

Status of Watersheds in the Gulf of Maine

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<http://www.gulfofmaine.org/2/sogom-homepage/>



Environment and Climate Change Canada

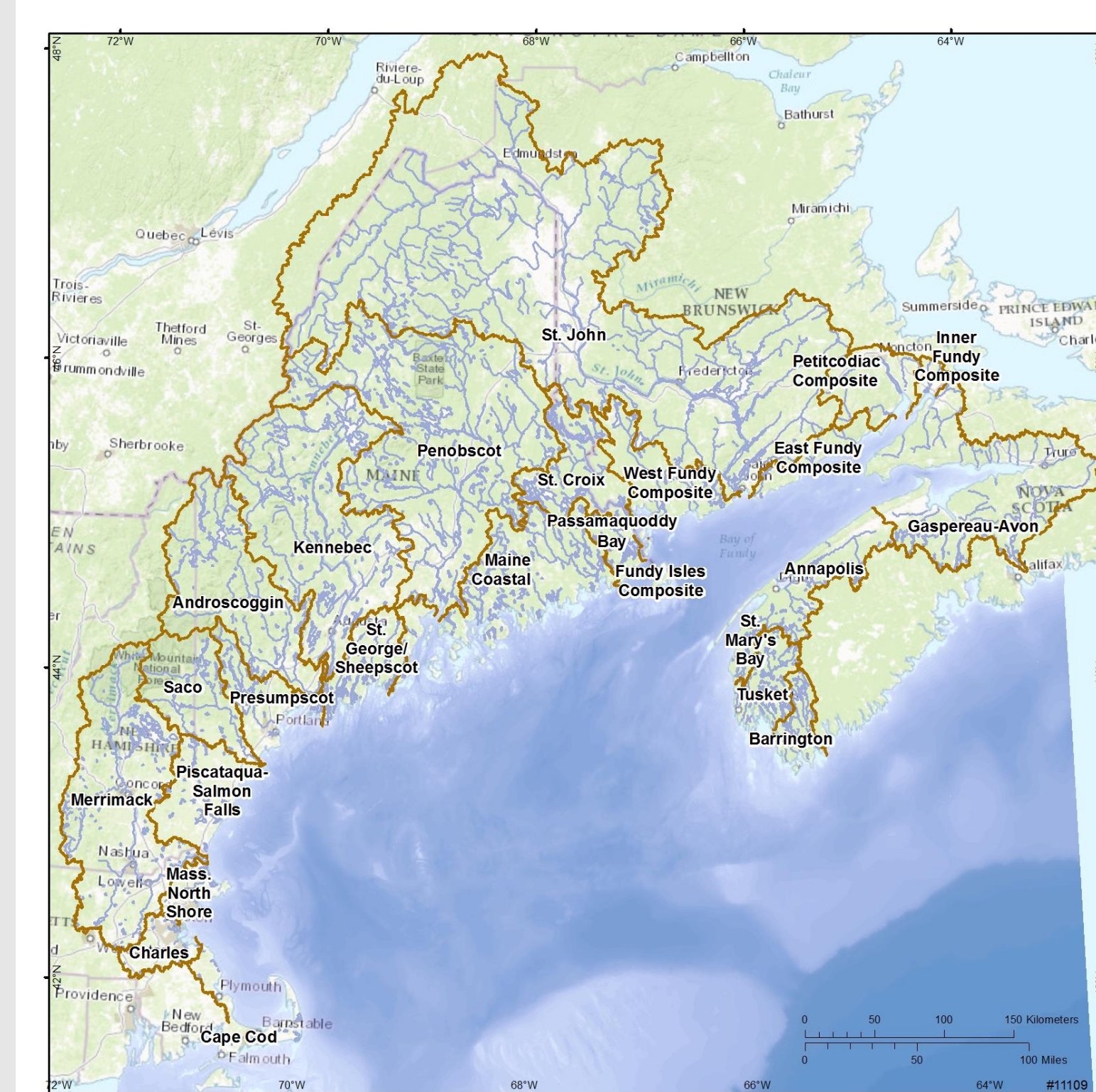
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ABSTRACT

This is a presentation of a report published in 2016 for the Gulf of Maine Council on the Marine Environment as part of its *State of the Gulf* series.

The GOM watershed is almost 70,000 square miles and extends from Cape Cod to the Bay of Fundy. We chose pressures and indicators that disrupt watershed functioning, reflect connections between riverine and coastal ecosystems, or exhibit regional threats. These include suburbanization tied to forest fragmentation, hydrologic alteration, nutrient enrichment, invasive species, mercury deposition; acid rain; and climate change.

We evaluated watershed condition for over 25 sub-watersheds—including the Merrimack and Saco river watersheds. Streamflow modification (e.g. dams), impairs watershed function and connectivity for fish passage. Water quality, once degraded by industrial pollutants, has improved, but is now threatened by nutrient enrichment. The spread of invasive species is linked to declines in biodiversity (especially among fish communities). Acid rain impacts have decreased in New Hampshire. Community-led and governmental initiatives are underway to improve water quality, nutrient cycling, biodiversity and other regional threats through conservation, restoration, management and monitoring.



Map of the Gulf of Maine watershed including the major basins. Prepared by Dan Morse for US EPA.

DPSIR Framework for development and nutrients

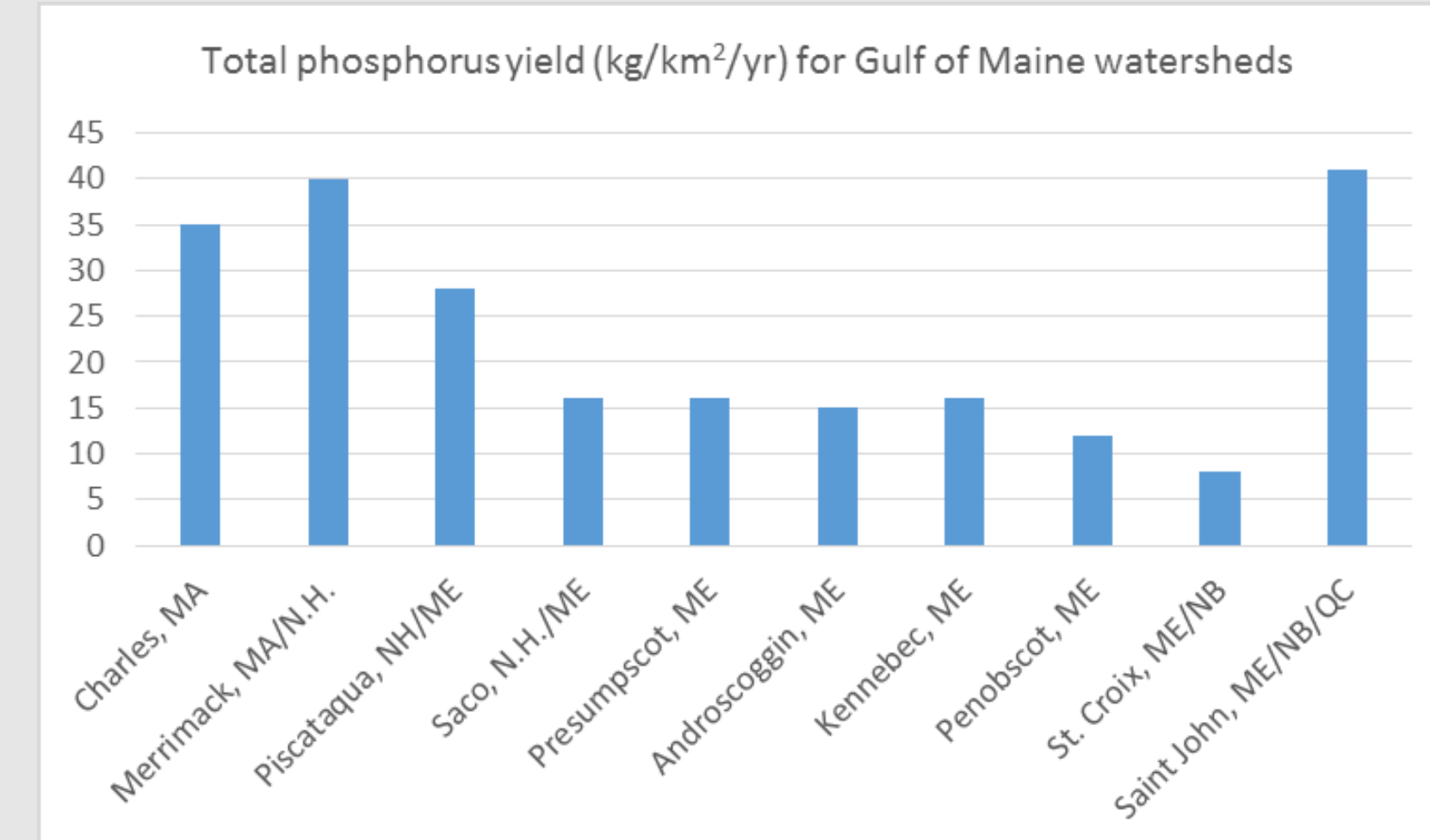
Driver: Development – over 10% of the land in the Merrimack River watershed is developed

Pressure: Increased habitat fragmentation, impervious surfaces and wastewater – more runoff and nutrient discharges disrupts stream and river communities

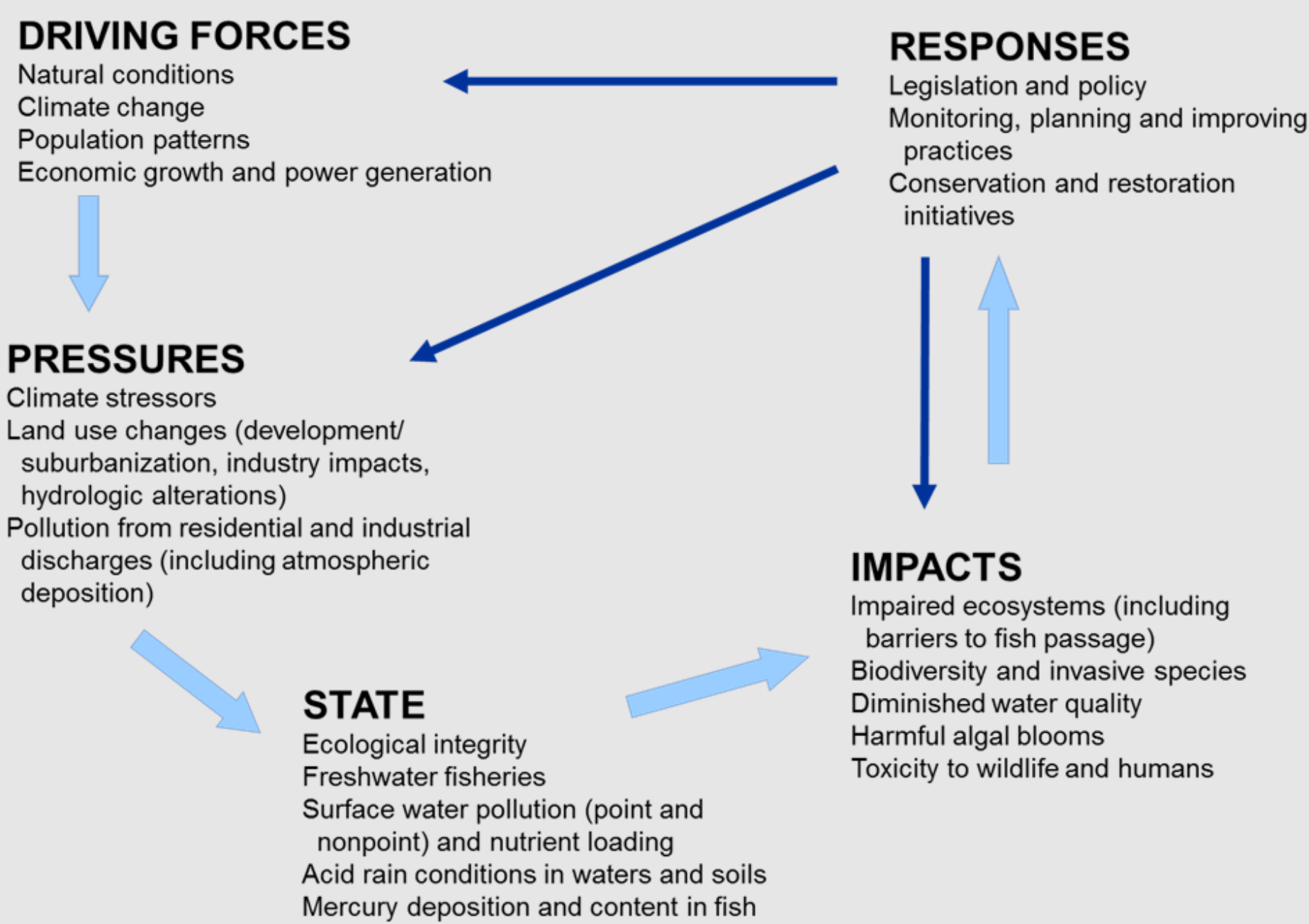
State: Surface water nutrient loads – about 40 kg phosphorus/km²/year discharged to the Merrimack River

Impact: Loss of ecological integrity – increased prevalence of harmful algal blooms

Response: Monitoring and management – citizen science to monitor blooms and permits to regulate nutrient loadings



Driving Forces – Pressure – Status – Impacts – Response (DPSIR) Framework



DPSIR Framework for hydrological modifications

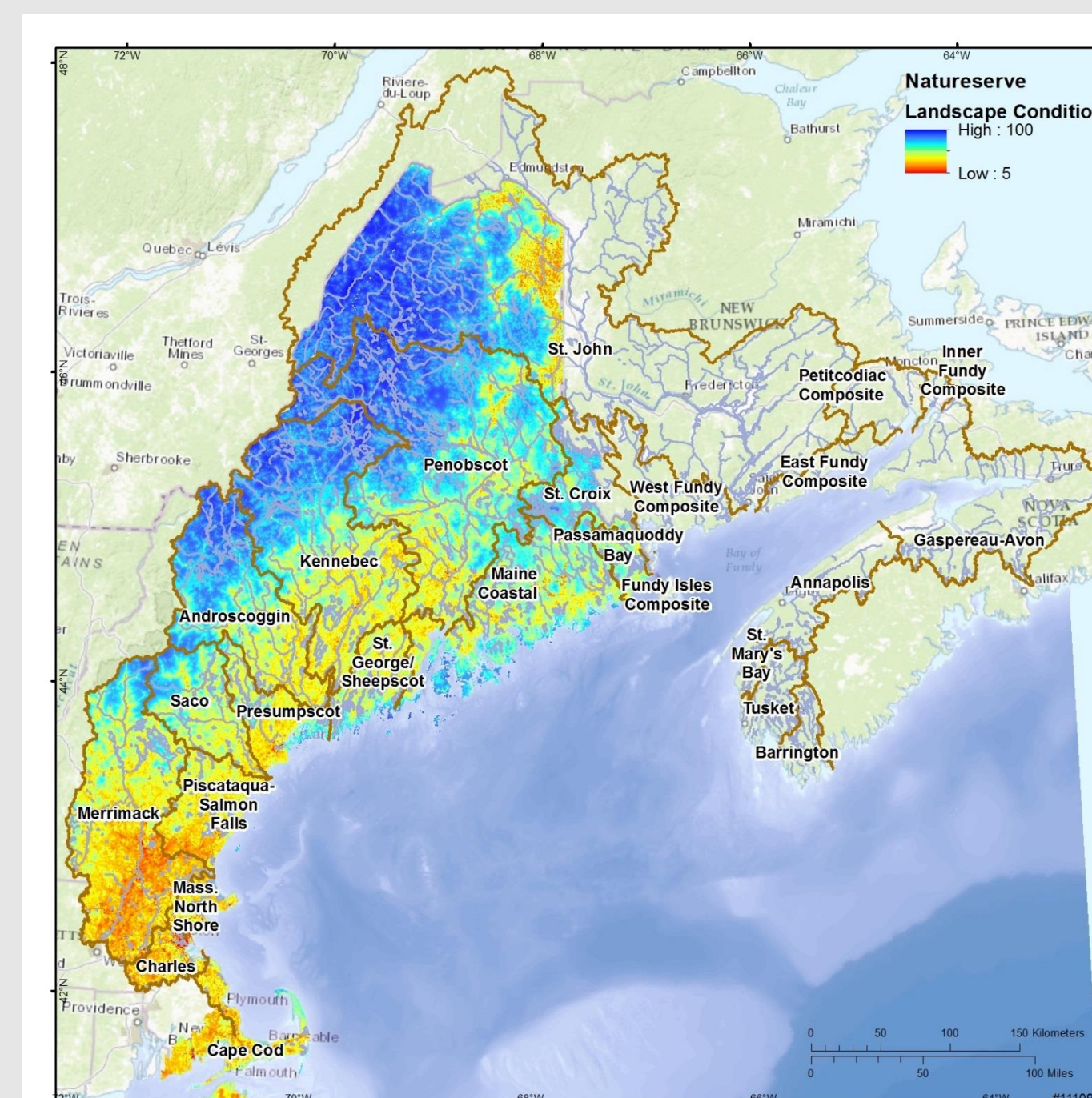
Driver: Economic growth and hydropower – rivers and topographic gradient fueled mills for timber industry and other industry

Pressure: Hydrological modification – there are more than 3000 active dams in the GoM watershed

State: Ecological integrity – more than 79 percent of rivers in US GoM watersheds exhibit modified stream flows (USGS)

Impact: Loss of diadromous fisheries and change in biological communities – warm water fish favored, access to freshwater spawning habitats reduced; Atlantic Salmon endangered

Response: restoration initiatives – dams have been removed along the Penobscot and other rivers



Landscape condition in the GoM watershed based on the Natureserve Landscape Condition model. Prepared by Dan Morse for US EPA.

Indicator Summary

Indicator	DPSIR Framework	Status	Trend
Storm intensity and frequency	Pressure	Fair—Precipitation events are growing more intense and more frequent	Worsening—Higher intensity precipitation is exacerbating erosion, runoff pollution and water quality degradation
Warmer water temperatures	Pressure	Fair—Water temperatures are gradually increasing	Worsening—Consistently warmer temperatures are likely to alter seasonal timing (phenology) and disrupt aquatic ecosystems and fisheries
Habitat fragmentation	Pressure	Fair—Human uses (agriculture, forestry, development) are fragmenting habitats at a rate that far exceeds population growth	Worsening—Projections are that this trend will increase, particularly in populous coastal counties
Dams and other hydrologic modifications	Pressure	Poor—The region has more than 6,000 barriers in watercourses, but widespread efforts are underway to restore flow	Improving—Many groups are working systematically to improve or remove existing barriers
Modified stream flows	State	Poor—79 percent of the streams assessed in the three U.S. states exhibit modified stream flows	No trend—Both positive and negative influences
Diadromous fish populations	State	Poor—Populations of many diadromous fish have fallen markedly and restoration efforts have not yet prompted a significant rebound	Worsening—Populations already suffering from habitat loss are experiencing pressures from climate change, invasive species and other ecological disruptions
Acidity of freshwater bodies	State	Fair/Poor—In many parts of the region, acidification has affected populations and health of biota	Improving—Studies indicate that fresh water bodies in New England may be decreasing in acidity while there is no apparent trend in Canada
Number of lakes and rivers with introduced species	Impacts	Fair—Many Gulf of Maine aquatic species are influenced by non-native species	Worsening—Invasive species are expanding in range
Number of harmful algal blooms	Impacts	Fair—Nutrient loading is contributing to more outbreaks of potentially harmful algal growth	Worsening—Warmer water temperatures will likely increase incidence of these blooms and risks to public health and wildlife
Concentration of mercury in key biota	Impacts	Poor—Mercury is a leading cause of impairment in New England water bodies and mercury levels in most biota in Atlantic Canada are unchanged or increasing	Unknown—Could improve because of reduced mercury deposition
Changes in acreage of permanently conserved land	Response	Fair—Many parts of the Gulf of Maine watershed have seen significant conservation gains	Unknown—Trend data not available by watersheds or for the Gulf of Maine watershed as a whole
Habitat and fish passage restoration	Response	Good—Many efforts are underway to restore ecological integrity	Improving—Community, nongovernmental and governmental efforts appear to be increasing