

**POLLUTANTS, SOURCES, AND CAUSES TO WATER QUALITY DEGRADATION IN THE  
GRAND TRAVERSE BAY WATERSHED**

*(COMPREHENSIVE WATERSHED MANAGEMENT TABLE)*

<b>Environmental Stressor or Pollutant</b>	<b>Impaired or Threatened Use</b>	<b>Sources</b> K = known, S = suspected, P = potential	<b>Causes</b> K = known, S = suspected, P = potential
<b>Sediment</b>		Road Stream Crossings (k)	Poor design/construction/maintenance (k) Lack of erosion/surface runoff controls (k) Steep approaches (k) Culverts not aligned to streambed (k) Undersized culverts (k) Failing/eroding culverts/bridges (k)
	*Coldwater Fishery	Bank/Shoreline Erosion (k)	Removal of riparian vegetation (k) Boat traffic/wakes (k) High flow velocities (k) Recreational activities (k) Sandy soils (k)
	*Other Indigenous Aquatic Life	Construction (k)	Poor soil erosion practices (p)
	*Navigation	Urban/Agricultural/Rural Storm Water (k)	Poor storm water management practices (k)
		Livestock (p)	Unlimited access to streams (p)
		Oil and gas well development (k)	Stream crossings for new access roads (s)
		Dams, Lake-level Control Structures (p)	Physical failures (p) Improper dredge spoil disposal (p)
		Wetland Filling (k)	Poor storm water management practices (k)
<b>Nutrients</b>		Residential or Commercial Fertilizer Use (k)	Improper application (amount, timing, frequency, location, method, P content) (k)
		Septic Systems (s)	Poorly designed, sited, and maintained (s) High density/age of systems (s)
	*Coldwater Fishery	Urban/Agricultural/Rural Storm Water (k)	Poor storm water management practices (k) Development (k)
	*Other Indigenous Aquatic Life	Lack of Riparian Buffer (k)	Development (k) Clearing by landowner (k) Lack of adequate shoreline setbacks (p)
	*Partial/Total Body Contact	WWTP (p)	Discharge of nutrients in waste water (p)
	*Public Water Supply	Agriculture (p) (fertilizer, manure, & livestock)	Improper manure application (amt., timing, freq., location) (p) Improper storage/handling/application (p) Close proximity to Bay/Tributaries (p)
		Animal Waste Runoff (p)	Grazing near stream edge (p)
		Reduction of Wetlands (k)	Development and filling (k)

**POLLUTANTS, SOURCES, AND CAUSES TO WATER QUALITY DEGRADATION IN THE  
GRAND TRAVERSE BAY WATERSHED CONT'D  
(COMPREHENSIVE WATERSHED MANAGEMENT TABLE)**

<b>Environmental Stressor or Pollutant</b>	<b>Impaired or Threatened Use</b>	<b>Sources</b> K = known, S = suspected, P = potential	<b>Causes</b> K = known, S = suspected, P = potential
<b>Changes to Hydrological Flow</b>	*Coldwater Fishery  *Other Indigenous Aquatic Life  *Navigation	Fluctuating Water Levels (k)	Dams and lake-level control structures (k) Urban storm water runoff (k) Inc. development & imperv surfaces (k) Loss of terrestrial vegetation (k) Global warming (p)
		Reduction of Groundwater Recharge (k)	Increasing develop. on recharge areas (k) Loss of terrestrial vegetation (k) Global warming (p)
		Sedimentation (k)	Erosion (k)
		Dams, Lake-level Control Structures (k)	Dam removal (p) Changes in operation (p) Creation/destruction of beaver dams (k)
		Road Stream Crossings (k)	Road crossing flow obstructions or restrictions (k)
		Reduction of Wetlands (k)	Development on wetlands (k)
		Lowland Filling	Erosion from 1) improper shoreline stabilization, 2) improper dredge spoil disposal, and 3) increase peak flood flows Development
<b>Invasive Species</b> (Eurasian Milfoil Only – Clam River)	*Coldwater Fishery  *Other Indigenous Aquatic Life  *Navigation	Connected Waterways (k)	Unrestricted movement thru waterways (k)
		Boat Hulls and Bilges (k)	Lack of restrictions on boat travel (k) Lack of public knowledge on impact (k)
		Other Biota (i.e. birds, frogs) (k)	'Hitching' a ride (k)
<b>Loss of Habitat</b>	*Coldwater Fishery  *Other Indigenous Aquatic Life	Development (including 're-development') (k)	Poor development and design practices (k) Lack of knowledge on impact (k) New construction (p) Inadequate laws or regulations (p) Lack of adequate enforcement (p) Habitat fragmentation (k) Wetland loss (k)
		Shoreline Erosion & Stabilization (k)	Wave/ice action (k) High lake/river levels (k) Improperly designed/sited sea walls (k) Removal or lack of riparian vegetation (k)

**TABLE XX: POLLUTANTS, SOURCES, AND CAUSES TO WATER QUALITY DEGRADATION IN THE GRAND TRAVERSE BAY WATERSHED CONT'D**

*(COMPREHENSIVE WATERSHED MANAGEMENT TABLE)*

<b>Environmental Stressor or Pollutant</b>	<b>Impaired or Threatened Use</b>	<b>Sources</b> K = known, S = suspected, P = potential	<b>Causes</b> K = known, S = suspected, P = potential
<b>Thermal Pollution</b>	*Coldwater Fishery	Urban/Agricultural/Rural Storm Water (k)	Poor storm water management practices (k)
		Impervious Surfaces (k)	More roads, roofs, and parking lots due to development (k)
	*Other Indigenous Aquatic Life	Lack of Streamside Canopy and Riparian Buffer (k)	Development (k) Clearing by landowner (k)
		Dams, Lake-level Control Structures (k)	Top draw structures (k) Hydrology – low flows at times (k)
<b>Toxins</b> (Pesticides, Herbicides, Oils, Gas, Grease, Etc.)	*Coldwater Fishery  *Other Indigenous Aquatic Life	Wells (p)	Abandoned Wells (leaking, uncapped) (p)
		Industrial Pollution (p)	Discharge violations (from NPDES list)
		Oil, Gas, Hydrocarbon Wells (p)	Maintenance (p), Accidents (p), Brine Storage (p)
		Underground Storage Tanks (p)	Leaking tanks (p)
		Urban/Agricultural/Rural Storm Water (k)	Poor storm water management practices (k)
		Motor Boats (k)	Inefficient (2cycle) or poorly maintained watercraft motors (k) Fuel spills (p)
		Improper Chemical Use and Disposal (s)	Poor public knowledge of consequences (s) Lack of disposal facilities and/or limited hours of operation (s)
		Road Salt and Airport De-icing in Winter (k)	Runoff from roads and airport de-icing (k)
<b>Pathogens</b> ( <i>E. Coli</i> and Fecal Coliform indicators)	*Coldwater Fishery	Urban/Agricultural/Rural Storm Water (k)	Poor storm water management practices (k)
	*Other Indigenous Aquatic Life	Animal Waste (k)	Geese/ducks along shore & beach areas (k) Riparian Grazing (p)
		Septic Systems (p)	Improperly designed and maintained (p)
	*Partial/Total Body Contact	WWTP (p)	Overflowing sewer systems in high flow (p) Hydrology (p)