FISHERY MANAGEMENT INVESTIGATIONS

IDAHO DEPARTMENT OF FISH AND GAME

FISHERY MANAGEMENT ANNUAL REPORT

Virgil Moore, Director

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LOWLAND LAKE AND RESERVOIR INVENTORIES AND SURVEYS

ABSTRACT

In 2010, Johnson Reservoir was identified as an underperforming fishery. In 2011, 2012 2013 and 2014 we stocked a total 223 Largemouth Bass *Micropterus salmoides* (LMB) over 270 mm to improve the size structure of the Bluegill *Lepomis macrochirus* population. The Bluegill proportional stock densities (PSD) increased from 2 in 2010 to 54 in 2014. Likewise LMB PSD increased from 12 to 26 during the same time frame. Bear Lake was trawled for Bear Lake Sculpin *Cottus extensus* during August. We captured an average of 25 adult sculpin per trawl which converts to a minimum population estimate of about 1 million, the lowest abundance observed in several years. Double-crested Cormorants *Phalakros auritus* (DCC) caused significant losses of hatchery Rainbow Trout *Oncorhynchus mykiss* (RBT) in Foster, Glendale, Treasureton, Johnson and Lamont Reservoirs in 2014. Overall we estimated that at a minimum, 5,437 RBT were consumed by DCC in 2014 at a production cost of about $5,576. The American white pelican *Pelecanus erythrorhynchos* and DCC continue to cause significant losses of hatchery RBT stocked into Chesterfield Reservoir. In 2014, we estimated the loss of RBT to be about 2,024 at a production cost of about $5,060. Edson Fichter Pond was renovated with Synpren© Fish Toxicant (2.5% rotenone) on 17 September 2014. Following treatment, a total of 209 Kg (460 lbs) of fish were removed from the pond. Carp/Koi *Cyprinus carpio* was the most abundant species recovered and comprised 95% (200 Kg) of the total weight of fish removed from the pond. Rainbow Trout were also recovered from the pond but only represented 4% by weight. Yellow Perch *Perca flavescens* and Green Sunfish *Lepomis cyanellus* were removed from the pond but their combined weight was less than one Kilogram.

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Johnson Reservoir

Introduction and Methods

Johnson Reservoir is located in Franklin County near Preston, Idaho. When full, Johnson Reservoir covers approximately 20 hectares and has an elevation of 1,485 meters. The reservoir is used primarily for irrigation storage but also provides angling opportunities for Largemouth Bass *Micropterus salmoides* (LMB), Bluegill *Lepomis macrochirus* (BG), Yellow Perch *Perca flavescens* and Rainbow Trout *Oncorhynchus mykiss*. Tiger Muskies *Esox lucius x E. masquinongy* were stocked in the past to provide a trophy component and to help reduce an over-abundance of BG less than 170 mm. The tiger musky program, however, was criticized by anglers and was discontinued.

During 2010 we identified Johnson Reservoir as an underperforming fishery due its high catch rates of undesirable sized BG. Over the past decade, BG Proportional Stock Density (PSD) has been well below what should be observed in a balanced population (50%-80%; Table 1). In an attempt to improve the size structure of the BG fishery, we began transferring LMB into Johnson Reservoir. During 2011-2014, we collected LMB from surrounding Franklin County reservoirs and relocated them to Johnson Reservoir. All LMB transferred to Johnson were large enough (≥ 275 mm) to prey on juvenile BG.

Predator and prey populations were monitored using boat mounted electrofishing gear. All fish captured were weighed (g), measured (mm; TL) and released. To avoid sampling newly stocked LMB, all surveys were conducted prior to LMB transfers.

Results and Discussion

The predator enhancement program appears to be having the desired impact on improving the PSD of BG. In 2010 and 2011 (prior to the implementation of this project) the BG Proportion Stock Density (PSD) was two and six percent, respectively. The BG PSD increased substantially to 31% in 2012 and again to 40% in 2013. In 2014, BG PSD was 54%; the highest PSD ever observed (Table 1; Figure 1). Even though the current BG PSD of 54% falls within the range recommended by Gabelhouse (1984; 50% to 80%), a BG PSD of 65%-70% is likely needed to restore angler participation in the fishery.

Overall, Bluegill relative weight (Wr) has increased over the course of the project. In both 2010 and 2011 (prior to LMB augmentation) BG Wr was similar at 87%. However in 2012, 2013 and 2014, BG Wr was 98%, 93% and 95%, respectively; all significantly higher than in 2010 and 2011(ANOVA; F=19.782; df=4; P=0.000). Even though Wr has not yet reached 100%, the values observed in 2012, 2013 and 2014 indicate good body condition and appropriate abundance for the available habitat.

Table 1. Catch-per-hour of electrofishing effort from Johnson Reservoir during 2010-2014. Proportional Stock Density values for Largemouth Bass (LMB) and Bluegill (BG) are shown in parenthesis.

Species	2002		2006		2010		2011		2012		2013		2014	
LMB	54	(7)	20	(0)	108	(12)	217	(26)	179	(17)	170	(17)	5	(26)
BG	305	(24)	240	(10)	297	(2)	417	(6)	1004	(31)	757	(40)	290	(54)

Historically, LMB PSD has been low in Johnson Reservoir. Largemouth Bass PSD has not reached at least 40% (Ideal range 40%-60%) in the last 10 Years (Table 1). Chronically low LMB PSDs likely explain the imbalance in the BG population.

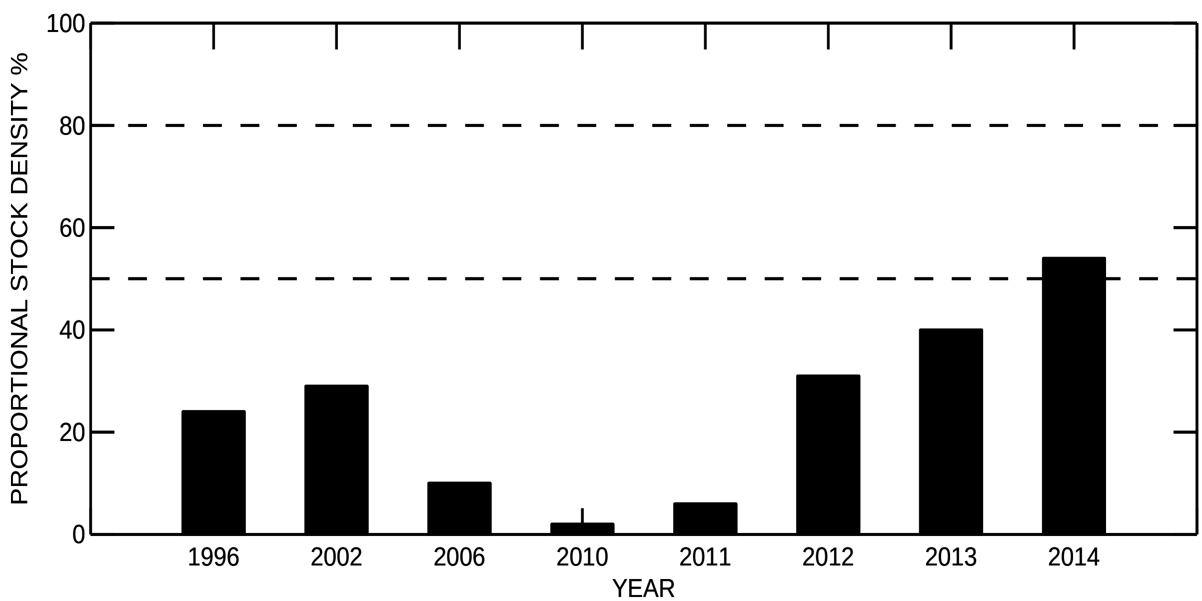

Figure 1. Proportional Stock Densities (PSD) of Bluegill collected from Johnson Reservoir, Idaho, over the past 18 years. The area between the horizontal dashed lines represents the ideal range of Bluegill PSD.

Largemouth Bass transfers occurred in June of 2011, October of 2012, June of 2013, and again in June of 2014. On 18 June, we transferred 31 LMB collected from Glendale and 23 LMB collected from Treasureton Reservoirs to Johnson Reservoir. These LMB had a mean length and weight of 362mm and 858g, respectively. Size of LMB transferred to Johnson Reservoir in previous years is presented in Table 2.

Table 2. Number, mean length and mean weight of Largemouth Bass transferred to Johnson Reservoir, Idaho, from 2011-2014.

Year	Number	Length (mm)	Weight (g)
2011	114	380	726
2012	22	292	502
2013	33	378	805
2014	54	362	858

In summary, the BG population in Johnson Reservoir appears to be responding positively to augmentation of LMB. However, LMB PSD remains well below objective. A polymodal size structure is indicative of a population not over exploited by anglers. However, the LMB population in Johnson Reservoir shows a unimodal size distribution which indicates the LMB fishery is over exploited (Figure 2; Beamish et. al 2006). Other area reservoirs also have over exploited LMB fisheries (Figure 3). To maintain both LMB and BG PSDs in the recommended ranges, a permanent solution is needed. Currently, LMB are managed in Johnson Reservoir under general fishing regulations (6 LMB, none <12 inches). Figure 2 shows that when LMB reach the legal harvest length of 12 inches (305mm), they are largely removed from the fishery by anglers. To that end, a regulation change that would leave LMB in the fishery a few years longer would likely keep LMB and BG PSDs within the recommended ranges. Therefore we recommend the LMB legal harvest length be raised from 12 inches to 14 inches on all area waters during the next fishing regulation cycle. This recommended change would only apply to waters that are currently managed under general fishing rules.

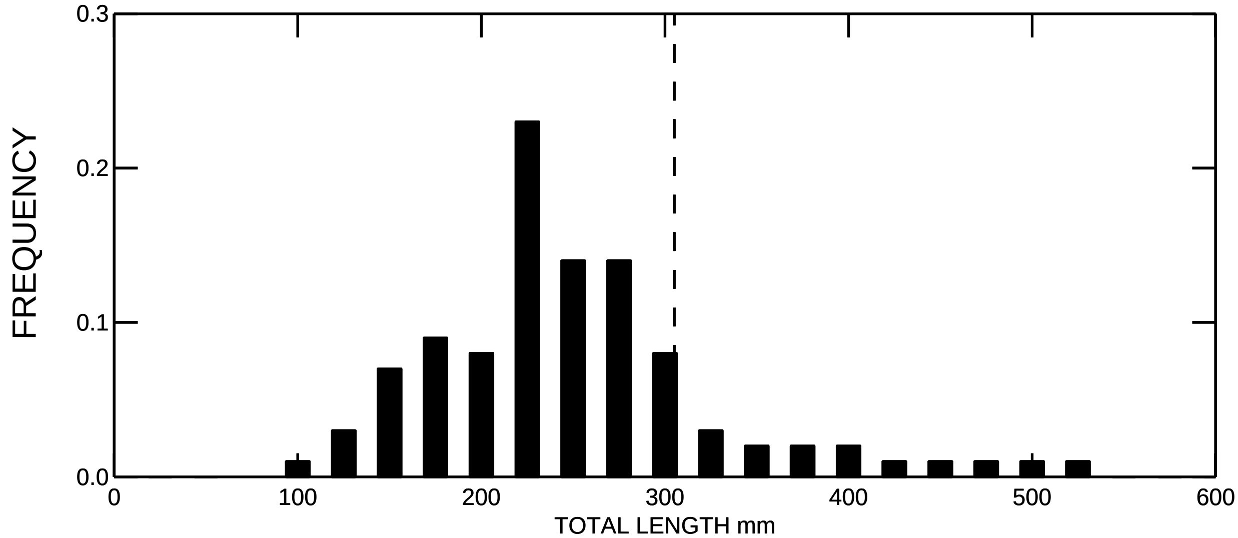

Figure 2. Relative length frequency distribution of Largemouth Bass collected from Johnson Reservoir, Idaho, in 2010-2014. The vertical dashed line at 305 mm (12 inches) represents when Largemouth Bass can be legally harvested.

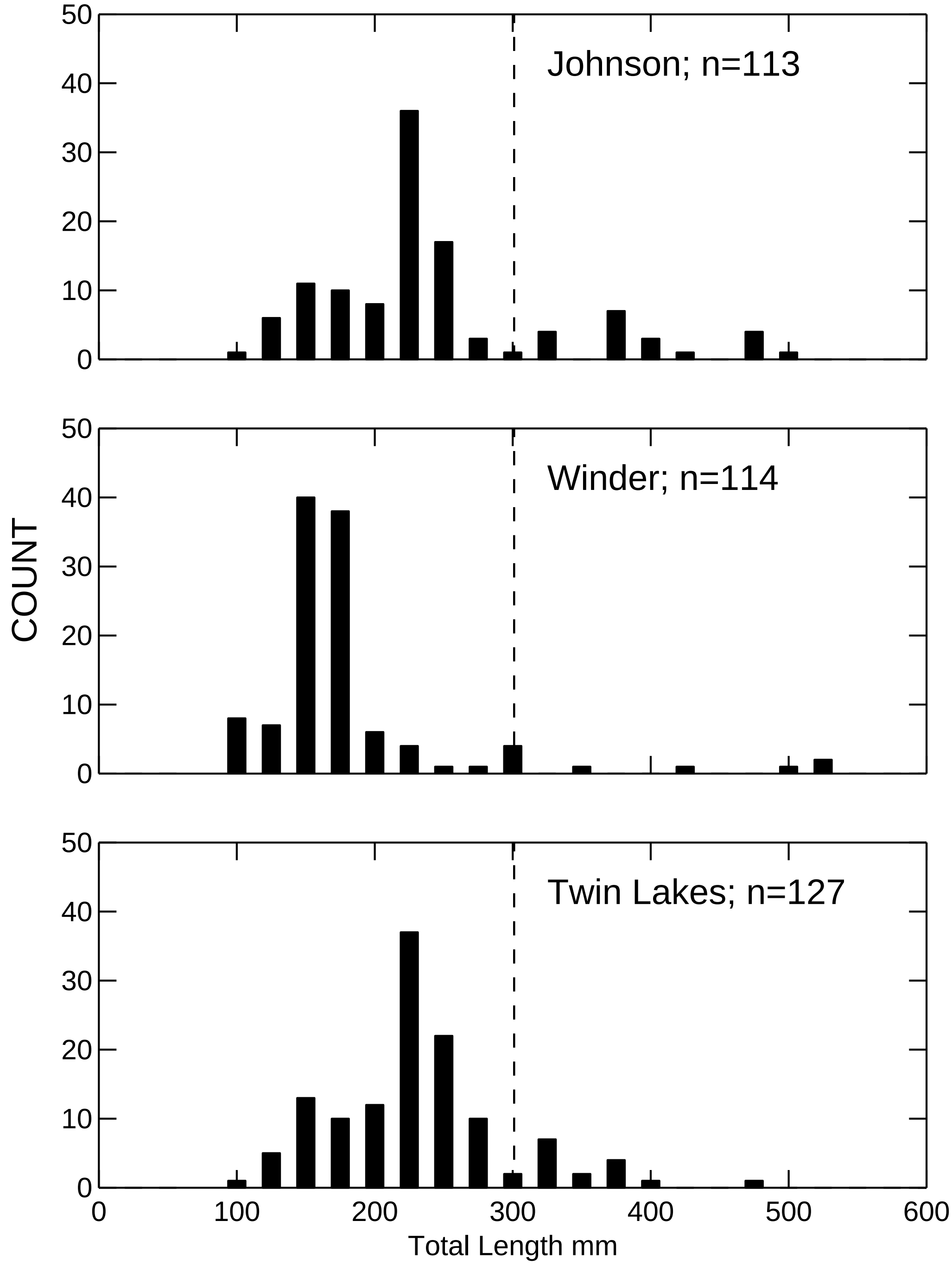

Figure 3. Length frequency histograms of Largemouth Bass (LMB) collected from three Southeast Idaho reservoirs in 2011. All waters are managed under general fishing regulations. The vertical dashed line indicates when LMB can be legally harvested.

<u>Bear Lake Sculpin Trawling</u>

Introduction and Methods

Bear Lake is a 28,328 hectare lake located in northern Utah and southeast Idaho. The Utah-Idaho border roughly bisects the 32 km long lake in half and the lake is 8-13 km in width. It has a maximum elevation of 1,806 m above sea level. The maximum depth, when at full pool, is 63 m and average depth is 26 m. Most of the lake bed is covered in fine marl sediment. Primary and secondary production are thought to be limited by precipitation of calcium carbonate, which strips phosphorous from the water column (Birdsey 1989). The precipitate also gives the lake its famous turquoise iridescence.

St. Charles, Swan, Big Spring, and Fish Haven creeks are the primary natural tributaries to the lake. In addition to the natural tributaries, The Bear River is diverted into Bear Lake. In 1911, a canal was constructed to divert the Bear River at Stewart Dam into Bear Lake. The water delivery system stores spring runoff water in Mud Lake which gravity flows into the northeast corner of Bear Lake. Pacific Corp operates, through a legal decree (Kimball Decree), the top 6.4 m of the lake as irrigation storage. The stored water is pumped out of the lake during the summer irrigation season and delivered back to the Bear River through the outlet canal.

Bear Lake's fish community supports four endemic species: Bonneville Whitefish (*Prosopium spilonotus*), Bear Lake Whitefish (*P. abyssicola*), Bonneville Cisco (*P. gemmifer*), and Bear Lake Sculpin (*Cottus extensus*). Bear Lake also supports one of two remaining native adfluvial stocks of Bonneville Cutthroat Trout (*Oncorhynchus clarkii utah*).

In 2010 the Bear Lake Management Plan (Plan) was finalized. The Plan specifically outlined a monitoring program for Bear Lake Sculpin. Bear Lake Sculpin (Sculpin) have been monitored since the 1980's first by Utah State University and later by the State of Utah. In 2010, Idaho Department of Fish and Game took over monitoring responsibilities. The management objective for Bear Lake Sculpin, as stated in the Plan, is to maintain a minimum population of 1-2 million adult Sculpin which translates to a mean density of 25 – 50 age 1(or older) Sculpin captured per trawl. If Sculpin numbers fall below a mean density of 25 adult Sculpin per trawl (1 million Sculpin) then Lake Trout (*Salvelinus namaycush*) stocking will cease and Cutthroat Trout stocking maybe reduced until the Sculpin population rebounds. Bear Lake Sculpin monitoring occurs biennially with the next sampling effort scheduled for 2016. For complete details on the Bear Lake Management Plan see Tolentino and Teuscher 2010.

Bear Lake Sculpin were sampled during the new moon phase in August. We sampled Sculpin with a semi-balloon otter trawl with a head rope of 4.9 m attached to two otter boards. The net had a mesh size of 12.7 mm with the cod-end containing a 5.0 mm mesh liner. We sampled at three locations (First Point, Gus Rich, and Utah State Marina; Figure 3) and at two depths: where the top of the thermocline intersected with the lake bed (12 m) and where the bottom of thermocline intersected with the lake bed (18 m). At each location a total of 6, 20 minute trawls were conducted (3 at the top and 3 at the bottom of the thermocline) for a total of 18 trawls. Boat speed was maintained as close to 1 m/s as possible. Trawling began at about 2100 hrs and ended at approximately 0400 hrs. All adult (>35mm) Bear Lake Sculpin and non-target fish encountered were counted and measured (Total Length) to the nearest millimeter and released. Young-of-the-year Sculpin were counted and released.

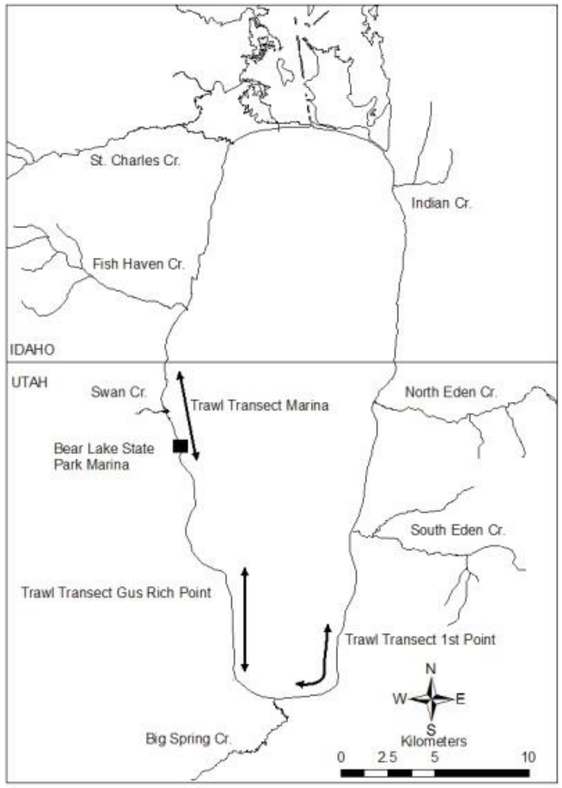

Figure 4. Locations within Bear Lake, Idaho/Utah, where Bear Lake Sculpin were sampled via bottom trawl in 2014.

Results and Discussion

Sculpin trawling occurred during 25-26 August, 2014. Adult Sculpin density was highest in shallow trawls and averaged about 30 adult Sculpin per trawl whereas mean adult Sculpin density was considerably less in deep trawls (20/trawl; Figure 4). Utah State Marina had the highest overall mean adult Sculpin density of 36/trawl followed by First Point at 29/trawl and Gus Rich at 10/trawl. The overall mean adult Sculpin (≥ 35mm) catch per trawl was 25, which converts to a minimum population estimate of about 1 million adult Sculpin.

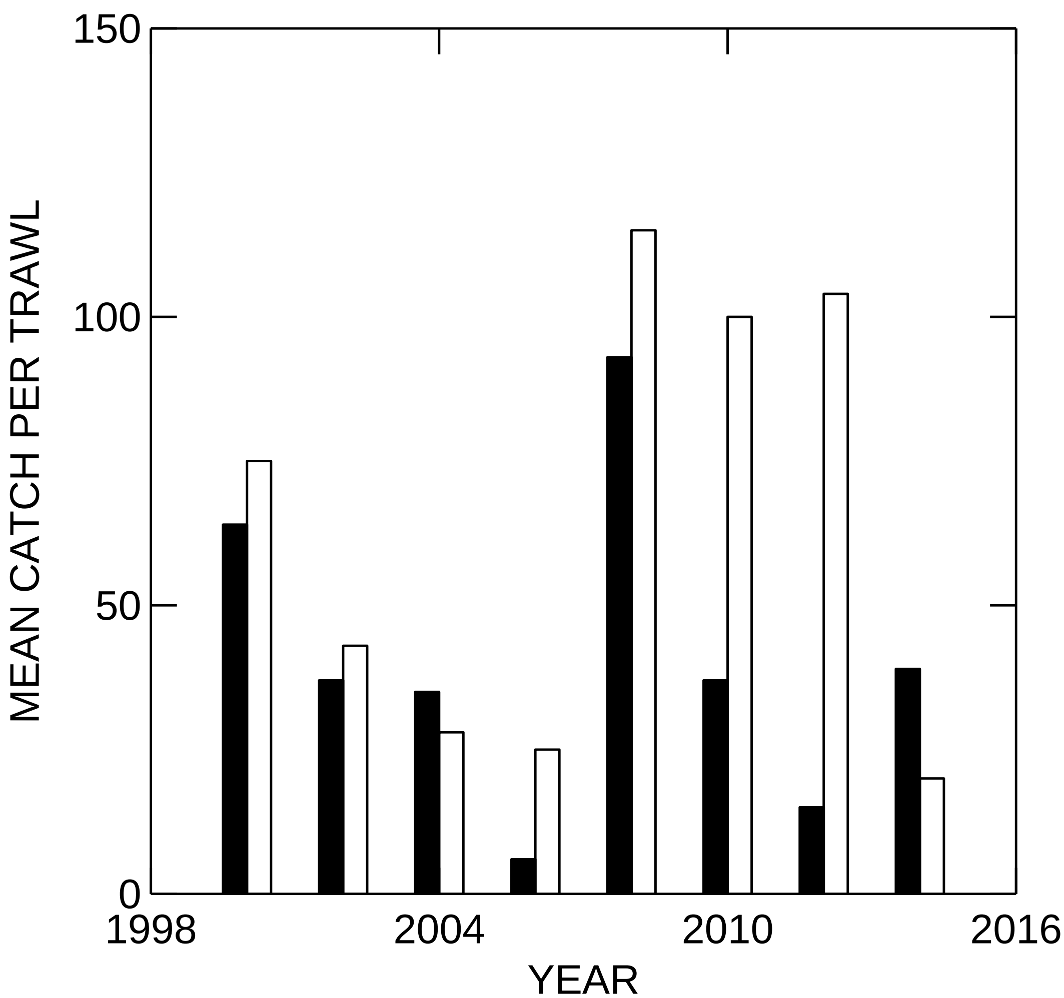

Figure 5. Mean Bear Lake Sculpin catch per trawl. Black bars represent samples collected from the top of the thermocline where it intersected with the lake bed (12m) and the white bars represent samples collected from the bottom of the thermocline where it intersected with the lake bed (18m). All trawls were 20 minutes in duration.

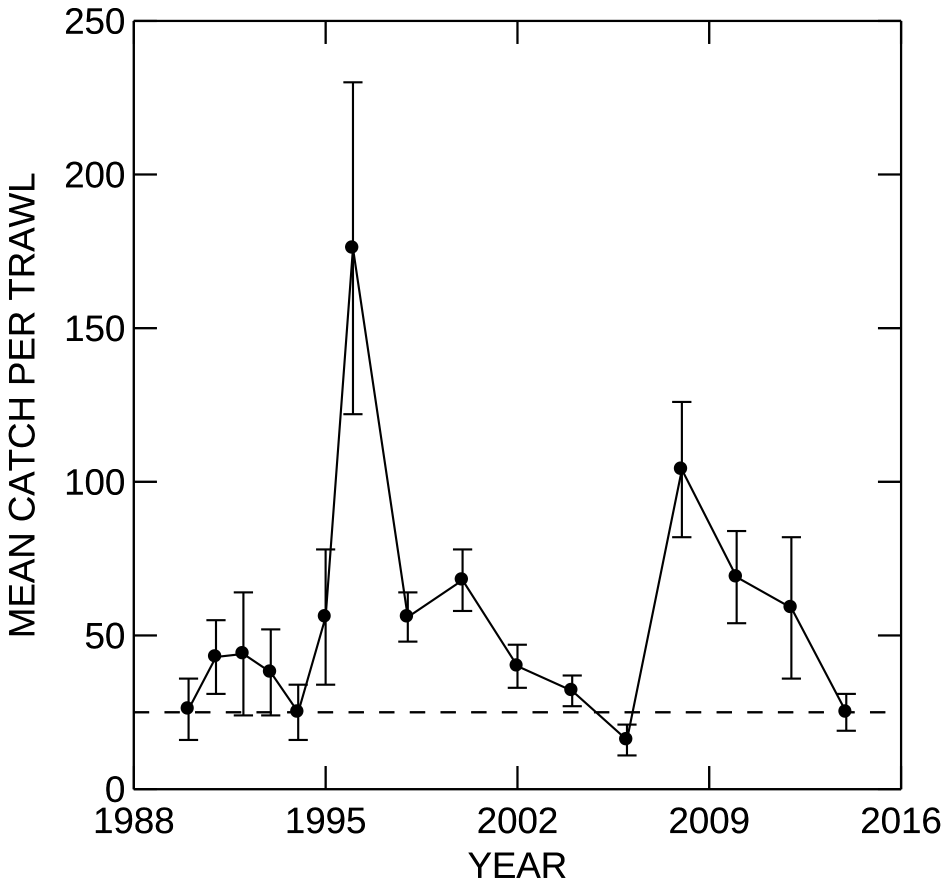

Figure 6. Mean catch (●) and standard error (I) per trawl for Bear Lake Sculpin collected from Bear Lake Idaho/Utah. Each trawl was 20 minutes in duration. The horizontal dashed line represents the minimum acceptable Bear Lake Sculpin population of 1 million as defined in the Bear Lake Management Plan (Tolentino and Teuscher 2010).

Double-crested Cormorant Predation in Franklin County Waters

Introduction and Methods

Foster, Glendale, Treasureton, Johnson and Lamont Reservoirs are popular Rainbow Trout *Oncorhynchus mykiss* (RBT) fisheries located in Franklin County near Preston, Idaho. All reservoirs with the exception of Treasureton are managed under general fishing regulations (6 trout, no length or bait restrictions). Treasureton Reservoir is managed under trophy trout regulations (2 trout, none under 20 inches, no bait).

Over the past decade, Double-crested cormorant *Phalakros auritus sp.* (DCC) use of these reservoirs has increased (Brimmer et al. 2012). Concerns have arisen regarding the predation impacts these birds may be having on the RBT fisheries found there. Therefore, the objective of this project was to evaluate the predation impacts by DCC on RBT in the reservoirs listed above.

During 2014, we PIT (Passive Integrated Transponder) tagged a portion RBT stocked in all five reservoirs. We used Half Duplex 23 mm tags purchased from ORFID (www.oregonrfid.com). In May, we randomly selected RBT from larger groups of fish from Grace and American Falls Fish Hatcheries that were to be stocked into the five reservoirs; PIT tagged them and released them back into the raceway they came from. These fish along with the general release groups were stocked in the five reservoirs during May and June 2014.

We attempted to recover PIT tags at two locations during the summer and fall of 2014. The first area we recovered PIT tags from was a small island located in the middle of Foster Reservoir. The second was a DCC nesting colony located on the Bear River near Smithfield, Utah. Double-crested Cormorants found at Foster Reservoir did not nest there but spent time loafing/roosting in the trees on the island. See Teuscher et al. (2015) for tag recovery methods.

Results and Discussion

Overall, we recovered 283 out of 1,496 PIT tags deployed at the five reservoirs in 2014. Tagged RBT released at Foster Reservoir had the highest recovery rate of 52% followed by Treasureton, Lamont, Glendale and Johnson at 15, 12, 10 and 6%, respectively (Table 3). Foster Reservoir likely had the highest recovery rate of the five reservoirs because the DCC loafing/roosting area is located there. The other reservoirs are some distance away from Foster so a fraction of the tags consumed by DCC at those locations were probably deposited at those reservoirs or were excreted during the flight back to Foster Reservoir. Only three PIT tags were recovered from the rookery at Smithfield, Utah, which may be due to its distance from the Franklin County reservoirs or predation impacts may be lower.

Our findings suggest DCC predation on the RBT fisheries in the five reservoirs comes at a significant cost. When the PIT tag recovery rates are applied to the total number of RBT released at each location, Foster Reservoir experienced the highest loss of RBT (2,237) to DCC predation which equates to a production cost of about $3,848 (Each fish valued at $1.72, M. Koenig, Idaho Department of Fish and Game, personal communication; Table 3). Furthermore, because of DCC predation impacts, there were fewer RBT available for harvest. Overall, we estimated that DCC consumed at least 5,437 RBT at a production cost of about $9,352. See Table 3 for specific costs associated with each reservoir as well as costs and losses incurred in 2013.

While the results of this study indicate DCC predation on RBT in the Franklin County reservoirs is significant, only a portion of total predation has been presented here. For example, we observed a tag recovery rate of 52% (Foster) which was derived by dividing the number of PIT tag recoveries by the total number of PIT tags released or in the case of Foster Reservoir, 143/296 (52%; Table 3). To expand this percentage to the entire release group, we multiplied the total number of fish stocked (4,301) by 0.52. But these equations only represent the PIT tags that were recovered. Our estimates are not corrected for PIT tags that were deposited by DCC at locations outside our two search areas. Additionally, tags may have been present within our search areas but went undetected or a fraction of the tags may have been damaged. Therefore, the total number of RBT consumed by DCC and the cost associated with that loss is likely much higher than reported here.

Table 3. Rainbow Trout (RBT) stocked, Passive Integrated Transponder (PIT) tagged, released and recovered at various reservoirs in Franklin County, Idaho during 2013 and 2014. Estimated number of RBT consumed by Double-crested Cormorants (DCC) and associated production costs are also reported. Each RBT valued at $1.72.

				PIT Tag recovery location					
Release location	Year	Number of PIT tags released	Total RBT released	Foster	Smithfield	Total number of PIT tags recovered	PIT Tag recovery rate (%)	RBT consumed by DCC	Production cost ($)
Foster	2014	296	4,301	153		153	52	2,237	3,848
	2013	293	3,915	98	2	100	34	1,331	2,289
Glendale	2014	300	6,490	30		30	10	649	1,116
	2013	399	6,590	20		20	5	330	568
Treasureton	2014	300	12,313	46		46	15	1,847	3,177
	2013	299	12,296	59		59	20	2,459	4,229
Johnson	2014	300	1,740	19		19	6	104	179
Lamont	2014	300	4,997	32	3	35	12	600	1,032
TOTALS	2014	1,496	29,841	280	3	283	19	5,437	9,352
TOTALS	2013	991	22,801	177	2	179	18	4,120	7,086

Chesterfield Reservoir

Introduction and Methods

Chesterfield Reservoir is one of the most popular trout fisheries in southeast Idaho. During the 1990s, the fishery was managed under general harvest rules that included a six trout limit with no size or bait restrictions. Those regulations maximized yield from the reservoir. In 1994, anglers fished an estimated 158,000 hours and harvested over 70,000 Rainbow Trout *Oncorhynchus mykiss* (RBT). Despite the popularity of the fishery, anglers began requesting more restrictive harvest regulations to allow more fish to grow to quality size. In response to angler requests and creel analysis that showed harvest would be significantly reduced under more conservative bag limits, the trout limit was reduced from 6 to 3 fish per day in 1998. The bag limit was reduced a second time to 2 trout in 2002.

Over the past decade, American white pelican *Pelecanus erythrorhynchos* (AWPE) and Double-crested cormorant *Phalakros auritus sp.* (DCC) use of Chesterfield Reservoir has increased (Brimmer et al. 2011). Concerns have arisen regarding the predation impacts these birds may be having on the RBT fishery in Chesterfield Reservoir. The objective of this study was to evaluate the predation impacts of AWPE and DCC on RBT in Chesterfield Reservoir.

During 2014, we PIT (Passive Integrated Transponder) tagged RBT stocked in Chesterfield Reservoir. We used Half Duplex 23 mm tags purchased from ORFID (www.oregonrfid.com). In May we randomly selected RBT from a larger group of fish from Hagerman State Fish Hatchery and American Falls State Fish Hatchery that were to be stocked into the reservoir; PIT tagged them and released them back into the raceway they came from. These fish were stocked in Chesterfield Reservoir on 24-April and again on 6-June. We attempted to recover PIT tags at Gull Island (Blackfoot Reservoir) during the fall of 2014. See Teuscher et. al 2015 for tag recovery methods.

Results and Discussion

A total of 28,912 RBT were stocked into Chesterfield Reservoir during the April and June stocking events. Of these, 28,512 were ‘Standard’ catchable size RBT (Mean Total Length of 254 mm) and 400 were ‘Magnum’ sized fish (Mean Total Length of 305 mm). Standard RBT were all stocked during April (28,512) while all Magnum size fish were stocked in June (400). We PIT tagged and released total of 499 RBT. Of these, 299 were stocked in April while 200 were released in June.

Overall, we recovered 36 out of 499 PIT tags deployed at Chesterfield Reservoir in 2014. Twenty one PIT tags were associated with the Standard group released in April while fifteen were from the Magnum group released in June. Raw PIT tag recovery rates for Standard and Magnum RBT were similar at 7.0 and 7.5%, respectively. Since the tag recovery rates were similar over time and between Standard and Magnum length RBT, we combined all of tag recoveries and calculated on overall raw tag recovery rate of 7.2%. This rate was much lower than what was observed in 2011 (32%), 2012 (30%) and 2013 (39%; Brimmer et. al In press). Some of the difference in rates between 2014 and previous years can be explained by a change in tag recovery effort. In 2014 we searched and recovered tags from Gull Island only whereas in previous years we searched and recovered tags at Willow Island and Chesterfield Reservoir as well. To standardize our raw PIT tag recovery rates we removed tags recovered from Chesterfield Reservoir and Willow Island during 2011-2013 and recalculated raw PIT tag recovery rates based on Gull Island PIT tag recoveries only. The standardized raw PIT tag recovery rates for 2011, 2012 and 2013 were 20%, 20%, and 26%, respectively. These adjusted rates were still higher than what was observed in 2014. We speculate that the intensive management of avian predators that occurred at Blackfoot Reservoir in 2014 may have reduced avian predation at Chesterfield Reservoir. Alternatively, the reduced raw PIT tag recovery rate observed in 2014 may be due to natural variation alone or in concert with our management activities on Blackfoot Reservoir.

Our findings suggest avian predation on RBT at Chesterfield Reservoir comes at a significant cost. When the PIT tag recovery rate is applied to the total number of RBT released at Chesterfield Reservoir in 2014, the fishery lost at least 2,024 fish at a production cost of about $3,481 (Each RBT valued at $1.72; Table 4). Furthermore, because of avian predation impacts, there were fewer RBT available for harvest. See Table 4 for costs and losses incurred during 2011-2014.

While the results of this study indicate avian predation on RBT in Chesterfield Reservoir is significant, only a portion of total predation has been presented here. For example, we observed a raw PIT tag recovery rate of 7.2% which was derived by dividing the number of PIT tag recoveries by the total number of PIT tags released or in this case, 36/499 (Table 4). To expand this percentage to the entire release group, we multiplied the total number of fish stocked (28,912) by 0.07. But these equations only represent the PIT tags that were recovered. Our estimates are not corrected for PIT tags that were deposited by avian predators at locations outside our search area. Furthermore some of the tags may have been within the search area but were not detected or some of the tags may have been damaged and went undetected. Therefore, the total number of RBT consumed by DCC and the cost associated with that loss is likely much higher than reported here.

Table 4. Rainbow Trout (RBT) stocked, Passive Integrated Transponder (PIT) tagged, released and recovered at Chesterfield Reservoir, Idaho during 2011-2014. Tag recoveries from Blackfoot Reservoir (BFR) are included. Estimated number of RBT consumed by American white pelicans (AWPE) and Double-crested Cormorants (DCC) and associated production costs are also reported. Each RBT valued at $1.72.

			PIT Tag Recovery Location						
Year	Number of PIT Tags released	Total RBT released	Gull Island (BFR)	Willow Island (BFR)	Chesterfield Reservoir	Total Number of PIT Tags recovered	Gull Island PIT Tag recovery rate % (combined)	RBT consumed by AWPE & DCC	Production cost $
2014	499	28,912	36			36	7 (7)	2,024	3,481
2013	385	28,576	99	2	51	152	26 (39)	11,145	19,169
2012	287	18,900	56	6	0	62	20 (30)	5,670	9,752
2011	300	32,000	60		37	97	20 (32)	10,240	17,613
TOTALS	1,471	108,388	251	8	88	347	18 (27)	29,079	50,016

Edson Fichter Pond Renovation

Introduction and Methods

The Edson Fichter Nature Area (EFNA) is a 14 ha parcel of land along the Portneuf River on the southern edge of Pocatello, Idaho. The land was purchased in 1993 with Idaho Department of Fish and Game (IDFG) license funds to provide public fishing access to the river and a public outdoor educational area. The outdoor educational component consists of a ½ mile interpretive trail with signage that educates readers about wildlife habitat, successional stages and water quality. Additionally, the area provides a working demonstration of water quality projects that can be implemented to improve the water quality of the Portneuf River.

In 2011, a 1.4 ha (45 af) fishing pond was added to the area. Edson Fichter Pond (pond) construction began in July and was completed in September. The total cost of pond construction was about $270,000. Of the $270,000, $70,000 came from private donations and the remainder from a Dingle/Johnson grant. Edson Fichter Pond is managed by IDFG as a put-and-take Rainbow Trout (RBT) *Oncorhynchus mykiss* fishery and receives heavy angler use annually (Brimmer et. al 2013).

In 2013, a large population of Carp/Koi *Cyprinus carpio* was found in the pond. The presence of Carp in the pond has resulted in degraded water quality and a reduction in primary productivity. Furthermore, the presence of Carp in the pond runs counter to our management objective there. Therefore, the objective of this project was to remove Carp from the pond using the piscicide Synpren© Fish Toxicant (2.5% rotenone).

We applied Synpren© Fish Toxicant to the pond using a large stock water tank and power sprayer. The 1,704 liter stock tank was placed in the bed of a pickup truck. Synpren© and water were then mixed in the stock tank according to label directions. A two inch vinyl hose was fitted to the tank's outlet valve and the other end connected to the sprayer's up-take orifice. A 50ft vinyl hose with an adjustable nozzle was connected to the outflow nipple on the sprayer. The sprayer and hoses were then placed in a small utility trailer hitched to the truck. Application of the toxicant was accomplished by slowly driving the application system around the pond while simultaneously spraying the chemical onto the surface of the pond (Figure 7).

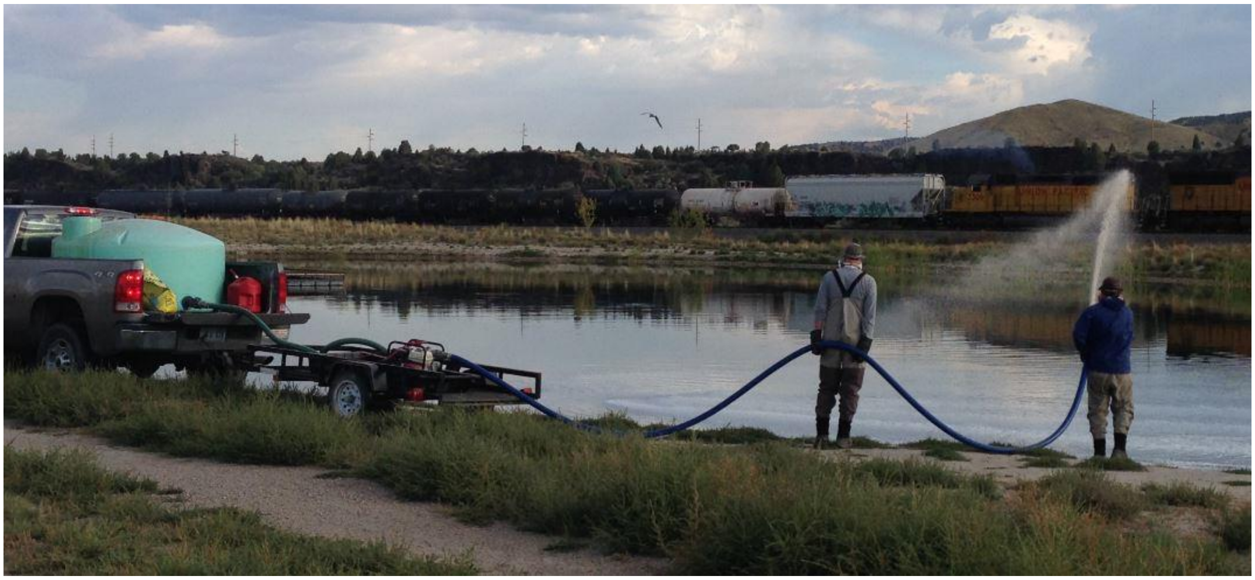

Figure 7. Photograph showing the application system used to deliver Synpren© Fish Toxicant to Edson Fichter Pond located in Pocatello, Idaho. The treatment occurred on 17 September 2014.

Sentinel fish were used to test pond toxicity following the chemical treatment. Two sentinel RBT were placed in each of the three cages and deployed so each cage was suspended about 0.5 m off the bottom. Two cages were placed at each end of the pond (one cage at each location) and the third cage was located in the center of the pond. During each trial, the fish remained in the cages for at least 24 hours before they were checked.

Results and Discussion

Synpren© Fish Toxicant was applied to Edson Fichter Pond on 17 September. We followed the Synpren© label instructions and applied 60 gallons of product to achieve a final concentration of 4 ppm in the pond. The mixing and application process took about 2 hours to complete and required a crew of three people.

A total of 209 Kg (460 lbs) of fish were removed from Edson Fichter Pond following the piscicide application. Carp/Koi was the most abundant species recovered and comprised 95% (200 Kg) of the total weight of fish removed from the pond. Rainbow Trout were also recovered from the pond but only represented 4% by weight. Both Yellow Perch *Perca flavescens* and Green Sunfish *Lepomis cyanellus* were also removed from the pond but their combined weight was less than one Kilogram (Figure 8).

Sentinel RBT were deployed on two separate occasions following treatment to monitor pond toxicity. A total of six fish were deployed on 24 September (Trial 1) and again on 1 October (Trial 2). No fish survived the first trial but all RBT survived the second trial. Since 100% of the sentinel fish survived the second trial, we determined the pond to be nontoxic to fish and RBT stocking resumed.

Figure 8. Various species of fish removed from Edson Fichter Pond, Pocatello Idaho. Pond renovation occurred on 17 September 2014.

We think a total renovation of Edson Fichter Pond was achieved since the pond remained toxic to fish for about a two week period following treatment. However, due to the pond's close proximity to the Portneuf River, we anticipate that periodic renovation of the pond will be needed to maintain the quality of the sport fishery.

MANAGEMENT RECOMMENDATIONS

1. Evaluate the fishery improvement efforts completed at Johnson Reservoir.
2. Evaluate cormorant predation on Chesterfield Reservoir and the Franklin County Reservoirs.

RIVERS AND STREAMS INVESTIGATIONS AND SURVEYS

ABSTRACT

We surveyed the Blackfoot and Bear River systems via electrofishing and trapping in 2014. Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* (YCT) escapement (807) in 2014 was still well below the highest observed on the Blackfoot River (4,747). Furthermore, the population of YCT on the Blackfoot River Wildlife Management Area continues to be well below historical levels. We think these low levels can be attributed to continued predation by American White Pelicans *Pelecanus erythrorhynchos* (AWPE). In an attempt to reduce AWPE use of the river during the YCT migration period, we increased hazing and lethal take of AWPE. Overall we expended a total of 178 non-lethal pyrotechnic projectiles and 146 shotgun shells and lethally took 68 AWPE. Our findings suggest that to effectively reduce AWPE use of the river, hazing and lethal take must be implemented in concert and daily lethal take of AWPE must exceed two birds per day. Bonneville Cutthroat Trout *O. c. utah* (BCT) were sampled from eight streams: six sites within the Pegram Management Unit and nine sites within the Nounan Management Unit. Overall, mean BCT density was 4.0 BCT/100 m^2 (±1.5; range 0.0 – 21.8). The highest BCT density was observed in Giraffe Creek (21.8 BCT/100 m^2) and the lowest in Bailey and Georgetown Creeks (0.0 BCT/100m^2). The percent composition of BCT was the highest in Preuss, Giraffe, Dry and Stauffer Creeks at 100%.

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Yellowstone Cutthroat Trout Monitoring in the Blackfoot River System

Introduction and Methods

There are two long-term monitoring programs in place for Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* (YCT) in the upper Blackfoot River. They are adult escapement estimates and population estimates. Adult escapement estimates are derived from fish captured at an electric weir trap located in the lower river near its confluence with Blackfoot Reservoir. The population estimates are derived from fish captured within a portion of the Blackfoot River Wildlife Management Area (BRWMA) located about 51 km above the reservoir. The adult escapement estimates have been completed every year since 2001. The population surveys are completed less frequently.

An electric fish migration barrier was installed in the Blackfoot River in 2003 to collect migrating adult YCT. The barrier includes a trap box designed using Smith Root Inc. specification. The barrier components include four flush mounted electrodes embedded in Insulcrete, four BP-X.X.-POW pulsators, and a computer control and monitoring system. The computer system can be operated remotely, records electrode outputs, and has an alarm system that triggers during power outages. Detailed descriptions of these components and their function can be obtained at www.smith-root.com.

The electric barrier was operated from 2 May to 23 June 14. Prior to observing fish at the trap, field crews checked the live box several times a week. Once fish began entering the trap, it was checked at least once a day. Fish species and total lengths (mm) and weights (g) were recorded. Yellowstone Cutthroat Trout were visually checked for bird scars. Bird scar monitoring began in 2004. Scar rates were associated with increases in pelicans feeding in the Blackfoot River downriver of the trap. All salmonids handled at the trap were injected with a 23 mm Half Duplex Passive Integrated Transponder (PIT) tag purchased from Oregon RFID (oregonrfid.com). These fish were tagged so they could be included in a pelican predation study.

In 1994, the Idaho Department of Fish and Game (IDFG), with assistance from the Conservation Fund, purchased the 700-ha ranch and began managing the property as the BRWMA. The BRWMA straddles the upper Blackfoot River, with an upper boundary at the confluence of Lanes, Diamond, and Spring creeks and a lower boundary at the head of a canyon commonly known as the upper narrows. Approximately 9 km of river meander through the property along with 1.6 km of Angus Creek, which is an historical YCT spawning and rearing stream. Since purchasing the BRWMA, IDFG has completed periodic population estimates to monitor native YCT abundance.

We estimated YCT abundance within 5.2 km of the BFRWMA reach of the Blackfoot River in 2014. The estimate was completed using mark-recapture methods. Fish were sampled with drift boat-mounted electrofishing gear. All YCT captured were injected (marked) with a 23mm PIT tag (oregonrfid.com), measured for total length (mm) and weighed to the nearest gram and released. However, only fish less than 400 mm TL were used to estimate abundance. Fish were marked on 23 July and recaptured 26 July. Data were analyzed using Fish Analysis + software package (Montana Fish Wildlife and Parks 2004).

Similar to 2013, non-lethal hazing and lethal take of AWPE was utilized again in 2014 in an attempt to reduce predation impacts on migrating YCT. From May through July, hazers patrolled the river from the confluence with the reservoir to the adult escapement trap and from the lower boundary of the BFRWMA to the confluence of Lanes and Diamond Creeks on foot or via ATV (Figure 9). When groups of pelicans were observed on the river, hazers launched explosive pyrotechnics towards the group of birds to scare them off the river. Hazing crews also enumerated the birds encountered each day. In addition to non-lethal hazing, lethal take was also used to discourage pelican use of the river. Lethal take occurred in concert with non-lethal hazing.

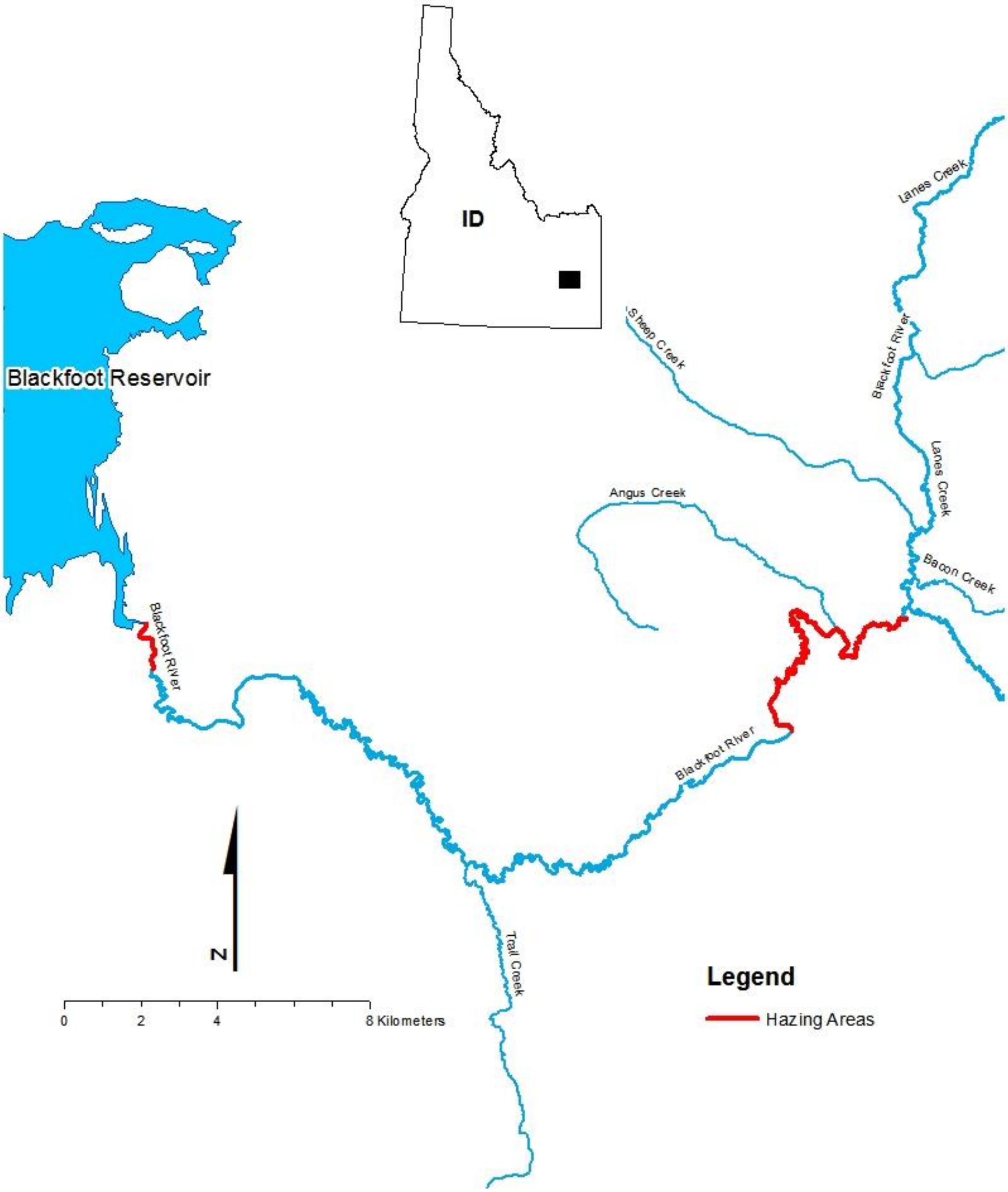

Figure 9. Locations where hazing and lethal take of American White Pelicans occurred on the upper Blackfoot River, Idaho, in 2014.

Results and Discussion

In 2014, a total of 807 adult YCT were collected at the migration trap. Of these, 667 were females and 139 were males; no sex determination could be made on the one, remaining fish. Captured females and males had a mean length of 483 and 509 mm, respectively. The bird scarring rate observed in 2014 was 24%, the lowest observed since 2010. Scarring rates have varied from no visible scars on fish collected in 2002 to a high of 70% scarred in 2004. Scarring rates may be related to the predation rate by pelicans, but no information is available to determine the relationship. Variation in scarring rates is likely impacted by the overall number of pelicans feeding on the river below the migration trap, water levels and clarity, and hazing efforts exerted on the birds to reduce predation impacts. Adult YCT escapement and bird scar trends are shown in Table 5.

A total of 255 YCT were sampled on the BRWMA during the mark and recapture electrofishing surveys (Table 6). The number of YCT captured in 2014 was higher than in 2013 but similar to 2012. We think AWPE predation on BRWMA YCT was a contributing factor to the low numbers of YCT encountered during the last three years (Teuscher et. al 2015).

Table 5. Yellowstone Cutthroat Trout escapement estimates for the Blackfoot River 2001-2014. No escapement estimates are available in 2011 due to extremely high river discharge during the migration season which resulted in poor tapping efficiency.

Year	Weir type	YCT count	Mean length(mm)	% Bird scars	Mean May river discharge (cfs)	Adult pelican count
2001	Floating	4,747	486	No data	74	No data
2002	Floating	902	494	0	132	1,352
2003	Electric	427	495	No data	151	1,674
2004	Electric	125	478	70	127	1,748
2005	Electric	16	Na	6	388	2,800
2006	Electric	19	Na	38	453	2,548
2007	Electric	98	445	15	115	3,416
2008	Electric	548	485	10	409	2,390
2009	Electric	865	484	14	568	3,174
2010	Electric	938	468	12	248	1,734
2011	Electric	Na	Na	Na	936	724
2012	Electric	530	483	37	200	3,034
2013	Electric	1,843	486	34	176	1,996
2014	Electric	807	487	24	302	2,096

Table 6. Yellowstone Cutthroat Trout abundance estimates collected from the Blackfoot River Wildlife Management Area of the Blackfoot River, Idaho.

Year	Fish marked	Fish captured	Fish recaptured	Recaptured (%)	Pop. estimate	Pop. estimate SD
2005	266	202	20	7.5	3,664	569.1
2006	339	450	57	16.8	3,534	352.3
2008	223	186	28	12.6	2,504	336.5
2009	279	319	44	15.8	2,567	286.5
2010	317	272	11	3.5	12,944	4,131.2
2011	318	147	16	5.0	3,222	411.3
2012	137	99	12	12.1	1,672	421.7
2013	65	N/A	N/A	N/A	N/A	N/A
2014[b]	137	130	12	9.2	2,147	417.9
Mean[a]	243	219	27	11.3	2,759	399.3

[a]Excludes 2010 and 2013.

[b]Excludes adfluvial fish > 400mm

In past surveys of the BRWMA reach, juveniles (< 300 mm) dominated catch. Thurow (1981) reported that about 80% of the fish caught during population surveys were less than 300 mm total length. Results from 2011, 2012, 2013 and 2014 surveys show similar ratios of juvenile cohorts (Figure 10).

Hazing and lethal take began on 10 May 2014 and continued through 11 July 2014. However, from 17 June through 23 June, hazing activities were temporarily suspended so that components of our ongoing AWPE predation study could be completed. Birds were hazed 1-2 times daily from the YCT trap downstream to the river's confluence with the reservoir (about 2.0 km). Efforts to haze birds on the upper River on or near the BRWMA occurred from 10 June through 11 July (the BRWMA is about 38 Km above the reservoir; Figure 9).

Overall, 1,419 AWPE were observed during hazing activities. Of these, 236 occurred from the mouth of the river to the YCT escapement trap, 14 on the BFRWMA and 1,169 near the river/reservoir confluence. During the same period, we expended a total of 178 non-lethal pyrotechnic projectiles and 146 shotgun shells. Overall, 68 AWPE were lethally taken during the hazing period (Figure 11).

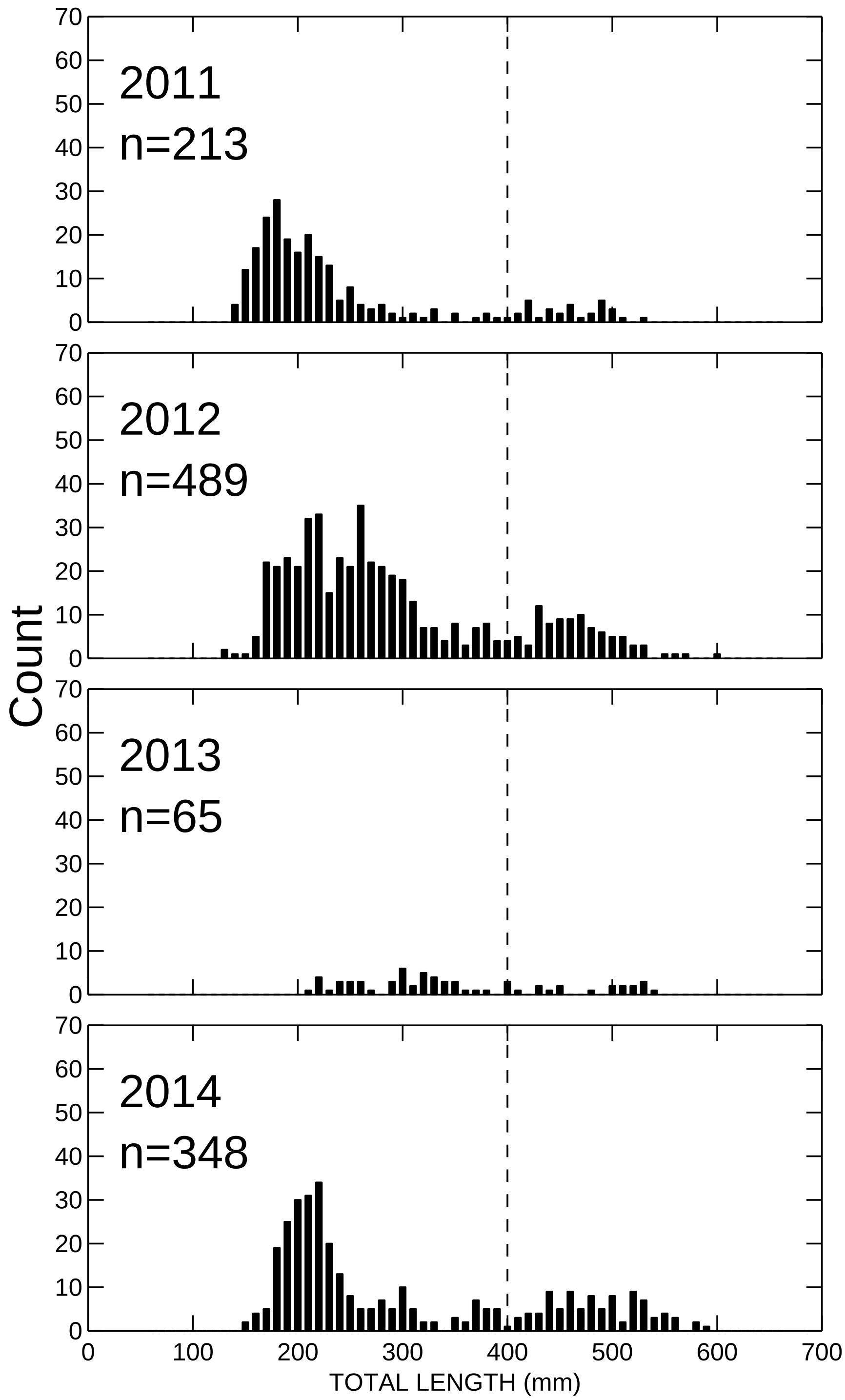

Figure 10. Length frequency distributions of Yellowstone Cutthroat Trout caught from the Blackfoot River Wildlife Management Area of the Blackfoot River, Idaho. The majority of fish located to the right of the vertical dashed lines are likely post spawn adfluvial fish that may return to Blackfoot Reservoir. The 2013 panel only represents fish collected during the marking survey, no recapture survey was conducted that year.

Hazing activities combined with lethal take appears to be effective in reducing AWPE use of the Blackfoot River. In 2014, we expended more effort hazing than we did in 2013 and also increased the lethal take of AWPE. Throughout the YCT migration season, the AWPE observed daily counts were about half of what was observed during 2013 (Figure 11; Figure12). American White Pelican abundance was similar for both years suggesting our efforts in 2014 had a positive effect in reducing AWPE use of the river (Table 5).

Yellowstone Cutthroat Trout run timing in 2014 was normal when compared to past years (Brimmer et. al 2012). However, we reported that in 2013, the YCT run was delayed about two weeks. Our conclusion was AWPE foraging at the mouth of the river were effectively blocking upstream migration of YCT. Once hazing was combined with increased take (take >2 birds/day), AWPE use of the river decreased substantially. Yellowstone Cutthroat Trout responded immediately and moved up stream in high numbers (Brimmer et. al in press; Figure 11).

In summary, we conclude that AWPE use of the river can be reduced by intensive hazing efforts coupled with the aggressive lethal take of birds. It appears that lethal take must exceed two birds per day to achieve the desired outcome.

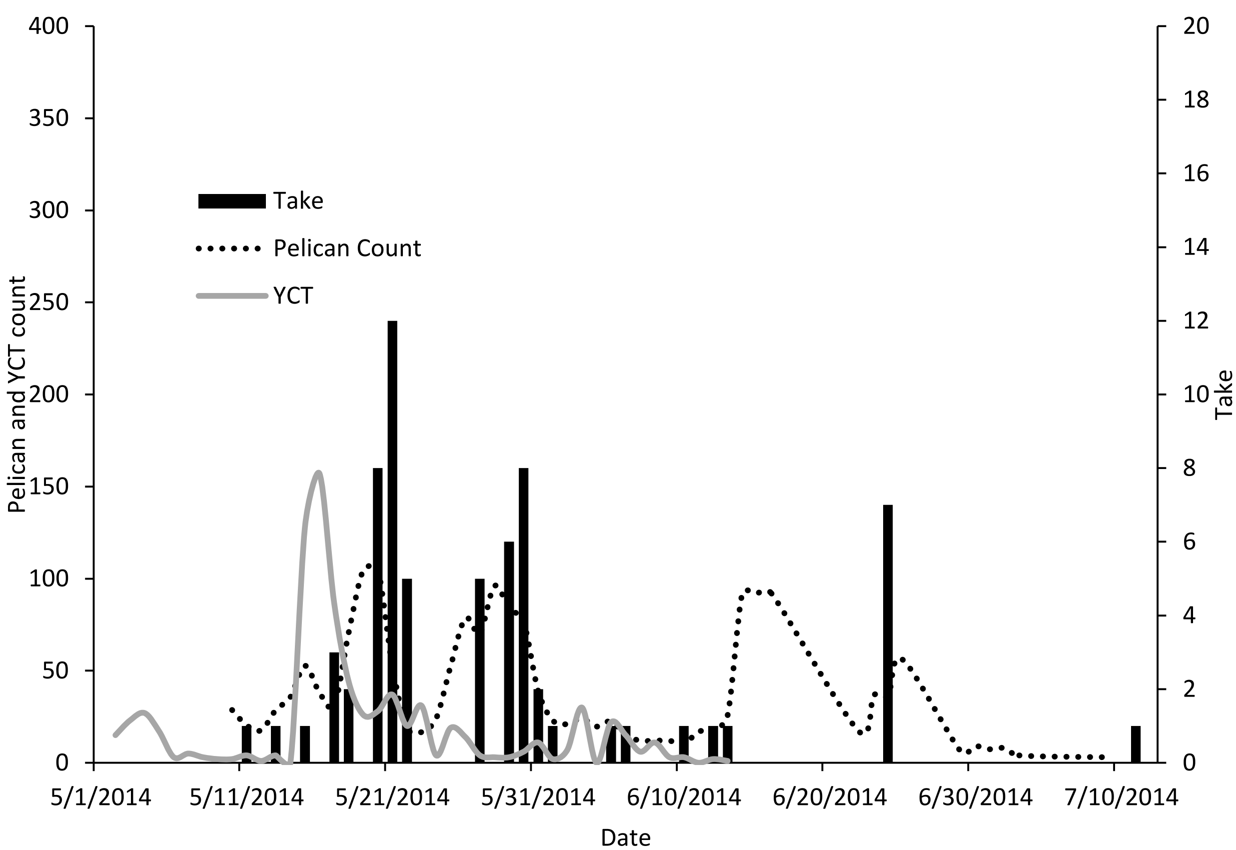

Figure 11. Numbers of Yellowstone Cutthroat Trout (YCT) and American White Pelicans observed on the upper Blackfoot River, Idaho, during 2014. Lethal take of American White Pelicans is also reported.

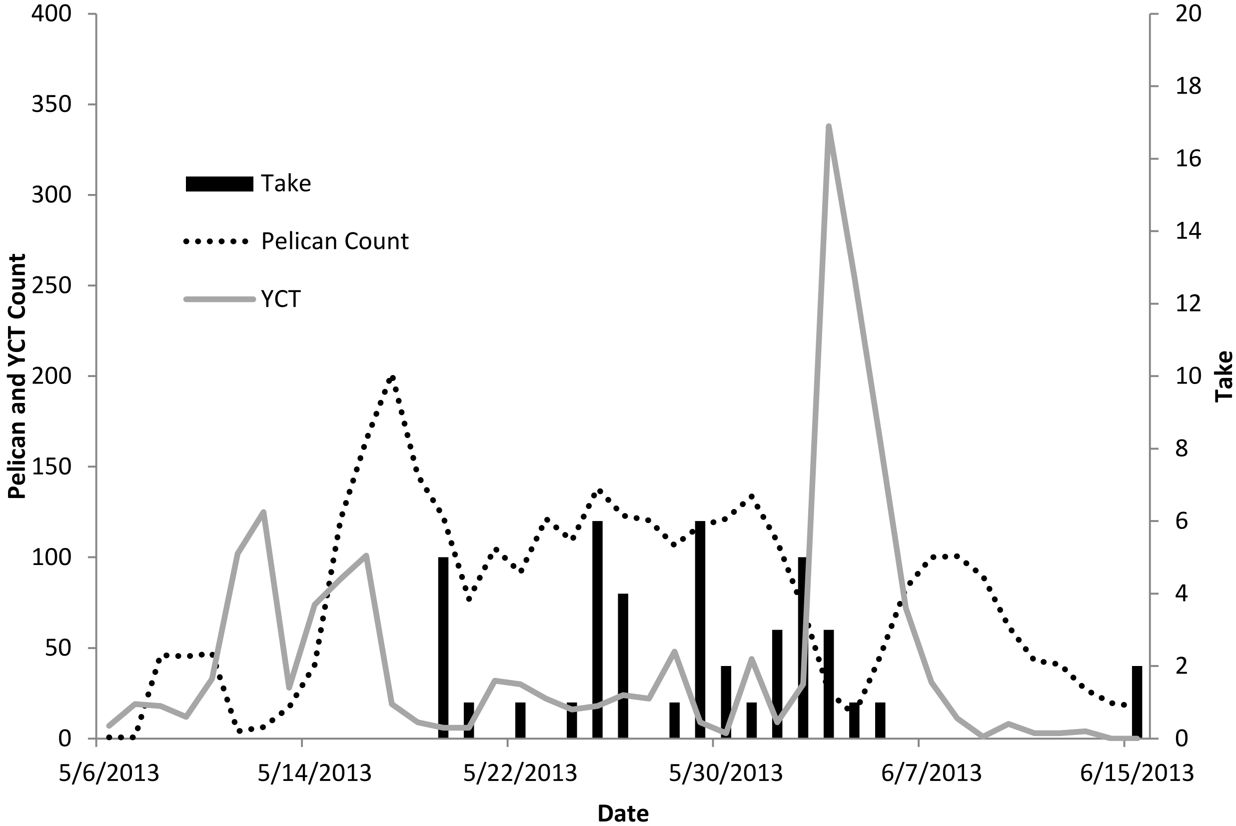

Figure 12. Numbers of Yellowstone Cutthroat Trout (YCT) and American White Pelicans observed on the upper Blackfoot River, Idaho, during 2013. Lethal take of American White Pelicans is also reported.

Bonneville Cutthroat Trout Monitoring Program

Introduction and Methods

Bonneville Cutthroat Trout *Oncorhynchus clarkii utah* (BCT) are one of three native cutthroat trout sub-species in Idaho. The distribution of BCT is limited to the Bear River Drainage in Southeastern Idaho. In the early 1980s, distribution and abundance data for this native trout were deficient. Initially, to better understand BCT population trends and the potential influence of natural and anthropogenic processes, a long-term monitoring program was initiated for three tributary streams of the Thomas Fork, Bear River (Preuss, Giraffe, and Dry Creeks). These streams were to be sampled every other year. In 2006, as part of the BCT management plan (Teuscher and Capurso 2007), additional streams were added to the BCT monitoring program to include a broader representation of BCT population trends from across their historical range in Idaho. These additional monitoring streams included Eightmile, Bailey, Georgetown, Beaver, Whiskey, Montpelier, Maple, Cottonwood, Snow slide, First, Second, and Third Creeks, and the Cub River. In 2010, IDFG personnel determined that the monitoring program would be better represented by dropping some sites and streams initiated in 2006, while adding other streams throughout the five BCT management units in the Bear River drainage (Figure 13). Currently, the monitoring program consists of three streams and eight sites in the Pegram Management Unit (PMU), six streams and 14 sites in the Nounan Management Unit (NMU), four streams and nine sites in the Thatcher Management Unit (TMU), four streams and eight sites in the Riverdale Management Unit (RMU), and three streams and six sites in the Malad Management Unit (MMU; Table 7). We will sample half of these streams annually. In addition, the monitoring program includes two segments of the main-stem Bear River in four of the five management units. Main-stem Bear River segments in each management unit will be sampled every four years.

There are a number of variables that may influence BCT population trends which include: annual precipitation, water temperature, irrigation, hydropower, grazing and others. (Teuscher and Capurso 2007). Given the sensitive status of BCT and recent petitions to list it under the Endangered Species Act, it is important to identify and correlate variation in BCT densities that appear to be associated with these and other variables. Therefore in 2011, we began collecting a suite of habitat variables to monitor potential changes in habitat and stream channel condition. The descriptions of these habitat variables and collection methods are listed in Table 8.

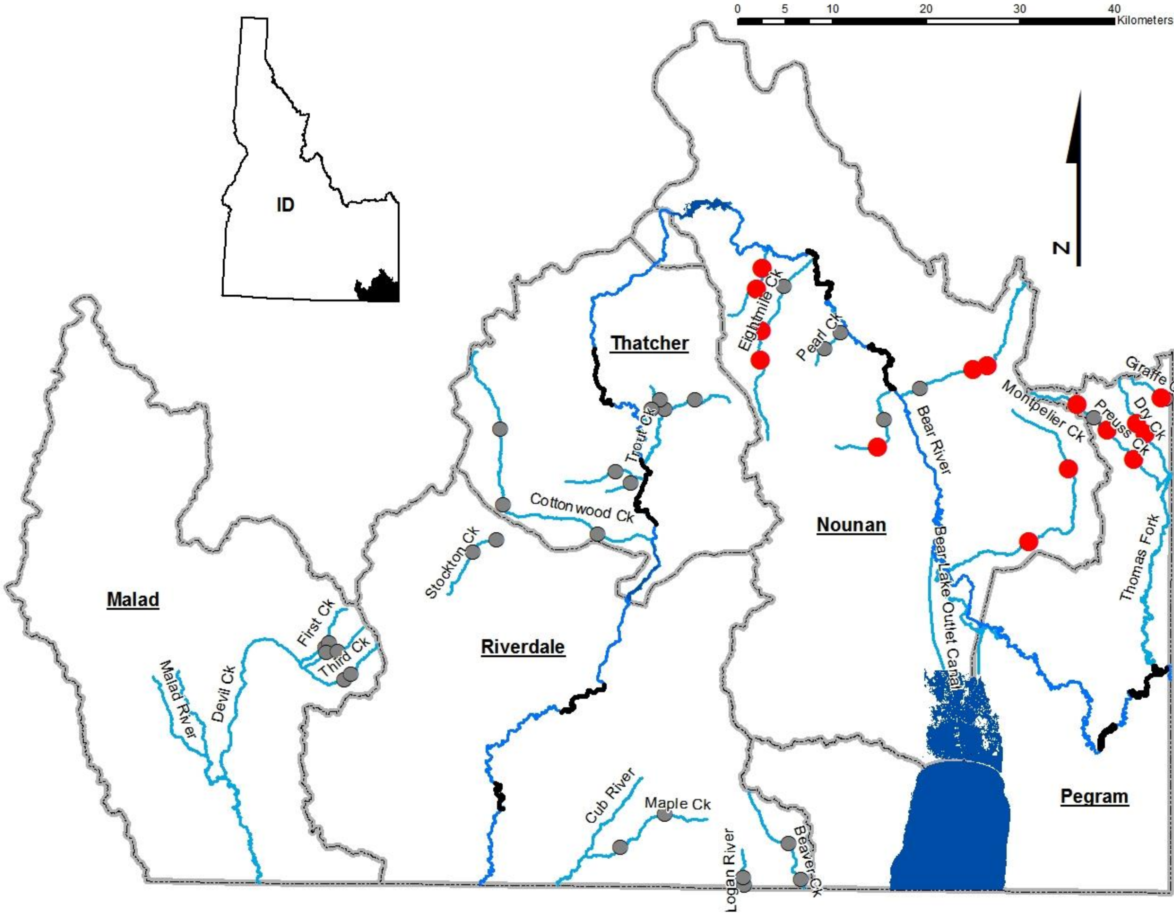

Figure 13. Map of the Bear River watershed in Idaho, including the six Bonneville Cutthroat Trout management units. The gray circles represent monitoring sites and red circles represent sites sampled in 2014. The black line segments on the main-stem Bear River represent monitoring reaches. No main-stem Bear River sites were sampled in 2014.

To calculate mean BCT densities, we sampled at least two sites on each stream using multiple pass removal techniques with backpack electro-fishing equipment. At each site, a segment of stream (approximately 100m) was sampled, which included block nets at the downstream and upstream boundaries. The area (m^2) sampled was calculated using length (m) and average width (m). We calculated a population estimate using Microfish 3.0 software (Microfish Software, Durham, NC, USA). BCT percent composition was calculated by dividing the number of BCT by the total number of all salmonids sampled. Mean densities and percent composition for an entire stream was calculated by averaging the mean values from each site within a stream. Relative weights (W_r) were calculated for individual fish using the equation $Log_{10}W_s = -5.189 + 3.099 \log_{10}TL$, which was obtained from Kruse and Hubert (1997). Mean relative weight for each stream was calculated by averaging individual relative weights.

Table 7. The 20 monitoring streams and number of sites within the five BCT management units, including the length (km) of stream sampled, total stream length (km), and the percent of stream sampled.

Management unit	Stream	Sites	Stream sampled (km)	Stream length (km)	% Sampled
Pegram	Dry Ck.	2	0.2	13.4	1.5
	Giraffe Ck.	2	0.2	5.7	3.5
	Preuss Ck.	4	0.4	22.0	1.8
	Bear River	2	17.2	61.2	28.1
Nounan	Bailey Ck.	2	0.2	9.9	2.0
	Eightmile Ck.	3	0.3	23.6	1.3
	Georgetown Ck.	3	0.3	21.8	1.4
	Montpelier Ck.	2	0.2	36.0	0.6
	Pearl Ck.	2	0.2	5.3	3.8
	Stauffer Ck.	2	0.2	14.5	1.4
	Bear River	2	18.8	94.5	19.9
Thatcher	Cottonwood Ck.	3	0.3	37.4	0.8
	Hoopes Ck.	2	0.2	13.5	1.5
	Trout Ck.	2	0.2	18.3	1.1
	Whiskey Ck.	2	0.2	5.1	3.9
	Bear River	2	18.0	37.8	47.6
Riverdale	Beaver Ck.	2	0.2	13.7	1.5
	Logan R.	2	0.2	4.7	4.3
	Maple Ck.	3	0.3	16.1	1.9
	Stockton Ck.	2	0.2	9.8	2.0
	Bear River	2	13.6	50.2	27.1
Malad	First Ck.	2	0.2	9.0	2.2
	Second Ck.	2	0.2	8.4	2.4
	Third Ck.	2	0.2	11.2	1.8

Table 8. List of habitat variables, units of measurement and collection methods for habitat characteristics used to explain variation in BCT abundance estimates.

Habitat variable	Unit of measurement	Collection methods
Water temperature	Celsius	Measured at beginning of survey with handheld thermometer to the nearest ± 0.5 (°C).
Conductivity	µs/cm	Measured at beginning of survey with conductivity meter to the nearest ± 0.1 (µs/cm).
Discharge	ft^3/sec	Measured stream discharge with Rickly discharge meter in a uniform stream segment, using methods proposed by Harrelson et al. (1994)
Gradient	Percent	Gradient was calculated using aerial imagery by calculating the difference in water elevation from an upstream location to a downstream location that was greater than 50 meters apart.
Stream width	Meters	Measure the wetted width (± 0.1 m) of the stream at ten (10) equally spaced transects within the survey reach and then calculate the mean reach width.
Stream depth	Centimeters	At ten (10) equally spaced transects, measure and sum the depth (± 1 cm) of the stream at ¼, ½, and ¾ distance across the channel and divide by four. Use these values to calculate the mean reach depth.
Width/depth ratio	Meters	Convert the mean reach depth into meters. Divide the mean reach width by the mean reach depth.
Percent stable banks	Percent	At the ten (10) equally spaced transects, determine and circle if the bank on the left and right are stable using the following definition. Streambank is stable if they DO NOT show indications of alteration such as breakdown, erosion, tension cracking, shearing, or slumping (Burton 1991).
Total cover	Percent	Followed instructions from the streambank cover form in Bain and Stevenson (1999).
Canopy	Percent	Used a spherical densiometer and followed the methods of Platts (1987).

Results and Discussion

In 2014, eight streams were sampled which included six sites within the PMU and nine sites within the NMU (Figure 13). The sites that we did not sample were due to either lack of landowner permission or water. Overall, mean BCT density was 4.0 BCT/100 m^2 (±1.5 S.E; range 0.0 – 21.8). The highest BCT density was observed in Giraffe Creek (21.8 BCT/100 m^2) and the lowest in Bailey and Georgetown Creeks (0.0 BCT/100m^2; Table 9; Table 10). The percent composition of BCT in relationship to other salmonids sampled was variable between streams. The percent composition of BCT was highest in Preuss, Giraffe, Dry and Stauffer Creeks at 100% (Table 9; Table 10).

There was only one stream, Montpelier Creek, which showed an increase in BCT densities compared to those estimated in 2012. All other streams showed a decrease in BCT Densities (Table 9; Table 10). The streams that showed high BCT densities in 2012 had dramatic decreases in BCT densities in 2014. These streams included Preuss, Giraffe, Dry and Stauffer Creeks (Table 9; Table 10). These changes are likely due to a transition from a good water and production year (2011), to poor conditions experienced over the past two years.

Table 9. Descriptive values of Bonneville Cutthroat Trout population trends for the Pegram Management Unit.

Management unit	Stream	Year	Sites	BCT / 100 m^2 Mean	BCT / 100 m^2 (±) 1 SE	% Comp	BCT avg. rel. wt. (W_r)
Pegram	Dry Ck.	1987	1	13.8	N/A	100	61
		1990		4.3		100	
		1993		0.0		100	
		1998	3	13.8	0.8	100	
		2000		24.9		100	
		2002		0.6		100	
		2004		0.0		100	
		2006	3	3.1		100	78
		2008	2	0.5	0.2	100	106
		2010	2	2.0	0.1	100	
		2012	2	14.9	0.1	100	82
		2014	1	3.6	N/A	100	91
	Giraffe Ck.	1981		2.2		100	
		1986	1	20.3	N/A	100	61
		1987	2	36.0	4.5	100	78
		1989	1	26.5	N/A	100	
		1990	1	9.8	N/A	100	
		1993	2	0.3	0.3	100	
		1995	3	3.9	0.7	100	
		1998	4	15.7	4.7	100	
		2000		16.9		100	
		2002	1	4.0	N/A	100	
		2004		4.0		100	
		2006	3	4.2		100	
		2008	4	5.0		100	92
		2012	2	25.1	2.9	100	90
		2014	2	15.8	6	100	84
	Preuss Ck.	1981	1	21.5	N/A	100	
		1985	2	24.1	9.7	100	78
		1986	2	15.7	1.1	100	58
		1987	3	10.7	2.8	100	71
		1988		22.0		100	
		1989	2	2.6	2.0	100	
		1990	3	2.8	0.1	100	
		1991	4	3.2	1.2	100	
		1993	5	5.1	2.6	100	90
		1995	6	3.1	0.7	100	
		1997		8.8		100	
		1998		3.2		100	
		2000		7.9		100	
		2002	2	5.0	1.7	100	
		2004	11	9.1		100	
		2006	7	6.0		100	77
		2008	7	4.0		100	87
		2010	2	2.7	0.3	100	87
		2012	2	28.2	15.6	100	82
		2014	3	4.6	2.5	100	88

Table 10. Descriptive values of Bonneville Cutthroat Trout population trends for the Nounan Management Unit.

Management unit	Stream	Year	Sites	BCT / 100 m^2 Mean	BCT / 100 m^2 (±) 1 SE	% Comp	BCT avg. rel. wt. (W_r)
Nounan	Bailey Ck.	2001	1	0.0	N/A	0	
		2006	1	0.0	N/A	0	
		2008	1	5.0	N/A	12	110
		2010	1	0.0	N/A	0	
		2012	2	0.3	0.3	2	
		2014	2	0.0	N/A	0	
	Eightmile Ck.	1993	4	1.0	0.4	3	
		1994	4	0.7	0.3	6	
		2001	4	0.1	0.1	1	
		2006	1	0.3	N/A	4	
		2007	3	2.4	0.7	25	93
		2008	1	2.8	N/A	12	87
		2010	3	0.9	0.3	4	80
		2012	3	2.2	1.9	5	90
		2014	2	0.3	0.3	1.5	95
	Georgetown Ck.	1994	4	0.0	N/A	0	
		2000	3	0.0	N/A	0	
		2006	3	0.0	N/A	0	
		2007	4	0.0	N/A	0	
		2008	2	0.0	N/A	0	
		2012	3	0.0	N/A	0	
		2014	2	0.0	N/A	0	
	Montpelier Ck.	2000	3	1.1	0.3	32	
		2006	3	1.6	0.6	20	82
		2008	2	1.8	1.1	42	97
		2012	2	2.1	1.9	15	73
		2014	2	2.4	2.4	21	91
	Pearl Ck.	2007	1	35.0	N/A	72	76
		2012	2	11.8	8.8	76	106
		2014	0	NO DATA			
	Stauffer Ck.	2007	5	7.7	4.7	100	81
		2012	2	22.9	20.0	100	78
		2014	1	5.8	N/A	100	91

MANAGEMENT RECOMMENDATIONS

1. Continue efforts to reduce pelican predation on Yellowstone Cutthroat Trout in the Blackfoot River system.

2. Continue Bonneville Cutthroat Trout population and habitat monitoring.

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