THE EFFECT OF WATER MANAGEMENT AND LAND USE PRACTICES ON THE RESTORATION OF LEE VINING AND RUSH CREEKS[1]

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Abstract: This paper describes water management and land use practices in the Rush and Lee Vining Creek watersheds and evaluates the effect they have had on the stream environment. The management practices will continue to have effects on the flow regime and consequently habitat conditions on lower Lee Vining and Rush Creeks. The implications of existing and potential management practices for the restoration of the stream habitat are discussed.

From 1940 to 1982, the riparian and aquatic habitat along the lower reaches of Rush, Lee Vining, Walker, and Parker Creeks was greatly reduced by the diversion of the streamflow for export to the City of Los Angeles. Since 1981 a combination of wet years and subsequent court injunctions has led to the rewatering of the formerly desiccated reaches of Rush Creek and Lee Vining Creek. In response to a court request, the California Department of Fish and Game (CDFG) is administering cooperative studies to determine the necessary flows for restoration and maintenance of the trout fishery on lower Rush Creek; similar investigations are expected for lower Lee Vining Creek. By analyzing the biological and physical properties of the stream, the in-stream flow studies provide the basis for relating the potential aquatic and riparian habitat to different flow regimes.

If the flow regime could be controlled by dam releases alone, the restoration and maintenance of the habitat could proceed fairly confidently from the recommendations of the in-stream studies. In the Mono Lake watershed, any prescribed flow regime for lower Rush and Lee Vining Creeks must be coordinated with the water management practices of the Los Angeles Department of Water and Power (LADWP) and Southern California Edison's (SCE) as well as any water management that will be required for maintenance of Mono Lake levels. Likewise, land use practices in the watershed will affect the condition of stream habitat and should be considered in any restoration plan. The in-stream studies can thus be viewed as the initial steps in developing a restoration plan.

This paper examines how water management and land use practices in the Mono Basin will affect the flow regime, and consequently, the restoration and maintenance of stream habitat on lower Rush and Lee Vining Creeks.

Setting

Rush Creek and Lee Vining Creek drain the 10,000-to 13,000-foot crest of the Sierra Nevada east of Yosemite National Park (fig. 1). They emerge from the mountain front at about 7200 feet and flow about 4 miles (Lee Vining Creek) to 8 miles (Rush Creek) across alluvial, lacustrine, and aeolian sediments of the Mono Basin before emptying into Mono Lake.

Under natural conditions, Rush Creek and Lee Vining Creek are the two largest tributaries of Mono Lake, a hydrographically closed lake (i.e. a lake with no outlet). The combined runoff of 50,000 acre-feet per year from Lee Vining Creek and 75,000 acre-feet per year from Rush Creek (including the inflow from Walker and Parker Creeks) accounts for over 80 percent of the natural surface inflow to Mono Lake. Runoff is primarily derived from the snowpack of the Sierra Nevada and about two-thirds of it occurs in the peak snowmelt months of May, June, and July. After snowmelt, summer precipitation and groundwater sustains streamflow.

The flow regime of the two streams has been altered since the 1860's when European settlers diverted streamflow for irrigation, mining, and milling. From 1915 to 1925, dams were constructed on natural lakes in the upper reaches of both streams to provide storage and outflow regulation for the production of hydroelectricity. Increased irrigation demands in the early part of the twentieth century prompted the construction of a dam at Grant Lake in 1915 which was subsequently enlarged in 1926. The most dramatic alteration of the flow regime occurred after LADWP completed the Mono Basin extension of the Los Angeles Aqueduct in 1940. The Mono Basin facilities gave LADWP the ability to divert the entire flow of Rush Creek and Lee Vining Creek in most years.

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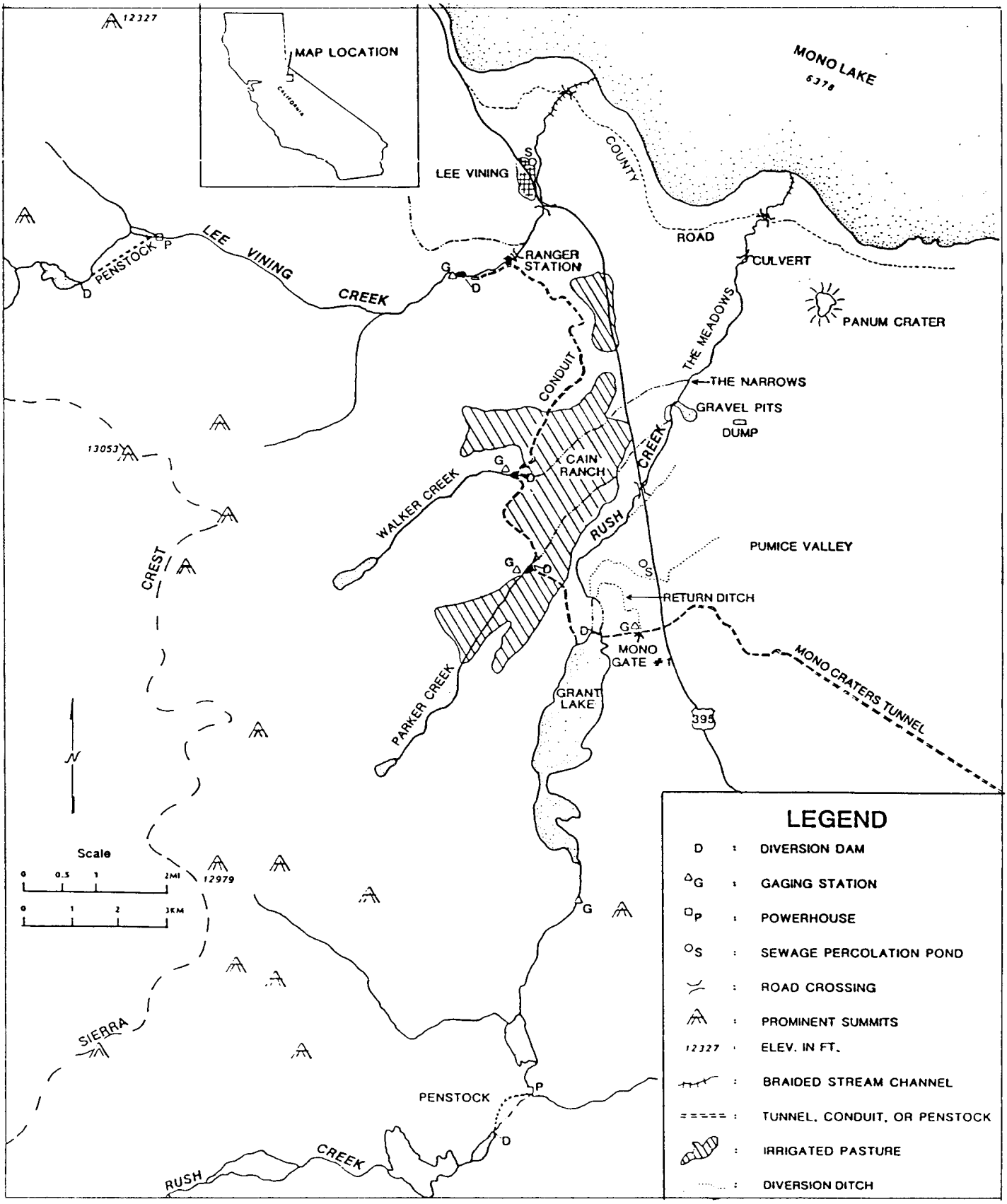

Figure 1- Location Map.

Abnormally high runoff from 1982 to 1984 forced the LADWP to release water into lower Rush Creek. A naturally reproducing population of brown trout reestablished itself in the rewatered lower Rush Creek. With the advent of drier conditions, LADWP announced the shut-off of the Rush Creek releases in late 1984, prompting a coalition of local fishermen, California Trout, and the Mono Lake Committee to file suit to prevent the shut-off and consequent destruction of the fishery. The court initially granted a temporary restraining order and later a preliminary injunction requiring that a 19 cubic feet per second (c.f.s.) release into lower rush Creek be maintained (Dahlgren et al vs. City of Los Angeles, Mono County Superior Court No. 8092). Similarly, involuntary releases on Lee Vining Creek led to the reestablishment of a fish population in formerly desiccated reaches of lower Lee Vining Creek. When LADWP ended the releases in August of 1986, a separate court action was initiated (Mono Lake Committee vs. City of Los Angeles, Mono County Superior Court No. 8608). In the fall of 1987 the trial court issued a preliminary injunction requiring a minimum release of 4-to-5 c.f.s. in order to maintain fish habitat in the first 2 miles of lower Lee Vining Creek. Both lawsuits assert that (1) California Fish and Game code section 5937 requires dam owners to release enough water to provide for a downstream fishery and (2) the public trust doctrine requires that sufficient water be released to protect riparian and aquatic habitat.

Water Management

Runoff from the upper reaches of Lee Vining and Rush Creek is stored and regulated by Southern California Edison (SCE) reservoirs. SCE's Rush Creek reservoirs can store up to 23,000 acre-feet, and their Lee Vining Creek reservoirs store up to 13,000 acre-feet. The outflow from the reservoirs is regulated by hydropower production; regulation can reduce downstream flows in the snowmelt months by 40 percent and increase flows in the fall and winter months by 400 percent (Vorster 1985). Water released through (and around during peak snowmelt) the power plants combines with downstream tributary inflow and becomes available for diversion by LADWP. LADWP diverts the water of Lee Vining Creek with a small check dam into a conduit; the Lee Vining conduit collects the runoff from Walker and Parker Creeks and transports the diverted water to the Grant Lake Reservoir on Rush Creek. Water from Grant Lake Reservoir is exported out of the Mono Basin through the Mono Craters tunnel. The reservoir's 47,500 acre-foot capacity regulates the seasonally variable runoff to the planned exports. LADWP tries to divert and export all of the runoff except for about 10,000 acre-feet that is released in the spring and summer from Walker and Parker Creeks and the Lee Vining conduit for irrigation of land around Cain Ranch. In years of high runoff all or most of the Los Angeles Aqueduct demand is satisfied by the Owens River Basin supplies, so the Grant Lake Reservoir water in excess of LADWP requirements is released back into lower Rush Creek through a control structure off the Mono Craters tunnel known as Mono Gate #1. The spillway can also be used to discharge water into Rush Creek when the reservoir is full, although it is not the preferred method since the release is uncontrolled. On Lee Vining Creek, water is spilled over the check dam when the holding pond (7 acre-foot capacity) is full, and the inflow exceeds the 300 c.f.s. capacity of the conduit or if Grant Lake Reservoir is full. Because of the limited on-stream storage capacity, Lee Vining Creek spills occur not only during peak snowmelt but also from intense summer precipitation. Controlled releases, such as the current 5 c.f.s. court-ordered release, are made immediately below the diversion dam.

Land Use

Nearly all of the land in the upper Rush and Lee Vining Creek watershed is owned by the USDA Forest Service. A few SCE parcels and some private inholdings in the June Lake Loop area are the only exceptions. In the lower Rush and Lee Vining Creek watersheds most of the land is owned by LADWP or the Forest Service; SCE owns about a 1 mile stretch along lower Lee Vining Creek. Private inholdings are gradually being acquired by the Mono Basin National Forest Scenic Area.

Both LADWP and the Forest Service permit grazing on their land, mainly by sheep. Grazers rotate their stock from the approximately 2000 acres of irrigated pasture around LADWP's Cain Ranch to the surrounding dry land under the Forest Service and LADWP control. Sheep graze in and along parts of the lower reaches of both creeks and dead sheep are commonly encountered in the creeks.

Unlike lower Rush Creek, the lower Lee Vining Creek watershed has a significant population of year round inhabitants and seasonal tourists. The Forest Service maintains a district ranger station and employee housing within a few hundred yards of the creek. SCE operates a switching station right below the Highway 395 crossing; the creek is routed into a steep concrete-lined channel at the switching station. The town of Lee Vining overlooks the creek below Highway 395. Lee Vining has 300 to 400 year-round residents and tens of thousands of visitors–mainly in the summer. Its wastewater is delivered to percolation ponds that drain into the creek.

Recreational use of stream corridors includes hiking, fishing, sightseeing, dirt-bike riding, snowmobiling, and cross-country skiing. Recreational use of lower Rush Creek has increased substantially since the fishery has been reestablished. Several sections along both streams are readily accessible to vehicles.

A number of active and abandoned gravel mining operations exist near lower Rush Creek. The largest active mine operates on the right (east) bank just above the Narrows (fig. 1). Wash water is disposed in a series of percolation ponds. Across the creek on the left (west) bank, and intermittently active gravel operation appears to use heavy equipment alongside and in the creek. Other land uses in the lower Rush Creek watershed are the Mono County dump and the June Lake Public Utilities District sewage treatment plant, both located less than a mile from the creek.

Impact on Flow Regime and Habitat

Flow in lower Rush and Lee Vining Creek was not significantly affected until 1947. A sequence of dry years from 1947 to 1951 caused LADWP to divert all of the runoff and eliminate all releases. From 1952 to 1969 releases were generally confined to periods of high runoff. The completion of the second barrel of the Los Angeles Aqueduct in 1970, which increased the delivery capacity from the Owens Valley to Los Angeles, allowed LADWP to eliminate releases in all but the very wettest years. Absent any releases by LADWP, the lower reaches of Rush Creek below the Narrows was able to sustain a small residual flow (0.1 c.f.s. to 5 c.f.s.) due to irrigation return flow and other groundwater contributions. The residual flow disappeared in the 1970's in part because irrigation return flow was reduced. Similarly in the reach of lower Lee Vining Creek from 1 to 2 miles below the LADWP diversion dam, a small residual flow (0.5 c.f.s. in summer up to 4 c.f.s. in winter) persisted, absent any releases or spills.

The flow regime of no releases for long periods punctuated by brief, catastrophic high flows had substantial impact on the stream environment of lower Rush and Lee Vining Creek. The great decline in riparian acreage and fish habitat was a direct result of the streamflow diversion and has been documented by Stine and others (1984), Taylor (1982), and Vorster (1985). The high flows caused bank erosion, vegetation removal, road washouts, channel migration and other alterations of the stream environment. The die-off of stabilizing riparian vegetation contributed to the channel instability. Channel instability is also accentuated during high flows if the stream has not kept up with changes in the level of Mono Lake which acts as the base level for lower Rush and Lee Vining Creek. As the level of Mono Lake declined from 6417 feet in 1941 to 6372 feet in 1982 in response to the diversion of up to 60 percent of its natural inflow, the creek channels incised in response to the lowered base level.

LADWP's irrigation management also influences the flow regime and habitat of lower Rush Creek. Prior to 1970, return flow from irrigation diversions helped to maintain the residual surface flow and remnant riparian vegetation in lower Rush Creek. Since 1970, about 10,000 acre-feet of water from the Lee Vining Conduit and Walker and Parker Creeks has been used to irrigate approximately 2,000 acres of land around the Cain Ranch from April through September. Consumptive use is about 2 feet per acre, so about 6,000 acre-feet is potentially available to lower Rush Creek via surface or subsurface drainage. This 6,000 acre-feet may still be important in sustaining spring flow (and consequently riparian vegetation) in lower Walker Creek and spring flow in the meadows section of lower Rush Creek.

Regeneration of riparian species is occurring as a result of the continuous flow releases of the last several years; the higher release on Rush Creek has led to greater regeneration than on Lee Vining Creek. The concomitant increase in fish habitat is responsible for the reestablishment of reproducing fish populations.

Implications for Restoration

The lack of regulating storage on Lee Vining Creek at the LADWP diversion facility means that the flow available for lower Lee Vining Creek will be directly affected by the operation of SCE's hydroelectric facilities. During dry periods very little water runs through the power plant because watershed runoff is very low, and the reservoir release is kept low in order to maintain minimum storage levels for recreational and other contractual purposes. Little or no release may also occur during power plant maintenance. Even with no outflow from the power plant there will always be some flow available for release into lower Lee Vining Creek because the Creek gains 3 to 5 c.f.s. of flow between the power plant and the LADWP diversion dam in low runoff periods (Torn Felando, Inyo National Forest, Bishop, CA, personal communication). In the summer evapotranspiration and percolation losses require that releases into lower Lee Vining Creek exceed 5 c.f.s. in order to maintain flow down to the stream mouth. The lack of upstream storage on Lee Vining Creek also means that high flows cannot be regulated as readily as on Rush Creek.

Grant Lake Reservoir has enough storage to insure that a minimum release into Rush Creek, such as the

presently required 19 c.f.s., can be sustained through a drought. An extended period of low reservoir levels, however, can cause the temperature of the outflow water to become dangerously warm for trout in the downstream reaches (Stacy Li, Beak consultants, Sacramento, CA, personal communication). The outflow water is also very turbid when the reservoir is low because it incorporates fine bottom sediment.

Grant Lake Reservoir is not large enough to prevent high releases after heavy snowfall winters. In high runoff periods the reservoir will fill rapidly and force LADWP to release and/or spill Rush Creek inflow (and any incoming Lee Vining conduit water) into lower Rush Creek. As in the past these high flows may cause stream environment changes especially if the Mono Lake level continues to decline.

It is unlikely that the current flow releases of 19 c.f.s. into lower Rush Creek and 5 c.f.s. into lower Lee Vining Creek will lead to the regeneration of the pre-1940 acreage of riparian vegetation (Botkin and others, 1988). Because of the downstream flow losses, only a portion of the release is available to the vegetation. In addition the vegetation needs overbank flooding to stimulate recruitment, although the timing and magnitude of these flood flows has not yet been determined. Grazing in the stream corridor is hindering the establishment of young plants (Patton, Arizona State University, Tempe, AZ, personal communication). Stream-side erosion will also retard the establishment of seedlings (Botkin and others, 1988). The erosion will be exacerbated if Mono Lake drops below its historic low stand of 6372 feet in elevation. Currently the lake level is about 6377 feet, and if releases are maintained at their present level, the lake will drop below 6372 feet in about 3 years.

Mono Lake Management

At the current time Mono Lake levels are not managed. The level will continue to decline because up to 50 percent of its average natural inflow is still being diverted by LADWP. Lake level rises will occur in very wet years. If Mono Lake drops below its historic low level of 6372 feet, a new episode of stream incision would result; if it rises above its recent high of 6381 feet, the stream channels will likely aggrade and become more sinuous in their lower reaches in response to the higher base level.

It is likely that the lake level will be managed in the future because of a number of recent actions: (1) in 1983 the California Supreme Court directed that a balance should be struck between the public trust values of Mono Lake and LADWP's water needs; (2) the Forest Service has recommended that the lake level be managed between 6377 and 6390 feet in the draft management plan for the lands surrounding the lake (Inyo National Forest, 1988); (3) the adverse consequences of further declines in lake level on lake-dependent resources has been documented by two different panels of experts (National Academy of Sciences 1987, and Botkin and others 1988). The maintenance of Mono Lake levels between the current (6377 feet) elevation and 6390 feet will require, on the average, about an additional 50,000 acre-feet (70 c.f.s.) of stream releases over the current level (24 c.f.s.) of releases. There has been no specification of the flow regime for the additional releases, although the Mono Lake Committee (1988) has suggested a wet year/dry year management approach for the stream releases. This approach would involve releasing most if not all of the stream runoff in wet years to take advantage of the lake rises that can occur in those years and releasing the minimum necessary for stream habitat maintenance in drier years so that LADWP can export the runoff when they have the most need for it. The management of the Mono Lake levels between 6377 feet and 6390 feet could enhance channel stability and riparian vegetation colonization.

Conclusion

This paper describes water management and land use practices in the Rush and Lee Vining Creek watersheds and suggests that they will continue to influence the flow regime and habitat on lower Lee Vining and Rush Creeks. If the streams are to be successfully restored, the implications of the management and land use practices must be considered along with the biological and physical properties of the stream. A restoration plan will have to balance the optimum flow requirements for restoring and maintaining fish habitat, riparian habitat, and Mono Lake levels as well as meeting LADWP export needs.

The agencies that actually have the operational control over the flow of water in the creeks–LADWP and SCE–will probably continue to operate as they have in the past until the courts require a permanent flow of water down Rush and Lee Vining Creeks. If and when that happens, an integrated plan involving all interested public agencies, landowners, and private citizens will need to be developed to restore not only the stream ecosystem but adjoining terrestrial and lacustrine ecosystems as well. Nature will presumably take care of the rest.

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