Real-Time Lake and Reservoir Meteorological and Vertical Water-Quality Monitoring

Seventh National Monitoring Conference

Session E1: Continuous Real-Time Monitoring: Applications in Lakes and Estuaries, 2:05pm

Reed Green, U.S. Geological Survey, Arkansas Water Science Center
Automated Real-Time Controls

- GSM / GOES Data Telemetry
- Database Server
  - WEB Display
  - Modeling Server
    - Run 3-D Models, Real-Time
    - Run Real-Time Simulations
- Discharge, continuous QW
- Meteorology, in situ QW
Lake Mead Monitoring – Platform, Meteorological Instruments, Winch and Data Sonde
Beaver Lake Monitoring – Meteorological Instruments, Thermistor, and Dissolved Oxygen String
Self-Adjusting Mooring System
Meteorological Station
Lake Monitoring Station
Operation and Maintenance

- Clean underwater thermistors and dissolved oxygen sensors, every 3 – 5 weeks

- Calibrate meteorological instruments, once annually (return to factory for calibration)

- Calibrate underwater thermistors and dissolved oxygen sensors, twice annually (return to factory for calibration)
Servicing the Underwater Thermistors and DO Sensors
Servicing the Underwater Thermistors and DO Sensors
Servicing the Underwater Thermistors and DO Sensors
USGS NWIS Web Display

USGS 07049200 Beaver Lake near Lowell

PROVISIONAL DATA SUBJECT TO REVISION

Available data for this site

Station operated in cooperation with:

Beaver Water District

The data for this station are temporary and will only be displayed for 60 days. Time series of cumulative daily values will NOT be available for retrieval following the 60-day display period. Although the instrumentation is calibrated at least once/year, the temporary classification means that documented routine inspections and other quality assurance measures are not performed at this station.

Available Parameters

Output format

Days

- Graph
- Graph w/ stats
- Graph w/o stats
- Table
- Tab-separated

1-120
Water Temperature

Summary of all available data for this site

Temperature, 0.6m below surface, water, degrees Celsius
Most recent instantaneous value: 17.7  04-20-2010  13:12 CDT
Summary of all available data for this site

Wind speed, meters per second
Most recent instantaneous value: 1.0 04-20-2010 13:12 CDT

--- Provisional Data Subject to Revision ---

Create presentation-quality / stand-alone graph
Wind Direction

Summary of all available data for this site

Wind direction, degrees clockwise from true north

Most recent instantaneous value: 242 04-20-2010 13:12 CDT

--- Provisional Data Subject to Revision ---
Short Wave Radiation

Summary of all available data for this site

Solar radiation SHORT WAVE (average flux density on a horizontal surface during measurement interval), watts per square meter

Most recent instantaneous value: 1,080 04-20-2010 13:12 CDT
Air Temperature

Summary of all available data for this site

Temperature, air, degrees Celsius

Most recent instantaneous value: 18.6 04-20-2010 13:12 CDT

Create presentation-quality / stand-alone graph
Depth and Time Contours

Beaver Lake

Water Temperature

Dissolved Oxygen

Data Uses

- Basic information – water-column profile trends (curiosity)
- Drinking-water intake gate elevation (decision support)
- Forecasting disintegration of the thermocline and mixing of the hypolimnion (decision support)
- Angler (fisheries) information – Reed...Nice to have data again....water is warming up nicely...whites are moving and stripers are showing up at my favorite point...life is good! Greg (decision support)
- Driving real-time hydrodynamic and water-quality models (data-driven monitoring and decision support)
Data-Driven Monitoring

- In lakes, samples are collected most often, at fixed points in space and time.

- Now, with advances in sensor technology and data telemetry,
  - we can let the data drive the monitoring,
  - using real-time 3-D lake and reservoir simulation tools to identify opportunities to sample at different times, at different locations, to capture events that might otherwise go unnoticed.
Guiding Principle

- If we can simulate it, we can monitor it.
Beaver Lake, northwest Arkansas

- Impounded mountain valley
- Deep, long, thin, dendritic
- Hydroelectric, flood control
- 4 drinking water intakes
- Recreation
- Fisheries and wildlife habitat
Beaver Lake Bathymetry
Beaver Lake Tracer Simulation
Beaver Lake Cyanobacteria Simulation
Current and Future Activities

- Continue the Beaver Lake real-time monitoring and 3D model development program
- Install new real-time instruments in Lake Maumelle, Arkansas and Great Salt Lake over the next month or two
- Currently working with the Texas Water Science Center to develop a 3D modeling program for Lake Houston, using their existing real-time monitors
- Currently working with the Utah Water Science Center to develop a 3D modeling program on the south arm of the Great Salt Lake
- Developing a new 3D modeling system in Lake Maumelle to replace the existing 2D model
Questions?