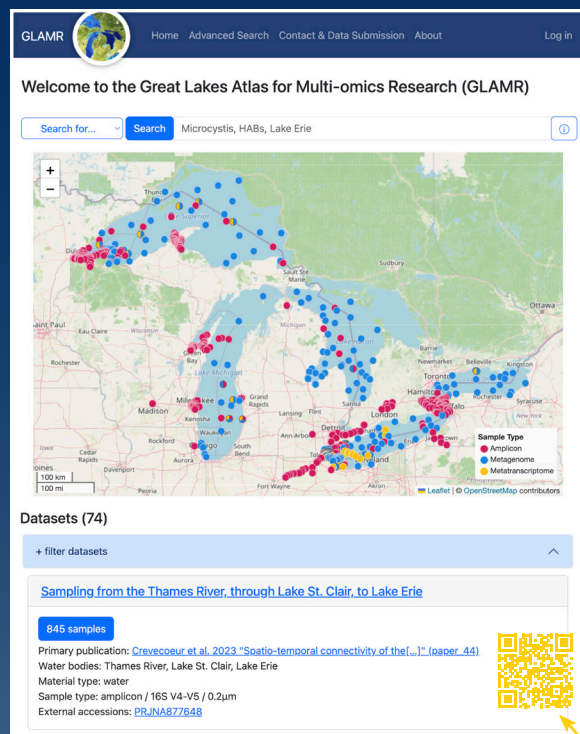


# The Great Lakes Atlas for Multi-omics Research (GLAMR)

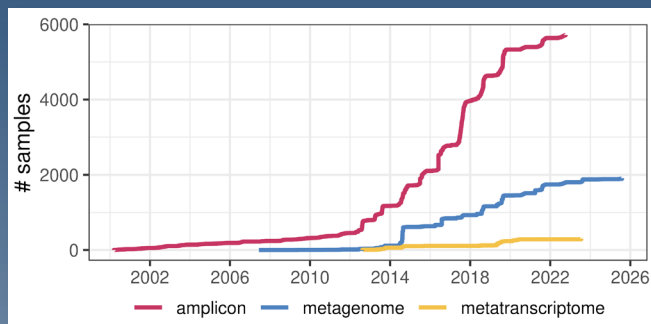
GLAMR ([greatlakesomics.org](http://greatlakesomics.org)) is an online resource that helps researchers and the public explore “omics” data from the Laurentian Great Lakes. Omics techniques allow scientists to study large numbers of biological molecules at once, including DNA (genomics), proteins, and metabolites, generating detailed datasets increasingly used in Great Lakes research.

GLAMR brings these datasets together, integrating multiple types of omics data with environmental measurements such as temperature, nutrients, and collection information. By integrating this information, GLAMR helps researchers better understand how microbial life in the Great Lakes responds to changing environmental conditions.

Datasets are processed using standardized bioinformatics pipelines, so results can be compared across studies. Users can download quality-controlled sequencing reads, abundance tables (showing how common genes or organisms are), and genomic assemblies (reconstructed genetic sequences), all valuable for modeling and large-scale analysis.



The GLAMR homepage: [greatlakesomics.org](http://greatlakesomics.org)



Sample accumulation in GLAMR over time (red=amplicon, blue=metagenome, yellow=metatranscriptome); collection of Great Lakes 'omics is expected to continue rapidly increasing.

To build GLAMR, the team collected publicly available datasets from papers and online databases, integrating metadata such as sampling location with environmental conditions, often from multiple sources.

In addition to supporting NOAA research, GLAMR is a resource for educators, water resource managers, policymakers, researchers, and the general public. Anyone can access the site to explore, for example, how certain species or genes are distributed across the Laurentian Great Lakes.

## GLAMR Highlights

- Integrates multi-omics datasets with environmental measurements (e.g., nutrients, toxins), standardizes using MxS guidelines and consistent units.
- Includes nearly 8,000 samples: >1500 metagenomic, >300 metatranscriptomic, >5,500 amplicon.
- Built for scalability and flexibility: bioinformatics pipelines use Snakemake; databases and web hosting are fully containerized.
- Enables integration with other data repositories such as the Great Lake Observing System (GLOS) Seagull platform and the global biodiversity information facility (GBIF; planned)



## GLAMR supports NOAA's research mission

- Collects, processes, manages, stores, and analyzes large 'omics datasets
- Helps move 'omics research into real-world applications
- Provides tools to support the Blue Economy
- Serves as a hub for building 'omics skills in the workforce

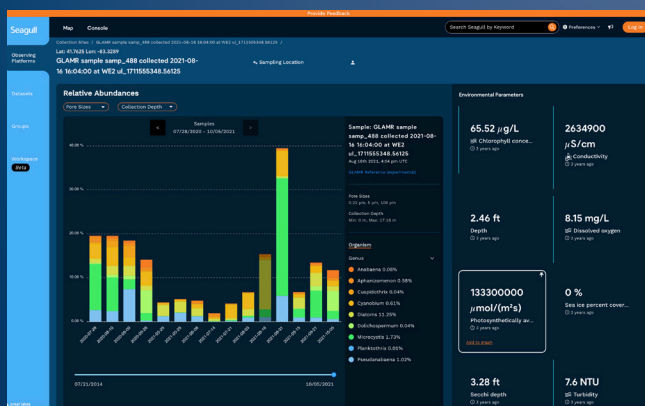
### Applications include:

- **Harmful algal bloom monitoring:** understanding drivers, interactions, and toxin production
- **Modeling biological processes:** including algal blooms and nutrient cycles
- **Invasive species monitoring:** presence and distribution
- Biodiversity surveys and natural products bioprospecting
- **Sustainable fisheries:** supporting food-web and resource management

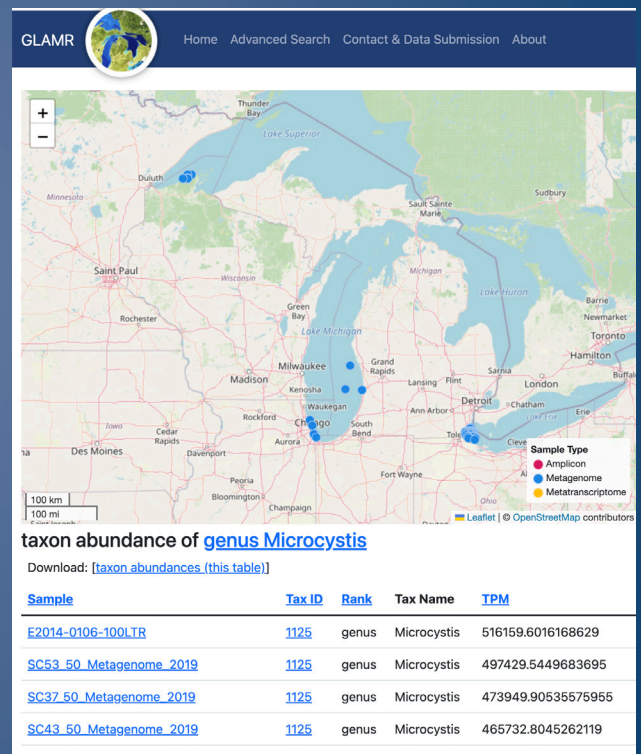
## Explore what's possible with GLAMR:

1) **Track species across the Great Lakes:** See where and when organisms like the harmful algal bloom-causing *Microcystis* were observed, how abundant they were, and how their presence relates to environmental conditions like temperature or nutrient levels. All data, including abundance tables (like the one on the right) and environmental measurements, can be downloaded for further analysis.

2) **Explore biological processes:** Investigate how processes like nitrogen fixation vary across the lakes by searching for related genes (e.g., *nifH*). View maps of where the gene occurs, tables of gene abundance, and download sequences to compare across locations or organisms.



GLAMR data in action: Omics datasets are sent to Seagull via API, where users can explore them with interactive graphs and overlay environmental factors like temperature or nutrient levels.



Search results for *Microcystis* taxon abundance on GLAMR.

3) **Connect with other platforms:** GLAMR shares data with systems like the GLOS Seagull platform ([seagull.glos.org](http://seagull.glos.org)), where users can explore harmful algal bloom-related data through interactive graphics. Standardized GLAMR datasets can be readily adapted and shared with other tools and platforms.

Questions, comments, or interested in submitting data? Email [GLAMR-omics@umich.edu](mailto:GLAMR-omics@umich.edu)