Enhancing Research Capabilities with Wireless Technology
Lake Annie GLEON site – Archbold Biological Station in Florida

Lake Annie, a small (37ha), relatively deep (21m) sinkhole lake is located on the property of Archbold Biological Station, Latitude 27.1085 N., Longitude 81.350 W, in south central Florida (www.archbold-station.org). The lake has long been recognized as one of the most pristine in the state (Shannon and Brezonik 1972, Layne 1979), although there have been observations of increased color in relation to higher rainfall and groundwater levels since 1993 (Gaiser et al. in prep). The existence of detailed monthly limnological data over the past 24-years for Lake Annie, together with other long-term hydrological and meteorological records kept by ABS, was justification for the inclusion of the lake in 2006-07 into the Global Lakes Ecological Observatory Network (GLEON). GLEON is a grassroots, international network of scientists, engineers and information technology experts who use near-real time, high-frequency data from in-situ sensors on lakes and reservoirs to advance our understanding of lake ecosystems. The Principal Investigator for GLEON-Lake Annie, Archbold, is Evelyn Gaiser (Florida International University) with Hilary Swain (Archbold) as the local Co-PI.

Existing infrastructure and needs. At present, the limnological data for Lake Annie are collected using traditional instrumentation deployed manually, once per month, from either the dock, or by boat from the center buoy. Complementary hydrological data, including groundwater levels from surrounding wells, and staff gauges in ponds and downstream, are collected manually, either weekly or monthly. Archbold meteorological data, collected at a fully automated instrumented weather station located at the main buildings are transmitted every 15 minutes via wireless connection to Archbold's LAN (a 60-drop, 9-server, fiber optic network). These weather data are currently available via ftp over Archbold's T1 connection, and sent to NOAA's MADIS network for global access. We are currently installing an SQL server to increase access to Archbold data. Our five goals, as part of GLEON are as follows. We seek funding here for ii, iii, iv, and v:

(i) Build and deploy an instrumented raft at the center buoy of Lake Annie to collect the full suite of limnological data, as at other GLEON sites (Archbold-funded). We are working with Kathy Weathers, IES, to standardize design of raft/sensors
(ii) build a wireless network to transmit these limnological data (15 mins, or hourly) over the 2.8 km from the lake south to the main buildings
(iii) install web cam at the lake dock, send via wireless network to display on web site
(iv) install pressure transducers in 6 groundwater wells and instrument staff gauges around the lake and transmit data via wireless connections to the main buildings
(v) have all lake data globally accessible via ftp and/or via our web site (using SQL)

Proposed infrastructure. Archbold will need to build a wireless network to transmit data over the 2.8 km distance between Lake Annie and the main buildings at Archbold. To accomplish this new network, at least one 35 foot crank down tower will need to be installed near Lake Annie. In addition, at least 17 Freewave FGR115RC radios will need to be purchased and installed at various data collection points. Fourteen Yagi antennas and three directional antennas will also need to be installed. A wireless camera would be installed at Lake Annie for display on our web site.

Anticipated benefits to site education and research. Increased real-time access to Lake Annie data will facilitate incorporation into Archbold's education activities including: a new module for our K-12 program reaching a highly diversified 3,000 students p.a.; the ~20 university classes that use Archbold annually; and more options for undergraduate research internships. Better data access will increase graduate and faculty participation at regional universities (e.g. FIU, FIT, and UF) and global access via GLEON will promote the use of Lake Annie data in a wide variety of international meta-analyses.

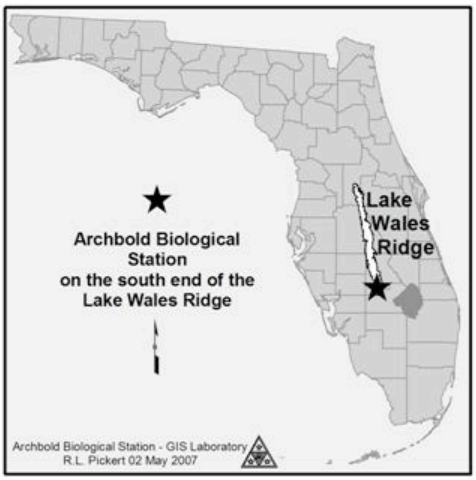

Fig. 1. Location of Archbold Biological Station

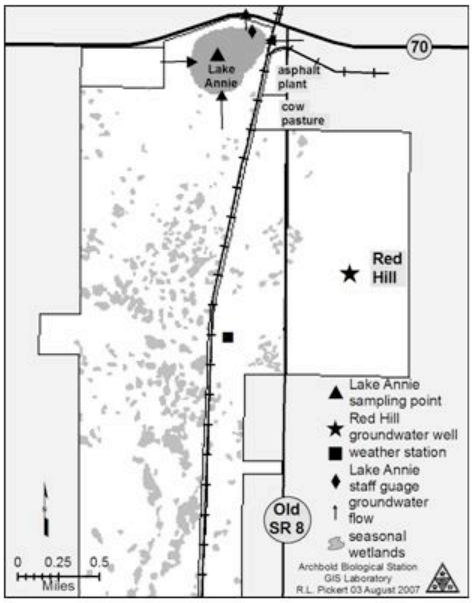

Fig. 2. Lake Annie in relation to main building which is co-located with the weather station.