

**Project Title:** Tennessee – Cumberland Rivers Data Management Application

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**Cooperating Agencies:** Kentucky Department of Fish and Wildlife Resources (KDFWR),  
Tennessee Wildlife Resources Agency, Alabama Wildlife & Freshwater Fisheries Division,  
Tennessee Cooperative Fishery Research Unit

**Statement of Need:**

Data management, data analyses, and reporting are key components of a monitoring program. Although large expenditures are commonly made on data collection, the amount of resources allocated to data management, analyses, and reporting is relatively small and inadequate. The TNCR is a collaborative network for monitoring invasive Asian carp and sharing data collected by individual members. Data collection by TNCR is guided by standardized sampling procedures developed to facilitate compatibility of data. To encourage further standardization, we will develop a system for digitizing data processing, analyses, and reporting. Products from this mechanization will focus on producing information useful to fish managers and policy makers in their decision making.

A similar application (FRAS) was developed for MDWFP and is currently in use by the agency to store and analyze statewide fisheries data. This application is currently being expanded to include monitoring planning support. Also, an application to access telemetry data (FishTracks) was developed by the USGS Upper Midwest Environmental Sciences Center. Our application is expected to be similar to FRAS and able to interface with FishTracks.

**Objectives:**

- 1. Develop web or desktop applications to analyze, summarize, and distribute data collected by Tennessee and Cumberland Rivers (TNCR) collaborators through standardized procedures from stored data
- 2. Provide a platform for storing and sharing non-standard data relevant to TNCR collaborators but contributed by external agencies

**Activities and Methods:**

*Objective 1* - Develop web or desktop applications to analyze, summarize, and distribute data collected by Tennessee and Cumberland Rivers (TNCR) collaborators through standardized procedures from stored data. During this first year we will finalize standardized protocols for monitoring bigheaded carps in the Tennessee and Cumberland rivers. Guided by this protocol, we will start building an application to facilitate storage and processing of data collected under the protocol and make the data available to cooperators. Standard analyses and reports requested

by TNCR will be developed using the R program. The programs will focus on facilitating data sharing, use, and analysis. They will provide TNCR agencies with automated reports and resource managers with summary and visualization tools to analyze the spatial and temporal distribution of bigheaded carps in the TNCR region.

*Objective 2* - Provide a platform for storing and sharing non-standard data relevant to TNCR collaborators but contributed by external agencies. During this first year we will identify all relevant data bases available in the TNCR region. These may include contracted fishing, agency netting and electrofishing, water quality, and other collection operations. The TNCR app will provide centralized access to these ancillary datasets in a scalable, query-able, downloadable database format.

## Results

### Objective 1:

Student initiated work on this project in November 2021. An initial draft of TNCR app was developed. The currently available features/analysis are:

- Data upload with automatic reformat to function within all analyses
- Custom error handling to guide user through troubleshooting issues
- Display raw data table to visualize user-uploaded data
- Data for all analyses can be filtered by year, season, species, habitat, sampling location, and system
- All data visualizations have:
  - Custom HTML tooltips to allow the user to hover over data and display information regarding an individual point, bar, line, etc.
  - Download handlers to export figures and data used to create figures
- Sampling map displays all unique combinations of sampling locations within the uploaded data
- Completed analyses:
  - Weight-length regression by site or system
    - Options for selecting a range of lengths and weights to use, data transformation, and display regression coefficients
  - Relative weight by site or system
    - Options for selecting a range of lengths and weights to use and manually defining standard weight coefficients
  - Length frequency by site or system
    - Options for selecting a range of lengths and histogram bin size
  - Species composition with invasive carp species only
  - Species composition with all species
  - Invasive carp catch by site or system
  - Frequency of invasive carp catch per net, including zero catches
  - Proportion of nets with invasive carp present
  - Proportion of nets with invasive carp present vs. mean invasive carp catch

- Invasive carp weight by site or system
- Generated analytical tools to conduct a power analysis to determine how much fishing effort is required to detect changes in the mean abundance of invasive carps and the occurrence of nets without invasive carps. This analysis can be used with multiple systems, sampling locations, and gear types. Analysis is currently being integrated into the TNCR app.
- Outlined integrating a gillnet selectivity analysis into the TNCR app.

**Literature Cited:**

Conover, G., R. Simmonds, and M. Whalen, editors. 2007. Management and control plan for bighead, black, grass and silver carps in the United States. Asian Carp Working Group, Aquatic Nuisance Species Task Force, Washington, D.C. 223 pp.