

Advancing innovation, competitiveness and resilience through responsible stewardship of the world's freshwater resources.

INDEPENDENT COMPETITIVENESS REPORT

Freshwater and the Next Economy

Ten Years Later

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October 2026

Findings and Strategic Opportunities

A foundation for a potential Phase III Competitiveness Study

An independent examination of how freshwater stewardship, energy, advanced manufacturing, agriculture, AI and computing, talent, infrastructure and investment shape competitiveness and prosperity. Building on the Council on Competitiveness water studies, this report examines freshwater security alongside innovation, economic and environmental resilience, and community well-being. Its Great Lakes findings offer a foundation for further research and approaches with global application.

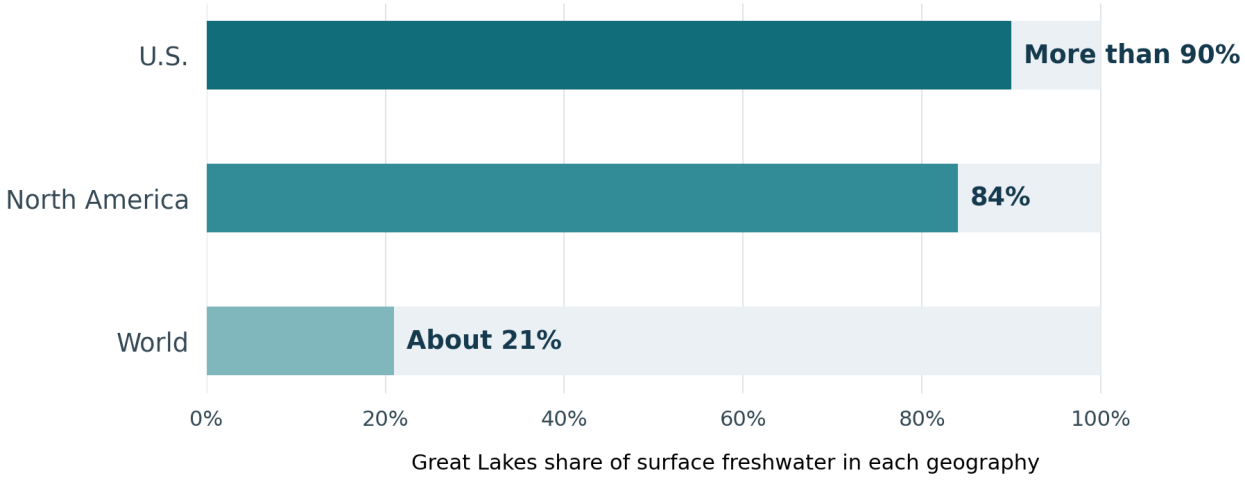
Researched and written by Robert J. Bogart

October 2026

Freshwater Competitiveness at a Glance

The scale of the resource The Great Lakes hold more than 90% of U.S. surface freshwater, 84% of North America's surface freshwater and about 21% of the world's surface freshwater.

Sources: EPA Great Lakes Facts and Figures | EPA Great Lakes restoration overview



Each bar uses a different geographic total. U.S. bar shows a conservative 90% baseline; the reported share exceeds 90%. These figures refer to surface freshwater, not all freshwater including groundwater and ice.

Why the Great Lakes is relevant to this study

The scale of the resource makes the Great Lakes a compelling setting for examining how freshwater security and responsible stewardship can support innovation, competitiveness and resilience. The basin spans the United States and Canada and connects freshwater systems with manufacturing, agriculture, energy, research institutions and communities. The study can assess these relationships together rather than treating water as a stand-alone input.

A potential Phase III study could connect existing Great Lakes research, testbeds, utilities and employers to evaluate water reuse, treatment, sensing, efficient cooling and other technologies. Shared demonstrations could improve regional resource productivity and develop solutions for use elsewhere. Resource abundance alone does not establish a competitive advantage: water quality, ecosystem health, infrastructure, affordability, energy and community benefits must be assessed alongside economic opportunity.

A decade after the Council's first water dialogue, the changing scale of digital infrastructure strengthens the case for examining freshwater security, innovation, competitiveness and resilience together, with the Great Lakes as a regional focus for work with global application.

The changing scale of computing

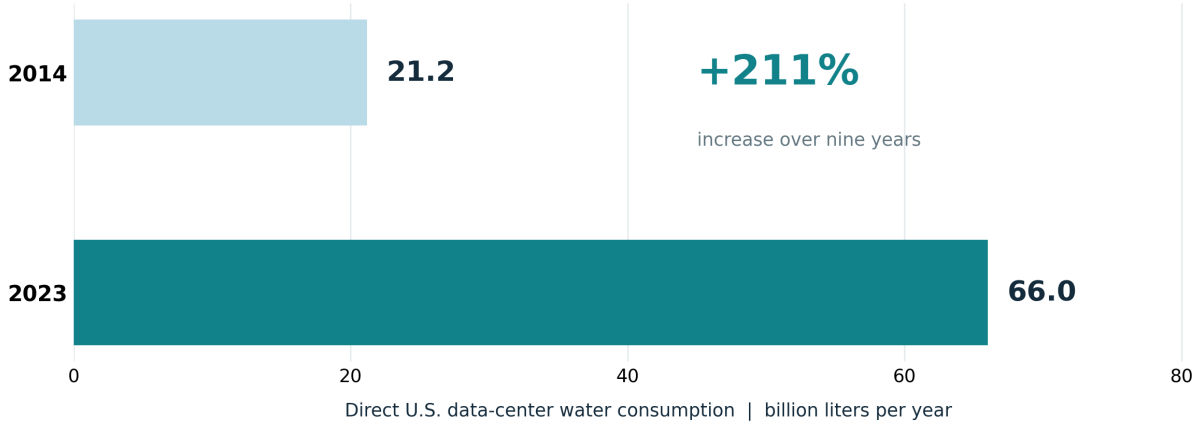


Figure 1 Direct U.S. data-center water consumption. Source: Lawrence Berkeley National Laboratory, 2024 United States Data Center Energy Usage Report, pp. 55–56, Figure 5.9. National estimates; this is a nine-year comparison, not a Great Lakes or AI-only measure.

The system a potential Phase III study should examine

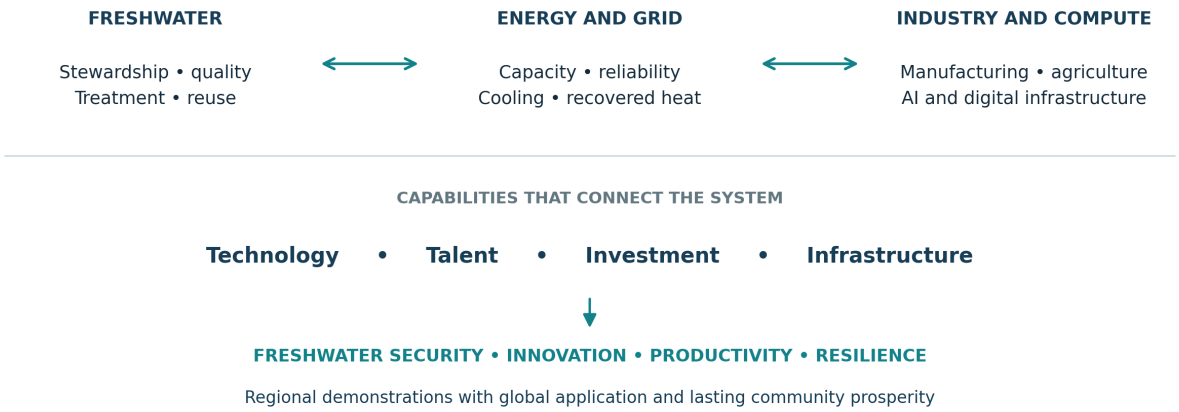


Figure 2 Proposed analytical framework. Freshwater security is one central outcome alongside innovation, productivity, resilience and community prosperity. Connections show questions for assessment, not quantified flows or adopted commitments. Author's synthesis of the report and the Council's four pillars.

Executive Findings

The Great Lakes' freshwater resources become a competitiveness asset through responsible stewardship, reliable infrastructure, technology and human capability. This independent report examines freshwater security alongside innovation, productivity, economic and environmental resilience, and community prosperity. Its regional findings identify questions for a potential Phase III study and approaches that could be adapted globally. Resource abundance alone does not establish usable capacity or justify additional demand.

The unit of analysis should be the system. Water, energy, grid capacity, cooling, advanced manufacturing, agriculture and digital infrastructure interact. Decisions should assess freshwater security and ecosystem health alongside productivity, economic resilience and the full costs and benefits for communities.

Integration is the principal research opportunity. Shared methods, testbeds and demonstrations can connect complementary Great Lakes strengths and produce evidence that individual institutions cannot generate alone. The study should test which results can be adapted to other resource, infrastructure and governance conditions around the world.

Technology translation deserves equal attention to facility location. Reuse, sensing, cooling, thermal systems, power equipment and engineering can create exportable capabilities as well as improve local operations.

Talent and community value determine durability. Research, training, career pathways, affordability and transparent cost allocation are necessary to turn investment into sustained productivity and prosperity.

Public and private investment should work as a connected system. Public restoration, research and infrastructure commitments can support reusable capability; corporate customers, sponsors and investors can help validate and commercialize technology. A Buffalo coordinating team could connect larger firms with innovators and universities across the basin, creating paid internships and early-career opportunities alongside measurable freshwater and economic benefits. All prospective support requires agreement.

Purpose and Method

Researched and written by Robert J. Bogart, this independent report presents independent findings and strategic opportunities as a foundation for discussing a potential Phase III Competitiveness Study. It builds on the Council's 2016 water and manufacturing work and its 2017 agricultural and consumer water use study. Council sponsorship and participation by other institutions remain matters for future agreement.

The report synthesizes the Council studies, publicly described institutional capabilities and the analysis developed in the underlying report. It does not establish a new organization, geographic development initiative or set of adopted public investment commitments. Quantitative estimates retain their cited periods; technical examples and proposed collaborations require further validation before deployment or funding decisions.

The distinction between findings and proposals is deliberate: observed connections and existing examples inform the analysis, while common standards, curricula, demonstrations and a formal Phase III study are recommendations for consideration.

Mission Vision and Strategic Purpose

Mission of the Independent Report

The mission of this independent report is to examine how freshwater stewardship, innovation and collaboration can strengthen competitiveness and improve lives. It explores how freshwater security, energy, advanced manufacturing, agriculture, AI and computing, talent and infrastructure together shape economic opportunity, environmental resilience and lasting prosperity.

Building on the Council on Competitiveness' earlier water studies, the report identifies opportunities to connect the complementary strengths of Great Lakes institutions, industries and communities across the United States and Canada. Its findings provide a foundation for a potential Phase III Competitiveness Study, using the region's experience to develop technologies, practices and investment approaches with global application.

A potential Phase III agenda should also connect public investment with private research, commercialization and customer adoption. It should give smaller innovators access to larger companies and qualified testbeds, and give students practical paid routes into freshwater, energy and industrial careers.

Vision for a Potential Phase III Study

A Great Lakes region whose U.S. and Canadian institutions work as a connected innovation system, advancing freshwater security while strengthening manufacturing, resilient food systems, sustainable computing and workforce opportunity. Its collaboration should demonstrate how responsible resource stewardship can support competitiveness and community prosperity, and produce technologies, practices and investment models that strengthen U.S. competitiveness and contribute to global resilience and well-being.

The central question

What can the Great Lakes achieve together that no city or institution can achieve alone, and how can those results advance freshwater security, innovation, competitiveness and prosperity in the region and around the world?

What success means

Success means measurable improvements in freshwater security, industrial and water productivity, technology adoption, workforce capability, infrastructure resilience and community prosperity. Assessment should track water quality and dependable access alongside affordability, ecological limits and the full cost of serving new demand. Global relevance should be tested through the adaptation of technologies, practices and investment approaches to other regions.

Geographic scope

The findings focus on the binational Great Lakes as a connected resource, industrial and innovation system. Comparative research and demonstrations should reflect all five lakes and the U.S. and Canadian portions of the basin. The wider goal is to identify approaches with global application, recognizing that water availability, climate, infrastructure, institutions and community needs vary across regions.

From Phases I and II to Phase III

Phase I, Leverage Water and Manufacturing, grew from the February 16, 2016 dialogue convened with Marquette University and A. O. Smith in Milwaukee. It organized competitiveness around technology, talent, investment and infrastructure. Its recommendations connected water stewardship, reuse, natural infrastructure, sensors and data, technology testbeds and technical workforce development.

Phase II, Leverage Agricultural and Consumer Water Use, followed a January 11, 2017 dialogue. It extended the inquiry to agriculture, lawn and garden, food production and consumers. It emphasized climate information, trustworthy shared data, efficient irrigation and reuse, alignment of incentives, water use measurement and disclosure, and education for technical workers and managers.

The ten year reference point is the 2016 Phase I dialogue. Phase II followed in 2017. Phase III should carry both bodies of work forward rather than treat AI and computing as a replacement for manufacturing, agriculture or consumer needs.

Foundation	Carry forward	Phase III extension
Phase I Water and Manufacturing	Stewardship; industrial efficiency; sensors and data; testbeds; technical talent.	Connect manufacturing and water technology with grid capacity, AI infrastructure, reuse, heat recovery and commercialization.
Phase II Agricultural and Consumer Water Use	Climate planning; verified data; conservation incentives; agricultural and consumer efficiency; skills.	Assess competing uses, food systems, watershed impacts, affordability and the community consequences of industrial and digital growth.
Proposed Phase III Freshwater and the Next Economy	Retain technology, talent, investment and infrastructure as the common analytical framework.	Use the binational Great Lakes as a demonstration of integrated resource competitiveness with national and global application.

Source basis: U.S. Council on Competitiveness, Leverage Water and Manufacturing (2016), printed pages 4–7; Leverage Agricultural and Consumer Water Use (2017), printed pages 4–7; Robert J. Bogart, Freshwater and the Next Economy, Phase III concept paper. Historical recommendations are summarized here; earlier quantitative estimates are not current baselines.

The Four Pillars of Competitiveness

Council pillar	Phase III focus	Evidence of progress
Technology	Water sensing and reuse; industrial efficiency; cooling and heat recovery; AI tools; shared testbeds; translation into adoption.	Validated technologies; deployments; measured water and energy savings; commercialization and supplier adoption.
Talent	Technical and research skills; skilled trades; management capability; graduate retention; cross border pathways; emerging work.	Employer validated credentials; placements; retention; occupational gaps; workforce participation and mobility.
Investment	Research translation; demonstration finance; industrial modernization; full lifecycle economics; public and private capital.	Capital committed and deployed; additionality; productivity; full public cost and return; affordability effects.

Council pillar	Phase III focus	Evidence of progress
Infrastructure	Water and wastewater; energy and grid; digital capacity; natural infrastructure; sites; community readiness.	Verified capacity; reliability; reuse; environmental performance; cost allocation; project readiness and resilience.

Each research module should address all four pillars. Water availability alone cannot establish an economic advantage; the study must test the contribution of infrastructure, technology, skills, governance and cost under actual operating conditions.

Freshwater Security and Resource Productivity

The Great Lakes represent one of the world's most significant freshwater systems. In a century in which reliable freshwater is becoming a strategic constraint on communities, agriculture, energy and industry, that resource should be understood as long-duration economic infrastructure - not as a license for unlimited consumption.

Why freshwater scarcity changes the competitive map

Global water stress is no longer a distant environmental issue; it is becoming a location, supply-chain, operating-cost and business-continuity issue. The 2024 United Nations World Water Development Report states that roughly half of the global population experiences severe water scarcity for at least part of the year. WRI's Aqueduct analysis finds that 25 countries, home to about one-quarter of the world's population, face extremely high annual water stress.

The trajectory strengthens the strategic case. Global water demand has more than doubled since 1960. WRI projects demand to rise another 20-25% by 2050 and estimates that $70 trillion - roughly 31% of global GDP - could be exposed to high water stress by 2050, compared with $15 trillion in 2010. For water-intensive and cooling-intensive industries, dependable supply, treatment, reuse, water quality and governance are therefore becoming increasingly material location factors.

Freshwater security becomes a competitive advantage when stewardship, infrastructure and technology support reliable access and efficient production. The opportunity is to convert resource security into innovation, research, industrial efficiency and exportable technology while protecting ecosystems and other users.

Water availability creates long-term value for:

- Food and beverage; Semiconductor suppliers; Advanced materials; Biomanufacturing; Cooling-intensive processes; Clean technology; Agricultural processing

Hydropower, electricity supply and grid conditions vary across the basin. Their value must be assessed at the site and system level, including eligibility, delivered cost, capacity, reliability and the timing and cost of upgrades.

The combined proposition

Responsible freshwater use, reliable energy, industrial capability and cross border collaboration should be tested together against the requirements of specific technologies, users and communities.

The Changing Scale of Digital Infrastructure

Berkeley Lab estimates that direct U.S. data center water consumption rose from 21.2 billion liters in 2014 to 66 billion liters in 2023, approximately 211% over nine years. The comparison demonstrates a substantial change in national demand; it is not a ten year measurement of Great Lakes consumption and does not attribute all of the increase to AI.

Berkeley Lab's update published in June 2026 estimates that data centers could account for 11.8% of U.S. electricity use by 2030, within a scenario range of 9.5%–15.3%. These projections reinforce the need to examine computing, water, electricity and infrastructure together, while testing how assumptions about equipment, cooling and utilization affect outcomes.

Sources: Berkeley Lab, 2024 United States Data Center Energy Usage Report, pp. 55–56 and Figure 5.9; United States Data Center Energy Usage Report 2025 Update, published June 2026.

Sustainable Compute and Advanced Industry

Sustainable computing connects freshwater, energy and grid capacity with semiconductors, thermal management, advanced manufacturing, water systems and research. The strongest competitiveness proposition is the capacity to develop and export the technologies and practices that make digital infrastructure more resource efficient, while evaluating hosting opportunities against local constraints and public value.

Target segments

- Data-center liquid-cooling systems and heat exchangers.
- Transformers, switchgear, power electronics, controls and high-density electrical systems; Thermal-management materials, pumps, valves and industrial components; Water-monitoring, treatment, reuse and closed-loop systems; Heat-recovery and district-energy equipment; Grid-flexibility, storage and microgrid technologies; Software for energy, cooling and water optimization.
- Engineering, commissioning, environmental monitoring and critical-facility services; Research, test and certification services.
- Selective high-performance computing and AI infrastructure that satisfies regional resource and community-value standards.

Why this is a manufacturing strategy as much as a data center strategy

Data center operations and the equipment supply chain offer different forms of economic value. Cooling, grid, thermal and water systems create manufacturing, engineering and commercialization opportunities. The study should compare permanent jobs, wages, exports and innovation benefits per unit of water, electricity and public investment rather than equate the size of a facility with its competitiveness contribution.

Infrastructure Costs and Community Safeguards

The most significant new risk in data-center-led growth is not simply resource consumption. It is cost allocation. A very large customer can require new generation, transmission, substations, water infrastructure, roads and public services. If the customer does not bear an appropriate share of those incremental costs, residential and small-business customers can effectively subsidize the project.

Ratepayer and taxpayer protection should be part of the competitiveness analysis. Transparent infrastructure economics, reliable service and fair allocation of project driven costs can reduce uncertainty for communities and long term investors.

Recommended safeguards

- Project-specific cost-of-service and infrastructure-allocation analysis before incentive approval; Transparent modeling of residential and small-business rate impacts.
- Dedicated or incremental capacity requirements when project load would otherwise tighten the system.
- Clear responsibility for transmission, substations, water-system and road upgrades attributable to the project.

- Environmental and thermal-discharge review before public support is committed.
- Independent verification of projected jobs, taxes, water use, electricity use and community benefits.
- Periodic post-opening audits comparing commitments with actual performance.

Integrating Computing with Energy and Water Systems

The Great Lakes region contains complementary assets relevant to sustainable computing. The analytical task is to determine where combining those assets creates measurable advantages, and where technical, environmental or infrastructure constraints limit the opportunity.

Illustrative case Empire AI heat recovery

In March 2026, Empire AI and the University at Buffalo announced a project to capture and reuse heat from the supercomputing center through UB's North Campus Clean Energy Master Plan. Its connection to campus thermal infrastructure illustrates a useful research question: under what operating and economic conditions can computing loads become part of a wider energy system? The announcement is a project example, not evidence that its anticipated benefits have all been realized.

Other illustrative technology models

- Toronto: Enwave Deep Lake Water Cooling uses Lake Ontario as part of a district cooling network serving data centers and other buildings.
- Cornell: Lake Source Cooling reduces campus cooling energy use by about 85% and provides approximately 98% of campus cooling through a renewable, refrigerant-free system.
- Microsoft Project Natick: subsea computing research demonstrated technical feasibility and a server failure rate one-eighth that of the land-based control group.

A Distributed Research and Demonstration Network

A Great Lakes sustainable compute research network could connect existing testbeds, university facilities, utilities and industrial users. The purpose would be to compare performance under different conditions and accelerate validated technologies into use. A common research agenda does not require creating a new permanent organization or a single physical laboratory.

Subsea computing is one technology pathway among many. The broader inquiry includes lake source and district cooling where technically and environmentally appropriate, direct liquid cooling, heat recovery, closed loop systems, power optimization and advanced infrastructure manufacturing. Technology choices should follow evidence on lifecycle cost, reliability and environmental performance.

Research and demonstration agenda

- Lake-source and closed-loop cooling systems.
- Direct-to-chip liquid cooling, immersion cooling and high-efficiency heat exchangers.
- Waste-heat recovery for district energy, campuses, greenhouses and industrial processes; Grid-interactive computing and workload flexibility; Hydropower integration, storage, microgrids and resilient power; Advanced power electronics, transformers and switchgear; Water measurement, reuse, treatment and thermal-impact monitoring.
- Data-center siting optimization incorporating land, fiber, power, water, environmental constraints and community cost.
- Lifecycle economics, community-benefit analysis and resource-productivity measurement.

Proposed Water Energy Compute Decision Framework

The proposed framework would make the tradeoffs of large computing and industrial loads comparable. It is an analytical tool for testing project and infrastructure choices; permits, utility tariffs and resource governance remain with the competent authorities. The criteria below are proposed assessment dimensions rather than an adopted regulatory or certification standard.

Dimension	Proposed standard
Electricity	Full transparent load forecast; project-driven infrastructure allocation; incremental capacity or flexibility where needed; no unreasonable residential cross-subsidy.
Water	Separate reporting of withdrawal and consumptive use; closed-loop/reclaimed options evaluated first; source-specific environmental review.
Thermal impacts	Thermal discharge modeled, limited and monitored; ecological safeguards built into permits and operating agreements.
Heat	Major projects complete a heat-reuse feasibility study and integrate recovery where technically and economically justified.
Economic value	Public support tied to verified permanent jobs, wages, R&D, supply chain, workforce development, local tax base and expansion potential.
Transparency	Annual reporting of agreed resource, employment and community commitments; independent verification for major subsidized projects.

Universities Research and Applied Talent Pipelines

Research capacity and workforce development are part of the same competitiveness system. A study should examine how universities, community and technical colleges, employers and labor can combine complementary strengths to educate, attract and retain the people required for emerging work.

Participation should be designed across Great Lakes institutions in both countries. Existing water science, energy, engineering, manufacturing and computing programs should be mapped before new programs are proposed. Community colleges, union apprenticeship programs, utilities, equipment manufacturers and data center operators should help define practical competencies and training needs.

Academic architecture

- Undergraduate concentration: Sustainable Digital Infrastructure; Graduate certificate: Water-Energy-Compute Systems; Professional master's track: AI Infrastructure and Resource Systems.
- Cross-registered courses in thermodynamics, data-center architecture, power systems, hydrology, environmental engineering, economics, public policy and cybersecurity.
- Technician credentials in liquid cooling, high-voltage systems, controls, commissioning and critical-facility operations; Shared research testbeds and industry-sponsored capstone projects.
- Great Lakes fellowships could connect graduate students and postdoctoral researchers with participating laboratories, utilities and industrial demonstrations.

Relevant university models

The relevant capabilities span several disciplines and institutions. A capability inventory should identify overlaps and gaps rather than assume that one institution supplies the complete model. The following examples illustrate components of a potential network:

- University of Waterloo: Collaborative Water Program delivered across 11 departments and schools in all six faculties, combining science, engineering, governance and economics.
- Cornell: long-running Lake Source Cooling plus engineering and environmental research.
- University at Buffalo: Empire AI, engineering and a campus-scale heat-recovery strategy linking high-performance computing to thermal infrastructure.
- Leading sustainable-computing programs elsewhere demonstrate work on AI energy, advanced cooling, data-center-water impacts and grid integration, but the Great Lakes can organize these disciplines around a distinctive freshwater and industrial context.

University and Industry Curriculum Collaboration

Higher education should be examined as part of competitive infrastructure. The proposed approach is a university led, employer informed network connecting existing courses, faculty, laboratories and applied projects. Academic standards and institutional identity remain with the participating institutions.

Map curricula to industrial problems and emerging work. Research capability, experienced talent, entry level training, applied facilities and commercialization should develop together, with clear evidence that proposed pathways address employer and student needs.

Illustrative academic building blocks

The institutions below illustrate relevant capabilities identified in the underlying analysis. This is a partial inventory, not a preferred governance roster or evidence that a fully integrated program already exists. A subsequent study should extend the inventory across the basin and Canada.

Institution	Relevant building blocks	Best strategic use
University at Buffalo	Clean energy; power systems and electronics; smart grid; engineering sustainability; AI/data; advanced-manufacturing scale.	Energy + grid systems; sustainable compute; industrial electrification; applied regional anchor.
Cornell University	Systems engineering; food-energy-water nexus; technoeconomic analysis; AI for sustainability; commercialization; ILR technology-and-work capability.	Systems architecture; water-energy-business core; resource productivity; commercialization; future-of-work transition.
Syracuse University	EMPOWER water-energy research; environmental systems; smart water management; cyber-physical infrastructure and resilience.	Water-energy nexus; smart water; water security; critical-infrastructure resilience.
Clarkson / SUNY ESF	Healthy Water Solutions; water resources; clean energy; advanced materials; applied water research.	Freshwater security; filtration/reuse; water-quality technologies; applied engineering.
RIT	Microelectronic engineering; semiconductor cleanroom; co-op model; applied computing and manufacturing.	Semiconductor facilities; UPW context; process technology; co-ops and workforce certificates.

Institution	Relevant building blocks	Best strategic use
Alfred / Alfred State	Ceramics, glass and materials; renewable energy; mechatronics; PLCs; automation; technician pathways.	Advanced materials; manufacturing equipment; automation; technician pipelines.

The test is whether existing academic strengths can be connected into useful pathways for students, researchers and employers, with measurable learning, placement and innovation outcomes.

Map curricula to business clusters not academic departments

The platform should begin with priority industry problems and assemble the academic capabilities required to solve them. Every degree, certificate, capstone or research pilot should be justified by a cluster need, an employer use case and a measurable talent or innovation outcome.

Business cluster	Skills / problems to solve	Current building blocks	Potential integrated track
Freshwater systems & water technology	Industrial water reuse; filtration; PFAS; sensors; treatment; resource recovery.	Syracuse; Clarkson/SUNY ESF; Cornell; UB.	Industrial Water & Circular Manufacturing
Energy, grid & power infrastructure	Power electronics; storage; substations; flexible load; hydropower systems.	UB; Cornell; Alfred; RIT.	Water-Energy-Compute Systems
AI / digital infrastructure & cooling	Liquid cooling; thermal systems; controls; AI optimization; cyber-physical resilience.	UB; Syracuse; Cornell; RIT.	Sustainable Digital Infrastructure
Semiconductor facilities & equipment	UPW; cleanrooms; process support; facilities engineering; reliability; equipment.	RIT; UB; Cornell; Alfred.	Semiconductor Facilities Engineering
Advanced manufacturing & automation	Materials; robotics; industrial AI; mechatronics; process improvement; resource efficiency.	RIT; Alfred/Alfred State; UB; Cornell.	Industrial Resource Productivity

A shared curriculum architecture one core and multiple industry tracks

A common interdisciplinary core would create coherence while allowing each institution to lead in areas where it has distinctive faculty, facilities and brand strength. The core should cover water systems; energy and grid systems; AI, controls and cyber-physical systems; manufacturing and materials; systems thinking; project management; and business/public-value topics such as technoeconomics, commercialization, project finance, incentives, lifecycle economics and resource stewardship.

- Water-Energy-Compute Systems - the cross-domain systems spine of the platform.
- Industrial Water & Circular Manufacturing - reuse, filtration, resource recovery and manufacturing process water.
- Sustainable Digital Infrastructure - cooling, energy, controls, heat recovery and AI/HPC infrastructure.

- Semiconductor Facilities Engineering - ultrapure water, cleanrooms, facilities systems, reliability and equipment interfaces.
- Freshwater Security & Cyber-Physical Resilience - sensing, contamination response, redundancy, SCADA/OT security and critical-infrastructure risk.
- Industrial Resource Productivity - productivity per acre, megawatt, gallon, worker and dollar invested.

Degree and credential concepts to co design

These concepts are not mandates. They are practical starting points for faculty, employers, accreditors and students to test, refine and own.

- Undergraduate minors/concentrations: Water-Energy-Compute Systems; Sustainable Digital Infrastructure; Industrial Systems & Resource Engineering; Semiconductor Facilities Support; Water Technology + Industrial Operations.
- Professional MS/MEng tracks: AI Infrastructure & Resource Systems; Industrial Water & Circular Manufacturing; Semiconductor Facilities Engineering; Grid-Interactive Industrial Systems; Freshwater Security & Resilience.
- Doctoral/research concentrations: Water-Energy-Compute Systems; Freshwater Security & Cyber-Physical Resilience; Industrial Resource Productivity; Advanced Materials for Water + Electronics; Resource-Efficient Manufacturing Systems.
- Stackable certificates: liquid cooling and thermal systems; power electronics and grid controls; SCADA/OT cybersecurity; ultrapure water; industrial water reuse; semiconductor facilities; resource-productivity analytics.

Connecting Academic Resources Across Institutions

The consortium model should preserve institutional identity and governance while creating a simpler regional pathway for students and employers.

- Shared demand signal — employers, universities, labor and regional delivery partners identify critical occupations, emerging skills, equipment needs, research opportunities, co op demand and public value measures.
- University-led modules - institutions contribute the courses, labs, faculty and research assets in which they are strongest.
- Student pathways could combine home institution enrollment with agreed online or hybrid modules, cross registration where feasible, employer capstones, paid co ops, stackable credentials and shared placement information.
- Joint research / demonstration network - present water labs, cleanrooms, grid simulators, automation labs, thermal systems and pilot facilities as one discoverable regional portfolio.
- Shared scorecard - track enrollment, completions, employer use, placements, retained graduates, research funding, pilots, IP, supplier growth and commercialization.

Employer aligned learning the curriculum should touch real assets

Curriculum becomes economic infrastructure when students, faculty and employers work on the same problems the region is trying to attract and scale. High-value programs should use real equipment, operating data, facilities, applied research and business cases, while preserving academic independence.

- Pilot and demonstration projects: industrial-water audits and reuse plans; cooling skids; sensor deployments; heat-recovery concepts; utility flexibility studies.
- Employer capstones: projects defined by utilities, manufacturers, hospitals, food processors, semiconductor suppliers, digital-infrastructure firms and startups.

- Co-ops and short-cycle credentials: pathways serving technicians, operators, engineers, managers and experienced workers.
- Commercialization translation: connect university research to field demonstrations, procurement introductions, startups and supplier growth.
- Public-value discipline: measure jobs, wage quality, placement, retention, employer use, research dollars, pilots, IP, water/energy productivity and community benefit.

Global models worth studying or partnering with

- WaterCampus / Wetsus (Netherlands) - a multi-university, industry-connected water-technology ecosystem and joint MSc model.
- IHE Delft Institute for Water Education - global graduate and professional water education with modular, interdisciplinary and problem-oriented programs.
- NTU Singapore / NEWRI - a research-engineering-deployment model linking water/environment research, technology acceleration and industry projects.
- TU Delft / Deltares ecosystem - deep water-management, environmental engineering, coastal/delta and applied hydraulic capability connected to national infrastructure.
- The examples above offer models for specific parts of the architecture. A subsequent study should test which features transfer to the Great Lakes context and what coordination would add to existing programs.

Future of Work and Emerging Economy extension

The curriculum platform should not only respond to today's vacancies. It should become a regional capability for anticipating work that is emerging, changing rapidly or does not yet have stable occupational definitions. AI cannot reliably predict the future, but it can improve signal detection across job postings, patents, research, venture funding, corporate capital spending, utility plans, skills, wages and employer operating data.

Cornell ILR offers relevant expertise in work, employment, organizations and labor market institutions. An emerging occupations observatory could draw on such capabilities across participating institutions to translate technology and employer signals into testable skills, curricula, transition pathways and employer pilots. Institutional leadership would need to be agreed rather than assumed.

- SCAN - collect weak signals from technology, employers, investment, research and labor markets.
- ANTICIPATE - build scenarios and identify plausible new tasks, occupations and industry configurations.
- DESIGN - translate signals into skills, curricula, credentials, research questions and employer pilots; PILOT - test with small cohorts, companies or applied research projects; DEPLOY - scale pathways that demonstrate value.
- MEASURE - track learning, placement, productivity, wages, mobility and employer adoption.
- LEARN + REDESIGN - compare evidence with assumptions; revise, retire or expand programs continuously.

Illustrative emerging roles include AI infrastructure resource engineer, industrial water-circularity engineer, semiconductor water systems specialist, liquid-cooling systems engineer, compute-energy optimization specialist, digital water systems architect, cyber-physical water security specialist, industrial heat-recovery systems engineer, resource-productivity analyst and human-AI work systems designer.

An Illustrative Twelve Month Curriculum Pilot

- 0-90 days - convene universities, employers and utilities; validate cluster skill maps; inventory existing courses/labs; select three curriculum pilots and five employer capstone projects.
- 3-6 months - outline the shared core; assign institutional module leads; map cross-registration, accreditation, tuition and faculty constraints; define certificate and co-op pathways.

- 6-9 months - launch the employer project bank and first shared seminar/sprint; fund equipment access, faculty release and student support; prototype the Emerging Occupations Observatory.
- 9-12 months - evaluate pilots; approve the next cohort; publish the first workforce/research scorecard; recruit global partners and visiting fellows.

Universities retain responsibility for academic standards and degree design; employers validate tasks and provide projects; workforce institutions and labor develop technician and transition pathways; utilities define operating requirements; commercialization partners and investors support translation; and designated coordinators maintain shared demand signals and results.

The competitiveness objective is to connect future industry requirements with the work, skills and institutions needed to support them.

Talent Attraction and Career Opportunity

Talent decisions depend on the work people can do and the lives they can build. The study should examine career mobility, housing, transport, family needs, professional networks and access to education alongside wages. A connected field spanning engineering, computing, freshwater science, skilled trades and entrepreneurship could strengthen the region's talent proposition.

The goal is not to predict a sudden population surge. It is to create the institutional density that changes migration decisions over time: visible employers, funded research, internships, multiple career options, startup opportunities, continuing education, housing and a strong regional identity around an important global problem.

Consumer and Community Value

Competitiveness should be assessed through its effects on residents and existing businesses as well as new investors. Computing and industrial growth may support grid modernization, waste heat recovery, district energy, manufacturing and research, but the benefits must be tested against project driven costs and environmental impacts.

Potential community benefits

- New generation, storage or transmission financed by large customers can improve regional capacity and reliability.
- Heat recovery can lower the energy requirements of campuses, buildings, greenhouses or district systems.
- Manufacturing cooling and electrical equipment may create significant employment and export opportunities; compare those outcomes with hosting facilities rather than assuming capital intensity predicts permanent jobs.
- University research and training can increase the value of the regional workforce.
- Transparent cost allocation can protect residential customers from project-driven infrastructure burdens.
- Environmental monitoring and water technology developed locally can become exportable capabilities.

Workforce Renewal and Talent Measures

The talent pillar

The proposed Great Lakes Phase III platform should examine talent attraction, retention and workforce renewal within the Council's talent pillar. Metros need the skills, research capacity and working age population to operate and renew their economies; population growth alone is an incomplete measure.

Compare how careers, housing, energy, infrastructure and quality of life affect talent retention and mobility across participating Great Lakes regions. Evidence should distinguish common challenges from conditions specific to individual places.

The Great Lakes should not assume that these constraints will automatically redirect migration. The region must earn that migration by creating compelling jobs, career mobility, housing, universities, amenities, welcoming communities and practical pathways for international talent.

- Develop a Great Lakes talent narrative alongside the investment narrative.
- Share university recruiting, internship and employer pipelines across participating metros where useful.
- Create Great Lakes benchmarking on working-age replacement, graduate retention, housing attainability and labor-force participation.
- Use international economic diplomacy to attract researchers, entrepreneurs and skilled workers as well as companies; Treat cross-border U.S.-Canada talent mobility as a competitiveness issue.
- Include talent and population outcomes in the common Great Lakes scorecard.

Existing Strengths Across the Great Lakes

The opportunity is to connect complementary capabilities across the U.S. and Canada through shared research, validation and demonstrations. The locations below illustrate the regional strengths discussed in this report.



1 Duluth and Lake Superior UMD Large Lakes Observatory; large-lake science and observing.

2 Milwaukee and Wisconsin The Water Council, UWM and Marquette; water technology and industry adoption.

3 Chicago and Illinois Current and Great Lakes ReNEW; circular water economy and commercialization.

4 Detroit Ann Arbor and Windsor NOAA GLERL, CIGLR and universities; basin science, modeling and manufacturing.

5 Toledo and Western Lake Erie UToledo Lake Erie Center; water quality, algal blooms and utility resilience.

6 Cleveland and Northeast Ohio Cleveland Water Alliance; sensing, testing, validation and Smart Lake systems.

7 Buffalo Niagara and New York Great Lakes UB RENEW and Buffalo State; freshwater, energy, AI and industrial research.

8 Toronto Hamilton and Ontario Universities, industry and utilities; district cooling, finance and commercialization.

Figure 3 Illustrative capability map, not a membership roster or a complete inventory. Node locations are representative city points. Regional coverage also depends on utilities, communities, ports, investors, labor, Indigenous Nations and First Nations, and binational institutions. Examples are drawn from the report's network table; lake outlines: Natural Earth 1:10m Lakes, public domain.

A Great Lakes Wide Research and Action Agenda

The Great Lakes can be examined as a portfolio of specialized innovation nodes, with U.S. and Canadian participation designed together. Milwaukee, Chicago, Cleveland, Detroit and Windsor, Toledo, Duluth, the New York Great Lakes and Southern Ontario each offer relevant capabilities. A comprehensive design process should identify additional contributors and meaningful roles across the basin.

Illustrative network of existing strengths

Node / geography	Existing capability to leverage	Potential role in shared strategy
Milwaukee / Wisconsin	The Water Council; UWM School of Freshwater Sciences; Marquette; mature water-tech industry cluster	Water technology, corporate stewardship, commercialization, workforce and industry adoption.
Chicago / Illinois	Current; Great Lakes ReNEW; university and national-lab ecosystem	Circular water economy, technology translation, startups, NSF Engine-scale commercialization and industrial deployment.
Cleveland / Northeast Ohio	Cleveland Water Alliance and regional innovation partners	Sensing, testing, validation, Smart Lake infrastructure, venture and market adoption.
Detroit / Ann Arbor / Windsor	NOAA GLERL; CIGLR; University of Michigan; University of Windsor; major manufacturing base	Basin science, observing systems, modeling, mobility/manufacturing interface and cross-border research.
Toledo / Western Lake Erie	UToledo Lake Erie Center, water-quality research, utility partnerships	Harmful algal bloom science, drinking-water resilience, real-time sensing and public-health translation.
Duluth / Lake Superior	UMD Large Lakes Observatory and Lake Superior research network	Large-lake science, climate, observing, freshwater systems and global comparative research.
Buffalo / Niagara / New York Great Lakes	UB RENEW; Buffalo State Great Lakes Center; NY Great Lakes Research Consortium; hydropower and industrial base	Freshwater-energy nexus, environmental research, economic analysis, Lake Erie/Lake Ontario gateway and Northeast connection.
Toronto / Hamilton / Ontario	Canadian universities, industry, finance, utilities and provincial innovation capacity	Canadian commercialization, industrial scale, finance, policy and cross-border market integration.
Great Lakes cities & communities	Great Lakes and St. Lawrence Cities Initiative and hundreds of municipalities	Infrastructure, water affordability, permitting, community value, resilience and implementation.
Binational / regional institutions	IJC; Great Lakes Commission; CGLR; Great Lakes Fishery Commission; Indigenous Nations and First Nations	Governance, shared-water stewardship, policy alignment, cross-border legitimacy and basin-wide coordination.

This is an illustrative starting roster drawn from the Phase III concept paper, not a closed list or a statement of institutional participation. Include additional utilities, ports, manufacturers, data center operators, energy providers, investors, labor, universities, Indigenous Nations and First Nations during study design.

Research modules and practical outputs

Research module	Core questions	Illustrative outputs
1. Freshwater competitiveness baseline	Where does water create measurable advantage? Where is it not differentiating? What are true resource and infrastructure constraints?	Comparable metrics; metro/basin profiles; common definitions.
2. Water-energy-compute	How do AI/HPC loads affect water, electricity, cooling, grid investment and community costs? Which technologies reduce tradeoffs?	Decision framework; siting principles; cost-allocation model.
3. Advanced manufacturing & industrial water productivity	Which sectors gain from Great Lakes resources? Where can reuse, closed-loop systems and technology improve productivity?	Sector opportunity map; productivity benchmarks; technology priorities.
4. Technology translation & demonstration	How can Milwaukee, Chicago, Cleveland, Michigan, Ontario and other nodes operate as one commercialization and validation network?	Shared demonstration pipeline; referral model; testbed interoperability.
5. Talent & research network	Where are capability gaps? How can universities and employers build shared pipelines?	Skills map; fellowship model; cross-border talent recommendations.
6. Infrastructure & community value	Who pays for new water, wastewater, power and grid capacity? How should affordability and resilience be protected?	Full-cost framework; ratepayer/community safeguards.
7. Binational competitiveness	What barriers prevent U.S.-Canadian resources, research, talent and supply chains from functioning as a coherent platform?	Cross-border policy agenda; allied innovation opportunities.
8. Global translation	Which elements of the methodology can be exported to other resource environments?	Comparative framework; GFCC/global partner working group.

Retaining the agricultural and consumer lens

Within the industrial productivity and community value modules, examine agricultural processing, irrigation and reuse, nutrient and runoff management, household conservation, water quality and affordability. Test how manufacturing and computing demand interact with food systems, municipal service and ecosystem requirements. Shared data should have quality controls, compatible definitions and protections for confidential and Indigenous knowledge.

Priority demonstrations

Select at least three proposed collaborations that require more than one city or a cross border partnership. Candidate areas include industrial reuse and sensing; cooling and heat recovery; and shared workforce or technology validation pathways. Each demonstration needs an identified user, baseline, delivery owner, financing plan, environmental review path and measurable public benefit before launch.

A common Water Energy Compute decision framework

Develop and test a voluntary analytical framework for large digital and industrial loads. Compare water withdrawal and consumption, source and seasonal availability, grid capacity, cooling options, thermal effects, reuse, heat recovery, infrastructure costs, permanent jobs and community benefits. This is a proposed decision tool, not an adopted regulatory or certification standard. Permitting, tariffs and resource governance remain with the competent authorities.

Collaborators and Funding

Purpose and regional approach

The proposed study would connect existing investments in freshwater restoration, water security, energy, industry, talent and infrastructure to a shared competitiveness agenda. Its contribution would be to identify where collaboration can accelerate innovation, improve resource productivity and increase the economic and community benefits of work already under way. The Great Lakes would be the regional focus, with U.S. and Canadian participation and an international network for testing and adapting the findings.

A preferred coordination base in Buffalo

Buffalo, New York, is the preferred location for a small coordinating team, subject to agreement with a qualified host and the participating institutions. A Buffalo base would organize research integration, investment mapping, meetings and reporting. Research and demonstrations would remain distributed across the basin; location would not confer control over partners, water governance or existing awards.

A concrete starting point is the University at Buffalo's June 2026 announcement of a five-year, $5 million NYSDEC grant to lead the Great Lakes Research Consortium through its RENEW Institute. GLRC STREAM offers an existing research network with which to discuss complementary economic analysis and technology translation. Its award is already directed to an established mission and should not be treated as discretionary funding for this proposal. [5]

Initial host discussions should include UB, SUNY Buffalo State, local utilities, NYSDEC and Canadian counterparts. Ask the Council on Competitiveness to consider national framing and convening. Agree the relationship with Current and Great Lakes RENEW, The Water Council, Cleveland Water Alliance, the Great Lakes Commission and other established networks before launching new infrastructure or duplicating their functions. [5, 6, 13–15]

How to read this inventory

Public funding figures below are documented program amounts or announced awards, not estimates of cash still available. The collaborator directory is an outreach agenda. Proposed roles are the author's assessment of fit; prospective funders must confirm eligibility, geographic limits, timing and permitted uses. No organization is represented as having endorsed this independent report.

Documented Great Lakes Funding

Selected U.S. funding envelopes total $1,388.7 million, with a further continuation award of up to $45 million bringing the combined published ceiling to $1,433.7 million. Canada's C$420 million federal commitment is reported separately. These figures demonstrate sustained public investment; they are not a basin-wide spending census, an annual total or a fund available to this study.

Program and source	Published amount and period	Accounting treatment
GLRI infrastructure-law supplement [1]	US$1,000.0m over FY2022–FY2026. Primarily accelerates restoration, including Areas of Concern.	Count once; separate from ordinary GLRI funding.
GLRI ordinary FY2026 framework [2]	US$369.0m. Approved regional budget framework in the official funding table, updated March 2026.	Count one year only; allocation framework, not unspent balance.
Great Lakes RENEW initial NSF investment [3, 4]	US$14.7m initial investment in 2024, reported by the recipient partnership.	Count separately from GLRI.
UB GLRC STREAM award [5]	US$5.0m, five-year NYSDEC grant announced June 2026.	Distinct named award; do not add its underlying fund contributions again.
Selected U.S. subtotal	US$1,388.7m = 1,000 + 369 + 14.7 + 5.	Mixed periods and program bases; not annual spending.
Great Lakes RENEW continuation [3, 4]	Up to US$45.0m over three years, announced March 2026.	Conditional ceiling; separate from the subtotal.
U.S. subtotal including continuation ceiling	Up to US$1,433.7m = 1,388.7 + 45.	Not proof of expenditures or remaining availability.
Canada Great Lakes Freshwater Ecosystem Initiative [7]	C$420.0m over 10 years beginning in 2023.	Separate currency and federal program; no FX conversion.

Method: amounts are combined only where the source identifies different programs or distinct award phases. The inventory intentionally omits earlier annual GLRI appropriations, rather than producing a cumulative historical total. It uses the ordinary FY2026 total but does not sum the GLRI website's multi-year tables, which show inconsistent FY2023 totals across their presentations. Confirm current obligations, balances and amendments with each award administrator before investment decisions.

Canada's September 2026 announcement of C$6.6 million for 31 projects and nearly C$6.5 million for First Nations participation are components of the C$420 million envelope and are not added again. The broader C$650 million Freshwater Action Plan includes that Great Lakes allocation and is also excluded from the total. [7]

Additional Funding Signals and Access Routes

Funding signal	Scale and relevance	Treatment
Great Lakes Funders [8]	Network reports more than US$75m in annual grantmaking by a binational group of over 50 organizations. Potential introductions and aligned research support.	Separate scale indicator; not an open pooled fund.
New York water infrastructure [9]	US$3.75bn statewide plan in the enacted 2026 budget; US$425m grant round announced in 2026.	Statewide, not solely Great Lakes. Do not add the round to its parent plan.
DOE NAWI renewal [10]	US$75m over five years announced in 2024; national water treatment and reuse research.	National envelope, not Great Lakes allocation; excluded from regional total.

Funding signal	Scale and relevance	Treatment
EPA water workforce program [11]	US$10.8m national funding announcement in August 2026. Listed deadline was October 15, 2026.	That deadline has passed. Track later rounds, not a currently open application.
Ontario Local Blue Economy Growth Fund [12]	C$1.5m Ontario commitment announced in 2026; municipal and First Nations water innovation.	Separate provincial signal; not U.S. study operating support.
Ontario Great Lakes Local Action Fund [25]	C$1.8m fourth round; up to C$100,000 per project for 2027. Deadline shown as November 6, 2026.	Ontario eligibility and local projects; confirm exact submission time in official portal.
NFWF Sustain Our Great Lakes [16]	Restoration grants combine federal, philanthropic and corporate support.	Do not add program awards or matching funds to GLRI without tracing their origin.

What this means for a competitiveness study

The strongest funding argument is additional value from coordination: a common investment map, comparable resource and economic measures, technology pathways between existing testbeds, and a shared workforce agenda. Large restoration and infrastructure budgets demonstrate relevance, but their statutory purposes do not automatically allow a general economic study or a Buffalo coordinating office.

Separate the initial research and convening budget from later pilots and capital projects. Seek flexible philanthropic or corporate support for the independent baseline and coordination; pursue mission-specific agency, utility and university support for defined modules. Existing grantees could participate through approved subawards or contracts only when their award terms and funder allow the proposed work.

Public and Private Investment in Freshwater Innovation

The public commitments documented above establish a substantial foundation for restoration, research and infrastructure. Private investment adds different capabilities: corporate R&D, customer-funded pilots, equipment and engineering, venture capital, growth equity, project finance and procurement. A competitiveness agenda should connect these flows to measurable adoption and public value rather than count every announcement as new available capital.

Documented investment signal	Amount and relevance	Treatment in the funding ledger
mHUB–Current water accelerator [84]	Seven selected startups; US$200,000 cash and in-kind package per team, or US$1.4m by calculation. Corporate partners include Marmon, Sentry, Exelon and Ingredion.	Regional example; blended public/private support. Not added to NSF or regional totals.
Polsky–Current Scaling Lab [79]	Access to over US$2.5m of existing equipment; up to US$2m in future equipment acquisitions described in the launch.	Assets and prospective purchases, not grants available to this study. Public sources may overlap.

Documented investment signal	Amount and relevance	Treatment in the funding ledger
Northwestern N.XT [81]	Portfolio includes water technologies; no verified water-only capital total identified in the program listing.	Evidence of investment pathways, not a water-specific funding total.
Xylem venture strategy [86]	US$50m corporate venture commitment announced in 2024 for water and climate innovation.	National/global scope; may include fund investments. Not a Great Lakes allocation.
Burnt Island Ventures Fund II [85]	US$50m fund announced in October 2025 for early-stage water innovation.	National/global fund. Possible investor overlap with corporate channels; not added.
WaterEquity resilience fund [87, 88]	More than US$100m reported for water and sanitation investment; corporate participation demonstrates private-sector interest.	Emerging/frontier markets, not Great Lakes capital; excluded from regional total.
Aquatech growth investment [92]	Cerberus announced investment in the Pennsylvania-based water technology business in April 2025; amount not disclosed in the announcement.	Private growth signal in a Great Lakes state, not proof of basin deployment or study support.

The documented regional U.S. public/program subtotal remains US$1,388.7m across mixed periods, or up to US$1,433.7m including the conditional RENEW continuation ceiling, with Canada's C$420m commitment separate. There is no defensible basin-wide private water investment total in this selected inventory. The private examples above should be reported alongside public commitments, not summed into a larger headline figure.

A first study deliverable should reconcile a project-level public and private ledger with program administrators, corporate partners and the Great Lakes Commission Investment Tracker. Record the original capital source, recipient, geography, award date, period, status, cash versus in-kind support and any onward investment. Separate grants, equity, loans, contracts, assets and anticipated spending to prevent overlap.

Build a balanced sponsorship portfolio

Seek a Buffalo anchor contribution for coordination; several larger sponsors for defined research modules, pilots and paid placements; and a flexible participation route for smaller innovators. Keep study sponsorship distinct from equity investment and commercial procurement. Value donated space, equipment and staff time separately from cash, and do not call potential contributions secured funding.

Federal Partners in the United States

Invite agencies by mission and proposed work package, not simply as general sponsors. Federal participation may involve data, laboratories, technical assistance, grants, cooperative agreements or procurement. [1, 2, 10, 11, 17–20]

Prospective collaborator	Proposed contribution and first discussion	Support role
EDA	Competitiveness baseline, regional planning and commercialization. Discuss Planning, Local Technical Assistance and Economic Adjustment Assistance with regional staff.	Planning grants / advice

Prospective collaborator	Proposed contribution and first discussion	Support role
Department of Energy	Water–energy–compute integration, industrial reuse, cooling and resource recovery; scope a technical module with NAWI and laboratories.	R&D / labs / pilots
EPA Great Lakes National Program Office	Align analysis with GLRI results and water-quality priorities; establish a connection between restoration and measured economic benefits.	GLRI / data
EPA Office of Water	Utility resilience, reuse, affordability and workforce; separate infrastructure finance from research and training eligibility.	Research / training
USDA NRCS	Agricultural runoff, soil and nutrient practices, producer economics; investigate RCPP and eligible conservation partnerships.	Conservation grants
USDA NIFA and Agricultural Research Service	Food–water systems, extension and applied agricultural research; work through qualified universities and research teams.	Research / extension
Department of Labor ETA	Occupational gaps, registered apprenticeships, water and industrial trades; involve workforce boards and employers.	Training / apprenticeship
National Science Foundation	Use-inspired water research, commercialization and talent; approach existing Great Lakes RENEW leadership before proposing overlapping infrastructure.	Research / innovation
NOAA GLERL and Sea Grant	Observing, forecasts, lake science, coastal economics and research translation; coordinate with CIGLR and GLOS.	Science / cooperative work
USGS	Water availability, water use, quality, groundwater and comparable datasets for the baseline.	Data / science
U.S. Army Corps of Engineers	Buffalo, Detroit and Chicago districts: water infrastructure, sediment, shoreline resilience, navigation and project economics.	Engineering / projects
Interior USFWS and Bureau of Indian Affairs	Habitat, fisheries and Tribal capacity; develop appropriate restoration and stewardship modules with sovereign partners.	Restoration / capacity

EDA's Research and National Technical Assistance page states that it is not accepting or evaluating concepts. Do not present that program as open. Other program listings likewise require current regional confirmation. [18]

State Provincial and Canadian Federal Partners

Include all eight Great Lakes states and Ontario. These are prospective counterpart agencies and finance channels; state revolving funds primarily finance eligible infrastructure, not unrestricted study administration. [2, 7, 9, 21, 22, 25]

Prospective collaborator	Proposed contribution and first discussion	Support role
New York DEC	Great Lakes Program, Action Agenda and GLRC STREAM alignment; request a fit review for research and small-grant pathways.	Research / stewardship

Prospective collaborator	Proposed contribution and first discussion	Support role
New York EFC and Department of Health	Water and wastewater capital inventory, project readiness, affordability and eligible financing analysis.	Infrastructure finance
NYSERDA and New York Power Authority	Water utility energy use, hydropower, cooling, grid impacts and demonstration economics.	Technical / demonstration
Empire State Development and NY Department of Labor	Industrial supply chains, research commercialization and workforce coordination; connect with regional economic planning.	Economic / talent
Michigan EGLE and economic development partners	Water infrastructure, industrial reuse, emerging contaminants and supplier development.	State programs / data
Ohio EPA, Agriculture and Lake Erie Commission	Nutrient management, H2Ohio-related practice evaluation, water quality and industrial opportunities.	Conservation / research
Wisconsin DNR and WEDC	Water technology cluster, stewardship, utility needs and manufacturers.	Economic / environmental
Illinois EPA and DCEO	Infrastructure and economic development coordination with Chicago-area research and water innovation.	State programs / data
Indiana IDEM and IEDC	Industrial water use, manufacturing, infrastructure and commercialization connections.	State programs / data
Minnesota PCA, DNR and DEED	Lake Superior, water quality, industrial resource efficiency and workforce alignment.	State programs / data
Pennsylvania DEP and DCED	Lake Erie communities, water protection, manufacturing and regional development.	State programs / data
Ontario environment and economic development ministries	Great Lakes protection, local innovation and commercialization; align provincial and municipal roles.	Provincial grants
Canada Water Agency and ECCC	Federal Great Lakes priorities, binational data and freshwater security; identify eligible Canadian work packages.	Canadian grants / science
NSERC, NRC IRAP and Mitacs	Canadian university–industry research, firm innovation and research talent; approach through eligible Canadian partners.	Research / firms / talent

Local Utility and Indigenous Partners

Utilities and communities make the study operational: they can identify constraints, supply operating evidence and host demonstrations. Indigenous Nations and First Nations should participate as governments and knowledge partners, with agreed authority over their data. [2, 7, 15, 23, 24]

Prospective collaborator	Proposed contribution and first discussion	Support role
City of Buffalo and Erie County	Preferred coordinating location; public infrastructure, public value, workforce and community engagement.	Local support / data

Prospective collaborator	Proposed contribution and first discussion	Support role
Buffalo Sewer Authority	Wastewater treatment, resource recovery, stormwater and utility workforce; identify a bounded demonstration.	Host / technical / data
Buffalo Water and Erie County Water Authority	Drinking-water reliability, affordability, source protection and utility operations.	Host / technical / data
Niagara Falls Water Board and Niagara County	Connecting-channel infrastructure, treatment operations and water-dependent industry.	Host / technical / data
Seneca Nation and Tuscarora Nation	Invite direct dialogue on stewardship priorities, knowledge, research design and participation requirements.	Sovereign collaboration
Chiefs of Ontario and Anishinabek Nation	Canadian Great Lakes governance and First Nations participation; determine appropriate Nation-level engagement.	Governance / knowledge
Chicago water management and MWRD	Large-system operations, water reuse, resource recovery and existing innovation partnerships.	Utility / testbed
Milwaukee Metropolitan Sewerage District	Resource recovery, green infrastructure and utility innovation.	Utility / testbed
Cleveland Water and NEORSD	Source water, distribution, wastewater, stormwater and regional validation opportunities.	Utility / testbed
Great Lakes Water Authority and Detroit partners	Regional utility resilience, workforce and research needs.	Utility / testbed
Toledo and Duluth utilities	Lake Erie and Lake Superior comparisons in water quality, reliability and community costs.	Utility / data
Toronto Water, Hamilton Water and regional conservation authorities	Canadian operating conditions, watershed management and comparative demonstrations.	Utility / watershed
Great Lakes and St. Lawrence Cities Initiative	Reach municipal, Tribal and First Nations leaders; connect local blue-economy initiatives.	Convening / local grants

Universities and Research Anchors in New York

Start with existing research networks. A Buffalo coordinating role should draw on statewide expertise while retaining open participation by institutions throughout the basin. [5, 21, 26, 27]

Prospective collaborator	Proposed contribution and first discussion	Support role
University at Buffalo RENEW and GLRC STREAM	Potential host discussions; connect funded freshwater science with competitiveness, resource economics and transnational collaboration.	Potential host / research
SUNY Buffalo State Great Lakes Center	Aquatic ecology and field research; connect basin science with local demonstration needs.	Research / fieldwork

Prospective collaborator	Proposed contribution and first discussion	Support role
Cornell University and NY Water Resources Institute	Water resources, food systems, economics and applied research; include ILR expertise in technology and work.	Research / extension
New York Sea Grant	Extension, coastal communities and research translation; connect Cornell and Stony Brook capacities.	Extension / engagement
SUNY College of Environmental Science and Forestry	Environmental systems and legacy GLRC relationships; identify complementary research responsibilities.	Research / education
Syracuse University	Water–energy systems, engineering and public policy; test research modules against existing faculty capacity.	Research / policy
Clarkson University	Water treatment, materials and engineering; explore links with Healthy Water Solutions.	Research / pilots
Rochester Institute of Technology	Manufacturing, semiconductor-related processes, engineering and applied workforce pathways.	Research / talent
Alfred University and Alfred State	Materials, industrial equipment and technician pathways; define employer-led applied projects.	Research / technicians
SUNY Erie and Niagara County Community College	Water, electrical and industrial training partnerships; validate employer needs before developing credentials.	Workforce / applied work
GLRC member campuses across New York	Invite research through consortium channels; avoid a closed preferred roster or duplicated administrative structure.	Distributed research

Research Anchors Across the U S Great Lakes

These candidates would supply scientific and industrial depth across all five lakes. Membership in an existing consortium is not evidence of participation in this proposed study. [6, 26, 28–30]

Prospective collaborator	Proposed contribution and first discussion	Support role
University of Wisconsin Milwaukee	School of Freshwater Sciences: lake science, research training and technology translation.	Lake Michigan research
Marquette University	Water treatment and resource recovery; continuity with the Council's original Milwaukee water dialogue.	Engineering / translation
University of Michigan and CIGLR	Lake science, modeling and research-to-operations; link federal science with industrial and public questions.	Basin science / data
Michigan State University	Agriculture, water and workforce; assess food–water and rural–urban relationships.	Food systems / research
Michigan Technological University	Great Lakes Research Center: engineering and freshwater research.	Lake Superior research
University of Minnesota Duluth	Large Lakes Observatory: Great Lakes and global large-lake comparisons.	Global comparison

Prospective collaborator	Proposed contribution and first discussion	Support role
Ohio State University	Water, agriculture and technology work; connect existing Great Lakes RENEW activity with proposed modules.	Research / agriculture
University of Toledo	Lake Erie Center: water quality and watershed research; connect evidence to municipal needs.	Lake Erie research
University of Illinois Chicago and Urbana Champaign	Water treatment, separations, engineering and commercialization; engage existing engine research teams.	Research / translation
Northwestern and University of Chicago	Water science, materials and engineering; develop tightly scoped joint research questions.	Research / innovation
Purdue and Illinois Institute of Technology	Water technology and engineering; coordinate with existing engine workstreams.	Research / validation
Central Michigan, Grand Valley State and Lake Superior State	Invite through CIGLR relationships; extend field and basin coverage.	Distributed research
Argonne, Berkeley and Oak Ridge national laboratories	Laboratory expertise in resource recovery, computation, water–energy systems and technology assessment.	Federal laboratory work

Canadian Research and Applied Talent Partners

Canadian participation is essential to a binational basin study. International collaborators should help compare conditions and translate results, rather than assume that one Great Lakes model fits every basin. [26, 31–34]

Prospective collaborator	Proposed contribution and first discussion	Support role
University of Waterloo Water Institute	Interdisciplinary freshwater research and graduate training; comparative water security and economics.	Research / talent
University of Windsor GLIER	Connecting channels, aquatic systems and cross-border research.	Binational research
University of Toronto Institute for Water Innovation	Water engineering and technology research; investigate industrial and municipal applications.	Research / technology
Western University	Water research and university–industry collaboration through Ontario networks.	Research / pilots
University of Guelph	Agriculture, food and water; develop producer and food-processing questions with qualified teams.	Food systems / research
McMaster University	Engineering, industrial systems and water-related research; investigate Canadian manufacturing applications.	Industry / research
Ontario Tech and Toronto Metropolitan University	Applied research and data-related questions; confirm fit with participating laboratories.	Applied research
Lambton College and Fleming College	Applied water technology and technician training through Ontario water innovation networks.	Applied work / talent

Prospective collaborator	Proposed contribution and first discussion	Support role
Ontario Water Consortium	Connect research infrastructure, institutions, firms and demonstration pathways.	Network / translation
IISD Experimental Lakes Area	Whole-lake evidence and freshwater research comparisons beyond the Great Lakes basin.	External scientific comparator
U.S. and Canadian workforce intermediaries	Invite workforce boards, labor, apprenticeship sponsors, National Fund for Workforce Solutions and CAEL to define skills and access.	Workforce collaboration

Energy Utilities and Power Sector Partners

Energy utilities should be core collaborators in a Great Lakes competitiveness agenda. Water treatment depends on reliable electricity; power production and industrial cooling depend on water. Invite both energy delivery companies and generators to connect freshwater security, resource productivity, innovation and regional investment. The roles below are proposed discussion topics, not commitments. Service territories and corporate footprints can extend beyond the Great Lakes drainage basin; select sites and report basin-specific results separately.

Exelon and Xcel Energy are separate companies. Exelon is the utility parent of ComEd; Constellation is a separate power producer. Engage each for its actual operating role. National Grid's documented wastewater efficiency work in Onondaga County provides a regional example of energy and water collaboration. [59–61, 69]

Prospective collaborator	Proposed contribution and first discussion	Support role
National Grid [59]	Upstate New York, including Western New York. Start with wastewater pumping and aeration efficiency, industrial electrification and grid readiness; build on its Onondaga County work.	Efficiency / pilots
Exelon and ComEd [60]	Northern Illinois. Engage ComEd on treatment-plant efficiency, demand response, resilient service and industrial load planning; seek Exelon stewardship and research participation.	Grid / efficiency
Constellation [61]	Great Lakes and wider U.S. generation fleet. Compare cooling, water withdrawals and consumption, discharge conditions and water-risk management across generation technologies.	Generation / cooling
New York Power Authority	New York, including Niagara and St. Lawrence hydropower. Expand the state-partner discussion into hydropower, industrial electricity, water utility efficiency and applied demonstrations.	Public power / research
Avangrid NYSEG and RG&E [62]	Upstate New York and Rochester. Discuss water and wastewater facility reliability, industrial load growth, efficiency and local grid constraints.	Delivery / efficiency
WEC Energy Group including We Energies and Wisconsin Public Service [63]	Wisconsin and the wider Great Lakes region. Compare generation water management, water–energy productivity and utility customer efficiency opportunities.	Generation / efficiency

Prospective collaborator	Proposed contribution and first discussion	Support role
DTE Energy [64]	Michigan. Use its published water policy as a starting point for generation cooling, water-use efficiency, withdrawals and watershed stewardship research.	Generation / stewardship
Consumers Energy [65]	Michigan. Explore water conservation, cooling and hydroelectric ecosystem management; verify ownership and transaction status for any proposed hydro demonstration.	Water / hydro / research
AEP and Indiana Michigan Power [66]	Indiana and Michigan. Discuss hydropower, river operations, reliable energy for treatment facilities and industrial water–energy analysis.	Hydro / grid / pilots
NIPSCO [67]	Northern Indiana. Discuss water utility and industrial energy assessments, customer efficiency programs and resilient service; confirm eligible measures and customer participation.	Efficiency / industry
FirstEnergy [68]	Ohio and Pennsylvania. Engage the relevant delivery utilities on infrastructure resilience, industrial loads and environmental stewardship; identify current asset ownership before generation outreach.	Delivery / resilience
Vistra [70]	Ohio and Pennsylvania power generation. Include Perry and Davis-Besse in prospective water–energy–compute research; distinguish Lake Erie sites from Beaver Valley outside the basin.	Generation / computing
Alliant Energy [71]	Wisconsin and the wider Midwest. Compare power-sector water management and industrial efficiency; distinguish Great Lakes sites from Mississippi basin operations.	Water / efficiency
Xcel Energy [69]	Minnesota and Wisconsin. Discuss water stewardship, hydro operations, cooling and ecosystem monitoring; map projects to the correct watershed. Separate company from Exelon.	Generation / hydro
Minnesota Power [72]	Northeastern Minnesota and the St. Louis River system. Discuss hydropower operations, watershed stewardship, industrial energy use and water resilience near Lake Superior.	Hydro / industry
Ontario Power Generation [73]	Ontario. Coordinate hydro and nuclear water research, reservoir and river information, cooling and ecosystem management with Indigenous and local partners.	Generation / research
Bruce Power [74]	Lake Huron, Ontario. Explore cooling, aquatic monitoring and nuclear water stewardship as an operating case for reliable low-carbon energy and freshwater protection.	Nuclear / monitoring
Hydro One [75]	Ontario electricity transmission and distribution. Engage on reliable power for water infrastructure, industrial connections, climate resilience and corridor stewardship.	Grid / resilience
Enbridge and Enbridge Gas [76]	Ontario and wider Great Lakes operations. Investigate wastewater biogas upgrading and renewable natural gas, industrial heat and watershed safeguards; verify the responsible operating entity.	Biogas / industrial heat

Begin with National Grid, NYPA and UB for a Buffalo-based water–energy work group, then convene the other regional utilities with their water and industrial customers. Ask each partner to identify one operating challenge, one potential demonstration and the data it can share. Assess support as technical staff time, operating data, approved efficiency incentives, equipment or independent research sponsorship. No new utility funding is assumed or added to the documented funding total.

Large Corporate Sponsors and Strategic Customers

Seek larger firms that can combine financial sponsorship with customers, equipment, technical staff, distribution and hiring. Sponsor fit is based on regional presence or relevant water, energy, manufacturing and financing capabilities. The proposed asks below are recommendations; no firm is represented as a committed sponsor, and no contribution amount is assumed.

Prospective sponsor or customer	Proposed discussion and contribution	Support role
M&T Bank [77]	Buffalo anchor prospect: independent study support, financial expertise, entrepreneur mentoring and paid placements; explore Seneca One workspace support with the bank and property representatives.	Anchor / in kind
KeyBank [90]	Regional banking prospect for convening, community participation, entrepreneurship and supplier finance introductions. Confirm the appropriate corporate or foundation route.	Finance / sponsorship
National Grid and NYPA	Priority Buffalo water–energy prospects. Sponsor a defined research module, contribute operating expertise and host eligible demonstrations; see the utility directory.	Energy / pilots
Exelon and ComEd	Consider a corporate challenge or utility efficiency pilot; Exelon is identified among supporting partners in the mHUB–Current water accelerator example. [84]	Grid / innovation
Xylem [86]	Water technology sponsor and commercialization prospect: innovation scouting, validation, pilot customers and potential investment through its established venture channels.	Water / investment
Ecolab and Nalco Water [88]	Industrial water and operating-economics research, customer demonstrations, stewardship and potential strategic investment.	Industry / pilots
A O Smith	Water treatment and heating; connect the Council's original dialogue to product development, manufacturing and engineering talent.	Manufacturing / talent
Pentair	Treatment, filtration and industrial systems; consider equipment, engineering, field validation and customer access.	Technology / pilots
Badger Meter	Metering, sensing and digital water; consider a measurement or utility analytics challenge.	Measurement / data
Zurn Elkay Water Solutions	Water efficiency and building systems; test community, institutional and commercial use cases.	Technology / pilots

Prospective sponsor or customer	Proposed discussion and contribution	Support role
Marmon Water and Marmon [84, 89]	Water engineering and industrial businesses; explore manufacturing support, commercialization mentorship and customer introductions.	Scale / manufacturing
Ingredion [84]	Industrial water-user perspective and food-processing pilots; engage on performance, reuse and operational constraints.	Customer / pilot host
DuPont Water Solutions	Membranes and separation science; discuss technical validation, process economics and commercialization partnerships.	Materials / pilots
Veolia	Water operations and treatment; discuss independent operating comparisons, field hosts and deployment models.	Operations / scale
Rockwell Automation and ABB	Controls, sensing, automation and industrial integration; co-develop a bounded water–energy performance challenge.	Controls / industry
Wilo and Grundfos	Pumping and system efficiency; discuss equipment access, engineering, pilots and technician training.	Equipment / training
Microsoft	Water- and energy-aware computing, cooling research and transparent operating data; explore research sponsorship and talent projects.	Computing / research
Upstate Niagara Cooperative and other food processors	Regional industrial users and farmer-linked enterprises; discuss water productivity, processing efficiency and early-career opportunities.	Industry / workforce

A Buffalo anchor sponsorship and Seneca One workspace

Approach M&T Bank as a prospective founding corporate sponsor for research coordination, convening, entrepreneurial support and paid talent placements. Its technology hub at Seneca One provides a relevant connection to Buffalo's innovation community. Explore whether the bank could sponsor or make appropriate space available, or help arrange a contribution with Seneca One representatives. [77, 78]

Office space, meeting rooms, connectivity, event access and staff mentoring could reduce cash needs for a small coordinating team. Any proposal requires confirmation of availability, lease permissions, costs, insurance and responsibility for operations. Workspace and sponsorship support would require a specific agreement. A Buffalo office would coordinate a distributed basin network and would not replace partner laboratories or commercial programs elsewhere.

Innovative Midsize and Emerging Companies

Use a separate participation route for established specialist businesses, startups and university spinouts. Their most valuable contribution may be technology, engineering, field learning, intellectual property or entrepreneurial effort. The group is organized by contribution and stage, not a verified employee or revenue threshold. Avoid setting a cash sponsorship minimum that excludes promising smaller firms.

Prospective innovator	Technology and proposed commercialization connection	Participation profile
Sentry Equipment	Sampling and process instrumentation. Pair with utilities and manufacturers to define validation methods, engineering placements and operating evidence.	Established specialist
Fondriest Environmental	Monitoring equipment and environmental data. Explore field deployments, instrument access and applied student projects.	Established specialist
LimnoTech	Water science, engineering and modeling. Consider independently scoped performance analysis and deployment planning.	Established specialist
Lakeside Equipment [91]	Wastewater process equipment. Discuss treatment efficiency demonstrations, operator input and manufacturing partnerships.	Established specialist
Amplify Dynamics [84]	Chicago startup developing ultrasound-based contaminant removal. Proposed match: treatment operators and larger equipment firms.	Emerging water tech
FloNergia [84]	Ontario venture developing efficient circulation and aeration. Proposed match: wastewater hosts, energy utilities and pump manufacturers.	Water / energy
Grapherry [84]	Chicago venture converting waste into graphene materials. Explore materials partners and testable circular-economy applications.	Circular materials
Nano Gas [84]	Illinois venture using small bubbles in treatment. Proposed match: industrial water users and qualified validation sites.	Treatment innovation
Noah System [84]	Chicago venture developing automated flushing to address lead risks. Proposed match: building owners and drinking-water specialists.	Drinking water
Rhoic [84]	California-based filtration venture in the regional accelerator cohort. Proposed match: separation-material users and manufacturers.	National innovator
Spacedrip [84]	Estonian reuse venture in the regional accelerator cohort. Proposed match: onsite reuse users and integrators.	Global innovator
Coral Innovations [81, 82]	Northwestern spinout using coatings to remove targeted water pollutants. Proposed match: materials manufacturers and industrial customers.	University spinout
Stemloop [81, 82]	Northwestern-linked cell-free water testing. Proposed match: water utilities, environmental monitoring and field-validation teams.	University spinout

The mHUB–Current cohort supplies examples of companies already connected to regional commercialization infrastructure. Inclusion does not establish technology readiness or performance. Use independent testing, customer requirements and site-specific review before selecting a pilot. [84]

Enwave, already identified in the report's Toronto cooling case, is an additional operating and infrastructure partner. Its contribution would be district-energy expertise and potential demonstration access rather than an assumed small-company sponsorship.

Connecting Innovators with Corporate Customers and Capital

The proposed study should build a practical route from a documented customer need to independently validated performance and commercial adoption. Use Current, The Water Council, Cleveland Water Alliance, university commercialization offices and existing accelerators as delivery partners. A Buffalo team would maintain the shared problem and opportunity inventory, convene buyers and track results.

Commercialization step	Required evidence and prospective support	Decision
Define a customer need	A utility or company specifies operating conditions, baseline cost, water or energy constraint and procurement requirements.	Named problem owner
Match and validate	An innovator and qualified university or testbed agree a protocol, site, safety review, IP terms and success measures.	Independent test plan
Fund and run a paid pilot	Corporate customer, eligible public program or investor supports engineering, equipment and evaluation; startups receive defined paid work.	Verified pilot result
Procure and finance adoption	Customer assesses total cost, reliability, permitting, cybersecurity and maintainability; lenders and investors assess a separate business case.	Purchase / financing
Scale and transfer	Manufacturing, distribution, workforce and follow-on capital support wider use where evidence transfers to other sites.	Revenue / outcomes

A pairing is a discussion opportunity, not an endorsement or promise of investment. Innovators should retain fair access to their IP and publication arrangements; any exclusivity, licensing, procurement or equity terms must be negotiated separately. Sponsors should not purchase favorable study findings.

University Commercialization and Investment Partners

University of Chicago Polsky Center

Polsky and Current announced the Great Lakes RENEW Scaling Lab in September 2026. It connects selected water startups to discounted incubator space, shared equipment and commercialization networks. This is a concrete partner pathway for technology translation within the basin. [79]

Ask Polsky to help identify eligible water ventures, connect corporate customers and investors, and develop student commercialization projects. Polsky's George Shultz Innovation Fund can invest up to US$250,000 in eligible UChicago ecosystem startups; its wider funding programs have distinct affiliation and selection rules. Neither that fund nor the Scaling Lab is an unrestricted source for a Buffalo office or this independent report. [80]

Northwestern University INVO and Querrey InQbation Lab

Northwestern's N.XT portfolio includes water contaminant-removal technology and cell-free sensing. Coral Innovations and Stemloop illustrate the connection between faculty science and emerging companies. Engage INVO, N.XT and the Querrey InQbation Lab on licensing, company formation, technical diligence, industry

introductions and paid student projects. Funding remains competitive and tied to each program's eligibility. [81, 82]

Additional university and ecosystem pathways

UB and its business and entrepreneurship resources, Cornell, UWM, Marquette, Michigan, Purdue, Waterloo, Toronto, Windsor and other participating institutions should identify their relevant technology transfer, venture and employer-engagement teams. The full partner directory preserves broad participation. Existing faculty work, laboratories, degree requirements and institutional IP rules should determine the appropriate pathway.

mHUB Ventures and Current offer a documented water accelerator model connecting equity investment, product development, pilot sites and larger corporate partners. Burnt Island Ventures provides a specialist water venture connection. These complement university programs and do not replace competitive diligence or guarantee funding for participants. [84, 85]

Paid Internships and Early Career Opportunities

A growing freshwater and energy innovation network can offer students a visible route from study into meaningful work. Every funded research module or demonstration should identify suitable paid student, graduate, technician or early-career roles, with real supervisors, learning outcomes and a path to continuing employment where demand exists.

Northwestern's paid eight-week Summer Scholars program demonstrates one established way to place students within startups commercializing university research. A Great Lakes talent pathway could adapt this approach through participating institutions and employers, subject to their approvals and resources. [83]

Talent pathway	Work and proposed host	Measure of progress
Paid undergraduate internships and co-ops	Utilities, water technology firms and innovators: monitoring, laboratory work, controls and engineering.	Paid placements / completion
Graduate and doctoral industry fellows	University–company projects: cooling, reuse, treatment, materials and water–energy economics.	Research / adoption
MBA and commercialization associates	Polsky, Kellogg, participating business schools and startups: market research, procurement, pricing and finance.	Customer validation
Technician and operator pathways	Community colleges, labor and employers: instrument maintenance, process operations, electrical and mechanical skills.	Credentials / hires
Early-career rotational roles	Utilities, corporate partners and smaller firms: multiple operating settings and mentorship.	Conversion / retention

For an initial twelve-month pilot, consider an illustrative target of 20 paid placements across 8–10 willing employers, subject to funding and validated demand. Larger sponsors could underwrite a shared placement pool so smaller innovators can host students without bearing the full cost. This is a design target, not a committed cohort. Pay, travel or housing support, legal work eligibility and cross-border requirements must be budgeted.

Track paid positions, applications, completions, subsequent offers, six- and twelve-month retention, wage quality and employer satisfaction. Include community and technical colleges alongside universities and compare access across places and backgrounds. Avoid counting unpaid project participation as employment.

Existing Great Lakes Water Efforts

The study should build an inventory and referral system around these efforts before creating additional platforms. Several already combine water science, commercialization, workforce development and global connections. [5, 6, 13–16, 21, 23, 26, 39, 54–56]

Prospective collaborator	Proposed contribution and first discussion	Support role
Current and Great Lakes RENEW	Coordinate circular-water research, commercialization, workforce and testbed pathways; avoid a parallel engine.	Chicago / multistate
The Water Council	Connect manufacturer networks, water stewardship and international water clusters.	Milwaukee / global
Cleveland Water Alliance	Technology validation and connected testbeds; connect monitoring with adoption and industry needs.	Cleveland / basin
GLRC STREAM	Use the existing New York university network for research referrals and funded-science alignment.	Buffalo / statewide
Great Lakes Commission	Investment Tracker, regional policy and cross-jurisdictional coordination; establish a shared funding ledger.	Binational / regional
Council of the Great Lakes Region	Business and cross-border dialogue; connect Great Lakes WISE water stewardship with industrial competitiveness.	Binational / economic
International Joint Commission	Scientific and governance perspectives under existing binational responsibilities; independent advice rather than project finance assumptions.	Binational / governance
Great Lakes Observing System	Observations and data access; examine interoperability, common metrics and industry applications.	Basin data network
Great Lakes Fishery Commission	Fisheries research and stewardship; connect ecosystem condition and economic value.	Binational / fisheries
Alliance for the Great Lakes and Freshwater Future	Community participation, water affordability, stewardship and public-value questions.	Community networks
Buffalo Niagara Waterkeeper	Watershed restoration and community perspectives; connect the preferred host region with field needs.	Local / watershed
NFWF Sustain Our Great Lakes	Connect eligible restoration demonstrations and existing public–private partnerships.	Restoration / grants
Nature Conservancy and National Wildlife Federation	Conservation science, community partnerships and stewardship expertise.	Regional / national
Sea Grant network and conservation authorities	Bridge scientific research, communities, watershed needs and implementation.	Extension / watershed

Philanthropic Funders and Finance Partners

Approach these organizations with a specific public-purpose research or demonstration proposition. Mission and geography determine fit. Most should be considered prospects for selected modules, not unrestricted support for the entire agenda. [8, 15, 16, 24, 40–43]

Prospective collaborator	Proposed contribution and first discussion	Support role
Great Lakes Funders	Seek introductions and a coordinated briefing of funders; the network is not itself an assumed grant pool.	Funder coordination
Charles Stewart Mott Foundation	Great Lakes stewardship, institutions and public-interest research; explore study design and community benefits.	Philanthropic prospect
Joyce Foundation	Explore water and regional policy fit for independent research and convening.	Philanthropic prospect
Fred A and Barbara M Erb Family Foundation	Explore water-quality and regional environmental fit, with attention to geographic restrictions.	Philanthropic prospect
Fund for Lake Michigan	Discuss Wisconsin or Lake Michigan modules rather than a general Buffalo operating grant.	Place-specific prospect
Wege Foundation	Explore aligned West Michigan or Great Lakes public-benefit work.	Place-specific prospect
Great Lakes Protection Fund	Discuss innovative projects with basin ecosystem benefits; endowment principal is not available project funding.	Innovation grants
Community Foundation for Greater Buffalo	Potential local convening and philanthropic introductions around environment and community benefit.	Buffalo philanthropy
Crown Family Philanthropies	Explore Chicago and Great Lakes water-related public-benefit alignment.	Philanthropic prospect
Americana Foundation	Explore environmental and place-based fit through the Great Lakes funder network.	Philanthropic prospect
NFWF and Freshwater Future	Potential eligible project support and community participation funding; trace pass-through sources.	Project grantmakers
Water-focused investors and banks	Invite Burnt Island Ventures, specialist funds and regional banks to assess later commercialization; investment capital is distinct from study grants.	Commercial finance

National and Global Collaborators

Global participation should supply comparative evidence, water-security needs and pathways for adoption. A Great Lakes coordinating office would remain the study base; international development finance would ordinarily support eligible country projects rather than U.S. headquarters costs. [10, 34, 44–53]

Prospective collaborator	Proposed contribution and first discussion	Support role
Council on Competitiveness	Potential national convening and competitiveness framing; seek agreement on a Phase III role.	National convenor
Global Federation of Competitiveness Councils	Compare regional models and share findings through national competitiveness institutions.	Global translation
Water Research Foundation	Develop utility-led research and co-funded projects with broader sector application.	Research / co-funding
US Water Alliance	Utility and community dialogue on integrated water management, affordability and workforce.	National network
Water Environment Federation and AWWA	Professional standards, operator education, adoption and employer networks.	Practice / training
NAWI	Water treatment, reuse and energy-efficient technology assessment with national laboratories.	National R&D network
UNESCO IHP and IHE Delft	Freshwater research, water security, education and capacity development comparisons.	Global science / talent
World Bank Group and 2030 Water Resources Group	Compare water–economy investment approaches and identify country-level adaptation opportunities.	Global implementation
Pacific Institute and CEO Water Mandate	Corporate stewardship and independent water-risk research; identify relevant industrial partners.	Corporate stewardship
Water Resilience Coalition	Potential corporate collective-action counterpart; verify its current structure and engagement route.	Global corporate network
World Resources Institute Aqueduct	Common water-risk screening and comparative analysis; distinguish risk indicators from local feasibility.	Data / comparison
Wetsus and WaterCampus Leeuwarden	University–industry research, water technology and international commercialization experience.	Global innovation
Deltares and other applied water institutes	Comparative water systems modeling, demonstration design and transferability testing.	Applied research

A Practical Path to Funding the Study

Begin with a defined independent research program

The initial request should finance a competitiveness agenda that connects existing efforts, rather than seek a portion of every regional water grant. A qualified nonprofit or university host could administer funds, contracts and reporting. Agree independent publication rights, treatment of sponsor interests, intellectual property and data access before accepting support.

Initial work package	Illustrative 12 month cost	Possible support
Research coordination and grant administration	US$180,000	Lead philanthropy; host support; unrestricted sponsors
Investment and capability inventory	US$120,000	Philanthropy; eligible planning support; research partners
Competitiveness and sector research modules	US$240,000	University co-funding; eligible agency research; corporate research contracts
Demonstration feasibility and technical evaluation	US$150,000	Utilities; manufacturers; approved R&D work packages
Workforce and community analysis	US$90,000	Workforce partners; community funders; eligible training research
Binational convening and global comparison	US$90,000	Foundations; host institutions; transparent sponsorship
Independent review and publication	US$30,000	Unrestricted research support
Illustrative planning total	US$900,000	Author's budget assumption; not a cost estimate or committed funding

This planning budget excludes construction, major equipment, full-scale pilots and ongoing institutional operating costs. Replace assumptions with scoped deliverables, host rates and written proposals before fundraising. Match and indirect costs depend on each award; the same expenditure cannot satisfy multiple funders' claims.

First discussions and first ninety days

First 30 days: meet the Council, UB/GLRC STREAM, NYSDEC, Current/Great Lakes RENEW and Canadian counterparts; establish what is already funded and what is missing. Invite a utility, industry, community and Indigenous advisory group. Select a Buffalo host only after clarifying its mandate and administrative capacity.

Days 31–60: reconcile a project-level funding ledger with the Great Lakes Commission Investment Tracker and agency records; define three to five research modules and two to three demonstration feasibility studies. Seek a lead philanthropic commitment and written technical contributions.

Days 61–90: submit eligible modular proposals, negotiate publication and data terms, confirm a funded budget and launch only the work packages with resources secured. Report progress in innovation, resource productivity, freshwater security, resilience and community prosperity.

Governance and the First Twelve Months

Ask the Council on Competitiveness to consider convening a design group before committing to a formal Phase III study. Its proposed role is national competitiveness framing, convening across business, universities, labor and national laboratories, and translating findings into an actionable agenda. Council of the Great Lakes Region, the International Joint Commission, the Great Lakes Commission and other existing institutions should be invited to contribute within their distinct missions and authorities.

If a subsequent study is commissioned, a small research secretariat could coordinate methods and integration. Existing institutions should co produce the substantive work, retain their identities and lead demonstrations in their areas of strength. Indigenous Nations and First Nations should participate as knowledge and governance

partners. Cities, utilities and communities must help define affordability, infrastructure and public value requirements.

Buffalo is the preferred coordination base, subject to a qualified host, resources and partner agreement. Explore M&T Bank and Seneca One representatives for possible workspace and anchor support while retaining distributed technical leadership. Establish separate sponsorship, technical-review and commercialization processes, with disclosure of sponsor interests and independent publication rights. No sponsor, office contribution or institutional participation is assumed.

Timing	Action	Outcome
0–60 days	Council-led design interviews across Great Lakes nodes, Canada, industry, utilities and existing regional institutions.	Validated scope; duplication map; research questions; co-chairs and partners.
Months 2–4	Create common data framework and commission baseline modules from partner institutions.	Shared definitions and comparable metrics.
Months 4–8	Run regional working sessions by capability — science, compute/energy, manufacturing, utilities, technology, talent, binational policy.	Co-produced findings and implementable opportunities.
Months 8–10	Integrate findings into Great Lakes competitiveness strategy and national/global comparative framework.	Draft Phase III report; demonstration opportunities; policy and investment agenda.
Months 10–12	Council competitiveness summit / Great Lakes forum with U.S. and Canadian leaders.	Public launch, implementation commitments and decision on continuing platform.

First year decision gates

At the end of design, confirm whether the work fills an unmet need, whether the Council wishes to convene it, and whether partners and resources support the scope. Before commissioning modules, agree on users, methods and deliverables. Before the public launch, secure specific implementation commitments and decide whether a continuing platform is justified.

Proposed first year measures

- At least three cross city or cross border demonstrations launched, subject to feasibility and funding.
- A common Water Energy Compute framework tested by multiple utilities or jurisdictions.
- Shared baseline definitions and research protocols used across participating institutions.
- New investment linked to validated collaborative opportunities, distinguishing commitments from funds deployed.
- Paid student placements, early-career hires and retention tracked alongside validated pilots, customer contracts and follow-on company investment. Use the proposed 20-placement pilot only if funded and supported by employer demand.
- A comparative methodology ready for testing by another U.S. or international region.

These are proposed study design targets. Final scope, governance, funding and implementation commitments would require agreement among participating institutions. Long term economic and workforce outcomes should be tracked separately from research delivery and demonstration milestones.

Governance and Institutional Responsibilities

The sustainable compute workstream should be co produced by participating universities, utilities, manufacturers, communities and relevant authorities. Regional economic development teams can coordinate local opportunities, while technical and governance decisions remain with the institutions responsible for them.

Workstream	Recommended lead role
Economic development / prospecting	regional delivery partners: investment proposition, prospect pipeline, project qualification and regional coordination.
Electricity and grid	Power authorities and serving utilities: capacity verification, rate analysis, interconnection, infrastructure and cost allocation.
Water / environmental	Relevant municipal, state and binational authorities plus university/environmental experts: permits, monitoring, stewardship and thermal analysis.
Research / curriculum	University consortium: research agenda, academic programs, testbeds, commercialization and talent.
Workforce	Colleges, workforce boards, unions and employers: technician and skilled-trade pathways.
Community value	Participating communities and local governments: housing, infrastructure, public reporting and community-benefit commitments.

Project owners should report comparable results through agreed study methods. Shared reporting does not transfer permitting, utility, labor or academic authority to a research secretariat.

Measuring Resource Productivity and Public Value

A focused scorecard should distinguish activity from outcomes. It should compare verified resource performance, economic value, talent development, infrastructure and community effects. Large announced investments should be distinguished from completed projects and observed benefits.

Category	Illustrative measures
Economic value	Permanent jobs, wages, local supplier spend, tax base, R&D, patents, licenses and expansion commitments.
Talent	Program enrollment, graduates, relocation hires, international student retention, technical vacancies and apprenticeships.
Infrastructure	Verified MW capacity, interconnection time, project-funded capacity additions, fiber and site readiness.
Water	Withdrawal, consumption, reuse, source, thermal discharge and environmental monitoring results.
Energy	Facility efficiency, peak load, load flexibility, recovered heat, incremental generation/storage and project-attributable infrastructure costs.
Community	Residential/small-business rate impact, project-driven public costs, housing and transportation impacts, verified community-benefit commitments.

Category	Illustrative measures
Great Lakes platform	Cross-border research, supplier wins, joint projects, external funding, cross regional collaboration and international visibility tied to measurable investment.

Workforce Renewal and Talent Availability

Workforce renewal measures should show whether emerging and incoming workers can meet occupational needs as experienced workers retire. Compare trends using consistent definitions while allowing for differences between U.S. and Canadian labor-market data. Validate the replacement-ratio methodology before adopting a numerical target.

Indicator	Illustrative measures
Workforce replacement ratio	Younger workers entering or migrating into the workforce for every 100 workers approaching retirement within an agreed period. Track replacement capacity and gaps in priority occupations.
Young-adult net migration	People moving into the region minus those leaving, using consistent age groups such as 18–34 and 25–44. Assess sustained improvement over several years.
International talent retention	Share of international graduates entering regional employment, where legally eligible. Track retention and the strength of pathways from education to employment.
Retirement exposure	Share of workers in priority occupations approaching retirement. Track whether training, recruitment and succession plans address expected losses of experienced workers.
Critical occupation vacancies	Unfilled positions and time to fill in healthcare, skilled trades, manufacturing, engineering, education and other priority fields. Track reductions in persistent vacancies and hiring time while maintaining qualification standards.

Funding Risk Management and Evidence

Benefits Realization and Project Verification

Each funded demonstration should specify its expected outcomes, baseline, delivery owner, timetable and verification method. Follow up after deployment to compare actual resource use, jobs, wages, costs and benefits with the assumptions used to approve the project.

Risk Identification and Mitigation

Maintain a risk register covering resource and grid capacity, technology performance, project concentration, financial viability, environmental effects, trade friction, data quality and workforce bottlenecks. Assign responsibility for mitigation and define conditions for redesigning or stopping a pilot.

Long Term Funding Strategy

Funding should follow the agreed research and demonstration portfolio. Identify the lead institution, existing resources, incremental funding requirement, prospective public or private sources and expected public value for each workstream. A design process should establish a preliminary budget before commitments are sought. Maintain separate accounts for public grants, corporate study sponsorship, donated facilities and equipment, customer-funded pilots and venture or project investment. Corporate sponsors should help finance shared research and talent access; investment in companies should follow independent commercial diligence. The public and private investment chapter provides the starting ledger and prospect segmentation.

Public Reporting and Execution Discipline

A public reporting covenant. Publish progress honestly, including losses, delays, and missed targets. Credibility will be more valuable than declaring every year a success.

Strategy Refresh and Course Correction

A scenario trigger system. Define external conditions that require tactical changes—for example, reduced immigration, energy constraints, recession, trade-policy shifts, automation acceleration, or a major employer closure.

Independent Five Year Evaluations

Use independent review at agreed decision points to assess methodology, additionality and observed outcomes. Scale approaches that demonstrate value, revise those with unresolved weaknesses and discontinue work that duplicates existing capability without a clear benefit.

Sustainable Compute Funding and Risk Guardrails

Funding principle

Public dollars should be concentrated on reusable regional capability - research testbeds, grid modernization, workforce programs, shared infrastructure, site readiness and supplier commercialization - rather than simply lowering the private cost of one large facility.

Major risks and mitigations

Risk	Mitigation
Freshwater abundance becomes a marketing slogan that encourages overuse.	Adopt explicit withdrawal, consumption, reuse, thermal and monitoring standards; treat water as strategic capital.
Large loads raise household electricity costs.	Require project-specific cost allocation, incremental capacity and board-level ratepayer safeguards.
Region attracts capital but few permanent jobs.	Prioritize suppliers, R&D, manufacturing, commercialization and workforce commitments in incentive decisions.
Universities create disconnected programs.	Use a consortium, shared curriculum map and employer-defined competencies.
Strategy becomes too broad.	Limit the first phase to a small number of pilots, target technologies and measurable outcomes.

Risk	Mitigation
Environmental opposition delays projects.	Engage environmental expertise and communities before site selection and incentive commitments; publish data and monitoring plans.
Technology changes rapidly.	Use five-year strategy resets and avoid locking the region into one cooling architecture, vendor or data-center model.

Conclusion and a Starting Point for Phase III

This independent report, researched and written by Robert J. Bogart, identifies opportunities to connect freshwater stewardship with innovation, competitiveness and lasting prosperity. Freshwater security is a central outcome, alongside industrial productivity, economic and environmental resilience, workforce opportunity and community well-being. The binational Great Lakes provide the regional focus for research and demonstrations whose technologies, practices and investment approaches could have global application.

The next step is a focused discussion with the Council on Competitiveness and prospective partners about a potential Phase III study. That discussion should refine the research questions, identify existing work to build upon, agree possible convening and research roles, and establish feasible demonstrations and funding needs. Evaluation should address freshwater security and economic and community outcomes, while testing which findings can be adapted to other regions. This report supplies an independent starting contribution to that process.

Selected Evidence and Further Research Questions

Selected evidence supporting the strategic proposition

Source / institution	Relevant evidence for the competitiveness analysis
U.S. Environmental Protection Agency	The Great Lakes contain about 84% of North America's surface freshwater and about 21% of the world's supply of surface freshwater.
U.S. Department of Energy / Lawrence Berkeley National Laboratory	The 2024 report estimated that data centers used about 4.4% of U.S. electricity in 2023 and projected 6.7%–12% by 2028. The June 2026 update provides a later projection discussed in the main findings.
UNESCO / UN-Water	Roughly half of the world's population experiences severe water scarcity for at least part of the year.
Enwave, Toronto	Deep Lake Water Cooling uses cold Lake Ontario water in a district system serving data centers and other buildings; the model demonstrates large-scale lake-based thermal infrastructure.
Cornell University	Lake Source Cooling reduces campus cooling-energy use by about 85%; approximately 98% of Ithaca campus cooling is renewable and refrigerant-free; the system was subject to extensive environmental review and monitoring.
Microsoft Project Natick	Subsea data-center research demonstrated technical feasibility and reported a server failure rate one-eighth that of the land-based control group.

Source / institution	Relevant evidence for the competitiveness analysis
Empire AI / University at Buffalo	A 2026 clean-energy project will capture and reuse heat from Empire AI's supercomputing center through UB's North Campus thermal system, creating an illustrative campus integration project.
University of Waterloo	Collaborative Water Program is co-delivered across 11 departments and schools in all six faculties, demonstrating an interdisciplinary model for water science, engineering, economics and governance.

Recommended Great Lakes academic product

- Great Lakes Certificate in Sustainable Compute Infrastructure; MS concentration in Water-Energy-Compute Systems; Joint university-industry research fellows program.
- Technician credential in liquid cooling, data-center electrical systems and controls.
- A proposed annual sustainable compute research exchange could rotate among participating Great Lakes institutions in both countries.
- Shared testbed and performance-data repository for energy, cooling, water and heat recovery.

Research questions for the first feasibility study

- Which sites and infrastructure systems across the Great Lakes can support computing demand without unacceptable grid, freshwater or community costs?
- Where can district cooling, lake-source cooling, groundwater, closed-loop systems or heat recovery produce genuine lifecycle advantages?
- What freshwater withdrawal, consumption and thermal thresholds should define acceptable projects?
- How should utility tariffs and project agreements protect existing customers while still remaining competitive for large investors?
- Which supplier categories offer the highest jobs and export value per unit of electricity consumed?
- Which academic programs and credentials can be launched quickly using existing faculty and facilities?
- Which cross city or cross border demonstrations could establish credible technology, productivity and community benefits within 24 months?

Source notes

The analysis draws on the Council on Competitiveness water studies and Phase III concept paper; U.S. Environmental Protection Agency Great Lakes Facts and Figures; U.S. Department of Energy and Lawrence Berkeley National Laboratory data center analyses; UNESCO and UN Water reports; World Resources Institute Aqueduct analysis; and institutional descriptions of the technology and academic examples discussed here. Source periods, project status and assumptions should be retained when interpreting numerical estimates. Proposed research would require updated baselines and agreed methods.

Partner and Investment Sources

Sources accessed October 29, 2026. Bracketed numbers identify the evidence supporting funding figures and institutional capabilities. Proposed contributions and funding strategy are the author's recommendations. Program listings do not establish that an opportunity is currently open. Corporate and institutional participation requires direct confirmation.

[1] EPA GLRI Action Plan IV FY2025–2029; infrastructure-law supplement. Official source

[2] GLRI Funding; March 2026 ordinary funding framework and agency allocations. Official source

[3] Current March 30 2026; continuation award of up to US$45m. Official source

[4] Cleveland Water Alliance March 31 2026; initial US$14.7m and continuation. Official source

[5] University at Buffalo June 16 2026; five-year US$5m GLRC award. Official source

[6] NSF Water Innovation Engine in the Great Lakes. Official source

[7] Canada Water Agency September 9 2026; Great Lakes commitments and projects. Official source

[8] Great Lakes Funders; network and annual grantmaking scale. Official source

[9] New York Governor; 2026 water infrastructure funding and enacted plan. Official source

[10] DOE April 11 2024; US$75m NAWI renewal. Official source

[11] EPA Innovative Water Infrastructure Workforce Development Program. Official source

[12] Ontario; Local Blue Economy Growth Fund investment. Official source

[13] The Water Council; history and manufacturer network. Official source

[14] The Water Council; water technology and global stewardship network. Official source

[15] Great Lakes and St Lawrence Cities Initiative; role and supporters. Official source

[16] NFWF Sustain Our Great Lakes Program. Official source

[17] EDA Program List; Planning, Local Technical Assistance and EAA. Official source

[18] EDA Research and National Technical Assistance; intake status. Official source

[19] USDA NRCS Great Lakes Restoration Initiative. Official source

[20] Department of Labor; apprenticeship funding opportunities. Official source

[21] NYSDEC Great Lakes Program. Official source

[22] NYSDEC Great Lakes Action Agenda. Official source

[23] Buffalo Sewer Authority; operations and water protection. Official source

[24] Community Foundation for Greater Buffalo; environmental priorities. Official source

[25] Ontario Great Lakes Local Action Fund; 2026 call for 2027 projects. Official source

[26] CIGLR consortium organization and research network. Official source

[27] SUNY Buffalo State Great Lakes Center. Official source

[28] Great Lakes RENEW; academic, industry and workforce leadership. Official source

[29] UWM School of Freshwater Sciences. Official source

[30] University of Minnesota Duluth Large Lakes Observatory. Official source

[31] University of Waterloo Water Institute. Official source

[32] Ontario Water Consortium postsecondary partners. Official source

[33] University of Toronto Institute for Water Innovation. Official source

[34] IISD Experimental Lakes Area. Official source

[35] The Water Council September 2026; manufacturer and technology members. Official source

[36] Ecolab water stewardship. Official source

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[39] Great Lakes Commission; priorities and Investment Tracker. Official source

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[50] UNESCO Intergovernmental Hydrological Programme. Official source

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[57] Xylem digital water capabilities. Official source

[58] DuPont Water Solutions. Official source

Additional suggested federal, state, local, university and company counterpart roles are outreach recommendations. Before submission, verify the specific program, institution, current contact and proposed work package with the organization. No estimated foundation or corporate contribution is included in the documented funding total.

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[61] Constellation environmental stewardship and water management. Official source

[62] NYSEG and RG&E Avangrid relationship. Official source

[63] WEC Energy Group water security reporting. Official source

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[66] Indiana Michigan Power hydroelectric operations. Official source

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[79] Polsky and Current Great Lakes RENEW Scaling Lab September 2026. Official source

[80] Polsky startup funding programs and eligibility. Official source

[81] Northwestern N XT portfolio including water technologies. Official source

[82] Northwestern InQbation Lab resident startups. Official source

[83] Northwestern paid Summer Scholars program. Official source

[84] mHUB and Current water accelerator cohort and corporate partners. Official source

[85] Burnt Island Ventures Fund II October 2025. Official source

[86] Xylem corporate venture commitment July 2024. Official source

[87] WaterEquity water and climate resilience fund. Official source

[88] Ecolab private investment in water innovation and resilience March 2025. Official source

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[90] KeyBank community investment. Official source

[91] Lakeside Equipment wastewater treatment capabilities. Official source

[92] Cerberus growth investment in Aquatech April 2025. Official source