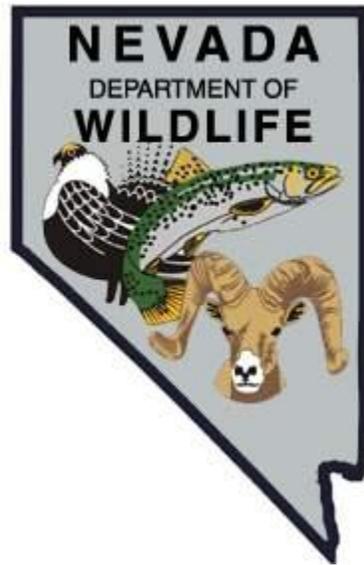


NEVADA DEPARTMENT OF WILDLIFE  
STATEWIDE FISHERIES MANAGEMENT



FEDERAL AID JOB PROGRESS REPORTS

F-20-50  
2014

RUBY LAKE NWR AND COLLECTION DITCH  
EASTERN REGION



**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION  
ANNUAL JOB PROGRESS REPORT**

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**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION  
ANNUAL JOB PROJECT REPORT**

**State:** *Nevada*  
**Project Title:** *Statewide Fisheries Program*  
**Job Title:** *Ruby Lake NWR and Collection Ditch*  
**Period Covered:** *January 1, 2014 through December 31, 2014*

**SUMMARY**

Ruby Lake National Wildlife Refuge (NWR) is separated into the Collection Ditch and the marsh area, which includes the dike units, South Lake, and the South Springs.

There were 32,308 trout stocked at Ruby Lake NWR in 2014. This included 3 different rainbow trout strains, 7,258 tiger trout, and 1,000 brown trout.

Between June and August, ten creel survey visits were made to Ruby Lake, with an additional twelve voluntary, angler drop-box questionnaires being received. Creel survey efforts contacted 160 anglers who put forth 709.5 hrs of effort to catch 1,042 fish, resulting in catch rates of 1.5 fish per hour and 6.5 fish per angler, which is slightly lower than 2013 success rates. All drop-box questionnaires were used for analysis, resulting in 12 anglers catching 193 fish in 49 hrs of fishing effort. Catch rates were 16.1 fish per angler and 3.9 fish per hour.

Due to windy spring conditions and low water, only one thermograph was put in place at South Lake main boat ramp. The bass nesting temperature was reached on May 14. There was a short cold snap shortly after, but it was expected that the initial nesting attempt was successful. The bass fry survey was not conducted due to low water, but agency personnel and anglers observed bass fry, which suggests some level of breeding success in 2014.

Due to low water levels and weedy conditions, only two transects were completed for the South Lake electroshocking survey, which was done two months early since boat launching conditions were deteriorating due to a declining water level. The two transects produced 99 largemouth bass and three trout in 2,239 electroshocking seconds, resulting in a capture rate of 164.3 fish per electroshocking hour. Body condition ratings for 88 measured bass averaged 4.86, for a rating of good.

The 2013-2014 winterkill was considered very low for fish populations in the South Lake, with dissolved oxygen (DO) levels taken at the main boat landing from December to February indicating adequate levels for fish survival. The dike units experienced areas of low DO levels, but considering that fish in a majority of the units already succumbed to die-offs, the impacts to the remaining fishery was considered minimal.

## **BACKGROUND**

Ruby Lake (Ruby Lake National Wildlife Refuge) is a major warmwater fishery in northeastern Nevada, while also providing an excellent coldwater fishery during the cooler months of the year. It lies at an elevation of 6,000 feet and contains over 9,000 acres of lakes, ponds, and waterways that are intermixed with islands, bulrush stands, and manmade dikes. The slow growth rate of largemouth bass is due to a short growing season and a limited food source combined with fluctuating water conditions that require close monitoring of this fishery. The yearly fluctuation in water levels, reproductive success, fish health, and angler use, requires a thorough understanding of the fishery to allow for adequate management decisions. Working with management needs of the Fish and Wildlife Service at the refuge is also necessary to reduce impacts to fish populations and distributions as well as angler use.

In January of 2007, it was found that quagga mussels might have been transported to Ruby Lake via hatchery-stocked fish from Lake Mead Hatchery. Quagga mussel monitoring, which includes artificial substrates, veliger plankton tows, and tactile surveys, was started in the summer of 2007 and continues at varying levels of intensity.

## **OBJECTIVES and APPROACHES**

Objective: General Sport Fisheries Management

Approaches:

- Conduct a pre-stocking evaluation of water quality/quantity.
- Conduct a general fisheries assessment through opportunistic angler contacts.
- Maintain and check for returns of volunteer, angler drop-box surveys during the course of other duties.
- Conduct a single nighttime, electroshocking survey at 3 established transects during summer.
- Monitor water temperature during early spring to late fall with 2 thermographs within the Dike Units and South Lake to assess sport fish spawning activity.
- Visually assess overwinter fish mortality after spring ice breakup.
- Monitor dissolved oxygen levels once a month throughout the ice period.
- Salvage largemouth bass from closed or drained ponds/areas as needed and stock in suitable waters of the Ruby Lake NWR.
- Conduct bass ball surveys in early summer in the North Dike Unit 20.
- Install an angler drop box along the Collection Ditch to better monitor angler activity.
- Sample for occurrence of quagga mussel veligers through plankton net tows conducted two to four times between June and September at up to three sites. Conduct visual and tactile surveys of artificial and natural solid substrates in conjunction with veliger sampling.

## PROCEDURES

Angler assessment at Ruby Lake was scheduled at periodic intervals to include weekdays, three weekend days, and boat openers in an effort to sample anglers uniformly throughout the largemouth bass fishing season. Anglers contacted were questioned as to their residence, number of anglers in their party, hours fished, target species, total fish harvested, and fish released. Harvested fish were recorded by species and fork length, total length, and weight measured. Any clipped fins or tags were noted.

A recording thermograph was placed at a predetermined location in the South Lake shortly after spring ice breakup and pulled prior to winter ice-up. The timeframe for this thermograph was expanded to incorporate monitoring of the quagga mussel spawning season.

The electroshocking survey was accomplished using the electroshocking barge at two predetermined transects in South Lake. The fixed probes were used for the anode and the barge served as the cathode. All fish were netted and held in the live well until the completion of a transect. The fish were then measured, weighed, and released.

Water chemistry data included measurements of dissolved oxygen, temperature, ice thickness, snow depth covering ice, current weather conditions, and water flow. Sites in the North Dike units were checked at water control structures along the dike system and the South Lake was checked near the main boat landing. These sites were sampled at regular intervals throughout the winter, ice-up period.

The South Lake winterkill survey was accomplished from a boat with a one- or two-man crew. Preferred conditions included calm and clear weather, which provided for maximum visibility in the water. Areas that have experienced winterkill in the past were checked closely, as well as a shoreline survey throughout portions of the South Lake complex. The North Dikes were periodically checked along the roadway borrow ditch. In units that revealed low dissolved oxygen and/or low water levels during the ice-up period, an in-depth search was done from a canoe.

Black bass fry surveys were to be conducted in Unit 20 using a two-man crew in a canoe. The transect is located in Unit 20 and started at the weed line just south of the S-turn on long dike and continued north to the culvert leading to Unit 14. Due to low water levels, this survey could not be completed.

## FINDINGS

### Stocking

There were 32,308 trout stocked at Ruby Lake NWR in 2014. This included 3 different rainbow trout strains, 7,258 tiger trout, and 1,000 brown trout. A summary of trout stocking can be seen in Table 1.

**Table 1.** Ruby Lake NWR Trout Stocking Summary.

	RB	TT	BN	
South Lake	11,765	2200		
Collection Ditch	7,615	3000		
South Springs	1,480	1,008		
Unit 21	1,880	1,050	1000	
Unit 10	1,310			
	24,050	7,258	1,000	<b>32,308</b>

### Angler Contacts

Between June and August, 10 creel visits were made to Ruby Lake NWR, resulting in contacting 160 anglers that put forth 709.5 hrs of angling effort to catch 1,042 fish. This effort produced angler success rates of 1.5 fish per hour and 6.5 fish per angler. A total of 133 largemouth bass anglers (83.1%) expended 633 hrs of angling effort to harvest 146 bass and release an additional 860 bass. This resulted in largemouth bass catch rates of 7.6 per angler and 1.6 per hour. Twenty-seven trout anglers (16.9%) put forth 76.5 hrs of angling effort to harvest 5 trout and release an additional 31 trout. Success rates for trout anglers were 1.3 per angler and 0.5 per hour.

The average length of largemouth bass harvested from the South Lake was 11.3 in (287.3 mm), which was the management target length. No rainbow trout were measured. Angler catch rate objectives for Ruby Lake NWR are set at 1.0 trout per angler, 0.45 trout per hour, 4.0 bass per angler, and 1.5 bass per hour. In 2014, angler catch rates exceeded management objectives for both species. High catch rates for largemouth bass were due to anglers catching high numbers of bass smaller than the 10 in minimum harvest limit. Numerous reports of fish in the 7 to 9 in range were received throughout the fishing season. If water conditions remain suitable, it is expected that numerous fish approaching the 10 in will reach harvestable size in 2015 and provide a quality fishing experience.

Supplemental angler information was received through an angler drop-box installed at the main boat ramp. A total of 12 completed questionnaires were received that showed 12 anglers caught 193 fish in 49 hrs of fishing effort, producing catch rates of 16.1 fish per angler and 3.9 fish per hour. Largemouth bass catch rates were 17.3 bass per angler and 4.1 bass per hour, while one trout angler produced catch rates of 3.0 trout per angler and 1.0 trout per hour. A comparison of angler catch rates between

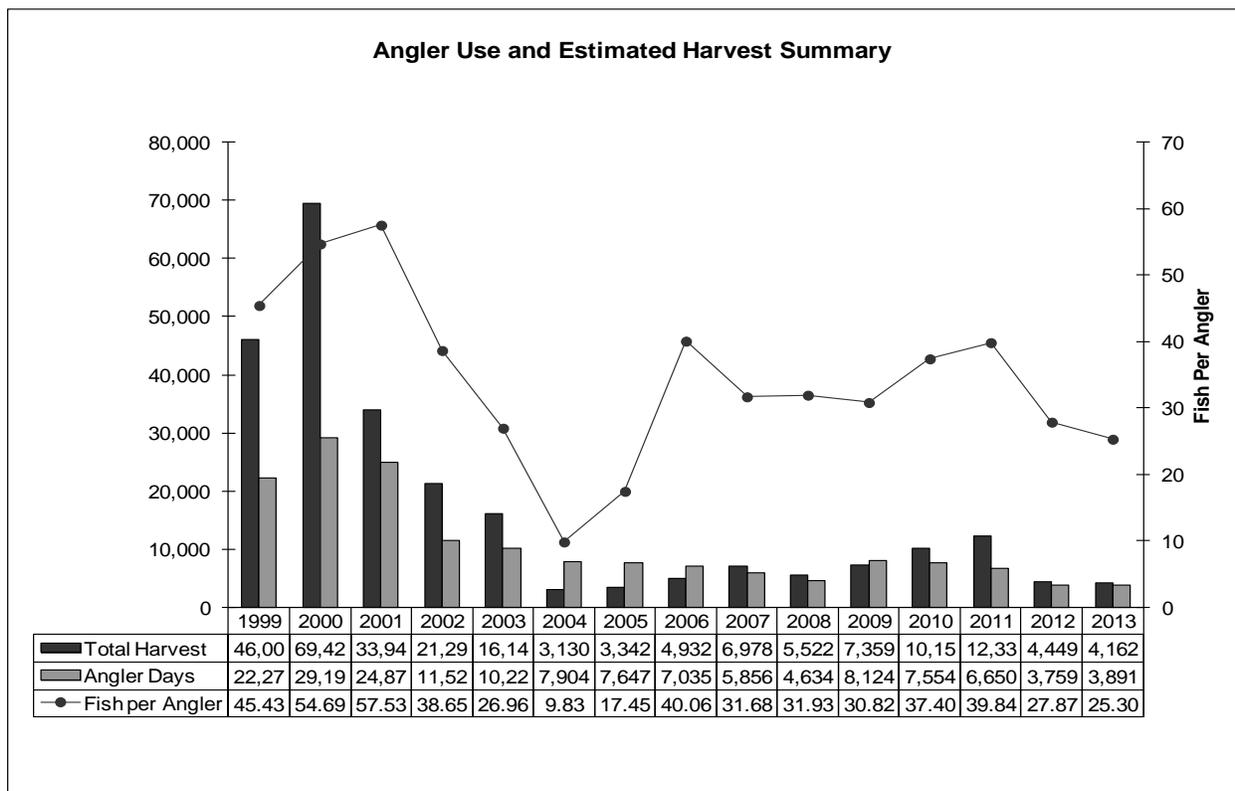
contact creel surveys and the angler drop-box survey can be seen in Table 2. The catch rates for trout are difficult to compare, considering the small sample size. The bass catch rates were noticeably higher for the angler drop-box, which was attributed to a small sample size and an over estimation of fish caught under 10 inches. Angler drop-box data for bass was over double the contact creel data and is a trend that has been seen for several years.

**Table 2.** Ruby Lake NWR Angler Catch Rates.

	T/A	T/H	B/A	B/H	F/A	F/H
<b>Creel</b>	1.3	0.5	7.6	1.6	6.5	0.7
<b>Angler Box</b>	3	1	25	4.1	16.1	3.9
<b>Combined</b>	1.4	0.5	8.3	1.8	7.2	2.1

The Nevada Department of Wildlife Mail-in, Angler Questionnaire Survey for the calendar year 2013 reported that 1,260 anglers fished 3,891 days and had a success rate of 25.3 fish per angler. Figure 1 shows the 15-year trend using expanded data for harvest, angler days, and fish per angler.

**Figure 1.** 1999-2013 Angler Questionnaire Data.

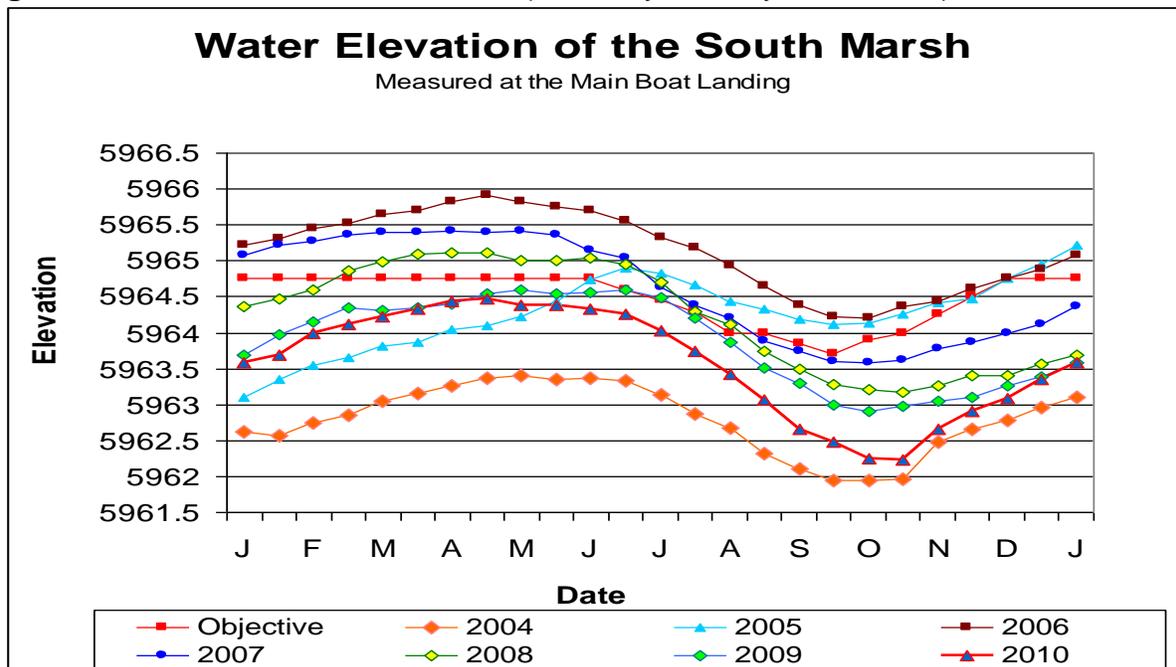


Angler use and harvest peaked in 2000 following five years of above average water; however, as the water levels dropped during poor water years from 2001 to

2004, harvest, angler days, and angler catch rates also dropped. Angler days continued to drop until 2009, when the number of angler days increased to almost double. Unfortunately, since 2009, angler days continued to drop and reached a 15 year low in 2012. The last 10 years of data has shown an average of 6,939 angler days, which is well below the 25,000 average seen in the late 1990s. Decreasing water levels at Ruby Lake have been the trend since 2006. Between 2000 and 2014, the average percentage of annual precipitation in the Upper Humboldt basin was 96%, which was high due to four years above 110% precipitation. Contrary to these positive years, there were also seven years below 90% that have been more detrimental for the overall water levels at Ruby Lake NWR.

As mentioned above, water levels have not only been below the objective for several years, but they have been on the decline since 2006 (Figure 2). No data is available for 2011 through 2014. Since 2006, which was the most recent high water year, the South Lake water level dropped two vertical feet in elevation when comparing October water levels. Water levels and the associated available habitat at South Lake are critically important to a successful fishery. It will be interesting to follow the water levels in 2015, which are expected to be low due to what appears to be a below average precipitation year. If the below average water years of 2012 through 2014 are followed again by another poor water year in 2015, the impacts to Ruby Lake NWR as a fishery and recreation site will continue to compound as summer progresses.

**Figure 2.** South Lake Water Elevation (Courtesy of Ruby Lake NWR).



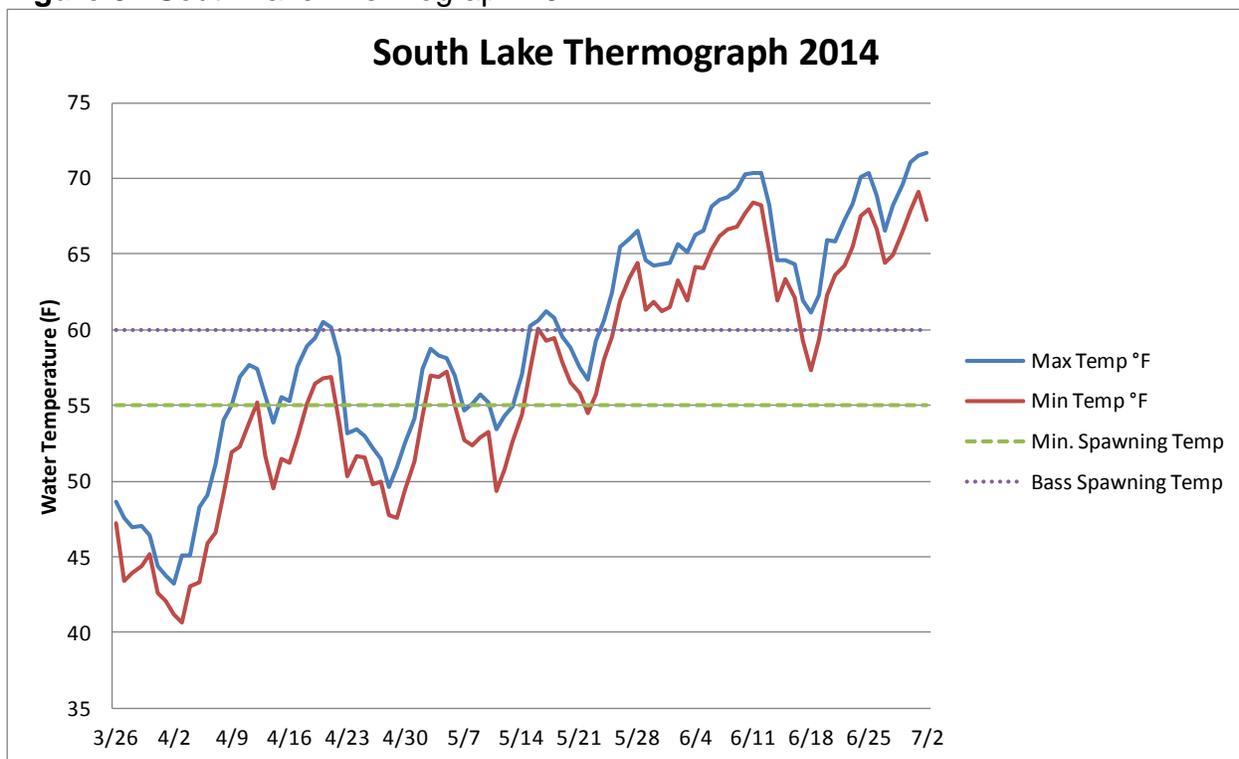
Creel surveys in the North Dike units were done secondarily to South Lake creel surveys and no anglers were contacted. Angler use in most units was minimal during 2014, with reports of slow angling success for largemouth bass, mostly due to low water and dewatering events.

## Thermographs

Springtime water temperatures at Ruby Lake have demonstrated a wide range of fluctuations. The severity of these fluctuations hampers largemouth bass spawning success, and in severe cases, an entire year class can be weakened. Largemouth bass at Ruby Lake begin nesting activities when the water temperature approaches 60°F (15.5°C), with the majority of nest abandonment occurring when the temperature then drops below approximately 55°F (12.8°C). Water temperature fluctuations are typically less varied in the South Lake as compared to the North Dike units mainly due to greater water depth.

A thermograph was placed in South Lake on March 26 and later pulled on July 2, in conjunction with the electroshocking survey (Figure 3). On May 14, the minimum water temperature reached bass spawning temperature of 60°F (15.5°C) and although the water temperature experienced a short cold snap shortly after, the nest abandonment temperature was reached for only a single day. It is suspected that there was a successful first spawn in 2014.

**Figure 3.** South Lake Thermograph 2014.



A thermograph was not placed in Dike Unit 20 due to low water conditions. Due to water management practices, this unit was again nearly dry by the end of summer.

## Largemouth Bass Ball Surveys

Because of the low water in Dike Unit 20, the bass ball survey was not conducted. Anglers reported several balls of bass fry, and during the electroshocking survey, several observations of young-of-year were made. Although the thermograph showed water temperatures were conducive to a successful spawn, the low water level made it difficult to assess the overall success of the spawn. Future electrofishing surveys will shed some light on the success of the 2014 cohort.

## Largemouth Bass Population Monitoring

Due to low water levels in South Lake, the electroshocking survey was conducted two months earlier than normal to facilitate the launching and navigation of the electroshocking barge. The survey was conducted under partly cloudy and calm weather conditions, with a water temperature of 72 °F (22.2 °C). Due to low water, the area southwest of the thermograph was shocked, with approximately 15 bass being captured. These fish were combined with the second transect being located on the west shoreline north of Otis Island and a third transect located along the west shoreline at the Water Ski Ponds. These transects produced a total of 102 fish, including three trout and 99 largemouth bass, in 2,239 electroshocking seconds, which resulted in a capture rate of 164.2 fish per electroshocking hour. This capture rate is quite low in comparison to past surveys, with capture rates of 357.4 fish per hour in 2012 and 554.6 fish per hour in 2013. The capture rate (netting success) was considered fair, with several smaller age class fish being observed, including young-of-year that were not captured.

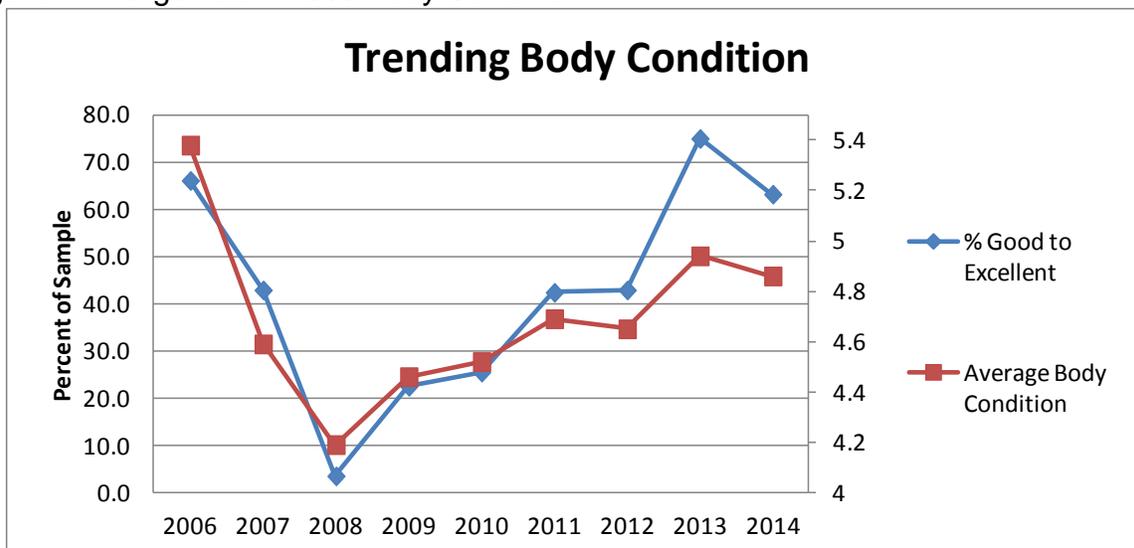
All captured fish were measured to total length (TL) for evaluating age classes and 57 of the bass were weighed to evaluate body condition. Bass averaged 9.2 inches (234.6 mm) TL and ranged in size from 5.7 to 20.5 inches (145 to 520 mm). The body condition of the 57 measured bass was as follows: three fish in poor condition (5.3 %), 18 fish in fair condition (31.6%), 35 fish in good condition (61.4%), and one fish in excellent condition (1.8%). The average body condition was 4.86, for a rating of good. The three trout measured between 9.1 and 11.1 inches (232 to 281 mm), but were not weighed to obtain condition ratings.

To continue with the Study Objectives for Cold Creek Reservoir, a total of 69 largemouth bass were transported from Ruby Lake NWR to Cold Creek Reservoir. This is the third year of transplants, and once again the bass appeared to be in good condition upon release at Cold Creek Reservoir.

Beginning in 2006 the percentage of sampled fish in good to excellent body condition dropped every year, bottoming out in 2008 with 3.5% of the sample being in good to excellent condition. This number started an upwards trend in 2009 at 22.5%, which has continued to improve. The 2013 survey showed a healthy bass population, with 75% of the fish in good body condition. There was a slight decrease in 2014 to

63.2% (Figure 4). It is important to mention that the 2014 survey was conducted in July, when the survey typically occurs in August/September.

**Figure 4.** Largemouth Bass Body Condition.



The 100 measured bass were broken into age classes to evaluate and follow the cohorts from various years. To make year to year comparisons, Figure 5 shows the age class breakdown from 2006 to 2014, with some additional data on catch rates and sample size. The graph shows two dominate cohorts, starting in 2007 with Class II and III, which continued into 2008 as Class III and IV. As these fish approached the 10 inch mark, Class V, the age class dominance was lost as they were targeted by anglers. However, as these fish reached maturity in 2009 and 2010, their reproductive success can be seen in the class I and II's in the 2011 survey. These two cohorts were clearly represented in the 2012 survey as well. The success of these two cohorts may be contributing to the highest percentage of class V+ bass in the last seven years, as well as the lowest small (under 10 inches) to keeper bass (over 10 inches) ratio in the same time frame. With low water conditions, it is difficult to predict the reproductive response of bass, but due to the strength of mature age class fish, the recovery of the fishery is looking good.

If water conditions continue to persist, it appears the current age structure of the largemouth bass fishery is in place to maintain a healthy and stable fishery. Because the capture rate is reduced for smaller age class fish, it appears that strong age classes are more easily identified in age class II, III, and IV (Figure 5). Based on this premise, it appears that the last six years have produced strong age classes on a yearly basis that seem to be showing a more consistent age class distribution and an overall increase in fish over 10 inches. As shown in the past, water is a limiting factor that can have a drastic influence on the Ruby Lake NWR fishery. Future refuge water management practices and precipitation amounts will play a critical role in the future of the largemouth bass fishery.

**Figure 5. Largemouth Bass Percent of Age Class Summary.**

Age Class	2014*	2013	2012	2011	2010	2009	2008	2007	2006
Class 0	0.0	0.0	0.5	1.1	5.9	0.5	0.0	0.0	1.9
Class I	0.0	3.2	2.5	17.2	1.5	2.3	1.8	2.0	31.4
Class II	11.0	26.3	14.9	22.5	7.4	4.5	10.5	43.3	41.1
Class III	29.0	39.2	36.6	26.2	30.0	53.4	47.1	41.3	20.7
Class IV	31.0	21.7	24.8	15.7	44.8	32.1	35.1	7.0	3.2
Class V	20.0	6.5	12.4	13.5	9.9	5.9	4.3	4.7	0.3
Class V+	9.0	3.2	8.4	3.7	0.5	1.4	1.2	1.7	1.3
N =	100	217	202	267	203	221	325	298	319
Small to Keeper	3.3	9.3	3.8	4.8	8.1	12.8	17.6	15.0	62.8
* July Sample Date									

### Winterkill Survey

The South Lake survey began at 1130 hrs on March 24 and continued to 1400 hrs. Survey conditions were cool, partly cloudy, and a light breeze, with the wind picking up near the end of the survey. Water temperatures ranged from 47 to 49.5°F, and included areas that have experienced fish losses in the past. No dead fish were observed during the survey, however, there were over twenty trout observed swimming.

An official survey of the dike units was not conducted due to low water levels in the units. Also, due to recent dewatering events in the units, a large majority of the fishery has been lost.

Water levels continued to rise in South Lake during the fall, winter, and spring following ice breakup. Many areas of deeper water (four to six feet), which can be used to overwinter by fish, were observed during the survey. Dissolved oxygen readings taken at the main boat ramp in January, February, and March indicated adequate levels for fish survival. Ice thickness reached seven to eight inches in January and ice breakup began in early March.

The overall winterkill fish loss for the winter of 2013-2014 was considered very low. Moderate water levels and shallow ice conditions provided adequate refugium for fish to overwinter with minimal losses. With this winter bringing less than average winter precipitation, the outlook for trout and bass fishing at Ruby Lake NWR is in doubt.

### Largemouth Bass Salvage

Based on late winter coordination with NWR staff, no dike unit was scheduled to be drained, thus no fish salvage was conducted.

### Quagga Mussel Monitoring

Surveys were conducted on June 23, July 14, August 25, and September 22, which included checking artificial samplers and plankton sampling at two separate

locations. A total of 16 individual samples were evaluated for the presence of quagga mussel veligers, all of which came back negative. All visual and tactile surveys were also negative for quagga mussels. Due to positive PCR tests in 2012, Ruby Lake NWR is currently listed as a Watch List Water, which requires continuous monitoring.

## **MANAGEMENT REVIEW**

All approaches were completed at Ruby Lake NWR, with the exception of a bass salvage, which was not needed due to NWR scheduling. Due to low water conditions, only one thermograph was placed in South Lake. Objectives will be continued in the future when conditions allow. Although management objectives are being met at Ruby Lake NWR, anglers continue to be concerned with the size of largemouth bass. Considering South Lake has seen a steady eight-year drop in water level, the fishery has been doing as well as can be expected. Slow growth and lack of available habitat directly impact the success of this fishery and, if the future provides adequate water levels, then the fishery will continue to improve.

## **RECOMMENDATIONS**

- Schedule a May/June 2015 electroshocking survey of the Collection Ditch as the start of biannual trend surveys.
- Continue to assess angling pressure and angler success rates throughout the fishing season.
- Continue to monitor and utilize the angler drop-box and improve the visibility of the box, with the intent of increasing angler participation.
- Recording thermographs should continue to be placed in South Lake and North Dike Units to help predict timing and success of largemouth bass spawning.
- Periodic nest surveys and fry ball surveys should continue during spring to evaluate largemouth bass spawning success.
- An annual electroshocking survey in summer should be conducted to evaluate the status of the recovering largemouth bass fishery.
- Winter water chemistries and associated spring winterkill surveys should be continued to aid in the assessment of projected angler success and fish loss. This information also justifies the need for supplemental trout stocking.
- Continue to assess angling pressure and angler harvest in the Collection Ditch as well as coordinate with the hatchery on trout stocking conditions and numbers.
- Salvage largemouth bass from closed or drained areas within the Ruby Lake NWR and stock in suitable waters.

- Work with Ruby Lake NWR, when applicable, on the completion of their Comprehensive Conservation Plan to ensure that quality fishing at the Refuge continues.

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Date: January 2015