

Appendix 3 — Relevancies (or Alternate Indicator Groupings)

The SOLEC list of indicators was developed according to the categories of open and nearshore waters, coastal wetlands, nearshore terrestrial, human health, land use, societal and unbounded. These groupings are convenient for SOLEC reporting, but they represent only one of many ways to organize information about the Great Lakes. Depending on the user's perspective, other groupings will be more convenient or will provide insight to aspects of the Great Lakes that differ from the SOLEC groupings.

Each of the proposed SOLEC indicators has been evaluated by the Indicators Group for relevance to several other organizational categories, and the results are displayed in the attached table. The categories include;

- C Indicator Type. Based on the State-Pressure-Human Activity model, each SOLEC indicator has been assigned to the appropriate category. Measurements of contaminants in an environmental compartment are considered a pressure on the ecosystem rather than a measurement of a state condition. There are currently 28 State, 37 Pressure and 15 Human Activity indicators proposed.
- C Environmental Compartments. This category sorts the SOLEC indicators by media, i.e., air (6), water (14), land (14), sediments (4), biota (21), fish (13), and humans (14). Fish have been separated from biota as a special case.
- C Issues. Environmental management decisions often reflect an attempt to address an issue rather than a medium or geographic location. Specific issues that SOLEC indicators support include toxic contaminants (29), nutrients (12), exotic species (8), habitat (28), climate change (4), and stewardship (11).
- C GLWQA Annexes. Several of the annexes of the GLWQA include monitoring and reporting requirements. The proposed SOLEC indicators currently address 10 of the 17 annexes. Annex 11 (Monitoring) is supported if an indicator supports any of the other annexes, and Annex 2 (LaMPs and RAPs) is supported if the indicators address any of the Beneficial Use Impairments.
- C GLWQA Beneficial Use Impairments. Under Annex 2 of the GLWQA, fourteen Beneficial Use Impairments are listed for consideration by Lakewide Management Plans and Remedial Action Plans. The SOLEC indicators address to some extent 11 of the 14 listed use impairments.
- C IJC Desired Outcomes. The IJC listed nine Desired Outcomes in its report *Indicators to Evaluate Progress under the Great Lakes Water Quality Agreement* (1996). SOLEC indicators address to some extent all nine Desired Outcomes. The many indicators with relevance to the outcomes of Biological Community Integrity and Diversity, and Physical Environment Integrity (including habitat) reflect SOLEC's emphasis on the biotic components of the Great Lakes ecosystem.
- C Great Lakes Fish Community Objectives. A series of fish community objectives have been released or are being developed for each of the Great Lakes with the support of the Great Lakes Fishery Commission. Some SOLEC indicators specifically reflect the state of fish communities, and others address related habitat issues.

To facilitate cross referencing of the SOLEC indicators to the alternate categories, a section has been added to each indicator description (Appendix 1) that lists all the applicable categories. This matrix of alternate groupings of SOLEC indicators is also being incorporated into the SOLEC indicators database. Users will be able to retrieve the list of indicators associated with any of the sorting categories.

While the SOLEC indicators are intended to meet the criteria of necessary, sufficient and feasible for SOLEC reporting, no attempt has been made to evaluate the adequacy of the subset of SOLEC indicators that are relevant to any of the alternate organizing categories from the perspective of other users. For example, LaMPs and RAPs are expected to require a greater level of detail and geographic specificity to assess Beneficial Use Impairments than will be provided by the proposed SOLEC indicators. **Suggestions and comments on the relevance of the SOLEC indicators to these or other alternate categories are encouraged.**

Table on following pages.

ID#	Indicator Name	Indicator Type			Environmental Compartments					Great Lakes Issues					SOLEC Groupings ¹					GLWQA Annex ²												
		State	Pressure	Human Activity	Air	Water	Land	Sediments	Biota (excluding fish & humans)	Fish	Humans	Contaminants & Pathogens	Nutrients	Exotics	Habitat	Climate Change	Stewardship	Open Waters	Nearshore Waters	Coastal Wetlands	Nearshore Terrestrial	Land Use	Human Health	Societal	Unbounded	1 Spec Objectvs	2 LaMPs / RAPs / BUIs	3 Phosphorus	4 Oil - Vessels	5 Wastes - Vessels		
Nearshore and Open Waters Indicators																																
6	Fish Habitat	X			X				X					X			X	X	X								X					
8	Salmon and Trout	X							X		X	X	X	X			X	X									X					
9	Walleye and Hexagenia	X						X	X		X	X	X	X			X	X									X					
17	Preyfish Populations	X							X		X	X	X	X			X	X									X					
18	Sea Lamprey		X						X			X					X	X									X					
68	Native Unionid Mussels	X							X			X					X	X	X								X					
93	Lake Trout and Scud (<i>Diporeia hoyi</i>)	X						X	X		X	X	X	X			X									X	X					
101	Deformities, Eroded Fins, Lesions and Tumors (DELT) in Nearshore Fish	X							X		X							X									X					
104	Benthos Diversity and Abundance	X						X			X	X		X			X	X	X								X					
109	Phytoplankton Populations	X						X			X	X	X				X	X									X	X				
111	Phosphorus Concentrations and Loadings		X		X							X					X	X	X							X	X	X				
114	Contaminants In Young-of-the-Year Spottail Shiners		X						X		X							X								X	o					
115	Contaminants in Colonial Nesting Waterbirds		X					X			X						X	X								X	X					
116	Zooplankton Populations	X						X			X	X	X				X	X									X					
117	Atmospheric Deposition of Toxic Chemicals		X		X	X					X						X										o					
118	Toxic Chemical Concentrations in Offshore Waters		X		X						X						X										X					
119	Concentrations of Contaminants in Sediments Cores		X				X				X						X	X									X					
120	Contaminant Exchanges Between Media: Air to Water, and Water to Sediment		X		X	X	X				X						X	X									X					
7059	Wastewater Pollution		X		X						X	X					X									X	X	X				
8142	Sediment Available for Coastal Nurishment		X		X	X								X			X		X								X					
Coastal Wetland Indicators																																
4501	Coastal Wetland Invertebrate Community Health	X						X						X				X									X					
4502	Coastal Wetland Fish Community Health	X						X				X	X					X									X					
4503	Deformities, Eroded Fins, Lesions and Tumors (DELT) in Coastal Wetland Fish	X						X			X							X									X					
4504	Amphibian Diversity and Abundance	X						X						X				X														
4506	Contaminants in Snapping Turtle Eggs		X					X			X							X									X					
4507	Wetland-Dependent Bird Diversity and Abundance	X						X						X				X									X					
4510	Coastal Wetland Area by Type	X			X	X								X				X									X					
4511	Gain in Restored Coastal Wetland Area by Type		X		X	X								X	X			X									X					
4513	Presence, Abundance & Expansion of Invasive Plants	X						X				X	X					X	X								X					
4516	Sediment Flowing Into Coastal Wetlands		X		X	X								X				X	X							X	X					
4860	Nitrate and Total Phosphorus Into Coastal Wetlands		X		X						X							X									X	X				
4861	Water Level Fluctuations		X		X									X	X			X	X								X					
Nearshore Terrestrial Indicators³																																
8129	Area, Quality, and Protection of Lakeshore Communities	X			X	X								X	X				X								X					
8131	Extent of Hardened Shoreline		X		X									X					X	X							X					
8132	Nearshore Land Use	X			X									X					X	X							X					

GLWQA Annex (con'd)																	IJC Desired Outcomes									GLFC Objectives				Beneficial Use Impairments														Totals									
6 Shipping / Pollution	7 Dredging	8 Facilities	9 Contingency Plan	10 Hazard. Poll. List	11 Monitoring	12 Pers. Toxic Subs.	13 Non-point Sources	14 Contam. Sed's	15 Airborne Toxic Subs.	16 Groundwater	17 Res. & Devel.	1 Fishability	2 Swimmability	3 Drinkability	4 Healthy Humans	5 Economic Viability	6 Bio. Integ. & Divers.	7 Virt. Elim. PTS	8 Excess Phos.	9 Physical Env. Integ.	Ontario	Erie	Huron	Michigan	Superior	1 F&W Consumption	2 Tainting	3 F&W Pop's	4 Tumors	5 Deformities/Reprod.	6 Benthos	7 Dredging	8 Eutrophication	9 Drinking Water	10 Beach Closings	11 Aesthetics	12 Ag./ Indust. Costs	13 Phyto-/ Zoo-plankton	14 F&W Habitat														
					X											X			X		X	X	X	X	X																		X	17									
					X											X					X	X	X	X	X		X																		X	16							
					X											X					X	X	X				X		X																	X	17						
					X											X					X	X	X	X	X		X																				X	17					
					X											X					X	X	X	X	X		X																				X	14					
					X											X					X	X	X	X	X																							X	10				
					X											X					X	X	X	X	X		X																					X	19				
					X	X										X	X										X																						X	10			
					X											X																																	X	12			
					X											X	X																																X	13			
					X	X										X	X				X																													X	18		
					X	X										X	X																																	X	10		
					X	X										X	X				X							X		X																				X	14		
					X											X																																		X	11		
					X	X		X	X							X	X																																		X	11	
					X	X										X																																			X	8	
X					X	X		X								X																																			X	13	
					X	X		X	X	X						X																																				X	14
					X	X										X	X																																			X	14
					X											X																																			X	10	
					X	X										X	X																																			X	10
					X	X										X	X																																			X	10
					X	X										X	X																																			X	12
					X	X	X			X						X	X																																			X	12
					X	X										X	X																																			X	10
					X	X	X									X																																				X	9
					X											X	X																																			X	10
					X	X										X	X																																			X	10
					X	X										X	X																																			X	11
					X											X	X																																			X	9
					X											X	X																																			X	10

ID#	Indicator Name	Indicator Type			Environmental Compartments					Great Lakes Issues					SOLEC Groupings ¹					GLWQA Annex ²															
		State	Pressure	Human Activity	Air	Water	Land	Sediments	Biota (excluding fish & humans)	Fish	Humans	Contaminants & Pathogens	Nutrients	Exotics	Habitat	Climate Change	Stewardship	Open Waters	Nearshore Waters	Coastal Wetlands	Nearshore Terrestrial	Land Use	Human Health	Societal	Unbounded	1 Spec Objectvs	2 LaMPs / RAPs / BUIs	3 Phosphorus	4 Oil - Vessels	5 Wastes - Vessels					
8134	Nearshore Plant and Animal Problem Species	X						X					X	X					X							X									
8135	Contaminants Affecting Productivity of Bald Eagles		X					X			X						X	X	X							X									
8136	Extent and Quality of Nearshore Natural Land Cover	X				X								X					X							X									
8137	Nearshore Species Diversity and Stability	X						X					X						X							X									
8139	Community / Species Plans		X					X							X				X			X													
8141	Shoreline Managed Under Integrated Management Plans		X			X									X				X	X		X													
8146	Artificial Coastal Structures	X				X							X				X	X								X									
8147	Contaminants Affecting the American Otter	X						X			X							X	X						X	X									
8149	Protected Nearshore Areas		X			X							X	X					X			X				X									
Land Use Indicators																																			
7000	Urban Density	X				X																													
7002	Land Conversion		X			X																													
7006	Brownfield Redevelopment		X			X									X																				
7012	Mass Transportation	X			X	X								X	X																				
7028	Sustainable Agricultural Practices		X			X									X											X	X								
7053	Green Planning Process		X			X	X								X																				
7055	Habitat Adjacent to Coastal Wetlands	X				X							X					X	X	X						X									
8114	Habitat Fragmentation	X				X							X													X									
Human Health Indicators																																			
113	Contaminants in Recreational Fish	X						X		X							X	X								X	X								
4081	<i>E. coli</i> and Fecal Coliform Levels in Nearshore Recreational Waters	X			X			X		X							X									X	X								
4083	Contaminants in Edible Fish Tissue	X						X		X							X	X								X	X								
4088	Chemical Contaminant Intake from Air, Water, Soil and Food	X							X	X																									
4175	Drinking Water Quality	X			X					X	X						X	X								X	X								
4176	Air Quality	X			X					X																X	o								
4177	Chemical Contaminants in Human Tissue	X							X	X																X									
4178	Radionuclides	X			X	X		X		X																X									
4179	Geographic Patterns and Trends in Disease Incidence	X							X																	X									
Societal Indicators																																			
3509	Capacities of Sustainable Landscape Partnerships		X						X						X																				
3510	Organizational Richness of Sustainable Landscape Partnerships		X						X						X																				
3511	Integration of Ecosystem Management Principles Across Landscapes		X						X						X																				
3512	Integration of Sustainability Principles Across Landscapes		X						X						X																				
3513	Citizen/Community Place-Based Stewardship Activities		X						X						X																				
7042	Aesthetics	X							X						X												X								
7043	Economic Prosperity	X																																	
7056	Water Withdrawal	X			X				X						X											X									

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7057	Energy Consumption	X			X					X					X	X						X		X										
7060	Solid Waste Generation	X			X	X				X	X				X	X							X											
8140	Financial Resources Allocated to Great Lakes Programs			X						X					X								X											
Unbounded Indicators																																		
4519	Climate Change: Number of Extreme Storms	X			X										X				X	X				X										
4857	Climate Change: First Emergence of Water Lily Blossoms in Coastal Wetlands	X						X						X				X					X											
4858	Climate Change: Ice Duration on the Great Lakes	X			X									X			X	X	X				X											
8150	Breeding Bird Diversity and Abundance	X						X					X										X			X								
8161	Threatened Species	X						X	X			X	X										X			X								
9000	Acid Rain	X			X	X	X				X												X		X									
9002	Exotic Species	X						X	X			X											X											
86	COUNT	30	36	13	9	19	19	4	24	14	13	29	11	14	27	7	19	21	24	21	18	13	9	15	7	18	49	5	0	0				
¹ Bold X designates the primary SOLEC Grouping for each indicator																																		
² o = Some LaMPs /RAPs are incorporating these measures into their plans even though the indicators do not have an associated BUI																																		
³ #8142 Sediment Available for Coastal Nurishment and #4861 Water Level Fluctuations are also co-grouped with Nearshore Terrestrial Indicators																																		

