Affected Environment--Hydrology

The INEEL Sagebrush Steppe Reserve receives water from three tributary basins, the Big Lost River, Little Lost River and Birch Creek Basins. It receives surface water from the Big Lost River and Birch Creek Basins, and it receives ground water flow from three aquifers: Birch Creek Valley aquifer (#62), Little Lost River Valley aquifer (# 64), and the eastern Snake River Plain regional aquifer (# 39)

Birch Creek surface water and ground water flows enter the reserve from the north and sinks into the Eastern Snake River Plain aquifer along the northern margins of the reserve. Big Lost River surface water flows enter the reserve from the southwest and flows through most of the reserve. However, the Big Lost aquifer connects with the Eastern Snake River Plain aquifer near Arco, Idaho and therefore, is not associated with the reserve. The Little Lost River Basin flows toward the reserve from the northwest; however the Little Lost River surface water flows are diverted for irrigation upstream of the reserve and have not flowed onto the reserve in modern history, the Little Lost aquifer discharges to the Eastern Snake River Plain on the northwest margin of reserve. The Eastern Snake River Plain aquifer receives surface and subsurface flows from each of these hydrologic systems.

Ground Water

The Birch Creek, Big Lost River and Little Lost River valleys all contain unconsolidated Quaternary alluvial materials and porous sedimentary rocks up to a few thousand feet thick. (Crosthwaite et al., 1970). These porous materials overlie relatively impermeable volcanic rocks and provide a porous conduit for the valley aquifer systems. While most of the water in each watershed originates in the adjacent mountains, the numerous tributaries and valley bottom streams lose a portion of their flow via seepage into the ground water before reaching their respective valley bottoms, except during heavy runoff events.

The Eastern Snake River Plain Aquifer extends for about 170 miles and varies up to about 60 miles in width. This extensive aquifer stores 1 to 2 billion acre-feet of water, approximately the same volume as Lake Erie. (Sehlke and Bickford, 1993). The ground water depths beneath the Reserve vary from about 200 to 600 feet and the aquifer is the source for all water used by the INEEL. The depth to ground water at TAN varies from 200 to over 350 feet (Lewis et. all, 1996). Past activities at the INEEL have affected the ground water quality at various areas. Before the mid-1980's, waste discharged to unlined ponds and injection wells introduced radionuclides, heavy metals, inorganic salts and organic compounds to the aquifer. With the exception of Test Area North, all of the facilities at the INEEL are down gradient from the Reserve. At Test Area North, detectable levels of radionuclides and volatile organic compounds have been found in monitoring wells. A number of these wells are on the Sagebrush Steppe Reserve. Detected compounds include trichloroethylene, tetrachloroethylene, 1,2-dichloroethylene, and the radionuclides tritium, strontium-90, cesium-137, and uranium-234 (Ref?). In addition, the surface and subsurface contaminants Cobalt-60, strontium-90, barium, cadmium, chromium, mercury, silver, benzene, toluene, ethyl-benzene, and xylene are present at Test Area North. However, extensive cleanup projects are underway to remediate the ground water and none of the contaminants discharge to or come in contact with the land surface or the biotic components of the reserve unless done so intentionally.

Surface Water

Potential exists for substantial surface flow to enter the Reserve from both Birch Creek and the Big Lost River.

The Birch Creek Hydrologic Unit (#17040216) drains about 750 square miles of the eastern slopes of the Lemhi Mountains and the western slopes of the Beaverhead Mountains (Koslow 1984). The drainage runs south for about 40 miles from Gilmore Summit to the Birch Creek Sinks near Test Area North. The valley ranges from about 12 to 18 miles wide between the mountain crests with the valley floor ranging from 7 to 8 miles wide. Perennial flow originates near the Kaufman Guard Station, where there are numerous springs that maintain relatively uniform flows through the year and from year to year. Most of the surface flow is lost to infiltration in the lower portions of the valley, with the remainder being diverted for power generation and irrigation

Beginning in the early 1900's the entire flow of Birch Creek was diverted for irrigation into the Reno Ditch, approximately 3 miles above the INEEL boundary. Although water was allowed to flow in the original channel during the winter, flows reached the Birch Creek Sinks only during exceptionally high runoff events. In 1969, rapid thaw of a deep snow pack resulted in runoff reaching the playa and flooding TAN (Koslow 1984). Since 1986, Birch Creek has been diverted above the Reno Ditch for irrigation and power generation. This has de-watered approximately 15 miles of historic Birch Creek riparian habitat, including approximately 10 miles on the Reserve. The diversion provides Birch Creek Power with 50 to 60 cfs (75 cfs maximum) for it's 2,700 KW plant near Reno Point. The power plant produces an average of 14 million KW-Hrs annually with the water outflow being used for irrigation during the summer. From approximately September through April, the outflows of the power plant are discharged back to the INEEL via a ditch where the water flows into the TAN North Gravel Pit (see map "Hydro"). Over the years, sediments carried in the return flows are sealing the bottom of the pit with overflows becoming more common. Water leaving the Tan North Pit are discharged to an area about 2 miles to the east where a seasonal lake, several acre-feet in size forms. The overflows become more common during cold weather when ice jams form. The increasing volume of flow into the ground water system is threatening to spread an existing TCE contamination plume near TAN.

The Little Lost River hydrologic unit (#17040217) drains about 950 square miles of the eastern slopes of the Lost River Mountains and the western slopes of the Lemhi Mountains. The unit runs for approximately 55 miles southeast from Summit Reservoir to irrigation diversions up stream and near Howe. The valley ranges from 8 to 28 miles wide, with the valley floor averaging about 7 miles wide. Historic documents reveal that the entire stream has been diverted above the Little Lost Sinks year round since prior to 1938 (Sterns et al., 1938) with no surface flow from the Little Lost River reaching the INEEL during that time.

The Big Lost hydrologic unit (17040218) drains about 1900 square miles of the Pioneer, Bolder and White Cloud Mountains on the West and the Lost River Mountains on the North and East. The headwaters in the Copper Basin are about 60 miles above the Big Lost sinks on the INEEL. Between the Thousand Springs Valley and Arco, the valley varies from about 3 to 6 miles wide.

The flow of the Big Lost River seldom reaches below the town of Arco, but during high runoff events, the Big Lost River flows southeastward and then northeastwardly in an arch to its terminus in the Big Lost Sinks and Playas on and near the Sagebrush Steppe Reserve. River flow is usually diminished by irrigation diversions and infiltration losses along the river channel. When flow exceeds approximately 350 cfs, on the INEEL, excess water is diverted into spreading areas located in the southwest corner of the INEEL. This diversion was constructed in 1958 to

protect downstream INEEL facilities and is capable of diverting up to 9,300 cfs. Discharge to the spreading areas was high during the mid to late 1960's and again in the mid 1980's. The peak discharge to the spreading areas was in June of 1984, with a diversion of nearly 50,000 acre-ft (Bennett, 1986). Flows from the Big Lost River reach the Reserve only during above normal runoff events.

Potential Management Alternatives for Hydro

Alternative 1 -- The Proposed Action as described in the Scoping Document

> "The Birch Creek Hydropower Outflow Return ditch would be re-engineered to return the winter flows to the Birch Creek channel. Flows would be returned to the historic channel as far up-gradient as is feasible. Negotiations with the current water rights owner would also begin, with the objective being to obtain some level of year round flow".
>
> Note: This alternative would also require additional fencing.
>
> Question: Do we know the potential affects of this on the ground water contaminants at TAN?

Alternative 2 -- No Action. The management direction that now exists without this plan.

> "The Birch Creek Hydropower Outflow Return ditch would continue to flow to the TAN North Pit".
>
> Question: Is this affecting the ground water contaminants at TAN or the facilities?

Alternative 3 – Maximize natural resource protection (on the Reserve).

> Same as "no action": keep the flows going to the Tan North Pit. The rationale for this is that the water is transporting noxious weed seeds and that recreating riparian in lower Birch Creek would attract cows to the area unless fencing is built.

Alternative 4 – Maximize stimulation of local economies.

> "The Birch Creek Hydropower Outflow would be routed to Mud Lake for irrigation use".
>
> Question: Is this proposal totally Dead? Are there other potential uses of the winter flows that might fly politically?