Lake Superior Environmental Monitoring Collaborative
Duluth, Minnesota
November 19 – 20, 2014

Organization	Types of Environmental Monitoring Data Collected
U.S. Environmental Protection Agency	*Water program* - National Aquatic Resource Surveys since 2007, with state & tribal participation, assesses conditions including: water quality, sediment quality, phytoplankton, zooplankton, fish contaminants, habitat assessment, pathogens, wetland vegetation. Coastal assessments NARS: http://water.epa.gov/type/watersheds/monitoring/aquaticsurvey_index.cfm *Great Lakes program*- (1) Cooperative Science and Monitoring Initiative since 2002, with multi-agency participation, assesses conditions including: open lake water quality, biological monitoring, pollutants (e.g., emerging chemicals of concern, nutrients), invasive species, native species restoration, food web, habitat. (2) Water Quality Surveys since 1992. (3) Fish Monitoring and Surveillance (whole fish) since 1970, to track lakewide contaminant trends. (4) Integrated Atmospheric Deposition Network since 1990, measuring pollutants in air and precipitation. (5) Great Lakes Sediment Surveillance Program, measures pollutants in sediment cores and surface to track trends. (6) Coastal wetland monitoring (2011-2016) of ecosystems, water chemistry. (7) Nearshore monitoring (2011) will cover entire lakeshore, looking at water quality, biology (phytoplankton, zooplankton, etc.) and nitrate. (8) Human health fish tissue study (2010, will repeat 2015), assesses pollutants in fish. http://www.epa.gov/grtlakes/glindicators/biology.html http://www.epa.gov/grtlakes/monitoring/limnology/index.html http://www.epa.gov/grtlakes/monitoring/fish/index.html http://www.epa.gov/grtlakes/monitoring/air2/iadn/resources.html http://greatlakeswetlands.org/ http://water.epa.gov/type/oceb/assessmonitor/ncca.cfm http://water.epa.gov/scitech/swguidance/fishstudies/ *Office of Research and Development* – develops new monitoring approaches in support of above efforts; high-resolution mapping of water conditions; invasive species early detection monitoring; since 2009, Duluth-Superior Harbor and St. Louis River Area of Concern assessing water quality and habitat.

	Data Sources 11/20/14: Map My Waters http://watersgeo.epa.gov/mwm/ How's My Water http://watersgeo.epa.gov/mywaterway STORET http://www.epa.gov/storet/ WQP http://www.waterqualitydata.us/ WQX http://www.waterqualitydata.us/upload_data.jspand http://www.exchangenetwork.net/data-exchange/wqx/
Bureau of Indian Affairs	BIA programs provide funding to tribes through several programs (Rights Protection; Endangered species; Invasive Species, GLRI), to carry out environmental monitoring on reservations and throughout the ceded territories of the Lake Superior basin. Tribes are the primary source for this data. Focus is on water quantity monitoring, economic development, and community planning for tribal water resources. Data collected through these programs includes water quantity and quality; fish tissue; wildlife; noxious weeds; soil erosion/sediment deposition; wild rice; and nutrient conditions.
U.S. Army Corps of Engineers	Data collected includes: sediment characterization (quality and physical characteristics) from federal harbors, generally every 5 years; sediment characterization data from permit dredging (outside federal channel); bathymetric surveys of federal harbors (generally at least annual) and nearshore; aerial photos of shoreline (2007, 2011-12); species characterization in limited areas as requested; wetland delineations in limited areas as requested; tributary modeling (since 2000); and shipping cargo data. Coastal data will be online 2015. Hydrographic Surveys: http://www.lre.usace.army.mil/Missions/Operations.aspx Sediment Characterization: Not available online from the Corps; Provided upon request from Pam Horner at pam.horner@usace.army.mil. Aerial Photos: http://greatlakes.usace.army.mil/ LIDAR Data: Data served by NOAA Coastal Service Center. http://www.coast.noaa.gov/dataviewer/# Great Lakes Tributary Modeling: http://projects.glc.org/tributary/ Wetland Delineation/Species Characterization: Not available online; Contact Regulatory representatives at the respective District: Detroit District for MI, St. Paul District for MN, WI

U.S. Fish & Wildlife Service	Midwest coordinated bird monitoring partnership (including citizen science) since 2009, provides public data on birds, bats and ecosystem. New program uses radar to collect data on night migration. Midwest Avian Data Center is online and includes mapping tool – a model for data consolidation and sharing. Annual monitoring of aquatic invasive species (fish such as sea lamprey, some benthic invertebrates) – about 120 Lake Superior tributaries, 15 off-shore areas. Working with partners, collects biological data including population data in the Lake Superior basin on native species including listed species (e.g. piping plover), coaster brook trout, lake trout, lake sturgeon. Midwest Avian Data Center: http://data.prbo.org/partners/mwadc
U.S. Forest Service	Ongoing programs collect a wide range of aquatic data on 4 national forests within the Lake Superior basin, including: water quality (lake and streams), biological (fish, benthic invertebrate, mussels, and invasive species) and some flow data. For terrestrial: wildlife & plant inventory, invasive plants, rare plants, etc. For abiotic: fire monitoring, climate change demonstration projects, geomonitoring, etc. Right now, data isn't readily available. However, USFS is creating an Inventory, Monitoring and Assessment System to integrate the constellation of monitoring and assessment data and make it readily available to partners.
U.S. Geological Survey	USGS has active monitoring and assessment programs to collect and analyze hydrologic and environmental data in cooperation with federal, state, tribal and local partners. Data collected on natural resources includes ecosystem health, streamflow, groundwater levels, water quality, soil, bedrock mineral resources and streambed sediment data. Many of the data collection activities are coordinated through the Lake Superior LaMP.

	Focus is on providing impartial data and synthesis to support discussions around mining, from establishing pre-mining conditions to understanding fate & transport during projects. Has been moving from collecting baseline data (2008-2012) to synthesis studies (2013-16) to determine status of pre-mine hydrology and water quality. Study areas include Bad River Basin – Groundwater modeling; Apostle Islands baseline hydrodynamic and water quality data 2014-2107 study with MNDNR: water quality, streambed sediment, soil, bedrock sampling, hydrology. USGS Minerals program 2014-2017 in the Duluth Complex to understand environmental risks and ecosystem resiliency related to mining. Studying geochemistry of water and soils, to understand effects on wild rice Tributary monitoring using streamgages, looking at flow trends 1980-2009 Participates in fish surveys, etc as part of GLRI Needs include better ways to share data; and more information on hydrology, including better data on groundwater in fractured soils. USGS is looking for ways to build a more complete, transparent data set. *Data Sources 11/20/14:* SiGL = Science in the Great Lakes http://wim.usgs.gov/SiGL EnDDaT http://cida.usgs.gov/enddat GLRI Science Explorer: http://cida.usgs.gov/glri/glri-catalog USA National Phenology Network: https://usanpn.org/
National Oceanic & Atmospheric Administration	NOAA has supported research primarily around the Keweenaw Peninsula and Isle Royale including temperature profiling (“Big Chill Project”), phytoplankton sampling, microplastics sampling, recovery of ice pressure sensors, measurement of optical properties for satellite data calibration.

	Numerous real-time observation sites (offshore buoys) collect data on marine weather. Supports Great Lakes Coastal Forecasting System to predict temperature, currents, water levels, wave height etc. every 6 hours– available online. Projects include Surface Currents mapping; ice classification mapping; remote sensing of concentrations of chlorophyll, dissolved organic matter, suspended mineral Great Lakes Observing System (GLOS) – federal agency and academic partnership to make observational data available to the public in real time. Range of monitoring tools used to collect data, including buoys and glider that can observe temp, conductivity, dissolved organic matter, etc. National Buoy Data Center: http://ndbc.noaa.gov Great Lakes Forecasting System: http://www.glerl.noaa.gov/res/glcfs *Data Sources 11/20/14* Great Lakes Coastal Forecasting System http://glerl.noaa.gov/res/glcfs Lake Levels http://tidesandcurrents.noaa.gov CoastWatch:http://coastwatch.glerl.noaa.gov Mussel Watch Contaminants http://egisws02.nos.noaa.gov/nsandt/index.html# Great Lakes Observing System http://data.glos.us/portal/ Mussel Watch Contaminants: http://egisws02.nos.noaa.gov/nsandt/index.html# Natural Estuarine Reserve System: http://nerrs.noaa.gov
National Park Service	NPS has active long-term monitoring programs to collect a wide range of data on parks within the Lake Superior basin including water quality, vegetation, land cover change, birds, amphibians and contaminant data. It also conducts many short-term, issue-driven studies. High-resolution mapping of land use to quantify landscape-scale disturbance could be run throughout the Lake Superior basin.

Minnesota Pollution Control Agency / Minnesota Department of Natural Resources	MPCA collects a wide range of environmental monitoring data throughout the Lake Superior basin including water chemistry, sediment, groundwater and biological data. This data is collected primarily in support of EPA's water programs. MDNR also collects a wide range of environmental monitoring data, including flow data (available online). Major statewide investment in ongoing lake and stream monitoring. Uses citizen monitoring to add annual data on physical condition, etc. to supplement more technology-intensive monitoring by state agencies. Collaborates with Michigan and Wisconsin to monitor for mercury. Also has a specific focus on sulfate. Other monitoring areas include: fishery evaluation; wetland quantity/quality; forest landcover & health; climate change; invasive species (aquatic & terrestrial) Beach Monitoring: http://www.mnbeaches.org *Data Sources 11/20/14* MNPCA Waters e services: http://www.pca.state.mn.us/index.php/water/ MNDNR Cooperative Stream Gages Site http://www.dnr.state.mn.us/waters/csg/index.html MDH – Environmental Public Health Data Access Portal https://apps.health.state.mn.us/mndata/
Fond du Lac Band of Lake Superior Chippewa	Wide range of data collection, including: water quality; hydrology; sediment quality; wetlands functional assessments; air quality; forest cover and stand age; wildlife; fisheries; wild rice. Mercury wet deposition monitoring since 1997; dry deposition since 2011. See handout for details. New project: Region 5 Manoomin Consortium. Exchange Network grant for R5 tribes to monitor and share information on wild rice across the region. Ongoing research on effects of sulfate on wild rice. Research on impacts of mining on headwaters of St. Louis watershed; looking to extend modeling to eastern Iron Range.

Grand Portage	Wide range of data collection, including: long-standing forestry monitoring (cover types, forest health, species); air monitoring (including PM 2.5, haze); wetlands (function and habitat, invasive species); water quality (nutrients, dissolved organic compound); fish consumption; groundwater; sediment; species assessments and surveys. Has studied historic nutrient concentrations. Starting a cumulative effects analysis. Studying effects of climate change.
1854 Treaty Authority	Surveys for native and invasive species; habitat assessment; watershed surveys (Cloquet, Upper St. Louis River); water quality sampling; wild rice surveys to document distribution – maintains a comprehensive database of wild rice waters; monitoring water depth; participate in annual aerial survey; species assessments and surveys. Participated in developing wild rice restoration plan to be released soon, identifying areas to restore wild rice.
Great Lakes Indian Fish & Wildlife Commission	GLIFWC collects a wide range of environmental monitoring data in the inland portions of the Lake Superior basin, as well as in Lake Superior including water quality and quantity, sediment mercury in fish, sea lamprey and other invasive species population, wild rice population, fishery population and wildlife population data. Monitoring includes species population monitoring, invasive species Emphasis on documenting traditional environmental knowledge (TEK) as critical baseline data on ecosystems and resources (e.g., harvest monitoring). Monitoring watersheds potentially impacted by mining

	Invasive species monitoring – sea lamprey, phragmites, purple loosestrife with beetles; created an Interactive web mapping tool for aquatic invasive species (www.glifwc.org). Keweenaw stamp sands project – mapping migration of sands toward spawning reef; multi-agency effort to prevent further migration. Climate change projects in planning on: (1) life cycle of plants; (2) temperature & depths of lake trout (using radio tags), to compare with 2001-04 study results. Needs include more baseline data on mineral development, mercury emissions and oil production.
Wisconsin Department of Natural Resources	WDNR collects a wide range of environmental monitoring data throughout the Lake Superior basin including water chemistry, sediment, groundwater and biological data. This data is collected primarily in support of EPA's water programs. Statewide baseline monitoring is available online. Works with local partners to monitor beaches. Air emission and deposition monitoring (for mercury, etc.) Aquatic invasive species early detection monitoring – framework is LS Aquatic Invasive Species prevention plan (2009). Lake trout and lake surgeon assessments. (Great Lakes Fishery Commission coordinates across agencies.) Statewide fisheries database includes shared fisheries in ceded territory (based on 1994 MOU). Fish tissue: mercury, PCBs, dioxin/furans.

Bad River Band of Lake Superior Tribe of Chippewa Indians	The baseline of traditional ecological knowledge reaches far back in time, and should be kept in mind when looking at more recent data. Need to look as far ahead as possible when planning – taking climate change and the long-term effects of projects into account.
Red Cliff Band of Lake Superior Chippewa	Fisheries, nearshore, and wetlands programs. Fish species assessment; macroinvertebrate assessment; surface water quality sampling (in STORET); wetlands assessment; draft data (not yet public) on approx. 1400 barrels dumped in Lake Superior by DOD in 1940s-50s, and background water & sediment sampling.
Sokaogon Chippewa	Call to be mindful of our obligation to future generations, and the need for collective action to meet this duty.
Lac Du Flambeau Band of Chippewa	Natural Resources Department mission is to protect, conserve and enhance resources through integrated resource management planning. Data is collected in support of this mission, including data on sturgeon (radio tagging), wildlife populations, water quality, etc.
Michigan Department of Environmental Quality	As do other states, MDEQ collects a wide range of environmental monitoring data throughout the Lake Superior basin including water chemistry, sediment, groundwater and biological data. On the horizon is further study of impacts of aquaculture – working across state agencies (Agriculture, Natural Resources) Voluntary network since 1974 to monitor water chemistry, vegetation, exotic species. (CLMP) Seeking to model impacts of groundwater withdrawal on lakes, against the backdrop of natural variability. Integrating this analysis with 30 years of data on fish species locations and prevalence. Pathogen monitoring (E. coli), working to differentiate sources. MiSWIMS: online mapping tool that integrates data on water chemistry, biota, sediment, etc. in a single portal.

	New program to find aquatic invasive species. Monitoring of Eagle River restoration efforts (after removal of copper mining stamp sands from 1800s) Study since 1999 of persistent bioaccumulative toxins in Bald Eagle nestlings. Large quantities of site-specific, high-quality data from permitting, site remediation – is working on making this data more available for use. MiSWIMS – http://www.mcgi.state.mi.us/miswims/
Bay Mills Indian Community	Couldn't attend due to weather but has water quality, beach monitoring and sediment data.
Lac Vieux Desert (Did not attend but wanted to share data collected.)	Lac Vieux Desert has conducted environmental monitoring in the Lake Superior watershed for many years. Under the Tribe's CWA 106 program there are 7 sites in the Ontonagon Watershed that are sampled for DO, pH, TSS, OPR, Conductivity, Turbidity, Temperature, ammonia, total nitrogen, total phosphorous, chlorophyll A, e-coli and macro invertebrates. For more information on the CWA 106 sampling contact Roger Labine at roger.labine@lvdtribal.com or 906-287-1337.