

**A MALFORMED AMPHIBIAN SURVEY  
OF  
CLARKS RIVER NATIONAL WILDLIFE REFUGE**



**U.S. Fish and Wildlife Service  
Ecological Services  
446 Neal Street  
Cookeville, Tennessee 38501**

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Southeast Region

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by

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## **INTRODUCTION**

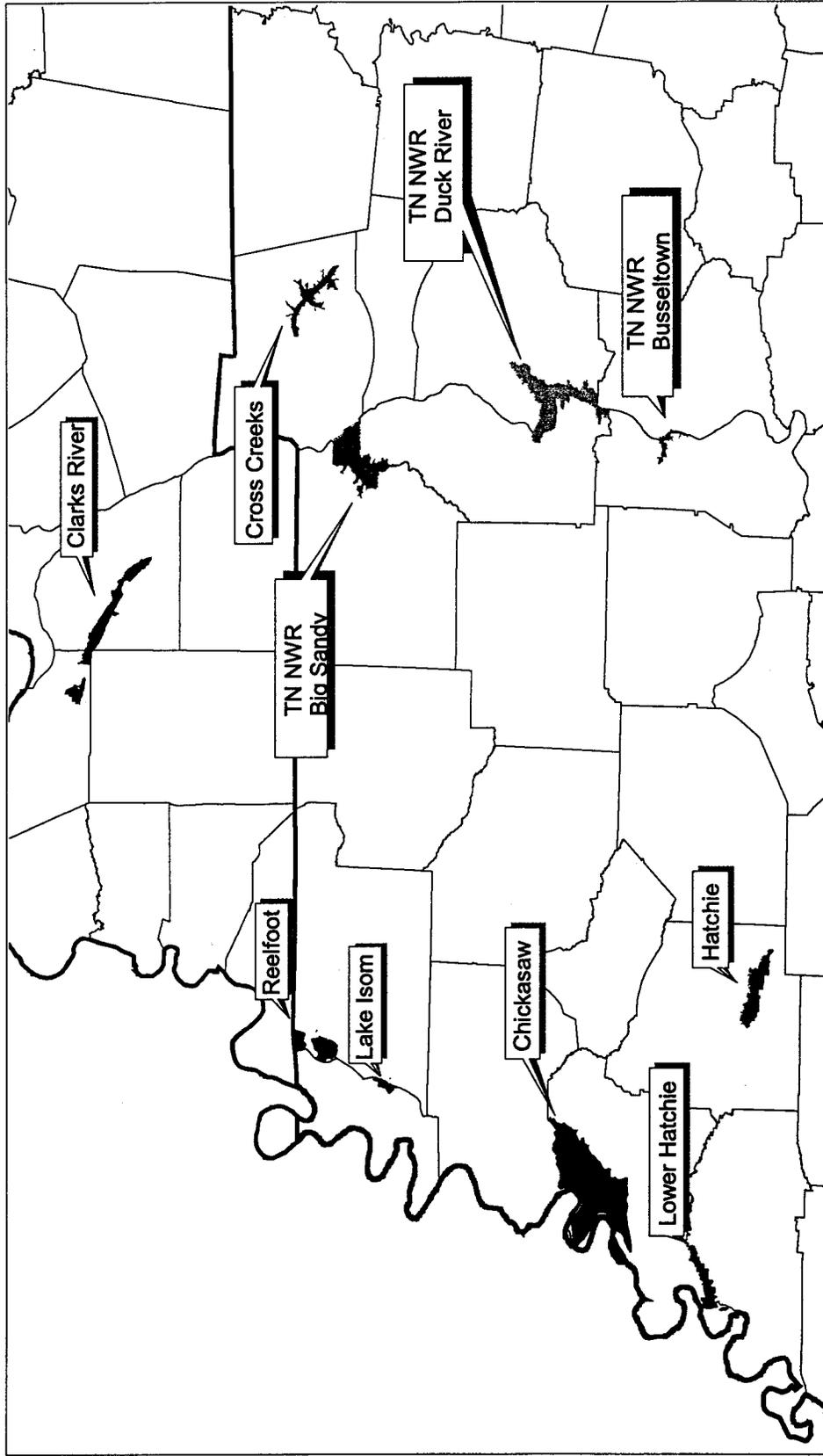
In Fiscal Year (FY) 2001, the Tennessee/Kentucky Field Office (FO) of the U.S. Fish and Wildlife Service (USFWS) initiated a survey (Project ID No. 42622-1261-4N67) for malformed amphibians, specifically metamorphosing tadpoles, at Clarks River NWR. The primary purpose of the survey was to conduct a baseline screening of the health of amphibians on the refuge. Field surveys for malformed tadpoles were conducted between June 2001 and August 2002 at nine sites. Funding for this work was provided through the USFWS Environmental Contaminants program.

## STUDY AREA DESCRIPTION

The Clarks River is a low-gradient, riverine system with areas of contiguous palustrine forested, scrub-shrub, and emergent wetland complexes. The East Fork of the Clarks River is one of the few rivers in the area that have not been dammed or channelized. This natural wetland ecosystem is relatively intact and has high wildlife habitat values, particularly for migratory birds and other species representative of bottomland hardwood systems. Clarks River National Wildlife Refuge was established in 1997, and is the first National Wildlife Refuge (NWR) (Figure 1) to be located solely within the Commonwealth of Kentucky. The USFWS has proposed to purchase 18,000 acres of bottomland hardwoods from willing sellers in Marshall, McCracken and Graves Counties. Current acquisition areas at Clarks River NWR encompass about 8,000 acres, with approximately 400 acres of cropland currently enrolled in cooperative farming agreements. Region IV Integrated Pest Management (IPM) guidelines and procedures have been implemented.

Within the previously assessed reaches of the Clarks River watershed, aquatic community structure is comprised primarily of pollution-tolerant species with low diversity. The reach from RM 59.2 to RM 48.4 is partially supporting the designated use of aquatic life and not supporting the designated use of primary contact recreation. The East Fork Clarks River in Calloway County is currently listed on the State's 303(d) list of impaired waters, and has been given a high priority for total maximum daily load (TMDL) development. In contrast, the downstream reach from RM 31.1 to the confluence of the Tennessee River at Paducah is fully supporting all designated uses. Previous biological data collected by various agencies indicated a fair to poor fish and benthic community in this reach.

**Figure 1. National Wildlife Refuges in Tennessee and Kentucky.**



Map produced on June 25, 2002 by the Area II  
GIS Center in the Cookeville, TN Field Office



## **METHODS and MATERIALS**

Sampling methods were based on the Standard Operating Procedures for Malformed Frog Survey, established by the Chesapeake Bay FO in 1999, and training provided at the Service's Malformed Amphibian Survey Training Workshop in Lafayette, Louisiana, in May, 2001. Due to drought conditions, we were unable to collect at least 50 individuals of one species at all except two sites.

Physicochemical (water quality) parameters were measured with a YSI 6000 UPG Sonde and 610 DM Data Logger at most of the sites surveyed. Photographs (Appendix A) were taken at each of the sites. Specimens retained for positive identification were either transported to the laboratory in site water or preserved in the field with a 10% buffered formalin solution

## RESULTS

Our nine study sites (Figure 2) were composed of ephemeral pools, ditches and ruts within and adjacent to agricultural fields and refuge roads. Perennial streams and wetland complexes were also surveyed. This area of Western Kentucky was considered to be in a severe drought condition for most of FY 2000 and FY 2001. Very low or no water conditions were often encountered and, due to these extended drought conditions, it was not possible to collect the recommended 50 individuals of the same species at most locations. With the exception of Site CL02 (Cypress Slough) and Site CL05 (Beaverdam Slough) where two collections were made, one collection was made at each site. In an effort to enhance our data collection efforts, subsequent surveys at these sites were performed throughout the summers of 2001 and 2002. Many of the individual site surveys were conducted during sampling events for an environmental contaminant baseline investigation for the refuge. Drought conditions persisted until the fall of 2002.

### Site CL01 (36.882842°N/88.335828°W)

This site (Photo 1), a perennial groundwater spring approximately 0.6 meter deep, is downgradient of the old Marshall County landfill. It is currently utilized as occasional pastureland for cattle. It was sampled on June 7, 2001. Three froglets (*Rana catesbiana*) and seven unidentified salamanders were collected. No abnormalities were observed.

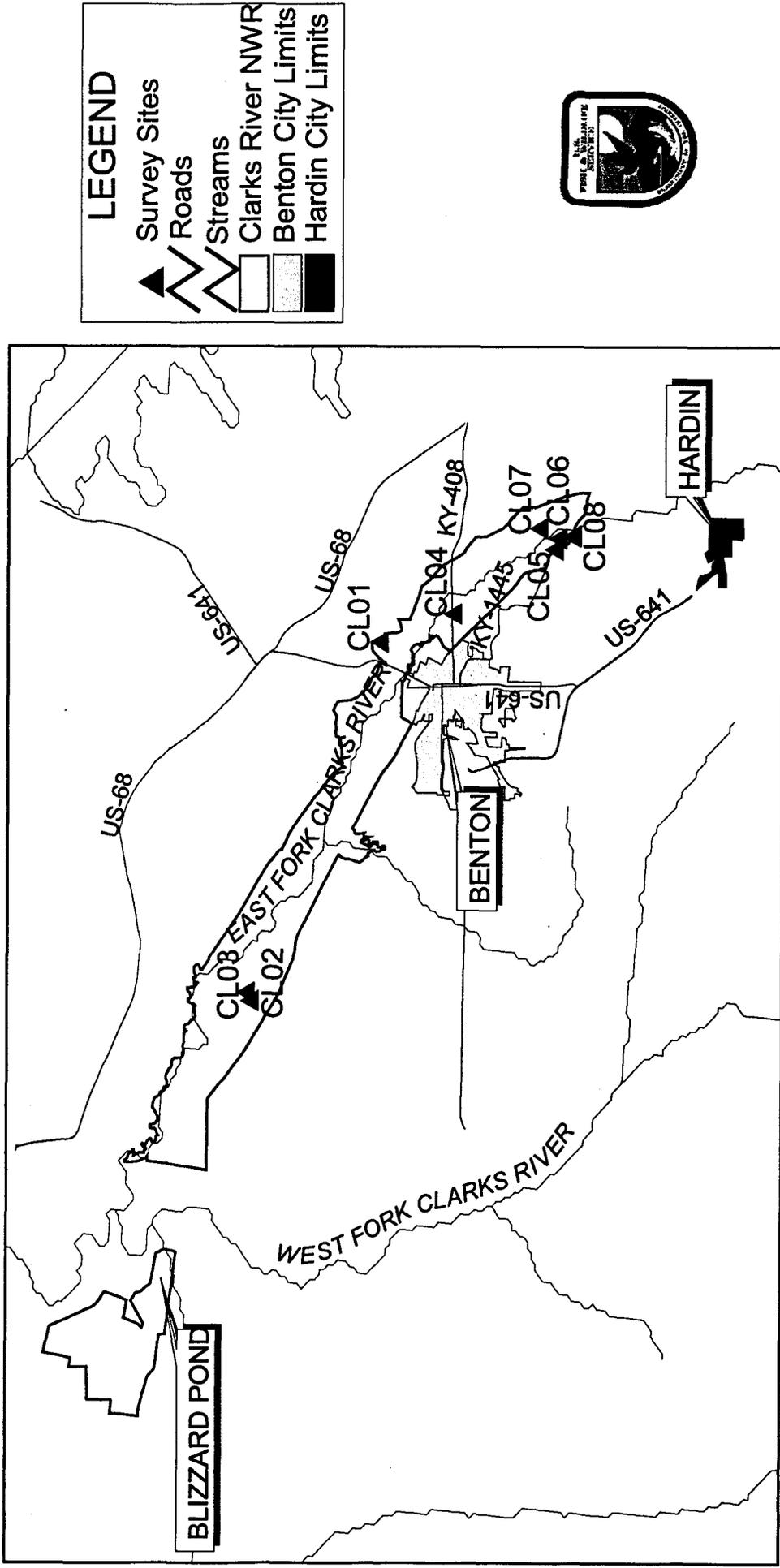
<u>Water Quality Parameter</u>	<u>Result</u>
Dissolved Oxygen (mg/l)	4.41
Temperature (°C)	17.62
Conductivity (µs/cm)	48
pH	5.09
Total Dissolved Solids (mg/l)	31

### Site CL02 (36.927339°N/88.458597°W)

This site is a perennial cypress slough formed by an unnamed tributary to the East Fork of the Clarks River. It is downgradient of several agricultural fields located on private property adjacent to the refuge. The site was initially surveyed on June 6, 2001 and August 15, 2001. Three amphibians were collected at this site; one *Rana catesbiana* (6/7/01 survey) and two *Bufo fowleri* (8/15/01 survey). No malformations were observed. Several subsequent surveys were performed at this site and no amphibians were observed.

<u>Water Quality Parameter</u>	<u>Result</u>
Dissolved Oxygen (mg/l)	5.04
Temperature (°C)	23.71
Conductivity (µs/cm)	91.0

# Figure 2. Malformed Amphibian Survey Sites on Clarks River NWR



pH	5.95
Total Dissolved Solids (mg/l)	57

**Site CL03 (36.928817°N/88.455867°W)**

Site CL03 is an ephemeral drainage ditch (Photo 2) between a refuge road and corn field near Site CL02. Water depth varied throughout the season. This site was surveyed twice during the summer and it was likely dry for most of the summer. Approximately 50 individuals (*Bufo fowlerii*) were collected on August 15, 2001. No malformations were noted. Water quality parameters were not measured at this site.

**Site CL04 (36.857206°N/88.326128°W)**

This site is an ephemeral unnamed tributary to the East Fork Clarks River in Marshall County adjacent to State Highway 408. The site was sampled on June 28, 2001 (Photo 3) and 6 individuals (*Rana clamitans*) were collected. No malformations were observed. During a survey in July 2001, low to no water conditions were encountered and no amphibians were observed. In a subsequent survey in August, sufficient water levels existed but no amphibians were observed.

<u>Water Quality Parameter</u>	<u>Result</u>
Dissolved Oxygen (mg/l)	4.27
Temperature (°C)	18.47
Conductivity (µs/cm)	50.0
pH	6.87
Total Dissolved Solids (mg/l)	32

**Site CL05 (36.822500°N/88.304167°W)**

Site CL05 (Photo 4) is located in Beaverdam Slough, a small perennial tributary of East Fork Clarks River. This site was visited three times during the summer and collections were made on June 27, 2001, and July 18, 2001. Over 50 individuals (*Bufo fowlerii*) were collected during the first survey in June. Water levels were significantly lower in July, however, 29 individuals of the same species were collected. No malformations were noted during both surveys. Another survey was conducted in August and no amphibians were observed. Water depth at the site varied between 0.2 and 0.6 meters.

**Site CL06 (36.821167°N/88.300500°W)**

Site CL06 (Photo 5) was a rut adjacent to an unimproved refuge road that contained water up to a depth of approximately 0.6 meters. This site was visited twice, however, we collected amphibians only on August 15, 2001. Thirty-five individuals (*Bufo fowlerii*) were collected. No malformations were observed. A Queen snake (*Regina septemvittata*) was observed feeding at

this site which may explain the absence of amphibians. Water quality parameters were not measured.

**Site CL07 (36.827780°N/88.296940°W)**

This site (Photo 6) is located adjacent to the mainstem of the East Fork of Clarks River. This site was visited twice during the summer. During a survey on June 27, 2001, one individual (*Acris crepitans blanchardii*) was collected. No malformations were observed. During a subsequent survey in July, no amphibians were observed.

<u>Water Quality Parameter</u>	<u>Result</u>
Dissolved Oxygen (mg/l)	6.29
Temperature (°C)	22.55
Conductivity (µs/cm)	235
pH	6.98
Total Dissolved Solids (mg/l)	151

**Site CL08 (36.816383°N/88.299683°W)**

This site (Photo 7) is a depressional area within an agricultural field. The site was dry for most of the summer. During an August 15, 2001 survey, 20 individuals (*Bufo fowlerii*) were collected. No malformations were observed. A few individuals had shortened tails which seemed to be the result of trauma. Water quality parameters were not measured.

**Site CL09 (36.816256°N/88.299647°W)**

This site, a rut in an old logging road, had standing water after rain events. There was no significant water present for most of the summer. A survey on August 15, 2001, resulted in the collection of 2 *Bufo fowlerii* tadpoles. No malformations were observed. Pictures were not taken and water quality parameters were not measured.

**Appendix A. Site Photographs.**



**Photo 1. Site CL01, Groundwater Spring.**



**Photo 2. Site CL03, Sharpe-Elva cornfield.**



**Photo 3. Site CL04, Unnamed Tributary Near Hwy.408.**



**Photo 4. Site CL05, Beaverdam Slough.**



**Photo 5. Site CL06, Refuge Road Rut.**



**Photo 6. Site CL07, Mainstem East Fork Clarks River.**



**Photo 7. Site CL08, Depressional Area in Agricultural Field.**

**Appendix B. Field Data Sheets.**





















