

Appendix: Groundwater Study

Lake Creek Groundwater Seepage Study Results

Lake Creek Ground Water Seepage Study

A ground water seepage study was conducted along a six mile reach of Lake Creek, the outlet drainage for Diamond Lake. The study was conducted as part of the Diamond Lake Restoration Environmental Impact Statement. The flow was measured along the transects shown on Figure 1. Table 1. show the flow values.

Table 1. Surface Water Flow at the Transect Stations along Lake Creek

Transect Station	Flow (cfs)
LC-1	11.01
Unnamed Tributary-1	0.13
LC-2	10.47
LC-3	11.98
LC-4	10.62
LC-5	11.47
Tributary-2	0.32
Tributary-3	0.31
LC-6	12.10
LC-7	12.82
LC-8	11.30
Sheep Creek	0.84

The flow data indicate that Lake Creek is a gaining and losing stream along the six mile reach that was measured. There is no appreciable accretion in surface flow along this six mile reach. Table 2. shows the changes in flow between the transects.

Table 2. Changes in Surface Water Flow Between the Transect Stations, (-) indicates a losing reach.

Stations	Change in Flow (cfs)
LC-1 to LC-2	- 0.54
LC-2 to LC-3	+ 1.51
LC-3 to LC-4	- 1.36
LC-4 to LC-5	+ 0.85
LC-5 to LC-6	+ 0.63 (Tributaries 2 and 3 entered between LC-5 and LC-6 at 0.63 cfs, therefore this reach is static with respect to inflow or outflow)
LC-6 to LC-7	+ 0.72
LC-7 to LC-8	- 1.52

The mean flow was 11.48 cfs, standard deviation δ_{n-1} 0.79.

Conclusions:

If ground water is migrating out of the lake basin at a depth below which the current wells can monitor, it could be discharging into Lake Creek, or recharging the deeper aquifer. Therefore, it was necessary to determine if it was surfacing in Lake Creek, downstream of the outlet. In September 2003, the U.S. Forest Service conducted a ground water seepage study along a six mile length of the creek. The study was conducted while the creek was at base flow. A series of stream gauging transects were completed at intervals along Lake Creek. Any increase in flow to Lake Creek at base flow could only come from ground water discharge, which could possibly be coming from the northwest area of the lake. The results of this investigation indicate that Lake Creek is a gaining and losing stream along the six mile reach that was measured with the mean flow of 11.48 cfs and a standard deviation of 0.79 cfs.

Flow at the first transect (0.25 miles from the outlet, and representative of surface flow from the outlet) was 11.01 cfs, and six miles downstream at the last transect, was 11.30 cfs, with no greater than 1.52 cfs change in inflow or outflow between transects. The results indicate that this six mile reach of the creek is essentially static with regard to accretion of surface flow, with no appreciable increase in flow due to ground water discharging to the creek. The conclusion drawn from this study was that even if ground water was migrating from the lake basin in the area of the H wells, it is not discharging into Lake Creek within the first six miles of the lake outlet, and therefore, if chemically treated lake water were to exit the lake via this route, it would have no deleterious effects on this reach of Lake Creek since it is not discharging into it at base flow. There is the possibility that ground water could discharge at a location further downstream. However, given the hydraulic conductivity of the shallow aquifer, the time required for a release to travel that distance, and the propensity for migration of rotenone to be severely retarded due to its preference to partition to the organic phase, it is very unlikely that rotenone would discharge (further downgradient) at a concentration deleterious to any receiving body of water.

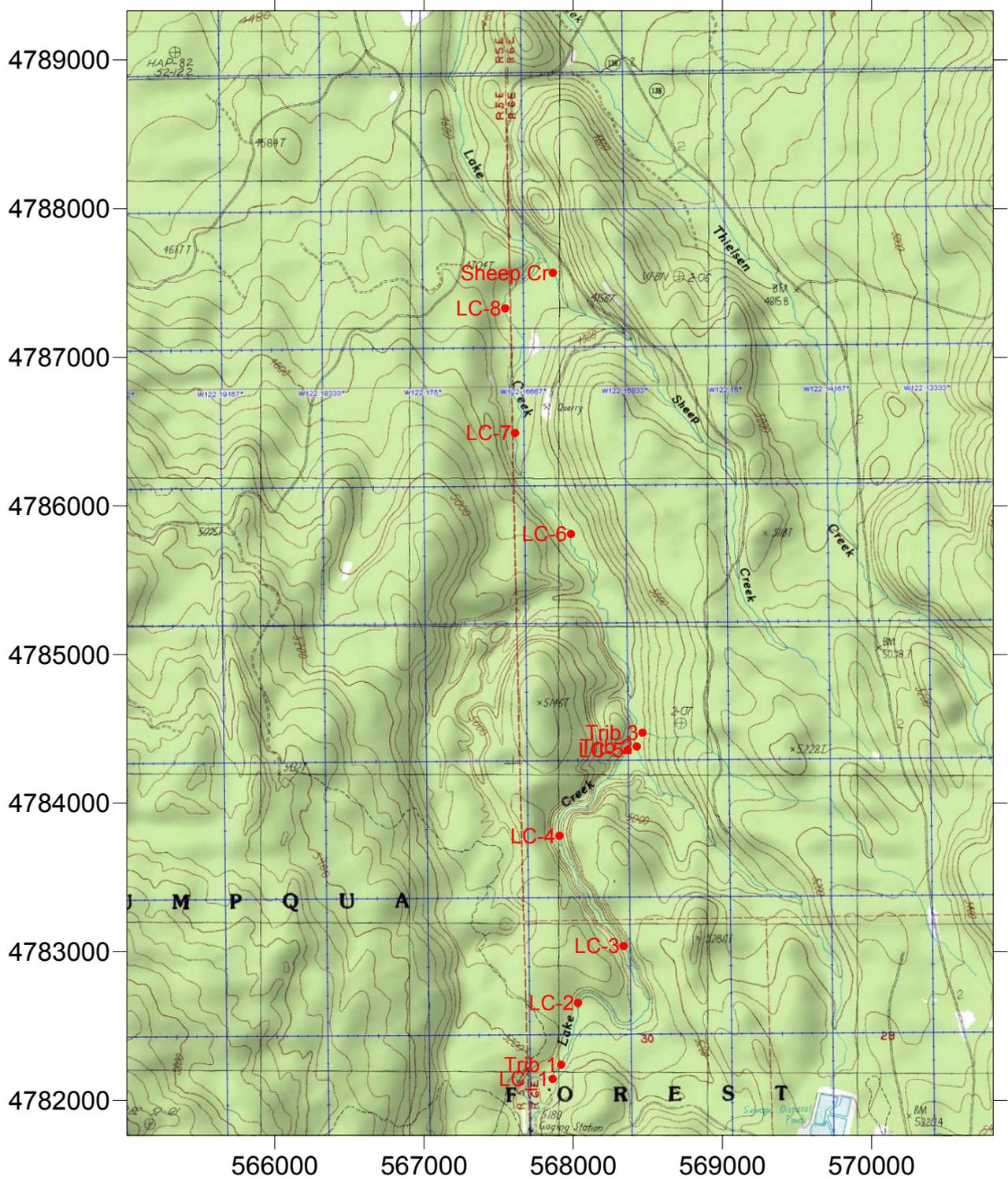


Figure 1. Locations of the Lake Creek Transects Flow Measurements