I. Watershed Characterization

Culture and History

Set on the far southeast corner of Idaho, Bear Lake canvases 160 square miles. Its azure blue appearance lends it the nickname of "Caribbean of the Rockies." For thousands of years, Native Americans used the area for hunting and fishing. Black bears were especially large in number for the region, hence the lake's name. The Shoshone in particular would ride through the area on their way to Wind River.

The lake was an abundant source of sustenance. On its shores, the natives could gather food and skins to trade with mountain men like Jim Bridger. A rendezvous gathering was held yearly at Rendezvous Beach on the north corner of Lake Town.[1] By 1827-29, the region became the center of the fur trade industry. Oregon pioneers passed through on their way to California as they made their way down the steepest slope they had covered so far known as the 'Big hill'.

Permanent settlers came to the area in 1863 with the expansion of Utah Mormon Pioneers. The climate was harsh in many ways, but the Mormons developed the land with the establishment of cheese, fruit, and grains and meat cooperatives. Canals and ditches were quickly built so that the farmers could harness the right amount of water seasonally for their growing communities and crop production.[2]

In 1902, a power company began to build canals that brought water in and out of Bear Lake. According to Rock Holbrook, systems manager from the modern day controller, PacifiCorp, the two canals were over 15 miles long and the company lost a man for every mile as wagon teams broke through the ice and fell into freezing water.

Ten years later, the lake had effectively been turned into a reservoir, and the river was stopped in its bed. The Lifton Pumping Plant regulates the flow of a million gallons of water so that the lake's level doesn't overfill or subside. Holbrook says, "It's a real juggling match. I don't know of many other natural lakes that are used as reservoirs." Farmers especially rely on the project and use storage water two out of every three years to get their crops to mature to the point of harvest.

Geology

The Bear Lake Valley is not of typical basin and range structure, but it is a graben, or a fault bounded basin. Both faults along the east and west side of the valley are presumed to be active by the Berry and Popelak study. The valley bottoms are mainly of the Quaternary period of the Cenozoic era.[3] The Bear River Range contains Paleozoic material of the Paris thrust plate.[4] Figure 1 shows the geologic time period

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[1] http://www.oregontrailcenter.org/Resources/recreation1.html

[2] Riechert, Bruce, host for "Welcome to Outdoor Idaho." Bear Lake County Program Transcript. www.idahoptv.org/outdoors/shows/bearlake/transcript.html

[3] Bear Lake County Comprehensive Plan – 2025 (2002) pp. 27

[4] Geology, Digital Atlas of Idaho 2000. Idaho Museum of Natural History. On-line: available http://imnh.isu.edu/digitalatlas/maps/webmaps/rrt/htmls/brlkvly/geology.htm

and locations throughout Bear Lake County. The Bear River Range is mainly comprised of limestone and dolomite, containing probably the most reliable aquifers in the area. The Wasatch and Salt Lake groups are both largely conglomerate aquifers, and are thus not regarded as having good potential for ground water development. The higher elevations of the St. Charles Creek watershed are made up of mostly marine dolomites, limestone, and sandstone with localized karst topography. The lower elevations, near the lakeside and the Dingle Swamp area are mostly lacustrine sediments of lake bottoms from the Recent age. The soils here contain high organic matter and high water tables prevail.[5]

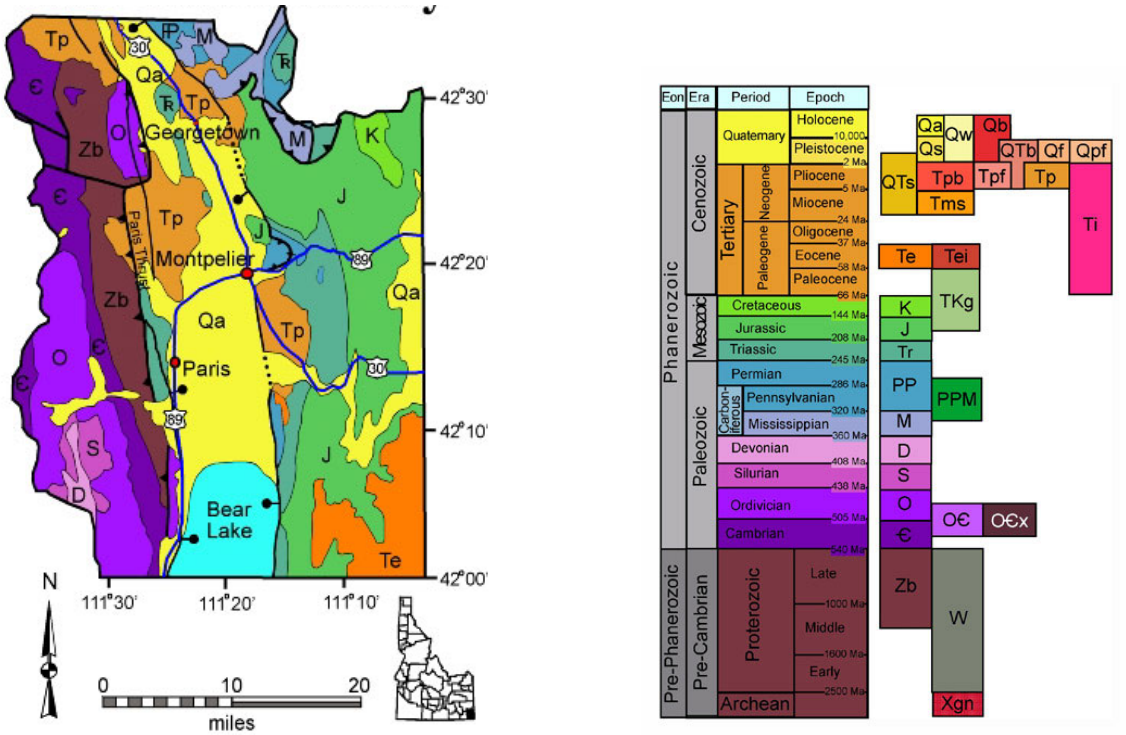


Figure 1: Geologic map of Bear Lake County from Digital Atlas of Idaho (2000).[6]

The slope of the St. Charles Creek watershed ranges from zero in the flat valley floor near the lake, to greater than 30% in the mountains closer to the headwaters of the creek. According to the Bear Lake County comprehensive plan they regard anything over 30% slope as too steep for development. The slopes of 21-30% are feasible for development but require special techniques. Caution and planning is also required in areas of 10-20% slope especially during construction of roads. The category of 0-10% is considered most suitable for development.[7] Figure 2 shows the slope categories from the Bear Lake County comprehensive plan.

[5] Bear Lake County Comprehensive Plan – 2025 (2002) pp. 35
[6] Digital Atlas of Idaho 2000. Idaho Museum of Natural History. Available on-line: http://imnh.isu.edu/digitalatlas/
[7] Bear Lake County Comprehensive Plan – 2025 (2002) pp. 32

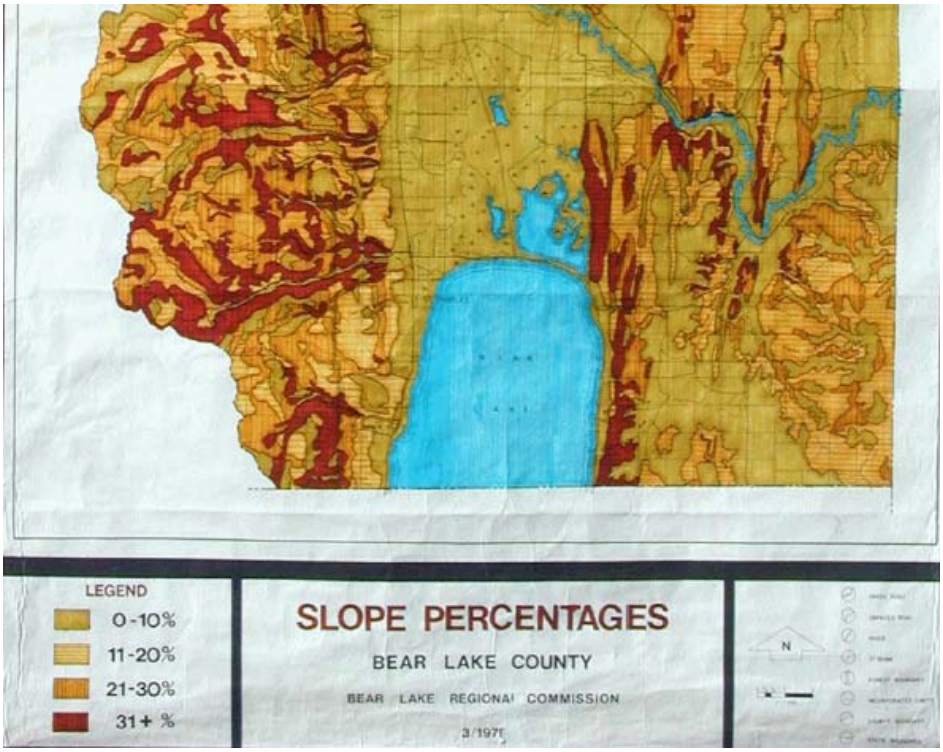


Figure 2: Slope categories from Bear Lake County, Idaho Comprehensive Plan 2025 (2002).[8]

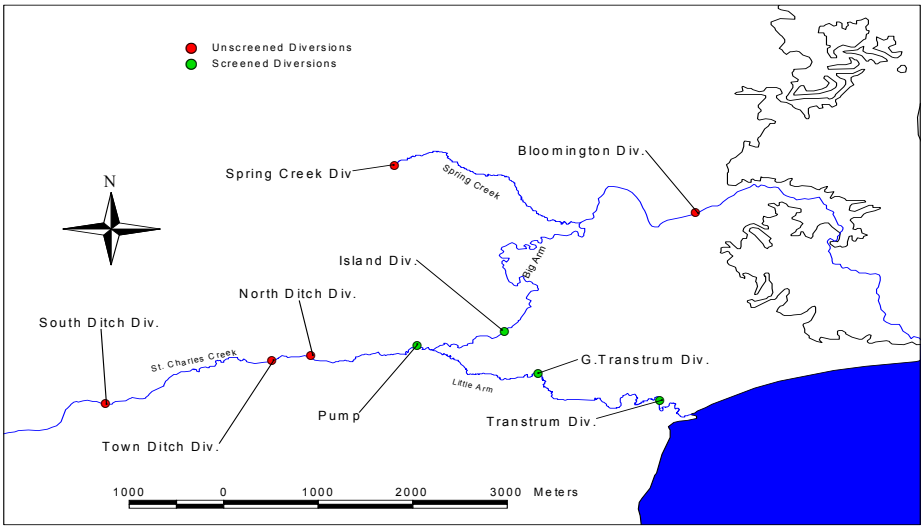
Climate

The Bear Lake area is known for its long, cold winters and short summers that dictate much of the crop growing ability in the area. Cool nights and warm days make the area ideal for growing raspberries.[9] However due to a short growing season, crops are limited to mostly wheat, barley, oats, alfalfa, and wild hay. Temperatures range from below zero to 90 degrees Fahrenheit. Comfortable summers have high temperatures averaging in the 80's with low temperatures near 50 degrees Fahrenheit. The winters however are cold with temperatures mostly in the 30's or lower throughout the season.[10] The average annual precipitation in the Bear Lake area is 9.5 inches[11], however higher up in the watershed there is much more moisture. Average annual precipitation in the higher elevations can reach up to about 40 inches.[12]

[8] Bear Lake County Comprehensive Plan – 2025 (2002) pp. 33
[9] Barraclough, Kim. 2000. From black bears to Bear Lake. Available on-line: http://www.hardnewscafe.usu.edu/archive/august2000/0803_bearlake.html
[10] Bear Lake County Comprehensive Plan – 2025 (2002) pp. 2
[11] Bear Lake County Comprehensive Plan – 2025 (2002) pp. 2
[12] Digital Atlas of Idaho 2000. Precipitation patterns. Idaho Museum of Natural History. On-line: available http://imnh.isu.edu/digitalatlas/

Basic Hydrology

St. Charles Creek is a 14.4-kilometer, second-order stream that flows eastward out of the Bear River Range. Its headwaters originate from elevations as high as 3400 meters and descend to 1805 meters where it enters Bear Lake. The creek splits into two separate arms, the Big Arm (or Big Creek) and the Little Arm, before it reaches the Lake. There are a number of diversions above and below the split (See Figure 1). The stream has two very different personalities at either end of its course: it is relatively pristine for the first several kilometers below its headwaters but upon approaching its confluence with Bear Lake, it has been heavily manipulated to the point that it serves very few of its original hydrologic functions.



Its upper portion is characterized as a high gradient (5%) stream with a forested riparian area and boulder dominated substrate' with a few lower-gradient segments that contain finer sediment (Burnett, 2002); this stretch is further typified by lower sinuosity and higher degrees of turbulence than can be found downstream (Jacobsen, 1995). A 10.1-kilometer free-flowing segment beginning near the headwaters 'met outstandingly remarkable "fisheries" values and was determined to be eligible for further study under the Wild and Scenic River Act' (Caribou-Targhee DEIS). The lower portion of the creek can be characterized as a low gradient (1%-2%), meandering stream with finer substrate and segments of high sedimentation (caused by diversion structures); willows are the dominant vegetation. The middle portion of the creek has conditions that fall between those found in the upper and lower portions; riparian vegetation represents a transition from mixed conifer forest to dense stands of willow. The width/depth ratio of three reaches measured by Jacobsen ranges from 17.4 to 1 at the lower end, 12.8 to 1 in the middle, and 14.0 to 1 at the upper end (Jacobsen, 1995).

The flow regime coincides with variations in the seasonal snowpack; higher flows occur during spring runoff and lower flows occur as the snowpack melts through the summer months. In 1961, the mean daily discharge (of the Upper Fork) ranged from a low of 20.1 cubic feet per second (c.f.s.) and 1,234 acre-feet in February to a high of just 56.7 c.f.s. and 3,485 acre-feet in May. By comparison, in 1986 the mean daily discharge (also of the Upper Fork) ranged from a low of 26.3 c.f.s. and 1,615 acre-feet in February to a high of 165.0 c.f.s. and 10,145 acre-feet in June (See Table 1).

The water temperature (in degrees Celsius) of the mainstem remains fairly cool and stable through the summer months, from a low of 5 degrees Celsius to a high of 16

degrees Celsius. However, the water temperature increases dramatically after the diversions. Temperatures taken at the mouth of the Little Arm indicate a low of 6 degrees Celsius and a high of 28 degrees Celsius (See Table 2). The water temperature on the Big Arm remains cool until it reaches the Island Diversion, after which most of the water comes from Spring Creek and is warm (Burnett, 2002).

Fisheries Characterization

St. Charles Creek is a third order stream and subwatershed within the Bear Lake Watershed. The creek is approximately 14.4 km in length and considered to be critical Bear Lake Bonneville cutthroat trout spawning and rearing habitat due to its size and sufficient historical discharge. Its headwaters begin in the Bear River Range at an elevation of ~3400m and flow in an eastern direction into Bear Lake at 1805m. The creek's upper section is distinguishable by its forested riparian areas consisting of Lodgepole pine (*Pinus contorta*), Douglas fir (*Psuedotsuga menziesii*), and Aspen (*Populus tremuloide*s). Stream gradients in the upper reaches range between 2 – 5% and transition to gradients of less than 1% in the lower portions. Transitional vegetation between the upper and lower sections consists of mixed conifer stands to various willow, and sedge (Carex sp.) and grasses (Salix sp.). Water temperatures in the mainstem of St. Charles Creek remain cold and constant throughout the summer.

Above Highway 89, St. Charles Creek divides into two separate streams, the Big Arm Creek and Little Arm Creek . The Big Arm flows in a northerly direction and carries approximately 2/3 of the mainstem's water. Spring Creek joins the Big Arm and drains into Bear Lake via the Bear Lake National Wildlife Refuge, known locally as the Dingle Marsh.

The Little Arm Creek is located below US Highway 89 south of the Big Arm. It also empties into the northern end of Bear Lake. The gradient of the creek is slowed to <1.0% as it travels through private agricultural lands.

Aquatic Inhabitants

The stream provides suitable habitat to an assemblage of native and non-native fish species. Native fish include the Bear Lake Bonneville cutthroat trout (*Oncorhynchus clarki utah)*, mottled sculpin (*Cottus bairdi*), Bear Lake sculpin (*Cottus extensus*), longnose dace (*Rhynicthys cataractae*), redside shiner (*Richardsonius balteatus*), Utah chub (*Gila atraria*), Utah sucker (*Catostomus ardens*), mountain sucker (*Pantosteus platyrhynchus*), and speckled dace (*Rhynicthys osculus*). Non-native fish species of which some are believed to be strong competitors include rainbow trout *(Oncorhynchus mykiss),* brook trout (*Salvelinus fontinalis*), green sunfish (*Lepomis cyanellis*), yellow perch (*Perca flavescen*s) and European carp (*Cyprinus carpio*).

Other aquatic species that occur within and adjacent to the Forest include:

Cutthroat trout

Three cutthroat trout subspecies are native to Utah (Bonneville, Colorado River, and Yellowstone). The Bonneville cutthroat trout is very similar genetically and morphologically to the Yellowstone cutthroat trout yet distinguishable by its larger spots that are more evenly dispersed along lateral sides. While these two subspecies appear to have been allopatric in recent geologic history, genetic evidence for differentiation is potentially inconclusive (Behnke 1992). There exists a high degree of variability within the Bonneville basin stock ranging from higher counts of scales and pyloric caeca (a tubular pouch extending from an opening into the posterior stomach) found in the Bear River specimens to more gill rakers and smaller more profuse spots found in western Utah's Snake River population.

The Bear Lake Bonneville cutthroat trout is the only cutthroat population that has persisted in their native waters with nonnative trout. Some of their unique features include delayed maturation, long lifespan, piscivorous feeding behavior, and growth overwinter which is rare in cold climates. Spawners range from 4-11 years (mean =7) with over 90% (total n=351) of the population in the adult cohort greater than 6 years old. Repeat spawning is rare but does occasionally occur. Resisting hybridization because of its highly specialized adaptation to unique environmental conditions.

Bear Lake has been stocked with Yellowstone cutthroat trout, rainbow trout, and a Yellowstone X rainbow hybrid in the past.

Native Fish

Common Name	***Scientific Name***
Mountain whitefish	(*Prosopium williamsoni*)
Bonneville cisco	(*Prosopium gemmifer*)
Bear Lake whitefish	(*Prosopium abyssicola*)
Bonneville whitefish	(*Prosopium spilonotus*)
Leatherside chub	(*Gila copei*)
Utah chub	(*Gila atraria*)
Mottled sculpin	(*Cottus bairdi*)
Piute sculpin	(*Cottus beldingi*)
Bear Lake sculpin	(*Cottus extensus*)
Longnose dace	(*Rhinichthys cataractae*)
Speckled dace	(*Rhinichthys osculus*)
Redside shiner	(*Richardsonius balteatus*)
Utah sucker	(*Catostomus ardens*)
Bluehead sucker	(*Catostomus discobolus*)
Mountain sucker	(*Catostomus platyrhynchus*)

Introduced Non-native Fish

Common Name	***Scientific Name***
Lake trout	(*Salvelinus namaycush*)
Yellow perch	(*Perca flavescens*)
Carp	(*Cyprinus carpio*)
Green sunfish	(*Lepomis cyanellus*)

The Bear Lake strain of the Bonneville cutthroat is largely adfluvial along with a resident fish population inhabiting in the stream's upper reaches. The adfluvial BLBCT population's life cycle consists of the adults using St. Charles Creek in the spring for spawning, where eggs incubate and juveniles rear for up to two years before migrating out to Bear Lake. Spawners range from 4-11 years (mean =7) with over 90% (total n=351) of the population in the adult cohort greater than 6 years old and repeat spawning is rare.

General Habitat Characterization

Typical habitat requirements of salmonids include clean, well-sorted gravel and suitable velocities. Higher velocities maintain aeration of egg conglomerates and assist in the removal of waste. Depths range from 0.3 m or greater in areas and where slow waters are present that allow for resting (0 – 0.1 m/s) yet are bordered by swifter waters that provide food and bank cover. Annual flow regime has the greatest influence on trout biomass. The "best" flow regime has no significant difference between maximum and minimum flows during the year. (Binns and Eiserman 1979)

Representative trout rivers maintain dissolved oxygen levels (9-12 mg/L or more) in the spring, which is adequate for developing trout eggs. Aeration is important because surface oxygen concentration is dependent upon the permeability of redd. When gravel in the redds become clogged by fine sediment, dissolved oxygen decreases due to reduces water flow through the redds (Behnke 1992). The ideal temperature for Bear Lake BCT is 15 ° C, however summer temperatures often approach 25°C.

St. Charles system BLBCT redd's are typically found at the end of pools and meander/bends. Additionally, rearing habitat is characterized by cool water, and shallow tream margins with adequate cover. However fry, fingerlings and young-of-year are capable of surviving in pools. Potential predators to the fry and juvenile are mottled sculpin and possibly, Rainbow and Brook trout.

Wildlife Characterization

Information obtained from the Caribou-Targhee National Forest Plan (2000) identifies numerous species that reside within the watershed's diverse forested, rangeland and riparian habitat types. Of these types, several amphibian, avian and mammalian species are managed as species of special concern. Whether these individual species are considered "Sensitive Species" and "Species-at-Risk" by
the U.S. Forest Service or "Species of Special Concern" (SSC) by the Conservation Data Center lists and the Idaho Department of Fish and Game or Endangered/Threatened Species by the U.S. Fish and Wildlife Service, they are unique in their habitat and survival requirements. However, for the scope of this analysis it is not feasible to consider all Species-at-Risk in detail but will be limited to address those "sensitive species". For the purposes of this analysis, information will be limited to those confirmed species known to exist in or utilize the St. Charles watershed.

Sensitive Species

Sensitive Species are those species identified by the Caribou-Targhee Regional Forester for which "population viability is a concern, as evidenced by significant current and predicted downward trends in population numbers, density, and/or habitat capability that would reduce a species' existing distribution." (CTNF DEIS 2000).

The Forest has thirteen species of terrestrial wildlife designated as Sensitive and are known to exist within the St. Charles watershed. Of those thirteen, seven are primarily associated with forested habitats, two are primarily associated with rangeland habitats, and four are primarily associated with riparian/wetland habitats during all or a portion of their lives.

Mammalian Species

Forested Habitat

Townsend's Big-eared Bat (*Corynorhinus townsendii*)

The Townsend's big-eared bat is considered to be uncommon to rare over much of its North American range. The species occupies forests, savannah and shrub-steppe habitats. They have been found to occupy caves and abandoned mine on the Montpelier Ranger District in which the St. Charles Watershed is located. The caves and mines serve as summer roosts and winter hibernacula. In general, the bats will intermittently take shelter in buildings as well, but do not typically tolerate a hot, dry roost environment for long periods. Males are solitary or occur in small groups while females form maternity colonies in suitable warmer caves. Hibernation occurs in local caves that range from 42.8 – 53.6 degrees F. They forage well after dark and selectively forage for nocturnal moths and occasional flies and beetles.

Of eighteen caves and mines surveyed on the Montpelier Ranger District during the winter, eleven were found to have low numbers of Townsend's big-eared bats (Lengas 1996 as cited in CTNF DEIS 2000). Of twelve caves and mines surveyed on the Montpelier Ranger District during the summer, five had low numbers of Townsend's big-eared bats (Lengas 1995 as cited in CTNF DEIS 2000). The Minnetonka Cave has been identified as the singular bat habitat within the St. Charles watershed. It is located ten miles up the St. Charles Canyon. Features guided tours from about June 15 through Labor Day, along 'lie one - mile length. No large concentrations were found in any season.

Wolverine *(Gulo gulo)*

The wolverine is a member of the Mustelidae or weasel family, which also includes fishers and martens. It is the largest terrestrial member of the Mustelidae family with an average weight ranging between 25-40 pounds. Historically in the lower 48 states the wolverine once inhabited forests from Maine to Washington

and south along the Rocky Mountains into Arizona and New Mexico. Today the last remaining stronghold in the lower 48 states is in western Montana and parts of Idaho, with scattered sightings in a half dozen other states.

Wolverine habitat is largely coniferous forests and alpine tundra with long, severe winters. Its range may be anywhere from 30-250 square miles for a solitary animal; and has been known to extend to 770 square miles. Wolverines breed during the summer and give birth in late winter or early spring. Wolverine dens are often built in snow -covered tree roots, log jams, or rocks and boulders.

A small population is thought to occur on the Caribou-Targhee NF or may travel throughout southeastern Idaho and northern Utah. In March of 1996, four potential track sightings were documented in the Bear River Range (Bissonette 1997). Some of the higher peaks appeared to provide talus communities required for denning habitat. However, it is unlikely that wolverine denning occurs in the St. Charles watershed because of the high concentration of snowmobiling activity during the winter season. Additional surveys conducted in 1999, indicate the distribution of wolverines in seven locations in southeast Idaho. In 1987 the Idaho Fish and Game reviewed the status of wolverine in Idaho, few sightings were attributed to low human population density and the resultant roadless nature of potential habitat. (Groves 1987).

The wolverine is a carnivore and will feed on many things from small eggs to deer. Their strong compact body allows them to take down animals 5 times their own size. Prey can include deer, wild sheep and elk. However, despite its legendary appetite, strength and ferocity, the wolverine obtains much of its food by scavenging.

There is overall agreement that wolverine habitat is best defined by adequate food sources found year-round in large, remote areas. Researchers generally agree that wolverine habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely uninhabited areas, rather than in terms of specific topography or vegetation types. With increased outdoor recreation occurring on the forest, wolverine populations have generally been pushed into the lesser-developed habitats. General agreement is that wolverines are high-elevation species.

Rangeland Habitat

Spotted Bat *(Euderma maculatum)*

Spotted bats are known to use various habitat types including open forests, desert scrub and savannahs, as well as open pastures and hay fields. Spotted bats are rare and may be limited by suitable roosting habitats. They are likely to roost alone in rock crevices located on steep cliff faces. Roosting crevices will range in widths from .8 to 2.2 inches. Limestone and sandstone cliffs tend to be important roosting locations. Although little is known about the bat's food habits, some previous research has shown

they forage primarily on moths. Spotted bats are thought to migrate south for the winter, but information on seasonal movements and winter activity is very limited.

The spotted bat is known to occur in the northeastern portion of the Greater Yellowstone Area in Montana and Wyoming; however, extensive surveys in Idaho indicate the species is located in the southwestern part of the state Groves et al (1997). However, it has not been documented to occur on the Caribou-Targhee National Forest, but is thought to be present in suitable habitats within the St. Charles watershed (personal communication, Keysor 2002).

Other Fauna

Uinta chipmunk *(Tamias umbrinus)*
Rock squirrel (*Spermphius variegatus)*
Merriam's shrew *(Sorex merriami)*
Yuma myotis *(Myotis yumanensis)*
Long-eared myotis (*Myotis evotis)*
Long-legged myotis (*Myotis volans)*
Western small-footed myotis (*Myotis ciliolabrum)*
common Moose *(Cervalces scotti)*
elk *(Curvus elufus)*
Mule deer (*Odocoileus hemionus)*
White-tailed deer (*Odocoileus virginianus)*

Avian Fauna

Migratory and resident bird species have undergone steady decline throughout Idaho and the importance of conserving bird habitat has increased. Within Idaho, a group of concerned agency biologists, university researchers, business representatives and the general public has formed a working group titled, Partners in Flight, to address the long and short-term goals and strategies for conserving Idaho's bird populations. In 2000, the team created an Idaho Bird Conservation Plan to minimize future impacts to Idaho's birds. While the reasons for decline are complex several mechanisms have been identified including, habitat loss, modification and fragmentation, loss of wintering and migratory habitat and brood parasitism. The plan addresses these issues with both specific and general recommendations according to particular habitat type as a means of conserving bird populations as opposed to measures for each individual species (Ritter 2000).

The restoration of healthy ecosystems to maintain productive and complete bird communities requires responsible management of the four most important bird habitats. These habitats of concern include, riparian, non-riverine wetlands, sagebrush shrublands, and forest habitats with Ponderosa Pine/ Douglas Fir/Grand Fir assemblages. St. Charles Creek watershed contains all of these important bird habitats and we therefore should consider their presence in this analysis.

Riparian Habitat

Much of the land adjacent to the creek is considered riparian habitat. In Idaho alone, nearly 46% of Idaho's bird species use the riparian zone for nesting. This habitat type is important not only to the success of migratory and nesting birds but also to mammals, amphibians, reptiles, fish, and various invertebrates. The riparian habitat along St. Charles Creek, while narrow, adds significantly to local avian diversity.

Studies have recently indicated that plant communities along rivers have been dramatically altered from irrigation practices, the suppression of high flow regimes and normal flooding. Some tree species, such as cottonwoods, are impacted because they require the deposition of fine sediment and bare substrate for successional regeneration. The composition of plant species had both direct and indirect affects on an assortment of bird species. The goals for riparian habitat conservation include no additional losses of habitat, return of natural disturbance regimes, and the restoration of severely limited habitats. Sensitive species within this habitat include Trumpeter swan (*Cygnus buccinator*) and Harlequin duck (*Histrionicus histrionicus*).

Wetland Habitat

Wetland habitats are also extremely important to a great number of bird species in Idaho where waterfowl densities have historically been high. This habitat is used by many birds for various uses including nesting, feeding, roosting, rearing, and molting. Wetlands are also invaluable to humans as they function to improve water quality, recharge groundwater supply, and assist in nutrient cycling. Dingle Marsh and the lands surrounding the lower reaches of St. Charles Creek down to Bear Lake provide high quality wetland habitat to a number of bird species found within Bear Lake County. The goals for wetland conservation include a net increase in number of wetland acres in Idaho.

Since its creation in 1968, much of this critical habitat has been included in the Bear Lake National Wildlife Refuge. Twenty migratory and nesting waterfowl species are known to occur on the refuge. As well, 34 species of water-birds and shorebirds are dependent upon the wetlands in this region (Cochran et. al. 2002). A list of species-at risk as identified in the C-TNF DEIS within this wetland habitat type include; Cinnamon teal (*Anas cyanoptera*), Redhead (*Aythya americana*), Sandhill crane (*Grus canadensis)*, Killdeer (*Charadrius vociferus*), Black-necked stilt (*Himantopus mexicanus*) , American avocet (*Recurvirostra americana*), and Trumpeter swan (*Cygnus buccinator*).

Sandhill cranes (*Grus canadensis)* have also historically utilized portions of this wetland habitat. Their diet is one of an opportunist, eating aquatic invertebrates, insects, worms, small mammals, young birds and eggs, seeds, grains, bulbs, berries, lichen and aquatic plants. Dingle marsh and the surrounding wetlands is likely an important stopover point for sandhill cranes during migration.

Trumpeter swan (*Cygnus buccinator*) are considered a sensitive species which utilize Dingle Marsh for nesting and foraging. The presence of open water on Bear Lake is a critical factor for their use of the area. Their diet consists of mainly vegetative matter including water plants such as pondweed, duckweed, and wild grasses but they also occasionally supplement with snails, small reptiles and fish, molluscs and occasionally

crustaceans. They are a migratory bird with a range from Alaska to northern latitudes of the intermountain west. In the early part of the 20th century this bird almost became extinct from the draining of marshes and hunting. Currently, they have received the highest priority scores for any Idaho breeding bird species (Ritter 2000).

This habitat is also important to the following birds found within Bear Lake County: eared grebe (*Podiceps nigricollis*), Western grebe (*Aechmophorus auritus*), snowy egret (*Egreta thula),* cattle egret (*Bubulcus ibis*), Black-crowned night-heron (*Nycticorax nycticorax*), White faced ibis (*Plegadis chihi*).

Sagebrush Habitat

Sagebrush habitat is found within the adjacent uplands of St. Charles Creek. This often xeric habitat supports the feeding and breeding of several species solely dependent upon this type of ecosystem. These communities have suffered severe degradation and loss, due to extensive grazing,
development, sagebrush eradication programs, changes in fire disturbance, and agriculture conversion. The conservation plan identifies the objectives for this habitat on a long-term scale including maintenance and restoration of degraded sagebrush communities, no net loss of habitat, and creation of habitat linkages.

One of the species solely dependent upon sagebrush habitat is the sage grouse (*Centrocercus urophasianus*). Throughout Bear Lake County sage grouse are found in isolated. This species is not overly tolerant of human activities and development, therefore, population declines are expected when these disturbances affect their winter and/or summer ranges, nesting habitat, and lek strutting areas (Cochran et. al. 2002). Sagebrush is depended upon by sage grouse for food, cover, security from predators, nesting sites and brood rearing. Natural springs and other sources of water within this habitat are particularly important to sage grouse as a water source and invertebrate food source. Currently, three of the four lekking sites found near the Caribou-Targhee National Forest are between Bear Lake and the Bear Lake mountains (C-TNF DEIS 2001). Presence of the sensitive Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus)* within the watershed has not been evidenced.

Other species in Bear Lake County dependent upon this habitat include the northern goshawk (*Accipiter gentiles*), Ferruginous hawk (*Buteo regalis*), Peregrine falcon (*Falco peregrinus anatum*), Franklin's gull (*Larus pipixcan*), California gull (*Larus californicus*), Caspian tern (*Sterna caspias*), Forster's tern (*Sterna forsteri*), Black tern (*Chlidonias niger*).

Forested Conifer Habitat

The forested coniferous habitat including Ponderosa Pine/ Douglas Fir/Grand Fir assemblages represents the most frequently disturbed habitat within all of Idaho (Ritter 2000). The role of fire in this community is significant with fire intervals ranging from 5-30 years. Grazing livestock, fire suppression, and logging have posed the greatest impacts to this habitat. The goals identified for conserving this habitat are to prevent

additional losses, maintain and restore a minimum of 10% of original distribution, and achieve natural disturbance regimes. The following birds are considered by the Forest Service to be sensitive species: boreal owl (*Aegolius funereus)*, flammulated owl (*Otus flammulated)*, great gray owl (*Strix nebulosa),* northern goshawk (*Accipiter gentiles)*, and three-toed woodpecker (*Picoides tridactylus*). As well, these species are considered at-risk on the C-TNF but we have not been able to validate their occurrence within the watershed though given their habitat preferences it is very possible; Sharp-shinned hawk, Northern pygmy owl, Lewis' woodpecker, Williamson's sapsucker, Brown creeper, Western tanager.

The sensitive northern goshawk (*Accipiter gentiles*) is found within Bear Lake County and is considered a forest habitat generalist. They are expected to found in the higher forested elevations of the watershed. They prey upon birds and mammals of medium size including grouse, snowshoe hare, ground squirrels and red squirrels (Patla 1997). Their nest sites are found in mature, high density Douglas-fir, mixed conifer and/or lodgepole pine cover types and they often have alternate nests within one's home range. Important habitat components include snags, downed logs, woody debris, openings, large trees, herbaceous and shrubby understories, and interspersion of vegetation structural/successional stages. Thirty-two of the forty-six known nest territories within the Caribou-Tarhee National Forest are located in the Montpelier Ranger District (C-TNF DEIS 2001).

Listed Threatened and Endangered Species

The Whooping crane (*Grus americana*) is listed by the IDFG CDC as occurring within Bear Lake County (IDFG website). However, we have not located any evidence to support Whooping cranes' (*Grus Americana)* use of habitat within the St. Charles Creek watershed.

The Peregrine falcon (*Falco peregrinus anatum*) has recently been de-listed from endangered status within the United States as atleast 1650 breeding pairs have now been documented. They utilize habitat ranging from wetlands to the riparian zone and prey almost exclusively on other birds.

Other Avian Fauna

Anseriformes

Trumpeter swan (*Cygnus buccinator*)
Harlequin duck (*Histrionicus histrionicus*)
Cinnamon teal (*Anas cyanoptera*),
Redhead (*Aythya americana*)

Gruiformes

Sandhill crane (*Grus canadensis)*

Ciconiiformes

Eared grebe (*Podiceps nigricollis*)

Western grebe (*Aechmophorus auritus*)
Franklin's gull (*Larus pipixcan*)
California gull (*Larus californicus*)
Caspian tern (*Sterna caspias*)
Forster's tern (*Sterna forsteri*)
Black tern (*Chlidonias niger*)
Great Blue Heron (*Ardea herodias*)
Killdeer (*Charadrius vociferus*)
Black-necked stilt (*Himantopus mexicanus*)
American avocet (*Recurvirostra americana*)
Snowy egret (*Egreta thula)*
Cattle egret (*Bubulcus ibis*)
Black-crowned night-heron (*Nycticorax nycticorax*)
White faced ibis (*Plegadis chihi*).
Northern goshawk (*Accipiter gentiles*)
Ferruginous hawk (*Buteo regalis*)
Peregrine falcon (*Falco peregrinus anatum*)

Galiformes
Sage grouse (*Centrocercus urophasianus*)

Strigiformes
Boreal owl (*Aegolius funereus)*
Flammulated owl (*Otus flammulated)*
Great gray owl (*Strix nebulosa)*
Three-toed woodpecker (*Picoides tridactylus*)
Whooping crane (*Grus americana*)

Coraciiformes
Belted Kingfisher (*Ceryle alcyon*)

Amphibians

Riparian and wetland habitats appear to be the most crucial habitats for St. Charles Creeks amphibian species. Of the seven species of amphibians suspected to occur on the Forest, four including the tiger salamander, western toad, leopard frog, and boreal chorus frog have actually been documented (C-TNF DEIS 2001). The following riparian species are considered at-risk; Northern leopard frog, Western boreal toad. The tiger salamander is the largest land dwelling salamander with size reaching 7-15". They inhabit ponds, lakes and streams and are voracious consumers of earthworms, insects, small mice and other amphibians. Most of their time is spent underground in ground squirrels, gopher and badger burrows. They are particularly sensitive to iodine concentration in the water and this determines whether they are aquatic versus terrestrial. High concentrations cause them to evacuate and become terrestrial.

Plant Species

The Forest contains potential habitat for the Ute ladies'-tresses, a federally listed Threatened orchid. Surveys for this species are ongoing. If found, special conservation or restoration measures may be needed in order to meet recovery obligations for this species under the Endangered Species Act.

The Forest contains known habitat for four Forest Service Sensitive plant species: slick-spot peppergrass, Cache beardtongue, Starveling milkvetch, and Payson bladderpod.

II. Identification of issues and key questions

1. Over allocation of water rights, ground water quality, and preservation of biodiversity create the need for counties and municipalities to plan for sustainable management of natural resources. Irrigation diversions, canals and pumping stations exist throughout the St. Charles Creek system. A series of three irrigation diversions and one pumping facility are located along the mainstem of St. Charles Creek which contribute to reduced flows throughout the May to November growing season. The three upper diversions known as the South Ditch diversion, the Town Ditch diversion and North Ditch diversion are unscreened and may contribute to reduced recruitment opportunities for fish particularly the Bear Lake Bonneville cutthroat trout.
2. St. Charles Creek is of concern because it provides critical native spawning . habitat for the BLBCT population.Bear Lake Bonneville cutthroat trout (BLBCT) populations have been in decline over the last century and until recently were thought to have gone extinct. They are the only trout endemic to the Bonneville Basin. This subspecies was once abundant throughout this range with its habitat encompassing portions of Utah, Wyoming, Nevada and Idaho. Since then, a combination of factors has contributed to the decline of the genetically pure and isolated population of Bear Lake Bonneville cutthroat trout including genetic introgression, habitat degradation, and exploitation (Duff 1998 and Nielson and Lentsch 1988). Currently, the State of Idaho and the Caribou-Targhee National Forest Regional Forester consider the BLBCT a “Sensitive Species” and a “Species of Concern” respectively. In addition, there have been numerous attempts to gain additional protection for this species through petitions to list the species as threatened under the Endangered Species Act.

III. Documentation of Current Conditions

Characterization of Limiting Factors to BLBCT

Overall fish habitat condition is affected by sedimentation changes in channel morphology, lack of woody debris, increased water temperatures, and dewatering. Of these, several factors exist within the St. Charles Creek system limiting Bear Lake BCT

production and out-migration including diversions, fish passage, fishing, and competition for food sources.

Diversions & Dewatering

In general, warmer temperatures adversely affect trout species. Optimal trout feeding temperatures occurs between 13° and 16° C. In the lower reaches of the St. Charles Creek system, particularly in both the Big Arm and Little Arm Creeks, temperatures exceed 21° C. in the summer months. When this occurs, other species gain a competitive advantage and trout feeding declines. Consistent water diversion contributes to system-wide, detrimental fluctuations, and, oftentimes, dewatering.

Unscreened irrigation diversions at the North Ditch, Town Ditch and South Ditch Diversions impact flows and fish passage throughout the St. Charles mainstem. While high flows occur between 7 –14 m3/s for two to six week period in May and June, low summer flows may languish between 0.5 – 1 m3/s from mid-May through November. Additionally, over-allocation of water alters stream connectivity and improperly constructed passage facilities prohibits fish migration to the mainstem's upper reaches.

The Town Pump diversion is located on the mainstem above the Big Arm and Little Arm split; and although the pump site is screened, water is drawn from the mainstem influencing system-wide volume, impairing migration, thereby degrading fish habitat.

The Little Arm also has similar limiting characteristics but they are compounded by additional factors such as decreased stream gradient. Two diversions exist on the Little Arm. The first diversion is located below US Highway 89 and is named the Glen Transtrum Diversion, however, it is not known to restrict fish passage. The second, known as the Transtrum Diversion located ~700m from the mouth is not constructed to allow fish passage and serves as a major irrigation diversion.

The Transtrum Diversion can be considered to be a primary impediment to system-wide fish migration and severely impacts BLBCT population success. The headgate at this location serves to raise water up to five feet, which is required to move water to the irrigation canal above. Temperature fluctuations are apparent due to habitat degradation and the cessation of stream flow above and below the headgate.

Big Arm Creek has two separate irrigation diversions located along its course. Both diversions were retrofitted to allow fish passage via fish ladders but are considered nonfunctioning. As well, in 1996, PACIFICORP and IDFG agreed to reconnect the Big Arm to Bear Lake with a fish ladder to facilitate fish movement. The "Mouth Ladder" located at the mouth of the Big Arm and Bear Lake permits fish movement into the Big Arm during spawning migration and is considered fairly effective in its design. The upstream ladders and diversions, however, prove to be more significant impediments to fish passage.

Given the restrictions of fish movement along both the Big Arm and Little Arm of St. Charles creek, efforts have been made to mitigate these impacts. The installation of three fish ladders were expected to improve access for potential spawners and out-migrators. The second fish ladder located at the Island Diversion was also constructed by IDFG to allow for fish passage. This fish ladder has not been monitored to determine its success in allowing cutthroat trout to move into the Big Arm, however it is not believed

to be fully effective. Recent research, however, indicates that this ladder is inadequately designed to function properly (Burnett 2001).

The screened Island Diversion is utilized for most of the summer growing season. As a result, flows between the Spring Creek confluence and the diversion are greatly diminished which allow increased water temperatures. All flow from Spring Creek entering the Big Arm is diverted as well at the next unscreened diversion named the Bloomington Diversion. It is noted that overall hydrologic function of the Big Arm is impaired due to reduced flows and headgate activity at this location causing ineffective sediment transportation through the system above and below both diversions. Fine sediment deposition is considered high when the silt is found to be in places at least 0.5m deep.

Recruitment

Current population trends reflect a general decline in Bear Lake BCT. Less that 100 wild fish migrated into St. Charles Creek to spawn during spring, 2000. The number of spawning fish rarely exceeds 500 individuals. In an effort to maintain the population, IDFG trap a large number of spawning BLB cutthroat trout, strip and transport their eggs to the Mantua Hatchery for rearing and reintroduction into Bear Lake. In addition, site selection of spawning redds may favor wild populations of Bear Lake BCT. However, hatchery fish tend to select less successful habitat that are identified as having increased fine sediments, warmer temperature, and less velocity resulting in decreased oxygen.

Research in 1995 indicated that 75 redds were present along St. Charles Creek ranging from the mouth of the Little Arm to above Town Ditch Diversion. Of these, the majority (n=43, 57.3%) of the redds were located in the lowest reach of the Little Arm below the Transtrum Diversion. Following mid-May 1995, water had been diverted either at the Transtrum diversion or other upstream diversions. Excavation of ten redds below the diversion found that all contained numerous dead eggs (Burnett unpublished Redd Survey). In addition, no spawning had occurred that season in the Little Arm 1.5km upstream of the Diversion, and there was only a fair amount of spawning near the highway crossing. Overall, the reach contained 66 (88.0%) redds while the mainstem had 8 (10.7%) redds. A summary conclusion would attribute redd failure below the Transtrum Diversion to reduced flows, broad temperature changes during the summer months and siltation.

During the same research, only one redd was recognized to exist between Highway 89 and the split of the Big Arm Creek and St. Charles Creek. Moreover, observations indicated that very limited spawning habitat existed below the Island Diversion as no spawning fish or redds were observed in Spring Creek.

Competition & Predation

Brook and Rainbow compete for limited space and limited food sources. Intra-specific competition between BLB cutthroat trout and other salmonids has been witnessed throughout much of the west. The decline of cutthroat trout has been attributed to many factors including competition from non-native species such as rainbow trout (Hickman and Duff 1978, Gerstung 1988)

Juvenile Bear Lake BCT in St. Charles Creek system are susceptible to predation by aquatic predators that include the mottled sculpin (*Cottus bairdi)* as well as terrestrial

predators such as the Belted Kingfisher (*Megaceryle alryon*) and amphibians like western gartner snakes.

Brook Trout (Salvelinus fontinalis)

Typically when Brook trout and Cutthroat trout are sympatric, they partition their use of habitat according to gradient and elevation with brook trout preferring lower gradients and elevations. When they are allopatric they tend to utilize similar regions of the river. However, along St. Charles Creek there appears to be a high potential for competition between brook trout and BLB cutthroats because they are most often found utilizing the same habitat. The lowest gradient reach of the creek is utilized by both species and they share a preference for scour pools, which are abundant within lower stretches (Jacobson 1995). Hilderbrand found that when cutthroat were the first species to establish residence after an experimental exclusion, the effect of brook trout competition was minimal. However, when brook trout were present before cutthroat trout were added, cutthroats had limited success in reestablishing. This could present problems for enhancement and reintroduction programs (Hilderbrand 1998).

There is also evidence that brook trout and BLBCT exhibit strong dietary overlap for invertebrate species within St. Charles creek. Trichopterans were found to compose the largest proportion of both species' diets (Kershner et al.).

Of the 11 streams sampled on the Caribou-Targhee National Forest in 2000, only 2 streams are considered strongholds for the BCT. The concern for the Bonneville cutthroat trout increased as stated in the report, "The extent of the invasion of nonnative fish species such as brook trout was very alarming. Brook trout are outcompeting Bonneville cutthroat trout for habitat and displacing them in most of the Bonneville trout survey streams"(Capurso 2000)

Current fishing regulations do not allow for brook trout harvest and the release of these piscivores could continue the apparent competition between these two species (Burnett personal communication).

Rainbow Trout (Oncorhynchus mykiss)

The most detrimental factor causing the decline of BLBCT has been the introduction of rainbow trout (Anderson 2000). Hybridization is a primary concern in terms of BLBCT genetic purity (Duff 1988). Additionally, continued stocking of Rainbow and Yellowstone cutthroat (*Oncorhynchus clarki bouvieri)* hybrids increases the potential of genetic impurity of BLBCT. The population could continue to compete with the BLBCT given the current fishing regulations that do not allow for Rainbow Trout harvest (Burnett, personal communication).

Other species of fish are less of a direct threat to the Bear Lake BCT in terms of either competition or predation but are a concern to overall habitat structure. The common carp, for example, can destroy habitat and stream structure at the mouths of the Big Arm and Little Arm streams at Bear Lake as well as in Dingle Marsh.

Fishing Pressure

Idaho Department of Fish and Game has declared St. Charles Creek a catch & release fishery for all trout from its mouth, upstream to the Caribou-Targhee National Forest boundary during July 1 – November 30. Additionally, the use of bait is prohibited.

Lake fishing pressures were recorded to have been a possible factor in total BLBCT population declines. Research conducted by Nielson and Lentsch, concluded that total fishing pressure and total harvest rates in 1988 were increasing with an annual lake catch rate of 0.08 fish/hour (Nielson and Lentsch 1988).

Water Rights

St. Charles Creek is one of the primary tributaries of Bear Lake; as such, the human inhabitants of the Bear Lake Valley have manipulated it for nearly one hundred and fifty years. There are at least seven irrigation diversions which severely impact the creek's natural processes; the diversions are used to flood-irrigate agricultural fields north and south of the town of St. Charles. The first reported irrigation project was constructed in 1864 (Pugmire). Nearly one hundred twenty five cubic feet per second was allocated in 1893 and 1894 between twelve different entities. Existing water claims (See Table 3) exceed the creek's normal volume. As such, the creek is over-allocated and in drought years, the lower reaches are typically dry during the summer irrigation season. Furthermore, measurements taken by Jacobsen indicate that many diversions exceed their allotment (See Table 4 and Figure 2)(Jacobsen, 1990). The State of Idaho secured a license for instream flows of 17 c.f.s. but that is the most junior water right and is not protected by Idaho Water Law (See Beneficial Use and Instream Flows below).

Domestic Supply

The town of St.Charles receives its culinary water from St.Charles Spring located approximately four miles west of town.

The State of Idaho is second only to California in total amount of irrigation water use (See Table 5)(USGS, 1990). Water diverted from St. Charles Creek is used primarily for agriculture and is done by flood-irrigation. The heaviest use of water occurs from May through October. These dates overlap the Cutthroat spawning season (Kershner and Horan, 1997). A substantial amount of water is lost due to seepage from the canals. In the spring, the subsurface flow is often quite substantial and reduces the total amount of arable land. The subsurface flow also causes problems for the town's culinary water system that was installed in 1988. The system is not sealed and lacks inflow/outflow meters. The town's sewer system is also not sealed (Pugmire, 2002).

The nearby towns of Paris and Georgetown have converted to gravity-fed sprinkler systems; Georgetown also installed low-head turbines that have produced enough power to help pay for the conversion. Farmers connected to either town's system have increased production and efficiency while reducing water-use (Pugmire, 2002).

Irrigation Diversions *(See Figure 1)*

Two diversions, the South Ditch (the uppermost diversion) and the North Ditch, have been constructed where the creek exits the canyon. The creek then splits one-half mile above town.

The Big Arm, which carries two-thirds of the flow, meanders to the north and is shortly dewatered by the Island Diversion. A fish ladder was constructed at this point,

but it was improperly designed. Also, the channel is commonly backfilled by a nearby landowner in order to direct flows into his diversion. A screen was recently installed to protect migrating trout. The remaining flow, if any, continues meandering northward until a tributary named Spring Creek (which is also diverted near its source) joins it. It then heads to the east where the Bloomington Diversion removes most of the remaining water. This diversion backs up the flow and creates a pool of murky, sediment-laden, warm water. For many years, a road separated the creek from Dingle Marsh. In 1994, an attempt was made by PacifiCorp and IDFG to reconnect the two with a fish ladder, but its success was limited due to the minimal instream flows at that point. Another attempt was made in 1996, but again, the effort was mitigated by low flows. The Big Arm, at this point usually devoid of water during irrigation season, then bends to the south and passes through Dingle Marsh. Along the way, subsurface flows enter the channel and 're-water' the stream. A fish ladder has been constructed near the mouth of the Big Arm and apparently it functions adequately. However, keeping the spawning trout in the proper channel is a major problem because many of the diversions are not screened. In 2001, a tagged trout was caught nearly forty miles down a diversion (Burnett, 2002) and there are other indications that trout have even migrated as far as the Thomas Fork.

The Little Arm, which carries at best one-third of the flow, has two diversions and carries none of the flow in low water years. The G. Transtrum Diversion takes only a small portion of the water. The downstream W. Transtrum Diversion severely impacts the creek's natural functions. This diversion backs up the flow, increases water temperatures, increases sedimentation, and disconnects the channel from the lake. Habitat degradation adjacent to the creek exacerbates the problem.

Bear Lake

Bear Lake was originally isolated from the Bear River but was reconnected by way of the Lifton Pumping Station. The lake's surface elevation fluctuates between one meter and one and a half meters per year (Burnett, 2002). As a result, the lake's transparency levels have declined and its connectivity to the surrounding wetlands and tributary streams has been reduced. (Burnett 2002, Hazzard 1935)

Two dredging projects have been planned for portions of Bear Lake. The first project is an attempt to isolate the Dingle Marsh by constructing a dike built from dredged material within the marsh. The goal is to improve the marsh's conditions by removing resident carp and restricting their future access.

The second project is located near the Lifton Pumping Station. 'The Bear River Project, established by the U.S. Secretary of Interior in 1907, is designed to store spring runoff in Bear Lake from the headwaters of the river in Bear Lake, then pump water out of the lake into the river for downstream irrigation and power production. Utah Power, now PacifiCorp, is required by contract, the three-state river operating system and subsequent agreements to deliver up to 230,000 acre feet of water to irrigators annually when the lake is at elevation 5914.7. The current lake level is below 5912 feet ' (Farm Bureau News, 2001). In the past, a sandbar near its mouth has periodically obstructed the channel leading to the pumping station.

One of the biggest problems caused by the canals is the build up of silt and mud into the lake and erosion of its shoreline. Long time resident of Bear Lake County,

Eulalie Langford has been disturbed by the mud since the 1950's. She equates the build up to dump trucks hauling in one hundred and eight tons of mud per day. Carly Burton, a PacifiCorp hydrologist refutes the problem claiming, "I can understand their concerns but you have to realize that Utah Power/PacifiCorp has operated in the this lake for over 80 years and the water quality figures that I see on this lake are no different than they were 2025 years ago. The lake has a great ability to heal itself."[13] Today the Bear Lake region faces typical problems coupled with growth and development.

Beneficial Use and Instream Flows *(See Appendix 1)*

Flows between 4-6 c.f.s on the Big Arm have been identified as suitable amounts to protect fry and juvenile fish (Kershner and Horan, 1997). PacifiCorp attempted to secure Instream rights but was unsuccessful (Kershner, 2002). Under Idaho law (Chapter 15, Title 42, Idaho Code) in-stream uses can be protected under water rights held by the Idaho Water Resource Board in trust for the people of the state of Idaho. However, the 'right must not adversely affect senior water rights' and 'it must be the minimum stream flow or lake level - not the optimum flow or level - to preserve the aquatic values, and it must be capable of being maintained' (IDWR). It continues to state that instream flows are allowed to go dry. The utility of this law is entirely subject to the needs of existing water rights and is largely ineffective for small, over-allocated streams like St.Charles Creek.

Water Quality

St. Charles Creek has been listed as a water quality impaired stream (an Idaho 303(d) listed stream), but has low priority for any progressive management actions. St. Charles Creek was scheduled to have a Total Maximum Daily Load report submitted by December of 2001. As of date, this has not yet been completed. Though water quality is impaired, other bodies of water have more pressing need. This combined with the small affected population lends to a having a low priority status. (EPA, 2002)

St. Charles is highly agricultural and these operations have the potential to have significant impacts on the water quality within the creek. Nitrogen runoff and sediment delivery are the principal water quality issues facing St. Charles creek, both of which result primarily as an irrigation byproduct. Farming bares the soils to increased water and wind erosion potential. Added fertilizers and pesticides can run off fields into surface water or seep into the subsurface aquifers.

Grazing in the basin is also a concern. St. Charles Creek lies within the Bear Lake Cattle Allotment of the Caribou National Forest. In this allotment there are 100 head of cattle that are rotated through 4 units. Grazing in riparian areas can seriously damage not only the vegetation, but also the stream bank, and increase erosion. Grazing is likely contributing to the increased nutrient and sediment levels observed in the creek (Heyrand, 2002)

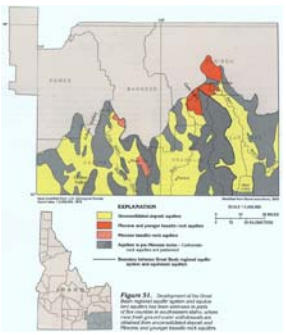
Riparian and wetland vegetation have been impacted and destroyed. The EPA estimates that in the between 24 and 43 percent of historical wetlands have been destroyed. It is critical that remaining wetland areas be preserved to maintain the health

[13] Riechert, Bruce, host for "Welcome to Outdoor Idaho." Bear Lake County Program Transcript. www.idahoptv.org/outdoors/shows/bearlake/transcript.html

and vitality of this watershed. Wetlands play an important role in filling groundwater and aquifer needs in the west, acting as natural filters to maintain water quality, and are an extremely valuable habitat to many diverse wildlife species.

Water temperature is an area of possible impact. After the irrigation diversions both arms of the creek experience increases in temperature. This habitat is critical for Bonneville Cutthroat so it is imperative that the temperature remains within tolerance levels.

Groundwater



The St. Charles Creek drainage does not fall within the confines of an aquifer of major importance (Harrington, 1999), however, groundwater is still an issue of concern. Currently there are multiple wells withdrawing water from the groundwater resources of the St. Charles Creek Basin with the potential to also impact surface flows.

As with any hydrologic system the surface and groundwater resources are connected and affect each other. A study in the Bear River Basin by Dion (1969) described the geology has been as being composed mostly of "unconsolidated basin-fill deposits of Quaternary age . . . and younger alluvium." This basin type is the most productive and widespread aquifer in Idaho (Whitehead,1994). The Dion study also showed that the Bear River Basin ground water and surface water are, for the most part, directly interconnected. Any diversion or use of water from either a surface stream or well will impact the total water supply available in the system. In cases such as this, when the groundwater and surface water systems are interconnected, the Idaho Dept. of Water Resources will manage the system as a single resource. (Bear River Groundwater Order, 2001).

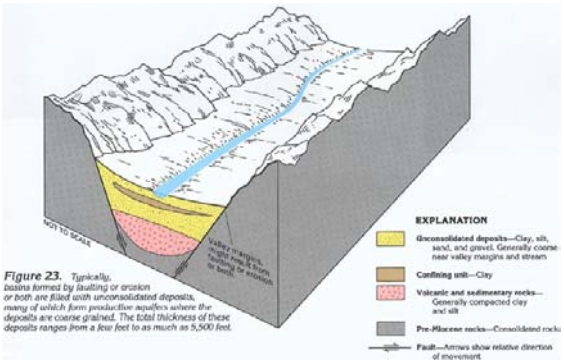


Figure 23. Typically, basins formed by faulting or erosion or both are filled with unconsolidated deposits, many of which form productive aquifers where the deposits are coarse grained. The total thickness of these deposits ranges from a few feet to as much as 5,500 feet.

The current withdrawal rates are within allowable standards, but do not allow for future growth and demand. However, growth is slow enough to allow for adequate planning to ensure resource protection. The IDWR is currently designing a groundwater management plan for the Bear River Basin, and until that is completed any new groundwater usage applications will be placed in queue, neither being approved or denied. (Bear River Groundwater Order, 2001)

A management area of particular concern that will need to be addresses are the wells near the lower stretches of the creek. If the wells overdraw the groundwater then the levels of St. Charles Creek could correspondingly fall. It is crucial that flows be maintained at adequate levels to allow for upstream travel of spawning fish, specifically Bonneville Cutthroat. It is believed that this section of the creek some of the most critical habitat, especially during the season that also corresponds with highest water demand. (Kershner and Horan, 1997).

Groundwater is the primary source of drinking water for the residents of St. Charles. No data is available concerning the quality of groundwater. With surface water failing to meet quality standards and the interconnectedness of the system, the potential for contamination exists.

Groundwater Conditions

Location	*Principal Aquifer*	*Depth to Water (feet below land surface)*	*Range of well yields (gallons per minute)*	*Principal Water Use*
Bear River Valley	Ud, Ybr, pM	flowing-60	10-1800	PS, DC, A, I

AQUIFER: Ud- Unconsolidated deposits; Ybr- Pliocene and younger basaltic rocks,
WATER USE: PS-Public supply; DC-Domestic and commercial; A-Agricultural (primarily) irrigation and livestock watering); I- Industrial

Big Arm Creek

Until 1996, a historic road severed the connection of the Big Arm to Bear Lake. A fish ladder was added by the Idaho Department of Fish and Game and PacifiCorp which allowed fish to migrate into the creek. Other potential impediments to fish migration in the Big Arm include two considerable diversions. The Island Diversion is a screened irrigation diversion designed to allow fish migration and continued irrigation. However, during the summer months, most streamflow is diverted, thereby dewatering the Big Arm almost entirely with the exception of some seepage. An unscreened diversion is located downstream from Powerline Road, known as the Bloomington Diversion.

Business/Economy

Traditionally Bear Lake County's economy found its base in agriculture. However, since 1970 farm proprietors have decreased and service and retail trade business has grown. Retail trade makes up 45% of the new job base, and government 38% of new jobs. Retail trade is the single largest employment factor. Services including health, legal, business, engineering, and management are the second largest sector accounting for 17% of new jobs in the last 27 years. Employment growth is lower than the rest of the state of Idaho, and the rest of the nation. Most of the growth in Idaho occurs in Montpellier and Paris. The City of St. Charles Creek lists only two businesses, a C-store café and a wood working shop.[14]
The region also receives a large portion of its revenue from tourism during the summer months. Minnetonka Cave, located in Cache National Forrest 10 miles from the city of

[14] Business Directory for Bear Lake County, Idaho.

St. Charles, receives over 20,000 visitors per year, and Bear Lake State Park averaged 80,250 visitors per year from 1996 to 1999.[15]

Population Growth

The county's growth ranks 38th out of 44 in Idaho, and falls behind national averages. Bear Lake County itself grows at a rate of 7.8% according to a Smart Growth report for Greater Yellowstone.[16] Montpellier, the county's largest city grew 4.9% in from 1990 to 2000.[17] However, percentages can be deceiving. County history shows that the current population of 6,200 residents remains lower than peak numbers of 7,385 in 1980. During the mid to late 1980's the county lost population, but has started to increase slightly during the 1990's. The all time population high was 7,729 in 1910.

Since 1986, Bear Lake County's population has grown slower than that of the state and the nation. However, the goal of county is to encourage and prepare for a diversified population. Bear Lake County projects an increase of 2,000 people in the next 25 years from 6,500 to 8,500.[18]

Population for Bear Lake County is difficult to measure because of the transient seasonal population from tourists and second home owners. High vacancy rates within existing developments indicate a large opportunity for growth. The largest growing part of the St. Charles Creek area comes from residential development on the south. Thirty percent of built housing structures are vacant. New units are being built in expanding developments. Three Hundred and Thirty Four units were built last year. Infrastructure is provided by municipalities or the county. Water systems for most of the county come from springs and individual wells. St. Charles Spring 4miles west of town feeds the city with a retaining tank and water purifier.[19]

Decision Making Agencies and Public Interest Groups

Major decision making agencies in the Bear Lake Area include county commissions, State Park officials, and governing municipalities. Other influencing agencies include the Bureau of Land Management, Idaho State Department of Fish and Game, Utah Division of Wildlife Resources. The Northwest Band of Shoshone would also like to be a part of decision making in the region. In addition, the Bear Lake County Commission encourages local participation of residents in hearings and land use planning meetings.

Public interest groups active in the region include Bear Lake Watch, Love Bear Lake, and Bear Lake Rangers. Bear Lake Watch is made up of higher end residents with shore front properties who watch the level of the lake and sound the watch cry from their living room windows if lake levels fluctuate abnormally.

Other interest group players include concerned residents, anglers, birdwatchers, and otherwise dedicated recreators. Economic players in Idaho include PacifiCorp, and other

[15] Bear Lake County Comprehensive Plan- 2025 (2002).
[16] www.greateryellowstone.org
[17] Allen, Shelly. Labor Market Analyst for Idaho Department of Labor.
[18] Bear Lake County Comprehensive Plan – 2025 (2002). pp 6.
[19] Bear Lake County Comprehensive Plan – 2025 (2002). pp13.

canal companies such as Last Chance Canal Company whose services depend on attentive maintenance of sensitive environments. [20]

Land Use

About 48% of the land in Bear Lake County is Federal and about 48% private, leaving only about 3% State land and less than 0.01% each of Municipal and County lands. This dominance is also shown in the St. Charles Creek watershed, most of which is either Forest Service land or privately owned. The private land is mostly agricultural land, however the highest level of subdivision development in the county is in Bear Lake West, causing the need for a central sewage system that also services the towns of St. Charles and Fish Haven.[21] Most likely this overlap of development will also affect residential housing in the town of St. Charles.

Although the population projections show a slow growth rate in the St. Charles Creek area, the county has plans to encourage population increase and diversity. From the future plans shown in the Bear Lake County Comprehensive Plan 2025, Figure 3 shows proposed commercial and business lands near the center of the Town of St. Charles.

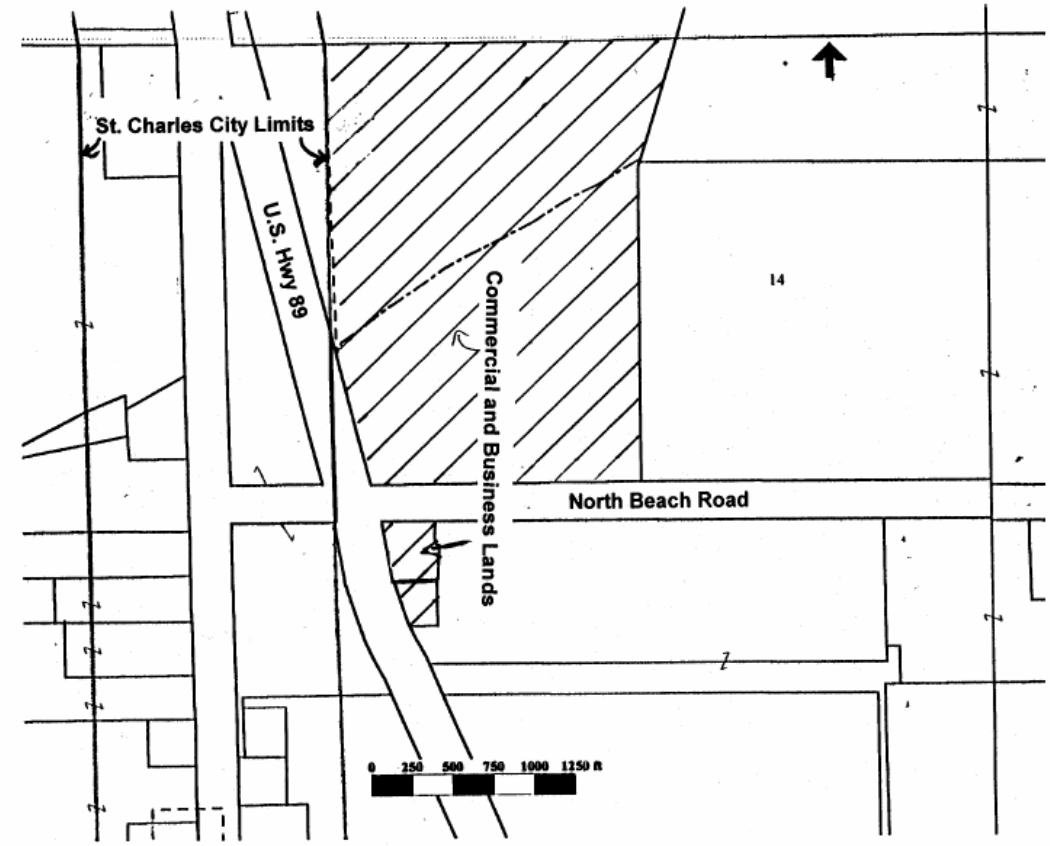


Figure 3: from Bear Lake County, Idaho Comprehensive Plan 2025 (2002).[22]

[20]Riechert, Bruce, host for "Welcome to Outdoor Idaho." Bear Lake County Program Transcript. www.idahoptv.org/outdoors/shows/bearlake/transcript.html

[21] Bear Lake County Comprehensive Plan – 2025 (2002). Pp. 58

[22] Bear Lake County Comprehensive Plan – 2025 (2002). Pp. 65

If this land shown in Figure 3 were really to be developed it would greatly impact the St. Charles creek that flows through this area. However the county comprehensive plan also mentions that they are planning to monitor development and guide it away from, or mitigate for impacts on sensitive areas. They plan to encourage setbacks to reduce the number of stream crossings, along with assessing groundwater and effects of development on the aquifers. The county has mapped sensitive lands, with St. Charles Creek watershed falling almost completely within the "highly sensitive" area. Sensitive lands are areas with natural resource conditions that are hazardous or of great importance to the public and their quality of life. The county plan specifically mentions St. Charles Creek fish spawning areas as particularly sensitive.[23]

In these sensitive land areas a there are several guidelines set in the Bear Lake County Comprehensive plan that landowners and developers are supposed to follow. After assessing the area with the developer and coming up with plans for development, the plans have to be presented to the county for approval. These plants are then subject to denial or acceptance by the county based upon the Comprehensive Plan. Although these somewhat vague guidelines appear to possibly restrict growth, the goals that were mentioned to want to improve the economy and encourage population growth may also influence the decision. There seem to be many aspects of the area that have to be incorporated in the decision to grant or deny permission for development, including natural resource issues and economic benefits to the county. In discussing the future land use of the Agricultural lands class in the Comprehensive Plan, they explain that the areas will allow residential uses associated with farm operations at a low density. However they also mention that cluster lot subdivisions or planned unit developments could be allowed, but that they must take into account impact on adjacent agricultural lands, wildlife, and other natural resources.[24] There seems to be some disagreement among residents when planning the future of the area. They would like to develop without being detrimental to natural resources, but also do whatever will be best for economic growth in the area.

[23] Bear Lake County Comprehensive Plan – 2025 (2002). Pp. 49
[24] Bear Lake County Comprehensive Plan – 2025 (2002).

Due to the nature of sensitive lands in the St. Charles Creek watershed, and the possibility and plans for future development, specific goals for the area should be proposed in order to preserve and improve natural resource needs of the area.

Region and County Socio-economic Data

Regional Overview

Many residents in the Bear Lake Region are concerned about what kind of impact changes in management will have on their economic well-being and traditions. Water originating on National Forest System lands serves agricultural, industrial, business, and residential uses. Local mills and some local firewood users depend on National Forest access and wood products. Grazing permittees rely on the availability of suitable forage

for grazing livestock. Outfitters and guides for various wildlife and recreation-related uses make all or part of their living from National Forest resources. Many local communities rely on the employment and income generated from the use of forest resources. This, in turn, affects and perpetuates the values, traditions, and culture of these rural communities. DEIS

Bear Lake County

Bear Lake County is the most southeast county in Idaho, bordering both Utah and Wyoming. Major employment in the county is found in phosphate mining, lumber, and farming. County residents also travel to bordering counties for employment opportunities. The major private employers are phosphate mining companies and Jensen Lumber Company. Recreational opportunities are the source for current and potential growth in the county, especially Bear Lake with surrounding scenery, boating and fishing opportunities. Subdivisions and non-resident seasonal housing and developments are occurring at a rapid rate adjacent to Bear Lake and in neighboring Rich County, creating concerns about cultural and economic changes in the local communities as newcomers arrive. The county is currently revising its county plan. The rapid development in the Bear Lake area is a major driver in this planning effort (Rine, 2001). The county is also a member of the Bear Lake Regional Commission, an organization of Idaho and Utah government and private entities that cooperate on mutual concerns, such as local rapid development. (See Rich County summary.)

The Forest provides dispersed and developed recreation sites that are heavily used by local and out of state visitors, primarily from Utah. Minnetonka Cave and St. Charles Canyon on the Forest offer scenic and educational opportunities that draw visitors the area during the summer months. DEIS

Agriculture

• Total net income from farming and ranching in Bear Lake County, in real terms, declined from over $10 million in 1970, to $5.7 million in 1980, and to $1.7 million in 1997.
• In 1970, 65 percent of gross farm income was from livestock, while 17 percent was from crops. In 1997, these numbers had changed just slightly to 67 percent of gross income from livestock, and 15 percent from crops. Income from government payments remained virtually the same with just a .3% increase from 1970 to 1997; however, over those 27 years government payments were as low as 1.3% in 1974 and as high as 15.8% in 1988.
Bear Lake County, Idaho Comprehensive Plan 2025

Minnetonka Cave Socio-economic Data

Minnetonka Cave is one of two caves on National Forest System lands that offer guided tours. The cave has extensive walkways and electrical lighting that take visitors through the first .5 miles (0.8 km) of the limestone formation cavern. A special use permittee maintains cave facilities and manages the guided tours.

The Forest offers two developed sites that are designed to interpret the natural environment to the public. Cherry Springs Nature Area provides educational facilities and interpretive trails adjacent to a riparian area of Mink Creek. Minnetonka Cave provides interpretive tours to over 20,000 visitors annually. DEIS

The fee-generating sites that are in the St. Charles Creek Watershed include the Minnetonka Cave, which generates approximately $85,000 per year and the three campgrounds that generate approximately $15,000 per year. Email from Darren Duehren, District Manager, USFS

Table 3.6 **Area Figures for Counties within the Analysis Area**

County	County land base	Farm land	Federal ownership	Caribou NF lands	
	Acres	Percent	Percent	Acres	Percent
Bannock	734,400	46%	30%	118,995	16%
Bear Lake	671,900	**43%**	46%	93,911	14%
Bingham	1,358,900	75%	24%	0	-
Bonneville	1,214,000	38%	51%	307,349	25%
Caribou	1,151,200	52%	39%	352,976	31%
Franklin	427,200	54%	33%	16,298	4%
Oneida	769,400	35%	53%	76,538	10%
Power	923,100	48%	32%	6,134	1%
Box Elder UT	3,592,960	40%	33%	5,393	<1%
Cache UT	749,440	36%	36%	1,562	<1%
Rich UT	661,760	79%	33%	0	0%
Lincoln WY	2,640,160	22%	75%	7,831	<1%

(Sources: Land Areas of the National Forest System, 1998. Caribou AMS, 1999.)

Table 3.9 1998 Employment Statistics for the Caribou Analysis Area and Idaho.

Sector[1]	A.F.F	Mining	Const	Manuf	TPCU	Wholesale	Retail	F.I.R.E.	Services	Govt
County	**Percent of Total Employment**									

Banock	2.4	<0.1	8.4	7.6	5.4	4.1	21.9	5.0	23.9	21.1
Bear Lake	20.3	0.0	6.6	3.6	3.4	3.1	20.3	4.3	15.9	22.3
Bingham	16.7	0.2	6.6	11.8	2.5	8.5	14.7	2.9	17.5	17.9
Bonneville	4.4	0.1	8.9	4.6	3.4	8.4	20.8	4.2	33.9	11.2
14.3	14.3	9.1	9.1	17.1	5.7	3.3	12.0	2.7	12.2	14.3
Franklin	22.2	0.3	6.4	6.7	3.4	4.6	17.8	3.4	16.7	17.5
Oneida	25.1	5.0	3.9	1.0	2.9	1.5	13.2	3.4	19.1	24.9
Power	16.9	<0.1	3.7	32.5	7.0	3.4	9.8	1.7	10.4	14.3
Box Elder UT	7.4	0.2	6.1	37.9	2.4	1.9	15.5	3.2	16.1	8.8
Cache UT	4.4	<0.1	7.6	22.6	2.3	2.2	16.6	4.1	26.2	13.5
Rich UT	27.9	0.00	7.3	1.3	0.9	1.2	13.6	6.9	25.4	15.3
Lincoln WY	10.5	2.2	13.0	5.6	6.7	1.3	18.3	5.9	17.7	18.6
Analysis area[2]	7.1	0.40	7.8	14.9	3.6	4.7	18.1	4.0	24.2	14.8
Idaho State	7.0	0.5	8.5	11.3	4.0	4.5	17.9	5.0	25.6	15.3
United States	1.3	0.5	5.5	12.2	4.8	4.6	16.7	7.6	31.1	13.7

1. **Sectors defined according to Standard Industry Classification Manual, 1987. (Source: MIG 2001.)**
   - **A.F.F. (Agricultural, forestry, and fishing services) includes businesses engaged in agricultural production, forestry, commercial fishing, hunting and trapping, and related services.**
   - **Mining includes the extraction of minerals occurring naturally, quarrying, well operations, milling, preparation at the mine site, and exploration and development of mineral properties.**
   - **Const. (Construction) includes new work, additions, alterations, reconstruction, installations, and repairs of structures.**
   - **Manufacturing (Total manufacturing) includes the processing of materials (products of agriculture, forestry fishing, mining, and quarrying) into new products. Examples include food, textiles, lumber, wood products, furniture, paper, machinery, and appliances.**
   - **Retail trade includes the selling goods for personal or household consumption and rendering services incidental to the sale of the goods. Examples include groceries, hardware, drug store, and other specialty stores.**
   - **Wholesale trade includes the selling goods to retailers or other wholesalers. Wholesalers maintain inventories of goods, extend credit; physically assemble, sort, and grade goods in large lots, break bulk goods into smaller lots and advertise.**
   - **Services include businesses engaged in providing a wide variety of services for individuals, business, government, and other organizations. Examples include hotels; health, legal, engineering, and professional services; and educational institutions.**
   - **F.I.R.E. (Finance, insurance, and real estate) includes business that operate in the fields of finance, insurance, and real estate, such as banks, investment companies, insurance agents and brokers; real estate buyers, sellers, and developers.**
   - **T.P.U.C. (Transportation, public utilities and communications) includes passenger and freight transportation, communications services, electricity, gas, steam, water and sanitary services and all establishments of the United States Postal Service.**
   - **Govt (Government) includes all federal, state, and local government employees involved in executive, legislative, judicial, administrative, and regulatory activities.**

Table 3.13 Role of Forest Service-Related Contributions to the Area Economy, 1997. (Source; MIG, 2001.)

	Employment		**Labor Income**	
Industry	**Area Totals**	**Forest-Related**	**Area Totals**	**Forest-Related**
	Average Annual Jobs		**Millions of Dollars**	
Agriculture	14,680	121	246.5	1.5
Mining	828	41	53.1	4.0

Construction	16,247	16	502.2	0.5
Manufacturing	30,986	30	1,179.3	1.0
TPCU	7,384	24	310.3	0.9
Wholesale trade	9,689	22	268.2	0.6
Retail trade	37,599	393	498.5	3.9
F.I.R.E.	8,382	28	185.5	0.6
Services	50,246	283	1,110.9	4.2
Government	30,589	314	943.8	9.5
Miscellaneous	678	2	5.2	0.0
Total	207,308	1,274	5,303.5	26.7
Percent of Total	100.0	0.6	100.0	0.5

The Shoshone Bannock Tribe

Traditional socio-economic paradigms are inoperative in considering the culture of the Shoshone Bannock Tribe. In fact, the word culture is self-limiting. What the tribe has, in fact, is not simply culture, in the Anglo sense; it is a *lifeway* neither bound by nature nor limited by time.

The Shoshone Bannock Tribe expects partnership in management of resources, both cultural and environmental. They expect to be involved as provided for in law and Executive Order. To the Tribe, proper management of cultural resources means management of the environment through proper methodologies that restore and protect native species, both plant and animal. Recently, the Tribe worked with the BLM to establish guidelines for grazing and watershed protection and restoration. They would like, if not expect, to be involved in similar efforts with the Forest Service from a perspective that is uniquely Native American.

"What we are doing on our land is our business. What you are doing on your land is our business too" (Yupe, 2001).

County Revenues from FS land

Under the 25% Fund Act of 1908, counties receive payments from the federal government equal to twenty-five percent of all receipts taken in from National Forest lands within that county. A formula is used to allocate these funds to counties in large part on acres of national forest and but also on other factors. The funds may be spent on public schools or roads in the county. Table 3.14 displays the payments made to counties based on twenty-five percent of total receipts from the Caribou in 1997.

Table 3.14 25% Fund Payments to Counties from Caribou Forest Revenues, 1997.

County	1997
Bannock	26,751
Bear Lake	21,112
Bingham	0
Bonneville	69,095

Caribou	79,352
Franklin	3,664
Oneida	17,206
Power	1,379
Box Elder UT	1,212
Cache UT	351
Rich UT	0
Lincoln WY	1,760

Late in 2000, new legislation, the Secure Rural Schools and Community Self Determination Act of 2000, H.R. 2389, has been proposed which may change the amount of these payments. Recognizing recent losses to many counties of income from reduction of traditional uses on federal lands and fluctuating payment amounts, the proposed law could increase payments to counties in compensation, and stabilize payment levels from year to year.

Under the Payments in Lieu of Taxes (PILT) Act of 1976, counties receive payments from the federal government for having federal lands within their counties to make up for lost revenues. Congress appropriates PILT payments based on a complex formula developed at a national scale using population and acreage of federal lands and the value of other federal revenues as key factors. The final annual PILT appropriation is not only based on the formula but is also sensitive to politics and other national funding priorities from year to year. Due to the complexity of the development of PILT payment values, past PILT payment amounts should only be used as a general indicator of possible future PILT values, and never as a guarantee of future revenues to counties. For the preceding reasons, changes in individual forest plans may not be good predictors of local PILT payments (Bill Howell, WO-BLM, personal communication, July 2000). Table 3.15 displays the amounts of payments to local counties from PILT in 1997.

Table 3.15 PILT Payments to Counties from Caribou Forest, 1997.

County	1997
Bannock	83,527
Bear Lake	61,089
Bingham	0
Bonneville	208,319
Caribou	132,724
Franklin	10,280
Oneida	33,794
Power	4,448
Box Elder UT	3,850

Cache UT	1,008
Rich UT	0
Lincoln WY	1,385

Key Biophysical Elements to Consider in Land Management:

Geology and Soils Characteristics – The St. Charles Creek Watershed lies on the east side of the Bear River Mountain Range in the geologic subsections named "Bear River Karst Highlands". As an initial stratification in ecological assessment, soils and geology influence vegetation, watershed condition, land uses, and have been used to determine the effects that timber harvest, livestock grazing, recreation, prescribed fire, and other management activities within watersheds. Because of the wide range of geologic and soil characteristics found on the Caribou National Forest (CNF), only relatively broad generalizations can be made.

The underlying geology is typified by marine dolomites, limestones, and sandstones, with localized karst topography. The erosion hazard is considered moderate to high throughout the watershed. Paleozoic rocks are mainly limestone and dolomite, and probably provide the most reliable groundwater aquifers in the area

Soils - The "Bear River Karst Highlands" subsection consists of three primary landscape settings. First, the mountains are located at all elevations with slopes ranging from ten to sixty percent. These landscapes include ridges and mountain slopes that are formed in sedimentary parent materials. Soils are shallow (less than twenty inches to bedrock) to very deep (greater than sixty inches to bedrock) and well drained. Soils on ridges are shallow, and the mountain slopes and foothills have moderately deep to very deep soils. Aspen, Douglas-fir, and sagebrush vegetation are associated with soils having dark surfaces, some thick, and some with a clay accumulation that begins just below the dark surface or others with clay deep in the soil profile.

Next, slopes in broad valleys at high elevations range from five to thirty-five percent and include bottoms and plateaus on the top of the mountain crest formed in sedimentary materials. Soils found here are very deep (greater than sixty inches to bedrock) and somewhat poorly drained to somewhat excessively drained.[24] Tall forb and sagebrush communities are found in soils with dark surfaces and clay accumulations just below the loam or silt loam textured surfaces.

Lastly, the lower elevation foothills slope range from ten to fifty percent and include rolling hills, fans, and mountain foothills formed from sedimentary parent materials. Soils are typically deep (forty to sixty inches to bedrock) to very deep (greater than sixty inches) and well drained. Sagebrush, mountain bush, and aspen cover types are

associated with soils that have dark surfaces, mostly thick, and clay accumulations below the loamy or silt loam surfaces.

Principle ecological concerns affecting soil quality are conifers expanding into aspen, sagebrush/grass, and riparian communities. Loss of the tall forb community and replacement with annual tarweed, spread of noxious weeds, and increased susceptibility to fires are also a concern. The principle management activities affecting soil quality are roads, livestock grazing, logging, fire, and recreation.

The Bear Lake County Comprehensive Plan 2025, dated February 2001, reports that most of the soils within the uplands portion of the Watershed is considered to be "Sensitive to Highly Sensitive" when classified for Land Capabilities Ratings. Lands on the floodplain and adjacent to Bear Lake are rated as tolerant.

Timber Harvest and Vegetation Community Types – In the St. Charles Creek watershed, timber harvest has been infrequent in recent history. During the mid 1990's, a salvage harvest of bark beetle killed Lodgepole Pine was undertaken to remove marketable timber and to reduce fire hazard in the area. Removal of logs out of the harvest area was done by using helicopters due to inventoried roadless areas lying between the harvest areas and the primary road.

Within the Bear River Watershed, approximately 10.5% of USFS lands are considered to be Sagebrush/mountain Shrub cover types. Other community types include:

- Forested land - Douglas-fir/Limber pine, Lodgepole pine, Mixed conifer, Subalpine fir/Engelmann spruce, Aspen, Aspen/Conifer mix
- Woodland Vegetation - Sagebrush/Mountain shrub, Mountain mahogany, Maple, Juniper
- Forbs and Grasslands.

There have been no floristic inventories of plant species to determine the presence of TES species to date within the Caribou NF.

Wildfire - The USFS decision to use suppression tactic(s) depends on many factors including threats to life, property, and investments; weather conditions; fuels; terrain; and the availability of firefighting personnel and equipment. Strategies regarding the use of fire in all aspects of ecosystem management and resource benefit are currently being developed. Fire intervals within the Watershed vary between habitat types, and range from twenty years in Shrubland habitats to over 130 years for subalpine fir habitat types.

Noxious Weeds - Noxious weeds occur throughout the Forest. In 2000, the Forest reported 141,673 of acres infested by noxious weeds and treated 3,950 acres. Federal,

state, and local agencies have expressed a growing concern about the spread and effects of noxious weeds on public and private lands. The Forest uses an Integrated Pest Management Strategy (IPMS) to manage noxious weeds. The strategy was the basis of the Environmental Analysis and Decision Notice completed on September 30, 1996. To the extent funds are available, the Forest treats noxious weeds through the IPMS approach. An objective of the Revised Caribou Land and Resource Management Plan will be to finalize and adopt the Forest wide Noxious Weed Strategy document.

Wildlife Habitat - The Forest provides a wide variety of diverse habitats for approximately 334 species of terrestrial vertebrate wildlife known or suspected to occur on the Forest. These habitats provide cover, forage, water, and reproductive sites for mammals, reptiles, birds, and amphibians, all of which contribute towards the biological diversity of the Forest. The habitats are not comprised of one dominant vegetation type, rather a variety of vegetation species and structural stages with unique environmental conditions arrayed across the landscape providing niches required by wildlife species (Thomas, USFS, 1979). Habitats can be broadly classified as forested, rangeland, and riparian cover types. The following tables identify several species known to occur within the Caribou NF.

Table. Threatened and Endangered Species Identified by the USFWS as known or suspected to occur on the Caribou National Forest and associated habitats

Species	Status[1]	Forest	Rangeland	Riparian
Gray wolf (*Canis lupus*)	LE;XN	X	X	X
Whooping crane (*Grus americana*)	LE;XN			X
Bald eagle (*Haliaeetus leucocephalus*)	LT	X	X	X
Canada lynx[2] (*Lynx canadensis*)	LT	X		[24]

[1] LE = Listed, Endangered ; XN = Experimental/Non-essential, LT = Listed, Threatened

Table. Sensitive Fauna Identified by the Regional Forester Known or Suspected to Occur on the Caribou National Forest and associated with forested, rangeland and riparian communities.

Sensitive Wildlife	Forest	Rangeland	Riparian
Spotted bat (*Euderma maculatum*)		X	
Western big-eared bat (*Corynorhinus townsendii*)	X		
Wolverine (*Gulo gulo*)	X		
Boreal owl (*Aegolius funereus*)	X		
Flammulated owl (*Otus flammeolus*)	X		
Great Gray owl (*Strix nebulosa)*	X		
Northern goshawk (*Accipiter gentilis*)	X		
Trumpeter swan (*Cygnus buccinator*)			X
Harlequin duck (*Histrionicus histrionicus*)			X

Three-toed woodpecker (*Picoides tridactylus*)	X		
Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus)*		X	
Spotted frog (*Rana luteoventris*)			X
Peregrine falcon *(Falco peregrinus anatum)*			X

Additionally, the USFS uses a method of identifying threatened habitat(s). The 1985 Forest Plan identified seven terrestrial species of animals as management indicator species (MIS). These MIS were chosen because of general, wide public interest, or because the species has habitat requirements similar to other species, thus acting as a biological barometer for the well-being of specific habitats.

In 1997, Region One/Four Terrestrial Protocols were approved. Steps to identifying MIS were outlined. A good indicator species will be sensitive to the underlying habitat of interest and will be specific to the habitat of interest. Several MIS were identified for specific habitats. Processes was used to identify habitats to be monitored by MIS and are generally those species identified as being at high risk, through either USFS PFC analysis, the Idaho Bird Conservation Plan, or the Columbia River Basin Assessment.

Table. Habitats at Risk and Suggested MIS

Habitat	Species	Rationale
Riparian shrub	Beaver	Keystone species associated with shrub riparian system engineer. Many of the Species at Risk (SAR) are associated with beaver ponds or shrub riparian, which is a key component necessary for beaver. Identified as MIS for Region 1.
Grassland and open canopy sagebrush	Columbian sharp-tailed grouse,	Only one of the SAR that is a yearlong resident, there is monitoring data and is a Sensitive Species.
Sagebrush	Sage grouse	Currently a MIS for the Caribou and was identified as a MIS for Region 1. Good monitoring data exists.
Aspen	Red-naped sapsucker	Currently a MIS for the Caribou and was identified as a MIS for Region 1.
Mature and old forest structure	Goshawk	Currently this is a Sensitive Species and monitoring data exists. Goshawks have large home ranges, use a variety of forest types and structural stages, but nest in older stands.
Early seral forest structure	Snowshoe hare	This species is affected by management activities, is a yearlong resident with small home ranges, and it would be feasible to monitor trends with changing forest structure

Species-at-Risk are those species for which a loss of viability, including reduction in distribution or abundance, is of concern within the plan area. This includes Threatened, Endangered, and Sensitive Species (which have been discussed previously). Additional species-at-risk for this analysis include species from the Region 4 Species-at-Risk data table (McCarthy, USFS), as well as incorporating species from other analyses. Species of

concern from the Idaho Conservation Data Center (CDC), the Interior Columbia Basin Assessment (USDA-FS/USDI-BLM, 1996), and the Idaho Bird Conservation Plan (Partners in Flight, 2000) have been incorporated where appropriate (Wildlife Process Paper in the project file). These species are listed by habitat association (forest, rangelands, and riparian) in the following tables. For more information on how these species were selected, and how they were grouped, see the USFS Wildlife Process Paper.

Table. Forest-associated Species-at-Risk

Low-elevation mixed conifer	**High-elevation mixed conifer**	**Aspen**
Sharp-shinned hawk	Uinta chipmunk	Ruffed grouse
Northern pygmy owl	Olive-sided flycatcher	Red-naped sapsucker (MIS)
Lewis' woodpecker	Hammond's flycatcher	
Williamson's sapsucker	Northern flying squirrel	
Brown creeper	Marten	
Western tanager		
Silver-haired bat		
Long-legged bat		
Long-eared bat		

Table. Rangeland-associated Species-at-Risk

Grassland/ Open Canopy Sagebrush	**Sagebrush/ Closed Canopy Sagebrush**	**Juniper/pinyon/ Mountain Mahogany**	**Arid Cover Types**
Columbian sharp-tailed grouse	Sage sparrow	Ferruginous hawk	Western small-footed myotis
Long-billed curlew	Sage grouse	Gray flycatcher	Pallid bat
Grasshopper sparrow	Pygmy rabbit	Plumbeous vireo	
Swainson's hawk	Sage thrasher	Western scrub jay	
Western meadowlark	Brewers sparrow	Pinyon jay	
Loggerhead shrike		Virginia's warbler	
Short-eared owl		Black-throated gray warbler	
Burrowing owl			
Lark sparrow			

Table. Riparian-associated Species-at-Risk

Riparian	Non-riverine wetlands
Northern leopard frog	Cinnamon teal
Western (boreal) toad	Redhead
Common garter snake	Sandhill crane
Lesser goldfinch	Killdeer
MacGillivrays warbler	Black-necked stilt
Black-chinned hummingbird	American avocet
Calliope hummingbird	
Rufous hummingbird	
Willow flycatcher	
Dusky flycatcher	
Yellow warbler	
American dipper	

Roads - Transportation facilities (roads, bridges, and culverts) provide important access to the Caribou National Forest for a variety of uses, including recreation, timber harvest, livestock grazing, and mining. As access has improved and local pressures have increased, additional roads have been pioneered for hunting, fuel wood gathering, and other recreational needs.

The current road system is a combination of planned and unplanned roads. The majority of planned roads have been located, designed, and constructed to an approved standard. Some existing, poorly located, unplanned roads are being closed, relocated, or redesigned to reduce environmental impacts through current timber management activities. Roads play a role in the condition of the ecosystem. They contribute to sedimentation and reduced water quality, interrupt normal surface and subsurface water flows, fragment wildlife habitat, remove land from production, can cause fish blockage, and accelerate water flows that result in stream bank erosion. Human use associated with roads can also increase the spread of noxious weeds and displace wildlife. At present, the concern for soil erosion related to roadways is minimal within the watershed.

Mining and Mineral Extraction – There does not appear to be any activity of this type occurring within the St. Charles Creek Watershed currently.

Livestock Grazing – Approximately ninety-seven percent (1,011,200 acres) of the more than 1.04 million acres of the Caribou National Forest are in grazing allotments open to grazing; fifty-one are cattle and eighty-one are sheep. Of these areas, about 566,800 acres rated capable for grazing cattle and about 1,000,400 acres for sheep. Four sheep allotments are vacant where no grazing occurs. No vacant cattle allotments are available

at this time on the Forest. All 132 allotments have approved Allotment Management Plans (AMP). Of these allotments, seventy-seven (~ 58%) are compliant with the National Environmental Policy Act (NEPA).

It was reported that there are four grazing "units" within USFS Lands in the watershed. Approximately 100 cattle utilize these grazing units. There are known State of Idaho and BLM lands within the watershed but data pertaining to grazing allotments, number of permittees, and number of livestock AUM's was not available at the time of this report. However, it can be reasonably assumed that the numbers of cattle grazing on private lands may equal or exceed 2 to 3 times the number per acre reported for federal lands.

Although definitive numbers of grazing livestock were not available for the report, grazing and rangeland management should be considered a potential source of soil erosion and overall degradation of watershed function. Historically, this activity has many examples of producing negative influences on the integrity of vegetation communities, wildlife habitats, soil erosion, and stream/riparian zone degradation.

Other Concerns – Recreation is becoming more prevalent in watershed and increasingly contributes to stream bank degradation, nutrient loading, and sedimentation of the stream. Predominant evidence of impacts occur in or near campgrounds and dispersed camping sites in Davis Canyon, however it is considered to be a minor concern on USFS lands at this time. Future concerns include additional conflicts between cattle and people, viewscape degradation, future lodgepole pine kills from insect infestations, and increasing fire hazards, will surely arise.

IV. Reference Conditions for St.Charles Creek, Idaho

The St. Charles Creek watershed has been influenced by human development since the early 1800's when the first pioneers settled the northern shores of Bear Lake. Many of the first visitors were trappers from the Wilson Price Hunt Expedition. Like most of the West, the density of furbearers at the time was likely much greater than today. The historic presence of beaver (*Castor canadensis)* likely resulted in vast flora and fauna differences.

The first settlers established livestock and agriculture in the valley that transformed the landscape much like today's current use. Human resident population in Bear Lake County has actually decreased over the past century but the number of recreational visitors has dramatically increased and the consumptive use of the natural resources is likely more impacting.

Historically high populations of waterfowl prompted the inclusion of Dingle Marsh in the creation of the Bear Lake National Wildlife Refuge.

Necessary levels of instream flow required for incubation and rearing are flows of 4-6 cfs for fry. Research indicates that there is a steady decline in success above those optimal levels. Furthermore, juvenile cutthroat tend to be occur in habitats that are deeper with more sustained, swift velocities. However, water discharges exceeding 20 cfs have shown to have negative impacts on juvenile habitat. Adult Bear Lake BCT

habitat does not appear to exist below 4 cfs. They utilize habitats with great velocities. Within the St. Charles system, diversions generally occur between 2-4 times during the summer. Habitat along the Little Arm below Highway 89 has been identified as the most critical habitat to protect during the diversion season. (Kershner and Horan)

Bonneville cutthroat trout (*Oncorhynchus clarki utah)*

The Bonneville basin is the largest basin found within the Great Basin. During the late Pleistocene the Bonneville basin comprised the largest ancient lake with native trout believed to be found in all suitable habitat. The ancient Bonneville Lake extended throughout much of Utah's western half covering approximately 40% of the basin's 132, 650 km^2. The lake was deep to about 300 m and it is presumed that fish were not able to access this water until approximately 30,000 years ago. At this time there was believed to be a shift in the Bear River. It had once drained into the upper Snake River and now through geologic processes became connected to the Bonneville basin. The population was distributed throughout the basin yet those inhabiting the Bear River region appear to have adapted and evolved to survive a more fluvial condition, as the larger lake did not entirely submerge the Bear River drainage.

V. Synthesis

Currently St.Charles Creek exhibits two very different personalities at either end of its course; this contrast is mostly due to human-induced changes. By far, the lower end of the creek has been altered more than the upper end. This dichotomy provides limited insight regarding the historical conditions of the creek.

Snowmelt and rainfall continue to be the two major sources for water in the creek, although there are a number of small springs that also contribute water. Existing channel morphology and flow regimes for the upper portion of St. Charles Creek are probably representative of conditions that have occurred for the past several hundred years, although there have not been many studies conducted to confirm this. The greatest evidence that this portion of the creek reflects past conditions is reflected by its continued importance to an endemic population of Bonneville Cutthroat trout. St.Charles Creek is the 'largest tributary to Bear Lake that supports a population of naturally-spawning adfluvial Bear Lake cutthroat trout.' (Jacobsen, 1995) The upper 10.1-kilometers of the creek are free-flowing and meet "outstandingly remarkable 'fisheries' values and was determined to be eligible for further study under the Wild and Scenic River Act."(Caribou-Targhee DEIS) Changes that have occurred at the lower end of the watercourse have limited the ability of these trout to return to their traditional spawning grounds. As a result, the stream's original ecological structure has been altered. Besides these changes, recent activities such as cattle grazing and timber harvesting have also affected the watershed, but both activities have historically occurred at relatively moderate levels. The upper portion of the creek remains 'well vegetated with Lodgepole

pine, Douglas fir, and aspen.' (Kershner and Horan, 1997) Douglas fir was introduced into the United States.

The lower portion of St.Charles Creek, however, does not reflect its historical conditions. This section of the creek used to be directly connected to Bear Lake and native trout could navigate their way to upstream spawning grounds. Water quality and temperature was probably relatively consistent from end to end. Lake levels fluctuated moderately in accordance to regional climate patterns whereas the lake currently endures substantial seasonal fluctuations. The split between the Big Arm and the Little Arm likely occurred due to marshy conditions near the lake's shore; both probably contained more consistent stream flows than currently observed. Historic groundwater levels likely remained at more stable levels with less fluctuation as no "unnatural" withdrawal of groundwater or surface water occurred. Fluctuations would have been in response to precipitation. Basin composition and flow pattern likely retain much of their historical characteristics.

Water quality has been seriously altered from its historical state. Though no precise numbers are available, it is known that sediment and nutrient loads were significantly lower. It is only since the late 19th century that agricultural practices have significantly increased these levels. Increased intact wetland and riparian areas would have helped regulate water quality and temperature consistency.

VI. Recommendations

Fisheries

Discontinue stocking of non-native rainbow trout into Bear Lake. If sport fishing is too valuable to the socio-economics of the region, use sterilized fish.
Screen Diversions to prevent juvenile fish mortality
Limit the amount of water used for irrigation
Improve the existing diversions sop that there is some flow through the diversion at all times
Install fish friendly irrigation weir so landowners can continue to some of the water by BLBCT are still capable of migrating in and out of the river.
Monitor and evaluate the effectiveness of the fish ladders.
Monitor the stream habitat condition to maintain high water quality by reducing sedimentation caused by grazing and agriculture practices. Limit high temperatures.
Work with landowners to re-establish the hydrology of St. Charles and reduce channelization.
Control brook trout populations if necessary to reduce competition.

Sustained water flows are deemed necessary in order to support a viable BLBCT population in St. Charles Creek. Stream flows must be adequate to maintain spawning and rearing habitat. Several diversion sites along the Big Arm and Little Arm have been

identified to impede movement of adult spawning migrants coming from Bear Lake and both adult and juvenile out migrants (Jacobson et. al. 1990).

Wildlife

"Wildlife Habitat would increase if the potential vegetative condition of the riparian habitat were improved"

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