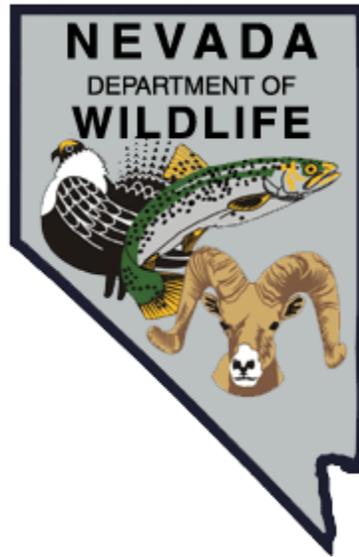


NEVADA DEPARTMENT OF WILDLIFE
STATEWIDE FISHERIES MANAGEMENT



FEDERAL AID JOB PROGRESS REPORTS

F-20-50
2014
TOPAZ LAKE
WESTERN REGION



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

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ANNUAL PROGRESS REPORT**

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

State: *Nevada*
Project Title: *Statewide Fisheries Program*
Job Title: *Topaz Lake*
Period Covered: *January 1, 2014 through December 31, 2014*

SUMMARY

Average monthly storage for Topaz Lake during 2014 was 22% of average (5,352 acre-ft, the 17 year historical average was 23,987 acre-ft). This was the third year of drought in the Walker basin.

Mail-in, angler questionnaire data for 2013 estimated 1,502 anglers fished 6,453 days to catch 6,457 fish (this represents data only collected from anglers buying a Nevada fishing license). The average catch rate was 1.00 fish per angler day. Coldwater and Warmwater General Fisheries Management Concept objectives were successfully met in 2014 based the mail-in survey as well as angler contacts and drop-box data.

Monitoring for aquatic nuisance species (quagga mussels) continued in 2014 and no veligers or adult mussels have been found.

Fish surveys conducted during 2014 verified an increasing population of smallmouth bass. A study aimed at assessing the effectiveness of artificial habitat structures on recruitment and survival of black bass was initiated during 2014 with the installation of 22 artificial habitat structures placed along the western shore during June. This project was a collaboration between Seth Doutre (an Eagle Scout applicant), the Nevada Department of Wildlife (NDOW), Walker River Irrigation District (WRID), and the Douglas County Parks and Recreation Department.

A study aimed at assessing the rainbow trout fishery was initiated during 2010. Growth and catch rates of four trout strains (bowcutt trout and Eagle Lake, Bel Air, and Tahoe strains of rainbow trout) were evaluated. Results from the study indicated that bowcutt trout performed better than the other strains.

BACKGROUND

The Nevada/California border about equally divides Topaz Lake, but it is owned and operated by the Walker River Irrigation District (WRID). Nevada Department of Wildlife (NDOW) and California Department of Fish and Wildlife (CDFW), nonetheless, share fishery management responsibilities. Both agencies collectively have established a significant coldwater fishery in the reservoir. The earliest record of stocking by Nevada occurred in 1930 with black bass (*Micropterus* sp.), and since then, the lake has been stocked abundantly with rainbow trout (*Oncorhynchus mykiss*). Other stocked

fishes have included brown trout (*Salmo trutta*), kokanee salmon (*O. nerka*), Lahontan cutthroat trout (*O. clarkii henshawi*), bowcutt trout (a hybrid between cutthroat and rainbow trout), tiger trout (a hybrid between brown trout and eastern brook trout, *Salvelinus fontinalis*), and black bullheads (*Ictalurus melas*). Common carp (*Cyprinus carpio*) also exist. Today, however, rainbow and bowcutt trout make up the principal sport fishery, other fishes such as tiger trout, black bass, and occasionally brown trout encompass a minor fishery. The native fish community is comprised of mountain whitefish (*Prosopium williamsoni*), Tahoe sucker (*Catostomus tahoensis*), Lahontan tui chub (*Siphateles bicolor obesus*), Lahontan reddsides (*Richardsonius egregious*), and Lahontan speckled dace (*Rhinichthys osculus robustus*).

Topaz Lake fishing season is open from January 1 to September 30. The fishing regulation states: Fishing is legal from 1 hr before sunrise to 2 hrs after sunset, except for the area within the jetties of Topaz Marina, which is closed to fishing. Limit is 5 trout, 10 mountain whitefish, and 15 warmwater game fish of which not more than 5 may be black bass.

There are two major boat-launching facilities, Topaz Landing and Douglas County Park. Topaz Landing is privately owned with a fee for launching, while Douglas County Parks is public and charges a fee to launch boats. The Douglas County boat ramp is large enough for multiple launchings and can be used at all but extremely low water levels. There is a fish cleaning station, camping sites, and restrooms. A drop-box near the Douglas County boat launch was installed in 2010 to collect basic angler information including hours spent fishing, number of fish caught, general size of fish and species. Douglas County Parks is open from January 1 to September 30.

Water storage typically declines during late summer, as water demands remain high. As the irrigation season ends in October, the water level increases throughout winter. Crop irrigation begins in mid-April and river runoff typically peaks shortly after, the reservoir then reaches maximum capacity for the year.

Maximum pool is 125,000 acre-ft, but usable storage, governed by the depth of the outlet, is about 59,500 acre-ft. At minimum stage, the reservoir reaches a depth of 59 ft. At full storage, maximum depth approaches 92 ft and the mean depth is 52 ft. It has 2,410 SA and sits at 5,005 ft above mean sea level when full.

OBJECTIVES

General Management Objectives:

- Conduct a general fisheries assessment through opportunistic angler contacts, angler drop-box surveys, and mail-in, angler questionnaire data.
- Monitor lake level and clarity when on site.
- Monitor for the presence of quagga mussels by conducting tactile surveys around boat docks and reservoir substrates at least three times per year.
- Conduct quagga mussel veliger sampling through plankton tows at established transects at least three times per year.

Study Specific Objectives, Black Bass:

- Install 20 artificial habitat structures that provide additional cover habitat for juvenile black bass.
- Conduct beach seining surveys at least three times during the spring and early summer near artificial habitat structures.
- Monitor habitat structures and spawning activity through snorkeling surveys during summer.

Study Specific Objectives, Rainbow Trout:

- Analyze biological data (i.e., growth rate, life span, body condition) and angler information (i.e., catch rates and satisfaction) collected on various strains of trout during the four year study and write final report.

PROCEDURES

General Management Objectives:

Conduct a general fisheries assessment through opportunistic angler contacts, angler drop-box surveys, and mail-in, angler questionnaire data. Information obtained from angler contacts included total time fished and number, size, and species of fish caught. Location of angler, place of residence, and type of bait or lure used was also recorded. Angler drop-box survey forms were collected from a single drop-box located next to the Douglas County boat ramp. Angler questionnaires were sent to 30,000 anglers purchasing a Nevada fishing license. Information returned to the Department of Wildlife was entered into a database and summarized for use in assessment of individual fisheries.

Monitor lake level and clarity when on site. Lake level was measured by a USGS gage in acre-ft near the dam and water clarity was measured using a Secchi disk. Secchi disk measurements were taken on four occasions (June 25, August 26, September 3, and October 15, 2014) near mid lake.

Monitor for the presence of quagga mussels by conducting substrate sampling around boat docks and reservoir substrates when on site. Monitoring of buoys, submerged rocks, exposed rocks, moored boats, and boat docks was conducted once per month from May through September. Tactile surveys included snorkeling around boat docks and buoys as well as visual inspection of surfaces that became exposed as the reservoir level dropped throughout the summer.

Conduct quagga mussel veliger sampling through plankton tows at established transects at least three times per year. Three stations have been established to sample for quagga mussel veligers. The first station was near Douglas County boat ramp, the second near mid-lake, and the third near Topaz Landing boat launch. Vertical tows were made from the hypolimnion to the surface and a minimum of 1,000 L of lake water was filtered through a 63- μ m mesh plankton net. Samples were

taken on June 25, August 26, and September 3. The samples were preserved in 75% ethanol and analyzed by Pisces Molecular in Colorado and Eco Analysts in Idaho.

Study Specific Objectives, Black Bass:

Install 20 artificial habitat structures, which will provide additional cover habitat for juvenile black bass. Twelve habitat structures were purchased from Mossback Racks in Arkansas, model number MB5832-58 (58 in tall with 32 “V” shaped PVC cross sections 58 in long). An additional ten habitat structures made from one- and four-inch PVC pipes were built by Seth Doure, a Boy Scout working towards his Eagle Scout project. The structures were constructed at the Douglas county boat launch and taken to four pre-determined locations along the western shore on June 24 and 25. At each location received three mossback units, a small “PVC tree” unit (4 in PVC that was 4 ft tall with 10 crossbars of 10 ft long 1 in PVC), and a larger “lay down PVC” unit (4 in PVC that was 10 ft long with 26 crossbars of 10 ft 1 in PVC). They were transported by boat and anchored to the bottom using concrete blocks. The four locations were selected based on public safety (placed away from high use areas by boaters and campers) water depth, substrate, cove vs open water, and land ownership. The Walker River Irrigation District (WRID) and Douglas County Parks and Recreation Department were notified prior to project implementation.

Conduct beach seine surveys at least three times during the spring and early summer near artificial habitat structures. Beach seining was not conducted due to timing of the artificial habitat project completion (post spawn).

Monitor habitat structures and spawning activity through snorkeling surveys during summer. Snorkel surveys were conducted on two occasions during August and September. A single swimmer dove from a boat near habitat structures and swam cautiously up to each structure. Fish species, approximate size, and location were recorded.

Study Specific Objectives, Rainbow Trout:

Use data collected through opportunistic angler contacts, return of angler drop-box surveys, and tagged fish returns to evaluate differences in strains. Angler drop-box survey forms were collected from a single drop-box located next to the Douglas County boat ramp. Information obtained from the anglers through both the drop-box survey and angler contacts included total time fishing and number, size, and species of fish caught as well as any tagged fish information including Floy tag color, number, and fish length to the nearest tenth of an inch.

FINDINGS

General Management Objectives:

Conduct a general fisheries assessment through opportunistic angler contacts, angler drop-drop box surveys, and mail-in, angler questionnaire data. A total of 71 anglers were contacted at Topaz Lake during 2014 (148 were contacted during 2013). Trout anglers showed a catch rate of 0.30 fish per hour (0.34 fish per hour during 2013 and 1.21 fish per hour during 2012) and 0.32 fish per angler day (during 2012, angler contacts yielded 0.78 trout per angler, and 2013 angler contacts resulted in 0.58 trout per angler). A total of nine rainbow trout were measured and averaged 14.3 in, only two bowcutt trout were measured (15.2 in and 13.2 in). Only six contacts were made in 2014 with anglers targeting bass. Even though angler use was limited, anglers caught 25 bass averaging 14.8 in at a catch rate of 2.08 fish per hour. These numbers also represent a decline in both catch rate (3.33 fish per hour during 2013) and size (15.3 in during 2013) for smallmouth bass. No largemouth bass were reported by anglers during 2013 or 2014.

Historical mail-in, angler questionnaire data is shown in Table 1. In 2013, below average numbers were reported for all categories.

Table 1

Mail-in Angler Questionnaire History

Year	No. of Anglers	Days Fished	Fish Caught	Fish/Angler Day
2004	3,408	19,056	28,817	1.51
2005	3,185	18,931	27,054	1.43
2006	2,945	14,704	23,098	1.57
2007	2,935	24,586	44,152	1.80
2008	2,482	10,474	12,443	1.19
2009	3,148	20,157	28,755	1.43
2010	2,793	14,895	22,395	1.50
2011	2,767	13,265	22,652	1.71
2012	2,574	8,414	12,497	1.49
2013	1,502	6,453	6,457	1.00
Average	2,774	15,094	22,832	1.46

The mail-in, angler questionnaire data does not distinguish between anglers targeting trout or bass so it is not possible to assess angler catch rates for warmwater species separately based only on this information. Historically, trout have dominated the sport fish community as well as angler catches, however, creel contacts and angler drop-box surveys suggest bass numbers and numbers of anglers targeting bass are increasing.

No drop-box surveys were collected during 2014. The Douglas county boat ramp was closed throughout the year; therefore, 2013 data was used. The angler drop-box survey does not distinguish between black bass species, however, angler creel contacts

reported 100% of the bass caught were smallmouth bass, therefore, it is assumed that most, if not all, bass reported for the drop-box survey are smallmouth. Largemouth bass are present in the lake, but numbers are low. Angler drop-box data for 2011 to 2013 is shown in Table 2. The installation of the angler drop-box and signage was completed during June 2010, after peak trout angling occurred; therefore, data was limited in 2010 and not necessary to present here. In 2013, 25 anglers averaged 0.66 fish per hour and 3.84 fish per angler day (Table 2). An increase in bass was reported from the drop-box survey, with four caught during 2012 and up to 45 during 2013. Conversely, there was a decline in rainbow trout reported in 2012 of 132 and 2013 of 50.

Table 2

Angler Drop-Box Survey – 2011 - 2013

	2011	2012	2013
No. Anglers	32	29	25
Hrs Fished	167	122	144.5
Bass	22	4	45
Tiger	1	7	1
Rainbow	108	132	50
Fish/Hour	0.78	1.17	0.66
Fish/Day	4.09	4.93	3.84

Topaz Lake is managed as a “two tiered fishery” under the guidelines of the Coldwater and Warmwater, General Fishery Management Concepts. The coldwater concept states “angler success rates should range between 0.25 and 0.75 fish per angler hour and 1.0 and 2.0 fish per angler day.” The warmwater concept states “angler catch rates should range between 0.25 and 0.75 fish per hour and 1.0 and 2.0 fish per angler day. Largemouth bass should average 10 inches.” The size of fish reported from the angler drop-box survey is shown in Figure 1; 73% of bass caught were larger than 11 inches and 92% of trout caught were larger than 11 inches. Available data for angler catch rates and size of fish suggests that Topaz Lake is meeting these management objectives with the exception of the trout caught per angler day during 2014.

Angler satisfaction during 2013 with fishing experience and size of fish was high (Table 3). The satisfaction survey is on a scale of -2 (being less satisfied) to +2 (being more satisfied).

Approximately half of trout stocking occurred during October and November, which is typical of a put, grow, and take fishery when stocking happens during the closed fishing season. The remainder of trout were stocked after the start of the fishing season (Table 4).

Figure 1

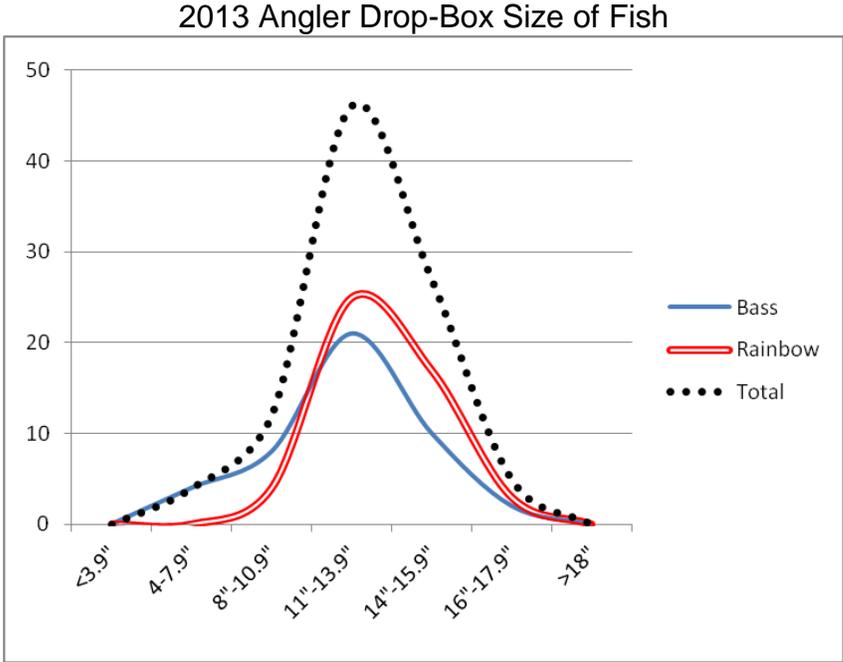


Table 3

2013 Angler Drop-Box Satisfaction Survey

	-2	-1	0	1	2	Total Ave.
Fishing exp.	5		2	8	10	0.72
Size of Fish	2	1	3	7	7	0.80
Number of fish	2		4	6	11	1.04

Table 5 shows the four year stocking history for both the Nevada Department of Wildlife (NDOW) and the California Department of Fish and Wildlife (CDFW). NDOW typically stocks approximately 50,000 catchable rainbow that range from 8.8 in to 10.7 in whereas CDFW typically stocks 25,000 smaller rainbow that range from 6.2 in to 8.9 in.

Monitor lake level and clarity when on site. Water quality profiles were taken at mid-lake on June 25, August 26, and September 3. Figures 2-4 show the temperature profiles observed. Annual temperature ranged from a high of 75°F at the surface (September 9) to a low of 41°F at the surface (December 31). Dissolved oxygen ranged from a high of 14 mg/L following a storm event on September 3 to a low of 0.07 on August 26 near the bottom at 56 ft depth. A strong thermocline developed during late summer and suitable trout tolerances were limited to approximately 6 ft of the water column from 26-33 ft where temperatures were below 68°F (20 C) and dissolved oxygen levels were above 6 ppm. Dissolved oxygen levels taken during June and August may not be accurate and the Hydrolab unit was recalibrated with assistance from the manufacturer before it was used during September.

Table 4

2014 Stocking

Date	Species	Strain	Number	Size
1/21/2014	Tiger Trout	TIGER	4502	8.9
2/7/2014	Rainbow	MT. SHASTA	4658	9.7
2/10/2014	Rainbow	MT. SHASTA	4530	9.2
2/10/2014	Rainbow	JUMPER	1514	9.9
2/11/2014	Rainbow	MT. SHASTA	6006	9.3
2/13/2014	Rainbow	EAGLE LAKE	4088	9.5
3/17/2014	Rainbow	EAGLE LAKE	5436	8.9
10/22/2014	Rainbow	TAHOE	4241	9.9
10/30/2014	Rainbow		5425	9.3
11/10/2014	Rainbow		4395	9.5
11/14/2014	Rainbow	TRIPLOID	5238	9.5
11/21/2014	Rainbow	EAGLE LAKE	1998	9.7
11/24/2014	Rainbow	TAHOE	3286	9.2
		Total Rainbow	50,815	9.5
		Total Tiger	4,502	8.9

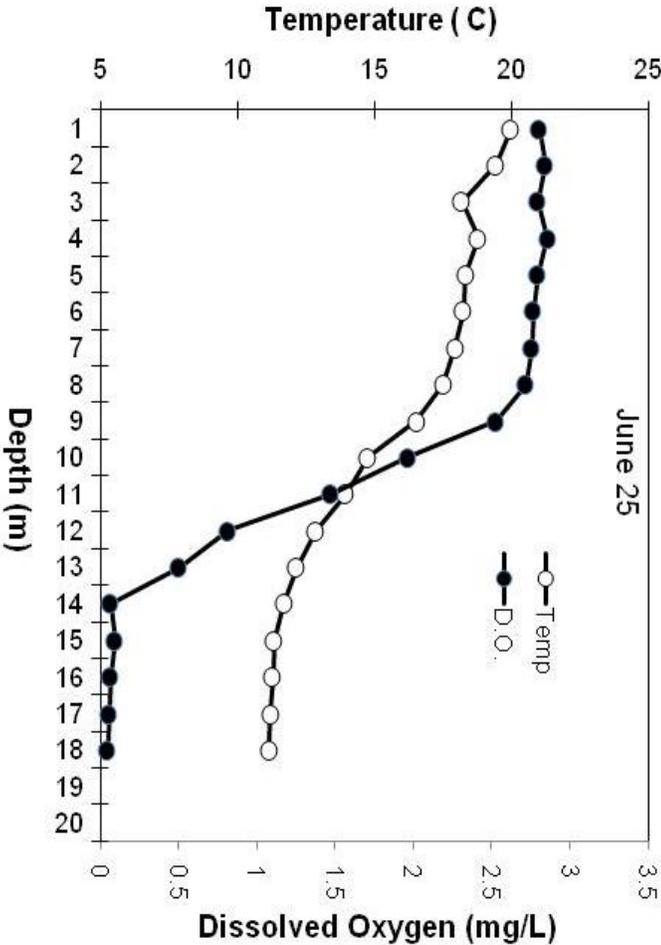
Table 5

Historical Stocking

Nevada Department of Wildlife				California Department of Fish and Wildlife				
		Number	Size (in)			Number	Size (in)	
2013	Rainbow	52,830	10.4	2013	Rainbow	25,200	6.5	
	Tiger	12,644	3.8					
	Bowcutt	4,752	9.5					
2012	Tiger Trout	5,010	10.0	2012	Rainbow	23,780	8.9	
	Rainbow	53,339	10.7					
2011	Rainbow	6,780	5.0	2011	Rainbow	15,600	6.2	
	Rainbow	50,110	9.6		Rainbow	10,000	7.1	
	Bowcutt	5,794	10.1					
2010	Rainbow	47,418	8.8	2010	Rainbow	12,812	6.3	
	Rainbow	36,562	3.3					
	Tiger	2,499	10.2					
	Tiger	1,582	3.0					
	Bowcutt	5,352	9.8					
	Largemouth	3,499	4.0					

Figure 2

Water Quality Profile, June 25, 2014

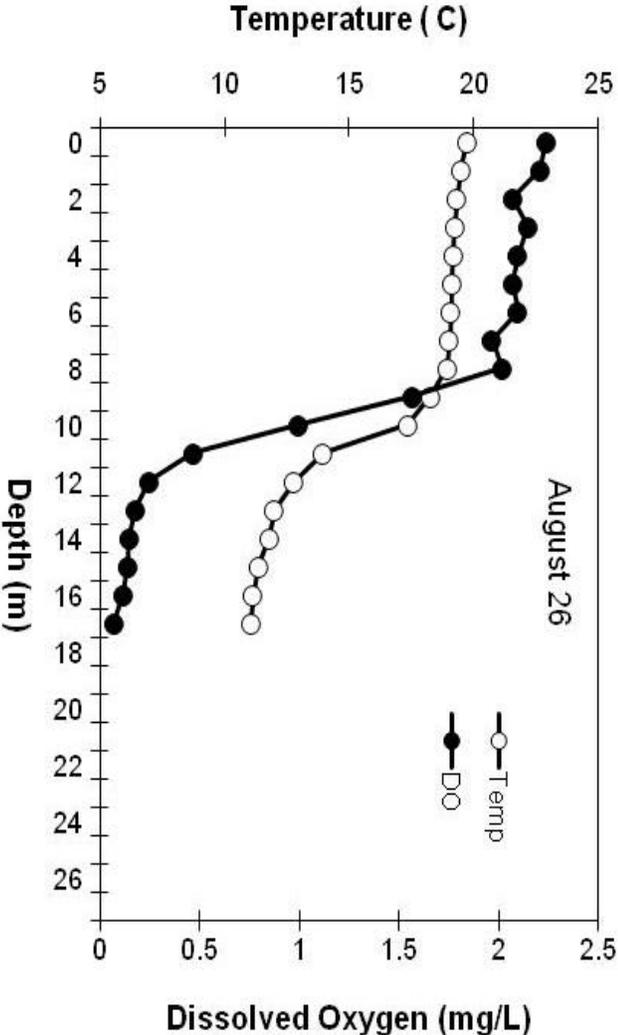


Secchi depth measurements were taken on each occasion when water quality data was recorded. The average depth of clarity was 13 ft (3.5 m), which is consistent with previous years' data.

Water storage reported in Figure 5 was taken from USGS gage number 10297000. Usable storage was measured from this gage, which was in addition to the 65,000 acre-ft at minimum pool. Reservoir levels remained low during 2014 and storage at the end of November was near the recent historic low observed during 2004. Average monthly storage during 2014 was the lowest recorded in the past 17 years. The reservoir peaked on May 28 at 9,320 acre-ft of usable water and the reservoir low was observed on October 26 at 2,220 acre-ft.

Figure 3

Water Quality Profile, August 26, 2014



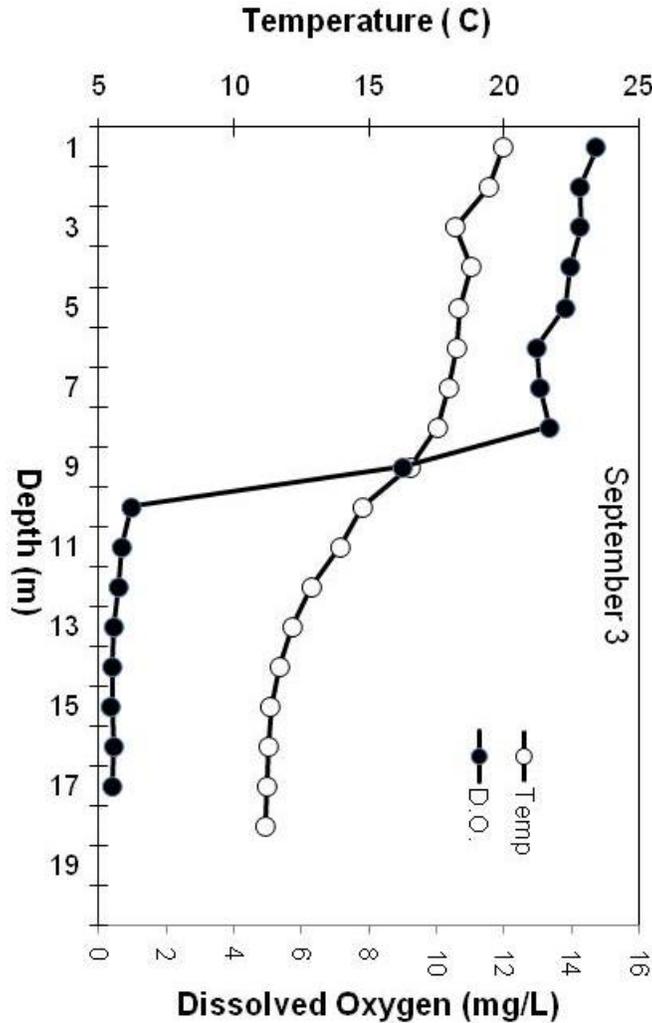
Water clarity fluctuates throughout the year at Topaz Lake. During winter, algae and macrophytes are reduced creating higher water clarity. During late summer and fall, water clarity diminishes and during moderate to heavy winds, visibility reduces to just a few feet. Adverse effects on sport fish survival and recruitment could be attributed to water level (e.g., lack of inundated vegetation for protection of juvenile black bass). Additionally, rising water temperatures combined with falling oxygen levels in summer due to a low water volume and increased surface area could affect trout survival.

Monitor for the presence of quagga mussels by conducting substrate sampling around boat docks and reservoir substrates when on site. Several substrate sampling methods for quagga mussels were used including tactile and visual

surveys of boat docks, buoys, submerged, and exposed rocks. Results have all been negative for detection of adult quagga mussels.

Figure 4

Water Quality Profile, September 3, 2014



Conduct quagga mussel veliger sampling through plankton tows at established transects at least three times per year. All samples have been negative for the presence of quagga mussel veligers.

Study Specific Objectives, Black Bass:

Install 20 artificial habitat structures, which will provide additional cover habitat for juvenile black bass. Twenty-two habitat structures were placed along the western shore on June 24 and 25. The project was successful and several different styles of structures were built (Figures 6-9). The smaller Mossback units appear to have greater surface area in a more confined space whereas the larger PVC tree designs have more space between crossbars. It is anticipated that adult fish will utilize

the larger units and juvenile bass will utilize the Mossback units. Previous artificial habitat structures were placed during 2011 and 2012 when reservoir levels were higher. These older structures were observed out of water and several yards away from the water's edge. Placement of the structures during 2014 was done when the storage level was near its lowest and, therefore, should provide protective cover for fish during drought conditions.

Figure 5

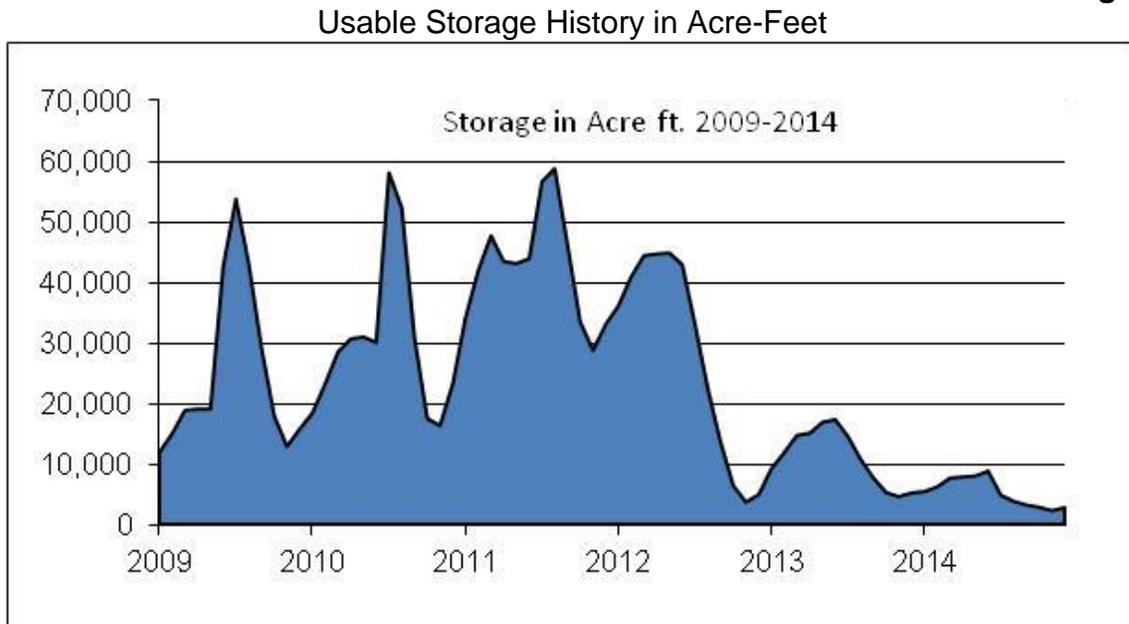


Figure 6

Mossback Rack Construction



Lay Down PVC Units

Figure 7



PVC Tree Design

Figure 8





Conduct beach seine surveys at least three times during the spring and early summer near artificial habitat structures. Beach seining surveys were not conducted during 2014.

Monitor habitat structures and spawning activity through snorkeling surveys during summer. Snorkel surveys during August and September resulted in observing four adult smallmouth bass of an estimated size range between 14 and 16 in. No juveniles were observed. Aquatic vegetation had already grown on the units and visibility was reduced due to macrophyte and suspended algae in the hypolimnion. Therefore, fish observation efficiency was likely low. Secchi disk measurements were up to 10 ft during snorkel efforts, it is likely that fish escaped prior to being observed or positively identified.

Study Specific Objectives Rainbow Trout:

Use data collected through opportunistic angler contacts and return of angler drop-box surveys and tagged fish returns to evaluate differences in strains. Table 6 shows growth and catch rate returns of tagged fish as of December 31, 2014. Bowcutt trout dominated the catch during the five-year study. Highlighted cells in Table 6 represent the highest performing strain for that particular category. Several factors made identifying the “best strain” to use difficult, which included age of fish at stocking, feed rationing at the hatchery, predation rates, annual water quality differences in the reservoir, angler participation rates, and quality of data provided by anglers. One additional fish was added to the study during 2014, a Tahoe strain fish

that was caught during 2011 but not reported until 2014. The final study report is attached as Addendum 1.

Table 6

Tagged fish returns as of December 31, 2014.

All values in inches	Tahoe	Bel Air	Bowcutt	Eagle Lake
Number tagged returns	29	17	96	18
Average Size at Stocking	9.94	9.24	11.05	9.08
Average size of Return	13.42	11.49	14.34	12.64
Ave number of Growth Days	212	149	175	154
Max size	18	14	20	15.75
Average growth	3.48	2.25	3.29	3.56
Average growth per month	0.51	0.47	0.58	0.72
Percentage of tagged returns	1.45	0.85	4.8	0.9
Number of fish carried over, next season	5	0	8	0
Average size of fish carried over	15.8	NA	17.4	NA

MANAGEMENT REVIEW

The 2013 Mail-in Angler Questionnaire Survey suggests that numbers of fish caught and days spent angling were much lower than was reported during previous years. Catch rates reported from the 2013 mail-in survey, 2013 drop-box, and 2014 contact creel survey suggest that management objectives are being met with the exception of average trout caught per day. The high summertime temperatures and low oxygen levels experienced during 2013 and 2014 have likely lead to limited trout carryover.

Monitoring for adult quagga mussels through tactile and visual inspection of boat docks, buoys, and substrates should continue annually. Monitoring for veligers should also continue. All results have been negative.

The rainbow trout study initiated in 2010 to determine the effectiveness (growth and catch rates) of stocking Bel Air, Tahoe, and Eagle Lake strains of rainbow trout and bowcutt trout continued during 2014. Results suggest that bowcutt trout are out-performing the other strains. The Bel Air strain has not been used previously in Nevada; however, adjacent states such as Oregon use it with success. An in-depth analysis of strain performance was conducted at the conclusion of the 2014 fishing season and is included as Addendum 1. Various species of trout including rainbow trout, tiger trout, brown trout, and cuttbow trout should be stocked based on habitat, fish availability, and the results of the trout study.

A black bass study was initiated in 2014. Addition of protective cover for juvenile bass was completed and further study of populations and habitat will determine if artificial habitat results in an increase in catch rate, maximum size, or relative abundance. Artificial habitat was placed where cover was limited and monitored during

the summer, only four adults were observed utilizing the structures during the fall. In addition to providing cover for juvenile bass, artificial habitat should also provide protection for other forage species inhabiting Topaz Lake.

RECOMMENDATIONS

General Management Objectives:

- Conduct a general fisheries assessment through opportunistic angler contacts, return of angler drop-box surveys, and mail-in, angler questionnaire data.
- Monitor lake level and clarity when onsite.
- Monitor for the presence of quagga mussels by conducting tactile surveys around boat docks and reservoir substrates at least three times per year.
- Conduct quagga mussel veliger sampling through plankton tows at established transects at least three times per year.

Study Specific Objectives, Black Bass:

- Conduct beach seining surveys at least three times during spring and early summer near artificial habitat structures.
- Monitor habitat structures and spawning activity through snorkeling surveys during summer.

Prepared by: Kris Urquhart
Biologist III, Western Region

Date: February 2015

NEVADA DEPARTMENT OF WILDLIFE



Topaz Lake Trout Study Completion Report SFY11-SFY15



**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
TOPAZ LAKE STUDY COMPLETION REPORT**

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**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION
STUDY COMPLETION REPORT**

State: Nevada
Project Title: Statewide Fisheries Program
Job Title: Topaz Lake Trout Study
Period Covered: SFY11 through SFY15

SUMMARY

A study aimed at assessing the rainbow trout fishery was initiated during 2010. Growth and catch rates of four strains of trout (bowcutt trout, and Eagle Lake, Bel Air, and Tahoe strains of rainbow trout) were evaluated. Results from the study indicate that anglers show better catch rates for bowcutt trout, which also had the greatest average size of fish returned to creel and the most fish carried over to the next fishing season. Eagle Lake strain rainbow trout had the highest growth rates. However, these differences could be attributed to the size, age, behavior, or hatchery conditions and not necessarily reflective of the strains themselves.

BACKGROUND

The Nevada/California border about equally divides Topaz Lake, but it is owned and operated by the Walker River Irrigation District (WRID). Nevada Department of Wildlife (NDOW) and California Department of Fish and Wildlife (CDFW), nonetheless, share fishery management responsibilities. Both agencies collectively have established a significant coldwater fishery in the reservoir. The earliest record of stocking by Nevada occurred in 1930 with black bass (*Micropterus* sp.), and since then, the lake has been stocked abundantly with rainbow trout (*Oncorhynchus mykiss*). Other stocked fishes have included brown trout (*Salmo trutta*), kokanee salmon (*O. nerka*), Lahontan cutthroat trout (*O. clarkii henshawi*), bowcutt trout (a hybrid between cutthroat and rainbow trout), tiger trout (a hybrid between brown trout and eastern brook trout, *Salvelinus fontinalis*), and black bullheads (*Ictalurus melas*). Common carp (*Cyprinus carpio*) also exist. Today, however, rainbow and bowcutt trout make up the principal sport fishery; other fishes such as tiger trout, black bass, and occasionally brown trout encompass a minor fishery. The native fish community is comprised of mountain whitefish (*Prosopium williamsoni*), Tahoe sucker (*Catostomus tahoensis*), Lahontan tui chub (*Siphateles bicolor obesus*), Lahontan reddsides (*Richardsonius egregious*), and speckled dace (*Rhinichthys osculus*).

Topaz Lake fishing season is open from January 1 to September 30. The fishing regulation states: Fishing is legal from 1 hr before sunrise to 2 hrs after sunset, except for the area within the jetties of Topaz Marina, which is closed to fishing. Limit is 5 trout, 10 mountain whitefish, and 15 warmwater game fish of which not more than 5 may be black bass.

There are two major boat-launching facilities, Topaz Landing and Douglas County Park. Topaz Landing is privately owned with a fee for launching, while Douglas County Parks has public boat launching at a fee. The Douglas County boat ramp is large enough for multiple launchings and can be used even at a low lake elevation. There is a fish

cleaning station, camping sites, and restrooms. A drop-box near the Douglas County boat launch was installed in 2010 to collect basic angler information including hours spent fishing, number of fish caught, general size of fish and species. Douglas County Parks is open from January 1 to September 30.

Water storage typically declines during late summer, as water demands remain high. As the irrigation season ends in October, the water level increases throughout winter. Crop irrigation begins in mid-April and river runoff typically peaks shortly after and reaches maximum capacity for the year.

Maximum pool is 125,000 acre-ft, but usable storage, governed by the depth of the outlet, is about 59,500 acre-ft. At minimum stage (65,000 acre-ft), the reservoir reaches a depth of 59 ft. At full storage, maximum depth approaches 92 ft and the mean depth is 52 ft. It has 2,410 SA and sits at 5,005 ft above mean sea level when full.

STUDY OBJECTIVE

Evaluating various strains of rainbow trout in Topaz Lake will provide a better understanding of their performance in Topaz Lake and possibly similar waters. Further management decisions will depend on the results of this evaluation. Biological data (growth rate and life span) was collected through angler information (contact creel surveys, drop-box surveys, and tagged fish returns) as well as population survey methods (gill netting, beach seining, and electrofishing). Catch rates and angler satisfaction information was collected through angler creel surveys, drop-box surveys, and tagged fish returns.

STUDY APPROACHES

- Floy tag (number and color specific) and measure length of 1,000 Bel Air strain rainbow trout, 1,000 Tahoe strain rainbow trout, 1,000 Eagle Lake strain rainbow trout, and 1,000 bowcutt trout prior to stocking.
- Use data collected through angler contacts and return of angler drop-box surveys to observe differences in strains caught.
- Use data from population monitoring through gill netting four net nights during spring at four established locations (north, south, east, and west shores) to observe differences in strains caught.
- Use data from population monitoring through electrofishing during spring at four established locations (north, south, east, and west shores) to observe differences in strains caught.
- Use data from population monitoring through beach seining during spring at four established locations along the north and east shores to observe differences in strains caught.
- Use data collected through angler caught tagged fish returns to observe differences in strains caught.
- Monitor lake level (USGS gauge number 10297000) in acre-ft and water quality (dissolved oxygen and temperature) to evaluate trout tolerance levels.

STUDY PROCEDURE AND RESULTS

Floy tag (number and color specific) and measure length of 1,000 Bel Air strain rainbow trout, 1,000 Tahoe strain rainbow trout, 1,000 Eagle Lake strain rainbow trout and 1,000 bowcutt trout prior to stocking. There were concurrent study areas in which tagged rainbow trout were being evaluated and, therefore, trout were tagged at Mason Valley Hatchery and split evenly into Hinkson Slough and Topaz Lake allocations. Anesthesia involved either of two chemicals, Aqui-s (clove oil based) and MS-222.

Tags used were FD-94, 3/4 inch monofilament Long T manufactured by Floy Tag & MFG., INC. A total of 2,000 Tahoe strain rainbow trout were identified with yellow tags placed near the dorsal fin. Tags were individually numbered from 0001 to 2,000. An additional 2,000 Bel Air strain rainbow trout were tagged with red tags placed near the dorsal fin and individually numbered from 2,001 to 4,000. A total of 2,000 fish were tagged with white tags placed near the dorsal fin of bowcutt trout individually numbered from 4001 to 6,000. An additional 2,000 Eagle Lake strain rainbow trout were tagged with blue tags placed near the dorsal fin and individually numbered from 6001 to 8,000. Two Bel Air strain rainbow trout and five bowcutt trout were removed from the Topaz allocation prior to stocking due to post tagging mortality, therefore, a total of 998 Bel Air strain rainbow trout and 1,000 Tahoe strain rainbow trout were stocked on October 11, 2010. A total of 1,000 Eagle Lake strain rainbow trout and 995 bowcutt trout were stocked on October 6, 2011. Each fish was measured to the nearest millimeter in total length during tagging.

Use data collected through angler creel contacts and return of angler drop-box surveys to evaluate differences in strains. Volunteer angler survey forms (Figures 1 and 2) were collected from a single drop-box located next to the Douglas County boat ramp. Information obtained from anglers for drop-box surveys and angler contacts included total time fished and number, size, and species of fish caught as well as any tagged fish information including color and number. Data collected from creel contacts and drop-box forms was combined for analysis.

Anglers providing appropriate data and a return address were sent a certificate of appreciation for participating in the program (Figure 3). One hundred thirty-four certificates were sent to anglers who indicated they were interested in receiving specific information about their fish.

Use data from population monitoring through gill netting four net nights during spring at four established locations (north, south, east and west shores) to observe differences in strains caught. Gill nets were set during June 2011 and June 2012. Nets were allowed to fish overnight for a total of 183 net-hours and the data was combined for this analysis. Locations were chosen based on many factors including public safety, creel information, historical locations, and reservoir levels. Nets were set along the north shore near the western edge of the buoys, the western shore on the south end in the major bay, the eastern shore in the middle bay, and near the river inlet on the south end. Nets were set at a 90-degree angle to the shore and anchored with three pound weights. Monofilament nets were 120 ft long and 6 ft deep, and had mesh sizes that ranged from 0.5 inches to 2.5 inches, which increased in increments of 0.5 inches every 20 feet.

Figure 3

Certificate of Appreciation

	<p>CERTIFICATE OF APPRECIATION AWARDED TO</p> <p>Steve Neilson</p>																									
<p>Tagged Fish Data:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Tag Number:</td> <td>4703</td> <td>Egg From:</td> <td>Marlette Lake</td> </tr> <tr> <td>Tag Color:</td> <td>White</td> <td>Date Hatched:</td> <td>7/25/2010</td> </tr> <tr> <td>Date Tagged:</td> <td>10/4/2011</td> <td>Tagging Length:</td> <td>9.2 inches</td> </tr> <tr> <td>Location Tagged:</td> <td>Mason Valley Hatchery</td> <td>Harvest Length:</td> <td>12.4 inches</td> </tr> <tr> <td>Tagger:</td> <td>Travis Hawks</td> <td>Date of Harvest:</td> <td>3/10/2012</td> </tr> <tr> <td>Stocked by:</td> <td>NDOW</td> <td>Strain:</td> <td>Bow-Cutt</td> </tr> </table> <p>Thank you for reporting your catch and helping us manage your sport fishery.</p>			Tag Number:	4703	Egg From:	Marlette Lake	Tag Color:	White	Date Hatched:	7/25/2010	Date Tagged:	10/4/2011	Tagging Length:	9.2 inches	Location Tagged:	Mason Valley Hatchery	Harvest Length:	12.4 inches	Tagger:	Travis Hawks	Date of Harvest:	3/10/2012	Stocked by:	NDOW	Strain:	Bow-Cutt
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<p>Kris Urquhart Biologist, Fisheries Division Nevada Department of Wildlife</p>																										

Tui chub dominated the catch (n=304) and averaged 11.8 inches. Tahoe and mountain suckers were combined (n=45) and averaged 13.0 inches. Smallmouth bass (n=35) averaged 14.8 inches. One largemouth bass (3.9 in), one mountain whitefish (14.4 in), three Lahontan reddsides and one speckled dace were also caught. Trout species identified during gill netting included rainbow trout (n=7, averaged 14.5 in). Tiger trout (n=3, averaged 11.1 in) and one bowcutt trout measured 20.0 in. Even though gill netting was successful in catching trout, it was unsuccessful in capturing tagged trout therefore data was excluded from further analysis in this study.

Use data from population monitoring through electrofishing during spring at four established locations (north, south, east and west shores) to observe differences in strains caught. Electrofishing occurred near gill net locations and was completed on the evening of June 14, 2011. The electroshocker was an 18 ft Smith-Root aluminum boat with two 24 in “spider” anodes and set at 60 V pulsed DC at 20-30% of range. There were four transects sampled for approximately 5-10 min. Total accumulated time electrofishing was 23 min. Data recorded included species of fish, length of fish, number of fish, electrofisher settings, sampling time, and general health of all fish caught.

Tui chub dominated the catch (n=16) and averaged 11.8 in. Two mountain suckers were also caught that averaged 12.2 in. No trout were caught; therefore, electrofishing data was removed from further analysis during this study.

Use data from population monitoring through beach seining during spring at four established locations along the north and east shores to observe difference in strains caught. Beach seining surveys were conducted during August of 2011 and 2012 along the northern shore, the western shore, and near the southern shore where the canal enters the lake. The seine was 6 ft high and 50 ft wide with a 6 ft by 6 ft purse in the middle. The seine was pulled parallel to shore for 200 ft at each location. The 2011 and 2012 data was combined for analysis.

Smallmouth bass dominated the catch (n=829) and averaged 2.5 inches. Tui chub were also caught and 783 averaged 1.8 inches. Tahoe and mountain suckers were combined (n= 207) and averaged 1.5 inches. No trout were caught; therefore, beach seining data was removed from further analysis during this study.

Use data collected through angler caught tagged fish returns to observe differences in strains caught. Table 1 shows growth and catch rate returns of tagged fish as of December 31, 2014. Bowcutt trout dominated the catch during the five-year study. Highlighted cells in Table 1 represent the highest performing strain for that particular category.

Table 1

Tagged Fish Returns as of December 31, 2014.

All size values in inches	Tahoe	Bel Air	Bowcutt	Eagle Lake
Number tagged returns	29	17	96	18
Average size at tagging	9.94	9.24	11.05	9.08
Average size of return	13.42	11.49	14.34	12.64
Ave number of growth days	212	149	175	154
Maximum size	18	14	20	15.75
Average growth	3.48	2.25	3.29	3.56
Average growth per month	0.51	0.47	0.58	0.72
Percentage of tagged returns	1.45	0.85	4.8	0.9
Number of fish carried over, next season	5	0	8	0
Average size of fish carried over	15.8	NA	17.4	NA
Age of fish from egg hatch to tagging (days)	461	313	436	258

Monitor lake level (USGS gauge number 1029700) in acre feet and water quality (dissolved oxygen and temperature) to evaluate trout tolerance levels. The thermocline was observed each year during late summer throughout the study period (Figure 4). Suitable trout temperature and dissolved oxygen levels were limited to a few meters of the hypolimnion during each year, this was likely to have reduced the number of fish surviving from one fishing season to the next. A few carryover fish were observed each year during the study, however, only Tahoe strain and bowcutt trout were confirmed via Floy tags to have survived through the summer and fall.

Storage levels observed (Figure 5) are in addition to the minimum stage (65,000 acre-ft). During the first two years of the study, storage levels followed typical historical cycles. During 2012, however, the Walker Basin entered into a drought (which has persisted into 2015).

Figure 4

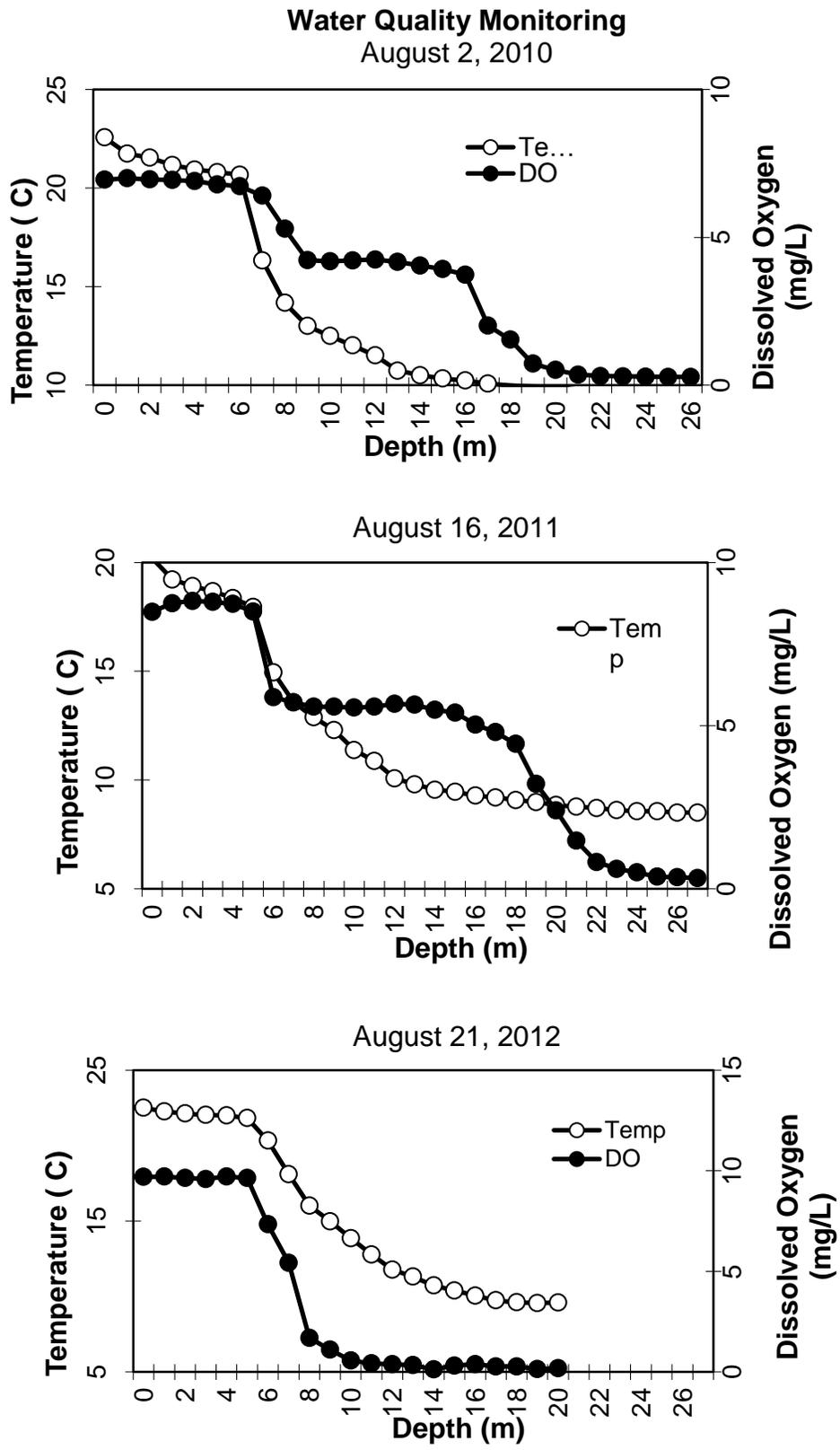
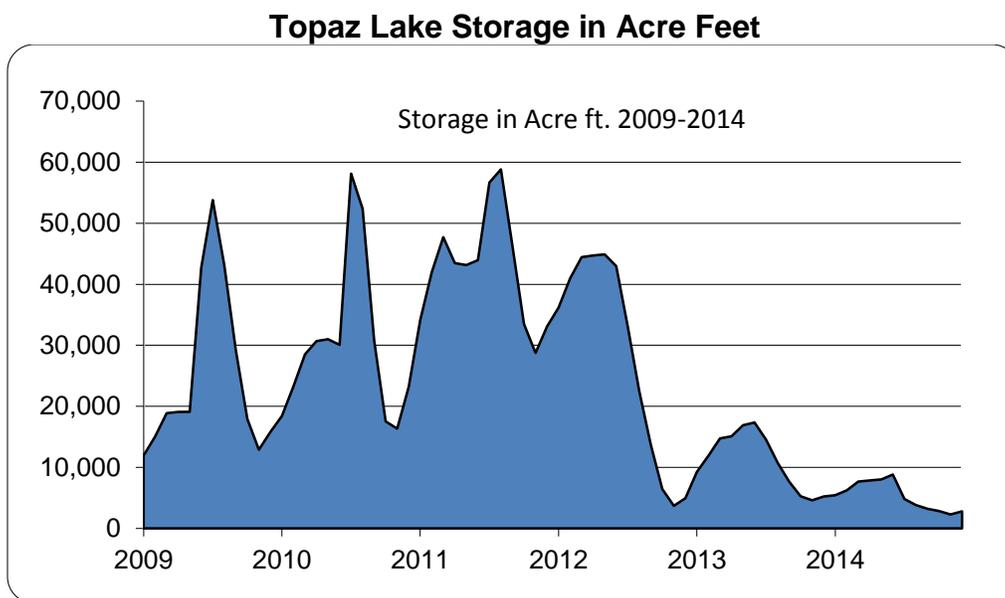


Figure 5



STUDY REVIEW AND DISCUSSION

The rainbow trout study, implemented during 2010, to determine the effectiveness (growth and catch rates) of the Bel Air strain rainbow trout in Topaz Lake compared to other commonly used strains such as Tahoe and Eagle Lake strains of rainbow trout as well as bowcutt trout, was completed during 2014. The Bel Air strain had not been used previously in Nevada; however, adjacent states such as Oregon have been using it with success. Results indicate that Bel Air strain rainbow trout catch rates, growth rates, maximum size, and ability to carry over to subsequent fishing seasons fell short of other rainbow trout strains and bowcutt trout evaluated. Results also suggest that bowcutt trout have a higher catch rate, larger maximum size, and better ability to survive to the next fishing season than the other rainbow strains. Eagle Lake strain rainbow trout had the highest growth rate during the study period and Tahoe strain rainbow trout were caught, on average, later in the fishing season than the other strains.

Not all factors were equal for each strain during the study, which made it difficult to conclusively identify the “best strain” for use in Topaz Lake. These factors include age of fish at stocking, size of fish stocking, feed rationing at the hatchery, grading of sizes during hatchery production, predation rates, annual reservoir water quality differences, angler participation, individual strain behavior, and quality of volunteer data collected by anglers. For instance, even though bowcutt trout and Eagle Lake strain trout were tagged one day apart from each other at the hatchery, they were far apart in age and size prior to stocking (one week after tagging). Hatchery reared rainbow trout have been studied extensively, for example, it is known that younger fish (Eagle Lake strain in this case) have a higher growth rate and larger fish (bowcutt trout in this case) have a higher percentage of return to creel. Therefore the differences observed during this study may not be attributed solely to strain, but rather to general hatchery reared trout characteristics. The United States Fish and Wildlife Service has a continuing study aimed at assessing American pelican foraging habits for birds that nest on Anaho Island at Pyramid Lake. During their study, 40 Floy tags

were recovered on the island that originated from this study (fish from either Hinkson Slough or Topaz Lake). Of these recovered tags, 38 were Eagle Lake strain rainbow trout and 2 were Bel Air strain. Size of these fish at tagging was 8.54 in, which suggests that either the smallest fish from the smallest lot were more easily preyed upon, the Floy tag color was more readily seen by the predators, or the behavior of Eagle Lake strain made them more susceptible to predation (e.g., swimming near the surface).

RECOMMENDATIONS

More research is needed to conclusively determine which strain has the ability to provide higher growth rates, more carry over fish, and provide anglers with higher catch rates in Topaz Lake. However, based on the results of this study, managers should 1) rear trout to a larger size in the hatchery prior to stocking and 2) use bowcutt trout as the preferred strain. Future research should attempt to use different strains of fish that are hatched near the same date, hatchery conditions should be kept identical (feed rates, grading, same number of fish per raceway, etc.), and the same color of Floy tag should be used for all strains to eliminate differences in predation and angler detection rates.

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