1.0 BACKGROUND INFORMATION

1.1 History of TWSD

The Twining Water and Sanitation District (TWSD) was the state-designed waste management agency for sewage generated in Taos Ski Valley. Although TWSD is on record as the current permit holder, the District has been dissolved. The Village of Taos Ski Valley is the current owner and operator of the wastewater treatment plant that accepts a large portion of the ski valley's sewage and discharges the effluent directly into the Rio Hondo, a high quality coldwater tributary of the Rio Grande. Application for a new permit has been made in the name of the Village of Taos Ski Valley.

During the 1970s, TWSD regularly violated effluent limitations defined by its National Pollutant Discharge Elimination System (NPDES) permit causing violations of stream standards and damage to the aquatic habitat within the Rio Hondo. In 1979, the New Mexico Environment Department (NMED), formerly known as the Environmental Improvement Division (EID), developed and implemented a new enforcement posture based on persistent application of the state's Water Quality Control Commission (WQCC) Regulations. Between 1979 and 1981, the Water Pollution Control Bureau of EID used eight surface-water sampling stations on the Rio Hondo to characterize the water quality and establish background conditions. As a result of the monitoring efforts during this time period, EID developed a revised NPDES permit (NM0022101) that defined effluent limitations such that the discharge from the Twining plant would not cause violations of the water quality standards protecting the Rio Hondo. In conjunction with NM0022101, new management took over plant operations in the late 1980s. With this new management, a new philosophy emerged at Twining, which resulted in a spirit of cooperation with NMED. Operational and physical changes also were made to the treatment plant resulting in an improved effluent over time. Operational changes included improving training and laboratory techniques to ensure that the data reported on the Discharge Monitoring Reports (DMRs) would be accurate. The physical improvements included slip-lining the collection system for infiltration and inflow removal, replacing old equipment with new equipment, and installing equipment to prevent possible spill situations. NMED and TWSD continue to have a good working relationship and a cooperative environment exists between the two organizations today.

The Compliance Evaluation and Sampling Inspection reports from 1993 to the present indicate that plant operations, maintenance, and effluents are meeting current NPDES permit requirements. The most recent Compliance Evaluation Inspection of VTSV's WWTP by NMED was conducted on March 4, 2002. This inspection included a review of DMRs for the years 2000, 2001, and 2002. During this time period, there were no exceedances of any effluent discharge limits.

The VTSV's present NPDES permit (NM0022101) expires in November 2005 and has a design capacity of 0.1 million gallons per day (MGD). Due to the age of the treatment facility, and current and future demands, many of the unit processes of the WWTP need to be upgraded and renovated to meet future effluent quality criteria and standards, and to provide for more efficient operations. The Village has applied for a Clean Water State Revolving Fund (CWSRF) loan

funded by the EPA and administered by NMED, for upgrade and renovation of the wastewater treatment plant. The Village plans to replace the headworks, modify the aeration basins and clarifiers, and relocate the chemical treatment process, pending approval of the CWSRF grant. The proposed project would accommodate a wastewater flow of about 0.2 MGD averaged over a seven-day period during peak winter season. The VTSV's WWTP is the only point source discharge into the Rio Hondo, however there are numerous natural and anthropogenic nonpoint sources of pollution in the upper Rio Hondo watershed.

1.2 Watershed Description

The Rio Hondo is a perennial tributary of the Rio Grande. The Rio Hondo watershed is part of the US Geological Survey (USGS) Hydrologic Unit Code (HUC) 13020101. The Village of Taos Ski Valley is situated near the headwaters of the Rio Hondo in the Sangre de Cristo Mountains of north central New Mexico in Taos County. From an elevation of 9,300 feet in the ski valley, the river flows for eight miles in a narrow steep-sided canyon until it reaches the forest service boundary where the elevation is 7,650 feet. The Rio Hondo then flows for nine miles through a broad, sloping piedmont valley and enters the Rio Grande at John Dunn Bridge. The elevation at the mouth of the Rio Hondo is 5,500 feet. The Rio Hondo watershed drains 21 square miles (mi^2) at the outlet of the assessment unit at the confluence with the South Fork, 36 mi^2 at the USGS gaging station near Valdez, NM, and roughly 72 mi^2 at John Dunn Bridge. The annual average discharge of the Rio Hondo at the USGS gaging station is 35.4 cubic feet per second (cfs) (USGS, http://nwis.waterdata.usgs.gov/).

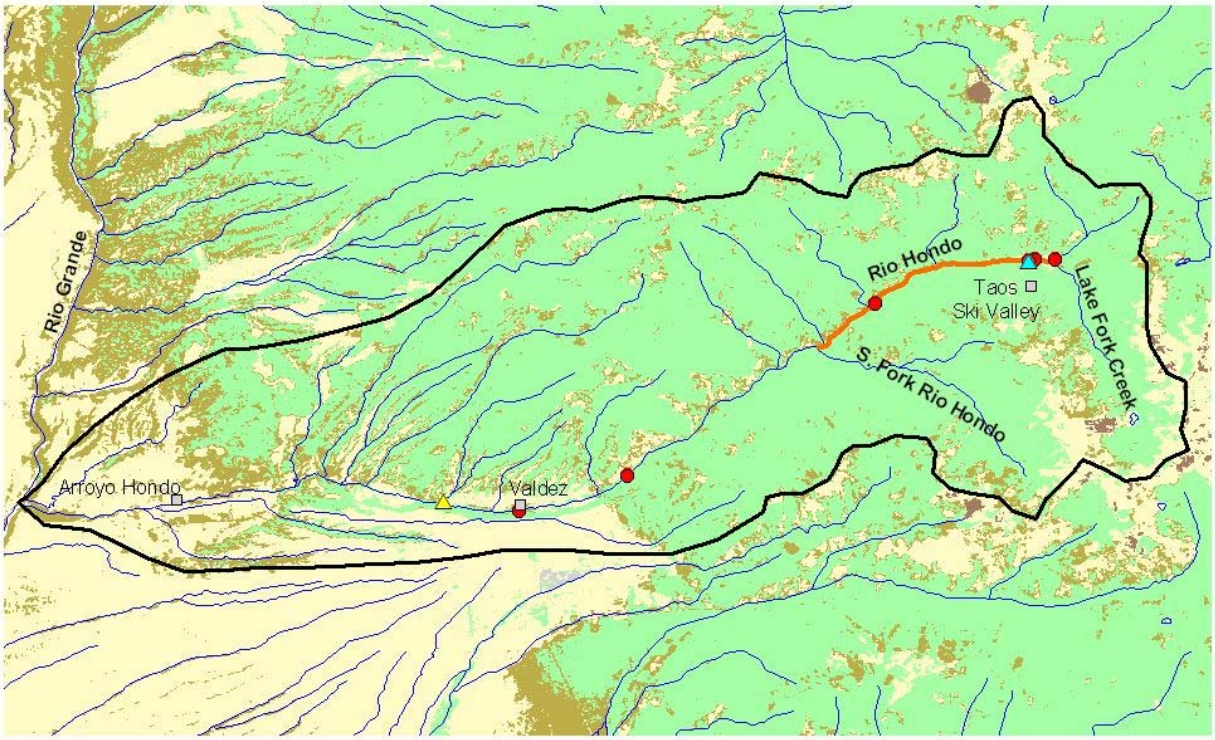
The upper mountain watershed of the Rio Hondo is forested by aspen, spruce, and fir, and is devoted to recreational activities, mainly skiing, and to livestock grazing by the Forest Service permittees. The lower piedmont valley supports traditional family agriculture. As shown in Figure 1-1 land use in this watershed is predominately forest (78%), but also includes grasslands (10%), shrubland (7%), urban areas (3%), and barren land (2%). Land ownership is 61% U.S. Forest Service (USFS), 38% private, and 1% tribal land (Figure 1-2). Designated uses include domestic water supply, fish culture, high quality coldwater fishery (HQCWF), irrigation, livestock watering, wildlife habitat, and secondary contact.

1.3 Survey Design

Four sampling stations used to develop this TMDL were established in the Rio Hondo watershed during the 2004 survey. Monthly surface-water grab samples were collected from all of the stations beginning in February and ending in September 2004 (see Appendix A for data). Samples were analyzed for a variety of chemical and biological parameters. The locations of sampling stations along the TMDL stream reach are shown in Figures l-1 and 1-2 and are listed below:

STORET No.	Station Location
28RHondo026.9	Rio Hondo 50 feet above WWTP
NM0022101	Twining WWTP effluent discharge to the Rio Hondo
28RHondo026.7	Rio Hondo 300 yards below WWTP
28RHondo022.4	Rio Hondo 2.4 miles below WWTP

Rio Hondo Watershed
Land Use/Cover



Twining WWTP
Sampling Stations
USGS Gage
TMDL Reaches
Watershed Boundary
Forest
Grassland
Shrubland
Urban
Barren

Source Data
National Land Cover Dataset 1993
NHD hydrography

Figure 1-1.

Rio Hondo Watershed
Land Ownership

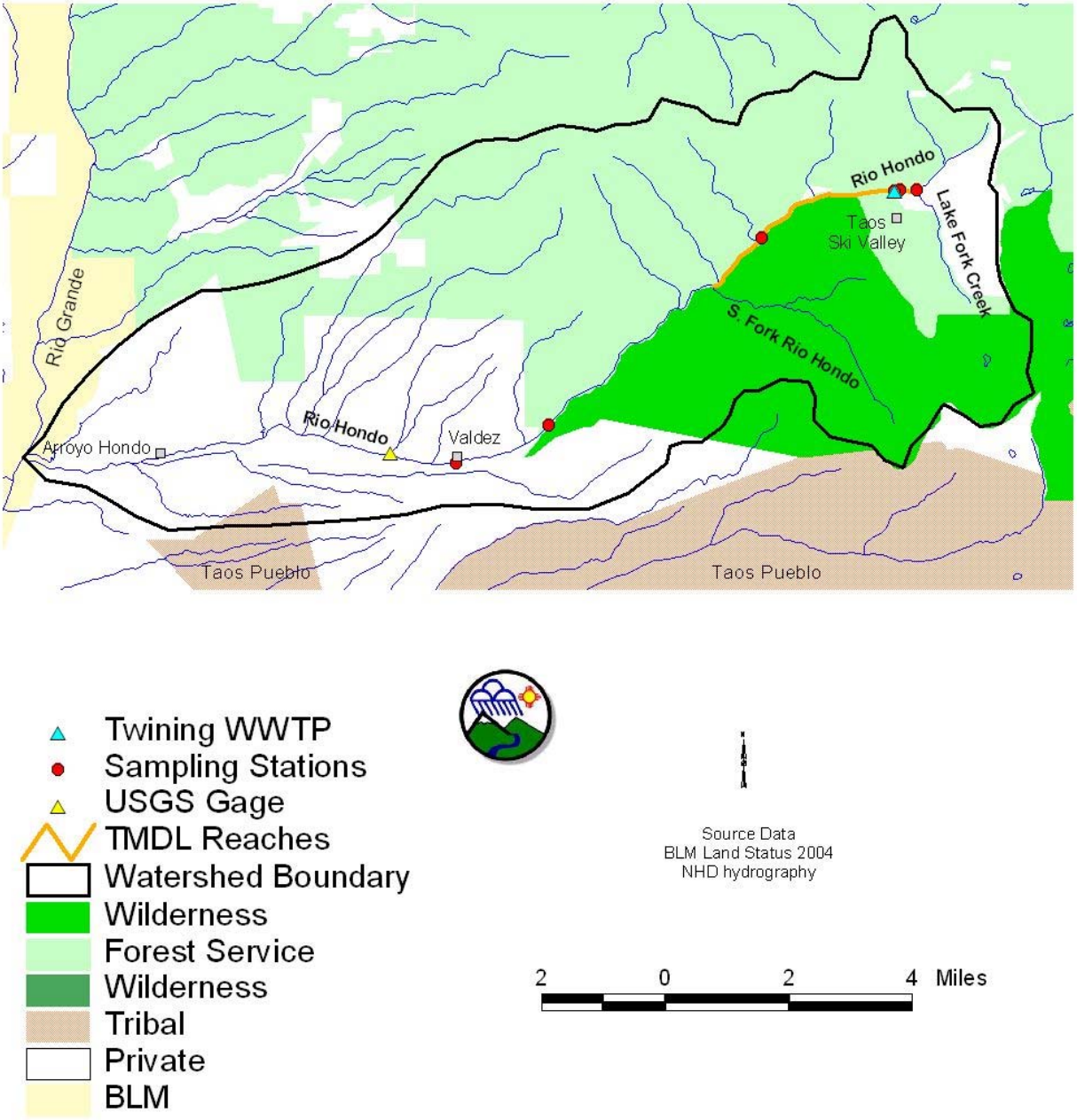


Figure 1-2.

1.4 Nutrient Cycling

Phosphorus and nitrogen generally drive the productivity of algae and macrophytes in aquatic ecosystems, therefore they are regarded as the primary limiting nutrients in freshwaters. The main reservoirs of natural phosphorus are rocks and natural phosphate deposits. Weathering, leaching, and erosion are all processes that breakdown rock and mineral deposits allowing phosphorus to be transported to aquatic systems via water or wind. The breakdown of mineral phosphorus produces inorganic phosphate ions ($H_2PO_4^-$, HPO_4^{2-}, and PO_4^{3-}) that can be absorbed by plants from soil or water (USEPA, 1999). Phosphorus primarily moves through the food web as organic phosphorus (after it has been incorporated into plant or algal tissue) where it may be released as phosphate in urine or other waste by heterotrophic consumers and reabsorbed by plants or algae to start another cycle (Nebel and Wright, 2000).

The largest reservoir of nitrogen is the atmosphere. About 80 percent of the atmosphere by volume consists of nitrogen gas (N_2). Although nitrogen is plentiful in the environment, it is not readily available for biological uptake. Nitrogen gas must be converted to other forms, such as ammonia (NH_3 and NH_4^+), nitrate (NO_3^-), or nitrite (NO_2^-) before plants and animals can use it. Conversion of gaseous nitrogen into usable mineral forms occurs through three biologically mediated processes of the nitrogen cycle: nitrogen fixation, nitrification, and ammonification (USEPA, 1999). Mineral forms of nitrogen can be taken up by plants and algae and incorporated into plant or algal tissue. Nitrogen follows the same pattern of food web incorporation as phosphorus and is released in waste primarily as ammonium compounds. The ammonium compounds are usually converted to nitrates by nitrifying bacteria, making it available again for uptake, starting the cycle anew (Nebel and Wright, 2000).

Rain, overland runoff, groundwater, drainage networks, and industrial and residential waste effluents transport nutrients to receiving waterbodies. Once nutrients have been transported into a waterbody they can be taken up by algae, macrophytes, and microorganisms either in the water column or in the benthos; they can sorb to organic or inorganic particles in the water column and/or sediment; they can accumulate or be recycled in the sediment; or they can be transformed and released as a gas from the waterbody (Figure 1-3).

As noted above, phosphorus and nitrogen are essential for proper functioning of ecosystems. However, excess nutrients cause conditions unfavorable for the proper functioning of aquatic ecosystems. Nuisance levels of algae and other aquatic vegetation (macrophytes) can develop rapidly in response to nutrient enrichment when other factors (e.g., light, temperature, substrate, etc.) are not limiting (Figure 1-3). The relationship between nuisance algal growth and nutrient enrichment in stream systems has been well documented in the literature (Welch, 1992; Van Nieuwenhuyse and Jones, 1996; Dodds et al., 1997; Chetelat et al., 1999). Unfortunately, the magnitude of nutrient concentration that constitutes an “excess” is difficult to determine and varies by ecoregion.

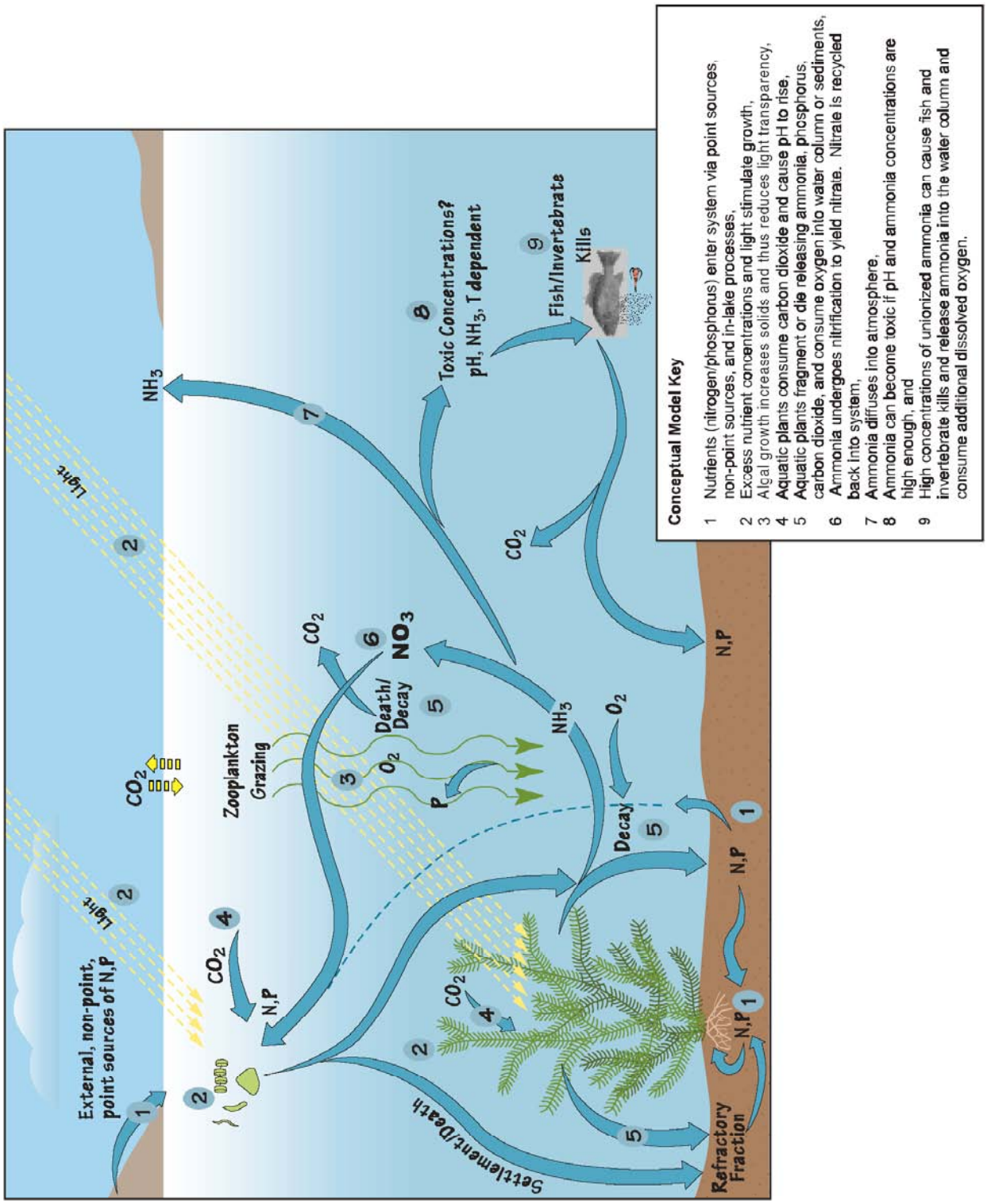


Figure 1-3. Nutrient Conceptual Model (USEPA, 1999)