Examination of Native Fish Recruitment and Description of the Fish Communities Found in the San Juan and Colorado River Interface Zones of Lake Powell, Utah

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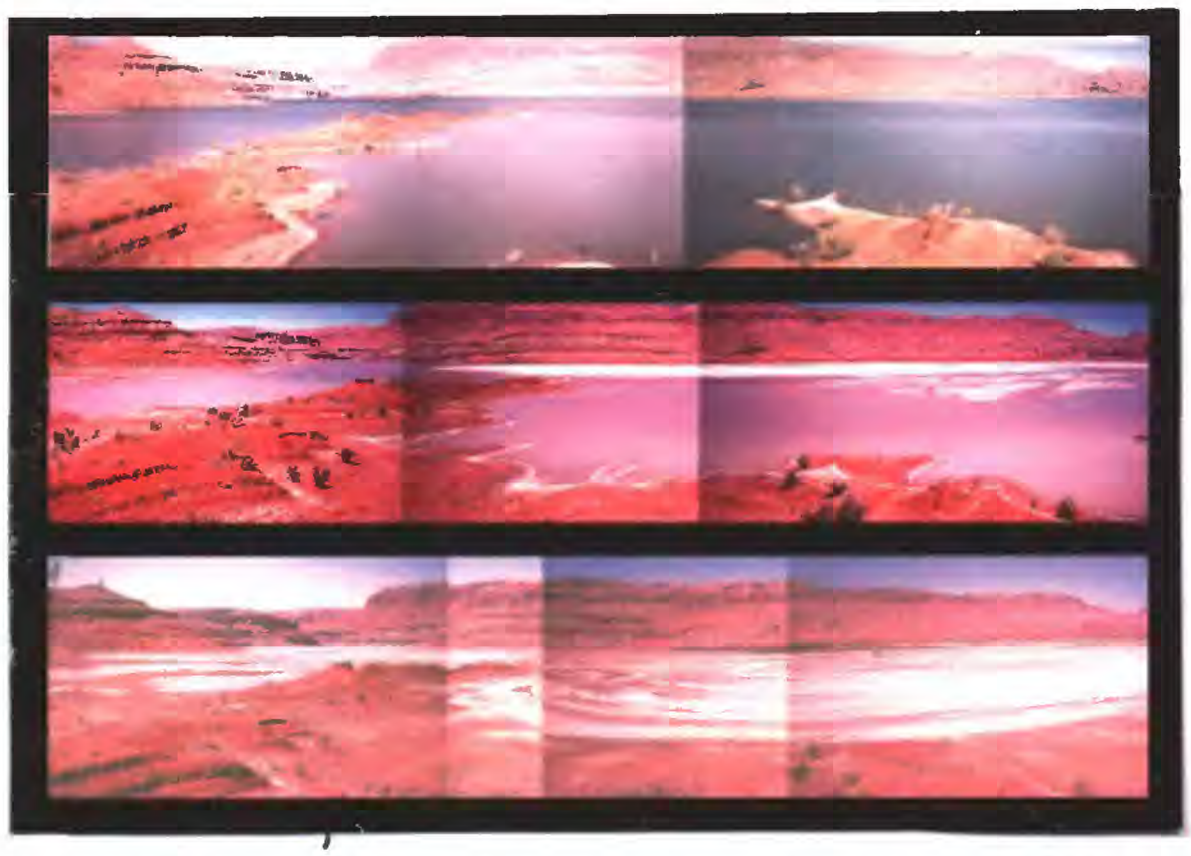

Composite photograph of Piute Farms, San Juan River inflow to Lake Powell.

U.S. Department of the Interior
U.S. Geological Survey

Prepared in Cooperation with the National Park Service, Utah Division of Wildlife Resources, and Bureau of Reclamation

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Examination of Native Fish Recruitment and Description of the Fish Communities Found in the San Juan and Colorado River Interface Zones of Lake Powell, Utah

By

[1]Gordon Mueller, U.S. Geological Survey, Midcontinent Ecological Science Center
[2]Mike Horn, Bureau of Reclamation, Technical Service Center,
[3]Quent Bradwisch, Utah Division of Wildlife Resources, and
[4]Lewis Boobar, National Park Service, Glen Canyon National Recreation Area

Open-File Report

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1 United States Geological Survey, P.O. Box 25007, D-8220, Denver, CO 80225
2 Bureau of Reclamation, P.O. Box 25007, D-8220, Denver, CO 80225
3 Utah Division of Wildlife Resources, P.O. Box 1446, Page, AZ 86040
4 Glen Canyon National Recreation Area, P.O. Box 1507, Page, AZ 86040

In Memory:

Lewis Boobar

Lewis always had a smile and an encouraging word. He will be missed by family, friends, colleagues, and by the resource he dearly loved.

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EXECUTIVE SUMMARY

Researchers examined the fish communities of the Colorado and San Juan river interface zones of Lake Powell during 1999 and 2000. The objectives were to: (1) search for young razorback sucker and Colorado pikeminnow and, if found, PIT tag them; (2) examine the effectiveness of various collection techniques on juvenile native fish; and (3) describe the fish communities found in these transitory, or actually "migratory" habitats. The San Juan River interface zone was sampled 5 times each year during the spring and summer while the Colorado River site was sampled a total of 3 times over the 2-year period, all in the spring.

Lake Powell's surface elevation fluctuated 5.3 m during the course of the study. Elevational changes caused the reservoir/river interface zone to advance up and retreat down the San Juan River >15 km. Over 1,000 ha of bottomland at Piute Farms was flooded and drained in 1999 alone. Sampling focused on these migratory habitats.

Nearly 40,000 fish were captured using seines, light traps, electrofishing, minnow traps, fyke nets, and trammel nets. Twenty three species were represented, only 5 species were endemic to the watershed. The fish community was far more indicative of the Mississippi River basin than Colorado River ichthyofauna. Numerically, nonnative fishes dominated the sample (99.4%) while natives only represented 0.6% of the fish collected. Thirteen adult razorback suckers were captured, all believed to be hatchery stocked. No juvenile razorback suckers were found. Three juvenile Colorado pikeminnow and one small chub (*Gila spp.*) were collected. Flannelmouth sucker was the most common large native species, however, they represented only 0.4% (41) of the fish captured. Two species not previously reported were the white crappie (*Promoxis annularis*) and gizzard shad (*Dorosoma cepedianum*).

The most common fish were red shiner, threadfin shad, common carp, striped bass, and channel catfish. Relative abundance was higher at the inflow area compared to a reservoir control site (Spencer's Camp). Common carp and bullhead sp. were twice as abundant in inflow habitats compared to the reservoir whereas smallmouth bass and green sunfish were less abundant. Species composition and abundance were influenced by habitat availability. For example, adult striped bass and walleye were more common in channel habitat while broad flood plain habitat supported more black crappie and juvenile fish.

Native fish were taken by a variety of sampling methods. No single technique proved effective for a particular species; sampling success was more indicative of life stage. Three species of larval suckers (razorback (2), flannelmouth (3), and possibly bluehead (2)) were captured in light traps. A juvenile *Gila spp.* and three juvenile Colorado pikeminnow were captured by minnow trap, seine, and trammel net, respectively. The majority of adult flannelmouth (36 or 86%) and razorback suckers (11 or 92%) were taken by trammel net. However, two (8%) razorback sucker were captured by electrofishing and 5 (14%) flannelmouth suckers were taken by hoop net.

Flooding at Piute Farms inundated over 1,000 ha of bottomland, creating 30,000,000 m^3 of new habitat. Ample physical habitat was available, however, we found no evidence to suggest that young native fish were surviving. Flooded areas were rapidly invaded by nonnative predators and their young. Maximum post-spawning densities in flooded areas reached 190,000 fish/ha in pelagic zones and >220,000 fish/ha in littoral habitats. The occasional report of native larvae or early life stages and absence of older subadult pikeminnow, chub, and native suckers, suggest nonnative predation has effectively eliminated native fish recruitment from this portion of the basin. Continued presences of razorback sucker and Colorado pikeminnow will ultimately depend upon upstream stocking programs.

INTRODUCTION

The study had three objectives: (1) to determine if juvenile razorback sucker and Colorado pikeminnow occur in the inflow areas, and if found, PIT tag them; (2) examine the effectiveness of various collection techniques on juvenile native fish; and (3) examine the fish communities found in these temporary habitats. If reservoir PIT-tagged fish were recovered by other monitoring programs, such data it would help validate reservoir recruitment.

The National Park Service's (NPS) initial research request was expanded to examine both native and nonnative species, and a reservoir component (control) was added to allow comparisons of fish communities between the reservoir and interface zone. We wanted to describe which fish migrated with and benefitted from these reservoir/river interface zones (hereafter referred to as "inflow areas").

Background

Inflow habitat Storage of spring runoff in Lake Powell causes the reservoir levels to expand. Shorelines move up side canyons and spread across broader flood plains, but the most pronounced flooding occurs in the tributary arms. Here, increases in reservoir elevation of 15 m can cause the inflow area to advance upstream 45 km, inundating thousands of hectares of flood plain. Typically these habitats remain flooded for >4 weeks, however, by late summer they drain as reservoir water is released to accommodate downstream water demands, provide hydroelectric power, and create additional flood storage for spring runoff.

Some researchers have speculated these habitats may serve as nurseries for young native fishes that drift into the reservoir. If survival was occurring and fish repatriate upstream habitats, reservoir recruitment could help explain the recent capture of adult razorback sucker and Colorado pikeminnow in the lower reaches of the San Juan and Colorado rivers.

It's well documented that river deltas are extremely productive habitats (Wright 1950). Nutrient-laden river waters mix with warmer reservoir waters to stimulate algal, zooplankton, and benthic production which supports fish. These shallow, warm habitats are ideal nurseries for both pelagic and lacustrine species, producing fish densities >125,000 fish/hectare (Mueller and Horn 1999). Some of the last wild razorback suckers collected for brood stock in the upper basin came from these areas (Platania et al. 1991, USFWS 1998). About 2 dozen wild razorback suckers were reported taken from the San Juan arm of Lake Powell (Platania et al. 1991, Wayne Gustaveson, Utah Division of Wildlife Resources [UDWR] personal communique) and less than a dozen from the Colorado and Dirty Devil river confluences in the late 1980s (Persons and Bulkley 1980, Persons et al. 1982, Valdez 1990, Lashmett 1993, 1994, 1995).

Past studies have collected tens of thousands of fish from the Colorado River inflow, however, sampling may have been biased toward either small or large fish (Valdez and Cowdell 1994a and 1994b, Muth and Wick 1996 and 1997). Seining, larval light traps, and electrofishing were the primary methods used. Seining was effective for small fish not large fish. Unfortunately, steep muddy banks, deep channels, and brush or debris make seining difficult. Larger fish are more susceptible to electrofishing, but turbidity decreases the likelihood of seeing and netting the fish. Because of these limitations, it was speculated that juvenile natives may have avoided detection and capture.

We used standard sampling methods to target all life stages, especially juvenile fish. These included custom built minnow traps, hoop nets, and 1.2-cm and 3.7-cm trammel nets. Many of the techniques have been developed for razorback sucker culturing programs in the Lower Basin (Tom Burke, Bureau of Reclamation [BOR] and Chuck Minckley, Fish and Wildlife Service [FWS] personal communique). To our knowledge, these methods had not been widely used in the Upper Basin.

Glen Canyon National Recreation Area recently developed an Adaptive Management Program to examine management issues for natural resources within the park's boundaries. A major program component is to better understand the influence that reservoir operation has on native and nonnative fish communities both upstream and downstream of Glen Canyon Dam. This study attempts to address some of those key issues.

METHODS

Sampling Schedule

Sampling started on Monday and was completed by Thursday of each trip. Five trips were conducted on the San Juan Arm both in 1999 and 2000 (Table 1). The Colorado River inflow was examined once in the spring of 1999 and twice in 2000. The schedule follows:

Table 1. Lake Powell Inflow sampling schedule

1999		
	Colorado River	April 12th
	San Juan River*	May 10th , June 14th , July 12th , August 16th , October 4th
2000		
	Colorado River	April 3rd, May 15th
	San Juan River*	May 1st, June 5th, June 26th, July 17th, August 21st

* included both the inflow and Spencer's Camp (control) sites

Mapping Description

Bathymetric data were collected using a BioSonics, scientific echosounder and a Rockwell GPS receiver. A boat with the equipment followed the shoreline and then ran cross-sectional profiles of the study area at 0.25-km intervals between RM 48 to 55 in the San Juan arm. The echosounder processed the data and produced files containing depth and UTM coordinates. This information was run through ARCinfo to develop bathymetric maps. The program also calculated area capacity and water volume tables.

Fishery Studies

Sample Locations Sampling site locations were recorded in river miles (RM) which started at Lee's Ferry (RM-0) and proceeded upstream to Imperial Rapids (RM-200). River mile designations for the San Juan River began at its (inundated) confluence with the Colorado River (RM-0) and proceeded upstream to Clay Hills Crossing (RM-56).

Fish were sampled at 3 locations: (1) the inflow area of the Colorado River; (2) inflow area of the San Juan rivers; and (3) Spencer's Camp area which served as a reservoir control site. Sampling in the inflow areas was adjusted with changes in reservoir elevation and river stage but remained constant at Spencer's Camp from RM-38 and 39.5 (Figure 1). The inflow habitats we studied were shallow (<2 m) floodplain zones, typically turbid, and adjacent to river flow. These areas were greatly influenced by changes in reservoir elevation and river stage. Sampling occurred between RM 48 and 56 in the San Juan Arm and between Imperial Rapids and Farley Canyon (RM 200 to 163) on the Colorado River Arm of the reservoir (Figure 2). River turbidity only extended to Hite Marina on the Colorado River arm and downstream to Copper Canyon on the San Juan Arm.

Sampling Techniques – The following 7 sampling methods were used:

Trammel Nets. Two mesh sizes and lengths of trammel nets were used at all locations: Small-meshed trammel nets (1.3 by 15- m long) were constructed of multifilament twine with 25-cm bar meshed outer panels and a 1.2-cm bar meshed inner panel, large-meshed trammel nets (1.8 m by 30 to 45 m in length) had 30-cm bar meshed outer panels and a 3.7-cm bar meshed inner panel. Trammel nets were typically set perpendicular to shore at depths <5 m. Nets were set prior to sunset and checked or pulled in early morning. Catch per unit effort (CPUE) was expressed as fish captured per 100 m^2 of net fished (fish/100 m^2) per net night.

Electrofishing. An electrofishing boat, equipped with a 5,000-watt generator and a Colfelt RF-10 shocker, was used to sample shoreline habitats. Generally, all shocking was done after dark except in flowing portions of the Colorado River which were sampled during the day for safety reasons. Shocking normally started an hour after dusk and fish were collected by two netters. Shocking effort was divided into 3, 15-minute (900 sec) shocking periods. CPUE was expressed

as fish captured per 15 minutes of actual shocking time (fish/15 minutes).

Hoop Nets. Nylon hoop nets had five 80-cm metal hoops, were double-throated, and had 5-m center leads. Two meshes sizes were used: 6 mm for small and 25 mm for larger fish. Nets were tarred. One large net without a lead was set in the current facing downstream. Leads were typically tied to shore, and the hoops were set in 1 to 2 m of water perpendicular to shore. Nets were set before dusk and checked twice daily, each morning and late afternoon. CPUE was expressed as fish captured per 12-hour set (fish/12-h/set).

Minnow Traps. Custom collapsible minnow traps were constructed of 6-mm nylon net, 4-50-cm metal hoops, and 2 detachable spreader bars that kept the trap erect. The trap had throats on each end, was tarred, and had a velcro flap for fish removal. Traps were generally set among submerged tamarisk, in rocky cover, or along vertical rock formations. Traps were set prior to dusk and checked each morning and afternoon. CPUE was expressed as fish captured per 24-hour set (fish/24-h/set).

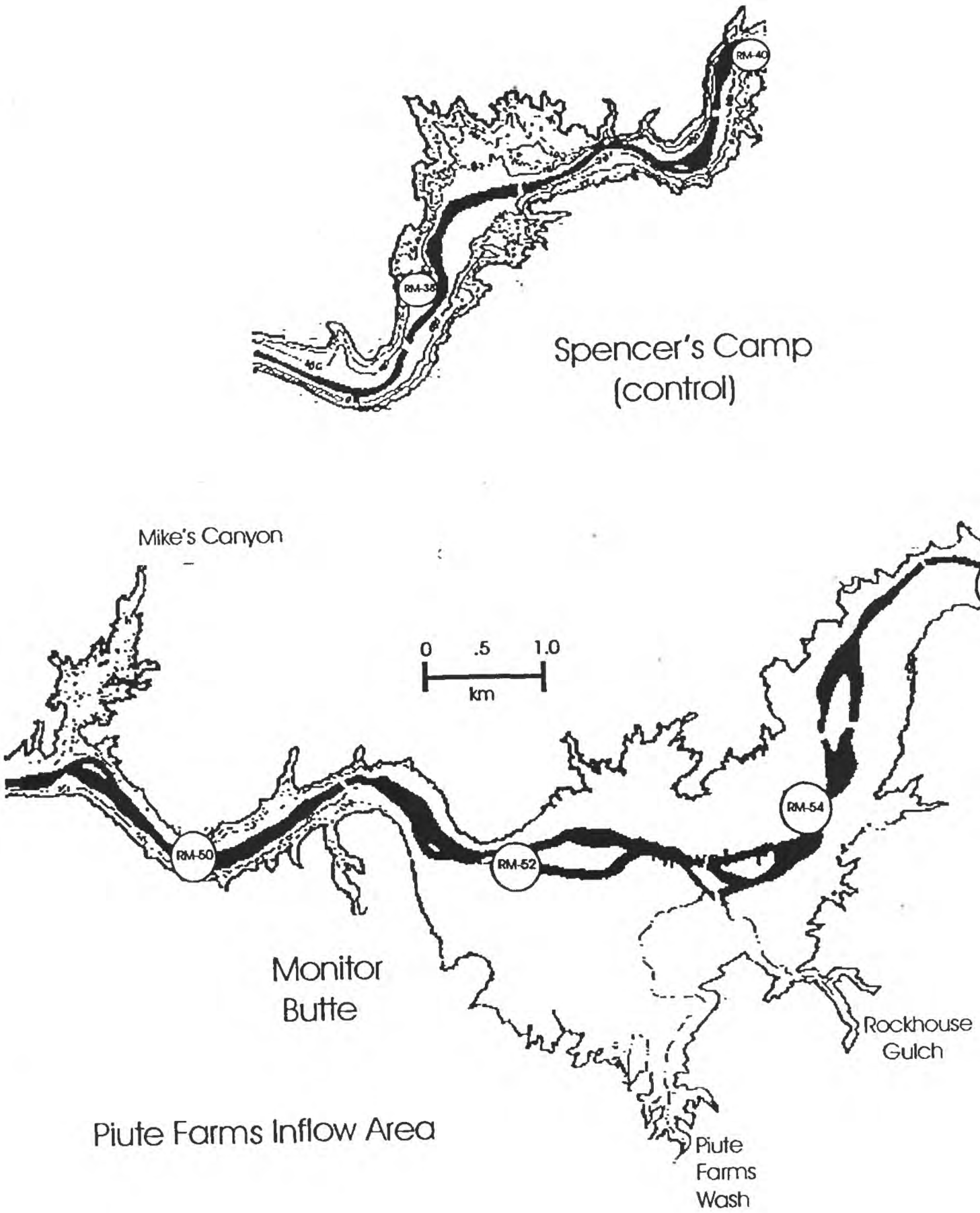


Figure 1. General map showing the study area and reservoir mile (RM) locations for Spencer's Camp (control) and the San Juan River inflow area.

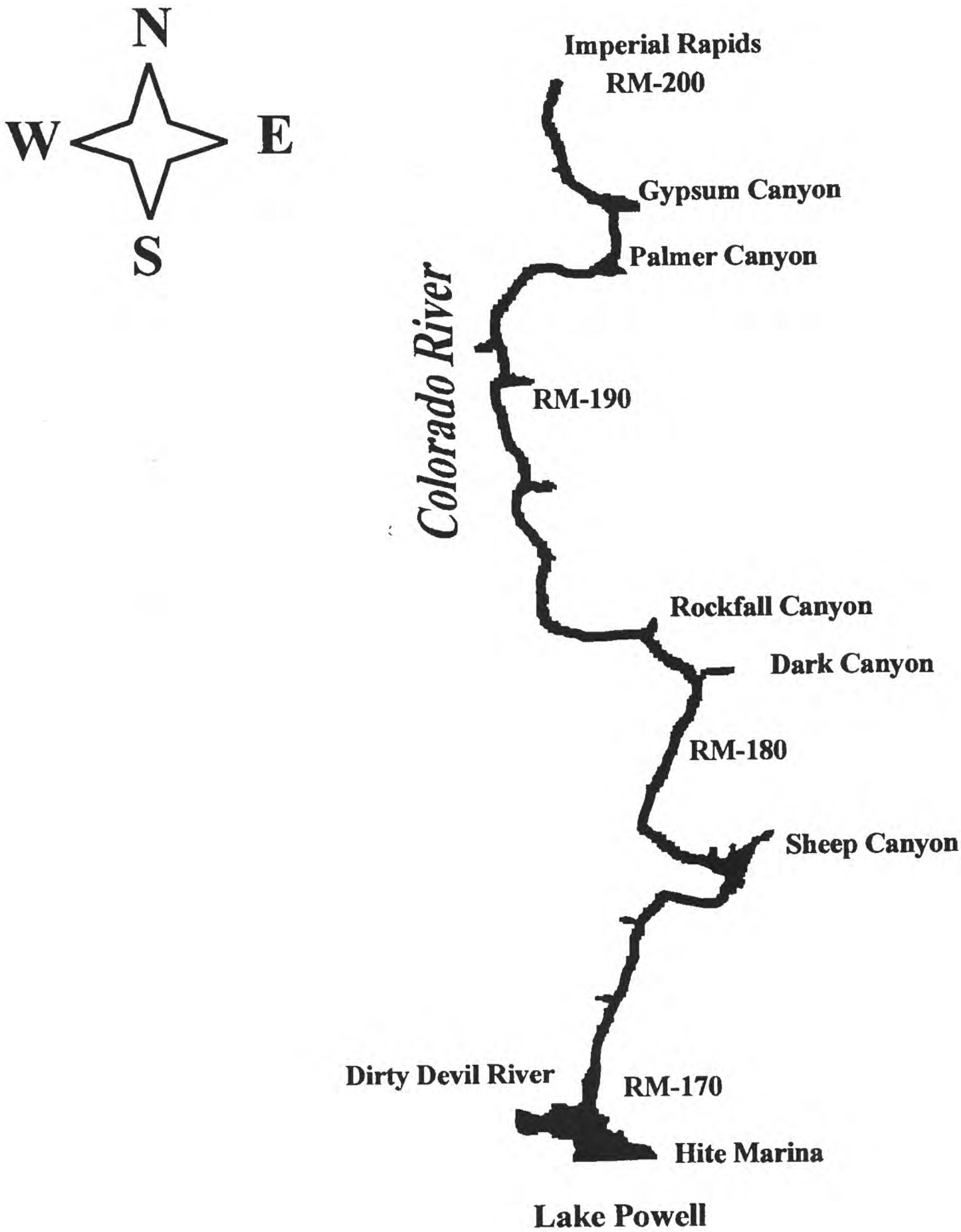


Figure 2. General map showing the study area and river mile (RM) locations for the Colorado River inflow area.

Light Traps. Quatrefoil style light traps were used to collect larval fishes (Mueller et al. 1993). Entrance widths were originally 10 mm to facilitate capturing larger native juveniles, however, potential predators such as adult red shiners and small sunfish also entered. Less than 30 larvae were captured during the 1999 season. The entrances were reduced to 5 mm to exclude predators during the 2000 field season. The traps had self-draining plankton nets to concentrate the samples and three 300-mA light bulbs (total 0.9 A) with two "D" cell batteries that provided light for 10 hours. Lights were placed in a clear 3-cm plexiglass cylinder. Two traps were set before dark along shore or in the backs of coves and recovered early in the morning. CPUE was expressed in numbers of larvae per night set (larvae/set).

Seining. Shoreline and backwater habitats were seined at the inflow sites using a nylon 4-mm meshed 1.5-m by 12-m seine. The seine was pulled going downstream (if current was present) and the area sampled (m^2) was estimated. CPUE was expressed as the number of fish seined per 10 square meters (fish/10 m^2).

Acoustics. Pelagic fish densities were measured using a scientific echosounder (BioSonics Model DT-5000). The system operated at 420 KHz and multiplexed between single and dual-beam transducers that were mounted on an aluminum platform on the side the boat. Permanent acoustical transect stations were established at RM 36, 38, 40, 42, 44, 46, 48, 50, and 52 on the San Juan arm. Addition transect data were collected at Spencer's Camp, Nokai Canyon, Castle Creek Canyon, and Mike's Canyon. Transects started at shore and proceeded to the thalweg. A minimum effort of 1,000 pings (approximately 5 minutes of mobile scanning) was collected at each site. Analyzed data provided size distribution and standing crop information (fish/m^3 and kg/m^3).

Sampling Effort

During the 4 sampling days per field trip, a crew of five to eight biologists set a minimum of two minnow traps, two small-mesh (6 mm) hoop nets, two large-mesh (2.5 cm) hoop nets, two large (3.7-cm) trammels, and two small-mesh (12 mm) trammels per night at the San Juan inflow and Spencer's Camp sites. Similar effort occurred at the Colorado River inflow, however, the number and types of nets used depended upon netting conditions and set opportunities. We seined (10 pulls) once each inflow trip and set light traps (May-July). All areas were electrofished using standardized methods developed by the UDWR. Each site was sampled one night and the effort consisted of three.15-minute shocking periods. Occasionally sampling was interrupted due to bad weather, equipment breakdown, or when we experienced high catch rates (>100 fish/set) for spawning carp and threadfin shad. All fish were released unharmed except for a total of 40 fish used for a heavy metal analysis (Jerry Miller, BOR). Field trips typically consisted of 4 sampling days.

Acoustical surveys were conducted before (May) and after the spawning peak (June-August). All surveys were conducted during daylight hours and took approximately 4 to 6 hours to

complete.

RESULTS

Hydrology and Reservoir Elevation

Though, the past decade has been the wettest on record, runoff from the Colorado River was just below average (89%) in 1999 (4,807,000 acre/ft) and well below (72%) average (3,856,000 acre/ft) in 2000. Flows from the San Juan River were similar but of a lesser magnitude (Figure 3). Runoff (1,671,000 acre/ft) in 1999 was slightly higher (110%) than normal and was substantially lower than normal in 2000.

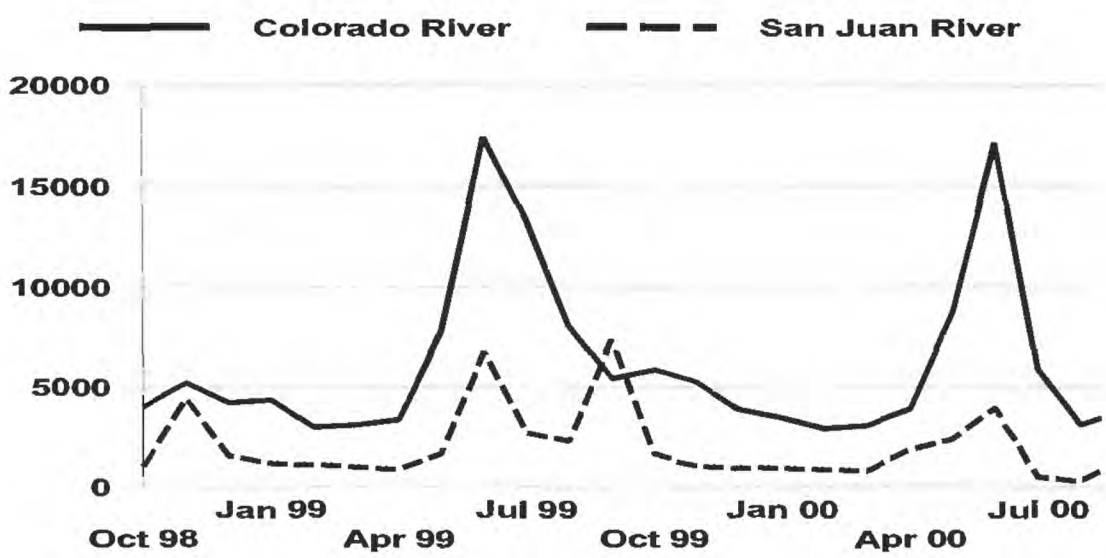


Figure 3. Hydrographs showing Colorado and San Juan river flows (cfs) into Lake Powell for October 1998 to September 2000.

Lake Powell's elevation attained its annual low (1,120.8 m) in late April 1999 and rose 5.3 m (1,126.1 m) during spring runoff (Figure 4). Detectible river currents extended downstream to RM 51 in April 1999, just upstream of the Piute Farms boat landing. By July, the reservoir extended upstream beyond Clay Hills (RM 56). Lake Powell's rate of filling (8 cm/d) in June and July 1999 allowed us to sample areas that were dry the previous trip.

The inflow of the Colorado River was confined to Narrow Canyon. At full pool, Lake Powell inundates areas as far upstream as Imperial Rapids (RM-200). Narrow Canyon starts about 4 km downstream of Imperial Rapids and extends downstream to RM-171 where the river broadens at the confluence of the Dirty Devil River (RM-170). The reservoir was at nearly full (90%) pool during the course of the study and backed up beyond RM-195 both years.

Backwater or slack water habitat was virtually nonexistent in the Colorado River inflow.

Backwaters were limited to the mouths of a few small side canyons which were typically isolated from the main river by sediment berms, however, backwaters in Dark Canyon (RM-183) and Rockfalls Canyon (RM-184) remained connected. Due to reservoir depth, Sheep Canyon (RM-177) formed a large expansion in the otherwise narrow inundated canyon.

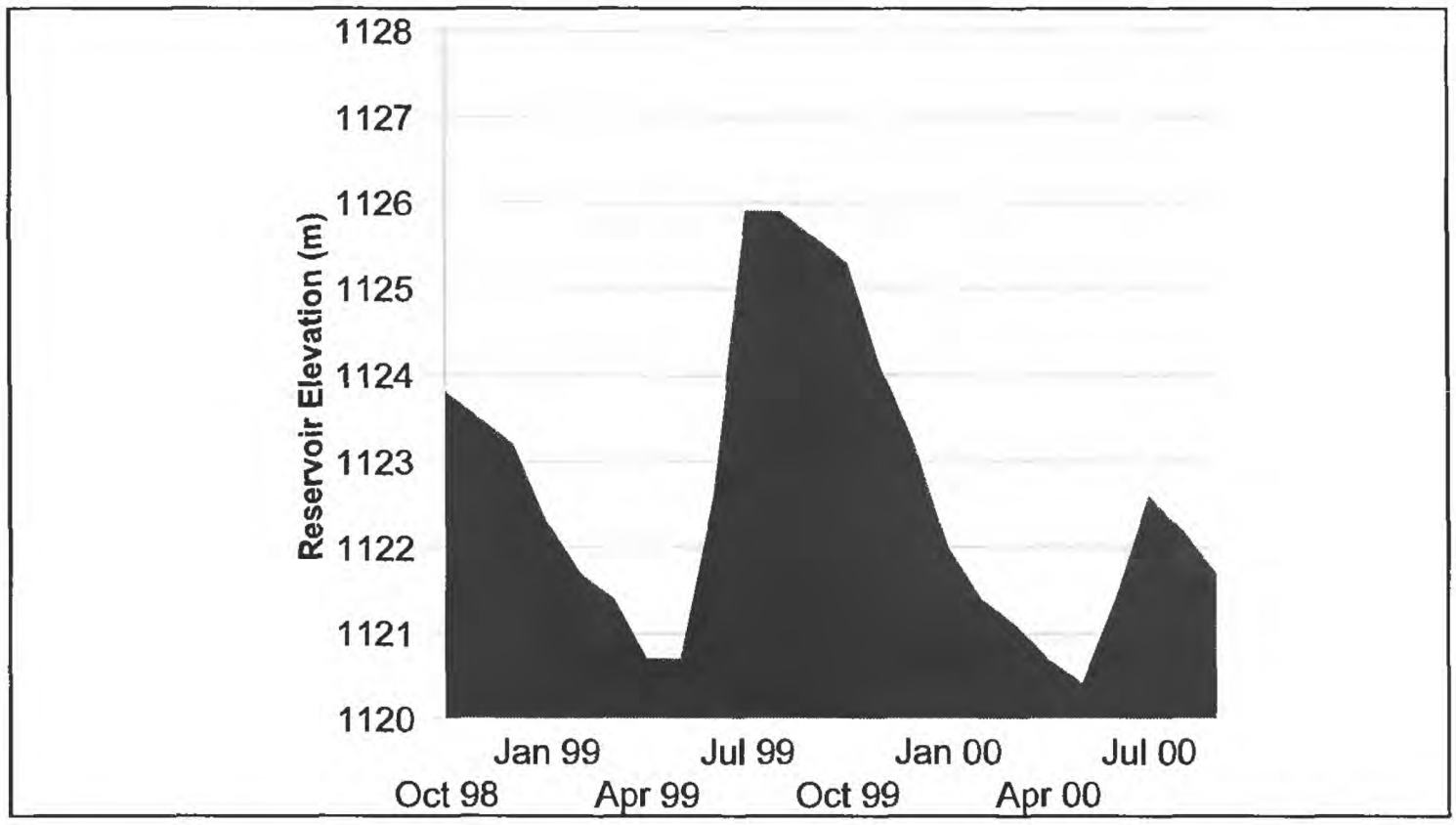


Figure 4. Graph showing surface elevation (meters M.S.L.) changes of Lake Powell during October 1998 through September 2000.

The following year (2000) Lake Powell dropped to similar elevations (1,120.7 m), however, runoff and storage were approximately a third of the previous year. Reservoir elevations peaked in late June at 1,122.7 m for an increase of only 2 m. Flooding was limited to the downstream portions of Piute Farms and extended only to RM-53.

Conditions at the Colorado River inflow were similar to the previous year except for depth and current. Narrow Canyon was 3 m shallower, and the river and current were detectible downstream of Dark Canyon.

Sediment Dynamics

Both rivers carry substantial amounts of sediment, especially during spring runoff and storm events. As currents slow, heavier sediments settle while finer materials remain suspended and are carried further downstream. Higher density (i.e., colder and more turbid) river waters causes river flows to drop below the reservoir's surface forming distinct turbid/clear transition zones in the reservoir.

Sedimentation is a complex process influenced by reservoir elevation, river stage, and topography. The higher the reservoir and the lower the flow, the further upstream sediment is deposited. Likewise, the lower the reservoir and the higher the river stage, the further downstream sediment is deposited. Changes in reservoir and river stage trigger a complex cycle of channel aggregation, scour, resuspension, and exposure which forms delta habitats at both inflow areas. Reservoir fluctuations also consolidate and aerate sediments which triggers the remineralization of nutrients such as nitrogen and phosphorus. Periodic exposure reduces organic loading of sediments through aerobic decay (Ploskey 1983).

Sediment dynamics at the San Juan Arm were complex due to the nearly full reservoir pool and associated broad flood plain topography. Sediment has been deposited over the broad flood plain at Piute Farms forming a large sedimentary plain that's nearly 2 km wide. San Juan River flows generally drop below 15 m^3/sec. during the summer. At low flows, sediment is deposited at the river's entrance where water depths are often measured in mere millimeters. If the reservoir drops, it triggers a process of head-cutting and scour through the exposed delta.

The process of channel aggregation or delta building has isolated side canyons resulting in the formation of backwaters that can be substantially deeper (>2 m) than the main river channel. Rockhouse Gulch (RM-53), Piute Farms Wash (RM-53), and several smaller backwaters along the northern shoreline (RM 53-56) were partially isolated during the study. At low reservoir elevations, these backwaters were completely isolated from the river by sediment berms covered by dense stands of *tamarisk*. Sediment buildup and vegetative (*tamarisk*) encroachment have isolated portions of the flood plain while channelizing the river between Clay Hills and Rockhouse Canyon. The process will eventually fill in and isolate areas that currently serve as nurseries.

Continued sediment deposition along the canyon walls and entrances to side canyons in the Colorado River inflow area has isolated or completely filled many side canyons in the upstream portion of Narrow Canyon. In the central portion of the reach, the blockage is less and the entrances to Dark Canyon, Rockfall Canyon, and Bowdie Canyon (190) are only partially blocked. Apparently berms are occasionally washed out by storm events. The process of sedimentation is also occurring underwater, and it will continue until the reservoir is filled or the dam is removed.

Bathymetry

Bathymetry of the San Juan inflow area was examined using existing bathymetry maps (Table 2) and data collected in July1999 (Figures 5 and 6). The river's delta and channel route changed dramatically the following year (2000). These data can only be viewed as "snap shots" of the physical changes that are occurring in the Piute Farms area.

Table 2. Surface area (ha) increase for the San Juan study sites based on existing topographical maps for reservoir elevational changes from 1,120 to 1,126 m.

		------Surface Area (ha)-----		
Location	RM range	@1,120 m	@1,126 m	% increase
Spencer's Camp	37.5-40.0	275	304	+10.5
San Juan Inflow	48.5-56.0	316	1,600	+406.3

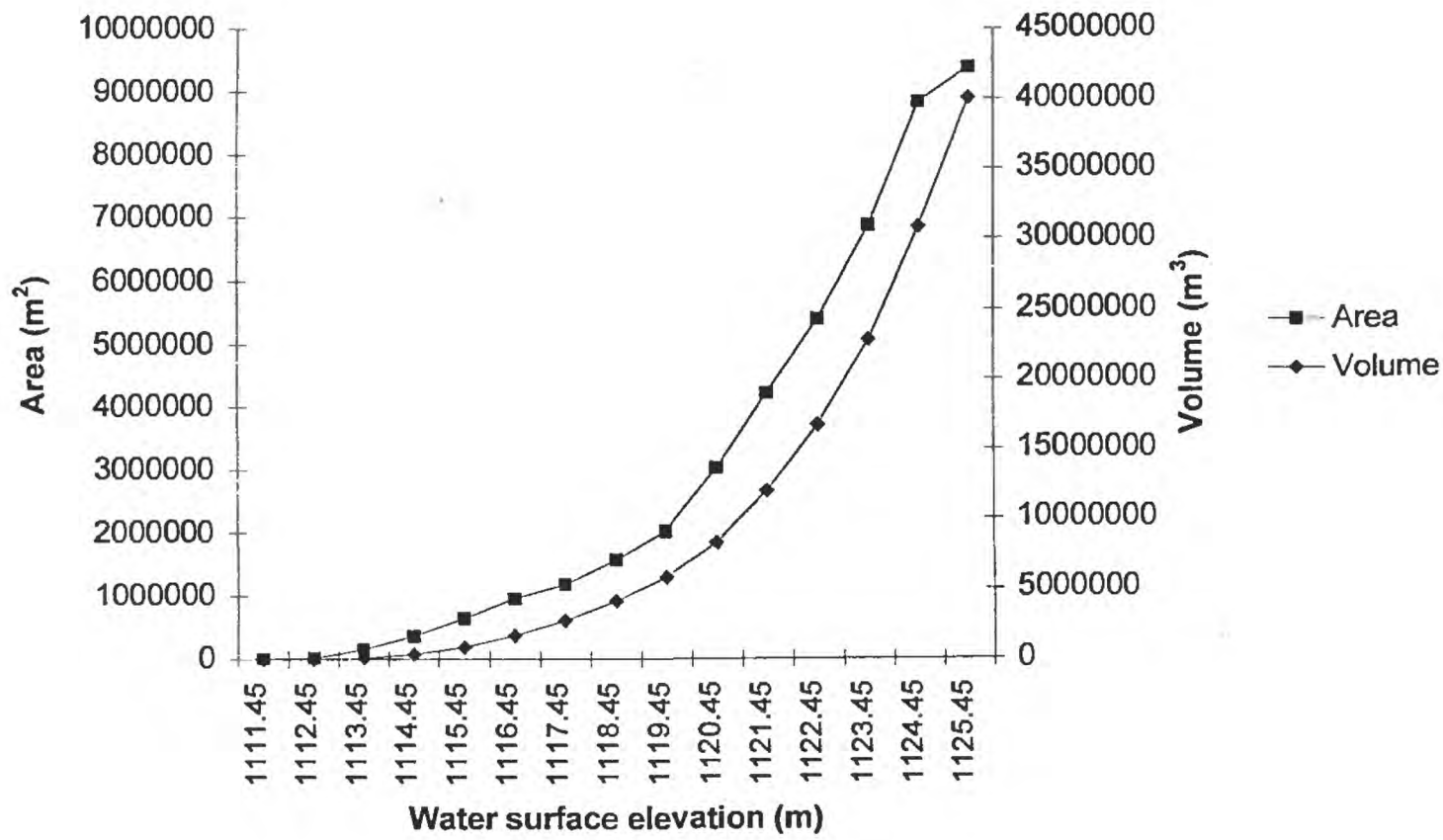


Figure 5. Area /volume table for a portion of the San Juan Arm of Lake Powell extending from Mike's Canyon to the upper reach of Piute Farms, measured July 14, 1999.

Figure 6. Bathymetric map of a portion of the San Juan Arm of Lake Powell extending from Mike's Canyon upstream to the upper reach of Piute Farms developed from July 14, 1999 data.

Species Composition

Nearly 40,000 fish were collected, representing 23 fish species: 18 nonnative and 5 native (Table 3). Passive netting and electrofishing accounted for 10,200 fish, seining >5,000, and larval light traps >22,000. Numerically, nonnatives dominated (>99.4%) the passive netting and electrofishing samples. Predominant species included: red shiner, threadfin shad, carp, bluegill, green sunfish, channel catfish, crappie, black bass, and striped bass.

Most species were generally found in both tributary arms. One exception was northern pike that were only collected in the Colorado River inflow. These were rarely reported elsewhere in the reservoir and to our knowledge have never been taken in the San Juan Arm. Northern pike are common in portions of the Yampa and Gunnison rivers.

Two species not previously reported in Lake Powell were white crappie and gizzard shad. Both were collected in the San Juan River inflow. White crappie are similar in appearance to black crappie. They may occur in low numbers reservoir wide, and we only positively identified them while sampling in the San Juan Arm. White crappie were reported in Reece Creek as early as 1936 (Sigler and Miller 1963), however, accuracy of this report is questioned. More likely is their unintentional stocking with other fish or escapement further upstream in the San Juan River basin. This appears to be the case for the gizzard shad we collected at Piute Farms (Jim Brooks [FWS] personal communique). Possible ramifications of these introductions are discussed later.

Fish Communities

Fish community structure was unique to each study site, reflecting existing flood plain and channel habitat. The characteristics of the inflow sites were unique for each river and highly subject to reservoir elevation. During this study, Lake Powell was near full pool which inundated vast expanses (>2,000 ha) of shallow, brushy flood plain in the San Juan Arm. However, flooding in the Colorado River inflow was contained by steep canyon walls in Narrow Canyon which limited the formation of shallow backwater habitat. These conditions would dramatically change with lower reservoir elevations. For example, if the reservoir dropped 50 m, the habitat characteristics for the Colorado and San Juan rivers would reverse. At that elevation, the Colorado River would enter Lake Powell at the broad floodplain downstream of Hite marina while the San Juan River would enter the reservoir in the narrow canyon downstream of Spencer's Camp. These differences in habitat type would strongly influence the composition and age class structure of local fish communities (Figure 7).

Table 3. Fish species and their location of capture from Lake Powell during 1999 and 2000

Common Name		Scientific Name	Colorado River	San Juan River	Spencer's Camp
Family:	Catostomidae (suckers)				
FMS	Flannelmouth sucker	*Catostomus latipinnis*	X	X	X
RZB	Razorback sucker	*Xyrauchen texanus*	X	X	
Family:	Centrarchidae (sunfish)				
SMB	Smallmouth bass	*Micropterus dolomieui*	X	X	X
LMB	Largemouth bass	*Micropterus salmoides*	X	X	X
BG	Bluegill	*Lepomis macrochirus*	X	X	X
GSF	Green sunfish	*Lepomis cyanellus*	X	X	X
BC	Black crappie	*Pomoxis nigromaculatus*	X	X	X
WC	White crappie*	*Pomoxis annularis*		X	
Family:	Cyprinidae (minnows)				
CARP	Common carp	*Cyprinus carpio*	X	X	X
CPM	Colorado pikeminnow	*Ptychocheilus lucius*	X	X	
RS	Red shiner	*Notripis lutrensus*	X	X	X
FMS	Fathead minnow	*Pimephales promelas*		X	
SS	Sand shiner	*Notropis stramineus*	X		
Chub (unknown)		*Gila sp.*	X		
Family:	Clupeidae (herrings)				
TFS	Threadfin shad	*Dorosoma petenense*	X	X	X
GZS	Gizzard shad*	*Dorosoma cepedianum*		X	
Family:	Ictaluridae (catfishes, bullheads)				
YBH	Yellow bullhead	*Ictalurus natalis*	X	X	X
BLBH	Black bullhead	*Ictalurus melas*	X	X	
CCF	Channel catfish	*Ictalurus punctatus*	X	X	X
Family:	Percidae (perches)				
WALL	Walleye	*Stizostedion vitreum vitreum*	X	X	X
Family:	Percichthyidae (temperate basses)				
STB	Striped bass	*Morone saxatilis*	X	X	X
Family: Poeciliidae (topminnow)					
GAM	Gambusia	*Gambusia affinis*		X	
Family: Esocidae (pike)					
NP	Northern pike	*Esox lucius*	X		

* first documentation.

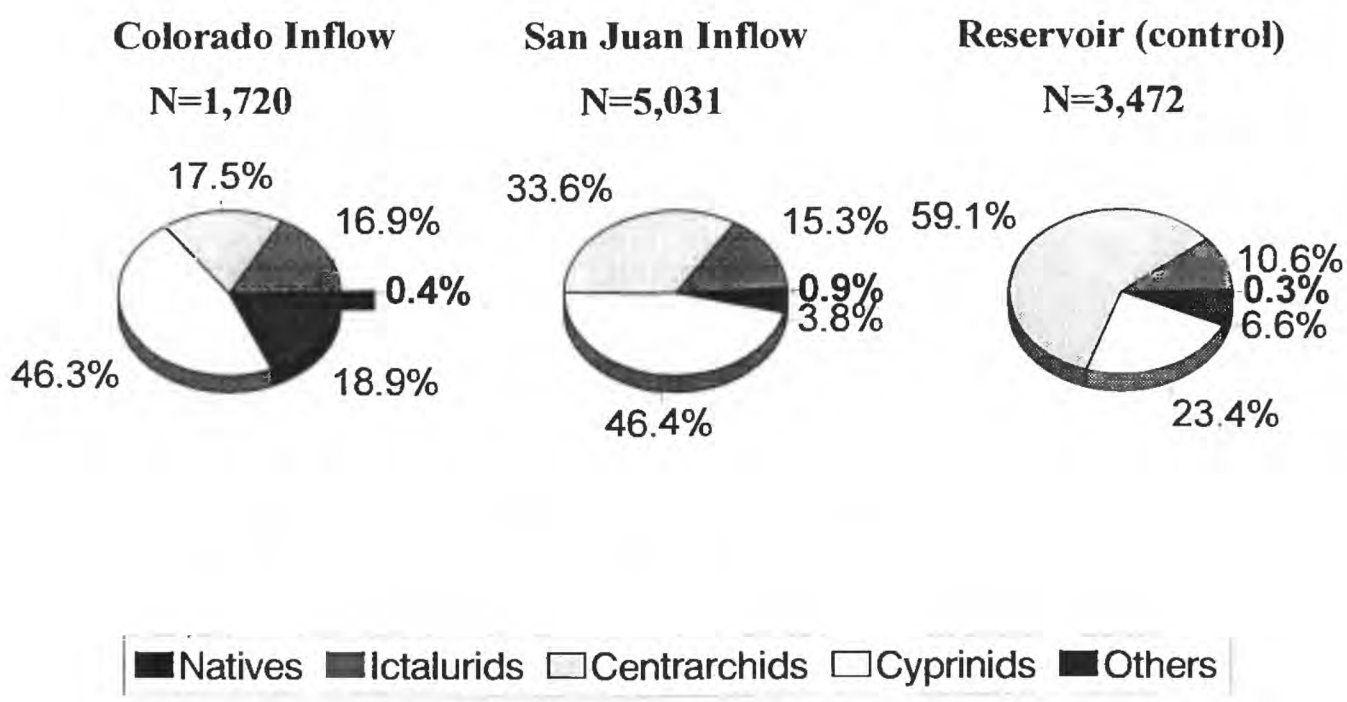


Figure 7. Composition of fish families in the Colorado, San Juan, and Spencer's Camp sample sites of Lake Powell, Utah, in 1999 and 2000.

Colorado River Inflow --*Native Fish* Passive netting and electrofishing produced 10,200 fish, of which only 9 (0.4%) were natives (Figure 7). One razorback, one chub (*Gila sp.*), one pikeminnow, and six flannelmouth suckers were taken. The chub was collected in a minnow trap, the pikeminnow in a seine and trammel net, and the suckers in trammel nets. We believe sand shiners were misidentified or overlooked during our seining for Colorado pikeminnow. Previous reports suggest they are more common than our data indicate in flowing portions of the Colorado River inflow.

The captured razorback sucker was an adult originally stocked in the Green River at Vernal, Utah. The fish was captured at Sheep Canyon in a trammel net and found dead. The fish had a severe infestation (>30 parasites) of *learnea* which probably contributed to its death (Creef and Clarkson 1993).

Most of the fish captured were adults. Young or juvenile fish were rare, reflecting scarcity of backwater habitat and the abundance of large predators, such as striped bass, walleye, and channel catfish. We expected to find more suckers in the river, especially upstream near Imperial

Rapids (RM-200). Instead we encountered large schools of spawning striped bass and walleye. Small fish and other species were absent.

Nonnative Fishes --Sampling results were as expected, except for the large number of striped bass and walleyes found downstream of Imperial Rapids during May 2000. Large numbers of spawners were shocked adjacent to the main river channel between RM 195 to RM 199. Roughly 90% of the striped bass were ripe males that were robust and in excellent condition. Fish were found along shore, especially near exposed rock talus at depths of 2 to 3 m. Daytime shocking rates exceeded 100 fish/15 minutes of shocking.

The predominant species sampled included: adult common carp (46.3%), striped bass, channel catfish, and walleye. Species composition shifted toward centrarchids downstream of Hite Marina where water clarity improved. Here smallmouth and largemouth bass, bluegill, green sunfish, and crappie dominated. Striped bass, largemouth and smallmouth bass, walleye, and channel catfish represented over 38% of the fish collected during all three trips. As always, common carp dominated the samples, especially in coves or in the back of side canyons.

San Juan Inflow --*Native Fish* -- Native suckers were more prevalent (0.9%) in the San Juan inflow. Eleven adult razorbacks were taken at or near Piute Farms. Nine of the eleven had been previously PIT-tagged and the remaining two were similar in size and appearance to the other fish. They didn't exhibit any of the characteristics (blindness, scarring) common to old fish and were believed to be stocked fish that had either lost or had malfunctioning PIT tags.

Two juvenile pikeminnow were collected; one was released and one died. Wild pikeminnow are extremely rare, much more so than in the Colorado River Arm (Ryden 2000). It's possible. but unlikely the pikeminnow were wild fish. Literally thousands of young Colorado pikeminnow had been stocked further upstream by UDWR. Stocked fish were marked with tetracycline. Unfortunately, the pikeminnow that died couldn't be frozen and was preserved in formalin which destroyed any tetracycline mark.

Nonnative Fishes -- The broad flood plain provided ample nursery habitat. As waters rose, red shiner, common carp, threadfin shad, bullheads, and centrarchids moved upstream to colonize these newly inundated areas. The speed and rate of nonnative fish colonization was impressive. During May and June, trammel netting sets averaged >3 fish every running meter of net. Comparison of 30- and 45-m trammel net catch rates suggests most were moving along shore. Fish were entering these new habitats to spawn and exploit new food sources. Applegate and Mullan (1966) reported that young centrarchids and especially black bullhead eat terrestrial animals such as earthworms and insects during flood events. They found bullhead in flooded areas had a much higher (56% versus 6%) percentage of terrestrial items in their stomachs.

Spawning common carp moved en masse during May and June, sexually active males were collected as late as October. In late spring and summer, threadfin shad were spawning along with red shiner, bullhead, channel catfish, and several centrarchids. In July 1999, we observed

over 50 large, dense schools of catfish fry along the shoreline of Piute Farms.

The production of young common carp, red shiner, and threadfin shad must provide a large percentage of the prey base for local game species: striped bass, largemouth and smallmouth bass, crappie, catfish, and walleye. Although large striped bass and walleye are considered thermally sensitive, both predators were commonly captured along shore during summer.

Spencer's Camp (Control) --The small basin at Spencer's Camp was more indicative of stable reservoir conditions. Maximum depth ranged between 30 and 40 m. Littoral habitats were substantially steeper and deeper (>5 m), highly transparent (>5 m), and minimally influenced by changes in reservoir elevation. The reservoir's steep shorelines and canyon walls generally limit shoreline movement to <50 m a year. Vegetative cover was sparse and restricted to small, dense stands of *tamarisk* growing in more protected areas of side canyons or backwaters. Wave erosion, poor soils, and desert conditions restrict the establishment of vegetation along the more exposed shorelines. Underwater cover was typically limited to rock and talus formations.

Native Fishes --Native species were virtually absent (0.3%) with the exception of nine flannelmouth suckers. Flannelmouth sucker was the only native captured. No razorback sucker, Colorado pikeminnow, or chub were taken.

Nonnative Fishes -- Centrarchids comprised 59% of the fish captured (Figure 7). Green sunfish was the most prevalent species, followed by common carp (23.4%) , bluegill, smallmouth bass, channel catfish, striped bass, largemouth bass, and crappie. Smallmouth bass and green sunfish were far more prevalent in the reservoir than the inflow areas.

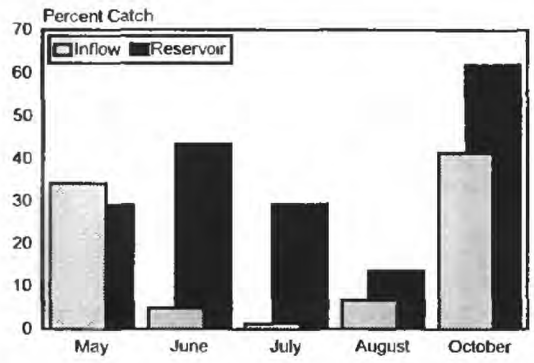
Seasonal Trends in the San Juan Arm

Sample composition was highly variable due to seasonal migrations, recruitment, and predation. A comparison of species composition is illustrated in Figures 8 through 15.

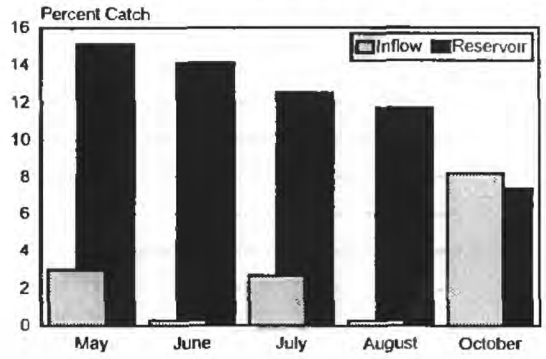
Bluegill, crappie, and green sunfish (panfish) were more numerous in the reservoir (Spencer's Camp) site compared to the inflow area (Figures 8 and 9). Panfish exceeded 30% of our late spring and early fall sample and typically <7% of summer values. Young of the year crappies became more common in the fall which suggested local spawning had occurred.

Largemouth and smallmouth (black bass) bass normally represented <3% of our inflow sample except in late summer when young bass captures increased. Smallmouth bass constituted >10% of the reservoir sample. The gradual seasonal decline shown in Figure 9 is misleading due to disproportionate increases of sunfish and threadfin shad.

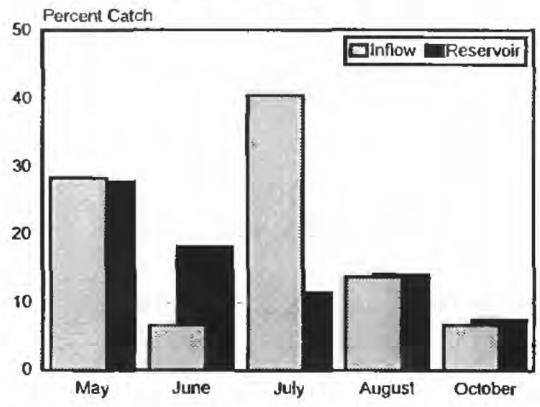
Sunfish spp.



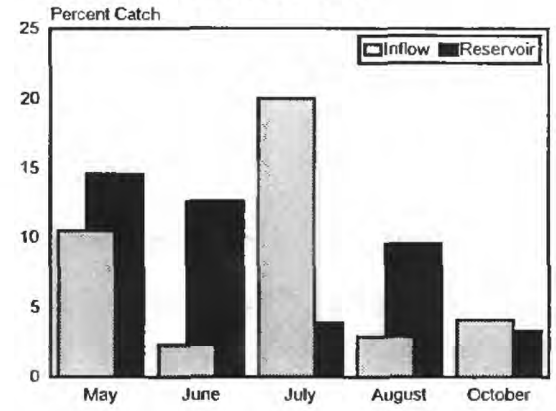
Black Bass spp.



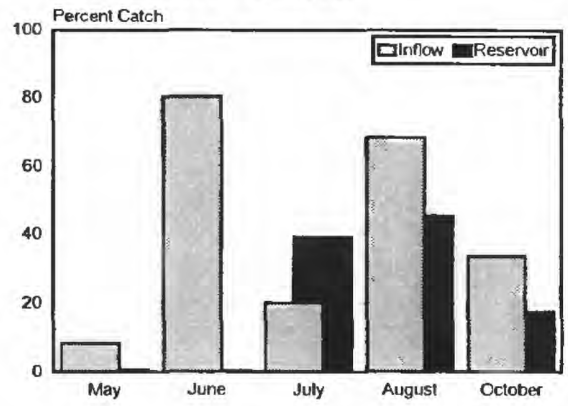
Common Carp



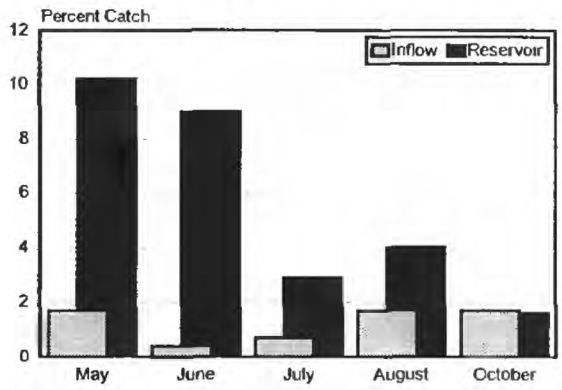
Channel Catfish



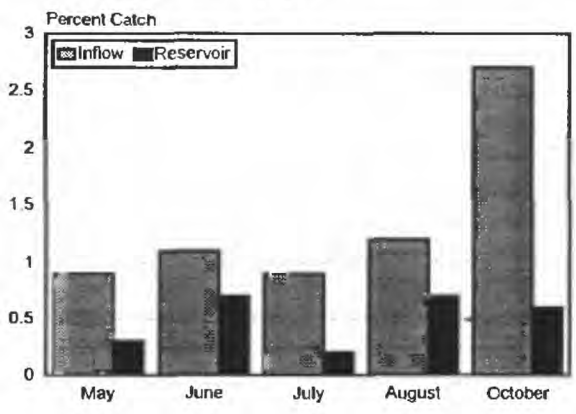
Threadfin Shad



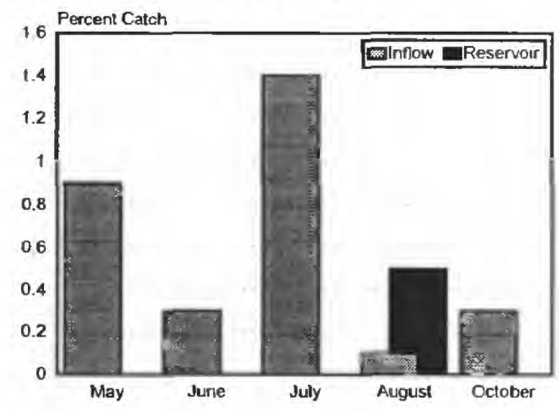
Striped Bass



Bullhead spp.



Native Suckers



Figures 8 to 15. Shifts in species composition over time for sunfish, black bass, common carp, channel catfish, threadfin shad, striped bass, bullhead and native suckers in the San Juan River inflow area and Spencer's Camp (reservoir control) for 1999.

Common carp generally made up 20% of the fish sampled at either location. Common carp were more prevalent during early spring, just prior to and during their spawning season. They were captured in large numbers in flooded *tamarisk* flats that served as prime spawning habitat. The percentage of common carp in the sample declined through the summer to levels that were <10% in the fall (Figure 10).

Channel catfish represented about 10% of all fish sampled. Monthly catch rates were variable but overall averages were similar for both sampling sites. Bullheads made up 1% of the fish sampled in the inflow and were less (0.5%) common in the reservoir.

Striped bass represented <2% of the San Juan inflow sample and >5% in the reservoir sample. At Spencer's Camp they were more common in May and June during their spawning season.

Flannelmouth and razorback suckers were extremely rare. They were <0.4% of the fish sampled. All razorback sucker and the majority of flannelmouth sucker were captured at the inflow area supporting our hypothesis of their scarcity.

Relative Abundance and Standing Crop

In general, relative fish abundance was greater in the San Juan inflow than to the reservoir control site.

1999–Electrofishing CPUE (#fish/15 minutes of shocking) values were normally low in early spring (May) but steadily increased through October for all study sites (Table 4). Widespread production of threadfin shad and centrarchids accounted for much of this increase and was supported by hydroacoustic data (following section). Hoop nets, in contrast, suggest a decrease in abundance at Spencer's Camp and a major increase at the inflow where we suspect higher recruitment. Declining reservoir elevations and the resulting loss of cover may have increased predation in the reservoir. Large-meshed trammel nets reflect relatively similar numbers and a decline in late summer of larger fish. Relative abundance measured by the small-meshed net was similar (30 fish/100 m^2) but suggested an increase in small fish numbers in October which correlates well with electrofishing and hoop net trends.

2000–Lake Powell only rose to elevation 1122.7 m during spring 2000. Electrofishing and hoop net trends suggested relative abundance was lower than in 1999, otherwise the seasonal patterns were similar. Catch rates peaked in mid-summer, there after dropped at Spencer's Camp but continued to increase at the inflow. Again, recruitment and receding reservoir elevations appeared to increase predation and reduce sampling efficiency.

Table 4. CPUE for each of the sampling techniques and sampling sites over time, May-October 1999, and April-August 2000.

Location	ELEC	SH	LH	MT	SEINE	LT	ST
	(#/15min)		----------(#/set)--------			(#/10m^2)	--(#/100m^2)--
May-1999							
Hite	9.9	1.0	--	0.5	43.0	9.0	19.2
Piute	33.4	1.6	--	2.6	1.5	35.0	45.7
Spencer	41.6	3.0	--	1.6	--	37.5	23.3
June-1999							
Piute	37.9	1.5	18.8	1.5	9.1	110.3	110.3
Spencer	30.7	6.6	--	9.8	--	30.1	52.0
July-1999							
Piute	10.1	1.7	7.4	9.8	1.2	49.9	31.1
Spencer	108.3	9.8	1.0	3.7	--	38.9	28.3
August-1999							
Piute	121.9	20.2	--	2.8	7.6	53.1	20.2
Spencer	79.3	0.8	0.1	1.3	--	20.8	26.4
October-1999							
Piute	209.7	27.1	1.8	3.3	--	24.7	76.4
Spencer	151.7	0.5	0.5	2.3	--	21.0	45.7
April-2000							
Hite	42.9	0.7	0.9	1.5	--	23.3	41.9
May-2000							
Hite	67.5	0.2	1.3	1.1	9.1	27.9	25.9
Piute	132.7	0.5	0.3	2.0	9.8	44.3	131.0
Spencer	58.2	2.7	1.0	9.0	--	12.6	15.4
June-early-2000							
Piute	39.6	3.8	1.7	5.8	1.1	109.4	134.0
Spencer	45.4	0.5	0.0	3.3	--	52.0	46.3
June-late-2000							
Piute	40.8	2.3	0.5	1.7	11.3	72.4	62.1
Spencer	43.4	2.5	1.7	3.0	--	23.0	24.8
July-2000							
Piute	55.1	4.5	0.3	1.3	43.6	54.7	81.8
Spencer	64.4	2.0	0.4	20.7	--	31.6	31.4
August 2000							
Piute	56.7	4.6	2.0	4.0	13.8	70.4	145.3
Spencer	24.3	0.3	0.2	2.8	--	26.0	50.7

Key: ELEC=electroshocking, SH=6-mm meshed hoop nets, LH=2.5-cm hoop nets, MT=minnow traps, SEINE=seining, LT=3.7-cm meshed trammels, ST=1.2-cm meshed trammel nets.

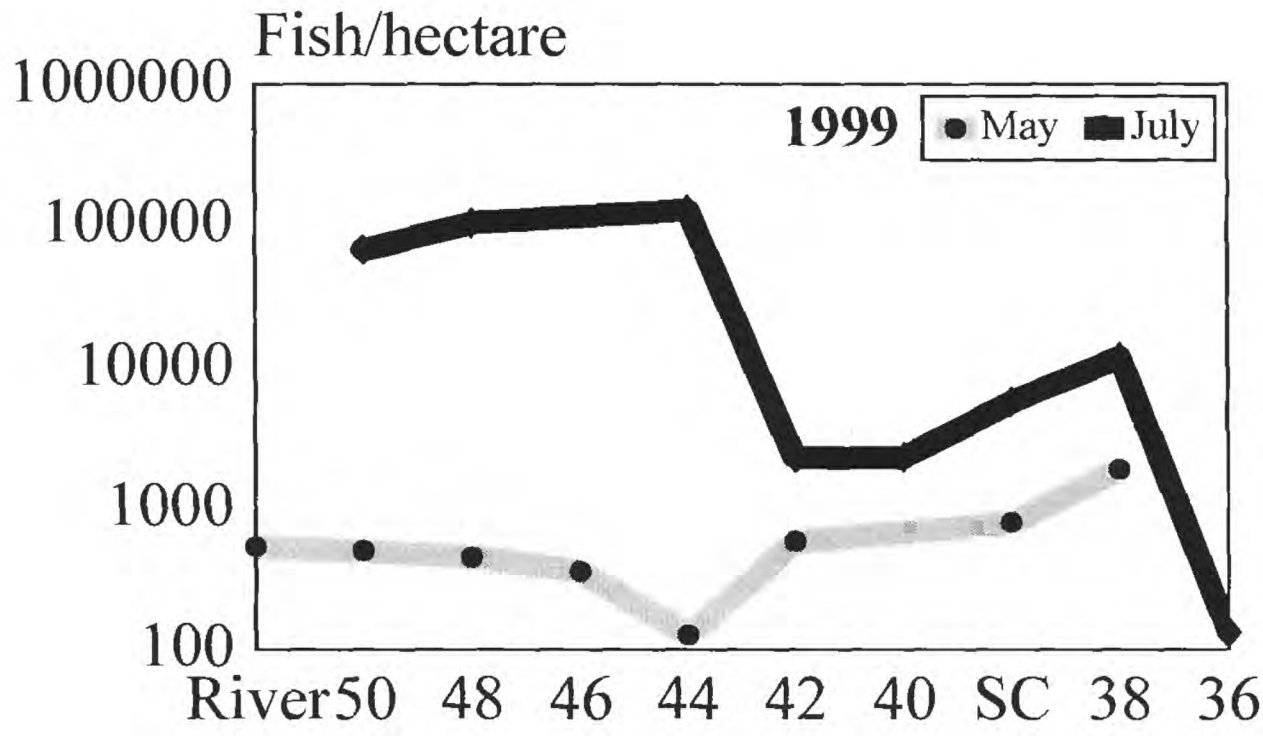
Acoustic Measurements

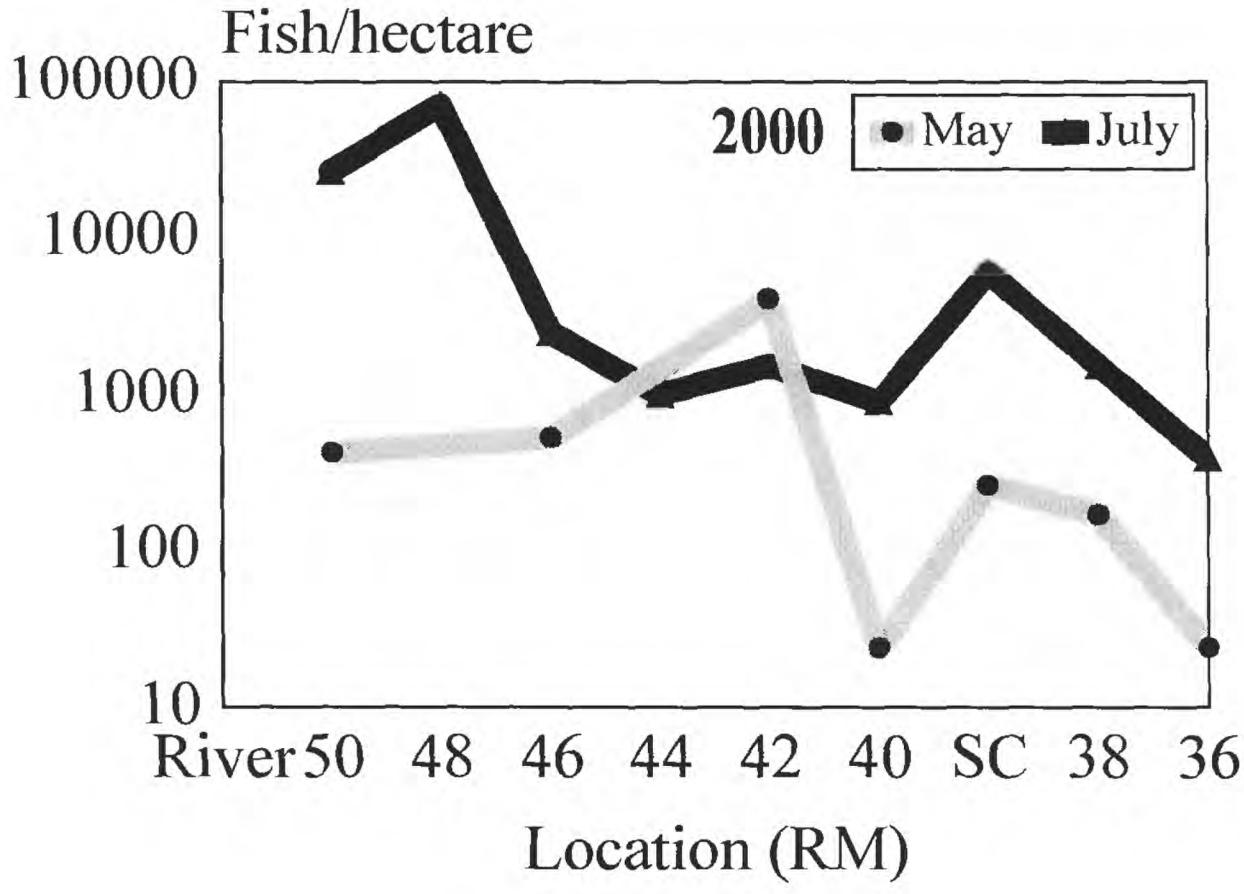
Pelagic fish densities were measured acoustically. Occasionally, we encountered gas emissions (bubbles) rising from sediments that were indistinguishable from fish. This normally occurred in the immediate inflow area and in major washes that appeared rich in organic sediments. Unfortunately, these were in the most productive areas (Mikes, Castle, and Nokai canyons). Occasionally, gas emissions were quite active, producing bubble "plumes" that disrupted the surface. On calm days, they could be avoided but were typically masked by wave action. Generally the gas emissions could be edited out during data analysis. Rarely, the problem was so severe that data had to be discarded.

Fish densities were lowest (<1,000 fish/ha) prior to peak spawning which was expected. At that time, fish were fairly well distributed longitudinally with just slightly higher densities located at the downstream sites (Figures 16 and 17). This agrees with results from earlier studies in that pelagic fish moved downstream to deeper habitats during the winter and in the spring move upstream toward spawning sites (Mueller and Horn 1999).

Maximum fish densities measured in May ranged from 1,083 fish/ha (1999) to 4,049 fish/ha (2000). This primarily represented the winter carryover of spawning threadfin shad. Threadfin shad, common carp, and red shiner were the primary broadcast spawners using these newly flooded habitats. Threadfin shad spawning peaked in June and July and was concentrated in the flooded *tamarisk* flats at Piute Farms and in the backs of major side canyons and washes. Pelagic fish production was higher and more widespread in 1999 than 2000. Maximum fish densities rose exponentially to 190,538 (1999) and 71,485 (2000) fish/ha at or near the inflow area. The higher fish densities in 1999 corresponded to higher reservoir elevations and more flooded habitat. Fish densities >100,000 fish/ha extended from the river/reservoir interface (RM-50) some 10 km downstream (RM-44) in 1999. Maximum densities in 2000 were approximately a third of the previous year and extended only 3 km downstream (RM-50-48).

Fish were not actually sampled, however, based on UDWR trawling elsewhere, the majority (>90%) of these fish were probably threadfin shad. Young fish were often observed concentrated at or immediately downstream of the inflow area. Fish production was also high in side canyons that experienced major flooding (Mike's Canyon. Castle Creek, Nokai Canyon). In late summer, fish appeared to prefer the mouths of side canyons instead of the mainstem channel. Fish densities in the side canyons are presented in Table 5.





Figures 16 and 17. Densities of pelagic fish found in the San Juan inflow area of Lake Powell measured by scientific echosounder during the spring and summer of 1999 and 2000.

Table 5. Fish densities (fish/ha) measured by acoustics in three major side canyons in the upper San Juan Arm of Lake Powell, Utah, during 1999 and 2000

	Date	Mike's	Castle	Nokai
1999				
	May	Bubbles*	1,710	Bubbles
	July 15th	6,444	1,179	6,314
	Aug. 17th	19,026	17,715	58,360
2000				
	May 1st	0	Bubbles	Bubbles
	June 26th	13,367	6,934	8,885
	July 17th	8,492	19,952	23,103

Bubbles* = gas bubble emission prevented accurate analyses

Sampling Technique Effectiveness

Native fish were taken by a variety of sampling techniques. No one technique worked best for any single species, instead sampling success was more indicative of life stage. The juvenile *Gila spp.* and three Colorado pikeminnow were captured by minnow trap, seine and trammel net, respectively. The majority of adult flannelmouth suckers (36 or 86%) and razorback suckers (11 or 92%) were taken by trammel net. Electrofishing produced two (8%) razorbacks suckers and a few (5 or 14%) flannelmouth suckers were captured by hoop net. Sampling revealed each method's intrinsic strengths and biases. Field results follows.

Larval Light Traps We initially used traps that had wide (>10 mm) entrances in hopes of collecting young suckers. While we did attract fry and larger juveniles, the traps also allowed access to potential predators such as large red shiner, bluegill, green sunfish and black bass. No young suckers and few (<30) larvae were collected in 1999. These data were considered unreliable and discarded. The gap (entrance) width of the traps was reduced to 5 mm in 2000 to allow access only to larval fish. The traps were effective bit location and water turbidity influenced capture rates. Often turbidity reduced illumination and the area of larval fish attraction to scant centimeters. Traps set in clearer water had substantially higher capture rates and may have attracted fish from greater distances. A total of 22,788 fish were captured with CPUE ranging from 0 to 3,272 larvae/set (Table 6).

Table 6. Composite (2) light trap samples collected from the inflow areas of the San Juan and Colorado rivers of Lake Powell, 2000.

Date	RM	CPUE	Fish Families					
		(Fish/trap)	Cypr.	Clup.	Icta.	Cent.	Perc.	Cato.
Colorado River								
4/4/00	139	0	0	0	0	0	0	0
5/16/00	154	2	4	0	0	0	0	4
San Juan River								
5/2/00	49	2	0	0	0	2	0	2
6/6/00	49-52	812	187	1,400	0	3	32	2
6/7/00	49-52	761	189	1,265	0	65	3	0
6/8/00	49-52	2,441	148	4,700	0	23	11	0
6/27/00	52-53	3,273	6,472	75	0	0	0	0
6/28/00	52-53	2,262	4,462	49	10	0	4	0
6/29/00	53	613	1,170	47	1	3	6	0
7/9/00	52	340	666	14	1	0	0	0
7/18/00	52	781	1,552	11	0	0	0	0
7/20/00	52	104	190	6	0	12	0	0
		Totals	**15,040**	**7,567**	**12**	**105**	**56**	**8**

Larval fish were collected from May 2 until trapping was suspended July 20. The first larvae appeared on May 2, and samples contained catostomids (suckers) and centrarchids (sunfish) (Figure 18). Cyprinids (minnows) were sampled the third week of May and clupeids (shad) and percids (striped bass) in early June. Larval ictalurids (catfish) were the last sampled in late June. Cyprinds were the most numerous larvae collected and occasionally totaled more than 1,000 fish per trap effort. Two larval razorback suckers were collected just downstream of Piute Farms on 2 May 2000. Identification was validated by Kevin Bestgen, Larval Fish Laboratory, Colorado State University.

Electrofishing Electrofishing effectiveness was influenced by fish size and habitats. Shocking was naturally biased toward larger fish. Bottom dwelling species, such as channel catfish were also less susceptible to electrical currents. Electrofishing conditions were highly variable, influenced by reservoir elevation, turbidity, and wave action. Suspended sediment undoubtedly increased conductivity and reduced the effective electrical field. Water visibility at the inflow area was often poor, measured in millimeters and habitats were shallow. Shocking is more effective in less turbid waters where netters can observe fish in the entire electrical field. In this study, we believe electrofishing significantly under estimated numbers because only a fraction of the fish stunned in turbid habitat were actually seen or netted. Average trip CPUE ranged from 10.1 to 209.7 fish/15 minutes shocking time.

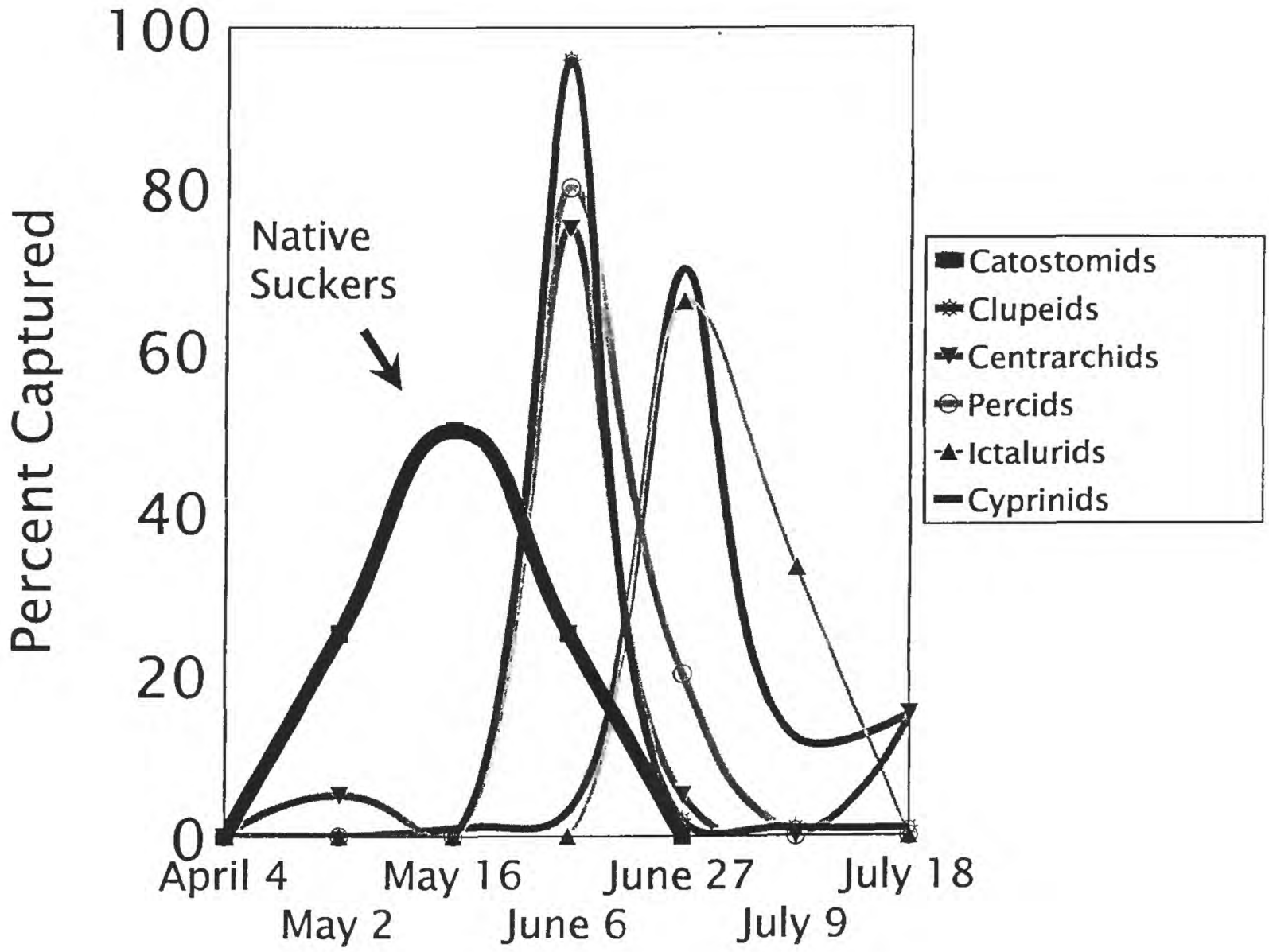


Figure 18. Percentages of larval fish (families) captured in light traps set in the inflow areas of the Colorado and San Juan rivers of Lake Powell, Utah, during May through July 2000.

Red shiner, striped bass, and common carp were the most prevalent species captured in the Colorado River inflow. Striped bass are difficult to shock, however, we encountered large schools of spawners which were unusually susceptible to the electrical field. Shocking in the San Juan inflow netted primarily bluegill, common carp, and red shiner. Smallmouth bass, green sunfish, and common carp were the most common species shocked at Spencer's Camp. Here, water visibility exceeded 5 m and stunned fish were more effectively netted. Shocking conditions at the inflows and Spencer's Camp were different enough that catch rates are not comparable. Only two native species, razorback sucker (N=2 adults) and a flannelmouth sucker

(N=1) were captured by shocking. In spite of its limitations, electrofishing was the only active sampling method available for use in flooded tamarisk flats.

Minnow Traps Minnow traps were effective in capturing small fish found along shorelines, especially in rocks or flooded vegetation. The trap's small entrance (<6 cm) limited catch to small fish. The species most commonly taken at the Colorado inflow were small channel catfish, red shiner, and common carp. Bluegill, green sunfish, and bullheads were collected from the San Juan inflow. Spencer's Camp produced green sunfish, bluegill, and smallmouth bass. One small *Gila spp.* was collected in the Colorado River inflow. Average trip CPUE ranged from 0.5 to 20.7 fish/set.

Crab traps Collapsible crab traps were added to the sampling regime the last year. They were smaller overall than minnow traps but had larger entrances (10 cm). Overall catch was poor, restricted to channel catfish, green sunfish, and a smallmouth bass. Average trip CPUE ranged from 0.0 to 0.5 fish/set.

Trammel Nets Small- and large-meshed trammel nets were the most effective passive method of collecting fish. Trammel nets were used instead of gill nets to minimize fish mortality. Trammel nets were effective in capturing common carp, threadfin shad, channel catfish, striped bass, and bullhead (Table 6). Except for striped bass, most of the fish were found in fairly good shape and released. The majority of striped bass died, especially in the summer months. Warm water temperatures and extremely high turbidity during storm events proved stressful to entangled fish.

The majority of native fish were captured by trammel net: 10 of the 12 razorback suckers and 36 (86%) of the flannelmouth suckers. Nets proved extremely effective in eddies, backwaters, and the control area. The use of 1.2-cm and 3.7-cm meshed nets adequately sampled fish >10 cm. Smaller mesh nets commonly entangled 90- to 100 mm threadfin shad. Average trip CPUE ranged from 9.0 to 145.3 fish/100 m^2 of net.

Hoop Nets Hoop nets were less effective in the clearer waters at Spencer's Camp but captured more fish under turbid conditions or when set in the current, facing downstream. Small-meshed (6-mm) hoops captured small centrarchids, ictalurids, and crayfish. Large-mesh (2.5-cm) hoops produced common carp, black bass, large crappie or bluegill, and occasionally walleye. When nets were set in shallow channels (1 m depths /10 to 50 cm/sec) facing downstream they often captured 12 or more large carp, channel catfish, and walleye. Average trip CPUE for both small- and large-meshed hoop nets ranged from 0.0 to 27.1 fish/set.

Seining Seining was the most effective method of capturing large numbers of small fish. Red shiners and channel catfish were the most prevalent species captured in the Colorado River inflow. One Colorado pikeminnow was also captured. Seining at the San Juan inflow produced red shiner, threadfin shad, and bluegills. Here, we captured one Colorado pikeminnow large enough to PIT tag.

Table 7. Listing of sample effort and ranked sample composition of the sampling techniques used at the Colorado River inflow (Hite), San Juan inflow, and Spencer's Camp (control).

		-------1999------	-------2000-----	Species Selectivity		
Location	Sample Type	# Efforts	# Efforts	1st	2nd	3rd
Hite						
	Small trammels	7	14	CARP	TFS	YBH
	Large trammels	12	17	CARP	CC	STB
	Small hoops	29	5	CC	BC	GSF
	Large hoops	0	4	CC	CP	
	Minnow traps	15	9	CC	RSH	CARP
	Crab traps	0	1	CC		
	Seining	10	14	RSH	CC	CPM
	Electrofishing	3	13	RSH	STB	CARP
San Juan Inflow						
	Small trammels	30	33	CARP	TFS	CC
	Large trammels	34	24	CARP	CC	STB
	Small hoops	45	21	BC	BG	GSF
	Large hoops	27	18	CARP	CC	BC
	Minnow traps	27	26	BG	GSF	BH
	Crab traps	0	8	SMB		
	Seining	86	53	RSH	TFS	BG
	Electrofishing	15	15	BG	CARP	RSH
Spencer's Camp						
	Small trammel	32	30	CARP	GSF	BG
	Large trammels	39	30	CARP	CC	STB
	Small hoops	44	25	BG	GSF	LMB
	Large hoops	15	23	BG	CC	WP
	Minnow traps	38	18	GSF	BG	SMB
	Crap traps	0	8	GSF		
	Electrofishing	15	15	SMB	GSF	CARP

BG=bluegill, GSF=green sunfish, BC=black crappie, WP=walleye, LMB=largemouth bass, SMB=smallmouth bass, RSH=red shiner, CC=channel catfish, YBH=yellow bullhead, TFS=threadfin shad.

Seining was most effective in the backs of coves or canyon inlets where tamarisk was absent; banks were not steep; depths were shallow; and substrates were firm. We had to search to find these conditions. Seining along mud flats as reported by Muth and Wick (1996, 1997) was difficult. Lower Cataract Canyon commonly had steep muddy banks that were temporary due to

repeated sequences of sedimentation and head-cutting. Steep, muddy slopes combined with "bottomless" mud flats made seining challenging, if not actually unsafe. Those seining sank to their waists in mud and had to either swim-crawl to shore or be physically rescued. Under the best conditions, the seine often plugged or filled with mud and samples were lost. Seining was difficult, but remained the most effective method for collecting minnow-sized fish. Average trip CPUE for seining ranged from 1.1 to 43.6 fish/10 m^2 of seined area.

Tagged Fish Recovery

Only one Colorado pikeminnow and two razorback suckers were PIT-tagged (Table 8). Other fish were too small (N=2), died (N=1), or had been previously tagged (11). We suspect that all razorback sucker captured were originally stocked. The two suckers without tags could be wild, however, their uniform size and condition suggested similar origins. In similar PIT tagging studies in the lower basin we've encountered failure >5%.

The distance razorbacks traveled from their point of release varied considerably. For example, one sucker had been stocked and recaptured at Piute Farms, and another, stocked in the upper Green River (RM-319) had traveled 562 km downstream to Sheep Canyon. That particular fish (7F7D16594F) had a severe *learnea* infestation which probably led to its death.

Table 8. PIT tagging data for razorback sucker and Colorado pikeminnow

Species	--Location--	Date	Length	Weight	Tag	PIT tag #	Status	Origin. Released
Chub?	Hite RM 190.0	4/14/99	59	–	NNA		Released	---
CRPM	Hite RM 199.3	4/14/99	32	–	NNA		Released	---
CRPM	PF RM 52.0	6/15/99	166	32	N	7F7A136847	Released	---
CRPM	PF RM 54.8	7/13/99	170	30	NNA		Mort, UDWR	---
RZB	PF RM 54.8	7/13/99	489	1495	N	5220551C28	Released	---
RZB	PF RM 53.5	8/17/99	467	1075	Y	7F7B1B5402	Released	SJ-RM 158, NM 5/98
RZB	PF RM 53.5	10/7/99	459	1048	Y	7F7B12155F	Released	SJ-RM 158, NM 5/98
RZB	PF RM 53.0	10/5/99	490	1320	Y	7F7B18014B	Released	SJ-RM 158, NM 5/98
RZB	PF RM 53.5	10/5/99	532	1590	Y	1F75115803	Released	Piute Farms 8/95
RZB	SC RM 176.6	5/16/00	459	1032	Y	7F7D16594F	Mort,	GR-RM 319, Vernal, UT
RZB	PF RM 52.0	6/6/00	492	1294	Y	1F41482038	Released	SJ-RM 158, NM 11/94
RZB	PF RM 52.0	6/6/00	472	1202	Y	1F6B2B7356*	Released	Piute Farms 8/95
RZB	PF RM 52.0	6/6/00	485	982	Y	7F7B11352B	Released	SJ-RM 158, NM 4/98
RZB	MC RM 49.0	6/7/00	505	1392	Y	1F732D724F	Released	SJ-RM 136, NM 11/94
RZB	PF RM 53.5	6/28/00	495	1390	N	1F4E594773	Released	---
RZB	PF RM 53.0	6/27/00	505	1466	Y	1F412A2D49	Released	SJ-RM 117, UT 11/94
RZB	PF RM 51.8	7/18/00	522	1540	Y	1F43686353	Released	SJ-RM 79, UT 10/94

* at the time of its recapture on 6/6/00 the PIT tag # was incorrectly recorded (IF6B2D9356)
PF=Piute Farms, SC=Sheep Canyon, MC=Mike's Canyon

One (1F75115803) had been stocked at Piute Farms in August 1995 and three (7F7B12155F-7F7B18014B-7F7B11352B) had been reared in golf course ponds in Page, Arizona and released in the San Juan River at Hogback Diversion, New Mexico (RM 158.6) (Quent Bradwisch and Dale Ryden personal communique). Razorback sucker 1F43686353 moved between Lake Powell and the San Juan River. The fish has an interesting history. It was surgically implanted with a radio transmitter by FWS and stocked 27 October 1994 at RM 79.6 (this river mile system starts at Piute Farms [RM-0] going upstream) near Bluff, Utah. It was captured by trammel net at Copper Canyon on 17 March 1995 and transported and released back at Bluff, Utah. It was recaptured and released again by FWS on 15 May 1995 at RM-72.1. The fish again moved downstream where it was recaptured at Piute Farms (RM-0) on 17 July 2000. On both occasions it was captured in the inflow area. First it traveled 143 km downstream and next, it moved 127 km downstream from its release site.

Fish Health

Fish appeared healthy, however, sometimes external injuries and mortality appeared higher than normal. During the spring dead flannelmouth suckers and channel catfish were observed at Piute Farms and (>25%) of captured fish had severe bacterial or fungal infections and/or lesions. These afflictions appeared to reflect spawning activities since they generally disappeared by fall.

Dead striped bass were commonly observed at Piute Farms, especially during the summer. Body condition of striped bass was a problematic: fish were small and robust fish or larger and emaciated. Striper boils were first observed in July and later became common during dawn and dusk. Fish angled from these boils were in excellent condition while larger fish captured fish in our nets were emaciated. We cannot explain these observations.

Fin leeches were common on largemouth bass and catfish, and there were a few minor infestations of anchor worm. All the razorback suckers captured were infested with anchor worms *(Learnea cyprinacea)*; most having severe infestations. When captured the infested areas would typically hemorrhage, indicating fish were stressed by this parasite. Creef and Clarkson (1993) suggested a direct correlation between infestation and netting mortality and attributed severe *Learnea* infestations.

New Documented Species

Two fish species not previously recorded for Lake Powell were collected in the Piute Farms area. Both appear to be unintentional stockings. Several large white crappie *(Pomoxis annularis)* were noticed and two were preserved and verified (Wayne Gustaveson [UDWR] personal communique). This is the first documented capture in Lake Powell, however, the species was reported in Reece Creek in 1936 during the Rainbow Bridge-Monument Valley Expedition (Sigler and Miller 1963). According to Sigler and Miller the creek was located on the northern slope of Navajo Mountain, however, we could not locate it on topographic maps.

More alarming was the first documented collection of a (35-cm) gizzard shad (*Dorosoma cepedianum*) in the San Juan River inflow area on June 6, 2000. The fish was taken in a trammel net from a small, shallow-turbid backwater adjacent to the river. The species is found in Rio Grande and Pecos valleys in New Mexico (Koster 1957) and was reported over 30 years ago on the "west slope" of Colorado (Minckley 1973). Bait bucket introduction is possible but unlikely due to the fragile nature of the fish. The probable source is Morgan Lake, located near Farmington, New Mexico, where gizzard shad were accidently stocked by FWS. According to Jim Brooks (FWS) gizzard shad and other unwanted species have been found in contaminated stocking shipments within the Colorado River basin.

Gizzard shad thrives in reservoirs and large rivers and inhabits both clear and turbid waters. It grows to a size (45 cm) large enough to discourage most predators and can out-compete threadfin shad, small fish, and other planktivors (Garvey and Stein 1998). If this species has been or becomes established in Lake Powell, it would be expected to expand rapidly through the Grand Canyon and entire lower basin. Once there, its expansion to southern California, central Arizona, and Mexico is likely by passage through major water diversions. This species could have significant effect on recreational and native species.

DISCUSSION

From our experience, the reservoir/river interface zone of the Colorado and San Juan rivers represented one of the most dynamic and productive aquatic ecosystems. The interface zones were in constant transition as they moved up and down the tributary arms, cycling through a process of flood plain inundation and drainage, delta building, and sediment head-cutting. Elevation of Lake Powell fluctuated a modest 5.3 m at near full pool causing the San Juan interface zone to move upstream and downstream about 15 km. During previous studies in the late 1980s and early 1990s, the reservoir was at 1130 m, or 27 m below full pool. This exposed nearly 100 km of deltaic sediment that experienced head-cutting. (Vernieu 1997).

Reservoir flooding at full pool is most prevalent at the broad San Juan River flood plain near Piute Farms. In 1999, the reservoir flooded over 1,000 ha at this location. Delta building and vegetative encroachment will eventually isolate much of this area from the reservoir. The

movement of the Colorado River interface was more subtle. The confining walls of Narrow Canyon restricted lateral flooding upstream of the highway bridge (RM-171) but depths increased. Waters remained turbid downstream to Hite Marina where they dropped below the reservoir's surface. The two most obvious differences between 1999 and 2000 were changes in volume (depth) and current strength.

The fish community found in the interface zone was different from the historic fishery. Species composition was more representative of the Mississippi River drainage; with 63% of the 23 species captured originated from this drainage. Stocked recreational species such as threadfish shad, largemouth bass, walleye, sunfish, and catfish occur throughout most of the basin and support productive and economically important recreational fisheries. In contrast, fishes endemic to the Colorado River basin are either rare or extinct.

Flood plains that once provided endemic species critical spawning and nursery habitats have been physically and biologically altered: to reservoirs, levee construction, and to competitors and predators (Marsh and Brooks 1989, Minckley et al. 1991, Ruppert et al. 1993, USFWS 1998, Tyus and Saunders 2000). In our study, nonnatives numerically (99.4%) dominated the flood-plain habitats of Lake Powell and apparently such dominance occurs for the entire watershed.

Recreational Fishery

The Colorado and San Juan river interface zones support one of the most productive recreational fisheries in the western United States (Blommer and Gustaveson 1997, Gustaveson 1999). Inflow areas provide valuable spawning and nursery habitat to both predator (striped bass, walleye, crappie, black bass) and prey species (threadfin shad, common carp, red shiner). Seasonal reservoir and river fluctuations trigger a cycle of habitat inundation and drainage critical to the maintenance of productive nursery habitat. Lateral flooding provides fish additional habitat, terrestrial food items, vegetative cover, and nutrient inputs. Drainage compacts substrates necessary for spawning, maintains vegetative cover, and allows aeration of sediments.

Maximum pelagic fish densities, believed to be primarily threadfin shad and game fish, reached 190,538 and 71,485 fish/ha at or near the inflow area in 1999 and 2000. Higher fish densities in 1999 corresponded to higher reservoir elevations (1,126-1,123 m) and flooded habitat. Fish densities in 1999 exceeded 100,000 fish/ha from the river/reservoir interface (RM-50) some 10 km downstream (RM-44). These densities are similar to those from downstream areas in 1995, 1996, and 1997 (Mueller and Horn 1999). These nurseries also support black crappie, striped bass, walleye, largemouth bass, catfish, and several sunfish species.

River-borne turbidity and flooded vegetation may offer limited refugia where prey can more effectively evade predators and maintain core populations. These habitats may be critical in the recovery of threadfin shad and other species during boom and bust cycles (Gustavenson 1999).

Seasonal fluctuations appear necessary to maintain healthy nursery areas, however, rapid declines, especially during spring filling (June and July), would negatively impact successful reproduction of threadfin shad, crappie, smallmouth and largemouth bass, and other sunfish species (Baker and Paulson 1980). Likewise, major draw-downs during the summer could strand young fish or cause them to retreat from protected habitats making them more vulnerable to predators. Vernieu (1997) suggested major draw-downs would resuspend deltaic sediments which could increase nutrient and heavy metal concentrations.

Status of Native Fish in Lake Powell

Razorback Sucker In the late 1980s, about two dozen adult razorback sucker were captured near the inflows of both the Colorado and San Juan rivers in Lake Powell. The fish were collected as brood stock for the upper basin recovery program. The origin or age of these fish was unknown (Frank Pfeifer [FWS] personal communique). These fish may have either: (1) migrated downstream from upstream populations, (2) inhabited the river when Lake Powell was filled in 1964 (36 years is within their estimated life span), or (3) entered the newly inundated reservoir at a young life stage and survived as did thousands of razorbacks in Lake Mohave (Minckley et al. 1991).

Thirteen adult razorback sucker and two larvae were encountered during this study. Eleven adults were PIT tagged, indicating they were stocked. The two unmarked fish were similar in size and appearance to the marked fish and didn't have any of the characteristics (blindness, scars) common to old fish. We suspect they were hatchery fish that had lost or had malfunctioning PIT tags.

Stocking programs appear to be responsible for the continued presence of razorback sucker in Lake Powell. Extensive surveys in the San Juan Arm during 1995 and 1996 encountered only one razorback sucker, an individual that was part of a FWS telemetry study (Mueller and Wydoski 1995, UDWR unpublished data) (Dale Ryden personal communique). Several thousand suckers had been stocked since 1995 (Ryden 1997), and at least five migrated downstream to Lake Powell.

To our knowledge, no reports of wild juvenile razorback sucker in Lake Powell have been taken. The absence of juveniles from the tens of thousands of fish collected from the Colorado and San Juan rivers during the last 2 decades indicates reservoir recruitment is not occurring detectable or measurable levels. Larval suckers drifting downstream into the reservoir (Muth and Wick 1997, Valdez and Cowdell 1994a and 1994b) are not surviving beyond the larval life stage (Minckley et al. 1991, Muth et al. 1998, USFWS 1998). Predation appears to be the best explanation for their disappearance (Marsh and Minckley 1989). Emergence prior to the appearance of other species undoubtedly puts them at a disadvantage (Garvey and Stein 1998). As mature spawners die and are not replaced, the upstream source of wild-born suckers will disappear. Stocking programs can replace spawners but unfortunately, it will take nearly a decade before females

become fully mature (Minckley 1983).

Colorado Pikeminnow Unlike the razorback sucker, the Colorado pikeminnow populations in the upper portions of the Green, Yampa, and Colorado rivers appear stable, and recruitment is occurring (Osmundson and Burnham 1996). All life stages have been found in Lake Powell. Some wild juveniles (YOY) were surviving well into their first year (50-100 mm) in the Colorado River immediately upstream of the reservoir (Valdez and Cowdell 1994a and 1994b, Muth and Wick 1996 and 1997). However, sub-adults appear extremely rare. An angler reported capturing a pikeminnow at Bullfrog in 1999 (confirmed), in the Dirty Devil (unconfirmed), and near the Hite bridge (reliable report). Unfortunately, the origin of these fish cannot be traced or confirmed. These fish may have drifted downstream as older life stages or entered the reservoir at earlier life stages and survived. While we can reject recruitment, the rarity of these fish suggests if recruitment is occurring, it's low.

Flannelmouth Sucker Flannelmouth suckers were captured at all three study sites. Twenty six were captured at the San Juan River inflow and 15 in the Colorado River arm. The species has never been common in the reservoir (Wayne Gustaveson [UDWR] personal communique) even though abundant upstream. Seining hauls in May 1999 captured hundreds (data lost) of small sucker fry that apparently drifted downstream into the reservoir. These fish disappeared from sampling by July. Adults were sporadically collected but we didn't encounter any year class I or II fish. Native sucker larvae and fry (flannelmouth) are entering the reservoir only to be eaten by nonnatives. Ryden (2000) reported that flannelmouth sucker were also disappearing from the lower (80 km) reach of the San Juan River while numbers of striped bass and walleye increased. This sharp decline suggests the species is not only at risk in the reservoir, but possibly in major portions of the lower San Juan River.

Is Flood Plain Restoration Opening Pandora's Box?

There is ample literature describing the importance of reservoir and riverine flooding in the reproduction cycle of many fish species (Ploskey 1983, Baker and Killgore 1994, Miranda and DeVries 1996, Kubisiak 1997). Unfortunately, little attention has been directed at the competitive nature of introduced and endemic species in these habitats.

The loss of flood plain habitat is not unique to the Colorado River basin and is a chronic problem nation-wide. Managers in the Missouri and Mississippi river basins are similarly attempting to reclaim historical flood plain habitat (Hess and Sheets 1993). Many of the 40 nonnative species that colonized the Colorado River evolved in the Mississippi drainage where flooding was equally important (Guillory 1979, Ross and Baker 1983, Kwak 1988, Baker and Killgore 1994, Kubisiak 1997). Flooding provides spawning substrates, nursery habitats, and vegetative cover that are typically limited in most rivers (Raibley et al. 1997). Backwaters protected from heavy siltation or scour in the Mississippi drainage, are havens for largemouth bass, sunfish, gizzard shad, and other lacustrine species (Pflieger 1971). These habitats typically supported 50% higher

fish densities compared to areas more susceptible to river hydraulics (Kubisiak 1997). This explains their successful colonization of the regulated Colorado River. These recreational species provide much of the economic base that supports fisheries management within the basin and unfortunately for the natives, little evidence exists to suggest their numbers could be, or would be controlled.

Speculation on the importance of flood plain nursery habitat to native fishes (Valdez and Wick 1983, Wydoski and Wick 1998) prompted this study. Water development and storage in the basin has reduced the duration and magnitude of spring flooding. While this impacts riverine flooding, it triggers a relatively rapid and prolonged flooding within the reservoirs. For example, historical maximum flood and drought flow (volume) ratios for the Colorado River were approximately 75:1 and flooding typically occurred for 2 to 6 weeks. In contrast, in our study over 30,000,000 m^3 of habitat was inundated for nearly 2 months, or normally twice the volume (130:1) of historic extremes. Over 1,000 ha of flood plain was flooded at Piute Farms in 1999. This magnitude and duration of flooding presented us an opportunity to examine predator-prey interactions in flood plain habitat.

What occurred was notable. Fish quickly (hours) invaded the freshly inundated flood plain. Common carp, red shiners, threadfin shad, striped bass, walleye and sunfish entered at rates that exceeded relative abundance measurements taken elsewhere in the reservoir. The disproportionate amount of flooded tributary habitat provided ample spawning habitat for threadfin shad, red shiner, and common carp. Following spawning, pelagic fish densities (primarily shad) reached >190,000 fish/ha and shoreline densities measured >220,000 fish/ha in the interface zone. This production provides the necessary prey base for the recreational fishery and a predator barrier for early life stages of native fishes entering the reservoir.

It's a common assumption that large predators are responsible for the disappearance of razorback sucker. However, the evidence points toward small predators. For example, razorback sucker young are being lost at early life stages. Being the earliest spawners in the system places their offspring at greater peril. Larvae were commonly collected in the early 1990s but fry >3 cm simply haven't been found (Minckley et al. 1991, USFWS 1998). Prey size is often proportionate to predator size (Popova 1967) and larger predators eat larger fish. Small predators could more effectively use shallow habitats and cover. Red shiner which reach high densities and have voracious appetites have been reported as an effective predator (Ruppert et al. 1993, Muth and Wick 1997).

Dense schools of red shiner, threadfin shad, and other young fishes were common along shore in early spring. Density measurements were similar to those of fathead minnows (*Pimephales promelas*) in prairie wetlands (Duffy 1998). Duffy (1998) found fathead minnow could consume prey biomass at 332 to 1,104 kg/ha per year, and at this consumption rates, minnows could effectively compete with ducklings for aquatic invertebrates. Similarly, inflow densities of 20 red shiner/m^2 could pose a formidable gauntlet for larval fish.

What Was, No Longer Is

Valdez (1991) was one of the first researchers to coin "Black Hole" to represent native fish survival in Lake Powell. Based on results of this and earlier studies we agree.

The Colorado and San Juan river inflow sites provide adequate physical habitat to support native fish (Minckley et al. 1991, Marsh 2000, *In Press*). However, the biological component, or specifically the predator community, continues to limit or restrict native fish recruitment.

Unlike the historical river, the river is regulated and the basin is "kinder, gentler, and wetter." Water development has altered the natural hydrograph, affecting the natural mechanisms which insured successful recruitment (i.e., flooding) and controlled predator communities (i.e., droughts). Floods have been tamed while the river basin is literally drowning in storage capacity that exceeds five times annual flow. Droughts have been eliminated by water deliveries and minimum flow requirements. Today, the Colorado River more closely resembles the Upper Mississippi River where the majority of non-natives evolved. Those predators now dominate the river system (Tyus 2000).

Dill (1944) eloquently described the problem nearly 60 years ago. His account of the factors which led to the demise of bonytail, Colorado pikeminnow, and razorback sucker in the lower Colorado River is just as appropriate for the upper basin. He explained:

"*Extremely low water would raise the river temperature and strand fish. Such processes have, of course, been going on for many years in the unstable Colorado, and it seems probable that the native fish populations have undergone alternate periods of rise and fall. But each period of destruction was followed by a period during which the population could rehabilitate itself. Before the dams were built the native fishes were at the mercy of an adverse physical environment, but the deleterious effect of predaceous exotic fishes must have been slight. That is, the population of the latter fishes was small before the creation of Boulder Dam, and floods and droughts must have worked just as severe an hardship–and probably more–on them. Because of the unfavorable water conditions around the early thirties it seems possible that the population of native fishes sank to one of its low points, and the coincidental advent of clear water following Boulder Dam brought about a heavy production of bass and other alien fishes which preyed upon the already reduced natives. Competition as well as direct predation may have played a large part in this supposed destruction.*"

The inflow communities we studied had densities similar to those reported for flood events in the river (Modde 1997, Burdick et al. 1997). In fact, Trammel and Chart (1999) recently reported that red shiner, sand shiner, and fathead minnow densities in

Green River backwaters (N=56) averaged >300,000 fish/ha which exceeded average densities we observed.

If backwater habitats are critical for razorback sucker recruitment as believed)Valdez and Wick 1983, Wydoski and Wick 1998), it's doubtful that recovery is biologically, economically or politically possible in the Colorado River mainstem (Minckley and Deacon 1991, Tyus 2000). Interpretation of razorback sucker information suggests natural recruitment may occur only through the *total* removal of nonnative fishes, which conflicts with recreational fishery goals (Minckley et al. 1991, Pacey and Marsh 1998, Marsh 2000, Mueller and Burke *in press*). Without total removal, efforts to restore razorback sucker, may be a waste of time, funding, and labor.

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APPENDIX A

Photographs

Color

8

APPENDIX B

Summarized Fishery Length and Weight Data

Lake Powell Inflow Study

		1999			2000		
		Length-mm	Weight-g	"K"	Length-mm	Weight-g	"K"
BKBullhead							
Piute	Minimum	50	10	1.01	84	258	1.09
	Maximum	310	465	1.74	302	332	2.08
	Mean	2165	181	1.35	237	295	1.48
	N	45	36	36	5	4	4
BCrappie							
Hite	Minimum	41			71	3	0.84
	Maximum	279			326	562	1.88
	Mean	113			228	236	1.6
	N	7			42	40	40
Piute	Minimum	23	2	0.58	36	6	0.68
	Maximum	352	580	3.57	353	762	4.63
	Mean	119	110	1.42	132	265	1.58
	N	142	71	71	152	61	61
Spencer	Minimum	99	10	1.03	76	115	1.25
	Maximum	355	620	1.72	362	775	1.63
	Mean	264	358	1.49	282	413	1.42
	N	21	11	11	13	12	12
Bluegill							
Hite	Minimum	36			31	4	0.66
	Maximum	58			310	366	2.76
	Mean	47			150	157	2.06
	N	2			77	55	55
Piute	Minimum	23	2	0.67	30	1	0.76
	Maximum	235	260	4.52	220	250	5.92
	Mean	73	39	1.86	76	53	1.71
	N	344	89	89	317	107	107
Spencer	Minimum	19	1	0.5	30	17	0.6
	Maximum	341	440	5.72	240	387	3.7
	Mean	111	122	1.9	131	177	2.17
	N	332	136	136	175	93	93
CCatfish							
Hite	Minimum	54			53	2	0.23
	Maximum	665			571	2083	2.86
	Mean	263			319	366	0.91
	N	64			160	154	154
Piute	Minimum	32	2	0.46	41	4	0.36
	Maximum	560	1920	2.05	540	1340	1.59
	Mean	319	319	0.79	286	326	0.77
	N	292	251	251	176	158	158
Spence	Minimum	61	5	0.47	40	6	0.54
	Maximum	630	2460	2.01	540	1772	1.14
	Mean	354	390	0.77	345	418	0.8
	N	185	145	145	135	126	126
Carp							
Hite	Minimum	20			239	153	0.52
	Maximum	504			624	3440	1.77
	Mean	383			429	1042	1.31
	N	105			578	164	164

		1999			2000		
		Length-mm	Weight-g	"K"	Length-mm	Weight-g	"K"
Carp (cont)							
Piute	Minimum	21	1	0.53	21	6	0.14
	Maximum	590	2520	5.49	770	3216	5.06
	Mean	373	891	1.31	409	920	1.23
	N	820	290	290	1017	387	387
Spencer	Minimum	187	640	0.98	70	35	0.71
	Maximum	610	2060	1.9	570	2044	2.7
	Mean	436	1001	1.19	412	973	1.22
	N	338	165	165	410	294	294
FMSucker							
Hite	Minimum				321	380	0.81
	Maximum				451	940	1.32
	Mean				374	570	10.8
	N				6	6	6
Piute	Minimum	335	340	0.72	338	334	0.74
	Maximum	468	865	1.02	453	804	0.92
	Mean	422	671	0.88	400	576	0.86
	N	21	20	20	5	5	5
Spencer	Minimum	423	690	0.77	451	816	0.89
	Maximum	490	1090	1.08	483	1048	0.97
	Mean	459	894	0.92	462	918	0.93
	N	5	5	5	4	4	4
Gizzard Shad							
Piute	Minimum				350	470	1.1
	Maximum				350	470	1.1
	Mean				350	470	1.1
	N				1	1	1
GSunfish							
Hite	Minimum	49			32	2	1.04
	Maximum	123			241	318	2.58
	Mean	81			101	111	1.86
	N	5			59	28	28
Piute	Minimum	21	5	0.46	38	2	0.46
	Maximum	224	38	2.72	238	292	2.77
	Mean	65	14	1.65	93	71	1.82
	N	99	14	14	127	59	59
Spencer	Minimum	27	2	0.61	22	3	0.38
	Maximum	249	345	4	238	327	2.66
	Mean	80	32	1.53	84	111	1.8
	N	345	161	161	412	75	75
LMBass							
Hite	Minimum				131	25	1.11
	Maximum				432	1202	1.82
	Mean				328	564	1.42
	N				33	33	33

Lake Powell Inflow Study

		1999			2000		
		Length-mm	Weight-g	"K"	Length-mm	Weight-g	"K"
LMBass							
Piute	Minimum	33	4	0.75	28	4	0.15
	Maximum	510	2280	2.27	771	1680	1.56
	Mean	179	274	1.32	251	390	1.11
	N	120	80	80	31	27	27
Spencer	Minimum	51	6	0.85	39	12	0.27
	Maximum	475	1430	1.58	520	2000	1.74
	Mean	280	458	1.24	223	363	1.24
	N	81	48	48	77	56	56
CRPikeminnow							
Hite	Minimum	32					
	Maximum	32					
	Mean	32					
	N	1					
Piute	Minimum	170	30	0.61			
	Maximum	170	30	0.61			
	Mean	170	30	0			
	N	1	1	1			
NPike							
Hite	Minimum				490	730	0.45
	Maximum				633	1258	0.62
	Mean				573	1044	0.55
	N				3	3	3
RZBSucker							
Hite	Minimum				459	1032	1.07
	Maximum				459	1032	1.07
	Mean				459	1032	1.07
	N				1	1	1
Piute	Minimum	459	1048	1.06	472	982	0.86
	Maximum	532	1590	1.28	522	1540	1.15
	Mean	487	1305	1.12	497	1324	10.8
	N	5	5	5	7	7	7
SMBass							
Hite	Minimum				92	12	1.01
	Maximum				365	655	2.4
	Mean				254	283	1.37
	N				66	62	62
Piute	Minimum	40	5	0.84	92	8	0.46
	Maximum	293	310	2.37	349	403	1.35
	Mean	100	51	1.48	242	197	1.1
	N	54	32	32	26	26	26
Spencer	Minimum	42	2	0.58	22	10	0.44
	Maximum	390	623	3.32	384	628	2.78
	Mean	201	173	1.25	184	157	1.29
	N	205	157	157	225	174	174

Lake Powell Inflow Study

		1999			2000		
		Length-mm	Weight-g	"K"	Length-mm	Weight-g	"K"
STBass							
Hite	Minimum	356			150	14	0.1
	Maximum	620			561	1440	1.18
	Mean	499			459	897	0.91
	N	48			193	155	155
Piute	Minimum	375	370	0.51	18	429	0.42
	Maximum	660	1840	1.05	655	2650	1.14
	Mean	481	917	0.82	401	1022	0.85
	N	66	60	60	57	44	44
Spencer	Minimum	279	406	0.42	43	11	0.67
	Maximum	644	2120	1.11	635	2124	1.59
	Mean	453	857	0.85	344	863	0.9
	N	126	98	98	58	44	44
TFShad							
Hite	Minimum	94			85	8	0.52
	Maximum	100			174	50	1.32
	Mean	97			122	24	0.85
	N	5			10	7	7
Piute	Minimum	7	2	0.55	12	2	0.28
	Maximum	147	30	2.2	166	50	1.38
	Mean	61	8	1.06	96	11	0.88
	N	330	87	87	297	108	108
Spencer	Minimum	26	2	0.22	33	9	0.68
	Maximum	154	40	6.1	170	43	1.6
	Mean	88	10	1	65	19	1.13
	N	180	118	118	99	18	18
WCrappie							
Piute	Minimum	105	14	1.21			
	Maximum	295	446	1.94			
	Mean	222	233	1.62			
	N	5	5	5			
Walleye							
Hite	Minimum	366			273	156	0.12
	Maximum	565			630	1080	1.72
	Mean	460			443	691	0.8
	N	29			48	48	48
Piute	Minimum	394	600	0.74	52	667	0.56
	Maximum	654	2522	0.98	637	2050	1
	Mean	533	1437	0.89	496	1179	0.81
	N	11	11	11	18	17	17
Spencer	Minimum	165	35	0.76	326	287	0.46
	Maximum	660	2250	1.01	505	1060	0.97
	Mean	386	736	0.88	431	657	0.79
	N	14	12	12	13	13	13
YBullhead							
Hite	Minimum	258			132	26	1.13
	Maximum	370			320	540	2
	Mean	302			283	347	1.48
	N	7			54	54	54

		1999			2000		
		Length-mm	Weight-g	"K"	Length-mm	Weight-g	"K"
YBullhead							
Piute	Minimum	89	8	0.71	63	4	0.64
	Maximum	320	585	1.91	303	415	2.91
	Mean	245	264	1.48	164	134	1.4
	N	51	40	40	30	27	27
Spencer	Minimum	67	4	0.84	244	195	1.28
	Maximum	300	330	1.35	304	464	1.65
	Mean	212	185	1.2	280	322	1.43
	N	12	9	9	7	7	7
Gila spp.							
Hite	Minimum	59					
	Maximum	59					
	Mean	59					
	N	1					

Lake Powell Inflow Study

		1999			2000		
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	Maximum	32					
	Mean	32					
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	N	1	1	1			
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	Maximum	644	2120	1.11	635	2124	1.59
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	Maximum	100			174	50	1.32
	Mean	97			122	24	0.85
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	Maximum	147	30	2.2	166	50	1.38
	Mean	61	8	1.06	96	11	0.88
	N	330	87	87	297	108	108
Spencer	Minimum	26	2	0.22	33	9	0.68
	Maximum	154	40	6.1	170	43	1.6
	Mean	88	10	1	65	19	1.13
	N	180	118	118	99	18	18
WCrappie							
Piute	Minimum	105	14	1.21			
	Maximum	295	446	1.94			
	Mean	222	233	1.62			
	N	5	5	5			
Walleye							
Hite	Minimum	366			273	156	0.12
	Maximum	565			630	1080	1.72
	Mean	460			443	691	0.8
	N	29			48	48	48
Piute	Minimum	394	600	0.74	52	667	0.56
	Maximum	654	2522	0.98	637	2050	1
	Mean	533	1437	0.89	496	1179	0.81
	N	11	11	11	18	17	17
Spencer	Minimum	165	35	0.76	326	287	0.46
	Maximum	660	2250	1.01	505	1060	0.97
	Mean	386	736	0.88	431	657	0.79
	N	14	12	12	13	13	13
YBullhead							
Hite	Minimum	258			132	26	1.13
	Maximum	370			320	540	2
	Mean	302			283	347	1.48
	N	7			54	54	54

		1999			2000		
		Length-mm	Weight-g	"K"	Length-mm	Weight-g	"K"
YBullhead							
Piute	Minimum	89	8	0.71	63	4	0.64
	Maximum	320	585	1.91	303	415	2.91
	Mean	245	264	1.48	164	134	1.4
	N	51	40	40	30	27	27
Spencer	Minimum	67	4	0.84	244	195	1.28
	Maximum	300	330	1.35	304	464	1.65
	Mean	212	185	1.2	280	322	1.43
	N	12	9	9	7	7	7
Gila spp.							
Hite	Minimum	59					
	Maximum	59					
	Mean	59					
	N	1					

APPENDIX C

Summarized CPUE Data

Key:

Methods:

Electro = electrofishing
MT = minnow traps
SH = small (6 mm mesh) hoop nets
LH = large (25 mm mesh) hoop nets
ST = small (12 mm mesh, 2 X 25 m) trammel nets
LT = large (37 mm mesh, 2 X 50 m) trammel nets

Species:

FMS	Flannelmouth sucker	*Catostomus latipinnis*
RZB	Razorback sucker	*Xyrauchen texanus*
SMB	Smallmouth bass	*Micropterus dolomieui*
LMB	Largemouth bass	*Micropterus salmoides*
BG	Bluegill	*Lepomis macrochirus*
GSF	Green sunfish	*Lepomis cyanellus*
BC	Black crappie	*Pomoxis nigromaculatus*
WC	White crappie	*Pomoxis annularis*
CARP	Common carp	*Cyprinus carpio*
CPM	Colorado pikeminnow	*Ptychocheilus lucius*
RS	Red shiner	*Notripis lutrensus*
FMS	Fathead minnow	*Pimephales promelas*
SS	Sand shiner	*Notropis stramineus*
TFS	Threadfin shad	*Dorosoma petenense*
GZS	Gizzard shad	*Dorosoma cepedianum*
YBH	Yellow bullhead	*Ictalurus natalis*
BLBH	Black bullhead	*Ictalurus melas*
CCF	Channel catfish	*Ictalurus punctatus*
WALL	Walleye	*Stizostedion vitreum vitreum*
STB	Striped bass	*Morone saxatilis*
GAM	Gambusia	*Gambusia affinis*
NP	Northern pike	*Esox lucius*

Hite - May 1999

method	date	mile	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	04/13/99	182-183		3	2.4						2															1				
ELECTRO	04/14/99	184-186		44	13.2						4					2				35			2			1				
ELECTRO	04/15/99	186-189		42	14.0						10									25			7							
LT	04/14/99	182.8		23	41.3			1		9	10												2			1				
LT	04/14/99	182.8		25	44.9					6	12												6			1				
LT	04/14/99	191.8		19	34.1					9	4												4			2				
LT	04/14/99	196.6		5	9.0																		4			1				
LT	04/15/99	182.8		25	44.9					4	12												4			3	2			
LT	04/15/99	182.8		48	86.1			1		3	24												12			8				
LT	04/15/99	191.8		8	14.4					2	1												1			2	2			
LT	04/15/99	196.6		4	7.2						1												2			1				
LT	04/16/99	182.8		15	26.9					3	10												2							
LT	04/16/99	184.8		3	5.4					2																	1			
LT	04/16/99	184.8		5	9.0					1	3												1							
LT	04/16/99	185		5	9.0																		1			3	1			
MT	04/14/99	182.8																												
MT	04/14/99	186.3																												
MT	04/14/99	190		1	1.0					1																				
MT	04/14/99	191.5																												
MT	04/14/99	192.5																												
MT	04/14/99	193.7		2	2.0					2																				
MT	04/14/99	194.2																												
MT	04/14/99	194.2																												
MT	04/14/99	195.4																												
MT	04/14/99	195.4		1	1.0						1																			
MT	04/14/99	195.4		2	2.0											1													1	
MT	04/15/99	182.8																												
MT	04/15/99	182.8		1	1.0				1																					
MT	04/15/99	191.1																												
MT	04/16/99	183.5																												
SEINE	04/14/99	199		9	0.4															9										
SEINE	04/14/99	199		7	0.1															7										
SEINE	04/14/99	199		6	0.1															6										
SEINE	04/14/99	199		4	0.1															4										
SEINE	04/14/99	199		14	0.2															14										
SEINE	04/14/99	199.3		117	2.1															117										
SEINE	04/14/99	199.3		6	0.1															6										
SEINE	04/14/99	199.3		437	6.8														1	436										
SH	04/14/99	194		2	2.0					2																				
SH	04/14/99	194		2	2.0					2																				
SH	04/14/99	194.1		2	2.0					2																				
SH	04/14/99	194.1		4	4.0					4																				
SH	04/14/99	194.1																												
SH	04/14/99	194.5																												
SH	04/14/99	194.5		2	2.0					2																				
SH	04/14/99	194.5		4	4.0					4																				
SH	04/14/99	194.8																												

method	date	mile	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
SH	04/14/99	194.8																												
SH	04/14/99	195.5																												
SH	04/14/99	195.5																												
SH	04/15/99	182.8		3	3.0				1							2														
SH	04/15/99	185		1	1.0					1																				
SH	04/15/99	186.4																												
SH	04/15/99	186.5		3	3.0					3																				
SH	04/15/99	189.2		1	1.0					1																				
SH	04/15/99	190.1																												
SH	04/15/99	190.1																												
SH	04/15/99	194.8		1	1.0						1																			
SH	04/15/99	195.5																												
SH	04/16/99	182.8		2	2.0			2																						
SH	04/16/99	182.8		2	2.0			2																						
SH	04/16/99	184																												
SH	04/16/99	184																												
SH	04/16/99	184.4																												
SH	04/16/99	184.5																												
SH	04/16/99	185																												
SH	05/16/99	184.9																												
ST	04/14/99	182.8		1	5.4						1																			
ST	04/15/99	182.8																												
ST	04/15/99	182.8		3	16.1			1			2																			
ST	04/15/99	182.8		7	37.7						2													3		1	1			
ST	04/15/99	183.5		7	37.7					1	2															4				
ST	04/16/99	182.8		6	32.3						4													2						
ST	04/16/99	183.6		1	5.4						1																			

Hite - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	89	3						16					2				60			9			2				
SEINE	600	22														1	599										
SH	29	29			4	1	21	1					2														
MT	7	15				1	3	1					1													1	
LT	185	12			2		39	77												39			22	6			
ST	25	7			1		1	12													5		5	1			
Total	935	88			7	2	64	107					5			1	659			48	5		29	7		1	
Percent					0.7	0.2	6.8	11.4					0.5			0.1	70.5			5.1	0.5		3.1	0.7		0.1	

Hite - CPUE and Species Composition by Collection Technique

method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO		9.9						18.0					2.2				67.4			10.1			2.2				
SEINE		1.2														0.2	99.8										
SH		1.0			13.8	3.4	72.4	3.4					6.9														
MT		0.5				14.3	42.9	14.3					14.3													14.3	
LT		9.0			1.1		21.1	41.6												21.1			11.9	3.2			
ST		19.2			4.0		4.0	48.0													20.0		20.0	4.0			

San Juan - May 1999

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	05/10/1999	Piute	N	101	33.4			1	26	2	31					15	5			2		1	2	16						
LT	05/11/1999	Piute	N	112	200.9			2	1	35	70		2										2							
LT	05/11/1999	Piute	N	7	12.6					3	1						2										1			
LT	05/11/1999	Piute	D																											
LT	05/11/1999	Piute	D	2	3.6			1									1													
LT	05/11/1999	Piute	N	19	34.1				3	2	4		1			2	3						2				2			
LT	05/12/1999	Piute	N	7	12.6				2	1	1						1						1				1			
LT	05/12/1999	Piute	D	2	3.6												2													
LT	05/12/1999	Piute	D	7	12.6			2	5																					
MT	05/11/1999	Piute	N	4	4.0				4																					
MT	05/11/1999	Piute	N																											
MT	05/11/1999	Piute	N	4	4.0				2							2														
MT	05/12/1999	Piute	N																											
MT	05/12/1999	Piute	N	3	3.0											3														
MT	05/12/1999	Piute	N																											
MT	05/12/1999	Piute	N																											
MT	05/13/1999	Piute	N	10	10.0				10																					
MT	05/13/1999	Piute	N	2	2.0											2														
SEINE	05/12/1999	Piute	D	33	0.1				28							5														
SEINE	05/12/1999	Piute	D	18	0.3				11																					7
SEINE	05/12/1999	Piute	D																											
SEINE	05/12/1999	Piute	D	10	0.2																			9						1
SEINE	05/12/1999	Piute	D	160	1.1															159										1
SEINE	05/12/1999	Piute	D																											
SEINE	05/12/1999	Piute	D																											
SEINE	05/12/1999	Piute	D																											
SEINE	05/12/1999	Piute	D																											
SEINE	05/12/1999	Piute	D																											
SEINE	05/12/1999	Piute	D																											
SH	05/11/1999	Piute	N	3	3.0				2																		1			
SH	05/11/1999	Piute	N																											
SH	05/11/1999	Piute	N																											
SH	05/12/1999	Piute	N																											
SH	05/12/1999	Piute	N	1	1.0												1													
SH	05/12/1999	Piute	N	2	2.0											2														
SH	05/13/1999	Piute	N	4	4.0				4																					
SH	05/13/1999	Piute	N	4	4.0				4																					
SH	05/13/1999	Piute	N																											
ST	05/11/1999	Piute	N	14	75.3						8		2				1							3						
ST	05/12/1999	Piute	D	3	16.1				2		1																			
ELECTRO	05/11/1999	Spencer	N	124	41.6			4	20	6	34					16	13					27	2	1		1				
LT	05/11/1999	Spencer	N	122	218.9			1	4	28	59		2										26			2				
LT	05/11/1999	Spencer	N	26	46.6			1	6	7							3					3	5			1			
LT	05/11/1999	Spencer	D	7	12.6				4	1							2													

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
LT	05/12/1999	Spencer	N	9	16.1			1		4	2											1					1			
LT	05/12/1999	Spencer	N	12	21.5			1	3	2	2		1				1						2							
LT	05/12/1999	Spencer	D	1	1.8												1													
LT	05/13/1999	Spencer	N	1	1.8					1																				
LT	05/13/1999	Spencer	N	8	14.4			1		1	2						3						1							
LT	05/13/1999	Spencer	N	2	3.6					1													1							
MT	05/11/1999	Spencer	N	3	3.0				3																					
MT	05/11/1999	Spencer	N																											
MT	05/12/1999	Spencer	N	1	1.0				1																					
MT	05/12/1999	Spencer	N	3	3.0				2							1														
MT	05/13/1999	Spencer	N																											
MT	05/13/1999	Spencer	N	1	1.0																			1						
MT	05/13/1999	Spencer	N	3	3.0				2	1																				
SH	05/11/1999	Spencer	N	6	6.0				5							1														
SH	05/11/1999	Spencer	N	1	1.0				1																					
SH	05/12/1999	Spencer	N	1	1.0				1																					
SH	05/12/1999	Spencer	N	4	4.0				4																					
SH	05/12/1999	Spencer	N	4	4.0				4																					
SH	05/13/1999	Spencer	N	6	6.0				6																					
SH	05/13/1999	Spencer	N	2	2.0				2																					
SH	05/13/1999	Spencer	N																											
SH	05/13/1999	Spencer	N	3	3.0											3														
ST	05/11/1999	Spencer	N	8	43.1				4	1	2						1													
ST	05/12/1999	Spencer	N	3	16.1				1							2														
ST	05/13/1999	Spencer	N	2	10.8			1																1						

Piute - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	101	3			1	26	2	31					15	5			2		1	2	16						
SH	14	9				10							2	1										1			
MT	23	9				16							7														
SEINE	221	11				39							5				159				9						9
LT	156	8			5	11	41	76		3			2	9						5				4			
ST	17	2				2		9		2				1							3						
Total	532	42			6	104	43	116		5			31	16			161		1	7	28			5			9
Percent					1.1	19.5	8.1	21.8		0.9			5.8	3.0			30.3		0.2	1.3	5.3			0.9			1.7

Piute - CPUE and Species Composition by Collection Technique

method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRD		33.4			1.0	25.7	2.0	30.7					14.9	5.0			2.0		1.0	2.0	15.8						
SH		1.8				71.4							14.3	7.1										7.1			
MT		2.8				69.6							30.4														
SEINE		0.2				17.6							2.3				71.9				4.1						4.1
LT		35.0			3.2	7.1	26.3	48.7		1.9			1.3	5.8						3.2				2.6			
ST		45.7				11.8		52.9		11.8				5.9							17.6						

Spencer - Summary of Total Effort and Species Captured																											
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	124	3			4	20	6	34					16	13					27	2	1		1				
	SH	27	9				23							4														
	MT	11	7				8	1						1								1						
	LT	188	9			5	17	45	65		3				10					4	35			3	1			
	ST	13	3			1	5	1	2					2	1							1						
	Total	363	31			10	73	53	101		3			23	24					31	37	3		4	1			
	Percent					2.8	20.1	14.6	27.8		0.8			6.3	6.6					8.5	10.2	0.6		1.1	0.3			

Spencer - CPUE and Species Composition by Collection Technique																											
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		41.6			3.2	18.1	4.8	27.4					12.9	10.5					21.8	1.6	0.8		0.8				
	SH		3.0				85.2							14.8														
	MT		1.6				72.7	9.1						9.1								9.1						
	LT		37.5			2.7	9.0	23.9	34.6		1.6				5.3					2.1	18.6			1.6	0.5			
	ST		23.3			7.7	38.5	7.7	15.4					15.4	7.7							7.7						

San Juan - June 1999

method	date	day/night	time	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	06/14/1999	Piute	N	30	37.5			1	20	1						5				3										
ELECTRO	06/14/1999	Piute	N	18	30.6				12		2									4										
ELECTRO	06/14/1999	Piute	N	43	45.7			6	8	1	9					1	2			15				1						
LH	06/15/1999	Piute	N	22	22.0	1		1		1	15						1									2	1			
LH	06/15/1999	Piute	D	19	19.0				1		18																			
LH	06/16/1999	Piute	N	13	13.0					4	9																			
LH	06/17/1999	Piute	N	21	21.0				1	7	13																			
LT	06/15/1999	Piute	N	39	70.0			1	1	9	27												1							
LT	06/15/1999	Piute	N	64	114.8			2		11	36		1										4				10			
LT	06/16/1999	Piute	N	58	104.1			1	1	10	36		4										3			2	1			
LT	06/16/1999	Piute	N	85	152.5				1	28	40		1				1					1	3			2	8			
MT	06/15/1999	Piute	N																											
MT	06/15/1999	Piute	N																											
MT	06/16/1999	Piute	N	2	2.0			1	1																					
MT	06/16/1999	Piute	N	2	2.0	2																								
MT	06/17/1999	Piute	N	2	2.0				1																		1			
MT	06/17/1999	Piute	N	3	3.0	3																								
SEINE	06/15/1999	Piute	D	6	0.1											1				5										
SEINE	06/15/1999	Piute	D	8	0.1				2											5								1		
SEINE	06/15/1999	Piute	D	34	0.5			1	8										1	21						1		2		
SEINE	06/15/1999	Piute	D	5	0.1				1															4						
SEINE	06/15/1999	Piute	D	6	0.1				2											4										
SEINE	06/15/1999	Piute	D	1	0.0															1										
SEINE	06/15/1999	Piute	D	9	0.1				5											3						1				
SEINE	06/15/1999	Piute	D	7	0.1				3							1				3										
SEINE	06/15/1999	Piute	D	10	0.1				6							3				1										
SEINE	06/15/1999	Piute	D	13	0.2				12							1														
SEINE	06/15/1999	Piute	D																											
SEINE	06/15/1999	Piute	D	3	0.1				1											2										
SEINE	06/15/1999	Piute	D	4	0.1				3											1										
SEINE	06/15/1999	Piute	D	3	0.0				2																					1
SEINE	06/15/1999	Piute	D	7	0.1				4											3										
SEINE	06/15/1999	Piute	D	90	1.4				1								1							88						
SEINE	06/15/1999	Piute	D	4	0.0			1	1															2						
SEINE	06/15/1999	Piute	D	19	0.4				17								1							1						
SEINE	06/15/1999	Piute	D	1	0.0															1										
SEINE	06/15/1999	Piute	D	38	0.5				3															34				1		
SEINE	06/15/1999	Piute	D	18	0.4				3								1							14						
SEINE	06/15/1999	Piute	D																											
SEINE	06/15/1999	Piute	D	10	0.1				3															7						
SEINE	06/15/1999	Piute	D																											
SEINE	06/15/1999	Piute	D	715	7.6				1								2			11				700		1				
SEINE	06/15/1999	Piute	D	24	0.3																			24						
SEINE	06/15/1999	Piute	D	93	1.2																			93						
SEINE	06/15/1999	Piute	D	875	5.6						1													874						
SEINE	06/15/1999	Piute	D	294	3.6												1			5				288						
SEINE	06/15/1999	Piute	D	249	3.2				1								1			2				245						
SEINE	06/15/1999	Piute	D	203	4.3															4				199						
SEINE	06/15/1999	Piute	D	318	2.0															11				307						
SEINE	06/15/1999	Piute	D	3	0.1				1											1								1		

method	date	day/night	time	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
SEINE	06/15/1999	Piute	D																											
SEINE	06/15/1999	Piute	D																											
SEINE	06/15/1999	Piute	D	1	0.0															1										
SH	06/15/1999	Piute	N	4	4.0	3			1																					
SH	06/15/1999	Piute	N	1	1.0			1																						
SH	06/15/1999	Piute	N	1	1.0											1														
SH	06/15/1999	Piute	D																											
SH	06/15/1999	Piute	D	2	2.0			1	1																					
SH	06/15/1999	Piute	D	1	1.0				1																					
SH	06/16/1999	Piute	N																											
SH	06/16/1999	Piute	N	2	2.0	1		1																						
SH	06/16/1999	Piute	N																											
SH	06/17/1999	Piute	N	6	6.0			3		2						1														
SH	06/17/1999	Piute	N																											
SH	06/17/1999	Piute	N	1	1.0	1																								
ST	06/15/1999	Piute	N	18	96.9					4	8		3							1				1			1			
ST	06/15/1999	Piute	N	17	91.5	3				2	6												3				1			
ST	06/16/1999	Piute	N	10	53.8	1					8									1										
ST	06/16/1999	Piute	N	37	199.1	3		14		4	8									2				6						
ELECTRO	06/15/1999	Spencer	N	35	34.8				1		2					18	7					6				1				
ELECTRO	06/15/1999	Spencer	N	25	25.1				4		2					2	1					13	1			2				
ELECTRO	06/15/1999	Spencer	N	32	32.0				9	1	3					3	5					11								
LH	06/15/1999	Spencer	N																											
LH	06/16/1999	Spencer	N																											
LH	06/17/1999	Spencer	N																											
LT	06/15/1999	Spencer	N	38	68.2				2	24	7											2	2			1				
LT	06/15/1999	Spencer	D	11	19.7				1	6	2						1						1							
LT	06/16/1999	Spencer	N	9	16.1					3	4												2							
LT	06/16/1999	Spencer	D	8	14.4				1	2	4															1				
LT	06/17/1999	Spencer	N	18	32.3					6	6												6							
MT	06/15/1999	Spencer	N	2	2.0											2														
MT	06/15/1999	Spencer	N	7	7.0											7														
MT	06/16/1999	Spencer	N	4	4.0				1							3														
MT	06/16/1999	Spencer	N	17	17.0				10							7														
MT	06/17/1999	Spencer	N	17	17.0				4							13														
MT	06/17/1999	Spencer	N	12	12.0				8							4														
SH	06/15/1999	Spencer	N	13	13.0											13														
SH	06/15/1999	Spencer	N	3	3.0				1							2														
SH	06/16/1999	Spencer	N	4	4.0				3													1								
SH	06/16/1999	Spencer	N	4	4.0				1							3														
SH	06/17/1999	Spencer	N	9	9.0				7							2														
ST	06/15/1999	Spencer	N	38	204.5				1	4	11					2	2					5	13							
ST	06/15/1999	Spencer	D	3	16.1						3																			
ST	06/15/1999	Spencer	N	17	91.5				2	1	2					12														
ST	06/15/1999	Spencer	D	2	10.8				1							1														
ST	06/15/1999	Spencer	N	10	53.8						2					6								1		1				
ST	06/15/1999	Spencer	D	1	5.4				1																					
ST	06/16/1999	Spencer	N	17	91.5				2	1	9											1	3				1			
ST	06/16/1999	Spencer	D	3	16.1				1		1											1								
ST	06/16/1999	Spencer	N	10	53.8						3					6	1													
ST	06/16/1999	Spencer	D	1	5.4				1																					
ST	06/16/1999	Spencer	N	3	16.1				2		1																			

method	date	day/night	time	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ST	06/16/1999	Spencer	D	3	16.1						3																			
ST	06/17/1999	Spencer	N	22	116.4				1	4	6					1							9				1			
ST	06/17/1999	Spencer	N	7	37.7						1					5											1			
ST	06/17/1999	Spencer	N	8	43.1				1		3					2	1							1						

Piute - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	91	3			7	40	2	11					6	2			22				1						
LH	75	4	1		1	2	12	55						1									2	1			
SH	18	12	5		6	3	2						2														
MT	9	6	5		1	2																		1			
SEINE	3071	36			2	80		1					6	7		1	85				2880		3		5		1
LT	246	4			4	3	58	139		6				1					1	11			4	19			
ST	82	4	7		14		10	32		3							4			3	7			2			
Total	3592	69	18		35	130	84	238		9			14	11		1	111		1	14	2888		9	23	5		1
Percent			0.5		1.0	3.6	2.3	6.6		0.3			0.4	0.3		0.0	3.1		0.0	0.4	80.4		0.3	0.6	0.1		0.0

Piute - CPUE and Species Composition by Collection Technique

method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO		37.9			0.1	0.4		0.1					6.6	2.2			24.2				1.1						
LH		18.8	1.3		1.3	2.7	16.0	73.3						1.3									2.7	1.3			
SH		1.5	27.8		33.3	16.7	11.1						11.1														
MT		1.5	55.6		11.1	22.2																		11.1			
SEINE		0.9			0.1	2.6							0.2	0.2		0.0	2.8				93.8		0.1		0.2		
LT		110.3			1.6	1.2	23.6	56.5		2.4				0.4					0.4	4.5			1.6	7.7			
ST		110.3	8.5		17.1		12.2	39.0		3.7							4.9			3.7	8.5			2.4			

Spencer - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	92	3				14	1	7					23	13					30	1			3				
LH		3																									
SH	33	5				12							20						1								
MT	59	6				23							36														
LT	84	5				4	41	23						1					2	11			2				
ST	145	15				13	10	45					35	4					7	25	2		1	3			
Total	413	37				66	52	75					114	18					40	37	2		6	3			
Percent						16.0	12.6	18.2					27.6	4.4					9.7	9.0	0.5		1.5	0.7			

Spencer - CPUE and Species Composition by Collection Technique

method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO		30.7				15.2	1.1	7.6					25.0	14.1					32.6	1.1			3.3				
LH																											
SH		6.6				36.4							60.6						3.0								
MT		9.8				39.0							61.0														
LT		30.1				4.8	48.8	27.4						1.2					2.4	13.1			2.4				
ST		52.0				9.0	6.9	31.0					24.1	2.8					4.8	17.2	1.4		0.7	2.1			

San Juan - July 1999

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	07/12/1999	Piute	N	16	15.9			1			8									4		2	1							
ELECTRO	07/12/1999	Piute	N	10	10.5						3									7										
ELECTRO	07/12/1999	Piute	N	4	4.0						3									1										
LH	07/13/1999	Piute	D	15	15.0					12	3																			
LH	07/13/1999	Piute	N	1	1.0					1																				
LH	07/13/1999	Piute	D																											
LH	07/13/1999	Piute	N	26	26.0					19	4		3																	
LH	07/14/1999	Piute	N																											
LH	07/14/1999	Piute	D																											
LH	07/14/1999	Piute	N	11	11.0					7	4																			
LH	07/14/1999	Piute	D	3	3.0					3																				
LH	07/14/1999	Piute	N	18	16.0					15	3																			
LH	07/14/1999	Piute	D	14	14.0					14																				
LH	07/15/1999	Piute	N																											
LH	07/15/1999	Piute	N	3	3.0					2			1																	
LH	07/15/1999	Piute	N	5	5.0					3	2																			
LT	07/13/1999	Piute	N	34	61.0			1		15	17												1							
LT	07/13/1999	Piute	D	14	25.1					3	9		1								1									
LT	07/13/1999	Piute	N	51	91.5	1				8	40												2							
LT	07/14/1999	Piute	N	22	39.5				1	4	17																			
LT	07/14/1999	Piute	N	18	32.3			1			16		1																	
MT	07/13/1999	Piute	N	17	17.0						16						1													
MT	07/13/1999	Piute	D	4	4.0						3						1													
MT	07/14/1999	Piute	N	18	16.0						18																			
MT	07/14/1999	Piute	D	4	4.0						4																			
MT	07/15/1999	Piute	N	6	6.0						6																			
SEINE	07/14/1999	Piute	D	1	0.0															1										
SEINE	07/14/1999	Piute	D	5	0.1															1			4							1
SEINE	07/14/1999	Piute	D	23	0.2																		23							3
SEINE	07/14/1999	Piute	D	4	0.1				1														3							3
SEINE	07/14/1999	Piute	D	6	0.0																		6							1
SEINE	07/14/1999	Piute	D	4	0.1												2						2							1
SEINE	07/14/1999	Piute	D	1	0.0																		1							
SEINE	07/14/1999	Piute	D	7	0.1												1						6							4
SEINE	07/14/1999	Piute	D	6	0.1											1	3			1			1							2
SEINE	07/14/1999	Piute	D	1	0.0												1													
SEINE	07/14/1999	Piute	D	2	0.1																		2							
SEINE	07/14/1999	Piute	D	9	0.2												1						8							
SEINE	07/14/1999	Piute	D	7	0.1												1			2			4							5
SEINE	07/14/1999	Piute	D	15	0.2												1			8			6							4
SEINE	07/14/1999	Piute	D	19	0.3												1			7			11							
SEINE	07/14/1999	Piute	D	49	0.5												1			11			37							
SH	07/13/1999	Piute	D																											
SH	07/13/1999	Piute	N	1	1.0					1																				
SH	07/13/1999	Piute	N	4	4.0					1	3																			

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
SH	07/13/1999	Piute	D																											
SH	07/14/1999	Piute	N																											
SH	07/14/1999	Piute	D																											
SH	07/14/1999	Piute	N	1	1.0																						1			
SH	07/14/1999	Piute	D	1	1.0	1																								
SH	07/15/1999	Piute	N	1	1.0						1																			
SH	07/15/1999	Piute	N	9	9.0	1				2	5																1			
ST	07/13/1999	Piute	D	17	91.5			1			14		1				1													
ST	07/13/1999	Piute	N	9	48.4						8															1				
ST	07/13/1999	Piute	D																											
ST	07/13/1999	Piute	D																											
ST	07/13/1999	Piute	N	11	59.2					1	10																			
ST	07/13/1999	Piute	D	7	37.7					1	5								1											
ST	07/14/1999	Piute	N	1	5.4						1																			
ST	07/14/1999	Piute	N	1	5.4						1																			
ST	07/14/1999	Piute	N	6	32.3					1	5																			
ELECTRO	07/13/1999	Spencer	N	39	38.7				6		4					7						19		3						
ELECTRO	07/13/1999	Spencer	N	104	104.0			1	7		3					8	2					15		68						
ELECTRO	07/13/1999	Spencer	N	183	182.4				5		2					10						6		160						1
LH	07/15/1999	Spencer	N	1	1.0																					1				
LT	07/13/1999	Spencer	N	31	55.6				2	5	9					1							13				1			
LT	07/13/1999	Spencer	N	24	43.1				3	9	9						1					2								
LT	07/14/1999	Spencer	N	28	50.2				3	5	11						2					6	1							
LT	07/14/1999	Spencer	N	18	32.3				3		6					2	2					3	1			1				
LT	07/15/1999	Spencer	N	15	28.9				1	3	10												1							
LT	07/15/1999	Spencer	N	14	25.1				4		6											3	1							
MT	07/13/1999	Spencer	N	2	2.0											1						1								
MT	07/13/1999	Spencer	N	3	3.0											2						1								
MT	07/13/1999	Spencer	N	8	8.0				4							3	1													
MT	07/14/1999	Spencer	N																											
MT	07/14/1999	Spencer	N	6	6.0											5						1								
MT	07/14/1999	Spencer	N	3	3.0				1							2														
MT	07/15/1999	Spencer	N																											
MT	07/15/1999	Spencer	N	4	4.0											1						3								
MT	07/15/1999	Spencer	N	7	7.0				1							6														
SH	07/13/1999	Spencer	N	4	4.0				2							2														
SH	07/13/1999	Spencer	N																											
SH	07/14/1999	Spencer	N	2	2.0												2													
SH	07/14/1999	Spencer	N	50	50.0				47	1						1	1													
SH	07/14/1999	Spencer	N	5	5.0											5														
SH	07/15/1999	Spencer	N	5	5.0				4							1														
SH	07/15/1999	Spencer	N	2	2.0											2														
SH	07/15/1999	Spencer	N	13	13.0				10							1	2													
SH	07/15/1999	Spencer	N																											
ST	07/14/1999	Spencer	N	8	43.1						6					1								1						
ST	07/14/1999	Spencer	N	2	10.8				1								1													

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ST	07/15/1999	Spencer	N	8	43.1						2					6														
ST	07/15/1999	Spencer	N	3	16.1				2		1																			

Piute - Summary of Total Effort and Species Captured

	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	30	3			1			14									12		2	1							
	LH	96	13					76	16		4																	
	SH	17	10	2				4	9																2			
	MT	49	5						47						2													
	SEINE	183	16				1							1	12			31				114						24
	LT	139	5	1		2	1	30	99		2								1		3							
	ST	52	10			1		3	44		1				1		1							1				
	Total	566	62	3		4	2	113	229		7			1	15		1	43	1	2	4	114		1	2			24
	Percent			0.5		0.7	0.4	20.0	40.5		1.2			0.2	2.7		0.2	7.6	0.2	0.4	0.7	20.1		0.2	0.4			4.2

Piute - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		10.1						0.5									0.4		0.1								
	LH		7.4					79.2	16.7		4.2																	
	SH		1.7	11.8				23.5	52.9																11.8			
	MT		9.8						95.9						4.1													
	SEINE		0.1				0.5							0.5	6.6			16.9				62.3						13.1
	LT		49.9	0.7		1.4	0.7	21.6	71.2		1.4								0.7		2.2							
	ST		31.1			1.9		5.8	84.6		1.9				1.9		1.9							1.9				

Spencer - Summary of Total Effort and Species Captured

	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	327	3			1	18		9					25	2					40		231						1
	LH	1	1																					1				
	SH	81	9				63	1						12	5													
	MT	33	9				6							20	1					6								
	LT	130	6				16	22	51					3	5					14	17			1	1			
	ST	21	4				3		9					7	1							1						
	Total	593	32			1	106	23	69					67	14					60	17	232		2	1			1
	Percent					0.2	17.9	3.9	11.6					11.3	2.4					10.1	2.9	39.1		0.3	0.2			0.2

Spencer - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		108.3			0.3	5.5		2.8					7.6	0.6					12.2		70.6						0.3
	LH		1.0																					100.0				
	SH		9.0				77.8	1.2						14.8	6.2													
	MT		3.7				18.2							60.6	3.0					18.2								
	LT		36.9				12.3	16.9	39.2					2.3	3.8					10.8	13.1			0.8	0.8			
	ST		28.3				14.3		42.9					33.3	4.6							4.8						

San Juan - August 1999

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	08/17/1999	Piute	N	230	230.0			5	5		9					6						20		184		1				
ELECTRO	08/17/1999	Piute	N	31	34.2			1	2	2	13											4		9						
ELECTRO	08/17/1999	Piute	N	101	101.6			2	1	2	16					4				1		9		66						
LH	08/18/1999	Piute	N																											
LH	08/18/1999	Piute	N																											
LT	08/17/1999	Piute	N	44	78.9					11	28						1						2				2			
LT	08/17/1999	Piute	N	35	62.8	1		1		12	13						1				1		6							
LT	08/18/1999	Piute	N	28	50.2		2	2	1		13						1						8			1				
LT	08/18/1999	Piute	N	19	34.1		1				13											1	4							
LT	08/18/1999	Piute	N	22	39.5		1			2	17											1					1			
LT + ST	08/17/1999	Piute	N	27	48.4					4	21																2			
MT	08/18/1999	Piute	N	3	3.0						3																			
MT	08/18/1999	Piute	N	5	5.0						2					3														
MT	08/18/1999	Piute	N	1	1.0						1																			
MT	08/18/1999	Piute	N	2	2.0	1										1														
SEINE	08/18/1999	Piute	D	3	0.1				3																					
SEINE	08/18/1999	Piute	D	7	0.1				3		2					2														
SEINE	08/18/1999	Piute	D	5	0.1																	5								
SEINE	08/18/1999	Piute	D																											
SEINE	08/18/1999	Piute	D	555	9.3																			555						
SEINE	08/18/1999	Piute	D																											
SEINE	08/18/1999	Piute	D	2	0.0																	2								
SEINE	08/18/1999	Piute	D	1	0.0				1																					
SEINE	08/18/1999	Piute	D																											
SEINE	08/18/1999	Piute	D	2	0.0												1					1								
SEINE	08/18/1999	Piute	D	5	0.1																	2		3						
SEINE	08/18/1999	Piute	D	5	0.1				4													1								
SEINE	08/18/1999	Piute	D	4	0.1				1													3								
SH	08/17/1999	Piute	N																											
SH	08/17/1999	Piute	N	11	11.0	2		8								1														
SH	08/18/1999	Piute	N	5	5.0						5																			
SH	08/18/1999	Piute	N	8	8.0			4								3						1								
SH	08/18/1999	Piute	N	6	6.0			4	2																					
SH	08/18/1999	Piute	N	10	10.0			7	2							1														
SH	08/18/1999	Piute	N																											
ST	08/17/1999	Piute	N	8	43.1					1	5																2			
ST	08/17/1999	Piute	N	7	37.7					1	5															1				
ST	08/18/1999	Piute	N																											
ST	08/18/1999	Piute	N																											
ELECTRO	08/18/1999	Spencer	N	19	19.0						6						2					2		9						
ELECTRO	08/18/1999	Spencer	N	180	180.0				3													7		170						
ELECTRO	08/18/1999	Spencer	N	39	39.0				4	1	6						2					11		15						
LH	08/17/1999	Spencer	D																											
LH	08/17/1999	Spencer	D																											
LH	08/18/1999	Spencer	D	1	1.0					1																				
LH	08/18/1999	Spencer	D																											

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
LH	08/18/1999	Spencer	N																											
LH	08/18/1999	Spencer	N																											
LH	08/19/1999	Spencer	N																											
LH	08/19/1999	Spencer	N																											
LT	08/17/1999	Spencer	N	26	46.6				2	7	5											4	7				1			
LT	08/17/1999	Spencer	N	25	44.9				6	4	11						1						2				1			
LT	08/17/1999	Spencer	D	6	10.8				1		3											2								
LT	08/17/1999	Spencer	D	2	3.6						1		1																	
LT	08/18/1999	Spencer	D	12	21.5				3	4	3												2							
LT	08/18/1999	Spencer	D	3	5.4				2	1																				
LT	08/18/1999	Spencer	N	10	17.9				1	3	4						1						1							
LT	08/18/1999	Spencer	N	8	14.4					3	4												1							
LT	08/19/1999	Spencer	N	9	16.1					3	1					1						1	3							
LT	08/19/1999	Spencer	N	15	26.9					5	7		1										1				1			
MT	08/17/1999	Spencer	N	1	1.0				1																					
MT	08/17/1999	Spencer	N																											
MT	08/17/1999	Spencer	D																											
MT	08/17/1999	Spencer	D																											
MT	08/18/1999	Spencer	D																											
MT	08/18/1999	Spencer	D	1	1.0																	1								
MT	08/18/1999	Spencer	N	5	5.0				3							2														
MT	08/18/1999	Spencer	N																											
MT	08/19/1999	Spencer	N	4	4.0				3							1														
MT	08/19/1999	Spencer	N	2	2.0											2														
SH	08/17/1999	Spencer	N																											
SH	08/17/1999	Spencer	N																											
SH	08/17/1999	Spencer	N	3	3.0				1							2														
SH	08/17/1999	Spencer	N	2	2.0																	2								
SH	08/17/1999	Spencer	D																											
SH	08/17/1999	Spencer	D																											
SH	08/17/1999	Spencer	D	1	1.0																	1								
SH	08/18/1999	Spencer	D																											
SH	08/18/1999	Spencer	D																											
SH	08/18/1999	Spencer	N	1	1.0																	1								
SH	08/18/1999	Spencer	N																											
SH	08/18/1999	Spencer	N																											
SH	08/19/1999	Spencer	N																											
SH	08/19/1999	Spencer	N																											
SH	08/19/1999	Spencer	N	5	5.0				3							1	1													
ST	08/17/1999	Spencer	N	4	21.5					3												1								
ST	08/17/1999	Spencer	N	14	75.3				1	2	3					3	3					1				1				
ST	08/17/1999	Spencer	D																											
ST	08/17/1999	Spencer	D	5	26.9				2													3								
ST	08/18/1999	Spencer	D	4	21.5				2	1						1														
ST	08/18/1999	Spencer	D	6	32.3				1		5																			
ST	08/18/1999	Spencer	N	1	5.4						1																			
ST	08/18/1999	Spencer	N	5	26.9				1							3						1								

method	dete	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ST	08/19/1999	Spencer	N	7	37.7					3	1					3														
ST	08/19/1999	Spencer	N	3	16.1												2							1						

Piute - Summary of Total Effort and Species Captured

	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	362	3			8	8	4	38					10				1		33		259		1				
	LH		2																									
	SH	40	7	2		23	4		5					5						1								
	MT	11	4	1					6					4														
	SEINE	589	13				12		2					2	1					14		558						
	LT	175	6	1	4	3	1	29	105						3				1	2	20			1	5			
	ST	15	4					2	10															1	2			
	Total	1192	39	4	4	34	25	35	166					21	4			1	1	50	20	817		3	7			
	Percent			0.3	0.3	2.9	2.1	2.9	13.9					1.8	0.3			0.1	0.1	4.2	1.7	68.5		0.3	0.6			

Piute - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		121.9			2.2	2.2	1.1	10.5					2.6				0.3		9.1		71.5		0.3				
	LH																											
	SH		20.2	5.0		57.5	10.0		12.5					12.5						2.5								
	MT		2.8	9.1					54.5					36.4														
	SEINE		0.8				2.0		0.3					0.3	0.2					2.4		94.7						
	LT		53.1	0.6	2.3	1.7	0.6	16.6	60.0						1.7				0.6	1.1	11.4			0.6	2.9			
	ST		20.2					13.3	68.7															6.7	13.3			

Spencer - Summary of Total Effort and Species Captured

	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	238	3				7	1	12						4					20		194						
	LH	1	8					1																				
	SH	12	15				4							3	1					4								
	MT	13	10				7							5						1								
	LT	116	10				15	30	39		2			1	2					7	17				3			
	ST	49	10				7	9	10					10	5					6		1		1				
	Total	429	56				40	41	61		2			19	12					38	17	195		1	3			
	Percent						9.3	9.6	14.2		0.5			4.4	2.6					8.9	4.0	45.5		0.2	0.7			

Spencer - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PKMN	PIKE	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		79.3				2.9	0.4	5.0						1.7					8.4		81.5						
	LH		0.1					100.0																				
	SH		0.8				33.3							25.0	8.3					33.3								
	MT		1.3				53.8							38.5						7.7								
	LT		20.8				12.9	25.9	33.6		1.7			0.9	1.7					6.0	14.7				2.6			
	ST		26.4				14.3	18.4	20.4					20.4	10.2					12.2		2.0		2.0				

San Juan - October 1999

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA
ELECTRO	10/05/99	Piute	N	158	158.0			6	76	1	7					6	28							34					
ELECTRO	10/05/99	Piute	N	244	244.0			12	42	7	2					8	20			4				149					
ELECTRO	10/05/99	Piute	N	227	227.0			4	50		2					20	28			3				117			3		
LH	10/05/99	Piute	N																										
LH	10/05/99	Piute	N	2	2.0			1	1																				
LH	10/06/99	Piute	N	4	4.0			4																					
LH	10/06/99	Piute	N	1	1.0			1																					
LT	10/05/99	Piute	N	39	70.0	4		4		11	6												11		2		1		
LT	10/05/99	Piute	N	18	32.3	1		1	1	6	6												1			1	1		
LT	10/05/99	Piute	D	1	1.8			1																					
LT	10/05/99	Piute	D	11	19.7				1	2	6										2								
LT	10/06/99	Piute	N	20	35.9			1		4	12												1				2		
LT	10/06/99	Piute	N	13	23.3	1				5	4															1	2		
LT	10/06/99	Piute	D	1	1.8	1																							
LT	10/06/99	Piute	D	10	17.9			2		2	6																		
LT	10/07/99	Piute	N	11	19.7			1		2	3										1		3				1		
MT	10/06/99	Piute	N	4	4.0				4																				
MT	10/06/99	Piute	N	4	4.0				2							1	1												
MT	10/07/99	Piute	N	2	2.0			1	1																				
SH	10/05/99	Piute	N	5	5.0				5																				
SH	10/05/99	Piute	N	18	18.0			1	16							1													
SH	10/06/99	Piute	N	119	119.0			2	115							1											1		
SH	10/07/99	Piute	N	32	32.0			1	30							1													
SH	10/07/99	Piute	N	2	2.0			1	1																				
SH	10/07/99	Piute	N	9	9.0			3	5								1												
SH	10/07/99	Piute	N	5	5.0	2		1	1	1																			
ST	10/05/99	Piute	N	6	32.3				1		3						1										1		
ST	10/05/99	Piute	N	13	70.0	1		3	1	1	1						2						1	2		1			
ST	10/05/99	Piute	D	26	139.9			2	1		2						2							19					
ST	10/05/99	Piute	D	5	26.9				1		2						1								1				
ST	10/06/99	Piute	N	9	46.4						6					1	1										1		
ST	10/06/99	Piute	N	7	37.7	4		1			2																		
ST	10/06/99	Piute	D	44	236.8			1									2							41					
ST	10/06/99	Piute	D	14	75.3				1		3					2	2						1	5					
ST	10/07/99	Piute	N	5	26.9			3		1							1												
ST	10/07/99	Piute	N	13	70.0	3		1		2	1												1	5					
ELECTRO	10/04/99	Spencer	N	145	145.0				52	3						78	1					6		3			2		
ELECTRO	10/04/99	Spencer	N	147	147.0				22	1	1					80						9		34					
ELECTRO	10/04/99	Spencer	N	163	163.0				27							92	1					14		27			2		
LH	10/05/99	Spencer	N																										
LH	10/05/99	Spencer	N																										
LH	10/06/99	Spencer	N																										
LH	10/06/99	Spencer	N																										
LH	10/07/99	Spencer	N	2	2.0			1	1																				
LH	10/07/99	Spencer	N	1	1.0			1																					
LT	10/05/99	Spencer	N	25	44.9			2		4	15											1	2			1			
LT	10/05/99	Spencer	D	3	5.4				2		1																		

method	date	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA
LT	10/05/99	Spencer	N	17	30.5			1		2	4					1	3						6						
LT	10/06/99	Spencer	N	15	26.9				1	2	10					1						1							
LT	10/06/99	Spencer	D	5	9.0			1	2	2																			
LT	10/06/99	Spencer	D	3	5.4						2												1						
LT	10/07/99	Spencer	N	14	25.1			1	2	1	8											1	1						
MT	10/05/99	Spencer	N	3	3.0											1						2							
MT	10/05/99	Spencer	N	4	4.0											4													
MT	10/06/99	Spencer	N	1	1.0											1													
MT	10/06/99	Spencer	N	4	4.0											2	2												
MT	10/07/99	Spencer	N																										
MT	10/07/99	Spencer	N	2	2.0											2													
SH	10/05/99	Spencer	N																										
SH	10/05/99	Spencer	N	1	1.0				1																				
SH	10/06/99	Spencer	N																										
SH	10/06/99	Spencer	N																										
SH	10/07/99	Spencer	N	1	1.0				1																				
SH	10/07/99	Spencer	N	1	1.0																	1							
ST	10/05/99	Spencer	N	27	145.3					1						1	2							23					
ST	10/05/99	Spencer	D	1	5.4																			1					
ST	10/05/99	Spencer	N	14	75.3					2	2					1	1							8					
ST	10/05/99	Spencer	D																										
ST	10/06/99	Spencer	N	16	86.1			1	1							3								11					
ST	10/06/99	Spencer	N	9	48.4				1	2	4						1							1					
ST	10/06/99	Spencer	D																										
ST	10/06/99	Spencer	D																										
ST	10/07/99	Spencer	N	15	80.7					1						9								5					
ST	10/07/99	Spencer	N	3	16.1						1					1	1												

Piute - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA
ELECTRO	629	3			22	168	8	11					34	76			7				300			3		
LH	7	4			6	1																				
SH	190	7	2		9	173	1						3	1										1		
MT	10	3			1	7							1	1												
LT	124	9	7		10	2	32	43										3		16		2	2	7		
ST	142	10	8		11	5	4	20					3	12						3	72	1	1	2		
Total	1102	36	17		59	356	45	74					41	90			7	3		19	372	3	3	13		
Percent			1.5		5.4	32.3	4.1	6.7					3.7	8.2			0.6	0.3		1.7	33.8	0.3	0.3	1.2		

Piute - CPUE and Species Composition by Collection Technique

method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA
ELECTRO		209.7			3.5	26.7	1.3	1.7					5.4	12.1			1.1				47.7			0.5		
LH		1.8			85.7	14.3																				
SH		27.1	1.1		4.7	91.1	0.5						1.6	0.5										0.5		
MT		3.3			10.0	70.0							10.0	10.0												
LT		24.7	5.6		8.1	1.6	25.8	34.7										2.4		12.9		1.6	1.6	5.6		
ST		76.4	5.6		7.7	3.5	2.8	14.1					2.1	8.5						2.1	50.7	0.7	0.7	1.4		

Spencer - Summary of Total Effort and Species Captured																										
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA
	ELECTRO	455	3				101	4	1					250	2					29		64			4		
	LH	3	6			2	1																				
	SH	3	6				2													1							
	MT	14	6											10	2					2							
	LT	82	6			5	7	11	40					2	3					3	10			1			
	ST	85	10			1	2	6	7					15	5							49					
	Total	642	37			8	113	21	48					277	12					35	10	113		1	4		
	Percent					1.2	17.6	3.3	7.5					43.1	1.9					5.5	1.6	17.6		0.2	0.6		

Spencer - CPUE and Species Composition by Collection Technique																										
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PKMN	PIKE	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA
	ELECTRO		151.7				22.2	0.9	0.2					54.9	0.4					6.4		14.1			0.9		
	LH		0.5			66.7	33.3																				
	SH		0.5				66.7													33.3							
	MT		2.3											71.4	14.3					14.3							
	LT		21.0			6.1	8.5	13.4	48.8					2.4	3.7					3.7	12.2			1.2			
	ST		45.7			1.2	2.4	7.1	8.2					17.6	5.9							57.6					

Hite - April 2000

type	date	mile	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
CT	04/06/2000	138	Hite	N	1	1.0												1													
CT	04/04/2000	168	Hite	N																											
CT	04/04/2000	168	Hite	D																											
CT	04/05/2000	168	Hite	N																											
CT	04/05/2000	168	Hite	N																											
CT	04/06/2000	168	Hite	N																											
CT	04/05/2000	169	Hite	N																											
CT	04/04/2000	170	Hite	N	1	1.0												1													
ELECTRO	04/05/2000	137	Hite	N	17	17.0						12					4						1								
ELECTRO	04/05/2000	137	Hite	N	20	20.0				3		7					3	1					6								
ELECTRO	04/05/2000	137	Hite	N	45	45.0				3		6					9	1					26								
ELECTRO	04/04/2000	168	Hite	N	67	65.2				7	2	45					7						4				2				
ELECTRO	04/04/2000	168	Hite	N	49	49.0				1	1	39					1				1		4	1	1						
ELECTRO	04/04/2000	168	Hite	N	61	61.0				9	2	28					14	3			1		3		1						
LH	04/06/2000	137	Hite	N	3	3.0					1							1									1				
LH	04/04/2000	168	Hite	N																											
LH	04/04/2000	168	Hite	D	2	2.0			1									1													
LH	04/05/2000	168	Hite	N																											
LH	04/05/2000	168	Hite	N																											
LH	04/06/2000	168	Hite	N																											
LH	04/04/2000	170	Hite	N	1	1.0			1																						
LT	04/06/2000	137	Hite	N	14	25.1				2	3	2						1					4	1				1			
LT	04/06/2000	138	Hite	N	8	14.4			1	2								1									2	2			
LT	04/04/2000	168	Hite	N	3	5.4						1					2														
LT	04/04/2000	168	Hite	N	24	43.1			2	6	3	6						1					2	1			2	1			
LT	04/04/2000	168	Hite	N	20	35.9			5		9	3																3			
LT	04/04/2000	168	Hite	D	2	3.6												2													
LT	04/04/2000	168	Hite	D	4	7.2			1									2					1								
LT	04/04/2000	168	Hite	D	2	3.6												2													
LT	04/05/2000	168	Hite	N	18	32.3			2	2	4	6					1	1					1					1			
LT	04/05/2000	168	Hite	N	13	23.3				4	2	1						2									1	3			
LT	04/05/2000	168	Hite	N	13	23.3			2	1	6	3																1			
LT	04/05/2000	168	Hite	N	2	3.6				1	1																				
LT	04/05/2000	168	Hite	N	2	3.6												1					1								
LT	04/05/2000	168	Hite	N	3	5.4			1	2																					
LT	04/06/2000	168	Hite	N	22	39.5			1	1	6	8						1					1	2			1	1			
LT	04/06/2000	168	Hite	N	17	30.5			1	1	6	7											1				1				
LT	04/06/2000	168	Hite	N	21	37.7			3	4	1	9						1									1	2			
LT	04/05/2000	169	Hite	N	30	53.8				2	1	19												6				2			
LT	04/05/2000	169	Hite	N	15	26.9				2	2	8							1								1	1			
LT	04/04/2000	170	Hite	N	27	48.4					11	15												1							
MT	04/06/2000	138	Hite	N	4	4.0											4														
MT	04/04/2000	168	Hite	N	1	1.0											1														
MT	04/04/2000	168	Hite	D																											
MT	04/05/2000	168	Hite	N																											
MT	04/05/2000	169	Hite	N	2	2.0				1							1														
MT	04/04/2000	171	Hite	N	2	2.0				1							1														
SH	04/04/2000	168	Hite	N	2	2.0				2																					
SH	04/04/2000	168	Hite	D																											
SH	04/05/2000	168	Hite	N																											
ST	04/06/2000	137	Hite	N	4	21.5				2							2														

type	date	mile	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ST	04/04/2000	168	Hite	N	5	26.9											3	1										1			
ST	04/04/2000	168	Hite	D																											
ST	04/04/2000	168	Hite	N	3	16.1				2		1																			
ST	04/05/2000	168	Hite	N																											
ST	04/06/2000	168	Hite	N	1	5.4																	1								
ST	04/06/2000	168	Hite	N	2	10.8						1												1							
ST	04/05/2000	169	Hite	N	3	16.1						2						1													
ST	04/06/2000	137	Hite	N	20	107.6					6	8					1	1					1					3			
ST	04/04/2000	168	Hite	N	16	86.1				2	3	4					1		1				2					3			
ST	04/04/2000	168	Hite	N	9	48.4				6	1	1						1													
ST	04/04/2000	168	Hite	D	2	10.8												2													
ST	04/05/2000	168	Hite	N	5	26.9				1	2						1	1													
ST	04/05/2000	168	Hite	N	1	5.4						1																			
ST	04/06/2000	168	Hite	N	8	43.1			2	1	1												3					1			
ST	04/05/2000	169	Hite	N	14	75.3				1	2	8											1	1			1				
ST	04/04/2000	170	Hite	N	18	96.9				1	3	9					1						2	1			1				
ST	04/04/2000	170	Hite	N	8	43.1					2	3											1	1			1				
ST	04/05/2000	171	Hite	N	29	156.1				2	1	23											1	1			1				

Hite - Summary of Total Effort and Species Captured

	method	# fish	# sets	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	259	6				23	5	137					38	5			2		44	1	2		2				
	LH	6	7			2		1							2									1				
	SH	2	4				2																					
	CT	2	8												2													
	MT	9	6				2							7														
	LT	260	20			19	30	55	88					3	15	1				11	11			9	18			
	ST	148	19			2	18	21	61					9	7	1				12	5			4	8			
	Total	686	70			23	52	77	149					19	26	2				23	16			14	26			
	Percent					3.4	7.6	11.2	21.7					2.8	3.8	0.3				3.4	2.3			2.0	3.8			

Hite - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		42.9				8.9	1.9	52.9					14.7	1.9			0.8		17.0	0.4	0.8		0.8				
	LH		0.9			33.3		16.7							33.3									16.7				
	SH		0.7				100.0																					
	CT		0.3												100.0													
	MT		1.5				22.2							77.8														
	LT		23.3			7.3	11.5	21.2	33.8					1.2	5.8	0.4				4.2	4.2			3.5	6.9			
	ST		41.9			1.4	12.2	14.2	41.2					6.1	4.7	0.7				8.1	3.4			2.7	5.4			

Hite - May 2000

mathod	date	mile	location	time	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
CT	05/16/2000	177.1	Hite	N																											
CT	05/16/2000	185.4	Hite	N																											
CT	05/18/2000	177.1	Hite	N																											
CT	05/18/2000	185.4	Hite	N	1	1.0					1																				
ELECTRO	05/15/2000	184	Hite	D	7					1	1	1									2			2							
ELECTRO	05/15/2000	184	Hite	D	26				1		1	14									9						1				
ELECTRO	05/16/2000	180	Hite	D	6	6.0						1												4			1				
ELECTRO	05/16/2000	182	Hite	D	7	6.9				1	4							1			1										
ELECTRO	05/16/2000	182.8	Hite	D	76	88.3			5		3	63													4		1				
ELECTRO	05/16/2000	199	Hite	D	21	41.4					1	5												13			2				
ELECTRO	05/16/2000	199	Hite	D	19	19.0																		19							
ELECTRO	05/17/2000	194	Hite	D	2	2.0					1	1																			
ELECTRO	05/17/2000	195	Hite	D	90	123.7						1												88			1				
ELECTRO	05/17/2000	196	Hite	D	70	137.3																		69			1				
ELECTRO	05/17/2000	197	Hite	D	44	43.7					5	5												31			3				
ELECTRO	05/17/2000	198	Hite	D	63	235.3						1												62							
ELECTRO	05/17/2000	199	Hite	D	42	39.0					7	4												27	1		3				
LH	05/16/2000	186.2	Hite	N	1	1.0					1																				
LH	05/17/2000	186.2	Hite	N	4	4.0					3	1																			
LH	05/18/2000	182.8	Hite	N																											
LH	05/18/2000	186.2	Hite	N																											
LT	05/17/2000	182.8	Hite	N	7	12.6					3	2												2							
LT	05/16/2000	177	Hite	N	36	64.6					5	24										1		2				4			
LT	05/16/2000	177	Hite	D	10	17.9					1	5		1										1			2				
LT	05/16/2000	177.4	Hite	N	23	41.3					5	14																4			
LT	05/16/2000	177.4	Hite	D	15	26.9					2	10												2			1				
LT	05/16/2000	182.8	Hite	N	49	87.9			9		4	33		2													1				
LT	05/16/2000	182.8	Hite	N	28	50.2					5	12		1										2			5	3			
LT	05/16/2000	184	Hite	N	1	1.6						1																			
LT	05/17/2000	177	Hite	N	9	16.1						8																1			
LT	05/17/2000	177	Hite	N	16	28.7					5	7		1														3			
LT	05/17/2000	177	Hite	D	6	10.8					1	3															1	1			
LT	05/17/2000	177	Hite	D	3	5.4					2	1																			
LT	05/18/2000	177	Hite	N	13	23.3						12																1			
LT	05/18/2000	177	Hite	N	5	9.0			1			3																1			
LT	05/18/2000	182.8	Hite	N	12	21.5					2	7		1													1	1			
MT	05/16/2000	177.4	Hite	N																											
MT	05/16/2000	184.8	Hite	N																											
MT	05/16/2000	185.4	Hite	N	2	2.0					2																				
MT	05/17/2000	177.4	Hite	N																											
MT	05/17/2000	184.5	Hite	N																											
MT	05/17/2000	185	Hite	N	4	4.0					2										2										

Hite - May 2000

method	date	mile	location	time	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
MT	05/18/2000	182.8	Hite	N	1	1.0			1																						
MT	05/18/2000	185.4	Hite	N	2	2.0					2																				
SEINE	05/16/2000	196.5	Hite	D	4	0.3															4										
SEINE	05/16/2000	196.5	Hite	D	17	1.4															17										
SEINE	05/16/2000	196.5	Hite	D	34	0.9															34										
SEINE	05/16/2000	196.5	Hite	D	20	0.4															20										
SEINE	05/16/2000	196.5	Hite	D	14	0.3					1										13										
SEINE	05/16/2000	196.5	Hite	D	48	1.0															48										
SEINE	05/16/2000	196.5	Hite	D	38	0.8					1										37										
SEINE	05/16/2000	196.5	Hite	D	52	1.0					1										51										
SEINE	05/16/2000	196.5	Hite	D	42	0.8															42										
SEINE	05/16/2000	196.5	Hite	D	133	2.7															133										
SEINE	05/16/2000	196.5	Hite	D	11	0.2															11										
SEINE	05/16/2000	200	Hite	D	8	0.2															8										
SEINE	05/16/2000	200	Hite	D	48	1.0															48										
SEINE	05/16/2000	200	Hite	D	88	1.8															88										
SH	05/16/2000	185	Hite	N																											
SH	05/17/2000	182.8	Hite	N																											
SH	05/17/2000	184.7	Hite	N	1	1.0					1																				
SH	05/18/2000	162.8	Hite	N																											
SH	05/18/2000	185	Hite	N																											
SH OR LH	05/16/2000	177	Hite	N	1	1.0																						1			
SH OR LH	05/16/2000	177.1	Hite	N	4	4.0					1	1																2			
SH OR LH	05/17/2000	177	Hite	N	1	1.0																					1				
SH OR LH	05/17/2000	177.1	Hite	N	9	9.0					1	6															2				
SH OR LH	05/18/2000	177	Hite	N	1	1.0																						1			
SH OR LH	05/18/2000	177.1	Hite	N	4	4.0						2															2				
ST	05/16/2000	177	Hite	N	5	26.9					1	2					1									1					
ST	05/16/2000	178	Hite	N	2	10.8						2																			
ST	05/16/2000	178	Hite	D																											
ST	05/16/2000	184	Hite	N	3	16.1					1	2																			
ST	05/16/2000	184.2	Hite	N	15	60.7						14									1										
ST	05/17/2000	177	Hite	N	2	10.8						1																1			
ST	05/17/2000	177	Hite	D	2	10.8			2																						
ST	05/17/2000	178	Hite	N	3	16.1						2														1					
ST	05/17/2000	178	Hite	D																											
ST	05/17/2000	182.8	Hite	N																											
ST	05/17/2000	184	Hite	N	1	5.4						1																			
ST	05/18/2000	177	Hite	N	4	21.5						2														1			1		
ST	05/18/2000	177.1	Hite	N	5	26.9						5																			
ST	05/18/2000	182.8	Hite	N	1	5.4																						1			
ST	05/17/2000	182.8	Hite	N	26	139.9					3	20												1			2				
ST	05/18/2000	182.8	Hite	N	8	43.1					4	4																			

Hite - Summary of Total Effort and Species Captured																											
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	473	13			6	2	23	96						1			12			315	5		13				
	LH	5	4					4	1																			
	SH	1	5					1																				
	SH OR LH	20	6					2	9															5	4			
	CT	1	4					1																				
	MT	9	8			1		6										2										
	SEINE	557	14					3										554										
	LT	233	15			10		35	142		6								1		9			11	19			
	ST	77	16			2		9	55					1				1			1	3		2	3			
	Total	1376	85			19	2	84	303		6			1	1			569	1		325	8		31	26			
	Percent					1.4	0.1	6.1	22.0		0.4			0.1	0.1			41.4	0.1		23.6	0.6		2.3	1.9			

Hite - CPUE and Species Composition by Collection Technique																											
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		67.5			1.3	0.4	4.9	20.3						0.2			2.5			66.6	1.1		2.7				
	LH		1.3					80.0	20.0																			
	SH		0.2					100.0																				
	SH OR LH		3.3					10.0	45.0															25.0	20.0			
	CT		0.3					100.0																				
	MT		1.1			11.1		66.7										22.2										
	SEINE		0.9					0.5										99.5										
	LT		27.9			4.3		15.0	60.9		2.6								0.4		3.9			4.7	8.2			
	ST		25.9			2.6		11.7	71.4					1.3				1.3				3.9			3.9			

San Juan - May 2000

method	date	mile	day/night	location	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
CT	05/02/2000	51	N	Piute	1	1.0																	1								
CT	05/04/2000	50	N	Piute																											
ELECTRO	05/02/2000	51	N	Piute	208	208.0				113	1	35					29	7			8		4	1	9		1				
ELECTRO	05/02/2000	51	N	Piute	95	95.0			1	46		16					23	6			1		1	1							
ELECTRO	05/02/2000	51	N	Piute	84	95.1			1	28		15					26				5		5		4						
LH	05/03/2000	51	N	Piute	1	1.0			1																						
LH	05/03/2000	51	D	Piute																											
LH	05/04/2000	50	N	Piute																											
LT	05/03/2000	51	N	Piute	21	37.7			1		6	4					1	1						5			1	2			
LT	05/03/2000	51	N	Piute	28	50.2			2	2	6	8		1			2						2	3				2			
LT	05/04/2000	50	N	Piute	25	44.9				3	6	9					2						1	3				1			
MT	05/02/2000	51	N	Piute	2	2.0				2																					
MT	05/03/2000	51	N	Piute																											
MT	05/03/2000	51	N	Piute	4	4.0				4																					
MT	05/03/2000	51	D	Piute	4	4.0				2							1											1			
MT	05/03/2000	51	D	Piute	2	2.0				2																					
MT	05/04/2000	50	N	Piute	1	1.0				1																					
MT	05/04/2000	50	N	Piute	1	1.0				1																					
SEINE	05/03/2000	51	D	Piute	3	0.0				1											2										
SEINE	05/03/2000	51	D	Piute	13	0.1				5							1	1			6										
SEINE	05/03/2000	51	D	Piute	7	0.1				4							1				2										
SEINE	05/03/2000	51	D	Piute	54	0.5															54										
SEINE	05/03/2000	51	D	Piute		9.1																									
SEINE	05/03/2000	51	D	Piute	7	0.1				1											6										
SEINE	05/03/2000	51	D	Piute																											
SEINE	05/03/2000	51	D	Piute	4	0.0				1											3										
SEINE	05/03/2000	51	D	Piute	1	0.0															1										
SEINE	05/03/2000	51	D	Piute	51	0.7				14											37										
SEINE	05/03/2000	51	D	Piute	2	0.0				2																					
SH	05/03/2000	51	N	Piute																											
SH	05/04/2000	50	N	Piute	1	1.0											1														
ST	05/02/2000	51	N	Piute	4	21.5																		2			1	1			
ST	05/02/2000	51	N	Piute	21	113.0				1	1	10					1							2	4		1	1			
ST	05/02/2000	51	D	Piute	13	70.0			1			5												5	2						
ST	05/02/2000	51	D	Piute	8	43.1				2		4					1								1						
ST	05/03/2000	51	N	Piute	19	102.3					1	5													13						
ST	05/03/2000	51	N	Piute	4	21.5						2													2						
ST	05/03/2000	51	N	Piute	142	764.3						3												1	136		1	1			
ST	05/03/2000	51	D	Piute	10	53.8						1					1								7		1				
ST	05/04/2000	50	N	Piute	17	91.5						8													9						
ST	05/03/2000	51	N	Piute	18	96.9				2	2	7		1			2						2	2							
ST	05/03/2000	51	D	Piute	15	80.7				1	2	8					1							3							
ST	05/04/2000	50	N	Piute	21	113.0					6	10					2	1						1				1			
CT	05/02/2000	38	N	Spencer																											
CT	05/03/2000	38	N	Spencer																											
CT	05/04/2000	38	N	Spencer																											
ELECTRO	05/01/2000	38	N	Spencer	51	49.7			4	7		11					6	9					12				2				
ELECTRO	05/01/2000	38	N	Spencer	50	50.5			4	6	2	6					13	4					15								

method	date	mile	day/night	location	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	05/01/2000	38	N	Spencer	74	74.5			2	6	7	14					22	1					21				1				
LH	05/02/2000	38	N	Spencer	2	2.0				2																					
LH	05/03/2000	38	N	Spencer																											
LH	05/04/2000	38	N	Spencer	1	1.0												1													
LT	05/02/2000	38	N	Spencer	18	32.3				5	10						2	1													
LT	05/02/2000	38	N	Spencer	3	5.4			2		1																				
LT	05/02/2000	38	N	Spencer	3	5.4					1	1						1													
LT	05/02/2000	38	N	Spencer	1	1.8												1													
LT	05/03/2000	38	N	Spencer	10	17.9				2	2	6																			
LT	05/03/2000	38	N	Spencer	5	9.0			1	1	1	1																1			
LT	05/04/2000	38	N	Spencer	4	7.2				1													1				1	1			
LT	05/04/2000	38	N	Spencer	12	21.5				1	3	8																			
MT	05/02/2000	38	N	Spencer	7	7.0											7														
MT	05/03/2000	38	N	Spencer	10	10.0											9						1								
MT	05/04/2000	38	N	Spencer	10	10.0											8						2								
SH	05/02/2000	38	N	Spencer	4	4.0				3							1														
SH	05/03/2000	38	N	Spencer	3	3.0											3														
SH	05/04/2000	38	N	Spencer	1	1.0			1																						
ST	05/02/2000	38	N	Spencer	4	21.5			1														1				1	1			
ST	05/02/2000	38	N	Spencer	7	37.7			3	1	1						1								1						
ST	05/02/2000	38	N	Spencer																											
ST	05/02/2000	38	N	Spencer	2	10.6				1							1														
ST	05/03/2000	38	N	Spencer	4	21.5						2					2														
ST	05/03/2000	38	N	Spencer	1	5.4						1																			
ST	05/04/2000	38	N	Spencer	2	10.8					1	1																			

Piute - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	387	3			2	187	1	66					78	13			14		10	2	13		1				
LH	1	3			1																						
SH	1	2											1														
CT	1	2																	1								
MT	14	7				12							1											1			
SEINE	142	11				28							2	1			111										
LT	74	3			3	5	18	21		1			5	1					3	11			1	5			
ST	405	12			3	227	2	70					84	1					1	2	13		1	1			
Total	1025	43.00			9	459	21	157		1			171	16			125		15	15	26		3	7			
Percent					0.9	44.8	2.0	15.3		0.1			18.7	1.6			12.2		1.5	1.5	2.5		0.3	0.7			

Piute - CPUE and Species Composition by Collection Technique

method	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	132.7			0.5	48.3	0.3	17.1					20.2	3.4			3.6		2.6	0.5	3.4		0.3				
LH	0.3			100.0																						
SH	0.5											100.0														
CT	0.5																	100.0								
MT	2.0				85.7							7.1											7.1			
SEINE	1.0				19.7							1.4	0.7			78.2										
LT	44.3			4.1	6.8	24.3	28.4		1.4			6.8	1.4					4.1	14.9			1.4	6.8			
ST	131.0			0.7	56.0	0.5	17.3					20.7							0.5	3.2		0.2	0.2			

Spencer - Summary of Total Effort and Species Captured																											
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	LH	3	3				2								1													
	SH	8	3			1	3							4														
	CT		3																									
	MT	27	3											24						3								
	LT	56	8			3	10	18	16					2	3					1				1	2			
	ST	20	7			4	2	2	4					4						1		1		1	1			
	Total	114	27			8.0	17.0	20.0	20.0					34.0	4.0					5.0		1.0		2.0	3.0			
	Percent					7.0	14.9	17.5	17.5					29.8	3.5					4.4		0.9		1.8	2.6			

Spencer - CPUE and Species Composition by Collection Technique																											
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	LH		1.0				66.7								33.3													
	SH		2.7			12.5	37.5							50.0														
	CT																											
	MT		9.0											88.9						11.1								
	LT		12.6			5.4	17.9	32.1	28.6					3.6	5.4					1.8				1.8	3.6			
	ST		15.4			20.0	10.0	10.0	20.0					20.0						5.0		5.0		5.0	5.0			

San Juan - early June 2000

mathod	date	mile	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
CT	06/06/2000	49	Piute	N																											
CT	06/07/2000	49	Piute	N																											
CT	06/06/2000	49	Piute	N																											
ELECTRO	06/06/2000	52	Piute	N	21	26.0				1		16		1			1	1					1								
ELECTRO	06/06/2000	52	Piute	N	17	14.1				2	1	5						1			7		1								
ELECTRO	06/06/2000	52	Piute	N	79	78.7			7	46		4					17	1			2		2								
LH	06/06/2000	51	Piute	N	1	1			1																						
LH	06/07/2000	52	Piute	N	2	2						1															1				
LH	06/07/2000	52	Piute	N	4	4						4																			
LH	06/08/2000	52	Piute	N	3	3						1															2				
LH	06/06/2000	51	Piute	N																											
LH	06/08/2000	51	Piute	N																											
LT	06/06/2000	49	Piute	N	52	93.3			1		6	38												7							
LT	06/07/2000	52	Piute	N	86	154.3			4	1	5	75															1				
LT	06/08/2000	49	Piute	N	45	80.7				1	4	35					1							1			2	1			
MT	06/06/2000	51	Piute	N	3	3				1		1					1														
MT	06/06/2000	49	Piute	N	8	8				8																					
MT	06/07/2000	51	Piute	N	6	6				6																					
MT	06/07/2000	49	Piute	N	2	2				1							1														
MT	06/08/2000	51	Piute	N	1	1				1																					
MT	06/08/2000	49	Piute	N	15	15				11							4														
SEINE	06/07/2000	53	Piute	D	2	0.1															2										
SEINE	06/07/2000	53	Piute	D	4	0.1															4										
SEINE	06/07/2000	53	Piute	D	4	0.1				2		1									1										
SEINE	06/07/2000	53	Piute	D																											
SEINE	06/07/2000	53	Piute	D	3	0.1				1											2										
SEINE	06/07/2000	53	Piute	D	12	0.3				3											9										
SEINE	06/07/2000	53	Piute	D	10	0.2				2											8										
SEINE	06/07/2000	53	Piute	D	4	0.1															4										
SEINE	06/07/2000	53	Piute	D	11	0.2				1			1								9										
SEINE	08/07/2000	53	Piute	D	3	0.1															3										
SH	06/06/2000	52	Piute	N																											
SH	06/06/2000	49	Piute	N	7	7				3																		4			
SH	06/07/2000	49	Piute	N	7	7			4	1							2														
SH	06/08/2000	52	Piute	N	1	1					1																				
ST	06/06/2000	52	Piute	N	23	123.8					2	15												6							
ST	06/06/2000	51	Piute	N	16	86.1					1	13						1						1							
ST	06/07/2000	52	Piute	N	22	118.4					1	15												6							
ST	06/07/2000	51	Piute	N	3	16.1					1	2																			
ST	06/08/2000	52	Piute	N	21	113.0					2	19																			
ST	06/08/2000	49	Piute	N	9	48.4			1	7																		1			
ST	06/08/2000	49	Piute	N	50	269.1						2					1							47							
ST	06/06/2000	52	Piute	N	38	204.5					5	28				1						3		1							
ST	06/07/2000	49	Piute	N	42	226.0				3	4	34															1				
CT	06/06/2000	38	Spencer	N																											
ELECTRO	06/05/2000	38	Spencer	N	58	57.8				2		20					8	3					24				1				
ELECTRO	06/05/2000	38	Spencer	N	42	41.1				3	1	6					12	2					15	1	1		1				

method	dete	mile	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	06/05/2000	38	Spencer	N	37	37.2				5		7					10	1					13		1						
LH	06/06/2000	38	Spencer	N																											
LH	06/07/2000	38	Spencer	N																											
LH	06/08/2000	38	Spencer	N																											
LH	06/08/2000	38	Spencer	N																											
LT	06/06/2000	38	Spencer	N	25	44.9				3	7	5					3						2	4				1			
LT	06/06/2000	38	Spencer	N	47	84.3				1	17	22					1	1						4			1				
LT	06/07/2000	38	Spencer	N	22	39.5				2	6	8		2										4							
LT	06/07/2000	38	Spencer	N	34	61.0				1	13	13		1										6							
LT	06/08/2000	38	Spencer	N	22	39.5				2	6	5					1						2	6							
LT	08/08/2000	38	Spencer	N	24	43.1					9	10		1			1						2	1							
MT	06/06/2000	38	Spencer	N																											
MT	06/07/2000	38	Spencer	N	2	2				2																					
MT	06/08/2000	38	Spencer	N	8	8				1							6	1													
SH	06/06/2000	38	Spencer	N																											
SH	06/06/2000	38	Spencer	N																											
SH	06/07/2000	38	Spencer	N																											
SH	06/07/2000	38	Spencer	N	2	2				2																					
SH	06/08/2000	38	Spencer	N																											
SH	06/08/2000	38	Spencer	N	1	1				1																					
ST	06/06/2000	38	Spencer	N	14	75.3					2	8					2	1							1						
ST	06/06/2000	38	Spencer	N	5	26.9					1													3	1						
ST	06/07/2000	38	Spencer	N	18	96.9				1		5					4								8						
ST	06/07/2000	38	Spencer	N	4	21.5					1	1						1							1						
ST	06/08/2000	38	Spencer	N	2	10.6											2														

Piute - Summary of Total Effort and Species Captured

	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	117	3			7	49	1	25		1			18	3			9		4								
	LH	10	6			1			6															3				
	SH	15	4			4	4	1						2											4			
	CT		3																									
	MT	35	6				28		1					6														
	SEINE	53	10				9		1	1								42										
	LT	183	3			5	2	15	148					1							8			3	1			
	ST	224	9			1	10	16	128				1	1	1				3		1	60		1	1			
	Total	637	44			18	102	33	309	1	1		1	28	4			51	3	4	9	60		7	6			
	Percent					2.8	16.0	5.2	46.5	0.2	0.2		0.2	4.4	0.6			8.0	0.5	0.6	1.4	9.4		1.1	0.9			

Piute - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		39.6			6.0	41.9	0.9	21.4		0.9			15.4	2.6			7.7		3.4								
	LH		1.7			10.0			60.0															30.0				
	SH		3.8			26.7	26.7	6.7						13.3											26.7			
	CT																											
	MT		5.8				80.0		2.9					17.1														
	SEINE		0.1				17.0		1.9	1.9								79.2										
	LT		109.4			2.7	1.1	8.2	80.9					0.5							4.4			1.6	0.5			
	ST		134.0			0.4	4.5	7.1	57.1				0.4	0.4	0.4				1.3		0.4	26.8		0.4	0.4			

San Juan - early June 2000

Spencer - Summary of Total Effort and Species Captured																											
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	137	3				10	1	33					30	6					52	1	2		2				
	LH		4																									
	SH	3	6				3																					
	CT		1																									
	MT	10	3				3							6	1													
	LT	174	6				9	58	63		4			6	1					6	25			1	1			
	ST	43	5				1	4	14					8	2						3	11						
	Total	367	28				26	63	110		4			50	10					58	29	13		3	1			
	Percent						7.1	17.2	30.0		1.1			13.6	2.7					15.8	7.9	3.5		0.8	0.3			

Spencer - CPUE and Species Composition by Collection Technique																											
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		45.4				7.3	0.7	24.1					21.9	4.4					38.0	0.7	1.5		1.5				
	LH																											
	SH		0.5				100.0																					
	CT																											
	MT		3.3				30.0							60.0	10.0													
	LT		52.0				5.2	33.3	36.2		2.3			3.4	0.6					3.4	14.4			0.6	0.6			
	ST		46.3				2.3	9.3	32.6					18.6	4.7						7.0	25.6						

San Juan - late June 2000

method	date	mile	location	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
CT	08/27/2000	52.5	Piute																											
CT	08/28/2000	53	Piute																											
CT	08/29/2000	52.5	Piute																											
ELECTRO	06/27/2000	50	Piute	24	23.9			2	1	1	5					3				11				1						
ELECTRO	06/27/2000	53	Piute	53	52.8			1	2		1						1			48										
ELECTRO	06/27/2000	53-52.5	Piute	46	45.8				9	8						1				24	1			1		1	1			
LH	06/27/2000	52.5	Piute																											
LH	08/29/2000	52.5	Piute	1	1.0			1																						
LT	06/27/2000	52	Piute	34	61.0				1	4	29																			
LT	06/27/2000	52.5	Piute	44	78.9				1	8	33															1	1			
LT	08/28/2000	53	Piute	43	77.1	1		2		4	34						1				1									
MT	08/27/2000	52	Piute	1	1.0											1														
MT	06/27/2000	52	Piute	1	1.0				1																					
MT	06/28/2000	52	Piute	3	3.0				1											2										
MT	06/28/2000	52	Piute																											
MT	06/29/2000	52	Piute	4	4.0				3								1													
MT	06/29/2000	52	Piute	1	1.0				1																					
SEINE	08/28/2000	50	Piute	1654	4.1				5		12									26				1611						
SEINE	06/28/2000	50	Piute	99	0.8			3									1			11				84						
SEINE	08/28/2000	50	Piute	167	0.7									1			1			21				144						
SEINE	06/28/2000	50	Piute	62	0.9												1			50				11						
SEINE	06/28/2000	50	Piute	72	1.0												1			28				43						
SEINE	06/28/2000	50	Piute	38	0.8												1			23				14						
SEINE	06/28/2000	50	Piute	31	0.4															18				13						
SEINE	06/28/2000	50	Piute	82	1.1				1											24				57						
SEINE	06/28/2000	50	Piute	57	0.9															14				43						
SEINE	06/28/2000	50	Piute	62	0.8															39				23						
SH	06/27/2000	52	Piute																											
SH	06/27/2000	52	Piute	6	6.0				4											2										
SH	06/28/2000	52	Piute																											
SH	06/28/2000	52	Piute	5	5.0				5																					
SH	06/29/2000	52	Piute	1	1.0				1																					
SH	06/29/2000	52	Piute	2	2.0				2																					
ST	06/27/2000	52	Piute	10	53.8			1		1	6						1							1						
ST	08/27/2000	52	Piute	17	91.5					3	13													1						
ST	08/28/2000	53.5	Piute	18	96.9			1		2	14					1														
ST	08/28/2000	53.5	Piute	21	113.0			2		3	13		1							1							1			
ST	06/29/2000	53	Piute	10	53.8	1				2	5												1	1						
ST	06/29/2000	52.5	Piute	8	43.1					1	1									4			1	1						
ST	08/28/2000	53.5	Piute	24	43.1	2				7	15																			
ST	06/29/2000	52.5	Piute	25	1.3					4	20												1							
CT	06/27/2000	38	Spencer	1	1.0											1														
CT	06/28/2000	38	Spencer																											
CT	06/29/2000	38	Spencer																											
ELECTRO	06/26/2000	38	Spencer	50	49.9				8		10					14	5					13								
ELECTRO	06/28/2000	38	Spencer	55	55.0				8		6					21	3					17								
ELECTRO	06/28/2000	38	Spencer	27	25.2					3	1					1	6					16								
LH	06/27/2000	38	Spencer																											

method	dete	mile	location	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
LH	06/27/2000	38	Spencer																											
LH	06/28/2000	38	Spencer	5	5.0						1					4														
LH	06/28/2000	38	Spencer	1	1.0																	1								
LH	06/29/2000	38	Spencer	1	1.0				1																					
LH	06/29/2000	38	Spencer	3	3.0				3																					
LT	06/27/2000	38	Spencer	10	17.9					3	2											1	3			1				
LT	06/27/2000	38	Spencer	13	23.3				3	4	3					1										2				
LT	06/28/2000	38	Spencer	5	9.0						3												2							
LT	06/28/2000	38	Spencer	23	41.3				4	5	8						3						2				1			
LT	06/29/2000	38	Spencer	12	21.5				3	2	5												2							
LT	06/29/2000	38	Spencer	14	25.1			1	1	2	7											2	1							
MT	06/27/2000	38	Spencer	4	4.0											4														
MT	06/28/2000	38	Spencer	1	1.0											1														
MT	06/29/2000	38	Spencer	4	4.0				1							3														
SH	06/27/2000	38	Spencer	3	3.0				3																					
SH	06/27/2000	38	Spencer	1	1.0											1														
SH	06/28/2000	38	Spencer	1	1.0												1													
SH	06/28/2000	38	Spencer	8	8.0											1	7													
SH	06/29/2000	38	Spencer	1	1.0				1																					
SH	06/29/2000	38	Spencer	1	1.0											1														
ST	06/27/2000	38	Spencer																											
ST	06/27/2000	38	Spencer	12	64.6				1		1					9						1								
ST	06/28/2000	38	Spencer	2	10.8											2														
ST	06/29/2000	38	Spencer	2	10.8				1							1														
ST	06/29/2000	38	Spencer	7	37.7				1		6																			

Piute - Summary of Total Effort and Species Captured

	# sets	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	123	3			3	12	9	6					4	1			83	1			2		1	1			
	LH	1	2			1																						
	SH	14	6				12											2										
	CT		3																									
	MT	10	6				6							1	1			2										
	SEINE	2324	10			3	6		12			1			5			254				2043						
	LT	121	3	1		2	2	16	96						1				1					1	1			
	ST	133	8	3		4		23	87		1			1	1			5			3	4			1			
	Total	2726	41	4		13	38	48	201		1	1		6	9			346	2		3	2049		2	3			
	Percent			0.1		0.5	1.4	1.8	7.4		0.0	0.0		0.2	0.3			12.7	0.1		0.1	75.2		0.1	0.1			

Piute - CPUE and Species Composition by Collection Technique

	# sets		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		40.8			2.4	9.8	7.3	4.9					3.3	0.8			67.5	0.8			1.8		0.8	0.8			
	LH		0.5			100.0																						
	SH		2.3				85.7											14.3										
	CT																											
	MT		1.7				60.0							10.0	10.0			20.0										
	SEINE		1.1			0.1	0.3		0.5			0.04			0.2			10.9				87.9						
	LT		72.4	0.8		1.7	1.7	13.2	79.3						0.8				0.8					0.8	0.8			
	ST		62.1	2.3		3.0		17.3	65.4		0.8			0.8	0.8			3.8			2.3	3.0			0.8			

San Juan - late June 2000

Spencer - Summary of Total Effort and Species Captured																											
	# sets	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	132	3				16	3	17					36	14					46								
	LH	10	6				4		1					4						1								
	SH	15	6				4							3	8													
	CT	1	3											1														
	MT	9	3				1							8														
	LT	77	6			1	11	16	28					1	3					3	10			3	1			
	ST	23	5				3		7					12						1								
	Total	267	32			1	39	19	53					65	25					51	10			3	1			
	Percent					0.4	14.6	7.1	19.9					24.3	9.4					19.1	3.7			1.1	0.4			

Spencer - CPUE and Species Composition by Collection Technique																											
	# sets		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		43.4				12.1	2.3	12.9					27.3	10.6					34.8								
	LH		1.7				40.0		10.0					40.0						10.0								
	SH		2.5				26.7							20.0	53.3													
	CT		0.3											100.0														
	MT		3.0				11.1							88.9														
	LT		23.0			1.3	14.3	20.8	36.4					1.3	3.9					3.9	13.0			3.9	1.3			
	ST		24.8				13.0		30.4					52.2						4.3								

San Juan - July 2000

method	date	mile	location	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	07/18/2000	53	Piute	35	35.2			15	1	1	11						2			2		2		1						
ELECTRO	07/18/2000	52.5	Piute	82	81.3			5	10	6	23					6	1			19		1	8	3						
ELECTRO	07/18/2000	52	Piute	49	48.8			8	9	4	8					2	1			8	1	2	3	3						
LH	07/18/2000	51.7	Piute	1	1.0																					1				
LH	07/19/2000	51.7	Piute																											
LH	07/20/2000	51.7	Piute																											
LT	07/18/2000	52	Piute	39	70.0			2		3	30						2									2				
LT	07/18/2000	51.7	Piute	36	64.6			5		3	26												2							
LT	07/19/2000	52	Piute	27	48.4				1	1	24												1							
LT	07/20/2000	51.7	Piute	20	35.9						19																1			
MT	07/18/2000	51.7	Piute																											
MT	07/19/2000	51.7	Piute																											
MT	07/20/2000	51.7	Piute	4	4.0				3							1														
MT	07/20/2000	51.7	Piute	1	1.0			1																						
SEINE	07/19/2000	52.5	Piute	626	10.4			2												100				524						
SEINE	07/19/2000	52.5	Piute	123	4.1			1	2											70				50						
SEINE	07/19/2000	52.5	Piute	41	0.9															41										
SEINE	07/19/2000	52.5	Piute	86	1.1			1												56				9						
SEINE	07/19/2000	52.5	Piute	1001	22.2					1										1000										
SEINE	07/19/2000	52.5	Piute	72	1.6				2											40				30						
SEINE	07/19/2000	52.5	Piute	45	1.5															35				10						
SEINE	07/19/2000	52.5	Piute	62	1.4															61				1						
SEINE	07/19/2000	52.5	Piute	116	2.6															116										
SEINE	07/19/2000	52.5	Piute	200	4.4															200										
SEINE	07/19/2000	52.5	Piute	76	1.7						1									75										
SEINE	07/19/2000	52.5	Piute	19	0.3															15				4						
SH	07/18/2000	51.7	Piute																											
SH	07/18/2000	51.7	Piute	2	2.0			2																						
SH	07/19/2000	51.7	Piute	1	1.0			1																						
SH	07/19/2000	51.7	Piute	6	6.0			5			1																			
SH	07/20/2000	51.7	Piute	1	1.0				1																					
SH	07/20/2000	51.7	Piute	17	17.0			14	3																					
ST	07/18/2000	52	Piute	17	91.5					1														16						
ST	07/18/2000	51.8	Piute	16	86.1				1	5	6					1								3						
ST	07/19/2000	52	Piute	18	96.9						4													14						
ST	07/19/2000	51.7	Piute	18	96.9			2		1	15																			
ST	07/20/2000	51.8	Piute	7	37.7					1	5													1						
ELECTRO	07/17/2000	38	Spencer	46	45.5			1	10		3					12	5					11	3	1						
ELECTRO	07/17/2000	38	Spencer	86	86.7				8	1	3					46						18	11	1						
ELECTRO	07/17/2000	38	Spencer	61	60.9				3	1	1					20	7					14		15						
LH	07/18/2000	38	Spencer																											
LH	07/18/2000	38	Spencer																											
LH	07/18/2000	38	Spencer																											
LH	07/18/2000	38	Spencer	1	1.0																	1								
LH	07/19/2000	38	Spencer	2	2.0												1					1								
LH	07/19/2000	38	Spencer																											
LH	07/19/2000	38	Spencer																											
LH	07/20/2000	38	Spencer																											

method	date	mile	location	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
LH	07/20/2000	38	Spencer	1	1.0			1																						
LT	07/18/2000	38	Spencer	34	81.0				4		27						2					1								
LT	07/18/2000	38	Spencer	5	9.0				1		4																			
LT	07/19/2000	38	Spencer	33	59.2				4	5	23															1				
LT	07/19/2000	38	Spencer	19	34.1				2	3	12											2								
LT	07/19/2000	38	Spencer	13	23.3				1		11						1													
LT	07/19/2000	38	Spencer	11	19.7				2	2	6						1													
LT	07/20/2000	38	Spencer	15	26.9				2	1	6					3	3													
LT	07/20/2000	38	Spencer	11	19.7				1	1	7					1						1								
MT	07/18/2000	38	Spencer	40	40.0											39						1								
MT	07/19/2000	38	Spencer	9	9.0											6						3								
MT	07/20/2000	38	Spencer	13	13.0						2					11														
SH	07/19/2000	38	Spencer	4	4.0											4														
SH	07/20/2000	38	Spencer																											
SH	07/20/2000	38	Spencer	2	2.0											2														
ST	07/18/2000	38	Spencer	7	37.7											6						1								
ST	07/18/2000	38	Spencer	13	70.0			1								8								4						
ST	07/18/2000	38	Spencer	12	64.6					1	9						2													
ST	07/18/2000	38	Spencer	2	10.8				2																					
ST	07/18/2000	38	Spencer	3	16.1											3														
ST	07/19/2000	38	Spencer	6	32.3						1					4										1				
ST	07/19/2000	38	Spencer	5	26.9				2		1					1								1						
ST	07/19/2000	38	Spencer	1	5.4				1																					
ST	07/19/2000	38	Spencer																											
ST	07/20/2000	38	Spencer	2	10.8					1	1																			
ST	07/20/2000	38	Spencer	10	53.8				1	1	1					7														
ST	07/18/2000	38	Spencer	9	48.4				4		2						2					1								

Piute - Summary of Total Effort and Species Captured

method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	166	3			28	20	11	42					8	4			29	1	5	11	7						
LH	1	3																					1				
SH	27	6			22	4		1																			
MT	5	4			1	3							1														
SEINE	2447	12			4	4	1	1									1809				628						
LT	122	4			7	1	7	99						2						3			2	1			
ST	76	5			2	1	8	30					1								34						
Total	2844	37			64	33	27	173					10	6			1838	1	5	14	669		3	1			
Percent					2.3	1.2	0.9	6.1					0.4	0.2			64.6	0.0	0.2	0.5	23.5		0.1	0.0			

Piute - CPUE and Species Composition by Collection Technique

method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO		55.1			16.9	12.0	6.6	25.3					4.8	2.4			17.5	0.6	3.0	6.6	4.2						
LH		0.3																					100.0				
SH		4.5			81.5	14.8		3.7																			
MT		1.3			20.0	60.0							20.0														
SEINE		4.4			0.2	0.2											73.9				25.7						
LT		54.7			5.7	0.6	5.7	81.1						1.6						2.5			1.6	0.8			
ST		81.8			2.6	1.3	10.5	39.5					1.3								44.7						

Spencer - Summary of Total Effort and Species Captured																											
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	195	3			1	21	2	7					78	12					43	14	17						
	LH	4	9			1									1					2								
	SH	6	3											6														
	MT	62	3						2					56						4								
	LT	141	8				17	12	96					4	7					4				1				
	ST	70	12			1	10	3	15					29	4					2		5		1				
	Total	478	36			3	48	17	120					173	24					55	14	22		2				
	Percent					0.6	10.0	3.6	25.1					36.2	5.0					11.5	2.9	4.6		0.4				

Spencer - CPUE and Species Composition by Collection Technique																											
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		64.4			0.5	10.8	1.0	3.6					40.0	6.2					22.1	7.2	8.7						
	LH		0.4			25.0									25.0					50.0								
	SH		2.0											100.0														
	MT		20.7						3.2					90.3						6.5								
	LT		31.6				12.1	8.5	68.1					2.8	5.0					2.8				0.7				
	ST		31.4			1.4	14.3	4.3	21.4					41.4	5.7					2.9		7.1		1.4				

San Juan - August 2000

method	date	mile	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
ELECTRO	08/21/2000	52	Piute	N	118	58.9				18	8	30					5	4			3		10		40						
ELECTRO	08/21/2000	52	Piute	N	58	54.5				21		3					1				13		2		18						
LH	08/22/2000	52	Piute	N	4	4.0					2	2																			
LH	08/23/2000	51.6	Piute	N	3	3.0						3																			
LH	08/23/2000	51.5	Piute	N	1	1.0						1																			
LH	08/24/2000	52	Piute	N																											
LT	08/22/2000	52	Piute	N	33	59.2			2			29												1			1				
LT	08/22/2000	52	Piute	N	42	75.3	1		1			40																			
LT	08/23/2000	51	Piute	N	61	109.4			17		3	36					2						2	1							
LT	08/24/2000	52	Piute	N	21	37.7					2	17												2							
MT	08/22/2000	52	Piute	N	6	6.0				1	1	1																3			
MT	08/23/2000	52	Piute	N	5	5.0			1	2	1	1																			
MT	08/24/2000	52	Piute	N	1	1.0					1																				
SEINE	08/23/2000	52	Piute	D	65	0.9				11											34				20						
SEINE	08/23/2000	52	Piute	D	86	1.4				13											18				55						
SEINE	08/23/2000	52	Piute	D	86	1.2			1	14	1	1									14				57						
SEINE	08/23/2000	52	Piute	D	144	1.6				33		3						1			50				57						
SEINE	08/23/2000	52	Piute	D	94	1.2				16		4									30				44						
SEINE	08/23/2000	52	Piute	D	122	2.0				8											47				67						
SEINE	08/23/2000	52	Piute	D	179	1.4				22	1	5						1			100				50						
SEINE	08/23/2000	52	Piute	D	12	0.4				1		1									8				2						
SEINE	08/23/2000	52	Piute	D	24	1.0			5												17				2						
SEINE	08/23/2000	52	Piute	D	106	2.7			3												3				100						
SH	08/22/2000	52	Piute	N	5	5.0				1	1																	3			
SH	08/22/2000	52	Piute	N	3	3.0					2																	1			
SH	08/23/2000	52	Piute	N	2	2.0			1		1																				
SH	08/23/2000	52	Piute	N	7	7.0			5		2																				
SH	08/24/2000	52	Piute	N	3	3.0			2																1						
SH	08/24/2000	52	Piute	N	10	10.0			9		1																				
SH	08/24/2000	52	Piute	N	2	2.0					2																				
ST	08/22/2000	52	Piute	N	15	80.7			1		2	11													1						
ST	08/22/2000	52	Piute	N	64	344.5			3		6	11											1		41			2			
ST	08/23/2000	52	Piute	N	21	113.0					2	5													14						
ST	08/23/2000	51.6	Piute	N	11	59.2			1		1	5					1								2			1			
ST	08/23/2000	51.5	Piute	N	38	204.5			3		4	31																			
ST	08/24/2000	52	Piute	N	13	70.0					1	4													8						
ELECTRO	08/22/2000	38	Spencer	N	23	23.0					1	2					8	1					11								
ELECTRO	08/22/2000	38	Spencer	N	27	27.0			1			6					8	1					11								
ELECTRO	08/22/2000	38	Spencer	N	23	23.0				1	1	3					10						7					1			
LH	08/22/2000	38	Spencer	N																											
LH	08/22/2000	38	Spencer	N																											
LH	08/23/2000	38	Spencer	N	1	1.0			1																						
LH	08/23/2000	38	Spencer	N																											
LH	08/24/2000	38	Spencer	N																											
LH	08/24/2000	38	Spencer	N																											

method	date	mile	location	day/night	# fish	CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
LT	08/22/2000	36	Spencer	N	14	25.1				1		7					4						1					1			
LT	08/22/2000	36	Spencer	N	15	26.9					1	10					1						2				1				
MT	08/22/2000	36	Spencer	N	8	8.0											8														
MT	08/22/2000	36	Spencer	N																											
MT	08/23/2000	38	Spencer	N	4	4.0											4														
MT	08/23/2000	36	Spencer	N	1	1.0											1														
MT	08/24/2000	38	Spencer	N	2	2.0											2														
MT	08/24/2000	36	Spencer	N	2	2.0											1						1								
SH	08/23/2000	36	Spencer	N																											
SH	08/23/2000	38	Spencer	N	1	1.0				1																					
SH	08/24/2000	36	Spencer	N																											
SH	08/24/2000	38	Spencer	N																											
ST	08/22/2000	36	Spencer	N	8	43.1					1						5						1				1				
ST	08/22/2000	36	Spencer	N	18	96.9						1					13						1	1	2						
ST	08/22/2000	36	Spencer	D	7	37.7						5					1	1													
ST	08/22/2000	36	Spencer	D	3	18.1																	3								
ST	08/23/2000	36	Spencer	N	8	43.1				1	1						6														
ST	08/23/2000	36	Spencer	N	7	37.7											1						1	1	4						
ST	08/24/2000	36	Spencer	N	8	43.1				1		3					3	1													
ST	08/24/2000	36	Spencer	N	3	16.1											2						1								
ST	08/23/2000	36	Spencer	N	17	91.5					2	14					1														
ST	08/23/2000	38	Spencer	N	8	43.1					1	4						1					2								
ST	08/24/2000	38	Spencer	N	17	91.5				2		12						1					1				1				
ST	08/24/2000	38	Spencer	N	9	48.4				1		6						1					1								

Piute - Summary of Total Effort and Species Captured

	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRD	176	2				39	8	33					6	4			16		12		58						
	LH	8	4					2	6																			
	SH	32	7			17	1	9														1			4			
	MT	12	3			1	3	3	2																3			
	SEINE	920	10			9	118	2	14						2			321				454						
	LT	157	4	1		20		5	122					2						2	4			1				
	ST	162	6			8		16	67					1						1		66			3			
	Total	1467	36	1		55	161	45	244					9	6			337		15	4	579		1	10			
	Percent			0.1		3.7	11.0	3.1	16.6					0.6	0.4			23.0		1.0	0.3	39.5		0.1	0.7			

Piute - CPUE and Species Composition by Collection Technique

	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		56.7				22.2	4.5	18.8					3.4	2.3			9.1		6.6		33.0						
	LH		2.0					25.0	75.0																			
	SH		4.6			53.1	3.1	28.1														3.1			12.5			
	MT		4.0			8.3	25.0	25.0	16.7																25.0			
	SEINE		1.4			1.0	12.8	0.2	1.5						0.2			34.9				49.3						
	LT		70.4	0.6		12.7		3.2	77.7					1.3						1.3	2.5			0.6				
	ST		145.3			4.9		9.9	41.4					0.6						0.6		40.7			1.9			

Spencer - Summary of Total Effort and Species Captured																											
	method	# fish	# efforts	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO	73	3			1	1	2	11					28	2					29					1			
	LH	1	6			1																						
	SH	1	4				1																					
	MT	17	6											16						1								
	LT	29	2				1	1	17					5						3				1	1			
	ST	113	12				5	5	45					32	5					11	2	6		2				
	Total	234	33			2	8	8	73					79	7					44	2	6		3	2			
	Percent					0.9	3.4	3.4	31.2					33.8	3.0					18.8	0.9	2.6		1.3	0.9			

Spencer - CPUE and Species Composition by Collection Technique																											
	method		CPUE	BLBH	BRBH	BC	BG	CC	CP	FHM	FMS	GAMB	GIZZ	GSF	LMB	PIKE	PKMN	RSH	RZB	SMB	STB	TFS	WC	WP	YBH	SUCKER	GILA	NO ID
	ELECTRO		24.3			1.4	1.4	2.7	15.1					35.6	2.7					39.7					1.4			
	LH		0.2			100.0																						
	SH		0.3				100.0																					
	MT		2.8											94.1						5.9								
	LT		28.0				3.4	3.4	58.6					17.2						10.3				3.4	3.4			
	ST		41.7				4.4	4.4	39.8					28.3	4.4					9.7	1.8	5.3		1.8				

FLOODING AND DRAINAGE

Photo mosaic of the flooded portion of Piute Farms located in the San Juan Arm of Lake Powell taken July 1999. Lake elevation was approximately 1,125 m. The reservoir inundated Clay Hills. Photograph was taken from "Raven Point" looking north.

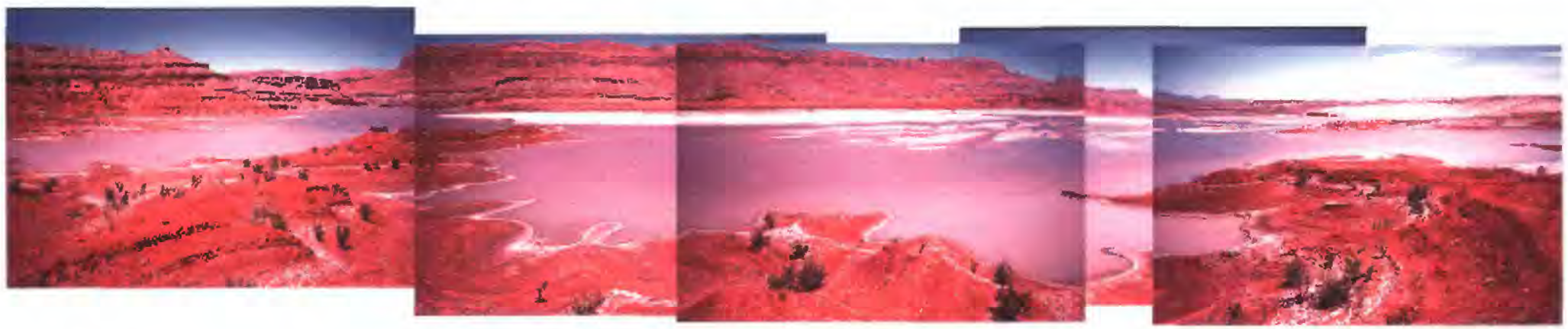


Photo mosaic of the flooded portion of Piute Farms located in the San Juan Arm of Lake Powell taken July 2000. Lake elevation approximately 1,122 m. Photograph was taken from "Raven Point" looking north. Notice the broad deltic alluvial fan of sandbars and shallow mud flats

NATIVE FISH

Photographs of Quent Brandwisch (l.) and Mike Horn (r.) holding razorback sucker captured from the Piute Farms area of Lake Powell in 1999. Note the hemorrhages caused by *learnea* (anchor worms).

Besides the razorback sucker, the Colorado pikeminnow (l.) and flannelmouth sucker (r.) constituted the native fish fauna found in the Piute Farms inflow area.

SAMPLING TECHNIQUES

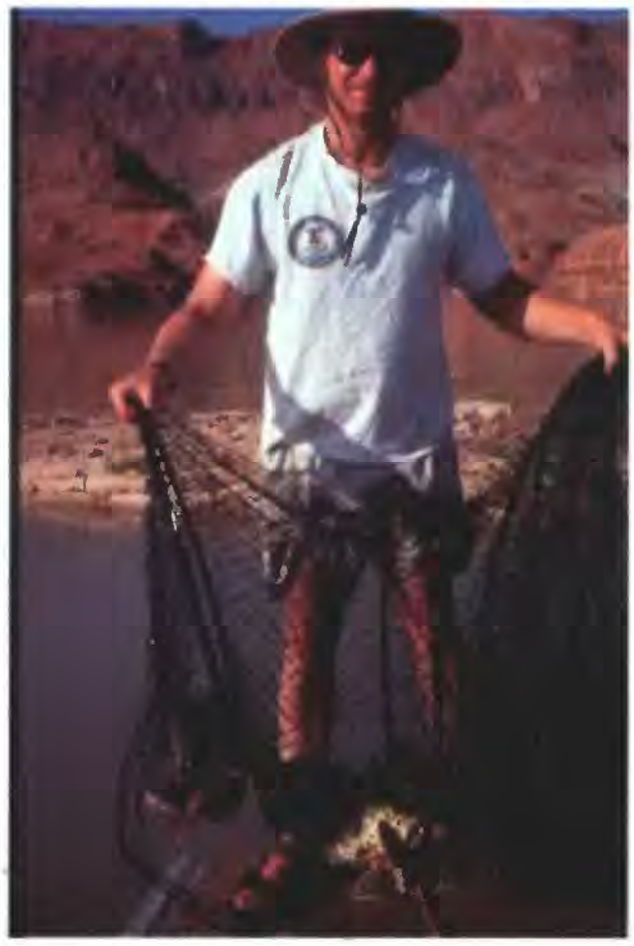
<u>Electrofishing</u> **worked well in shallow, inflow habitats especially around flooded brush. Turbidity at the inflow sites made it difficult for netters to see stunned fish while at Spencer's Camp they could easily capture fish at 2 m depths.. Spawning striped bass and walleye were quite vulnerable to captured in the Colorado River Arm of the reservoir.**

<u>Trammel netting</u>
proved the most effective method of capturing native and other adult fish. Eleven of the 13 razorbacks were captured with trammel nets. They also proved extremely effective for carp and catches of 100 carp per net were not uncommon.

SAMPLING TECHNIQUES

Larval light traps were set in April, May, and June 2000 at the inflow areas. Traps floated and were tied off o brush and allowed to fish overnight. . A light powered by flashlight batteries attracted larval fish which entered the trap and were collected in an attached plankton net.

Minnow traps were effective in capturing juvenile fish from flooded brush and along rock structure. Nets were collapsible and captured many of our juvenile sunfish, bass, crappies, and bullheads.



Hoop nets with center leads were either set in backwaters perpendicular to shore or set facing downstream in current. They were effective for crappie, sunfish, bullhead, and carp.

Striped bass were typically in good body condition. However, it appeared fish fell into two categories; (1) small adults that were robust and had good fat reserves and fewer (2) large framed fish that appeared near starvation. The emaciated fish had a large head, minimal muscle tissue, and often their ribs and backbones protruded under their skin. . Food was abundant and their poor condition could not be easily explained.

FISH THAT THRIVE IN INFLOW HABITATS

Redshiner and threadfin shad are the most numerous fish found in shallow inflow habitats. They are certainly one of the first to colonize newly flooded areas. Sampling suggests their numbers may reach over 200,000 fish/ha.

Black crappie communities appear dependent upon brushy, flooded habitat. Their young were commonly collected from minnow traps and adults were taken in hoop nets. Collection of several white crappie represented the first documentation of the species in Lake Powell.

Bullheads, both yellow and black, were among the first colonizers and were found on several occasions to have spawned in hoop and minnow traps.

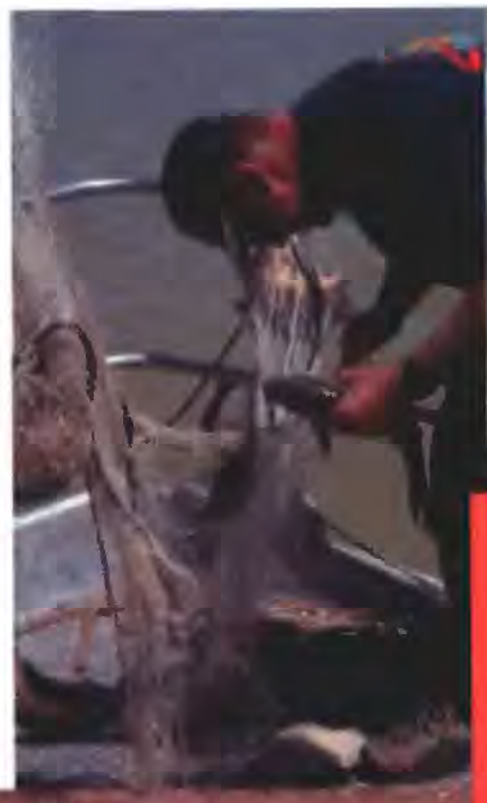
The first gizzard shad (*Dorosoma cepedianum*) taken in the Colorado River system was collected at Piute Farms (RM-52) on 6 June 2000. The fish measured 35 cm and weighed 470 g. If this species becomes, or is established, it could impact both recreational and native fish communities throughout the basin.

TRANSITIONAL HABITATS

<u>Rockfall Canyon</u> -- Changing reservoir elevations trigger a cycle of sediment building, headcutting, and rebuilding. The mouths of side canyons provide unique and rare backwater habitat. In time, these areas will completely filled.

<u>Dark Canyon</u> --We were able to motor inside this canyon in 1999 but lower reservoir elevations combined with siltation made that impossible in 2000. A huge sand berm which is being stabilized by vegetation is gradually plugging the canyon's entrance.

Lake Powell -- 1999-2000



"Best field crew - Bar none!"