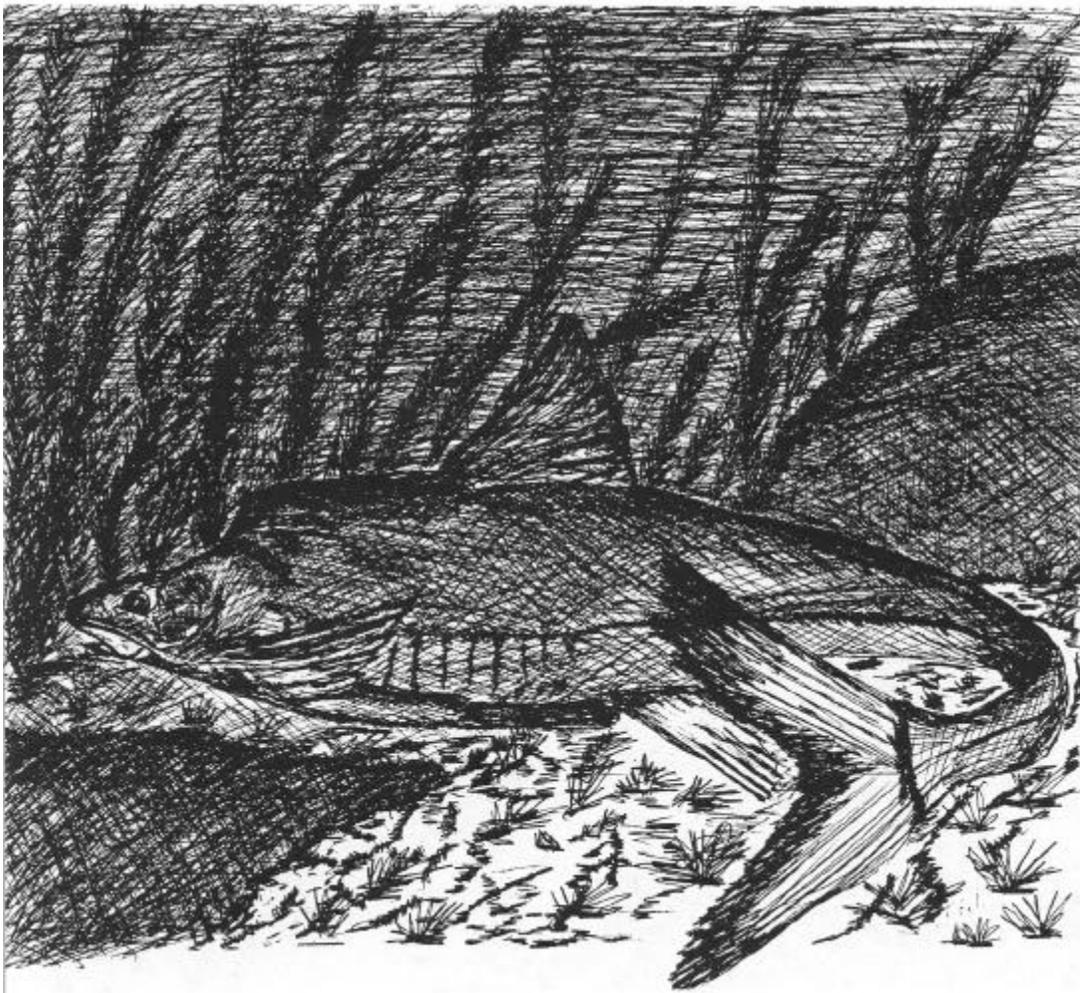


# Southeastern Utah's Fish



## Southeastern Utah's Fish (Piscinian Species)

Today, there are 42 species of freshwater fish inhabiting southeastern Utah's streams and lakes. At the time of Utah's settlement (1847) only 12 species of native (indigenous) fish inhabited the region. Transplants of 30 species exotic to southeastern Utah have advantaged altered habitats, particularly for development of sport fisheries. Unfortunately, habitat change caused by man and competition with exotic fish has caused four indigenous species --humpback chub (*Gila cypha*), bonytail chub (*Gila elegans*), Colorado squawfish (*Ptychocheilus lucius*), and razorback sucker (*Xyrauchen texanus*) -- to become endangered with extinction. These same problems have caused another indigenous species, the roundtail chub (*Gila copei*), to become rare, although still occurring in numbers adequate for survival. Yet another species categorized as rare, the leatherside chub (*Gila copei*), was introduced as an exotic into the region. It is also rare in its native range. Fortunately, no fish species have become extirpated or extinct.

Without question, streams support more fish species than lakes. Generally, numbers of species decrease as elevation increases. For example, Ferron Creek drainage area at desert elevations supports many times more species of fish in streams or lakes as compared to numbers at sub montane or montane elevations (Table 1).

Each fish species has its own set of habitat requirements and each commands its own range of adaptability to changes in that environment. Although a fish population may survive the effects of an environmental change, reproduction, feeding, and general behavioral patterns may be negatively impacted, resulting in decreased reproductive success. The net result could be a smaller population.

Changes to water quality parameters can occur naturally or by man. In order to assess potential impacts and subsequently mitigate losses or disturbances, there must be an understanding of some of the life requisites and habitat requirements of fish.

**Table 1.** Numbers (#) of piscinian (fish) species that now (1990) inhabit drainage areas in southeastern Utah and the proportion (%) of that total which inhabit streams or lakes of each ecological association.

Drainage Areas/ # of Species	ECOLOGICAL ASSOCIATIONS					
	Cold Desert (3,700-5,800 ft.)		Sub montane (5,500-8,500 ft.)		Montane (6,500-12,721 ft.)	
	stream	lake	stream	lake	stream	lake
Lake Powell /29	0	100	0	0	0	0
San Juan River / 22	100	64	0	0	0	0
Recapture Creek /10	80	10	10	20	10	10
Montezuma Creek / 6	100	0	0	0	0	0
Halls Creek / 0	0	0	0	0	0	0
Bullfrog Creek / 0	0	0	0	0	0	0
Dirty Devil River / 20	90	0	70	0	20	0
Fremont River / 5	100	0	60	0	20	0
Muddy Creek / 7	86	0	71	14	29	14
Colorado River / 35	94	28	60	0	26	0
Green River /31	97	10	64	10	64	6
San Rafael River/ 23	91	13	61	0	13	0
Ferron Creek / 10	80	10	70	50	60	40
CottonwoodCreek/10	60	10	70	30	60	40
Huntington Creek / 13	61	46	61	38	38	23
Price River / 18	83	28	83	22	67	28
Willow Creek / 3	33	0	67	67	67	67
White River / 9	22	0	44	0	67	11
Scofield and Tributaries /7	29	14	43	14	86	71
Nine Mile Creek /2	50	0	100	50	0	0
Indian Creek / 2	0	0	50	50	100	100
Kane Springs Creek / 0	0	0	0	0	0	0
Mill Creek /5	40	20	100	20	60	40
Dolores River / 17	100	6	60	0	12	0
East Coyote Wash /1	100	100	0	0	0	0
La Sal Creek / 4	0	0	75	25	50	50
Granite Creek / 1	0	0	0	0	100	100

Fish are "cold-blooded" animals which rely heavily on their environment for regulation of body temperature. Dependent upon the species, its health, and environmental factors, long-term deviations from optimum temperatures could directly hinder biological processes of the species and may even result in disease and death. Short-term drastic fluctuations in temperature could cause immediate shock and death to fish. Indirect impacts to fish can occur from the loss of various food species (hydrophytes, plankton, and invertebrates) due to temperature changes or other pollution factors. Fish reproduction and larval survival appear to be the most sensitive life processes to changes in temperature outside the optimum range.

The amount of dissolved oxygen (DO) in water is often used as a gauge to measure the potential of the stream or lake to sustain aquatic life. Generally, a DO concentration of 5.0 parts per million (ppm) is necessary to maintain healthy fish populations. Again, this will vary depending on species, age, and health of the organism as well as other environmental factors. DO levels are directly related to temperature changes. As temperatures increase, DO levels decrease, while at the same time the dissolved oxygen requirements of fish increase. At spawning areas, consideration also needs to be given to the substrate type where eggs are deposited when making decisions on desirable DO concentrations. If the substrate is not sufficiently porous to allow easy flow of oxygenated water to the egg surfaces, DO levels of only 5.0 ppm may not be adequate to sustain the eggs through incubation.

Total dissolved solids (TDS) is a term that describes dissolved inorganic salts, small amounts of dissolved organic matter, and other dissolved materials in water. Most freshwater fish cannot tolerate TDS concentrations exceeding 15,000 ppm. Salinity factors specifically identify the dissolved inorganic salt content of water of which carbonates, chlorides, sulfates, nitrates, sodium, potassium, calcium, and magnesium are the principal ions.

Turbidity, which is most often measured as nephelometric turbidity units (NTU), describes the amount of suspended solids in the water column. Jackson turbidity units (JTU) are just another type of turbidity measurement. Suspended solids, identified in parts per million (ppm), reduce the amount of light penetration through the water. This can subsequently reduce the abundance of food available to the fish by hindering growth of the food species. Resultant turbidity of water due to suspended solids can also disorient fish to the point of modifying their behavioral patterns, movements, and migrations. More immediate impacts of turbidity can directly abrade the mucous coating of a fish and reduce its resistance to disease. This can result in death or a reduced growth rate. Generally speaking, increases in NTU that exceed 10% of background conditions represent negative impacts to aquatic systems.

Settleable solids fall into gravel spawning beds and can cause high egg and larval mortalities. Silt can adhere to egg surfaces preventing oxygen and carbon dioxide exchanges. Damage can also occur to the invertebrate population. If settleable solids are organic, their accumulation will result in decreased dissolved oxygen concentrations.

The measure of hydrogen ion activity in water (pH) is regulated by a water's carbonate system. The range of 6.5 to 9.0 pH is considered suitable and healthy for freshwater aquatic life. Generally, pH values outside of this acceptable range cause adverse physiological effects to aquatic life. Such effects increase in severity as the degree of pH deviation increases until mortality is experienced. Rapid variations of pH within this range should be avoided as resultant adverse effects could result in mortality. Changes in pH effects dissociation of weak acids and bases which also results in the increase of toxic effects of metallic ions on fish life.

Life requisite information for the following fish species attempts to take into account some of the water quality parameters that can potentially affect populations. In some cases, optimum conditions are specified, whereas other parameters are analyzed for conditions considered to be lethal. In addition, life history information is outlined with focus on preferred habitat, spawning seasons, and egg incubation periods. All water bodies are considered critical valued habitat for the obvious reason that fish require these habitats for basic life functions. Both stream and lake categories broadly refer to bodies of running or standing water, respectfully, regardless of size.

Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
		Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
Family: Clupeidae threadfin shad <i>Dorosoma petenense</i>  These exotic nongame fish are found in Lake Powell and adjoining tributaries. They are the major forage source for the lake's sport fishery. Shad spawn in June and July when water temperatures reach 68-70°F. Eggs incubate for 4 to 5 days. Adult survival requires water temperatures greater than 45°F. Abrupt temperature drops below 54°F can result in high mortality. TDS levels <5000 ppm are considered optimal. At water temperatures #59°F, optimum DO concentrations are >7 ppm. At water temperatures >59°F DO concentrations should be \$9 ppm.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	1	1				

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental

Piscinian Species  (* high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific)	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
Family: Salmonidae *cutthroat trout <i>Oncorhynchus clarki</i>  These indigenous game fish inhabit cold, clear waters of all elevations. They do well in small streams. Optimum DO concentrations are >7ppm at water temperatures #59°F and \$9ppm at water temperatures >59°F. It has been reported that feeding behavior stops at turbidity levels >35ppm. Spawning occurs from March through mid June when water temperatures exceed 40°F. At 50°F, the eggs will incubate for 41 days. Clean gravel/cobble zones (0.08 to 2.5 inch diameter), having a substrate depth and a depth of flowing water each of at least 6 inches, provide optimum conditions for redd development. The Yellowstone ( <i>O.c. bouvieri</i> ), Snake River ( <i>O.c. ssp.</i> ), and Colorado ( <i>O.c. pleuriticus</i> ) subspecies inhabit southeastern Utah.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek						
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		Stream	Lake	Stream	Lake	Stream	Lake		
*rainbow trout <i>Oncorhynchus mykiss</i>  These exotic nongame fish inhabit cold, clean waters of all elevations. "pH" values of 7 to 8 are optimal for growth. Minimum DO values of 4.0 to 4.5 ppm are required for healthy populations. They survive well in fast water, although they are stocked in many lakes and small farm ponds. Spawning occurs between April and June when water temperatures approach 44 to 48°F. At 50°F, 41 days is required for incubation. Optimum growth occurs at water temperatures of 62°F. Clean gravel/cobble zones (0.08 to 2.5 inch diameter), having a substrate depth and a depth of flowing water each of at least 6 inches, provide optimum conditions for redd development. This species does not compete well with kokanee, Utah chubs, or white suckers.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek		u			l	l	l	l
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		Stream	Lake	Stream	Lake	Stream	Lake
*splake <i>Salvelinus namaycush x fontinalis</i>  These exotic hybrid game fish are found only in Joes Valley Reservoir. Their presence is the result of stocking lake trout (female) and brook trout (male) fingerlings produced from laboratory hybridization. They are not expected to naturally reproduce.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek				1		
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		Stream	Lake	Stream	Lake	Stream	Lake
*brook trout <i>Salvelinus fontinalis</i>  These exotic game fish inhabit cold, clear waters at any elevation with an optimum turbidity of 0 to 3 JTU. Spawning is initiated in October when water temperatures drop to 50°F and lasts until water temperatures drop below 41°F. Eggs hatch in 68 days at 45°F. Clean gravel/cobble zones (0.8 to 2.5 inches diameter), having a substrate depth and a depth of flowing water each of at least 6 inches, provide optimum conditions for redd development. Water temperatures of 80°F are lethal. They tolerate pH levels of 3.5 to 9.8. Alkalinity <10 ppm and TDS <20 ppm have resulted in stunted growth. The species shows a tendency to overpopulate, resulting in stunted growth.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek						
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		Stream	Lake	Stream	Lake	Stream	Lake
<p>Family: Salmonidae *kokanee <i>Oncorhynchus nerka</i></p> <p>Although they do best in high, cold, large mountain lakes, these exotic game fish have been verified in cataract canyon. They prefer well oxygenated waters of 50-59°F. They spawn over gravel bars from late August to January when water temperatures are 39-46°F. Hatching occurs from April through June. Zooplankton comprise the bulk of their diet. Obstructions along spawning runs appear to be the major limiting factor to the kokanee.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>	o					

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		Stream	Lake	Stream	Lake	Stream	Lake
Family: Esocidae *northern pike <i>Esox lucius</i>  These game fish inhabit cold desert and submontane waters. Spawning runs of these exotic, carnivorous fish begin as soon as the ice melts and at water temperatures as low as 34°F. Spawning continues at water temperatures 40-52°F. Shallow, weedy areas and stable water levels are critical to successful spawning. Eggs hatch in 12-14 days when water temperatures are 48-52°F. Maximum growth occurs between 66°F and 70°F. At 82°F, populations of these fish cannot survive prolonged DO concentrations <1.5 ppm. The upper TDS limit is 3500 ppm. These fish inhabit waters with pH range of 5.0 to 8.9. Adults forage on fish and small vertebrates.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	u	u				
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		Stream	Lake	Stream	Lake	Stream	Lake
Family: Cyprinidae longfin dace <i>Agosia chrysogaster</i>  These indigenous nongame fish prefer streams with sandy substrates in the cold desert zone. Spawning is initiated from February through August and occurs in shallow waters with slight currents and sandy bottoms. Water temperatures of 75°F are required for hatching which occurs after a 4 day incubation period. These fish are not harmed by flooding.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	u					
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		Stream	Lake	Stream	Lake	Stream	Lake
<p>*humpback chub <i>Gila cypha</i></p> <p>These indigenous nongame fish inhabit cold desert and submontane waters. They are endemic to the large rivers (Colorado, Green, Dolores, and San Juan Rivers) of the Colorado River Basin. They have become endangered due to habitat inundation by dams and subsequent cold water releases. Spawning occurs when water temperatures range from 66- 72°F. This occurs in deep turbulent canyons from May through June. Eggs hatch in 4-7 days at water temperatures of 66-68°F. Young-of-year fish inhabit back-water areas from early July through late November. Optimum larval maintain DO concentrations of 9 to 21 ppm and pH values of 7.9 to 8.75. Adults have been found in waters with TDS levels as high as 11,600 ppm.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>	e	e				
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*bony tail chub <i>Gila elegans</i>  These indigenous nongame fish inhabit cold desert and submontane waters. They are endemic to the large rivers (Colorado, Green, and San Juan) of the Colorado River Basin. They have become endangered due to habitat inundation by dams and subsequent cold water releases. Spawning occurs over gravel bars of shallow pools from June to July at water temperatures of 64-70oF. Eggs hatch in 4-7 days when water temperatures range from 68-70oF. Young-of-year fish inhabit backwater areas from early July through late November. Optimum larval conditions exist when DO concentrations are 7.6 to 10 ppm and pH values are 7.8 to 9.0.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	e	e				
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		Stream	Lake	Stream	Lake	Stream	Lake
*roundtail chub <i>Gila robusta</i>  These indigenous nongame fish, which are only found in waters of cold desert and submontane zones, are protected in the state of Utah. Spawning occurs from May to August at water temperatures of 62- 68°F. Eggs hatch in 6-8 days. Shallow pools seem to be preferred spawning sites. Rubble and boulder substrates covered with silt are usually found at the bottom of the pools. Introduction of exotic fishes has caused competition for these fish, resulting in substantial population reductions.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek		r				

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brassy minnow <i>Hybognathus hankinsoni</i> These exotic nongame fish inhabit waters of desert elevations. They feed primarily on plankton. Eggs are deposited over vegetation during a 10 day spring spawning season when water temperatures range from 60-80°F. Eggs incubate for 4 days at 70°F. The fish prefer acidic water.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	o o					

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<p>*Colorado squawfish <i>Ptychocheilus lucius</i></p> <p>These indigenous, carnivorous nongame fish have become endangered due to competition with exotic fish and habitat inundation by dams and subsequent cold water releases. Spawning occurs from July through mid August when water temperatures are 68-75°F. Eggs will hatch in 3-5 days at these temperatures. Fast water areas having cobble/rubble substrates provide spawning habitat. Young-of-year fish inhabit back water areas until late November. The species will tolerate high turbidity but does best if TDS concentrations are 560 to 1150 ppm and the DO concentrations is &gt;7.0 ppm. Optimum pH values range from 6.5 to 8.5.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>	e	e				

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		Stream	Lake	Stream	Lake	Stream	Lake
<p>longnose dace <i>Rhinichthys cataractae</i></p> <p>These exotic, carnivorous nongame fish are found in clear waters of submontane and montane zones. They are valuable bait and forage species for trout. They breed in shallow, gravelly riffle areas from May to August at water temperatures of 57-66°F. At a water temperature of 60°F, the eggs will hatch after 7-10 days. The young will inhabit the mid water column, although as adults (4 months of age) they will become bottom dwellers in riffle and run areas that are up to 3 feet deep. Optimum reproduction and growth occurs in waters with DO concentrations &gt;7.0 ppm. pH values of 6.5 to 8.5 are preferred.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>			u			u

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental





Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
Family: Castostomidae white sucker <i>Catostomus commersoni</i>  These exotic nongame fish are only found in waters of cold desert elevations. They are omnivorous. Spawning occurs in swift streams with gravel substrates from April to June when water temperatures reach 54°F. Spawning migrations begin when water temperatures reach 50°F. A pH value of 5.8 has been shown to result in high reproductive success. Eggs incubate for 8-11 days at water temperatures of 50-59°F. Adult white suckers use pools that are 23-26 inches deep for cover, as well as rest stops during migration. They prefer turbidity levels <50 JTU's and avoid DO concentrations <2.4 ppm.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	u					

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Piscinian Species  (* high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific)	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
flannelmouth sucker <i>Catostomus latipinnis</i>  These indigenous nongame fish inhabit waters of cold desert and sub montane elevations. DO concentration levels >7.0 ppm and pH values between 6.5 and 8.5 are optimal. The species can tolerate highly turbid conditions. They feed on aquatic vegetation and zooplankton. Spawning occurs in riffle areas from April to May when water temperatures reach 43-50°F. The eggs will hatch after about 6 days. Adults can be found at depths of 1 to 20 feet, in sparsely vegetated pools of large streams. Construction of dams can prove to have negative effects on populations as cold water releases prevent spawning downstream.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek		c	c			

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Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
*razorback sucker <i>Xyrauchen texanus</i>  These indigenous, nongame fish are a federally listed endangered species. They occur in water of desert and submontane elevations. Successful reproduction has not been documented in the last 25 years. Populations have declined due to the competition with introduced exotic fish, as well as habitat inundation by dams and subsequent cold water releases. The species is adaptable to a wide array of habitats and can be found in shallow rivers or lakes with depths of 1-20 feet. Spawning occurs during a 6 week period in April and May when water temperatures reach 53-64°F. Riffle areas with cobble/rubble substrates are used for spawning areas. At 70°F, 4-6 days are required for incubation.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	e	e				
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Piscinian Species  (* high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific)	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
Family: Ictaluridae *black bullhead <i>Ameiurus melas</i>  These exotic, omnivorous game fish inhabit waters of cold desert and submontane zones. Spawning occurs between May and July when water temperatures range from 66-76°F. Eggs are laid in log stumps, muskrat dens, vegetation, or simple depressions where water is 1-4 feet deep. Incubation lasts about 15 days. Preferred habitat consists of still ponds and lakes with vegetated silt bottoms. The fish can tolerate pH levels down to 3.4 but do best in pH ranges of 6.5 to 8.5. Optimum DO concentrations are >7.0 ppm. During the summer, DO ~3.0 ppm is considered lethal but in the winter the concentration can drop to 0.2 to 0.31 ppm for short periods. The fish prefer TDS levels of 100-600 ppm. Larval growth is impaired when salinity concentrations are >800 ppm. Black bullheads do not do well in areas populated with other fish.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	u	o				
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Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
*channel catfish <i>Ictalurus punctatus</i>  These exotic, omnivorous game fish inhabit waters of cold desert and submontane zones. Growth is best in waters where the turbidity <100 ppm. Preferred TDS levels are 100-350 ppm, DO concentrations are ~7.0 ppm, and pH values are 6.5 to 8.5. No growth occurs when salinity is >11.0 ppt. Spawning can only occur when salinity <2 ppt. Spawning occurs from May-July when water temperatures reach 70°F. Submerged debris is critical for survival since it provides nesting sites and cover. Incubation lasts 7 days at 80°F. Lake habitats include littoral and limnetic zones whereas deep pools are utilized in riverine systems.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	c	c				

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Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
Family: Cyprinodontidae plains killifish <i>Fundulus zebrinus</i>  These exotic, omnivorous, nongame fish inhabit clear, shallow waters of the cold desert zone. Spawning occurs in July and August when water temperatures reach 79°F. The eggs are deposited in small, shallow pools over sand or gravel. They incubate for 4 days at 75°F. No care is provided to the eggs or fry by the parents. These fish are adaptable to high salinity, alkalinity, turbidity, and dissolved solid concentrations. They also tolerate low dissolved oxygen concentrations.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	c	o				

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Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
<p>Family: Percichthyidae *striped bass <i>Morone saxatilis</i></p> <p>These exotic, carnivorous, game fish inhabit waters of cold desert and submontane elevations. They occur where pH values are 5.5 to 9.1 and can do well at turbidities of 1.5 to 170 JTU. Spawning occurs from April to June when water temperatures are between 53°F and 70°F. Eggs are deposited near the surface and abandoned to drift until hatching, which occurs within two days at 65°F. In riverine systems, strong currents are needed to keep the eggs afloat to assure successful hatching. Zooplankton are critical as forage for the fry. A pH level between 7.5 and 8.5 is considered optimal. Young are intolerant of rapid fluctuations in pH. Growth of the fry and subsequent foraging occurs in lacustrine or estuarine habitats.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>	u	c				

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Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
<p>Family: Centrarchidae *green sunfish <i>Lepomis cyanellus</i></p> <p>These exotic, game fish inhabit waters of cold desert and submontane zones. They prefer waters with turbidities of 25-100 JTU and pH values of 6.5 to 8.5. Optimum DO concentrations are &gt;5.0 ppm. DO concentrations #1.5 ppm are considered lethal. They won't tolerate salinity levels &gt;5.6 ppt and do best where levels are &lt;3.6 ppt. Spawning occurs in 2-8 feet deep pools from May-August when water temperatures reach 66-68°F and do not exceed 82°F. The male guards the nest which is constructed in weedy areas under debris. At water temperatures of 75°F the eggs will hatch in 3-5 days. These fish do not tolerate the presence of other fish and are often competitive with young game fish. Vegetation along the stream bank or lake shore is critical for providing a sufficient supply of insects for food.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>	<p>u</p> <p>c</p> <p>l</p>					
<p>1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental</p>							



Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
*smallmouth bass <i>Micropterus dolomieu</i>  These exotic, carnivorous, game fish prefer to inhabit waters of cold desert and submontane zones with turbidity levels of 25-75 JTU. Waters should also maintain TDS concentrations of 100-350 ppm. Spawning occurs over a 6-10 day period between mid April and June when water temperatures reach 61-65°F. Eggs hatch in 2 to 3 days at water temperatures of 75°F. After hatching, the fry drop into the gravel for 6-10 days. The smallmouth's preferred habitats are deep, large, cool waters with little vegetation. An abundance of rock and gravel substrate is important in providing cover. The optimum pH range is 7.9 to 8.1. Growth will not occur until water temperatures reach 50-57°F. Water temperatures from 69-81°F are optimum for adults. DO concentrations >6.0 ppm are also necessary for optimum growth.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	1	1				

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Piscinian Species  (* ) high-interest because of economic, aesthetic, educational, scientific, or ecological value scientific	Indigenous/exotic	Relative Abundance by Ecological Association <sup>1.</sup>					
	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
<p>Family: Percidae *yellow perch <i>perca flavescens</i></p> <p>These exotic, carnivorous, game fish inhabit waters of the cold desert lone. Spawning occurs in freshwater between April and June when water temperatures range from 42-50°F. At times, yellow perch have been found in waters with salinities as high as 13.0 ppt. Eggs are deposited over vegetation in quiet waters that are 3-12 feet deep. Eggs hatch in 8-20 days. Water with pH values &lt;5.5 reduce reproduction success. Large, warm lakes are preferred by the perch, although they are adaptable to cooler lakes and rivers. Water temperatures of 66-75°F result in optimum growth for the adult fish. Dissolved oxygen concentrations &gt;5.0 ppm are optimal.</p>	<p>Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek</p>	u					
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	Drainage areas arranged by stream order	Cold Desert (3,700 - 5,800 ft.)		Submontane (5,500 - 8,500 ft.)		Montane (6,500 - 12,721 ft.)	
		Stream	Lake	Stream	Lake	Stream	Lake
*walleye <i>Stizostedion vitreum</i>  These exotic game fish are carnivorous and occur at all elevations where waters maintain pH values of 6.0 to 9.0. Spawning occurs from April-May when water temperatures range from 42-48°F. Eggs are deposited between rocks in 3-9 feet of water with moderate currents. They are also known to use riprap along banks and dams for deposition of eggs. Walleye eggs hatch in 12-18 days. Adult fish prefer large, clear bodies of water up to 45 feet deep and 50-100 acres in size. They use the shallow areas for feeding and spawning. Optimum conditions for growth occur at water temperatures of 68-75°F and dissolved oxygen concentrations over 3.5 ppm. DO concentrations <1.0 ppm are considered lethal.	Lake Powell San Juan River Recapture Creek Montezuma Creek Halls Creek Bullfrog Creek Dirty Devil River Fremont River Muddy Creek Colorado River Green River San Rafael River Ferron Creek Cottonwood Creek Huntington Creek Price River Willow Creek White River Scofield Tributaries Nine Mile Creek Indian Creek Kane Springs Creek Mill Creek Dolores River East Coyote Wash LaSal Creek Granite Creek	o	l				
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