Draft Assessment Study Plan
March 31, 2022

Prepared by the U.S. Fish and Wildlife Service on behalf of the Anniston Trustee Council

2022 Fish Community Survey and Index of Biological Integrity of the Lower Choccolocco Corridor,
Anniston Polychlorinated Biphenyl Assessment Area, Anniston Alabama

Background
The U.S. Department of the Interior (DOI), acting through the U.S. Fish and Wildlife Service; and the State of Alabama, acting through the Alabama Department of Conservation and Natural Resources (ADCNR) and Geological Survey of Alabama (GSA), (the “Trustees”) are conducting a natural resource damage assessment and restoration (NRDAR) to assess and restore natural resources injured by hazardous substances released at or from a chemical manufacturing facility (Facility) located in Anniston, Alabama. A variety of organic and inorganic chemicals have been produced at the Facility since 1917, including ferro-manganese, ferro-silicon, ferro-phosphorous compounds, parathion, phosphorous pentasulfide, paranitrophenol, and polychlorinated biphenyls (PCBs). Other contaminants of potential concern released include polychlorinated-dibenzodioxins (PCDDs), dibenzofurans (PCDFs), lead and mercury. Production of PCBs at the facility continued until the early 1970s (USEPA 2001).

The Facility encompasses an area of approximately 70 acres in the Snow Creek watershed (MESL and Cantox 2004). Effluent and/or runoff from the Facility was released into the environment via a small stream (11th Street Ditch) to Snow Creek. From the confluence with the 11th Street Ditch, Snow Creek extends about five river miles to Choccolocco Creek. Choccolocco Creek extends about 35 river miles from the confluence with Snow Creek to Lake Logan Martin, a reservoir located on the Coosa River. The Facility is the primary source of chemicals of potential concern in the Anniston Assessment Area (Assessment Area). For purposes of the NRDAR, the Trustees have defined the Assessment Area to include the Snow Creek watershed, the Choccolocco Creek watershed (downstream of Snow Creek and the associated backwater area; AOI-2/OU-4), and the Coosa River (including Lake Logan Martin) from the Neely Henry Dam to the Lay Dam (AOI-3) (Figure 1). The Trustees compared the concentrations of total PCBs in fish tissues from the Assessment Area to toxicity thresholds for fish associated with adverse effects on the survival, growth, or reproduction. Data from 3,921 fish-tissue samples from the Assessment Area collected between 1981 and 2013 indicate that concentrations of PCBs in the Assessment Area are substantially higher than those from reference areas, and the majority of fish sampled from the Assessment Area had body burdens above suggested toxicological thresholds (e.g., see Hinck et al. 2008).

Aquatic habitats in the Coosa River drainage support numerous fish species. Previous surveys documented the use of the Assessment Area by a variety of species missing from recent surveys (ADCNR, 2014 unpublished data). The Comprehensive Environmental Response, Compensation, and Liability Act’s implementing NRDAR regulations provide that injury quantification should consider “species, habitats, or ecosystems that are especially sensitive to the oil or hazardous substance and the recovery of which will provide a useful indicator of successful restoration” (43 C.F.R. § 11.71(l)(2)(ii)). The Trustees propose to conduct standardized population assessment surveys to gather information on the presence, density and
abundance of fish species within Choccolocco Creek in the Assessment Area. This *2022 Fish Community Survey and Index of Biological Integrity of the Lower Choccolocco Corridor, Anniston Polychlorinated Biphenyl Assessment Area, Anniston Alabama (2022 Fish Community Survey)* study plan is consistent with the Trustees’ Anniston PCB Site Stage I Assessment Plan (Anniston PCB Site Trustee Council, 2009).

**Study Site**
The Choccolocco Creek watershed consists of 1,313 square kilometers (km²) (507 square miles (mi²)) in Calhoun, Clay, Cleburne, and Talladega Counties in east-central Alabama. Topographic relief in the watershed exceeds 305 meters (m) [1,000 feet (ft)], and the watershed drains parts of three ecoregions in Alabama. Sixty five percent of the total watershed area (850 km²; 328 mi²) lies in the Upper and Middle Choccolocco Creek hydrologic unit areas, where land uses include agriculture, woodland, pasture, commercial turf farming, and residential. Land uses in the Cheaha Creek hydrologic unit area include agriculture and woodland, whereas land uses in the Lower Choccolocco Creek hydrologic unit area consist of agriculture, residential, business-industrial or military. The upper reaches and eastern slopes of Choccolocco Creek, Shoal Creek, Salt Creek, and Cheaha Creek drain a heavily forested area, principally in the Talladega National Forest. Choccolocco Creek discharges to Logan Martin Lake at river km 186 (115.7 mile) on the Coosa River (U.S. Army Corps of Engineers, 1972). The watershed also includes parts of the cities of Oxford and Anniston and the Anniston Army Depot.

The climate of Choccolocco Creek watershed is classified as humid, subtropical. Estimated average annual rainfall is 132-137 centimeters (cm) [52-54 inches (in)] (Lineback et al, 1974; U.S. EPA, 2021). The average annual temperature approximates 16.6 °C (62°F) while average monthly temperature approximates 6.1 degrees Celsius (°C) [43°F Fahrenheit (°F)] in January and 26.7°C (80°F) in July (National Oceanic and Atmospheric Administration, 1989). Average annual streamflow generated from USGS Streamstats range from 9.49 to 21.2 m³/s. Springs in the watershed can be a major source of stream flow during periods of dry weather. About 55 km
[34 miles] of lower Choccolocco Creek, from Lake Logan Martin to the mouth of Hillabee Creek, are included on Alabama's final 2020 §303(d) list of water-quality-impaired waters as nonsupportive of their Fish and Wildlife water use classification (ADEM, 2021) because of priority organic pollutants in sediment (i.e., PCBs), pathogens (E. coli) from collection system failures and pasture grazing, and mercury from atmospheric deposition.

A high-definition stream survey (HDSS) of habitat in Choccolocco Creek was conducted by Trutta Environmental Solutions, Inc (Trutta) in May, 2015 (Connell and Parham, 2016). The rapid, multi-attribute, geo-referenced HDSS technique was used for delineation of streambank erosion potential and instream habitat types. Trutta surveyed 60 miles of Choccolocco Creek and 8 miles of Cheaha Creek using the HDSS sampling method to gather geo-referenced video and to develop spatially continuous maps of bank conditions and stream habitat. The HDSS technique is also used for the development of sediment TMDLs, mapping of aquatic habitats, comparing thalweg and cross-sectional transect approaches, and prioritizing aquatic restoration areas (Connell and Parham, 2016). The post-processing of field collected data consisted of aligning all data streams to accurately pair time and location for all sensor data resulting in a continuous track log and video of the surveyed stream reaches ultimately displayed in ArcGIS. River habitat conditions were assessed to include left and right bank condition, habitat type (riffle, run, pool), water depth, presence of large woody debris and man-made structures. Habitat type (riffle, run or pool) were visually classified from the forward-facing geo-video based on best professional judgement. Trutta defined stream habitat using the following qualitative criteria during their high-definition stream survey:

- Riffles were the sections of the bed with the steepest slopes and shallowest depths at flows below bank full. Riffles typically occur at the cross over locations and have a poorly defined thalweg. Visually, riffles are defined as areas with broken surface flows (whitewater).
- Runs differed from riffles in that depth of flow is typically greater and slope of the bed is less than that of riffles. Runs will often have a well-defined thalweg. Visually, runs are areas without broken surface flows but with obvious current present.
- Pools were the deepest locations of the reach. Water surface slope of pools at or below bank full flows is near zero. Pools were often located at the outside of meander bends. Visually, pools had smooth surfaces without obvious current present.

Sampling Methodology

Habitat stratification and sample reach selection

This study proposes to use standard depletion electrofishing techniques and depletion sampling analysis methods to estimate fish numbers in discrete areas of specific habitat types (pools, shoal-runs, riffle complexes) and then extrapolate fish numbers to the total area of that particular habitat type in the study area. Stratifying Choccolocco Creek into specific habitat types (pools, shoal-runs and riffle complexes) allowed focused sampling and better extrapolation across the site. Identifying sample reaches using this stratification approach allowed the team to categorize all reaches of Choccolocco Creek to help account for natural longitudinal variability of fish populations. Sampling was then tailored across the site to fit habitat conditions within each identified stratum.
Feaster et al. (2020) discussed the utility of a streamflow variability index (SVI) for relating geology to low-flow stream characteristics. We focused on examining the geology and geologic contacts along Choccolocco Creek and looked for changes in habitat type, hydrologic metrics, or a combination of both to stratify Choccolocco Creek to a manageable number of sampling units. A plot of SVI versus watershed area for 15 points along Choccolocco Creek from CC02 to CC09 (see Figure 1) revealed that three unique stream reaches could be defined by the streamflow variability index (Figure 2). The endpoints of these reaches also closely correspond to the geologic contacts that Choccolocco Creek crosses between points CC02 to CC09. The upstream reach (reach 1) generally has more sustained base flows compared to the most downstream reach (reach 3) which empties into the backwater of Logan Martin Lake on the Coosa River. The SVI relationships to flow, when considered along with the geologic map of the study area, results in a convenient tool to stratify, and thereby organize, fish sampling effort in the study area.

The habitat surveys completed by Connell and Parham (2016) provided a basis of habitat coverage allowing calculation of the linear extent of each habitat type within each unique hydrologic reach discussed above. We used these data to estimate the number of samples desired based on the proportion of habitat within each reach, with more sampling in habitat types that occur in greater proportion. We propose to sample 20-30 creek locations, distributed among pools, run-shoals, and riffle complexes. The examples in table 2 illustrate how samples could be proportioned over the study area; table 2 will serve as a guide for reach sample numbers, which we will adjust as sampling proceeds to assure that samples will be collected in habitats that occur in very small proportion within each reach.

Table 2. Estimated and adjusted number of samples to be collected per proportioned habitat type in three Choccolocco Creek stream reaches.
Estimated total samples

<table>
<thead>
<tr>
<th>Habits and linear coverage</th>
<th>Samples per habitat</th>
<th>Adjusted samples per habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pool</td>
<td>Run-Shoal</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reach 1 Length (m)</td>
<td>15,800</td>
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<tr>
<td>Reach 3 Length (m)</td>
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<td>Total Length (m)</td>
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<td>proportion</td>
<td>0.746</td>
<td>0.068</td>
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</table>

Multiple-pass depletion/IBI sampling

The GSA 30+2 Index of Biological Index (IBI) sampling methodology (O’Neil et al. 2006, O’Neil and Shepard 2011) for wadeable streams, consisting of backpack electrofishing in combination with seines and dip nets, will be combined with the three-pass depletion technique to estimate fish populations and IBI across wadeable riffle-complex sites. Non-wadeable pool and run-shoal sites will be sampled using small-stream electrofishing boats following the methodology of O’Neil et al. (2014). A standard three-pass depletion method will be used within all sites and habitats following analysis procedures described by Carle and Strub (1978) and Lockwood and Schneider (2000). General sampling best practices and procedures have been described for nonwadable and wadable habitats for studies using the Index of Biotic Integrity (O’Neil et al. 2006; O’Neil et al. 2014; Saylor and Ahlstedt 1990).

The techniques and equipment adjustments to be used will be based on the habitat types present in each of the three sampling reaches. A sampling “pass” is defined uniquely for each habitat classification. For nonwadable pool and run-shoals approximately 100 m of stream reach will be delimited with block nets set at the up and downstream limits. A sampling “pass” will be defined
as sampling 100 m of the right shoreline, 100 m of the left shoreline, and 100 m of mid channel. This sampling “pass” will be repeated two more times yielding a three-pass depletion total sampling effort.

Habitat in the wadable riffle-complexes is a reflection of channel bed topography consisting of shallow riffles, runs, and pools created by the interaction of stream flow and downstream bedload sediment transport (Petts and Foster, 1985). Riffles are topographic high areas created by accumulated coarse sediment material and outcrop of underlying geology, and a pool is a topographic low usually characterized by accumulated finer sediment material. Shallow runs are transitional areas where, as one moves downstream from a pool to a riffle, depth decreases and velocity increases, and when exiting a riffle depth increases and velocity decreases. Shoreline habitat is found where the water surface interacts with the landscape resulting in a diverse array of microhabitats such as shallow shoals, deep holes, riparian cover (or lack of cover), log snags, weed beds, and undercut banks. Because of these features, the shoreline can be the most species-rich area in a stream. Some fish species are distributed throughout the riffle-complex reach, others may occur in two or three habitats, while others may be confined to one habitat and may even prefer small microhabitats within a habitat zone or use different habitat zones during different seasons. For wadable riffle-complex habitats, fish netted from a minimum of three-pass depletions will be held separately in water-filled buckets until processed. Each of the four shallow riffle-complex habitat types will be sampled as follows:

- **Riffles and Runs** - Three seines, one 4.6 m net and two 6.1 m nets, will be joined to form a basic fish weir. The 4.6 m net will be set perpendicular to flow and serve as the catch net. The two 6.1 m nets will be attached to each of the 4.6 m seine brails and run parallel to flow. This geometry results in a fish weir type of configuration with three sides constraining the sample area to minimize fish escape while collecting the sample. A person with the backpack shocker will enter the weir upstream and proceed downstream with collecting aides who will be using dip nets, kicking the substrate, and moving along with the backpack shocker to push fish downstream to the catch seine. Depletion passes 2 and 3 will be executed in the same area and manner as pass 1 with pass catches held in separate buckets for processing. This three-pass technique will be repeated in up to 10 riffle habitats and 10 run habitats.

- **Pools** - Pools will be sampled by executing 9.1-12.2 m seine hauls in combination with a backpack electrofishing unit. The same pool footprint will be sampled identically for two more passes then repeated for up to 10 pool habitats.

- **Shoreline** - Shoreline is sampled by using backpack electrofishing units to sample shoreline structure for 45 m. This same shoreline is sampled for two more passes. A minimum of 2 shoreline efforts will be completed in each riffle-complex sampled.

In riffle complexes emphasis will be placed on sampling areas that provide cover and shelter to fish, including small submerged trees, logs, snags, rock and boulder shoals, grass beds, riffles, shallow runs adjacent to emergent vegetation and undercut banks, with the goal of collecting a sample that reasonably represents the diversity and population abundance patterns of the resident fish community.
Analyses
Total fish and species-specific population estimates for samples will be calculated following Carle and Strub (1978) and Lockwood and Schneider (2000). These sample estimates will be scaled up to total habitat coverage in a reach by applying simple sampled habitat area/total available habitat area proportions. Biological integrity at riffle-complex sites will be determined by calculating an IBI score using methods described by O’Neil and Shepard (2011). Scores will be compared to IBI scores calculated during previous surveys of riffle-complexes in the area and those from other watersheds, as applicable (e.g., O’Neil and Shepard 2000), to determine variability in Choccolocco Creek stream conditions through time and habitat quality relative to other Alabama streams. Neither IBI metrics nor IBI scoring criteria have been established for non-wade samples in Alabama. As such, the non-wade analyses will consist principally of population estimates, not calculated IBIs. We will evaluate a combination of non-wade data, wade data and IBI scores to investigate potential useful and interesting patterns of IBI variation and condition of resident fish communities.

References


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