

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-3

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2012 Fisheries Management Survey Report

Meredith Reservoir

Prepared by:

Charles Munger, District Management Supervisor
and
John Clayton, Assistant District Management Supervisor

Inland Fisheries Division
District 1-A, Canyon, Texas



Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2013

1
TABLE OF CONTENTS

| | |
|--|------|
| Survey and Management Summary | 2 |
| Introduction..... | 3 |
| Reservoir Description..... | 3 |
| Angler Access | 3 |
| Management History | 3 |
| Methods..... | 4 |
| Results and Discussion..... | 5 |
| Fisheries Management Plan | 6 |
| Literature Cited..... | 7 |
| Figures and Tables | 8-13 |
| Water Level (Figure 1) | 8 |
| Reservoir Characteristics (Table 1) | 8 |
| Boat Ramp Characteristics (Table 2)..... | 9 |
| Harvest Regulations (Table 3) | 9 |
| Stocking History (Table 4)..... | 10 |
| Structural Habitat Survey (Table 5)..... | 11 |
| Channel Catfish (Figure 2)..... | 12 |
| Proposed Sampling Schedule (Table 6) | 13 |
| Appendix A | |
| Catch Rates for all Species from all Gear Types..... | 14 |
| Appendix B | |
| Map of 2012-2013 Sampling Locations | 15 |
| Appendix C | |
| Photos of Meredith Reservoir | 16 |

SURVEY AND MANAGEMENT SUMMARY

Fish Populations in Meredith Reservoir were surveyed in 2012 using trap netting and in 2013 using gill netting. Historical data are presented with the 2012-2013 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Meredith Reservoir is an impoundment on the Canadian River 35 miles northeast of Amarillo, Texas. It was built in 1965 to provide municipal and industrial water. It experiences substantial water level fluctuations and covered approximately 1,800 acres during 2012-2013, down from an average 3,264 acres in 2010-2011. A new record low of 28.15 feet ft maximum water depth was documented on 08 April 2013. Maximum depth based on a sonar survey of the basin was only 16 ft due to siltation within the reservoir basin. The first documented golden alga kill occurred 20 December, 2010 into March, 2011. An additional golden alga kill occurred in spring 2012. Angler and boat access was adequate but only one boat ramp was usable in 2012 due to low water. There were two handicap accessible fishing piers. Habitat was primarily silt and rock, with some non-native macrophytes.
- **Management History:** Important sport fish included Walleye, White Bass, Smallmouth Bass, Largemouth Bass, White Crappie, and catfish. Walleye were managed with a two fish under 16 inches regulation to improve angler catch rates and size of fish caught. Smallmouth Bass were placed under a 12-15 inch slot limit in 1992 in an effort to increase the number of larger fish. Largemouth Bass, crappie, and catfish have been managed under statewide regulations.
- **Fish Community:**
 - **Catfishes:** The only game species found in the reservoir in the past three years of surveys was Channel Catfish. Based on gill net surveys, the population appears to be declining.
- **Management Strategies:** Continue monitoring of sport fish populations to determine impact of low water levels and increased chlorides due to drought conditions, and monitor golden alga blooms. Conduct annual gill net surveys and conduct a trap net survey in 2016. Conduct a habitat survey in 2016.

3
INTRODUCTION

This document is a summary of fisheries data collected from Meredith Reservoir in 2012-2013. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the current data for comparison.

Reservoir Description

Meredith Reservoir is a 16,505-acre impoundment constructed in 1965 on the Canadian River by the US Bureau of Reclamation. It is located in Hutchinson, Moore, and Potter Counties approximately 35 miles northeast of Amarillo and is operated and controlled by the Canadian River Municipal Water Authority. The land surrounding Meredith Reservoir is owned and operated by the US Department of the Interior, National Park Service as the Lake Meredith National Recreation Area and the Alibates Flint Quarries National Monument. Primary water uses included municipal water supply and recreation. Meredith Reservoir was mesotrophic with a mean TSI chl-a of 44.44 (Texas Commission on Environmental Quality 2011) an increase of 1.78 since 2008. The first documented golden alga fish kill began in December, 2010 and continued through March 2011. An additional golden alga kill occurred in spring 2012. Habitat at time of sampling consisted of silt, rocks, and non-native submerged vegetation. Water level has been declining since 2000 and a new record low of 2,841.15 feet MSL was documented on 08 April 2013 (Figure 1). Official depth tables indicate the current depth is 28 feet but the deepest water found by a sonar survey of the basin was only 16 feet. The Canadian River Municipal Water Authority records show the reservoir had 22,425 acre-feet of water in April 2012. Without significant inflows, the reservoir is expected to lose half of this to evaporation over the next year. Chlorides peaked at over 1,350 ppm in 2012 and specific conductance was over 6,000 $\mu\text{mhos/cm}$. Calculated salinity was 2.4 ppt [salinity (ppt) = $0.0018066 \times \text{Cl}^-$ (mg/L) Vernier Software & Technology, Beaverton, OR]. Evaporation loss will result in increases in chlorides and a continued decline in water quality. Boat access consisted of one open public boat ramp. Four ramps were closed due to low water levels. Other descriptive characteristics for Meredith Reservoir are in Table 1.

Angler Access

Meredith Reservoir has seven public boat ramps and no private boat ramps. Two of the public ramps have been unusable due to low water levels for over 20 years. Declining water levels have reduced available ramps to a single ramp located at Sanford-Yake Marina. Five ramps were extended as water levels declined, but no further extensions are planned at four ramps due to reduced slope and available water. Continued declines in water level will likely reduce the feasibility of extending the remaining usable ramp. Additional boat ramp characteristics are in Table 2. Shoreline access is available throughout the basin but is limited due to the distance from parking and the slope of the basin. There is a handicap accessible fishing dock located at Sanford-Yake.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Munger and Clayton 2011) included:

1. Drought conditions have dramatically changed available habitat in the reservoir and have increased chlorides. While the water is low, most of the basin is accessible to conduct a detailed structural habitat survey. February water analysis indicates chlorides were 927 ppm and specific conductance was 3,768 $\mu\text{mhos/cm}$. Calculated salinity was 2.4 ppt. Evaporation loss will result in increased chlorides. Strategies were to conduct detailed habitat mapping of the reservoir basin while water levels are low and substrate is visible and to investigate impact of increased chlorides on sport fish populations through standard sampling.

Action: Detailed mapping of the reservoir basin has been conducted, facilitated by

satellite imagery. Standard sampling has been conducted except for electrofishing. High conductivities have impacted our ability to survey with electrofishing.

2. Meredith Reservoir experienced its first bloom of golden alga in 2010. High chlorides and low water levels may increase the incidence of golden alga blooms. Strategies were to monitor the reservoir for repeat golden alga blooms and evaluate the impact of the bloom on sport fishes.

Action: Monitoring for golden alga and sport fish has continued.

3. Analysis of zebra mussel risk to Meredith Reservoir indicated it is at high risk due to location between infested reservoirs, environmental conditions and angler traffic between infested reservoirs in adjacent states and Texas. Current low water conditions and high chlorides have reduced the risk of infestation, but inflows could return the reservoir to high risk. Strategies were to continue monitoring for infestations and maintain communication with controlling authorities and the public concerning the risk of infestations.

Action: Conditions for zebra mussels have deteriorated with increased chlorides and decreased water. We are continuing contacts with the National Park Service about monitoring and refining responses.

Harvest regulation history: Sport fishes in Meredith Reservoir are currently managed with statewide regulations with the exception of Smallmouth Bass (Table 3). From 1988 to 1992, Smallmouth Bass were managed with a 14-inch minimum length limit. A 12- to 15-inch slot length limit was implemented in 1992 to improve population size structure.

Stocking history: Meredith Reservoir has not been stocked since 2000 (Largemouth Bass and Walleye). Largemouth Bass have been stocked to supplement natural reproduction when the Young:Adult Ratio was <1 and water levels were sufficient to provide nursery habitat. Yellow Perch were experimentally stocked between 1980 and 1995 to provide an alternate forage species for Walleye and an additional sport fish for anglers. The complete stocking history is in Table 4.

Water transfer: Meredith Reservoir is primarily used for municipal water supply and recreation. The reservoir supplies water to 11 member cities via a 358-mile aqueduct system. When functioning, the water system transfers water from the Canadian River Basin to the Brazos River Basin. The recent drought has resulted in water levels receding below the water intakes ceasing the ability to pump water.

METHODS

Fishes were collected by gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 stations). Catch per unit effort (CPUE) for gill and trap nets was recorded as the number of fish per net night (n/nn). Electrofishing was not conducted due to very high conductivities caused by drought conditions. Trap net survey sites were biologist-selected. Gill net surveys were located as near as possible to fixed sites based on historical sampling. All surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011) except that historic gill net sites were used to sample Walleye. Sampling efforts were reduced due to extreme low water levels.

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Standard error (SE) was calculated for structural indices and relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics. Source for water level data was the United States Geological Survey (USGS) website http://waterdata.usgs.gov/tx/nwis/uv/?site_no=07227900&PARAMeter_cd=00062,72020,00054.

RESULTS AND DISCUSSION

Habitat: A habitat survey was conducted in 2012 (Table 5). Littoral zone habitat consisted of silt and rocks.

Prey species: No Gizzard Shad or Bluegill have been collected by surveys in the past three years.

Channel catfish: The gill net catch rate of Channel Catfish was 1.0/nn in 2013 and 4.3/nn in 2012. The Channel Catfish population appears to be declining due to low water levels (Figure 2).

Fisheries management plan for Meredith Reservoir, Texas

Prepared – July 2013.

ISSUE 1: Drought conditions have dramatically changed available habitat in the reservoir and have increased chlorides. Current estimates from the Canadian River Municipal Water Authority indicate the reservoir had 22,425 acre-feet of water in April, 2012. A new record low water level was set on April 2013 at 28.15 ft maximum depth. Sonar surveys indicated the maximum depth is actually about 16 ft due to siltation in the reservoir basin. Chlorides are currently at about 1,350 ppm with a calculated salinity of 2.4 ppt. Continued evaporative loss will result in increased chlorides and salinity. Current salinity levels are well below the Channel Catfish tolerance limit of 12 ppt.

MANAGEMENT STRATEGY

1. Continue detailed habitat mapping of the reservoir basin while water levels are low and substrate is visible.
2. Monitor the status of the Channel Catfish population through standard sampling.
3. Consider restocking forage and sport species if reservoir conditions improve.

ISSUE 2: Meredith Reservoir experienced its first bloom of golden alga on 12/20/2010. The bloom continued through 3/23/2011 with a subsequent bloom in spring 2012. The blooms appear to have eliminated all major sport species except Channel Catfish. High chlorides and low water levels may increase the incidence of golden alga blooms.

MANAGEMENT STRATEGIES

1. Conduct quarterly golden alga cell counts to monitor restocking potential.
2. Monitor impact of golden alga on the Channel Catfish population through standard sampling.
3. Consider restocking forage and sport species if reservoir conditions improve.

ISSUE 3: Boating access has been eliminated at all but one boat ramp at Sanford-Yake. Extension of that boat ramp is limited because the lake bottom levels out at the end of the ramp with limited access to deeper water.

MANAGEMENT STRATEGIES

1. The National Park Service will continue to lengthen the existing ramp as long as is feasible.

ISSUE 4: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state. Analysis of zebra mussel risk to Meredith Reservoir indicated it is at high risk due to location between infested reservoirs, environmental conditions and angler traffic between infested reservoirs in adjacent states and Texas. Current low water conditions and high chlorides have reduced the risk of infestation, but inflows could return the reservoir to high risk.

MANAGEMENT STRATEGIES

1. Monitor reservoir water quality for conditions favorable to zebra mussels.
2. Continue work on the Meredith Zebra Mussel Response Plan with the National Park Service and the Canadian River Municipal Water Authority.
3. Cooperate with the controlling authority to post appropriate signage at access points around the

reservoir.

4. Educate the public about invasive species through the use of media and the internet.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes annual gill net surveys in 2014 and 2016 and trap net sampling in 2016. Electrofishing will only be conducted if water levels increase enough to lower conductivity to allow sampling. Sampling with all gears is conducted in 2016/2017 (Table 6).

LITERATURE CITED

- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. *Fisheries* 32(7): 348.
- Munger, C. and J. Clayton. 2011. Statewide freshwater fisheries monitoring and management program survey report for: Meredith Reservoir, 2010. Texas Parks and Wildlife Department, Federal Aid In Sport Fish Restoration, Grant F-221-M-1, Performance Report, Austin.
- Texas Commission on Environmental Quality (TCEQ). 2011. Trophic Classification of Texas Reservoirs, 2010 Water Quality Inventory and 303(d) List.

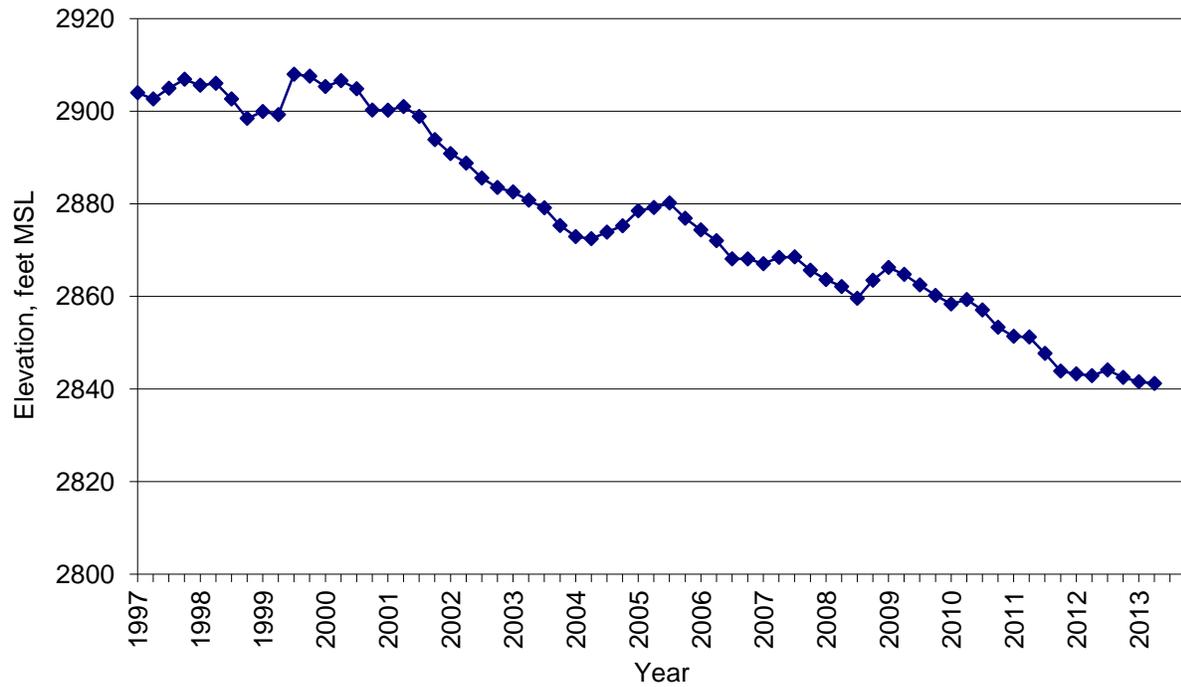


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Meredith Reservoir, Texas. Conservation pool is 2,936 ft MSL.

Table 1. Characteristics of Meredith Reservoir, Texas.

| Characteristic | Description |
|-----------------------------------|--|
| Year constructed | 1965 |
| Controlling authority | Canadian River Municipal Water Authority |
| Counties | Hutchinson, Moore, Potter |
| Reservoir type | Mainstream |
| Shoreline Development Index (SDI) | 1.68 |
| Conductivity | 6,540 μ mhos/cm |

Table 2. Boat ramp characteristics for Meredith Reservoir, Texas, August, 2012. Reservoir elevation at time of survey was 2842 feet above mean sea level.

| Boat ramp | Latitude Longitude (dd) | Public | Parking capacity (N) | Elevation at end of boat ramp (ft) | Condition |
|-----------------|-------------------------------|--------|----------------------------|--|--|
| Sanford-Yake | 35.707534 -101.555136 | Y | 120 | 2844 | Usable with landing mat extension. Extension is feasible. 2 ft above water End of ramp (EOR) elevation is 61 ft above water. Extension is not feasible. |
| Cedar Canyon | 35.694990 -101.573509 | Y | 60 | 2903 | EOR elevation is 21 ft above water. Extension is not feasible. |
| Fritch Fortress | 35.688489 -101.592646 | Y | 80 | 2863 | EOR elevation is 70 ft above water. Extension is not feasible. |
| Harbor Bay | 35.652362 -101.628718 | Y | 40 | 2912 | EOR elevation is 53 ft above water. Extension is not feasible |
| Blue West | 35.68815 -101.63032 | Y | 50 | 2895 | EOR elevation is 70 ft above water. Extension is not feasible |
| Alibates | 35.587616 -101.708155 | Y | 20 | 2912 | EOR elevation is 73 ft above water. Extension is not feasible |
| Plum Creek | 35.597238 -101.713031 | Y | 20 | 2915 | EOR elevation is 73 ft above water. Extension is not feasible |

Table 3. Harvest regulations for Meredith Reservoir, Texas.

| Species | Bag limit | Length limit |
|---|----------------------------|-------------------------|
| Catfish: Channel and Blue, their hybrids and subspecies | 25 (in any combination) | 12-inch minimum |
| Catfish, Flathead | 5 | 18-inch minimum |
| Bass, White | 25 | 10-inch minimum |
| Bass, Smallmouth | 5 | 12 – 15-inch slot limit |
| Bass, Largemouth | 5 | 14-inch minimum |
| Crappie: White and Black, their hybrids and subspecies | 25 (in any combination) | 10-inch minimum |
| Walleye | 5 | No more than 2 under 16 |

Table 4. Stocking history of Meredith Reservoir, Texas. Size Categories are: FRY = fry, FGL = fingerling, and ADL = adults.

| Species | Year | Number | Size | Species | Year | Number | Size | |
|------------------|-------|---------|------|--------------------------------|---------------|-----------|---------|-----|
| Rainbow Trout | 1973 | 50,000 | ADL | Florida Largemouth Bass | 1986 | 631 | ADL | |
| Brown Trout | 1973 | 30,000 | ADL | | 1990 | 401,749 | FGL | |
| | | | | | 1993 | 100,000 | FGL | |
| | | | | | Total | 502,380 | | |
| Blue Catfish | 1965 | 2,500 | FGL | Florida Largemouth Bass hybrid | 2001 | 32,000 | FGL | |
| | 1966 | 9,000 | FGL | | | | | |
| | 1971 | 12,000 | FGL | Kemp's Largemouth Bass | 1988 | 412,727 | FGL | |
| | 1972 | 30,000 | FGL | | 1990 | 189 | ADL | |
| | 1988 | 160,500 | FRY | | Total | 412,916 | | |
| Total | | | | 214,000 | | | | |
| Channel Catfish | 1965 | 421,500 | FGL | Mixed Largemouth Bass | 1989 | 197 | ADL | |
| | 1966 | 360,000 | FGL | | 1990 | 40 | ADL | |
| | 1970 | 9,680 | FGL | | Total | 237 | | |
| | 1971 | 12,000 | FGL | Crappie | 1994 | 308 | ADL | |
| | 1973 | 107,690 | FGL | | White Crappie | 1965 | 125,000 | FRY |
| Total | | | | 910,870 | | | | |
| Flathead Catfish | 1966 | 15,000 | FGL | 1965 | 258 | ADL | | |
| | 1966 | 18 | ADL | 1966 | 50,000 | FGL | | |
| Total | | | | 175,258 | | | | |
| White Bass | 1965 | 15 | ADL | Black Crappie | 1966 | 150,000 | FGL | |
| Smallmouth Bass | 1974 | 11,100 | FGL | Yellow Perch | 1980 | 2,500 | ADL | |
| | 1975 | 28,000 | FGL | | 1981 | 2,500 | ADL | |
| | 1976 | 66,000 | FGL | | 1983 | 2,212 | ADL | |
| | 1977 | 322,700 | FGL | | 1984 | 400 | ADL | |
| | Total | | | | 427,800 | | | |
| | | | | | 165,116 | | | |
| Largemouth Bass | 1965 | 480,000 | FGL | Walleye | 1992 | 165,116 | FGL | |
| | 1966 | 432,000 | FGL | | 1995 | 30,381 | FGL | |
| | 1973 | 61,000 | FGL | | Total | 203,109 | | |
| | 1973 | 27,000 | ADL | | 1965 | 500,000 | FRY | |
| | 1983 | 553 | ADL | | 1966 | 2,000,000 | FRY | |
| | 1994 | 286,400 | FGL | | 1969 | 750,000 | FRY | |
| | 1995 | 586,663 | FGL | 1998 | 5,096,000 | FRY | | |
| | 1997 | 177,000 | FGL | 2000 | 290,196 | FGL | | |
| | 2000 | 20,370 | FGL | Total | 8,636,196 | | | |
| | Total | | | | 2,070,986 | | | |

Table 5. Survey of structural habitat types, Meredith Reservoir, Texas, 2012. Shoreline habitat type units are in miles.

| Habitat type | Estimate | % of total |
|--------------|-----------|------------|
| Natural | 6.1 miles | 61.0 |
| Rocky | 3.9 miles | 39.0 |

Channel Catfish

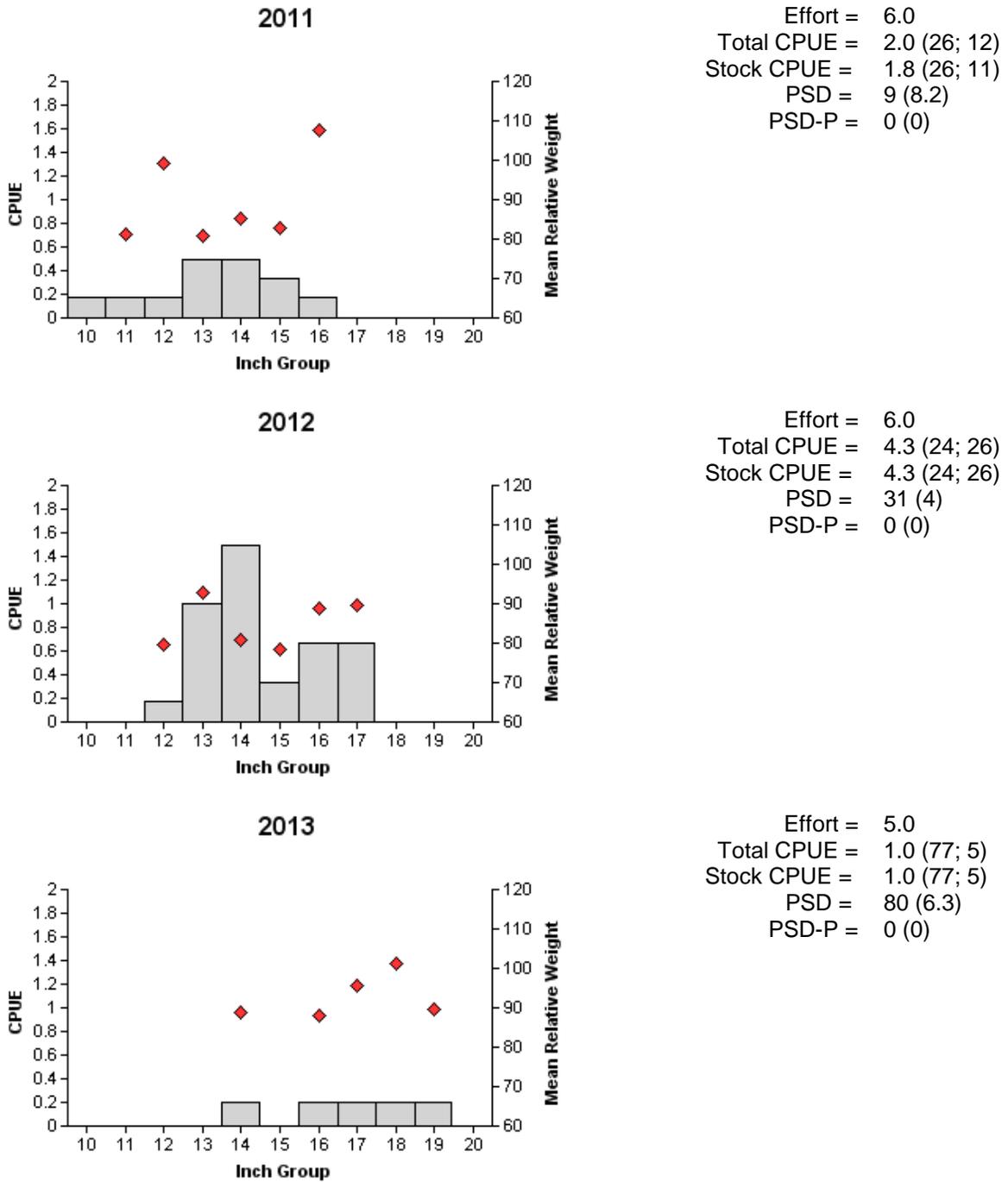


Figure 2. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Meredith Reservoir, Texas, 2011, 2012, and 2013.

Table 6. Proposed sampling schedule for Meredith Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard surveys are denoted by an S and additional surveys are denoted by an A. The creel survey will be 3 months from April through June. Electrofishing will only be conducted if conductivity decreases.

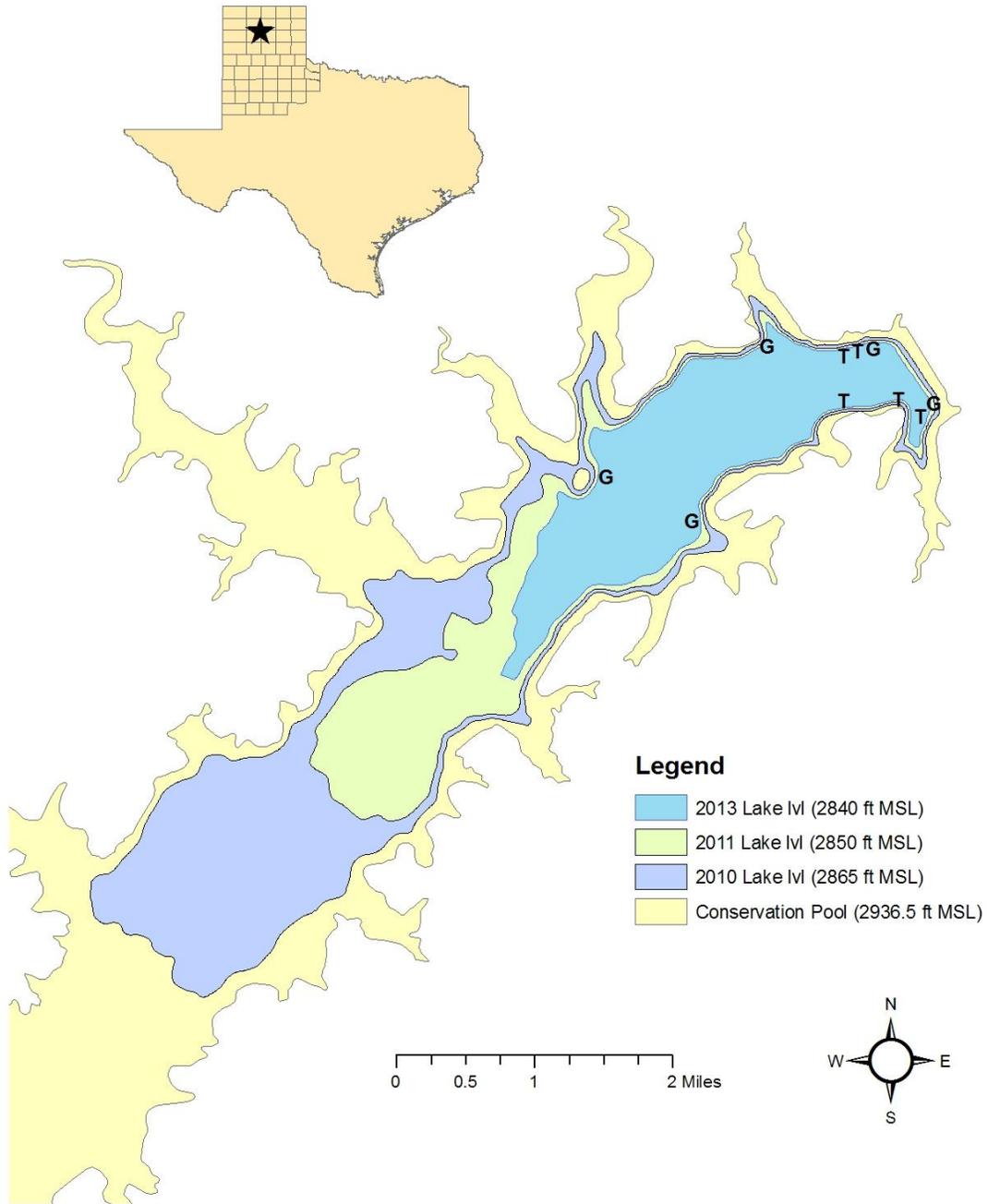
| Survey year | Electrofishing | Trap net | Gill net | Habitat | | | Creel survey | Report |
|-------------|----------------|----------|----------|------------|------------|--------|--------------|--------|
| | | | | Structural | Vegetation | Access | | |
| 2013- 2014 | | | A | | | | | |
| 2014- 2015 | | | A | | | | | |
| 2015- 2016 | | | A | | | | | |
| 2016- 2017 | S | A | S | S | S | S | S | S |

14
APPENDIX A

Catch rate (CPUE) and number (N) of all species collected from all gear types from Meredith Reservoir, Texas, 2012-2013. Effort was 5 net nights for gill nets, and 5 net nights for trap nets.

| Species | Gill Netting | (N - Gill) | Trap Netting | (N - Trap) |
|-----------------------|---------------------|-------------------|---------------------|-------------------|
| Common Carp | 4.60 | 23 | 13.40 | 67 |
| River Carpsucker | 4.00 | 20 | 4.20 | 21 |
| Channel Catfish | 1.00 | 5 | 1.80 | 9 |
| Fathead Minnow | | | 0.40 | 2 |
| Green Sunfish | | | 10.00 | 50 |
| Orangespotted Sunfish | | | 3.40 | 17 |
| Grass Carp | 0.20 | 1 | | |

15
APPENDIX B



Location of sampling sites, Meredith Reservoir, Texas, 2012-2013. Trap net and gill net stations are indicated by T and G, respectively. The 2013 lake level indicates approximate elevation at time of sampling.

16
APPENDIX C



Blue West 05/25/2003



Blue West 08/29/2010



Blue West 10/22/2012



Arrowhead Island 05/25/2003



Arrowhead Island 08/29/2010



Arrowhead Island 03/27/2012