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REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
SOUTHEAST REGION

Estimating Bird Consumption on Fish in Blackfoot Reservoir
Southeast Idaho Angling Survey
Franklin County Creel Surveys
Blackfoot River and St. Charles Creek Cutthroat Trout Monitoring

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EXECUTIVE SUMMARY

In 2002, the southeast Idaho fisheries program continued long-term monitoring surveys for Yellowstone and Bonneville cutthroat trout, estimated bird predation on trout populations in Blackfoot Reservoir, summarized public comments from six public meetings and a random mail survey, completed six-month creel surveys on five Franklin County reservoirs and the Bear River below the Oneida Dam.

Double crested cormorants and American white pelicans consumed an estimated 194 metric tons of fish during the 2003-nesting season. Although rainbow trout made up a small percentage of the total fish consumption estimate, pelicans and cormorants fed opportunistically on newly stocked hatchery rainbow trout. Total rainbow trout consumption by pelicans and cormorants was 6.9 metric tons, which is 101% of the total weight of hatchery trout stocked in 2003. Cutthroat trout were observed in diet samples in 2002 but not in 2003.

Because 2003 was a regulation-setting year, significant time and effort were placed on surveying public opinions. Public comments were collected at six public meetings, from a random mail survey (sent to 1,000 anglers), and during a three-day outdoor expo held in Holt Arena on the Idaho State University campus. Anglers supported developing a quality cutthroat trout angling rule for part of the Portneuf River (55%) and making it illegal to possess bait while angling on waters with a no-bait rule (49%). Despite a recent access fee imposed by the Twin Lakes Canal Company, anglers also supported (54%) the continued stocking of rainbow trout in Twin Lakes. Potential regulation changes that did not gain public support included the proposals to adopt trophy and quality bass regulations on Glendale Reservoir and the Snake River below American Falls Dam, respectively.

A total of 22,454 anglers fished 59,313 hrs and caught 112,302 fish during the six-month creel surveys completed on five Franklin County Reservoirs. Twin Lakes was the most heavily fished reservoir and provided the highest catch rates (3.1 fish / hr) and yield (447 fish / ha). Harvest on the reservoirs was dominated by bluegill (39,811). Of the five waters creeled, total catch per surface area was lowest for the waters managed primarily for quality and trophy bass (Glendale and Condie reservoirs). Anglers fishing the Bear River caught 17,380 rainbow trout, 400 brown trout, 69 smallmouth bass, and 27 cutthroat trout. Only 7% of the rainbow and brown trout caught were harvested.

The number of Yellowstone cutthroat trout migrating out of the Blackfoot Reservoir to spawn in the upper Blackfoot River has declined precipitously since the 2001 count of 4,747. In 2003, only 427 migrating spawners were counted. The new electric weir may, however, impact the results. Other trout caught in the trap included 3 rainbow trout and 19 hybrids. The rainbow trout and hybrids were culled. A visual rating system for species classification was validated by genetic analysis. Overall agreement between genetic and visual classification methods was 99%.

Low water level at Bear Lake prevented adult cutthroat trout from ascending St. Charles Creek to spawn. Only three adults reached our trap and they migrated during a period when PacificCorp created an artificial channel to aid upstream migration. Unfortunately, the artificial channel functioned for less than 24 hrs. Juvenile production in the creek parallels poor adult escapement. Only one age-1 cutthroat trout was caught in downstream migration traps.

Inadequate adult passage at low lake levels and loss of fish in unscreened irrigation diversions are the two most limiting factors for cutthroat trout production in St. Charles Creek and should be the focus of restoration efforts.

During the past two years, the southeast fisheries program prioritized native cutthroat trout monitoring and restoration efforts. In 2002, a working group was established on St. Charles Creek to bring all user groups together to form a restoration plan for native cutthroat trout. That effort combined with monitoring programs on St. Charles Creek and the Blackfoot River utilized most of our time and budget (Figure 1). In 2003, we also prioritized genetic sampling for Bonneville cutthroat trout across their range in Idaho. The genetic samples were collected as a preliminary step to developing an Idaho Bonneville cutthroat trout restoration plan. In 2004, we plan to initiate a multi-agency effort to complete that plan.

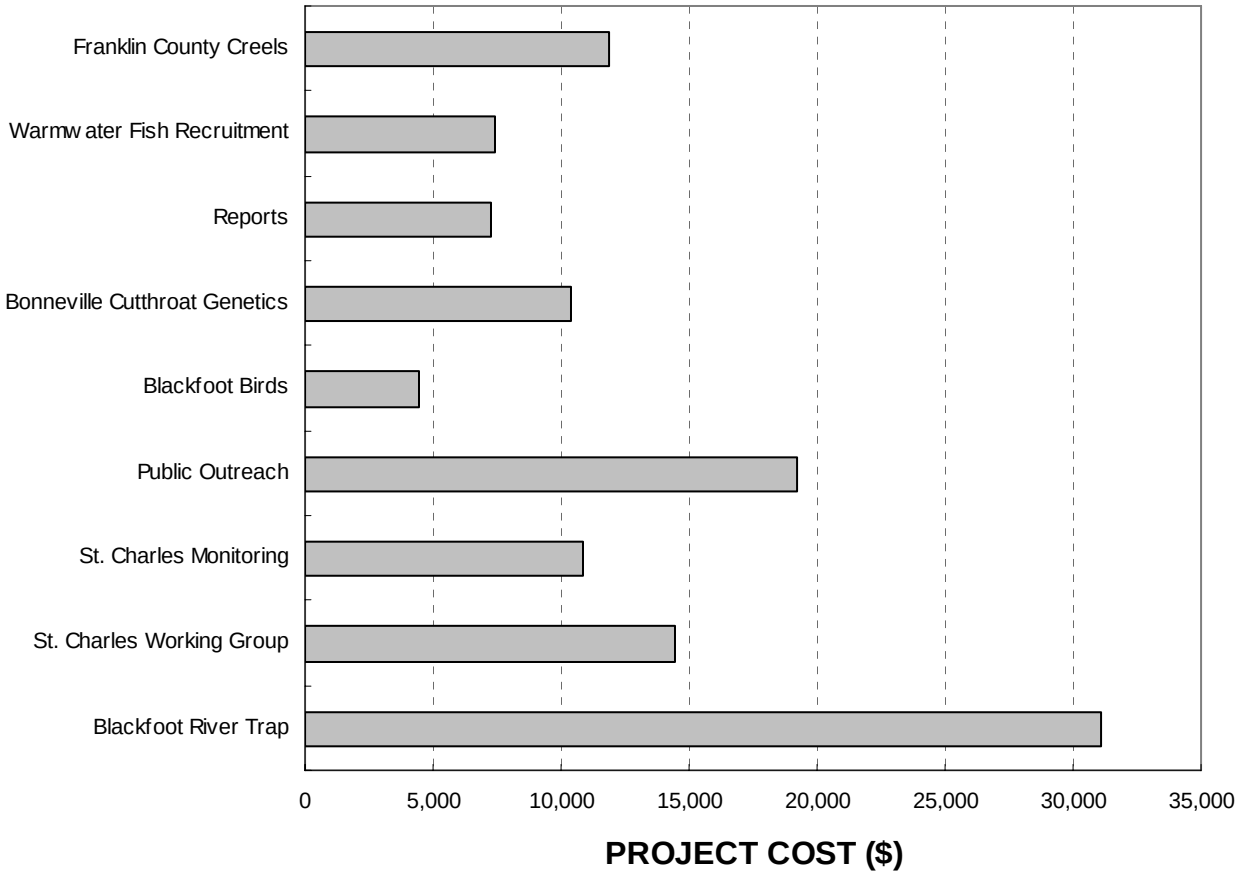

Figure 1. Estimated costs for major projects completed by the southeast region fisheries program in 2003. Estimates were derived using the ABC time coding system. Administration, leave, and other minor projects are not included in this graph.

PREDATION BY DOUBLE CRESTED CORMORANTS AND AMERICAN WHITE PELICANS ON HATCHERY RAINBOW TROUT AND YELLOWSTONE CUTTHROAT TROUT IN BLACKFOOT RESERVOIR, IDAHO

ABSTRACT

Expansion of Double Crested Cormorants and American White Pelicans nesting on Gull Island in Blackfoot Reservoir has increased concerns over their impact on hatchery rainbow trout and native Yellowstone cutthroat trout populations. To estimate the fishery impact of piscivorous birds, we developed a predation model using estimates of predator abundance, diet analysis, and daily consumption demand. Total adult bird populations nesting on Gull Island were 1,672 pelicans and 694 cormorants. Those adult birds and their young consumed an estimated 194 metric tons of fish between May 1 and July 31, 2003. Utah chub made up the largest proportion of prey consumption (65.5%), followed by Utah sucker (11.1%), common carp (7.5%), yellow perch (5.5%), dace sp. (5.1%), and rainbow trout (3.6%). Although rainbow trout made up a small percentage of the total fish consumption estimate, pelicans and cormorants fed opportunistically on newly stocked hatchery rainbow trout. Pelican counts near the hatchery-trout stocking site increased from 21 the day prior to fish releases to 150 the day after. Similarly, rainbow trout dominated (66%) cormorant diets after fish stocking events. Total rainbow trout consumption by pelicans and cormorants was 6.9 metric tons, which is 101% of the total weight of hatchery trout stocked in 2003. Nesting birds also consumed Yellowstone cutthroat trout, but to a lesser degree. Diet samples in June 2002 showed that Yellowstone cutthroat trout made up 2% of pelican diet and 0% of cormorant prey. In 2003, no Yellowstone cutthroat trout were observed in diet samples. The paucity of Yellowstone cutthroat trout in bird diet is likely a reflection of how few cutthroat trout there are relative to other fish species in the reservoir. In summary, nesting bird colonies on Gull Island significantly reduced the survival of hatchery rainbow trout and may reduce survival of native Yellowstone cutthroat trout in Blackfoot Reservoir. Releasing hatchery rainbow trout is futile using current stocking protocols, but may be successful if fish can be distributed evenly over the reservoir or stocked in the fall after birds migrate south. Lastly, additional information is needed to better understand the impact of bird predation on the population structure of Yellowstone cutthroat trout in Blackfoot Reservoir.

INTRODUCTION

During the last two decades, Double Crested cormorants *Phalacrocorax auritus* (DCC) have enjoyed widespread expansion in the United States and Canada. Mean annual population growth in North America is about 6% and in some regions is as high as 29% (Wires et al. 2001). The expansion has increased concerns over impacts to recreational fisheries. Derby and Lovvorn (1997) showed that DCC consumed 80% of rainbow trout *Oncorhynchus mykiss* stocked in the North Platte River, Wyoming. In a similar study, Modde et al. (1996) reported that 31% of rainbow trout stocked in Minersville Reservoir, Utah were consumed by DCC. In Lake Ontario, DCC consumed up to 18% of lake trout *Salvelinus namaycush* plants, with less mortality occurring for fish stocked offshore (Elrod 1997). In Lake Ontario, DCC predation from a single colony of birds nesting on Little Galloo Island consumed an estimated 9.4 million panfish and 900,000 smallmouth bass (Schiavone 2001). Conclusions from that work suggested that the predation by DCC was negatively impacting the recreational fishery for smallmouth bass (Johnson et al. 2001; Schiavone 2001; Ross and Johnson 1999; Lantry et al. 1999).

DCC and American White Pelicans *Pelecanus erythrorhynchos* (AWP) recently established breeding colonies on Gull Island in Blackfoot Reservoir, Idaho. The large concentration of piscivorous birds may impact the sport fishery and reduce native Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* (YCT) populations. Annually, about 1 million fingerling and 35 thousand catchable size rainbow trout are stocked in Blackfoot Reservoir. Recent angling surveys indicate that survival to harvest is about 2% for catchable size trout and 0.3% for fingerling plants (Teuscher 2002). Additionally, YCT are the native trout species in the Blackfoot River system and are classified by the Idaho Department of Fish and Game (Department) as a species of special concern. The adult spawning populations of YCT in the upper Blackfoot River has varied markedly over the past 15 years, and has not benefited from closing sport fish harvest. Predation loss by birds may be contributing to the low cutthroat trout population.

This paper describes our effort to quantify the impacts of bird predation on Yellowstone cutthroat trout and hatchery stocked rainbow trout populations in Blackfoot Reservoir. The specific question addressed in this study include: 1) how many AWP and DCC are nesting on Gull Island, 2) what is the total fish consumption demand by those birds, and 3) what impact does that predation have on hatchery rainbow trout stocking and the overall production of native Yellowstone cutthroat trout in Blackfoot Reservoir.

STUDY AREA

Blackfoot Reservoir is located in the southeast corner of Idaho at an elevation of 1,685 meters. The reservoir covers 7,284 ha. The fish community is dominated by Utah chub, Utah sucker *Catostomus ardens*, yellow perch *Perca flavescens*, and common carp *Cyprinus carpio*. Yellowstone cutthroat trout and hatchery-stocked rainbow trout make up less than 5% of the species composition in the reservoir. Rainbow trout and various species of cutthroat trout have been stocked in the reservoir since its impoundment in 1912. Recently, cutthroat trout stocking was terminated to reduce the potential interaction with the native Yellowstone cutthroat trout and rainbow trout stocked are treated during egg development to induce sterility. Annually, the Department stocks approximately 1 million fingerling and 35,000 catchable size rainbow trout.

In 2002, due to a three-year drought, fingerling rainbow trout were not stocked and only 18,000 catchables were released in the reservoir. In 2003, to help evaluate the impact of bird predation, normal stocking protocols were reinstated. A total of 500,000 fingerlings and 18,000 catchable rainbow trout were released on May 5, 6, and 7, 2003.

Gull Island is 2.1 ha located near the west shore of Blackfoot Reservoir (Figure 2). The island is surrounded by six other islands but is unique in that it is largely denuded of vegetation. Gull Island is about 110 miles (177 km) north of the Great Salt Lake, which supports one of the largest nesting colonies of AWP in the United States.

METHODS

Bird predation data were collected in 2002 and 2003. In 2002, we focused on testing methods for estimating bird abundance and collecting non-lethal diet samples. In 2003, we designed a study that would provide enough information to construct a quantitative predation model of trout predation by DCC and AWP. The predation model combined the following variables: 1) predator abundance, 2) daily predator consumption demand, 3) predator days, and 4) prey selection. The model was built using Excel spreadsheets.

In addition to completing the predation model, qualitative observations were made during the nesting period. We recorded egg-hatching dates, counted numbers of adult birds feeding on newly stocked hatchery rainbow trout, identified other species of birds feeding on fish in the reservoir, and completed a point estimate of actively feeding adult birds over the entire reservoir on June 11. Figure 2 shows the location of Gull Island and hatchery trout stocking sites.

Predator Abundance

Adult bird abundance was estimated using active nest counts. An active nest was defined as one that contained eggs or chicks. The adult bird population was estimated by doubling the active nest counts (VanDeValk et al. 2002). To complete the counts, two or three observers walked parallel transects along the edge of the Island's plateau. The counting method was developed after a preliminary survey was completed to determine manpower and time requirements needed to canvas the entire Island. Nest counting was facilitated by the lack of vegetation and concentration of nests along the rim of the island's plateau.

AWP and DCC chicks were included in the predation model. To estimate the number of feeding chicks, counts were made early in the nesting period prior to chicks being able to leave their nests. Brood values were one chick per AWP nest and two chicks per DCC nest and were similar to values reported in the literature (Brown and Urban 1969; Harrison 1978; Weseloh et al. 1983; Knopf 1997).

Diet Analysis

We completed diet analysis by examining regurgitations by adult and juvenile birds. During the first few weeks post-hatch, adult bird regurgitations were prevalent in and around nests. Chicks also regurgitated when approached by a humans. The regurgitated fish were identified to species. Whole prey items were commonly found.

Scale size, flesh color, cutthroat slashes, and spotting patterns were used to distinguish hatchery rainbow trout from Yellowstone cutthroat trout.

For AWP diet, the regurgitation method was not used for the first 10 days of the predation model. Unlike DCC, adult AWP did not regurgitate near the nests until after chicks hatched. The majority of AWP chicks hatched the last week of May. The later hatch time limited diet analysis for AWP during the first few weeks of the predation model period. Because of the lack of regurgitation data, we used feeding observation to estimate diet proportions. During the first two weeks of the study, the key prey species of interest was hatchery rainbow trout. We monitored AWP abundance near the hatchery trout stocking sites. AWP abundance near the hatchery trout stocking site increased from less than 1% of the total adult AWP population prior to stocking trout to 13% immediately after stocking. We assumed that all of the new AWP feeding at the stocking site fed exclusively on hatchery rainbow trout and that the remaining 87% of the AWP population fed exclusively on their preferred prey (Utah chub). Therefore, the diet proportion used for hatchery rainbow trout at the beginning of the model run was 13%. Regurgitations from AWP were available the last week of May and were used in the model thereafter.

Consumption Estimates

Model values for daily consumption demand were 0.45 kg of fish per day for DCC (VanDeValk et al. 2002) and 1.10 kg of fish per day for adult AWP (Brown et al. 1969; Shmueli et al. 2000). Consumption demand by chicks began at zero on June 1, and increased linearly until it equaled half the adult daily consumption demand 60 days post hatch. The June 1 start date for consumption was based on observation when most of the chicks were hatched and were being fed by their parents.

We ran the predation model for a conservative 90-day period (May – July). The model period was limited to 90 days because of the availability of diet and predator abundance data. Once the DCC began fledging, we could no longer estimate the abundance of predators or collect their diet. Table 1 shows how the data variables were used to estimate daily consumption of each prey species.

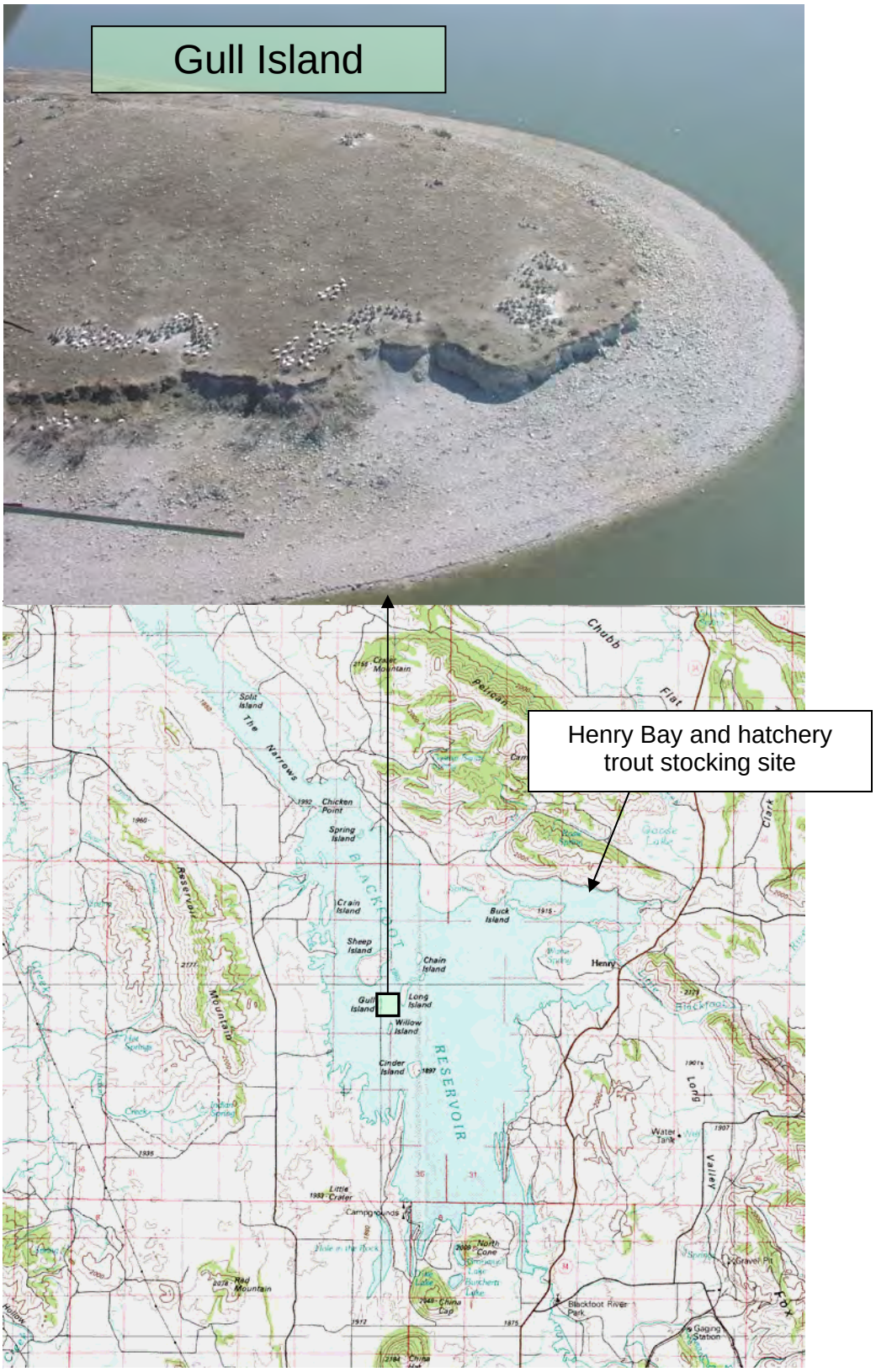

Figure 2. Aerial view of gull Island, Blackfoot Reservoir and Henry Bay. Henry Bay is the hatchery trout release site. Total surface area of Gull Island is 2.1 ha.

Table 1. Predation model estimates of yellow perch consumption by AWP and DCC on July 31, 2003.

	American White Pelicans		Double Crested Cormorants	
	Adults	Chicks	Adults	Chicks
Abundance	1,674	837	526	526
X				
Consumption Demand (Kg / bird / day)	1.10	0.56	0.46	0.24
X				
Yellow Perch Diet Proportion	0.11	0.11	0.40	0.40
=				
Yellow Perch Consumption (Kg on July 31)	203	52	97	51

RESULTS

Qualitative Observations

On May 1, 2003, the majority of AWP and DCC finished building their nests on gull Island. Eggs began hatching the second week in May. Late eggs and hatchlings were present on the Island through June, but mortality on the late hatching birds appeared to be very high. Mortality came chiefly from nesting California gulls *Larus californicus.* The California gulls were the most abundant bird on Gull Island. The California gulls nested primarily on the interior of the Island, harassed and stole food from AWP and DCC, and killed untended young. DCC fledged first and left the Island by mid August. AWP offspring were still using Gull Island in August, but were making test flights, swimming and actively feeding on their own.

AWP and DCC fed opportunistically on newly stocked hatchery trout. On May 4, 2003, the day prior to releasing hatchery trout in Henry Bay, observers counted 21 AWP and 12 DCC feeding in the bay. The day after releasing hatchery rainbow trout in Henry Bay, 150 AWP and 30 DCC were actively feeding on fingerling and catchable rainbow trout. Pelicans were feeding in large coordinated lines. On May 7, the point estimate of actively feeding birds in Henry Bay dropped to 121 AWP. On June 11, 58 AWP were observed feeding in the Henry Bay.

The confluence of the Blackfoot River with the reservoir consistently supported the greatest concentration of feeding AWP. During the reservoir-wide count completed on June 11, there were 250 AWP at the mouth of the Blackfoot River. The total count of AWP, which were feeding around the reservoir away from Gull Island, was 648. That count did not include the AWP tending their nests on Gull Island. A second large concentration of birds fed several hundred meters from Gull Island. Accept for those two concentrations, AWP fed primarily in flocks of 10 to 50 birds.

Predator Abundance

Active nest counts for 2002 and 2003 are shown in Table 2. Total combined nest counts ranged from 810 to 1,100. Fewer DCC nested on Gull Island in 2003. The decline in DCC was offset by an almost equal increase in nesting AWP. The late pulse in AWP nests, that occurred between May 16 and May 28, 2003 (154 new AWP nests), coincided with a decline in DCC nests. Based on the active nest counts, AWP abundance peaked at 1,672 adults and 837 chicks. Peak DCC abundance was 694 for both adults and their chicks.

Table 2. Active nest counts on Gull Island in 2002 and 2003. A nest was considered active if it contained eggs or chicks.

Date	Pelicans	Cormorants	Totals
2002			
May 20	619	400	1,019
May 30	676	418	1,094
June 5	648	412	1,060
2003			
May 1	556	254	810
May 9	556	254	810
May 16	675	347	1,022
May 28	829	245	1,074
June 11	837	263	1,100

Diet Analysis

A total of 77 bird regurgitations were analyzed from 2002 and 119 in 2003. In 2002, all 77 samples were collected on June 27 and both species fed mainly on Utah chub. In 2003, diet samples were collected at regular intervals throughout the three-month nesting period. In May, AWP fed primarily on Utah chub and newly-stocked hatchery rainbow trout. In June and July, AWP diversified their feeding habits by including common carp, Utah sucker, and yellow perch (Table 3). On May 7, hatchery rainbow trout made up 66% the diets of DCC. By the end of the nesting period, DCC shifted to feeding mainly on common carp and yellow perch.

From the large diet sample taken June 27, 2002, we observed one adult Yellowstone cutthroat trout in AWP nests (total length 494 mm). Three additional Yellowstone cutthroat trout were observed in AWP nests in 2002. Those fish were noted but not taken in concert with a random sample of bird diets. Interestingly, no Yellowstone cutthroat trout were observed in diet samples from 2003 (Table 3).

AWP consumed larger fish than DCC. Mean length of Utah chub consumed by AWP was 321 mm compared to 212 mm for DCC. With the exception of newly stocked rainbow trout, most of the fish observed in the May and June diet were fish greater than 200 mm. Conversely, on July 31, both species fed chiefly on juvenile carp and yellow perch (mean total lengths

< 100mm). The largest fish measured was a 530 mm Utah sucker regurgitated by an AWP on July 31, 2003.

Table 3. Diet results for AWP and DCC nesting on Gull Island in Blackfoot Reservoir, Idaho. For the 2003 predation model, interpolations were used between the sample days shown in this table. For example, the DCC diet proportion for rainbow trout diet declined from 66% on May 7 to 0% on May 16. The rainbow trout diet proportion used in the model on May 12 was 35%.

	American White Pelicans								
Date	**N**	**RBT**	**YCT**	**Chub**	**Sucker**	**Carp**	**YP**	**Dace**	**Other**
6/27/02	34	0	2	91	2	5	0	0	0
5/7/03	*	13	0	87	0	0	0	0	0
5/28/03	4	0	0	100	0	0	0	0	0
6/11/03	7	0	0	86	0	0	0	0	14
6/23/03	18	11	0	72	6	11	0	0	0
7/16/03	7	0	0	43	43	0	14	0	0
7/31/03	41	5	0	17	17	50	11	0	0
2003 mean		**3**	**0**	**70**	**11**	**10**	**4**	**3**	**3**

	Double Crested Cormorants								
Date	**N**	**RBT**	**YCT**	**Chub**	**Sucker**	**Carp**	**YP**	**Dace**	**Other**
6/27/02	43	0	0	91	6	0	0	0	3
5/7/03	12	66	0	25	0	0	9	0	0
5/16/03	4	0	0	75	0	0	25	0	0
5/28/03	15	0	0	100	0	0	0	0	0
6/11/03	3	33	0	0	0	0	0	67	0
6/23/03	2	0	0	0	0	0	0	100	0
7/31/03	5	0	0	0	0	60	40	0	0
2003 mean		**11**	**0**	**39**	**0**	**10**	**0**	**28**	**0**

* diet proportions estimated by observing feeding AWP (see methods page 14).

Consumption Estimates

Nesting birds on Gull Island consumed an estimated 194 metric tons of fish during the 90-day model period. Consumption was greatest for Utah chub (65%, 127 metric tons), followed by Utah sucker (11.1%), common carp (7.5%), yellow perch (5.5%), dace sp. (5.1%), and rainbow trout (3.6%). Total rainbow trout consumption by AWP and DCC during a 90-day model period was 6.9 metric tons or 101% of the total hatchery trout stocking biomass. Due to their relative abundance and higher consumption demand, AWP consumed the larger portion of rainbow trout (5.7 metric tons; Figure 3). Rainbow trout losses to bird predators were greatest

during the first week after stocking. During that first week, nearly 30% (150,000) of the newly stocked hatchery rainbow trout were lost to bird predation. Table 4 shows estimated total consumption of all prey species during the 90-day model period.

Table 4 Total fish consumption estimates by DCC and AWP in Blackfoot Reservoir during the 90-day model period.

	Pelicans		**Cormorants**		**Totals**	
Prey	**Kg**	**%**	**Kg**	**%**	**Kg**	**%**
Utah chub	119,714	70.9	7,537	29.4	127,251	65.5%
Utah sucker	21,518	12.8	0	0.0	21,518	11.1%
Common carp	11,050	6.5	3,538	13.8	14,588	7.5%
Yellow perch	7,246	4.3	3,441	13.4	10,687	5.5%
Dace	0	0.0	9,868	38.5	9,868	5.1%
Rainbow trout	5,729	3.4	1,262	4.9	6,991	3.6%
Other	3,507	2.1	0	0.0	3,507	1.8%
Totals	**168,763**		**25,646**		**194,409**	

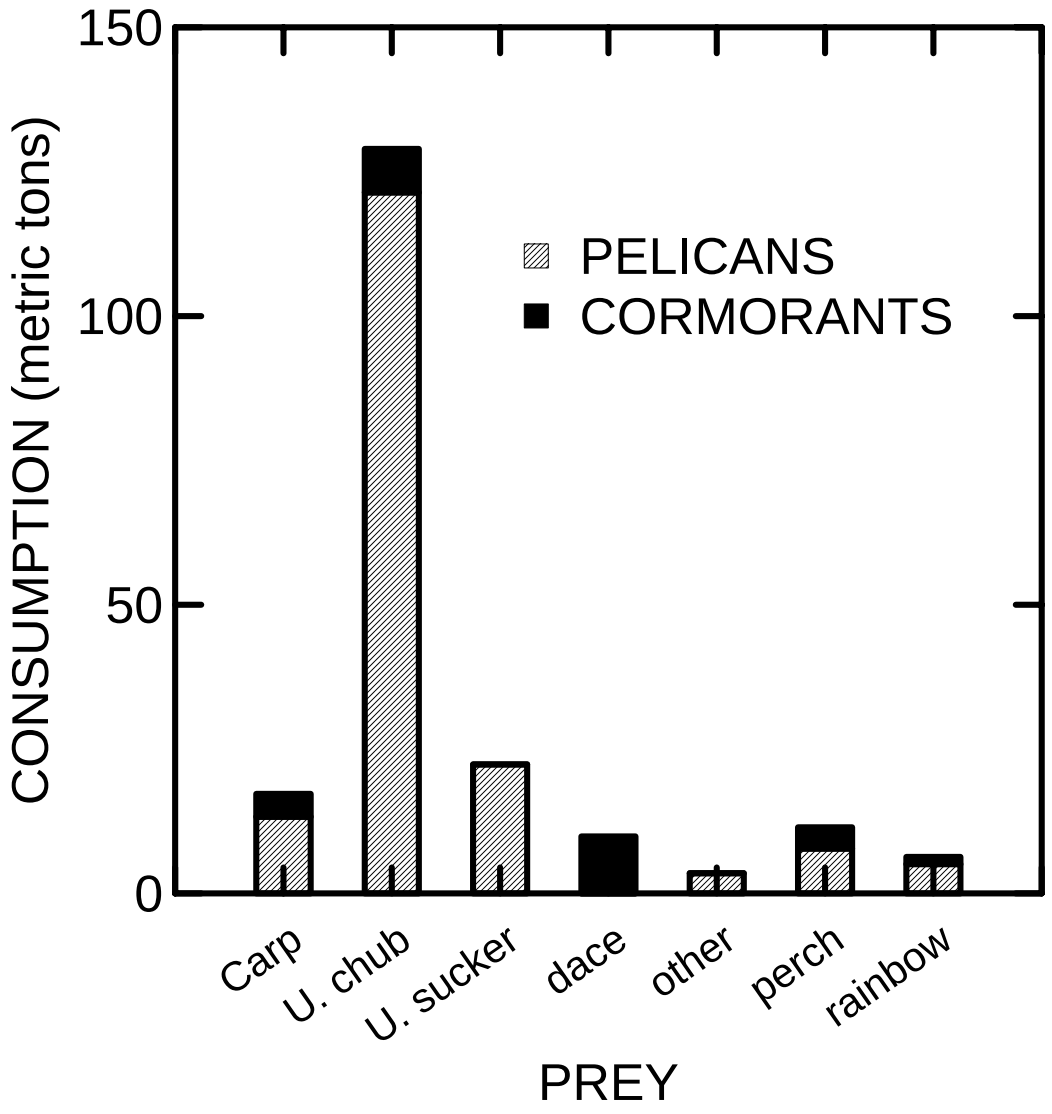

Figure 3. Total prey consumption estimates during the 90-day model period by prey species for AWP and DCC. The other category included brook trout and mottled sculpin.

DISCUSSION

Our predation model did not estimate total annual consumption of fish by birds in Blackfoot Reservoir. AWP and DCC fed on fish in the reservoir for approximately twice the time period modeled. Lethal diet sampling techniques and additional bird counts would be required to estimate total annual consumption. Our data, however, do provide an estimate of the impact during the three-month nesting season on hatchery rainbow trout and qualitative observations of predation on Yellowstone cutthroat trout.

Predation by DCC and AWP was a significant cause of hatchery rainbow trout mortality. During the first week post stocking, AWP and DCC consumed an estimated 30% of the hatchery trout released in reservoir. Just the feed cost to produce the 2 metric tons of trout consumed the first week is about $8,000 ($3.86 / kg x 2,000 kg). In addition to the immediate loss of rainbow trout to AWP and DCC, Caspian terns and American gulls were observed feeding on newly stocked trout in Henry Bay.

Not all of the rainbow trout found in regurgitations were newly stocked rainbow trout. Some of the rainbow trout consumed by AWP exceeded 400 mm total length. Rainbow trout greater than 400 mm were either naturally produced fish or carryover trout stocked in a previous year. The availability of carryover trout or naturally produced trout may explain why total rainbow trout consumption during the 90-day model period exceeded the total biomass of trout stocked in 2003.

There are several assumptions that may impact model accuracy. Of the three main variables used in the model (predator abundance, diet analysis, consumption demand), predator abundance may be the most robust. It makes intuitive sense to multiply the active nest count by two to estimate the adult bird population. Additionally, our reservoir-wide survey showed that the majority of birds nesting on Gull Island were feeding on fish in Blackfoot Reservoir. Potential error may be more significant from the diet analysis and consumption demand variables. Due to small sample size, some of our diet estimates used in model predictions may overestimate or underestimate actual prey consumption for a given prey species. Model predictions are also very sensitive to the values entered for daily consumption demand. Despite being amazed on numerous occasions at the volume of fish regurgitated from a single bird, we have no data verifying consumption demand or gut evacuation rates. If adult AWP and DCC do not consume close to the literature values of 1.1 kg (AWP) and 0.46 kg / bird / day (DCC), then our consumption estimates would differ proportionately from true consumption values.

Avian predation on Yellowstone cutthroat trout was observed in 2002 but not 2003. Several factors may contribute to the absence of cutthroat in 2003 diet samples. First, the Yellowstone cutthroat trout population appears to be declining in the reservoir and their relative abundance may be low enough that encounter rates by birds are extremely low. Secondly, the release of nearly 500,000 fingerling rainbow trout in 2003 may have relaxed predation pressure on Yellowstone cutthroat trout. Lastly, both avian predators may have included Yellowstone cutthroat trout in their diet in small proportions, but at low enough frequency that we did not detect it in our samples.

Despite the direct predation loss of hatchery rainbow trout, there may be a positive impact on salmonid production in Blackfoot Reservoir from AWP and DCC predation. Reducing Utah chub densities to improve trout production is a common practice in productive western reservoirs. Some of the best trout angling in Blackfoot Reservoir occurred after the completion of a non-game (mostly Utah chub and Utah sucker) fish reduction treatment in 1961. Total consumption of Utah chub was 127 metric tons. Most of the Utah chub consumed were adult fish (>200 mm total length). Based on mean length estimates from bird diets, avian predators removed about 350,000 adult Utah chub. That predation may be compensated for by increased production of juvenile Utah chub. Conversely, if the predation is depensatory, the avian predators could indirectly benefit trout populations by reducing competition between Utah chub and rainbow trout.

AWP and DCC fed opportunistically in Blackfoot Reservoir. The birds quickly responded to the release of 501,800 naive hatchery rainbow trout. AWP and DCC fed heavily on Utah sucker and Utah chub that concentrated at the mouth of the Blackfoot River during their spawning runs. It appeared that regardless of fish species, large concentrations of fish attract avian predators. Fortunately, that feeding behavior may allow for improved rainbow trout survival by spreading the hatchery fish evenly throughout the reservoir.

Abundant AWP and DCC populations may impede recovery of Yellowstone cutthroat trout. The decline in Yellowstone cutthroat trout has occurred despite no-harvest regulations by anglers on the upper Blackfoot Reservoir since 1990 and the Blackfoot River since 1998. The decline in cutthroat trout may be caused by a three-year drought, increased predation pressure by birds, or a combination of both. Regardless, if the cutthroat trout population rebounds to a level where thousands of adult fish concentrate to make a spawning run up the upper Blackfoot River, they will most likely attract the attention of these piscivorous birds either on their spawning beds, or during their migration in and out of the river.

In conclusion, while fishery managers may be able to reduce predation losses by adjusting hatchery rainbow trout stocking practices, the current level of nesting birds on Gull Island may be an obstacle to recovery of the adfluvial population of native Yellowstone cutthroat trout in Blackfoot Reservoir. Future research should focus on monitoring the abundance and feeding behavior of AWP and DCC during the cutthroat trout spawning run.

Management Recommendation:

1. Stock hatchery rainbow trout either prior to bird arrival or in the fall after the birds migrate south. On average, sparse forage resources make fall releases less productive compared to spring plants (Teuscher et al. 1998). ***However, the current limiting factor for hatchery trout survival in Blackfoot Reservoir is avoiding avian predation not finding food.*** If stocking during the spring nesting period is necessary, stock fingerlings in numerous areas around the reservoir. Do not stock more than 10,000 fingerlings in any one location and do not repeat a stocking site on consecutive days.

2. Monitor the relative species composition in Blackfoot Reservoir to determine if Utah chub mortality by avian predators in depensatory or compensatory mortality.

INTRODUCTION

Public comments were collected at six public meetings, from responses of a random mail survey, and during a three-day outdoor expo held in Holt Arena on the Idaho State University campus. Our objective was to obtain public opinion on angling preferences, ongoing management activities, and potential rule changes. Public comments are used to help set regional fish recommendations that are considered by the commission for the 2004-05 fishing regulations booklet.

The public meetings began with a short questionnaire asking participants to rank their preferred angling experience. Each angler was asked how he or she would prefer to spend 10 days fishing for the species and type of regulation they prefer (e.g., fishing for native cutthroat trout in streams, fishing for trophy bass, hatchery trout in reservoirs, panfish, etc.). Once the angling preference surveys were completed, Department fisheries staff gave a brief presentation of the potential regulation changes being considered for the 2004-05 fishing rules. The meetings concluded by distributing a second questionnaire that gave each individual an opportunity to support or appose the management activity or potential regulation change. The survey included the following questions: 1) should the Department continue to stock rainbow trout in Twin Lakes where the local irrigation company recently imposed access fees, 2) should Glendale Reservoir's minimum harvest restriction of bass be changed from 16-inches to 20-inches, 3) should a quality bass regulation for smallmouth bass be implemented in the Snake River below American Falls dam, 4) should the Department manage a section of the upper Portneuf River as a quality cutthroat trout population with limited cutthroat trout harvest and reduced rainbow trout stocking, 5) and should the Department make it illegal to possess bait while fishing waters with a no-bait rule. The questionnaires are included in Appendix A.

The same questionnaires were mailed to 1,000 anglers who purchased fishing licenses in southeast Idaho in 2002. The 1,000 anglers were randomly selected from a pool of 40,247 license buyers. To increase return compliance for the mail survey, participants were entered in a drawing for a $50.00 reward. Resident and non-resident license buyers were included in the survey.

In addition to completing the mail and public surveys, Pocatello City holds an outdoor expo every spring. During the April 2003 expo, the angler preference survey was offered to anyone that stopped at the Department booth. The booth consisted of basic information handouts, a PowerPoint presentation, and a large fish tank that held many of the sport fish species found in southeast Idaho.

RESULTS

Angling Preferences

Anglers from all three survey methods (mail, expo, and public meetings) prioritized fishing for trout over any other species. Within the trout fishing categories, anglers preferred fishing general regulation waters (71%) over quality or trophy trout systems (29%). Bass (12%) and panfish (8%) were the second and third most sought after fish species. Similar to trout angling, general bass harvest regulations were more popular (60%) than quality or trophy trout angling (40%).

In a few categories, angling preferences varied between collection methods. Anglers attending public meetings and the outdoor expo prioritized fishing on special regulation waters more so than respondents from the random mail survey. For example, respondents of the random mail survey indicated that 24% of their effort would be spent fishing quality or trophy trout waters. Quality and trophy trout waters received higher marks from participants of the outdoor expo (38%) and public meetings (36%). The same trend was evident for quality bass fishing regulations between the mail surveys (36%) and the outdoor expo results (48%). Table 5 shows results from all three surveys.

Preferences for native trout and hatchery trout differed slightly between survey methods. In the random mail survey, more anglers days were spent fishing for hatchery trout in streams (21%) compared to native trout in streams (18%). Conversely, results from the outdoor expo and public meetings showed a preference for native trout angling over fishing for hatchery trout in streams (Table 5).

Potential Rule Changes and Management Actions

A total of 69 people attended the public meetings. Attendance was greatest at the Pocatello (20) and Preston (17) locations, followed by Montpelier (11), Soda Springs (7), Blackfoot (7), and Malad (6). From the 1,000 surveys sent by mail, a total of 286 were completed and returned to the Department. Some of the questionnaires (7.6%) were returned to our office unopened due to changes in address or labeling errors. We assumed that all other questionnaires (924) reached the intended party. Response for the mail survey was 31% (286 of 924).

Results from the surveys indicated that three of the potential actions were supported and two were opposed (Table 6). Anglers supported stocking Twin Lakes (54%), developing a quality cutthroat trout angling rule for part of the Portneuf River (55%), and making it illegal to possess bait while angling on waters with a no-bait rule (49%). For the Twin Lakes and Portneuf River actions, those opposed were outnumbered by supporters two-to-one (Table 6). The two questions that did not have public support were the proposals to consider trophy bass regulations on Glendale Reservoir and the Snake River below American Falls Dam. For Glendale Reservoir, 58% opposed the change to trophy regulations and only 11% favored the change. Forty one percent opposed the trophy bass proposal for the Snake River, with 28% in favor of the change. A large percentage of anglers (31%) had no opinion regarding the bass rule changes.

Table 5. Results from the angling preference surveys. Sample sizes (questionnaires completed) for each survey were 286 by mail, 122 from the Expo, and 62 at public meetings.

	% of days allocated			
Fishing Preference Categories	**Mail**	**Expo**	**Meetings**	**Pooled**
Hatchery trout in reservoirs, general regs	21	10	17	18
Hatchery trout in reservoirs, quality or trophy	13	10	12	12
Bass general	6	8	10	7
Bass quality or trophy	3	7	5	5
Panfish	7	9	11	8
Walleye	3	5	5	4
Sturgeon	2	9	1	4
Native trout in streams reduced harvest	18	23	20	19
Hatchery trout in rivers and streams, 6 trout	21	16	10	18
Other –write in any preference not listed	6	2	11	5
All trout categories combined	73	60	58	67
All bass categories combined	10	15	14	12
General trout	76	62	66	71
Quality or trophy trout	24	38	34	29
General bass	64	52	68	60
Quality or trophy Bass	36	48	32	40

Table 6. Angler survey results (percentages) for six public meetings and a mail survey sent to 1,000 license buyers from southeast Idaho. Totals do not sum to 100% because some survey respondents listed “no opinion”.

Public Meetings

		Twin Lakes		Glendale		Portneuf R.		Snake R.		Bait Rule	
	n	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Preston	17	12	76	18	71	71	12	29	47	53	41
Pocatello	20	75	15	50	35	100	0	65	25	90	5
Malad	6	67	0	50	33	100	0	50	33	100	0
Soda Springs	7	100	0	14	43	71	14	14	29	71	29
Blackfoot	7	71	29	0	57	57	29	0	57	57	43
Montpelier	11	73	0	18	18	55	9	27	9	64	9
Sub Total	68	59	28	27	45	77	10	36	33	71	22

Mail Survey

		Twin Lakes		Glendale		Portneuf R.		Snake R.		Bait Rule	
	n	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Residence	203	51	31	6	63	45	36	25	47	40	49
Non Res.	83	58	18	10	59	63	12	29	30	51	35
Sub total	286	53	27	10	62	50	29	26	42	43	45

Combined Survey Totals

		Twin Lakes		Glendale		Portneuf R.		Snake R.		Bait Rule	
	n	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Grand Total	**354**	**54**	**27**	**11**	**58**	**55**	**26**	**28**	**41**	**49**	**40**

Results of the bait rule question were inconsistent between the random mail survey and public meetings. At the public meetings, adopting the no possession bait rule was favored by 71%. Conversely, respondents of the random mail survey opposed the change (45% opposed, 43% supported).

Except for one question, residents of Idaho agreed with responses from non-residents. The exception was the bait possession rule. Residence opposed the change (49% opposed, 40% supported). Non-residents supported the change (51% supported, 35 opposed).

DISCUSSION

Public opinion surveys indicated that fishing for trout is still the highest priority for southeast Idaho anglers. Quality and trophy regulations appear to be an important part of the opportunity available to anglers but do not equal the priority placed on general regulation waters. Interestingly, responses from the angling preference survey and specific regulation proposals were consistent. Anglers showed a preference for general bass regulations and also rejected more restrictive harvest rules on Glendale Reservoir and the Snake River. Fishing for native trout in streams receive a significant amount of total angling day preferences and the native cutthroat trout proposal on the Portneuf River was supported (55% support, 26% opposed).

Some of the differences between survey methods may be explained by the environment present during each survey. During the outdoor expo, respondents had the opportunity to observe a six-foot long sturgeon swimming in a tank. The marks on angling preferences for sturgeon were much higher for the outdoor expo (9%) than for the random mail survey (2%) or the public meetings (1%). The no-bait possession is another example where environment may have impacted survey results. Support for the no-bait possession rule was 71% from public meetings and only 43% from the mail survey. The presence of fish and game employees may have biased the public meeting responses.

Recommendations

1. Reject the proposed quality bass fishing rule for the Snake River below American Falls Dam. The public opinion surveys do not support the proposed quality bass rule. Furthermore, a recent creel survey indicated the harvest of bass in this river reach was relatively minor. Both creel surveys and public opinion surveys support maintaining the current general bass fishing rule.

2. Reject the proposed change to initiate a trophy bass regulation on Glendale Reservoir. This proposal was not supported by any of the public opinion surveys. Additionally, a recent population survey of the reservoir demonstrated a balance between bass predators and their prey. Protecting more predators from harvest under the proposed 20-inch minimum could disrupt the current balance between predation and prey.

3. Continue stocking Twin Lakes. Despite the recent access fee initiated by the irrigation company, anglers preferred (54% supported, 27% opposed) that the Department continue normal trout stocking in the reservoir. A recent creel survey of Twin Lakes showed that it is a popular fishing destination with high catch rates. Therefore, despite the new access fee, the Department should continue to work with the irrigation company to facilitate public access and maintain the quality family fishing experience currently offered.

4. Accept the proposed cutthroat trout regulation on the Portneuf River. Public opinion supported this rule change.

5. Reject the proposal to make it illegal to carry bait while fishing waters with a no-bait regulation. Despite modest overall support for this regulation. The random survey results were nearly split (43% supported and 45% opposed). The random mail survey should be the best overall measure of all license buyers in southeast Idaho.

FRANKLIN COUNTY CREEL SURVEYS

INTRODUCTION

It has been more than a decade since creel data were collected on many of the popular Franklin County reservoirs. The last major creel efforts were conducted in 1987-1992. Since then, fishing regulations have changed on some of the reservoirs. Population growth in Cache Valley also may have increased pressure on these fisheries. The Bear River below Oneida Dam is another key fishery that is experiencing changes in species composition, water management, and angler use. The goal of this work was to quantify angler use on five reservoirs and the Bear River below Oneida Dam. Specific questions of interest include: 1) has angler effort on key reservoir fisheries changed since the last creels were conducted; 2) have recent changes in regulations impacted angler use; 3) are brown trout still contributing to the Bear River fishery; and 4) are angler preferences reported at public meetings and from random mail surveys consistent with actual creel information.

STUDY WATERS

Creel surveys were completed on five reservoirs located in southeast Idaho. All of the reservoirs are small (<200 ha), shallow, and productive. Table 7 shows reservoir name, elevation, surface area, species composition, and current management regulations.

Table 7. Reservoirs included in the 2003 creel surveys. In addition to the listed species, all of the reservoirs are stocked with hatchery rainbow trout.

Water	Elevation (m)	Surface Area (ha)	Species Composition	Fishing Regulations
Johnson	1,485	20	LMB,BG,YP,TM	General
Lamont	1,485	37	LMB,BG,YP,TM	General
Glendale	1,509	93	LMB,BG,CR,YP	Quality bass
Twin Lakes	1,452	180	LMB,BG,YP,CR	Family fishing
Condie	1,500	47	LMB,BG,YP,TM	Trophy bass

LMB = largemouth bass, BG = bluegill, YP = yellow perch, TM = tiger muskellunge, CR = crappie

The Bear River below Oneida Dam is a moderately large system with summer flows generally ranging from 200 to 1,200 cfs. The Department annually stocks about 10,500 hatchery rainbow trout in three locations below the dam (first bridge, Red Point, and Mink Creek). Recent changes in the fishery that contributed to the rationale for completing this study

include an invasion of smallmouth bass from Oneida Reservoir, increased use by drift and pontoon boats, and the termination of brown trout stocking. The popular river fishery commonly referred to as the Bear River Narrows, is about 35 miles from Logan, Utah and receives substantial pressure from non-resident anglers.

METHODS

The surveys were conducted from April 1 to October 31, 2003. During this period, surveys were completed once during the week and once during the weekend. Each week, the weekday surveys were rotated one day later than the previous week and the weekend survey rotated between Saturday and Sunday. The surveys were also performed at different time intervals. These intervals were broken into morning (sunrise-noon), afternoon (noon-1700), and evening (1700-sunset). Time intervals were adjusted between surveys so that we never repeated the same time interval as the previous survey. Typically, we varied the direction the survey was conducted (south or north) to achieve variation in creel count times. All accessible anglers were interviewed. Those anglers that were not contacted were counted as a shore or boat angler. The creel survey questions (Appendix B) were based upon the Creel Survey Analysis Program (C-SAP), generated by the Colorado Division of Wildlife Aquatic Research. Angler responses were entered into the C-SAP program for analysis.

The Bear River creel survey reach was broken into two sections. The upper section included the Bear River from Oneida Reservoir Dam downstream to the highway 36 bridge (10.7 km). The lower section began at the highway 36 bridge and continued downstream to the river crossing at the highway 34 bridge (7.6 km).

RESULTS

Lamont Reservoir

A total of 154 anglers were counted during the surveys and 68 were interviewed. The creel program estimated 2,885 anglers fished 7,011 hrs and caught 9,113 fish (246 fish / ha). Angler catch rate was 1.3 fish / hr. Largemouth bass dominated the catch (4,033) followed by bluegill (2,545), rainbow trout (1,456), and yellow perch (1,079). Total harvest was 3,448 fish (93 fish / ha). Bluegill dominated harvest (2,177) followed by yellow perch (654), rainbow trout (496), and largemouth bass (122). Every year, the Department stocks about 4,600 catchable rainbow trout in Lamont Reservoir. Assuming that the 2003 creel represents a normal harvest of rainbow trout, return to creel is approximately 11% and percent caught was 32%. Those estimates do not include the ice-fishing season. Mean total length of rainbow trout harvested was 293 mm, which suggest that carryover sized rainbow trout made up a small fraction of harvest. Bait was the preferred angling method for both resident and non-resident anglers, although the ratio of bait to lure anglers amongst non-residents was significantly smaller. Fishing effort was almost equally split between bank (45%) and boat (55%) anglers. Residents made up 75% of anglers fishing Lamont Reservoir.

Johnson Reservoir

A total of 85 anglers were counted during the surveys and 58 were interviewed. The creel program estimated 6,279 anglers fished 4,860 hrs and caught 8,770 fish (438 fish / ha). Angler catch rate was 1.8 fish / hr. Catch rates for all waters by species are shown in Figure 4. Bluegill dominated the catch (8,071) followed by rainbow trout (569), and yellow perch (130). No largemouth bass or tiger muskellunge were reported in the catch on creel days. Largemouth bass and tiger muskellunge were not observed in the creel but do occupy the reservoir. Total harvest was 2,900 fish (145 fish / ha). Bluegill dominated the harvest (2,286) followed by rainbow trout (133). Every year the Department stocks about 1,750 catchable rainbow trout in Johnson Reservoir. Assuming that the 2003 creel represents a normal harvest of rainbow trout, return to creel is approximately 8% and percent caught was 33%. Mean total length of rainbow trout harvested was 302 mm, which suggests that carryover sized rainbow trout made up a small fraction of harvest. Bait was the preferred angling method for both resident and non-resident anglers. Residents made up 85% of anglers fishing Johnson Reservoir. Fishing effort on Johnson Reservoir was greatest from boats (61%).

In August, Johnson Reservoir was drained in order to repair the outlet pipe. Between the surveys on August 16 and August 27, there was a complete fish kill. There were no further surveys conducted after August 27th.

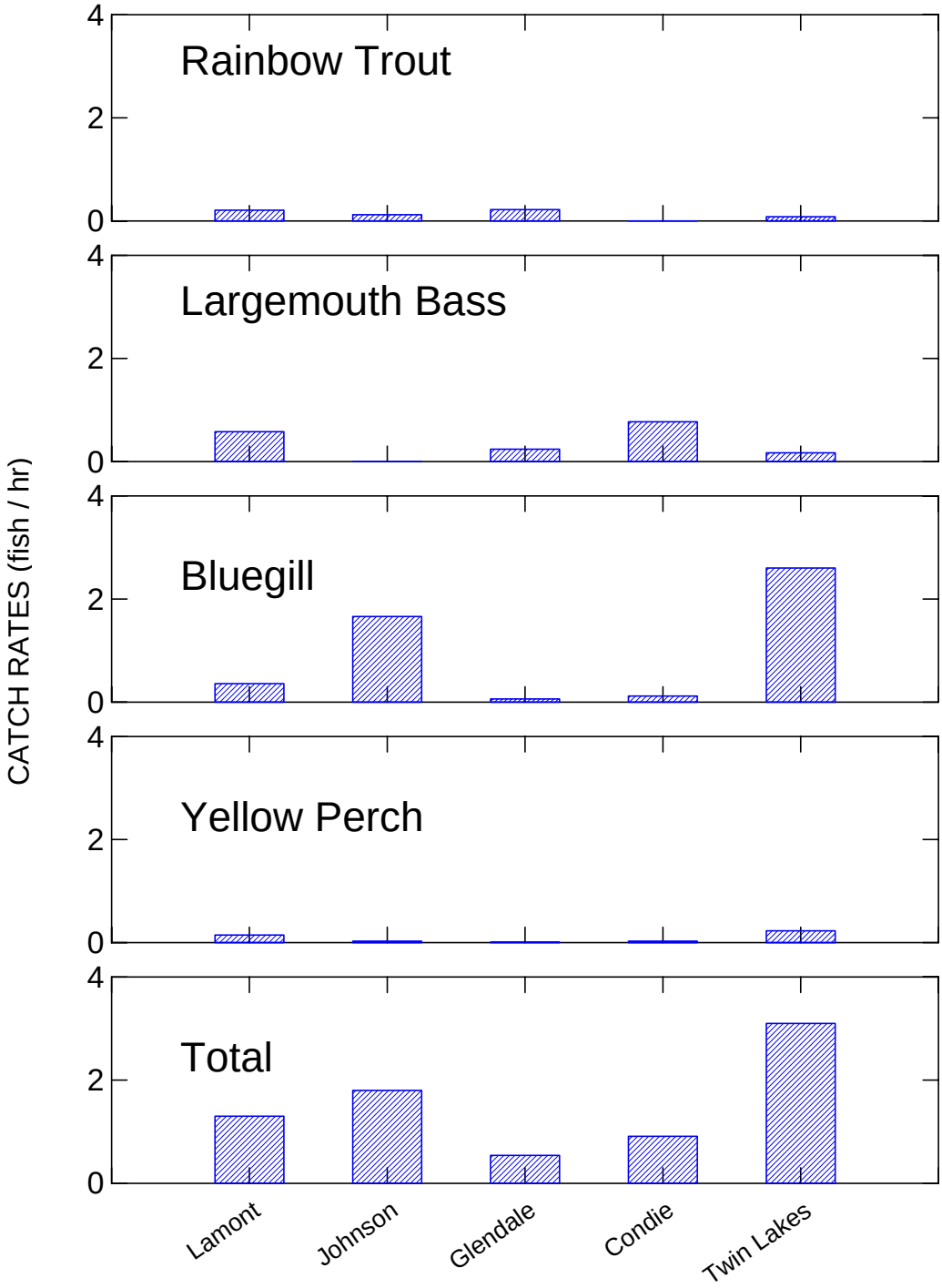

Figure 4. Catch rates (fish / hr) for five Franklin County reservoirs.

Glendale Reservoir

A total of 266 anglers were counted during the surveys and 133 were interviewed. The creel program estimated 4,956 anglers fished 14,617 hrs and caught 7,877 fish (85 fish / ha). Angler catch rate was 0.54 fish / hr. Largemouth bass dominated the catch (3,471) followed by rainbow trout (3,250), bluegill (882), yellow perch (123), and crappie (117). Total harvest was 3,695 fish (40 fish / ha). Rainbow trout dominated the harvest (3,041) followed by bluegill (415), yellow perch (123), and crappie (117). Despite their being the most commonly caught species in the reservoir, none of the 133 anglers interviewed harvested largemouth bass. The Department annually stocks about 900 kg of rainbow trout (4,600 catchable and 10,000 fingerling rainbow trout) in Glendale Reservoir. Using mean length of harvested rainbow trout (371 mm) and the length-weight relationship, the weight of rainbow trout harvested was an estimated 1,730 kg (18.6 kg / ha). Harvest biomass was 192% of the total weight of hatchery trout stocked in the reservoir. Bait was the preferred angling method among residents and lures were preferred among non-residents. Residents made up 59% of anglers fishing Glendale Reservoir. Fishing effort was 37% bank and 63% boat.

Condie Reservoir

A total of 94 anglers were counted during the surveys and 63 were interviewed. The creel program estimated 2,433 anglers fished 6,770 hrs and caught 6,169 fish (131 fish / ha). Angler catch rate was 0.91 fish / hr. Largemouth bass dominated the catch (5,181) followed by bluegill (812), and yellow perch (176). No rainbow trout were reported being caught during the survey. Because of the trophy bass regulations, rainbow trout stocking has been intermittent during the past five years. No catchables were stocked in 2003. Bluegill were the only species harvested (803; 17 fish / ha). Non-residents preferred the use of a fly, while residents used lures as their preferred angling method. Effort was 26% bank and 74% boat. Residents composed 78% of total anglers interviewed.

Twin Lakes

A total of 311 anglers were counted during the surveys and 209 were interviewed. The creel program estimated 5,901 anglers fished 26,055 hrs and caught 80,373 fish (447 fish / ha). Angler catch rate was 3.1 fish / hr. Bluegill dominated the catch (67,623), followed by yellow perch (6,025), largemouth bass (4,332), rainbow trout (2,135), and crappie (232). Total harvest was 41,112 fish (228 fish / ha). Bluegill dominated harvest (34,130) followed by yellow perch (4,869), rainbow trout (1,916), largemouth bass (168), and crappie (30). Of all the reservoirs surveyed, Twin Lakes is the only water with no minimum size restrictions for bass harvest. Every year, the Department stocks about 11,150 catchable rainbow trout in Twin Lake Reservoir. Assuming that the 2003 creel represents a normal harvest of rainbow trout, return to creel is approximately 17% and percent caught was 19%. Mean total length of rainbow trout harvested was 397 mm. Bait was the preferred angling method among residents and non-residents. Fishing effort was almost equally split between bank (49%) and boat (51%) anglers. Residents composed 66% of total anglers interviewed.

Bear River (lower section)

A total of 45 anglers were counted during the surveys and 13 were interviewed. The creel program estimated 937 anglers fished 2,653 hrs and caught 1,188 fish. Angler catch rate was 0.45 fish / hr. Only two species were caught in this section of the river; rainbow trout (1,144) and smallmouth bass (44). There were no reported harvested fish on the lower section during survey days. Lures were the preferred angling method among resident and non-residents. Angler pressure on this section of river was 349 hrs per km of river. Fishing effort was 65% bank and 35% boat. Residents composed 38% of total anglers interviewed.

Bear River (upper section)

A total of 200 anglers were counted during the surveys and 139 were interviewed. The creel program estimated 7,074 anglers fished 12,828 hrs and caught 20,322 fish. Angler catch rate was 1.6 fish / hr. Rainbow trout dominated catch (16,236), followed by brown trout (400), cutthroat trout (27), and smallmouth bass (25). Harvest totals were 1,206 rainbow trout and 27 brown trout. Harvest results show that the majority of anglers are practicing catch and release. Only 7% of the rainbow and brown trout caught were harvested. Angling methods preferred among residents was bait and among non-residents was fly. Angler pressure was much higher on this section of river (1,198 hrs / km) compared to the lower reach (349 hrs / km). Fishing effort was 98% bank and 2% boat. Residents composed 53% of total anglers interviewed.

Comparison with 1987 Creels

In 1987, creel surveys were completed on Glendale, Condie, and Twin Lakes. Figure 5 shows a comparison of angler effort between the 1987 and 2003 surveys. Effort declined for Glendale and Condie reservoirs, but increased markedly for Twin Lakes. Angling effort on Twin Lakes increased by 40% from the 1987 estimate.

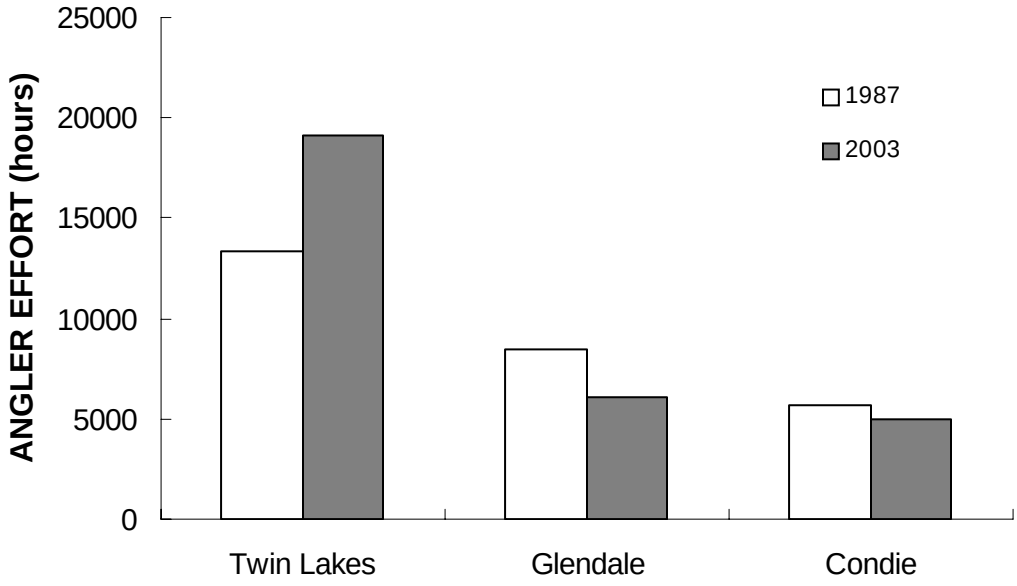

Figure 5. Angler effort comparisons between 1987 and 2003 creel surveys.

DISCUSSION

Twin Lakes was the most heavily fished reservoir surveyed and provided the highest catch rate and yield. Twin Lakes is probably the best example of a sucessful family fishing water in the southeast region. On average, anglers caught a fish every 20 minutes and a variety of species were available. Of the five waters creeled, total catch per surface area was lowest for the waters managed primarily for quality or trophy bass opportunity (Condie and Glendale reservoirs). For example, bluegill catch rates were very low in Condie (0.12 / hr) and Glendale reservoirs (0.06 / hr). Bluegill catch rates in the other reservoirs were 2.6 fish/ha in Twin Lakes, 1.7 fish/ha in Johnson, and 0.36 fish/ha in Lamont reservoirs. Family fishing and general bass regulations on Twin Lakes, Lamont and Johnson reservoirs showed greater diversity of species harvested and higher overal catch rates. Despite very slow growth, reservoir productivity in southeast Idaho can provide some quality and trophy-sized bass (Teuscher and Scully 2003). However, the cost of such management may reduce overall fish harvest and limit species diversity available to anglers.

Utilization of the Bear River fishery varies between residents and non-residents. Non-residents were more likely to fish with flies and release their catch. Resident anglers frequently fished with bait and harvest fish more often. Natural production of brown trout does not appear to be maintaining the brown trout fishery. Only 27 brown trout were harvested and their mean length was 530 mm. The limited number of brown trout being caught are mostly older individuals.

Angling preferences reported at public meetings and in mail surveys are supported by angling preferences measured by creel surveys. On questionnaires mailed in 2003, anglers said that they would spend more days fishing general regulation waters than they would spend fishing waters with special regulations. In our 2003 creel data, effort (hrs / ha) was greater for the general and family fishing waters (Twin Lakes, Lamont, and Johnson) compared to the special regulation waters (Glendale and Condie reservoirs).

MONITORING PROGRAMS

INTRODUCTION

Monitoring programs are essential to the management of southeast Idaho fisheries. Monitoring programs provide information on fish population structure and abundance, and help guide restoration activities of native species. In the Southeast Region, we have five ongoing monitoring programs. Three of those programs monitor native cutthroat trout populations in key drainages. The native trout monitoring programs include: 1) Yellowstone cutthroat trout in the Blackfoot River, 2) Bonneville cutthroat trout in the Thomas Fork Tributaries, and 3) Bonneville cutthroat trout in St. Charles Creek. The other two monitoring programs are general lowland lake and reservoir surveys and opening day creels. The adult monitoring traps and opening day creel surveys are generally completed every year. The Thomas Fork monitoring program is completed every other year. Lowland lake and reservoir surveys are generally completed on key fisheries every three years. Data storage for lowland lake and reservoir surveys will be compiled and available in a statewide database.

The monitoring programs listed above are intended to be continued for the foreseeable future. It is important to document variation in these fisheries in annual report form, but not necessary to repeat lengthy methods sections or devote significant effort to detailed analysis of the data. Therefore, this section of our annual report is intended to update tables and provide a source of trend information. Annual conclusions or management recommendation may not be included unless a major change in methodology is needed or the trend information is being used to support a specific change in angling regulations or management direction.

BLACKFOOT RIVER CUTTHROAT TROUT SPAWNING TRAP

The Blackfoot River drainage is located in central Caribou County, Idaho. The upper Blackfoot River begins at the confluence of Lanes and Diamond creeks approximately 60 km above Blackfoot Reservoir. Primary tributaries to the Blackfoot River include Lanes, Diamond, Sheep, Angus, Timothy, Spring, Slug and Trail creeks. Blackfoot Reservoir was constructed in 1909. The construction completely blocked interchange between downriver and upriver populations of Yellowstone cutthroat trout. The upriver population, however, quickly adjusted to the reservoir conditions by developing a successful adfluvial life strategy (Schill and LaBolle 1990). The Blackfoot River and its tributaries provide spawning and juvenile rearing habitat. At age-1, most of the cutthroat trout migrate downstream to the reservoir where they spend two to three years before returning to the river to spawn (Thurow 1981). Typical spawning size of the adfluvial form ranges between 400 and 600 mm total length.

The purposes for operating the adult cutthroat trout migration trap on the Blackfoot River are twofold: 1) enumerate the adult spawning population, and 2) remove rainbow trout from the migrant population to reduce the potential threat of hybridization. The adult migration trap has been intermittently operated for the past three decades. Several different traps have been used during that period. However, most have difficulty operating during high flows that occur during normal spring runoff.

In 2003, the Department installed an electric barrier to allow for trap operation under a broader range of flows. The electric barrier should operate during high water events because there is no trap material in the river to impede river flow. The electric barrier is flush with the river bottom.

The electric migration barrier and trap box were designed using specifications obtained from Smith Root Inc.. 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 location of the trap is approximately one mile upstream of the confluence of the Blackfoot River with Blackfoot Reservoir. In 2003, we operated the adult migration trap from March through 1 July. We identified adult migrants as cutthroat, rainbow, or rainbow x cutthroat hybrids. A rating system was used to partition fish by species. The rating system was:

1 = rainbow trout
2 = more rainbow looking but has cutthroat slash markings
3 = many characteristics of both rainbow and cutthroat
4 = more cutthroat looking but may have head spots
5 = cutthroat trout with no head spots

This classification was used to help develop a rating system for trap operators. In 2002, a subsample of the migrating fish had fin clips removed for genetic analysis. On the day that genetic samples were collected, fish were randomly pulled from the trap, given a rating from 1 to 5, photographed, and fin-clipped for genetics work. Results of the genetic work indicated a high level of phenotypic and genotypic agreement (Campbell and Cegelski 2003). In a sample of 125, one fish was identified by visual observation as a hybrid and culled from the population, but did not have any rainbow trout markers present using genetic analysis. It was determined that a level of disagreement of 1% (1 / 125) between the genetic and visual observations was considered acceptable when weighed against the potential negative impacts of allowing rainbow trout to pass the trap site and potentially hybridize with cutthroat trout. Therefore, we employed the same phenotypic key and rating system for the 2003 monitoring effort.

A total of 427 Yellowstone cutthroat trout were captured. Other trout caught in the trap included 3 rainbow trout and 19 hybrids. Table 8 shows trap count data since 1991. In addition to trout, 1,656 Utah suckers were captured in 2003.

Table 8. Yellowstone cutthroat trout escapement in the Blackfoot River.

	Yellowstone Cutthroat Trout						Other Trout		
	Count			Mean Length		Peak			
Year	Male	Female	Total	Male	Female	(Day)	RBT	HYB	Total
1991			575						
1992			521						
1995			1,663						
2001	1,600	3,147	4,747	475	507	May 16			37
2002	387	451	902	476	520	May 20	8	10	18
2003	205	217	427			May 14	3	19	22

ST. CHARLES CREEK ADULT AND JUVENILE CUTTHROAT TROUT MONITORING

St. Charles Creek is a second order tributary to Bear Lake originating in the Bear Lake Range and flowing eastward into Bear Lake. The lower portion (approximately 13 km) flows through private property where it splits into Big and Little St. Charles creeks. Much of St. Charles Creek is diverted for agricultural purposes. The stream is the only tributary to Bear Lake that has a history of maintaining a viable population of naturally reproducing Bear Lake cutthroat trout.

During the 1990s, the Department completed several projects on Little St. Charles Creek to improve habitat for the Bear Lake cutthroat trout. Completed projects include cattle-exclosure fencing and screening of three irrigation diversions. In 2001, a graduate student initiated a telemetry study to describe spawning biology of the adfluvial cutthroat trout and identify limiting factors to restoration (Burnett 2003). Additionally a watershed working group was formed in 2002 to prioritize cutthroat trout enhancement efforts.

There are two arms of St. Charles Creek and both were monitored for spawning cutthroat trout and juvenile outmigration. PacifiCorp constructed a box trap for monitoring the spawning populations using the big arm. The little arm trap is a floating weir. The big arm trap was operated from April 15 through July 1. The little arm trap was operated from April 15 though June 10. The little arm trap was removed earlier than the big arm trap because there was not enough depth in the creek for fish to migrate up from the lake, and transplanted adult cutthroat trout from Fish Haven Creek were drifting back to the lake and were being stranded on the weir. All fish captured in the traps were identified by species and released.

Three adult cutthroat trout were collected on May 8 in the little arm of St. Charles Creek and no adults were sampled in the big arm. No other fish were caught in the little arm trap. Two common carp and one brook trout were sample in the big arm trap. Table 9 shows adult spawning escapement estimates from 2001 – 2003.

Table 9. Adult escapement and mean length (mm) estimates for the big and little arms of St. Charles Creek.

	Little Arm		Big Arm		Totals	
Year	Males	Females	Males	Females	Males	Females
2001	26 (525)	44 (525)	13 (527)	27 (510)	39	71
2002	17 (584)	19 (499)	17 (491)	28 (498)	34	47
2003	0 (-)	3 (-)	0 (-)	0 (-)	0	3

Recent drought conditions have resulted in below average lake levels for Bear Lake. During the spring 2003 cutthroat trout spawning run, the elevation of the lake was about 6 m below full pool. At that elevation (1,800 m), St. Charles Creek meanders and braids across a dry lakebed and becomes very shallow. Water depth at the confluence with the lake was 1 to 3 inches deep. The shallow water prevents upstream migration of spawning cutthroat trout. The three fish that did migrate up the creek, made it after PacificCorp installed plastic bladders on the little arm to facilitate upstream migration. Unfortunately the plastic bladders only worked for a few hours and then failed due to undercutting. Pictures of the structures and additional

migration barrier information were compiled for the St. Charles Creek working group (Appendix C). It is important to note that the same low lake levels do not create a shallow braided estuary on Swan Creek, Utah. In 2003, the Swan Creek spawning population was the highest recorded in the past decade. The Swan Creek population is maintained by hatchery supplementation. The returns to Swan Creek suggest that lake mortality is not the limiting factor for spawning cutthroat trout in St. Charles Creek.

Krey-Meekin traps were operated on both arms and the mainstem St. Charles Creek (Figure 6). Traps were operated once or twice a week and set for approximately 24 hour periods. Trapping began on April 5. Trap efficiencies were estimated several times during the trapping period. Trapping on the little and big arms was discontinued June 25 and 10, respectively. On those dates, the little arm was dewatered and blue-green algae mats from Mud Lake clogged the big arm trap. Operation of the mainstem trap continued through the end of September.

Only one age-1 juvenile cutthroat trout (103 mm) was caught during the seven months of trapping St. Charles Creek. That fish was caught in the little arm trap on June 1. During emergence of young-of-year cutthroat trout, 26 newly-hatched cutthroat trout were captured in the trap near the forest boundary. At that time, trap efficiencies were about 14%. Total fry recruitment past the forest boundary trap was an estimated 3,000 cutthroat trout. Peak emergence of cutthroat trout fry in the creek occurred the first week in August. Table 10 shows total catch in the traps by species. Bear lake sculpin dominated the catch in both the little (170 fish) and big arms (662). The peak of Bear Lake sculpin migration from Mud Lake into Bear Lake at the big arm trap occurred during the third week in May. The peak count of Bear Lake sculpin was 268 and occurred on May 26.

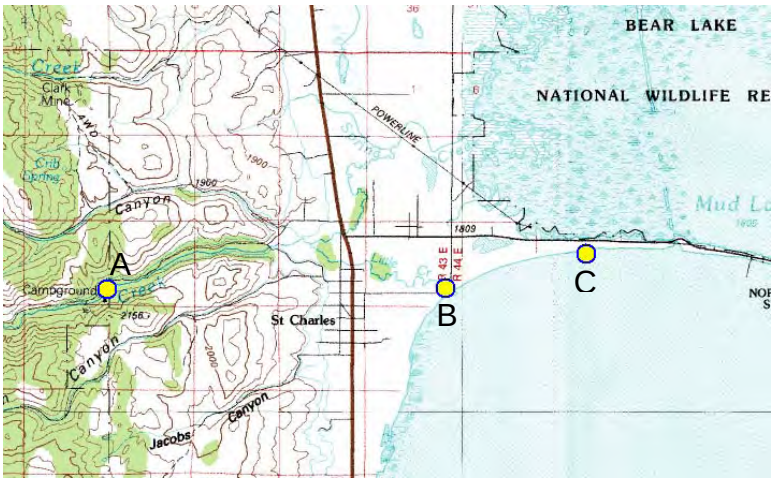

Figure 6. Trap locations on the mainstream (A), little arm (B), and big arms (C) of St. Charles Creek.

Table 10. Trap results for three Krey-Meekin traps operated on St. Charles Creek.

Species	Forest boundary	Little Arm	Big Arm
Age-1 cutthroat trout		1	
YOY cutthroat trout	26		
Bear lake sculpin		170	662
Brook trout	3		
Common carp			4
Green sunfish			4
Mottled sculpin	15	10	16
Rainbow trout	2		
RBT X BCT hybrid	1		
Redside Shiner		5	36
Speckled Dace		5	1
Unidentified sculpin	1	5	6
Utah sucker		1	69
Yellow Perch			1

The paucity of downstream migrating juvenile cutthroat trout may be due to low population abundance or failure to sample during their migration period. Outmigration may occur after out traps were pulled on September 31. However, the lack of outmigrating juveniles is consistent with low numbers of adult spawners.

Natural production of adfluvial cutthroat trout in St. Charles Creek is extremely low. Adult escapement was three fish in 2003 and fewer than 100 wild fish in 2001 and 2002. Limiting factors for St. Charles Creek cutthroat trout are discussed in Burnett (2003). In short, dewatering redds and unscreened irrigation diversions are likely the most limiting factors. Because the other major tributary to Bear Lake is currently enjoying record runs of adult cutthroat trout (Swan Creek), lake survival does not appear to be the bottleneck for recovery. Improving survival of cutthroat trout from the egg until they arrive at Bear Lake should be the focus of restoration efforts.

Recommendation

Obtain funding for screen diversion on St. Charles Creek and work with irrigators to maintain water flow through the lower section of the St. Charles Creek during the spawning and egg incubation period. Work with PacifiCorp to maintain a migration corridor across the exposed lake bottom.

ACKNOWLEDGMENTS

Brian O'Hearn and Kevin Yelton were instrumental in data collection for the bird predation and Blackfoot River cutthroat trout monitoring.

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APPENDIX

Appendix A. Angler survey questionnaire used at public meetings and mailed to 1,000 anglers that purchased fishing licenses in southeast Idaho.

Idaho Department of Fish and Game
Southeast Region Fishing Rules Questionnaire
July 24, 2003

Please help fishery managers find out what type of fishing you prefer. If you had 10 days to fish in Southeast Idaho, how many of these 10 days would you take for each of the following types of fishing?

Example: I like to fish for trophy trout and catfish. I would place 5 days in the space in front of one of the trophy trout options and 5 days in the catfish category. Your total number of days should add up to 10.

_____For hatchery trout in reservoirs with general rules (6 trout).

_____For hatchery trout in reservoirs with trophy or quality trout rules (2-trout with a large minimum size and bait restrictions).

_____For bass with general rules (6-bass).

_____For bass with quality or trophy rules (2-bass with large minimum size restriction).

_____For panfish (perch, bluegill or crappie) with general rules (no number or size limits).

_____For walleye

_____For Sturgeon

_____For catfish

_____For native cutthroat trout on rivers and streams with reduced harvest rules (2-trout or 2-trout with a 16-inch minimum size or catch-and-release).

_____For hatchery trout on rivers and streams with general rules (6-trout).

_____Other types of fisheries (You specify).

PART 2: The following five management changes are being considered in southeast Idaho. Please read the background information and check the box that represents your opinion.

Question # 1: Since 2002, the Twin Lakes Canal Company has charged fees for access and camping at Twin Lakes Reservoir in Franklin County. Fees are $5 per day for each vehicle and $8 per night for a single family camping space. The Idaho Department of Fish and Game manages the fishery of Twin Lakes, including fish stocking, renovation to remove rough fish species, population studies and enforcement of Fish and Game rules. Anglers fund this management by purchasing fishing licenses. Similarly, Idaho Fish and Game stocks fish and manages fisheries at waters where Idaho Department of Parks and Recreation charge access fees. Some anglers have suggested that the Fish and Game Department should no longer stock trout in Twin Lakes because of the fees being charged by the irrigation company. This would likely lead to elimination of all Fish and Game Department management at Twin Lakes.

Do you want the Department of Fish and Game to continue managing the Twin Lakes fishery, including the annual stocking of rainbow trout?

Yes_____ No_____ No opinion_____

If you answered "yes" to the above question:

a. How much would you be willing to pay the canal company for daily access per vehicle?
   $2____$5_____$7_____$10_____More than$10_____No opinion_____

b. How much would you be willing to pay the canal company for a nightly fee for single family camping? Currently the facilities are primitive.
   $5___$8___$10___$12___$15____More than $15____No opinion____

Question # 2: The upper Portneuf River currently has a trout fishery for native Yellowstone cutthroat and hatchery stocked rainbow. The current limit is six trout, but only two may be cutthroat trout and the cutthroat must be at least 16 inches long to keep. Some anglers have asked that a portion of the upper Portneuf River be managed as a trophy wild trout fishery. This would reduce the limit of native cutthroat trout to either catch-and-release or two cutthroat over 20-inches long and the Department would no longer stock rainbow trout in this reach. Restrictive harvest rules would maintain adequate numbers of cutthroat trout to provide a good fishery and protect the cutthroat population. The limit for non-native trout species would remain at six-trout of any size. The river reach proposed for trophy wild trout management is from the bridge immediately upriver from the mouth of Pebble Creek upriver to the bridge on Kelly-Toponce Road, a river length of about 5 miles.

Would you like the five-mile reach of the upper Portneuf River from the bridge above the mouth of Pebble Creek up to the Kelly Toponce Road Bridge managed for trophy wild trout?

Yes_____ **No**_____ **No opinion**_____

Question # 3: Glendale Reservoir has been managed for quality size largemouth bass since 1992. Daily creel limit for bass is two and bass must be at least 16-inches long for harvest. Prior to initiation of this rule, most bass caught by angers at Glendale Reservoir were less than 12-inches long. Currently most bass caught are between 12-inch and 15-inch long. This length change has been the benefit of the quality bass rule.

Some anglers would like the minimum harvest size for Glendale bass increased from 16-inches to 20-inches with the expectation that anglers could then catch larger bass. For increased average size of bass to result from an increase in the minimum size of bass harvested, angler harvest would have to be limiting the size of bass. If bass are poached before they reach 16 inches and this prevents anglers from catching larger bass now, changing the limit to 20 inches would have no effect on this problem.

If slow growth and high natural mortality rate prevent many bass from becoming larger than 16 inches long, then a reduction in bass density might allow more of the remaining bass to grow longer than 16 inches. Catch rate, the number of bass that anglers catch per hour would decrease if a fishing rule allowed harvest of younger fish as a means of increasing growth of the surviving bass.

If bass density in the 12 to 15 inch size range is currently high, then an increase in the minimum size limit to 20 inches would have very little benefit in terms of increasing the number of large bass in Glendale Bass fishery and the fishery would essentially become catch-and-release with most bass dying of old age before reaching 20-inches long. Currently biologists do not have enough biological data to determine with certainty if any of the above scenarios is occurring in the Glendale bass fishery.

PLEASE CHECK ONE OF THE FOLLOWING CHOICES

a. An increase in the bass size limit to 20 inches without further studies?_____
b. No change but continue further biological studies so that they can tell anglers with more certainty what the effect of different bass regulations would be at Glendale Reservoir?_____
c. No change in the bass regulation and do not prioritize bass studies at Glendale Reservoir?_____
d. No opinion?_____

Question # 4: In recent years, a smallmouth bass fishery has developed in American Falls Reservoir and in the Snake River below American Falls Dam. Many of the bass currently caught by anglers are of quality size. Some anglers would like to reduce the limit on bass in this river reach to maintain this quality fishery.

A creel survey in 2002 estimated that anglers caught 1,800 bass in this river reach, but harvested only 200 bass. The upper end of Lake Walcott, where much bass fishing occurs was not surveyed. However most of Lake Walcott is off limits to angling because of Federal Fish and Wildlife Service rules.

PLEASE CHECK ONE OF THE FOLLOWING CHOICES

a. A rule change from the general 6-bass, none under 12 inches to the quality rule of 2 bass with a minimum size of 16 inches?_____
b. No rule change now, but IDFG should prioritize studies on the Snake River to determine the effect on the bass population and anglers of changing to the quality bass rule listed above?_____
c. No rule change now, and do not prioritize studies for this fishery?_____
d. No opinion?_____

Question # 5: The southeast Region has four special rule trout reservoirs that require anglers to fish with artificial flies or lures. That is, edible bait such as angleworms, corn or Power-bait is prohibited. Conservation officers have found that violation of this rule is common on these waters. To aid in the enforcement of this rule, it is suggested that the rule be modified to state that “the use or possession of any bait while fishing on Southeast Region reservoirs designated artificial fly-and-lure-only is unlawful.”

Do you support the suggested rule change to prohibit both the use and possession of any bait while fishing on Southeast Region reservoirs designated artificial fly-and-lure-only?

YES_____ **NO**_____ **NO OPINION**_____

Thank you for your help!

Appendix B. Creel survey form.

Survey Water_____Clerk: _____

Date: _____ Section: _____

ID	NUMBER ANGLERS		TYPE	COMP TRIP	HOURS FISHED		Target Species	RBT		BRN		SMB		LMB					
	RES	NONRES	boat/shore	Y/N	Bait	Lure/fly		kept	rel	kept	rel	kept	rel	kept	rel	kept	rel	kept	rel
A																			
B																			
C																			
D																			
E																			
F																			
G																			
H																			
I																			
J																			
K																			
L																			
M																			
N																			
O																			
P																			

ANGLER COUNT

	TIME	SHORE	BOAT
#1	_____	_____	_____
#2	_____	_____	_____

Be sure to complete the form as thoroughly as possible. Hours fished is total hours for the group (i.e. 3 anglers fishing for 1.5 hours is 4.5 hours fished). Target species codes are A-anything, B-bass, T-trout, S-sturgeon. In the angler count section, if you use a running (tick mark) method be sure to record the final total number and circle it.

Appendix C. Paper prepared for the St. Charles Creek working group on limiting factors for cutthroat trout in St. Charles Creek.

LIMITING FACTORS FOR CUTTHROAT TROUT PRODUCTION IN ST. CHARLES CREEK

David Teuscher and Richard Scully

Idaho Department of Fish and Game

October 15, 2003

Limiting Factors for Cutthroat Trout Production in St. Charles Creek

Introduction

St. Charles Creek is the most important natural spawning location for Bear Lake cutthroat trout. In May and June, cutthroat migrate out of Bear Lake into St. Charles Creek to spawn. Young produced by the spawning cutthroat live in the creek from one to two years before migrating back downstream to Bear Lake where they feed on insects, cisco, and other fish. To complete their life cycle successfully, cutthroat must have enough water to migrate upstream, clean substrate for spawning, abundant insect life to feed their young, and safe migration for juvenile cutthroat swimming back to the lake where they become the large cutthroat trout that Bear Lake is famous for.

Unfortunately, St. Charles Creek's cutthroat trout population is declining. Hundreds and even thousands of spawning cutthroat trout observed in 1950s through the 1970s have dropped to less than 100 wild fish a year.

To improve conditions for wild cutthroat trout, a local working group was established to develop a strategy that will improve fish conditions while protecting the uses of water by irrigators and other user groups. The working group was established winter 2002 and has concentrated initially on information exchange and identifying areas where additional information is needed to build an efficient and effective plan. The working group has identified several information needs that include measuring water flow in St. Charles Creek and associated canals, identifying irrigation alternatives, and quantifying water needs for cutthroat trout. This document addresses the habitat requirements necessary to reestablish a viable populations of wild Bear Lake cutthroat trout in St. Charles Creek.

Based on work completed in 2003 and past graduate student efforts, fisheries biologist have identified four major factors limiting cutthroat trout production in St. Charles Creek. The factors include:

1) **intermittent dewatering of the little arm of St. Charles Creek.**
2) **adult fish migration barrier in the mud flats of Bear Lake during drought years.**
3) **adult and juvenile fish losses in irrigation diversions.**
4) **adult and juvenile fish losses in the big arm of St. Charles Creek.**

This document describes those limiting factors in more detail and provides a preliminary discussion for improvements.

Intermittent Dewatering

In 1977, an Idaho Department of Fish and Game biologist estimated minimum water maintenance flows for cutthroat trout in St. Charles Creek. The cutthroat trout maintenance flows were 14 cfs for spawning and egg incubation and 9 cfs for winter and summer rearing conditions (Cochnauer 1977). Maintenance flows are considered the minimum flows required for fish survival.

In 2003, water flows were measured periodically above and below the irrigation diversions on St. Charles Creek.

Measured flows exceeded maintenance flow in the upper site, but dropped below maintenance flows for cutthroat trout in the lower section in June and October (Figure 1). The minimum measured flow of 1 cfs dewaters eggs deposited in the gravel and blocks or strands any adult fish in the area of impact. In 1989, a USU student documented a 7 day dewatered period on the lower portion of little St. Charles Creek. In 1990, in the same area, the creek was dewatered for 20 days.

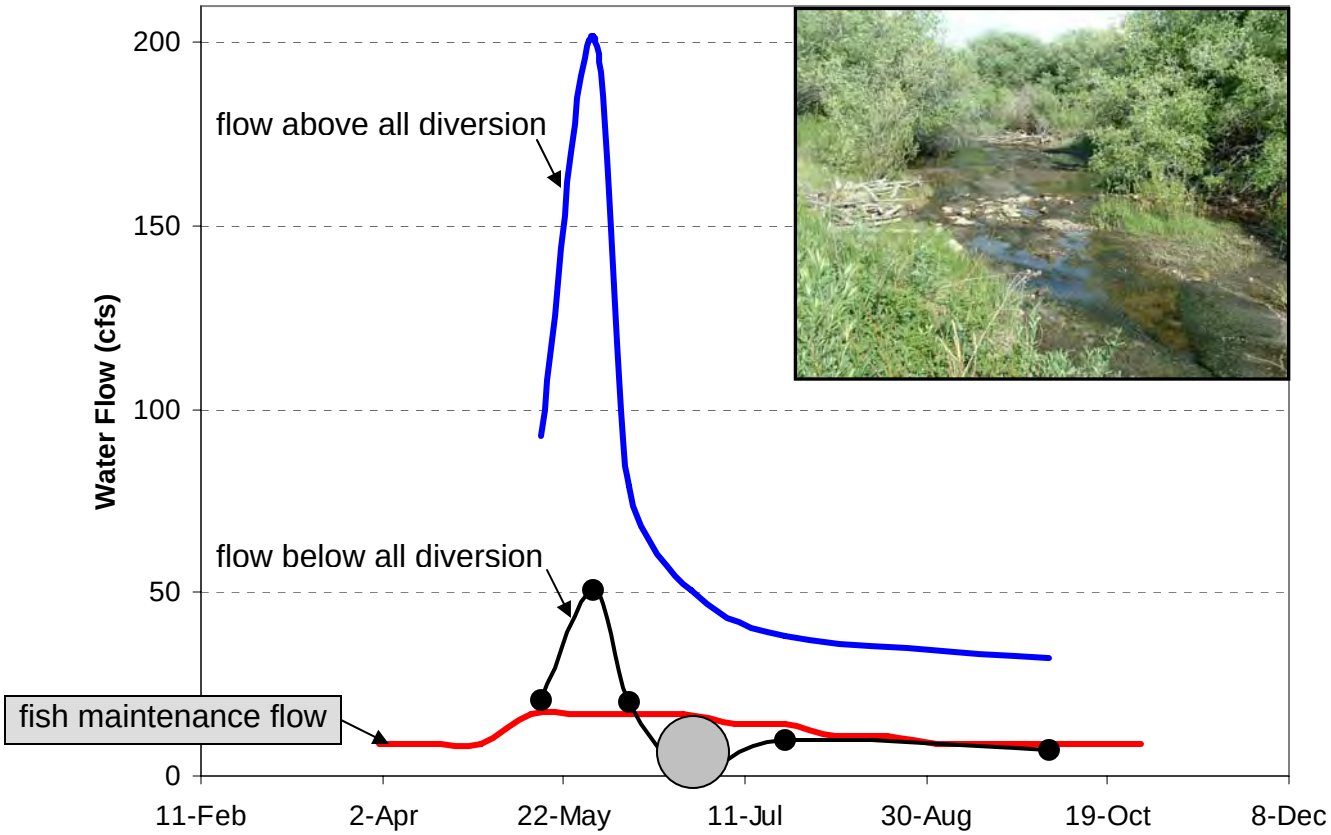

Figure 1. Water flow measurements for St. Charles Creek above all diversions near the forest boundary and below all diversions on the little arm of St. Charles Creek in 2003. Fish maintenance flows are also shown and range from 9 to 14 cfs. The inset picture was taken during a period in June when water flows in the little arm of St. Charles Creek fell below fish maintenance levels (shaded circle).

Lake Levels

Recent drought conditions have resulted in below average lake levels for Bear Lake. At low lake levels, St. Charles Creek meanders across a dry lakebed and becomes very shallow. The shallow water prevents upstream migration of spawning cutthroat trout. During drought years, the shallow lakebed barrier is the most significant limiting factor for wild cutthroat trout production.

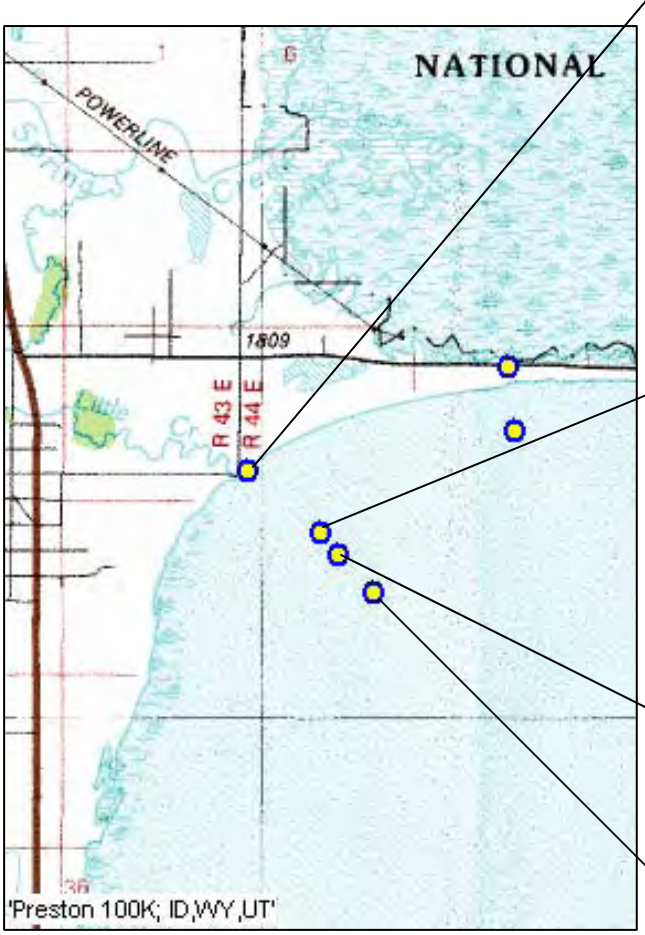

Figure 2. Bank destabilization on the little arm of St. Charles Creek. Photographs taken 29 May 2003. Low lake levels created an impassible barrier for spawning cutthroat trout. The shallow water also creates a feeding site for pelicans and other predation birds.

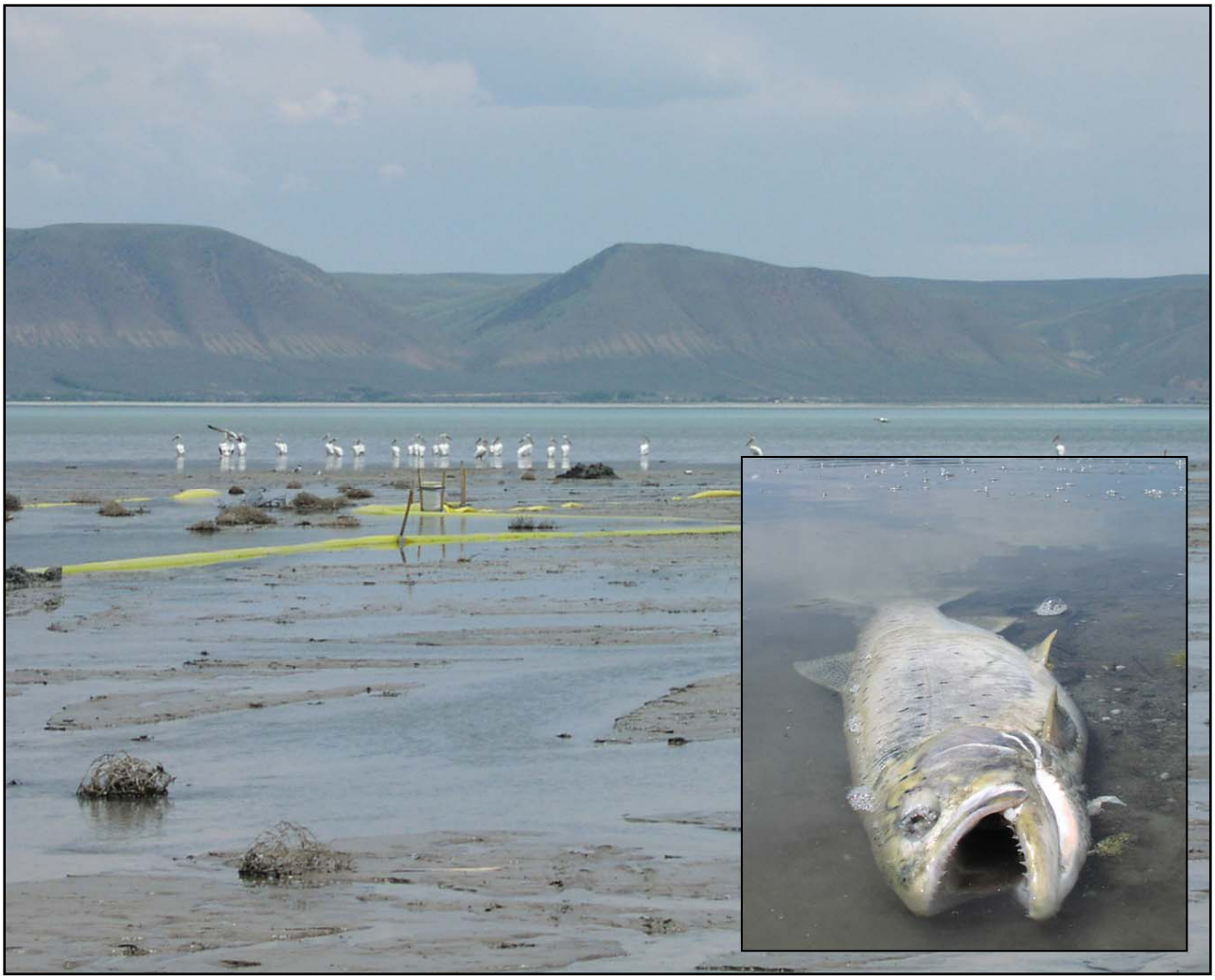

Figure 3. Confluence of the little arm of St. Charles Creek and Bear Lake 29 May 2003. Water depth at the confluence was 1 to 3 inches deep. The yellow plastic and posts were part of a failed effort to confine the channel to provide cutthroat trout passage. The dead cutthroat trout was stranded in the shallow water offshore from the pelicans. The day that this fish was stranded, flow below all irrigation diversions in the little arm of St. Charles Creek was 51 cfs. That flow is about 30 cfs above the minimum flow requirements for fish passage when the lake is at full pool elevation. At this lake elevation (about 5,908 ft), it is unlikely that any normal amount of spring runoff from St. Charles Creek would provide passage across this mud flat. In 2002, fish migration in the little and big arms was possible at a lake elevation of 5,912 ft. Although passage was possible, bird predators have access to fish over a greater stretch of the creek at the 5,912 ft level.

Diversion Losses

There are several unscreened fish diversions on the big and little arms of St. Charles Creek. Both adult and juvenile cutthroat trout have been sampled in these diversions. In one of the diversion canals fisheries crew sampled more than 70 juvenile cutthroat trout in 100 yards of canal (Jacobson 1990, progress report to IDFG). In 2000 and 2001, Paul Burnett observed adult cutthroat trout in irrigation diversion.

In 2003, IDFG monitored downstream migration of juvenile cutthroat trout on the big and little arms of St. Charles Creek. Traps were placed at the bottom of both arms (Figure 4).

Figure 4. Outmigration trapping locations on the little and big arms of St. Charles Creek.

Figure 5. Trap used to monitor downstream migration of cutthroat trout.

A third trap was placed above all irrigation diversions on the main arm of St. Charles Creek near the forest boundary. Figure 4 shows trap locations. Traps were operated twice a week from April through October.

The traps were positioned so that fish caught at the upper trap could be marked and recaptured in the lower traps either on the big or little arms. The effort would provide passage estimates downstream through the irrigation diversions and provide overall juvenile cutthroat trout production to the lake.

About 50 female cutthroat trout spawned in St. Charles Creek in 2000 and 2001. Those females would have to produce thousands of juvenile cutthroat trout to keep the population from declining. In other words, if fewer than several thousand juvenile cutthroat trout are produced, the population of spawners will decline.

Only one cutthroat trout was caught during the trapping period. There

are several factors that may explain the lack of juvenile cutthroat trout. Possible factors include: 1) our traps were not functioning, 2) we missed the downstream migration period, and 3) the juvenile cutthroat trout perished in unscreened irrigation diversions or spawning redds were dewatered.

Despite the lack of cutthroat trout, we caught thousands of other fish in our traps. Bear Lake sculpin dominated the catch followed by suckers, mottled sculpin, carp, redside shiners, and brook trout. The type of traps used have been very successful in monitoring juvenile outmigration of cutthroat trout in other systems. We sampled during the time of year when juvenile migration is expected. Losses in irrigation diversion and (or) dewatering in the main channels are the most likely causes of cutthroat trout mortalities in St. Charles Creek.

Big Arm Sink

Fish entering the big arm disappear from the Bear Lake system. Prior to reconnecting the big arm with Bear Lake, all juvenile cutthroat trout using the big arm had no connection back to Bear Lake. Juvenile fish following flow downstream were either lost in irrigation diversions or in Mud Lake.

In 1995, the big arm was reconnected to Bear Lake. Unfortunately, radio tracking studies completed in 2001 and 2002 show that the majority of adult fish that started up the big arm to spawn would stray into the marsh and (or) follow flow down the Bear River.

Electrofishing surveys completed in 2000 and 2001 show that juvenile cutthroat trout were abundant in the big arm of St. Charles Creek. Most of those cutthroat trout should have migrated downstream to the lake during the spring of 2003. We did not catch a single cutthroat trout in the big arm trap. Similar to the fate of adults, juvenile cutthroat trout were either lost in irrigation diversions or followed water flow into Mud Lake and down the Bear River.

Conclusion

Intermittent dewatering, low lake levels, the big arm sink, and irrigation diversions have all contributed to the reduced run of naturally produced cutthroat trout in St. Charles Creek. The naturally produced segment of the cutthroat trout run is extremely small. The hatchery program continues to produce adults that stray into St. Charles Creek and mask the true shortage of naturally produced cutthroat trout. There would likely be no run of cutthroat trout in St. Charles Creek without strays from Swan Creek.

To consider Bear Lake cutthroat trout as a viable population relative to threatened or endangered species status, these fisheries must constitute a viable, self sustaining population. That is not dependent on artificial propagation for their existence. Fish that spend part of their life in a hatchery may loose the characteristics that allow them to survive through all life stages.

Can the limitations to recovery of cutthroat trout in St. Charles Creek be overcome? We believe they can and provide a list of prioritized activities to do so.

Prioritized Recovery Activities

- Design and construct an artificial migration channel that will provide upstream migration across the mud flats of Bear Lake during drought or when lake elevations fall below full lake level.

- Develop a prioritized list of irrigation diversions to be fitted with fish screens and flow measuring devices and in some cases upstream passage structures (fish ladders).

- Disconnect the big arm of St. Charles Creek or completely isolate that arm from Mud Lake. If the arm is disconnected, then a fish screen must be installed to keep juvenile cutthroat trout from entering that arm.

- Work with local irrigators to try and maintain minimum fish requirement flows of 9 and 14 cfs in the little arm of St. Charles Creek.

The last two goals required considerable input and participation from the local working group. In addition, the completion of the Utah State University irrigation study that is underway will provide further information to help find solutions for fish and ensure irrigator and other water user interests.

The goal of this document was to identify the needs of the fish so that all participants of the working group will have a better understanding of the limiting factors for fish. We fully recognize that St. Charles Creek has many important functions in addition to providing critical fish habitat.

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