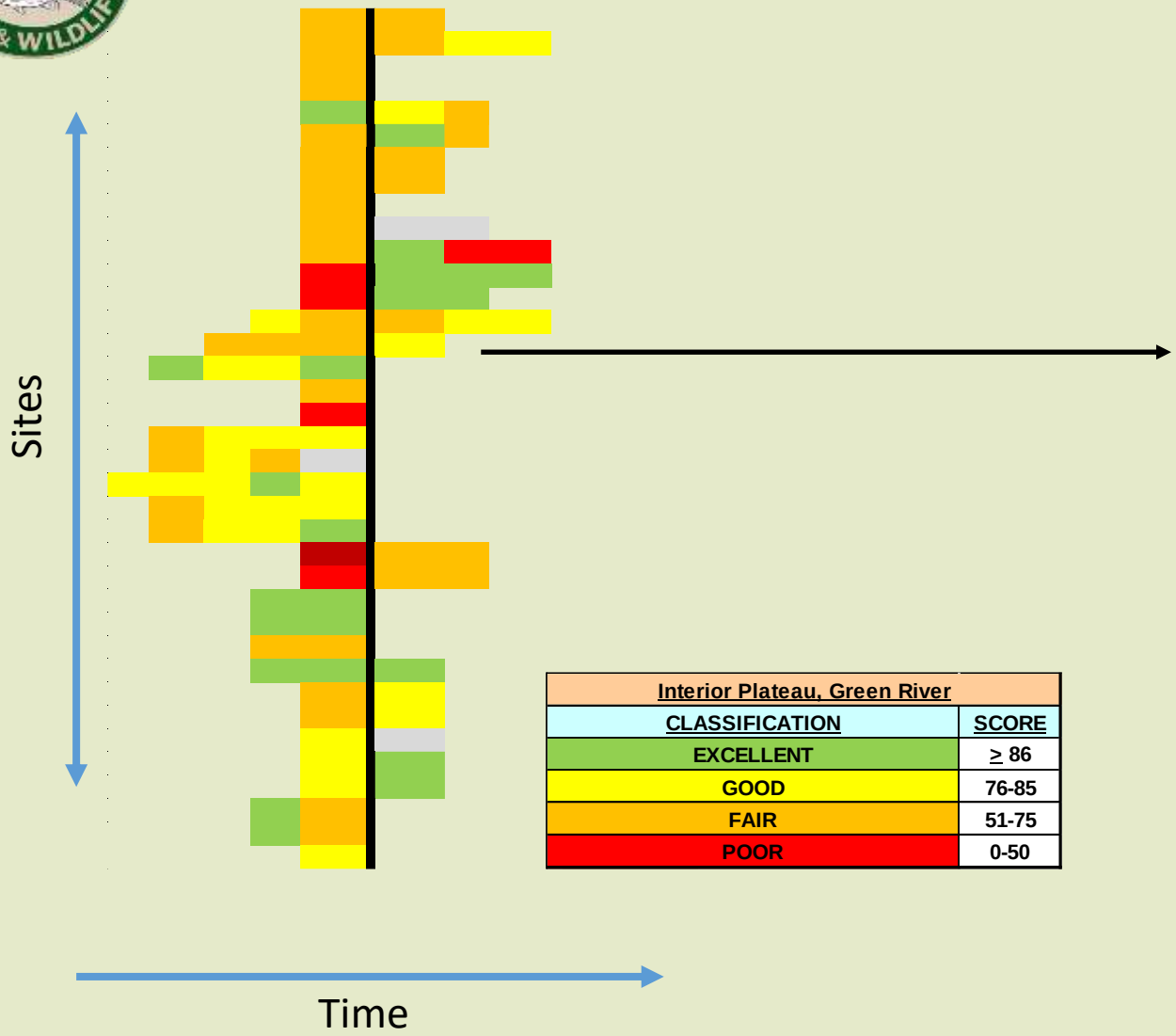
Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division of Water

Version 3.0

Effective Date: February 2022
Original Effective Date: March 1, 2009

Document ID: DOWSOP03008





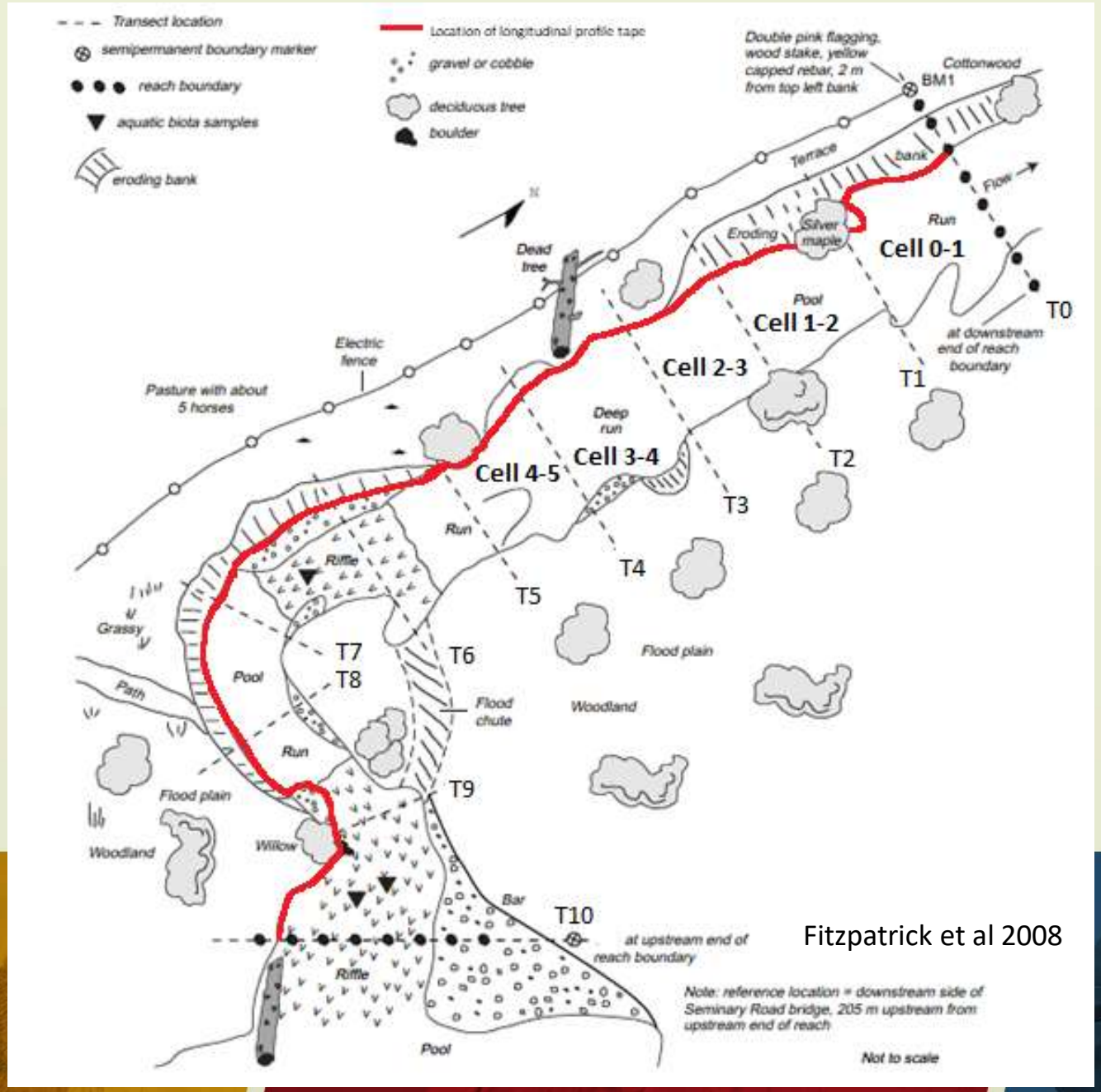
Interior Plateau, Green River	
CLASSIFICATION	SCORE
EXCELLENT	≥ 86
GOOD	76-85
FAIR	51-75
POOR	0-50

GOOSE CREEK FISH SAMPLE	PRE-RESTORATION 10/20/2017	POST-RESTORATION 08/03/2020
Species	**Count**	**Count**
Campostoma oligolepis	76	143
Cyprinella spiloptera	1	9
Luxilus chrysocephalus	29	32
Lythrurus fasciolaris	9	80
Notropis buccatus	0	8
Notropis leuciodus	6	4
Notropis micropteryx	0	34
Notropis volucellus	47	0
Pimephales notatus	3	32
Semotilus atromaculatus	6	15
Hypentelium nigricans	11	26
Moxostoma duquesnei	0	8
Noturus elegans	9	1
Fundulus catenatus	14	2
Gambusia affinis	0	1
Cottus carolinae	16	5
Ambloplites rupestris	0	7
Lepomis cyanellus	1	10
Lepomis macrochirus	0	2
Lepomis megalotis	1	0
Lepomis sp.	2	1
Micropterus dolomieu	0	1
Etheostoma bellum	17	13
Etheostoma blennioides	19	16
Etheostoma caeruleum	66	23
Etheostoma flabellare	29	1
Etheostoma rafinesquei	29	22
Etheostoma spectabile	13	4
Etheostoma zonale	4	13
n=	**408**	**513**

Species Richness	**22**	**27**
KIBI	**75-Fair**	**84-Good**

Questions

- Can we optimize restoration designs for aquatic habitat?
- Which habitat types influence fish and macroinvertebrate communities?



Fitzpatrick et al 2008

Landscape

- Land Use
- Ecoregion
- Bioregion
- River Basin

Watershed

- Basin length
- Slope
- Perennial stream length
- Drainage area
- Drainage density
- Drainage shape
- Land use

Reach

- Vegetation Sinuosity
- RBP
- Channel modification
- Mitigation type
- Stream order
- Land use
- Reach slope
- Riffle slope
- Glide slope
- BEHI
- W/D
- ER
- Bankfull area
- Floodprone width
- Max pool depth
- Dominant substrate
- Habitat length or %
- Discharge
- Water Chem (DO, pH, temperature)
- Macro-invertebrates

Cell

- Instream habitat cover
- Canopy cover
- Min/Max depth & velocity
- Microhabitat type
- Dominant substrate
- Fish

Methods

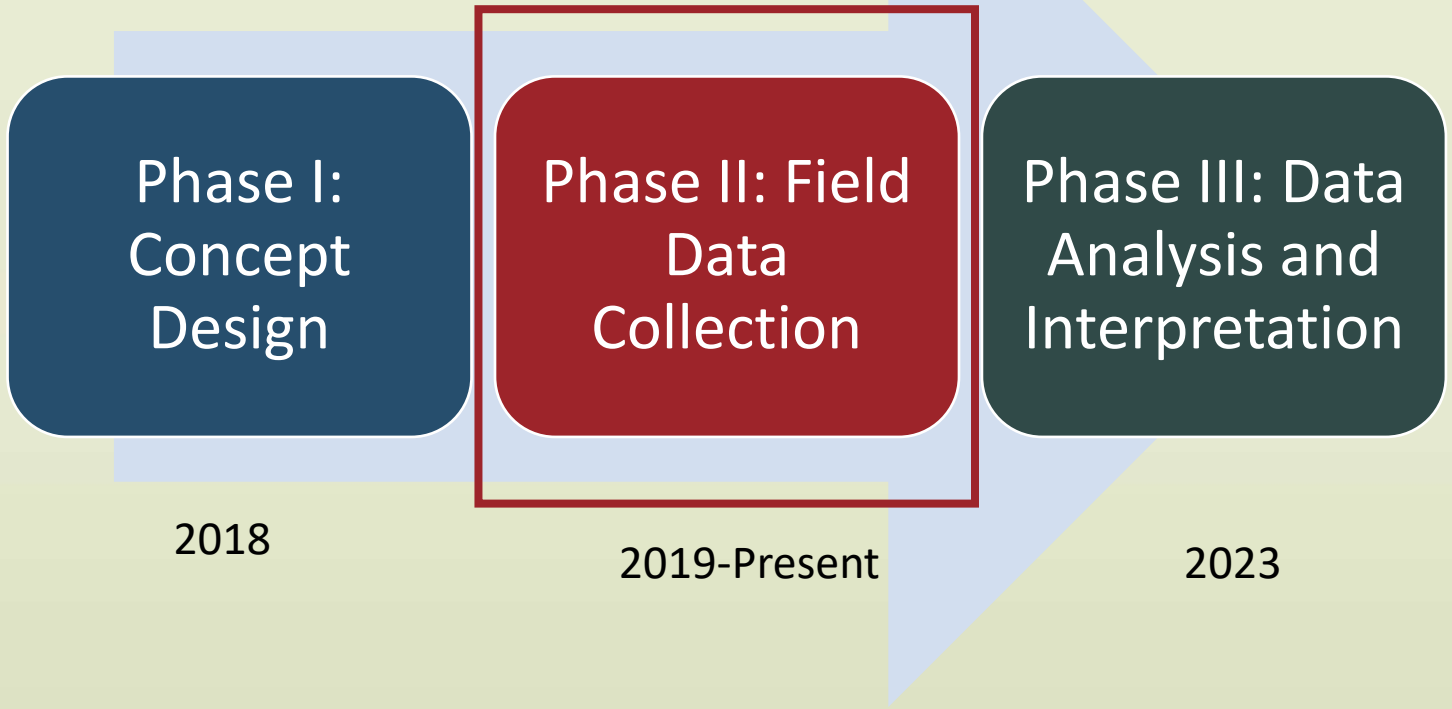
Site Selection

- Pre-and-Post-Restoration
  - 2 yr Pre-Construction (min.)
  - Fish, macroinvertebrates, habitat
  - Annual targets

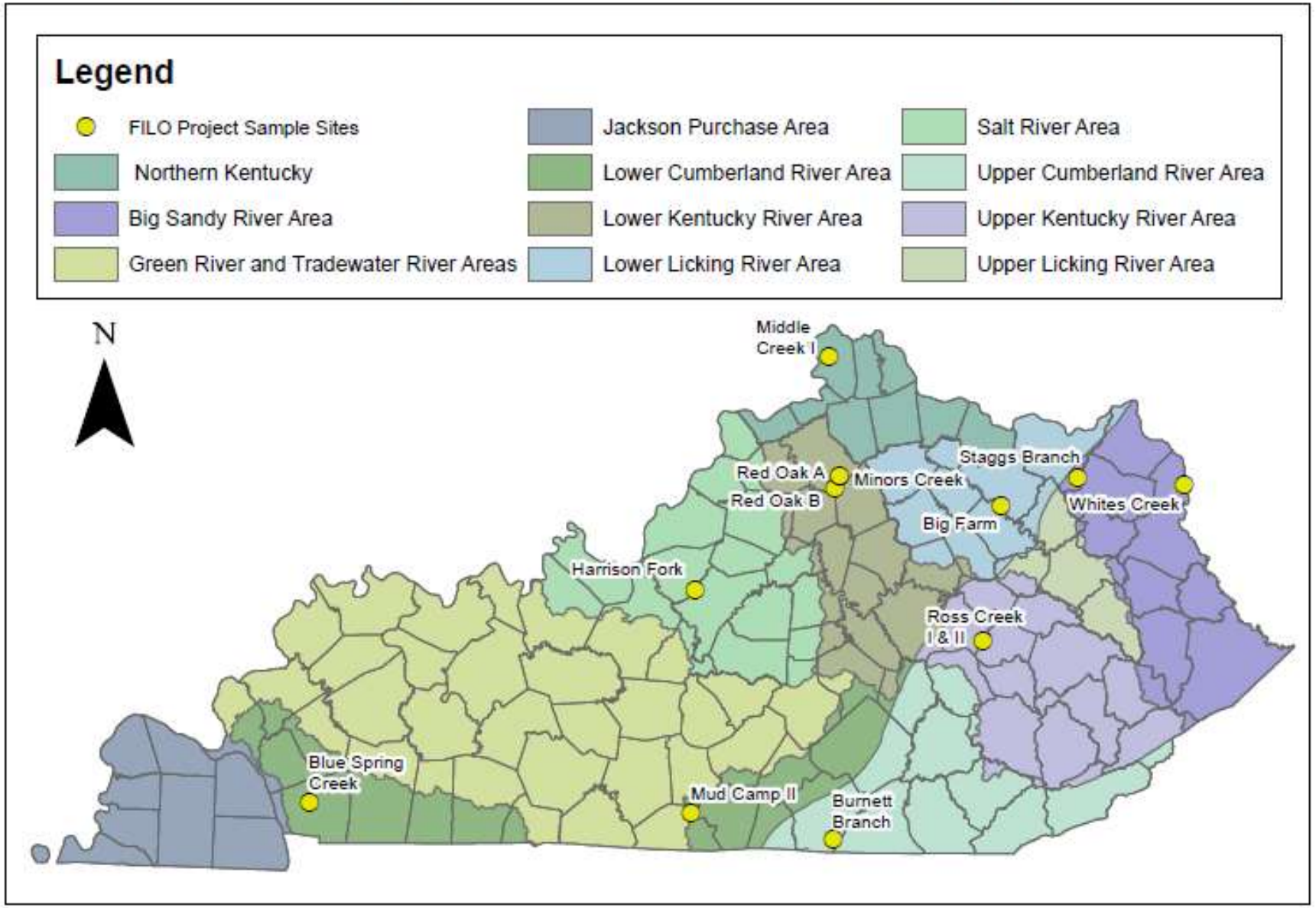
Reach Selection

- Restoration type
- Position in watershed

Status


Phase I: Concept Design
Phase II: Field Data Collection
Phase III: Data Analysis and Interpretation
2018
2019-Present
2023

FILO Projects- USGS Sampling Sites



Future

- Increase data collection
- Analyze data
- Identify restoration techniques with greatest influence on aquatic communities
- Create monitoring protocol for intermittent streams-terrestrial biota (amphibians)

Data Analysis

Multivariate Statistics

- Principal Component Analysis
- Hierarchal Linear Regressions
- Similarity Indices
- Species Diversity and Evenness
- Non-metric Multi-dimensional Scaling (NMDS; pre-and-post restoration comparisons)

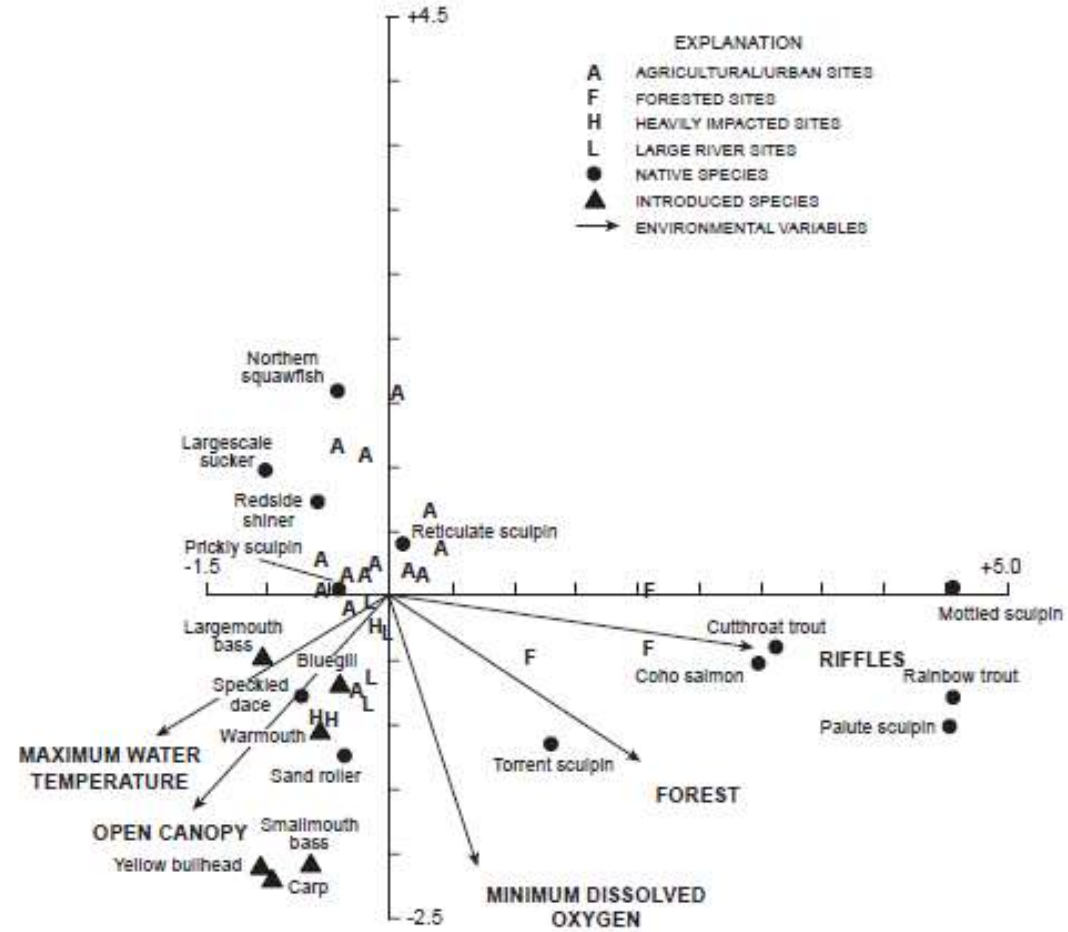
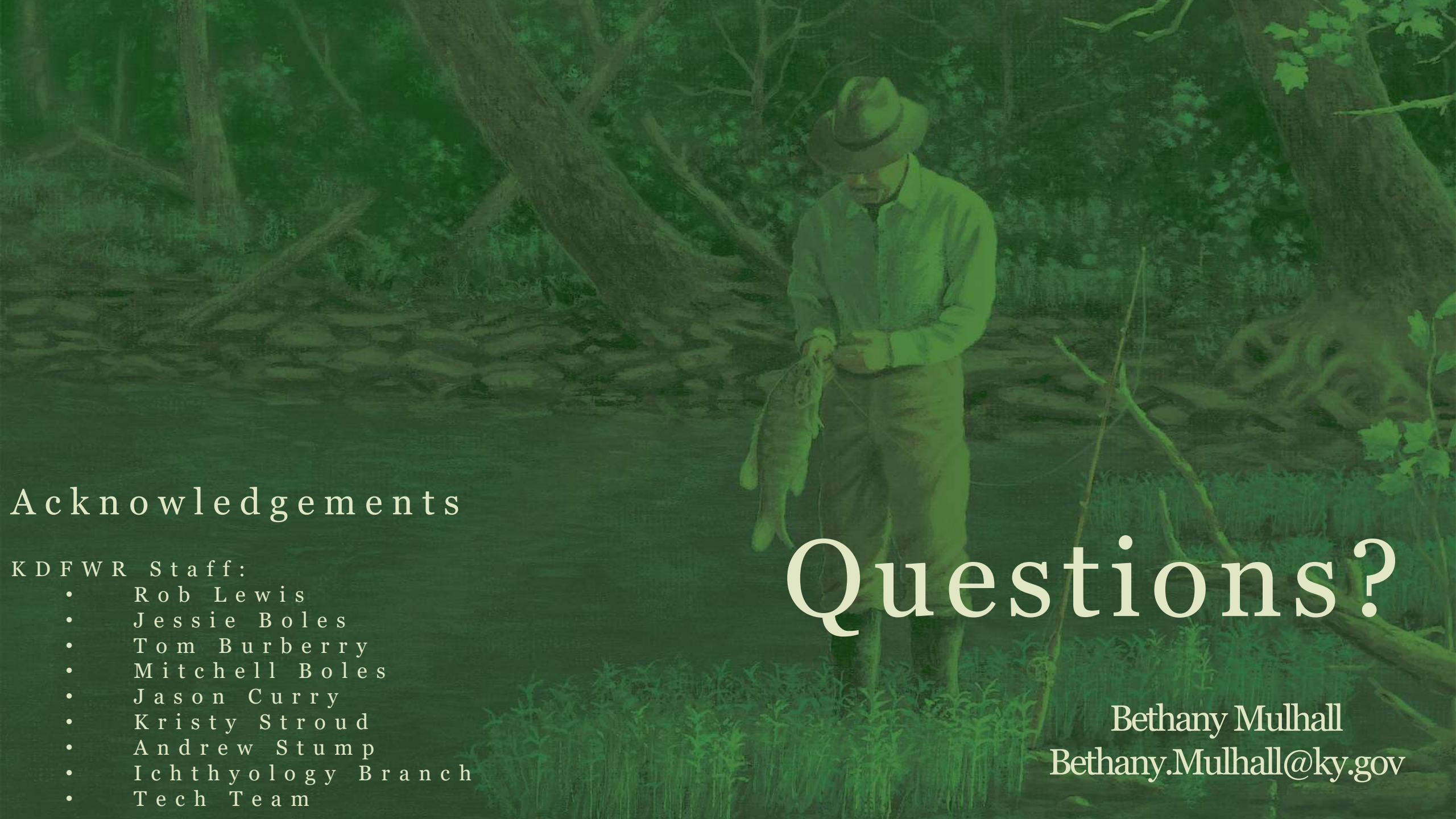


Figure 16. Results from canonical correspondence analysis of fish relative abundance and five environmental variables in the Willamette Basin, Oregon.

Fitzpatrick et al 2008



Questions?

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