Three Lakes Inlets Temperature and Specific Conductivity Monitoring Program

Water Quality Department

The following describes Northern Water's continuous monitoring of temperature and specific conductivity on the inlets to the Three Lakes.

This program's objective is to collect continuous temperature and specific conductivity data at all the inflows into the Three Lakes system to support water quality modeling efforts. This program began in 2011.

MONITORING LOCATIONS

The Three Lakes Inlets Temperature and Specific Conductivity Monitoring Program currently consists of nine stations located in the Three Lakes Region with two stations operated by Northern Water and the other seven stations operated by Grand County Water Information Network (GCWIN).

Table 1. Three Lakes Inlets Temperature and Specific Conductivity Monitoring Locations

Station	Description	Latitude	Longitude	Entity
EI-GLU	East Inlet upstream of Grand Lake	40.2369	-105.8010	GCWIN
NI-GLU	North Inlet upstream of Grand Lake	40.2511	-105.8145	GCWIN
CR-SMU	North Fork of the Colorado River upstream of Shadow Mountain Reservoir	40.2189	-105.8573	Northern Water
AC-GRU	Arapaho Creek upstream of Lake Granby	40.1128	-105.7497	GCWIN
RF-GRU	Roaring Fork upstream of Lake Granby	40.1308	-105.7671	GCWIN
GR-PUMP	Granby Pump Canal upstream of Shadow Mountain Reservoir	40.2068	-105.8495	Northern Water
WC-PUMP	Willow Creek Pump Canal Inflow to Lake Granby	40.1430	-105.8888	GCWIN
WG-PUMP	Windy Gap Pump Canal Inflow to Lake Granby	40.1429	-105.8888	GCWIN

Map of Monitoring Locations

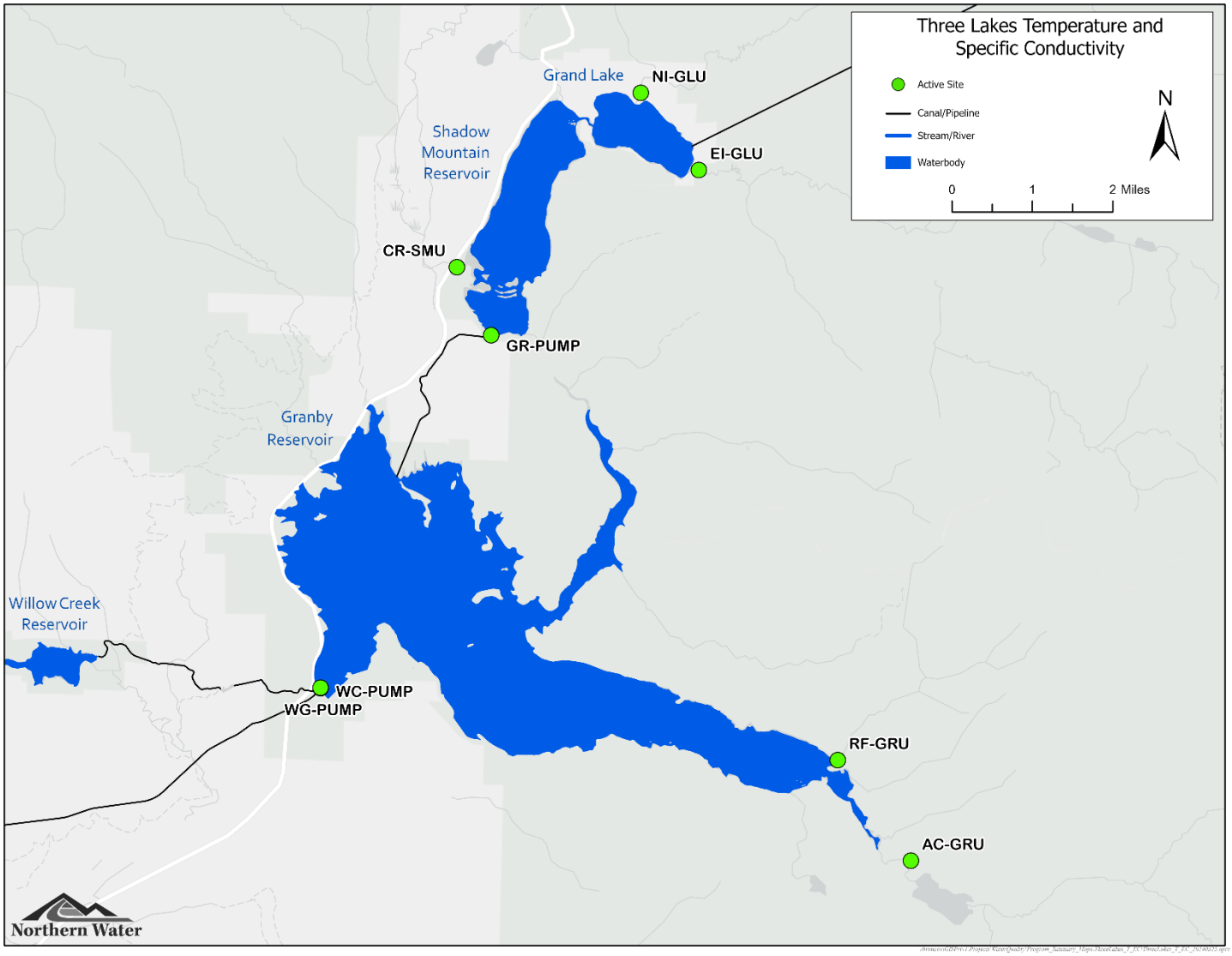

Figure 1. Map of Three Lakes Inlets Temperature and Specific Conductivity Monitoring Locations

STATION OPERATION AND MAINTENANCE

In-Situ Aqua-TROLL 100 temperature and conductivity sensors are used to collect the data at all stations except GR-PUMP and CR-SMU. At GR-PUMP and CR-SMU, a YSI 600XLM Sonde is used to collect the data. Northern Water performs an annual temperature check and calibration prior to the sensors being installed. The stations operate from early spring to late fall. Effort is made to install the sensors in April as soon as the ice is off the water and before runoff begins. The sensors are removed before the water freezes for the winter, generally in October. The sonde at GR-PUMP remains in the canal all year; it is only removed for the annual temperature check and calibration.

Figure 2. Aqua-Troll 100 sensor used for Temperature and Specific Conductivity Monitoring

Northern Water maintains the GR-PUMP and CR-SMU stations. Calibrations are done at these stations bi-weekly when accessible. Data from these GR-PUMP and CR-SMU are real-time; the data are transmitted by telemetry to Northern Water's database.

The sites with the Aqua-Troll 100 sensors are installed and maintained by the Grand County Water Information Network (GCWIN). Their guidelines for maintaining the equipment and downloading the data are:

- Calibrations checks are performed up to eleven times; bi-weekly calibration the first month and monthly for the remainder of the season (depending on runoff conditions)
- Data is downloaded monthly from June (or when sensors become accessible) to October
- Data is submitted to Northern Water for quality assurance/quality control and then uploaded in the Northern Water's database

All data are processed and finalized during the winter following the sampling season. The final data are available on Northern's website at https://www.northernwater.org/our-data/water-temperature-data

APPENDIX 1 – HISTORY OF PROGRAM CHANGES

Changes to Sampling Schedule, Monitoring Frequency and Sample Collection

Year	Description of Change
2011	The program is initiated with the goal of continuous collection of temperature and specific conductivity data at all the inflows into the Three Lakes system. This data is crucial for supporting water quality modeling efforts.
2015	Northern Water assumes maintenance operations at CR-SMU in addition to GR-PUMP. GCWIN still maintains all other sites. An eleventh calibration is added each year.
2015	ST-GRU site is removed due to property access permissions and site location issues
2022	GCWIN adds additional visits to four sites. These visits will not include a data download. These sites will be visited weekly from June through October to ensure they are not compromised due to sediment or debris. This applies to the following sites: NI-GLU, WG-PUMP, WC-PUMP.
2024	CR-SMD was removed because of duplicative monitoring with Northern Water's temperature site at the same location.


Northern Water