

## **Bear River Ecology<sup>1</sup>**

The ecology of the Bear River is understudied. The Yuba River to the north and the American River to the south have been given more attention, partly because they have larger, more diverse watersheds, and partly because Bear River habitat is so heavily impacted by human activities, both current and historic. The information which follows is largely anecdotal, gathered primarily from interviews with agency biologists, researchers, activists, and anglers.

More is understood about the upper and very lower reaches of the Bear than about the reaches in between. The headwaters of the Bear down to the first impoundment at the Drum afterbay are relatively unimpaired, and serve as the River's only remaining high-quality coldwater aquatic habitat. The lower reach of the river, downstream of the dam at Camp Far West, still offers the potential for fall-run Chinook salmon. The reaches in between—constituting most of the Bear River—are heavily impacted by water imports and diversions, barriers, gravel mining, municipal and residential effluent, and other factors and offer far less quality habitat than was available under pre-development conditions.

The following is a compilation of information gleaned from those with the most first-hand knowledge of Bear River ecology. Sections are organized by reach, beginning at the headwaters and moving downstream.

### ***Upper Bear*** (headwaters to Drum afterbay)

This reach stretches approximately eight miles from the Bear's headwaters just below Lake Spaulding to the afterbay following the Drum powerhouses (which are powered by Yuba River water conveyed by way of the Drum canal). The upper reach of the Bear River is fed by natural springs. From pioneer records, these springs kept the river flowing during the heat of summer historically. Today, operators are required to maintain at least 5 cfs in this reach, and water is added from the South Yuba canal to ensure these flows. The headwaters are at approximately 5000 feet elevation, and the Drum afterbay is at approximately 3300 feet elevation, so the drop in the upper canyon is steep.

The upper reach of the Bear River supports a wild trout fishery, with browns and rainbows at populations typical for Sierra streams at that elevation (Carlson 2002). The California Department of Fish & Game surveys by electrofishing every couple of years to determine populations (Hiscox 2002). The river emerges from a forested area just downhill from Lake Spaulding, flows out into a meadow known as Bear Valley, then moves downstream into its canyon. The stretch through the meadow had been severely degraded by cattle grazing. Ten years ago, a quarter-mile long restoration project in the meadow was designed by Fish & Game and constructed with volunteer labor from the Granite Bay Flycasters club. They built sediment traps and planted riparian vegetation on

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<sup>1</sup> Edited version of Doug Johnson original, Spring 2002

banks to provide cover. The channel has been restored to a narrow, deep profile, and today the habitat supports a healthy trout fishery (Baker 2002, Coleman 2002).

Bear Valley is important habitat for at least one sensitive species, the willow flycatcher (*Empidonax traillii*), which is on the California Endangered list (Hiscox 2002, Carlson 2002). The Mountain yellow-legged frog (*Rana muscosa*), a California Species of Concern, is found down to 4,500 feet and could conceivably be found in the upper watershed, though it is primarily found in lacustrine, rather than riverine, environments. The Foothill yellow-legged frog (*Rana boylei*), a California Species of Concern, and the Red-legged frog (*Rana aurora draytoni*), federally listed as Threatened, may have been found there historically.

Half of Bear Valley is owned by the Forest Service as part of the Tahoe National Forest, the other half by Pacific Gas & Electric. Though proximate to Interstate 80, the PG&E properties are now protected as part of the newly-established Pacific Forest and Watershed Lands Stewardship Council.

### ***Middle Bear*** (Drum afterbay to New Camp Far West Reservoir)

This reach runs approximately fifteen miles from the Drum afterbay (3300 feet elevation) down to Rollins Reservoir (2100 feet elevation), then approximately ten miles to Lake Combie (1600 feet elevation), then approximately seventeen miles to New Camp Far West Reservoir (300 feet elevation). This reach is predominantly deep in a steeply incised canyon.

### Fish

The Bear River from its headwaters all the way down to Camp Far West historically supported a cold water fishery with brown and rainbow trout. (While salmon once thrived in the lower reaches of the river, a natural waterfall or ledge -- now submerged under New Camp Far West Reservoir -- blocked further migration upstream. Yoshiyama, 2001, page 117) Today, extended periods of high diversions and low minimum flows, warm water from reservoir storage (especially at lower elevations and in from late spring to mid fall), and introduced aquatic species all reduce the quality of the fishery (Hiscox 2002). The coldwater fishery that still exists in the upper reach before diversions is drastically limited in the middle Bear. Though the Bear likely ran very low in the summer historically, today's short-term fluctuations are harder on native aquatic wildlife than more gradual seasonal variations.

The reach between Lake Combie and Camp Far West Reservoir is now reputed to be a renowned area for bass fishing. Introduced *Centrarchids* such as small mouth bass and green sunfish are popular game fish—they also displace native species. During high flow events, game fish probably wash into the river from stocked ponds on private property. (Hiscox 2002).

## Amphibians

Amphibian species are used as indicator species by the California Department of Fish & Game to gauge the health of aquatic habitat. In the elevational range of the middle Bear River reach, the Foothill yellow-legged frog (*Rana boylei*), a California Species of Concern, is the principal indicator species (Lehr 2002).

*Rana boylei* requires shallow, flowing water, apparently preferentially in small to moderate-sized streams with at least some cobble-sized substrate. This type of habitat is probably best suited to oviposition of egg masses and likely provides significant refuge habitat for larvae and postmetamorphs. This species deposits masses of 300-1200 eggs on the downstream side of cobbles and boulders over which a relatively thin, gentle flow of water exists. The timing of oviposition typically follows the period of high flow discharge resulting from winter rainfall and snowmelt, which results in oviposition usually occurring between late March and early June. After oviposition, a minimum of roughly 15 weeks is needed to attain metamorphosis, which typically occurs between July and September. The embryos have a critical thermal maximum (CTM) of about 26°C, but the precise embryonic CTM for this species is not known (Jennings and Hayes 1994).

The ideal Foothill yellow-legged frog location is on a point bar at the mouth of a tributary. This gives them the habitat they need, with slower water moving over cobbles, as well as access to a small stream refuge during high flow events (Lehr).

There have been incidental sightings of *Rana boylei* by the U.S. Forest Service at Dutch Flat while they were surveying for endangered Red-legged frogs (*Rana aurora draytoni*). No Red-legged frogs were found (Carlson 2002). There are, however, historic records of Red-legged frogs near Dutch Flat (Museum of Vertebrate Zoology collection, U.C. Berkeley, specimen numbers 29314, 29315, 29316 taken 0.5 mile NE of Dutch Flat in 1939).

Foothill yellow-legged frogs are severely impacted by non-native species such as bullfrogs (*Rana catesbeiana*), green sunfish (*Lepomis cyanellus*), bass (*Micropterus* spp.), fathead minnows (*Pimephales promelas*), and red swamp crayfish (*Procambarus clarkii* and *Pacifasticus* spp). These species are favored by the warmer water that results from reservoir storage, diversions, and extended low flows. Frogs are also not well adapted to flows that vary suddenly or regularly, such as those coming from dam releases. (Flows below Rollins can vary from 10 to 2,000 cfs in a day (Hiscox). They are, however, adapted to high winter-time flushing flows, and can survive them by retreating into tributaries. Especially strong flushing flows have occasionally reduced populations of exotic species, with an attendant rebound in native species (Lehr 2002). Re-operation of the river for a cold water fishery via increased releases, reduced diversions, and/or modified storage operations would create an environment more conducive to healthy amphibian habitat too.

### Turtles

The Western pond turtle (*Clemmys marmorata*), which existed in the Sierra watersheds historically, is a California Species of Concern (Jennings and Hayes 1994). Bullfrogs prey on hatchling or juvenile turtles and may be responsible for significant mortality because they occupy shallow-water habitats in which the youngest age groups of turtles are frequently observed. Bass are also known to prey on the smallest juveniles, and sunfishes (*Lepomis* spp.), though they are not large enough to prey on hatchling western pond turtles, probably compete with them for food since they are known to be able to keep available nekton (free swimming aquatic animals) at very low levels (Jennings and Hayes 1994).

### Habitat Degradation

Barriers and diversions (i.e., large and small dams), imports, exports, and storage operations are not the only factors affecting aquatic habitat. Groundwater pumping decreases flows in river, and sewage runoff from aging and poorly functioning septic lines and fields causes nutrient loading (Hiscox 2002). The Bear River CRMP and Nevada County RCD had a grant for a one-year monitoring program to take water quality samples and conduct macro-invertebrate assessments to gauge the health of the food chain (Gallentine 2002).

The flumes and canals that transport the majority of the watershed's flow occasionally fail, spilling water until they are shut off. Two notable instances are the Pitman slide in 1991 and the Chicago Park slide in 2002. In both instances, huge flows spilled from flumes onto steep hillsides where they washed enormous amounts of soil and debris into the Bear River. The sediment from these slides decimated aquatic habitat. The Pitman landslide actually dammed the river briefly, and when the river eventually breached the dam formed by the landslide, the resulting flood wrecked the Drum powerhouse and caused extensive resource damage (Hiscox 2002).

Gravel mining operations above Rollins Reservoir and Lake Combie also contribute to habitat degradation. These operations continuously skim gravels from the river bed, disrupting natural sediment movement (Hiscox. 2002).

Campgrounds, such as the Bear River Recreation Area at the Dog Bar Road crossing, provide access for intensive human use. Refuse, human waste, and disturbance of stream banks and the streambed are all potential impacts.

### ***Lower Bear*** (below Camp Far West)

This reach of the Bear River extends for approximately six miles from the dam at Camp Far West to Wheatland, then another twelve miles to the confluence with the Feather River, some thirteen miles before the Feather joins the Sacramento River. This reach is fairly flat. The reservoir spillway is at approximately 300 feet elevation, and the water stage recorder 1.2 miles downstream is at 120 feet elevation.

### Salmonids

Most of the water below New Camp Far West dam is diverted to irrigation canals. As recorded from 1964 to 1990, flows downstream of the diversions from July through October averaged from 14 to 17 cfs. These minimal fall flows have drastically reduced the ability of fall-run salmon to spawn in the reach. The Bear River is thought to have had a major fall-run Chinook population historically, though natural barriers to higher elevations probably limited upstream migration. The reach has a remnant fall Chinook run, but its size and quality has long been limited by extended periods of low flows, high water temperatures, and generally poor habitat conditions due to the lack of gravel replenishment and resultant scouring.

USFWS records show that in years where the October flow was below 20 cfs, the number of adult spawners is negligible, typically zero. During years with flows from 20 up to 50cfs, the number of spawners climbs as high as 300. Raising flows during the fall would be expected to at least double escapement, the number of adults that successfully spawn (McEvitt 2002, USFWS 1997). The USFWS has recommended that flows be increased to 100-250 cfs in October and November when fall run Chinook are spawning (USFWS 1997).

A few miles upstream of the Bear-Feather confluence is Dry Creek, a 19,000-acre watershed located north of the Bear and south of the South Fork of the Yuba. Near its headwaters is the Spenceville Wildlife Area, an 11,213-acre wildlife preserve managed by the California State Department of Fish & Game. Over 175 species of birds, including the state and federally-listed California black rail and bald eagle, have been seen in the Spenceville area. The valley elderberry longhorn beetle, a federally listed as threatened, is supported by the area's stands of elderberry. The area "has exceptional species richness and contains many game and non-game species and unique and diminishing habitats, and animal movement corridors. Spenceville contains the greatest contiguous public blue oak woodland in the tri-county area. Not counting plants, at least six federal- and/or state-listed threatened or endangered species are known to use the wildlife area" (Friends of Spenceville).

Spenceville is also linked to Bear River water supplies in at least two ways. First, Spenceville receives up to 5 cfs of surplus water from NID via NID's Tarr Canal. If demand for the district's water resources increases, or if the available water resources themselves shrink, then flows for Spenceville may be vulnerable to being withdrawn for other purposes absent advance or concurrent measures that to firm up (or enhance) Spenceville's interim contract supply. And second, additional NID water could be dedicated by or acquired from NID (or perhaps someday from NID users directly) to support and enhance Dry Creek's salmon and steelhead, especially so if passage can be provided above General's Dam, a 30+ foot high diversion dam located on the Beale AFB several miles below Spenceville.

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