Great Lakes Observing System (GLOS)
<u>User Needs Assessment</u>

Use Category: Recreational Uses – Swimmability – Biological Pathogens

Background on biological pathogens in nearshore waters

Any transport that helps to carry sewage and wastes to rivers, lakes and nearshore coastal waters contributes to pollution problems with pathogens. Stormwater is a major contributor of nonpoint source pollution, and human fecal pollution in urban areas is largely attributed to sewage overflows.

There are two types of sewage overflows: sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs). SSOs are the release of untreated sewage from municipal sanitary sewers directly into surface water bodies. There are numerous causes of SSOs including extreme weather, system failure, incorrect system operation and maintenance, and vandalism/terrorism. Combined sewer systems carry both sanitary sewage and stormwater. During wet-weather periods these combined systems may exceed capacity due to the increased amount of stormwater in the system and, as a result, this combined sewage is discharged directly into the nearby surface waters.

CSOs are the largest contributor of bacteria and viruses to nearshore waters of the Great Lakes. CSOs combine residential, commercial and industrial wastes, which carry pollutants in the form of sewage solids, metals, oil, grease and bacteria. During periods of heavy rain, the water in the CSOs combine with the stormwater running over the land. The CSO then becomes overwhelmed with water, which forces it to discharge untreated or partially treated wastewater into nearshore waters through the combined sewer overflow.

Localized inputs of fecal bacteria from wildlife, such as waterfowl roosting on shorelines, can also negatively impact water quality, as can fecal contamination from agricultural runoff.

Once deposited in water and sediments, certain pathogens can persist for periods of several weeks to months. Occasionally, high bacteria counts after a storm are due to re-suspended fecal coliforms in sediment rather than additional new bacteria entering the water.

Current data collection

Many state and local health departments routinely collect water samples at beaches to determine if the water is safe for swimming. Water samples are generally taken one foot below the surface, at a depth of 3-6 feet. A laboratory performs the analysis using standard methods such as Method1600, m-Tec or Colilert. Results of the analysis are available after approximately 24 hours. Escherichia coli (*E. coli*) bacteria – used as an indicator of the presence of waterborne pathogens – are counted and judged against standards established by state and federal guidelines. Results are measured according to *E. coli* colonies/100ml of sample.

County health departments generally take a minimum of three samples each time a beach area is monitored, which can be daily, weekly or several times/month. A minimum of five sampling events (consisting of at least three samples per event) must be collected within a 30-day period for the results to be considered a reliable indication of water quality.

Additional lake conditions data currently compiled through beach monitoring efforts include: water temperature, general weather conditions, heavy storm events, precipitation, wind, wave height. Location of water quality sampling, time of day of sampling and test method used are also recorded.

Predictive Modeling

Predictive models (e.g., based upon correlations between atmospheric conditions and E. Coli monitoring data) have been developed for some locales. Bacterial source tracking has also been developed for selected beaches. There is a distinct need for more advanced predictive modeling tools to support beach managers.

Meteorologic data, wind/wave forecasts and nearshore circulation modeling are particularly important to assess the frequency and cause of pathogen loadings. Meteorologic data collected in close proximity to Great Lakes coastal beaches include air temperature, hourly rainfall, relative humidity, and hourly wind speed and direction. Other factors commonly monitored include water temperature, specific conductance, lake current speed/direction, insolation (solar radiation), pH, dissolved oxygen, Chlorophyll fluorescence, stream inflow, and turbidity.

Improved knowledge of local hydrodynamics, regional environmental processes, beach orientation with respect to water circulation patterns and the temporal changes in nearshore currents are needed. Additional information is also needed on the impacts of nearshore circulation and lake level changes on sediment suspension. These observations need to be factored into predictive modeling systems to provide near-real-time water quality forecasting to ensure public health and safety.

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Unmet data collection / information needs (specific locations appreciated):

Value-added products GLOS could provide (integrated data products, predictive modeling tools, etc):

Please return survey by April 30, 2004, to:

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