The Effects of Climate Change on Invasive Aquatic Species

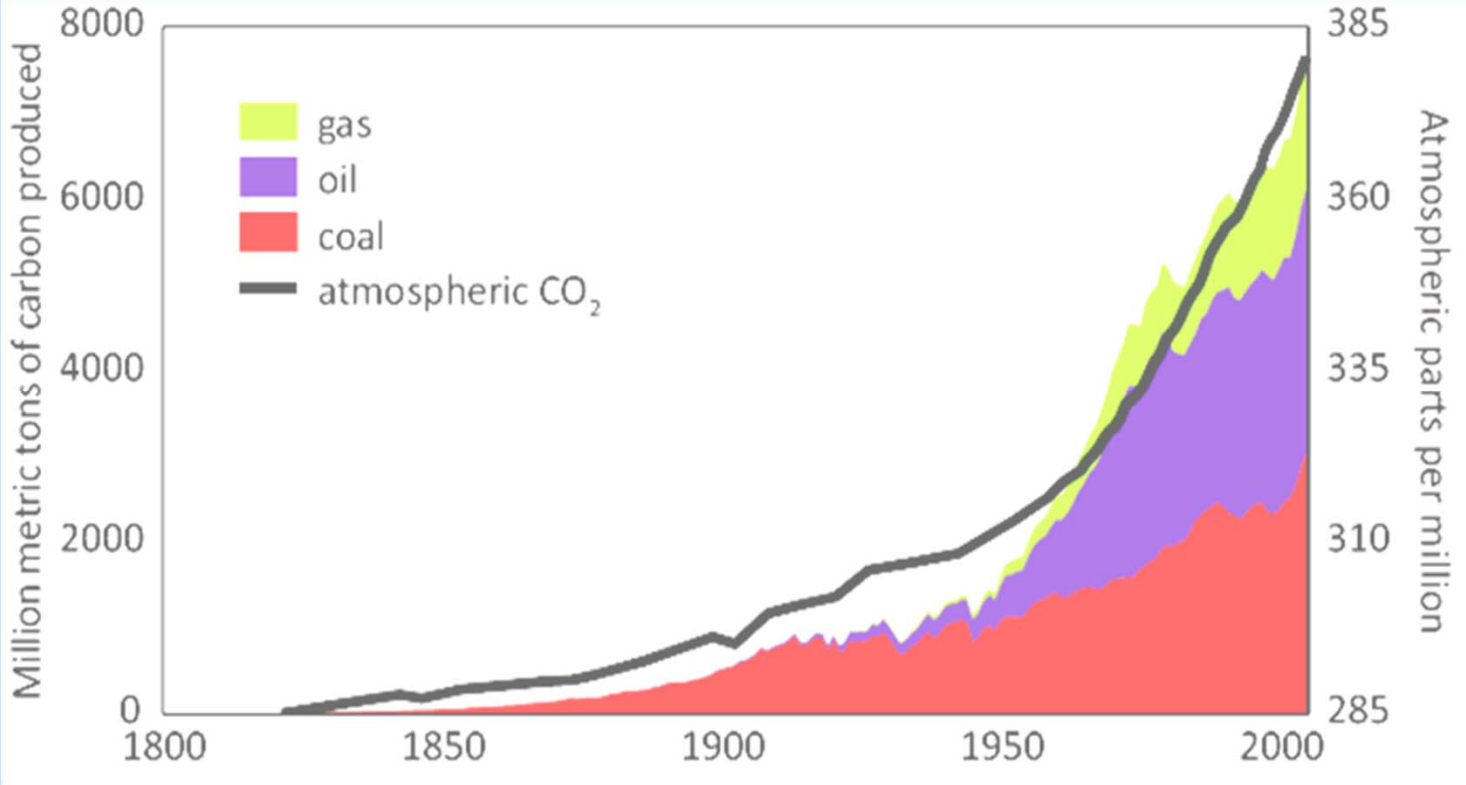
Threats to Maine's Lakes

Roberta Hill,

Lake Stewards of Maine

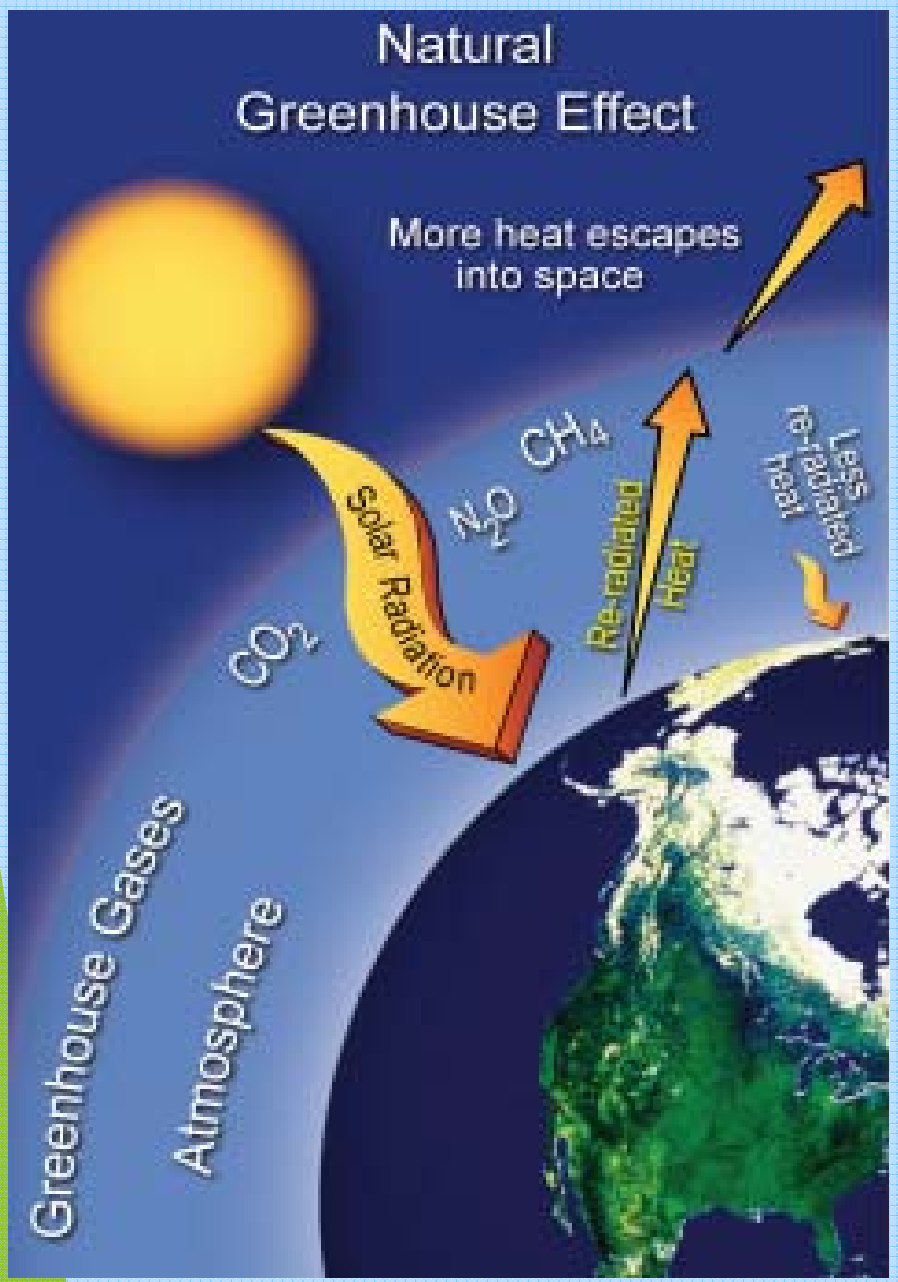
Scientific Consensus

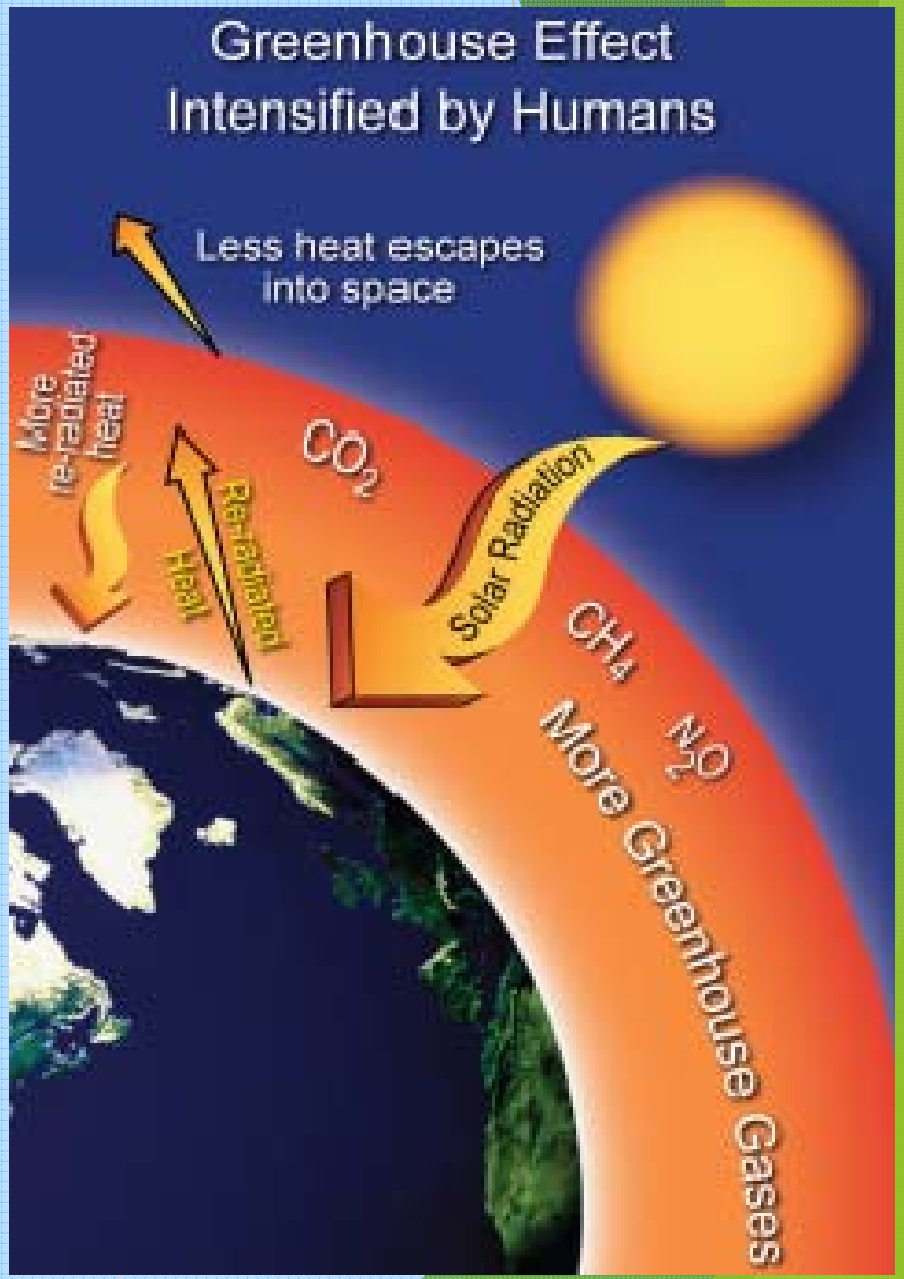
97% - 99.999 %



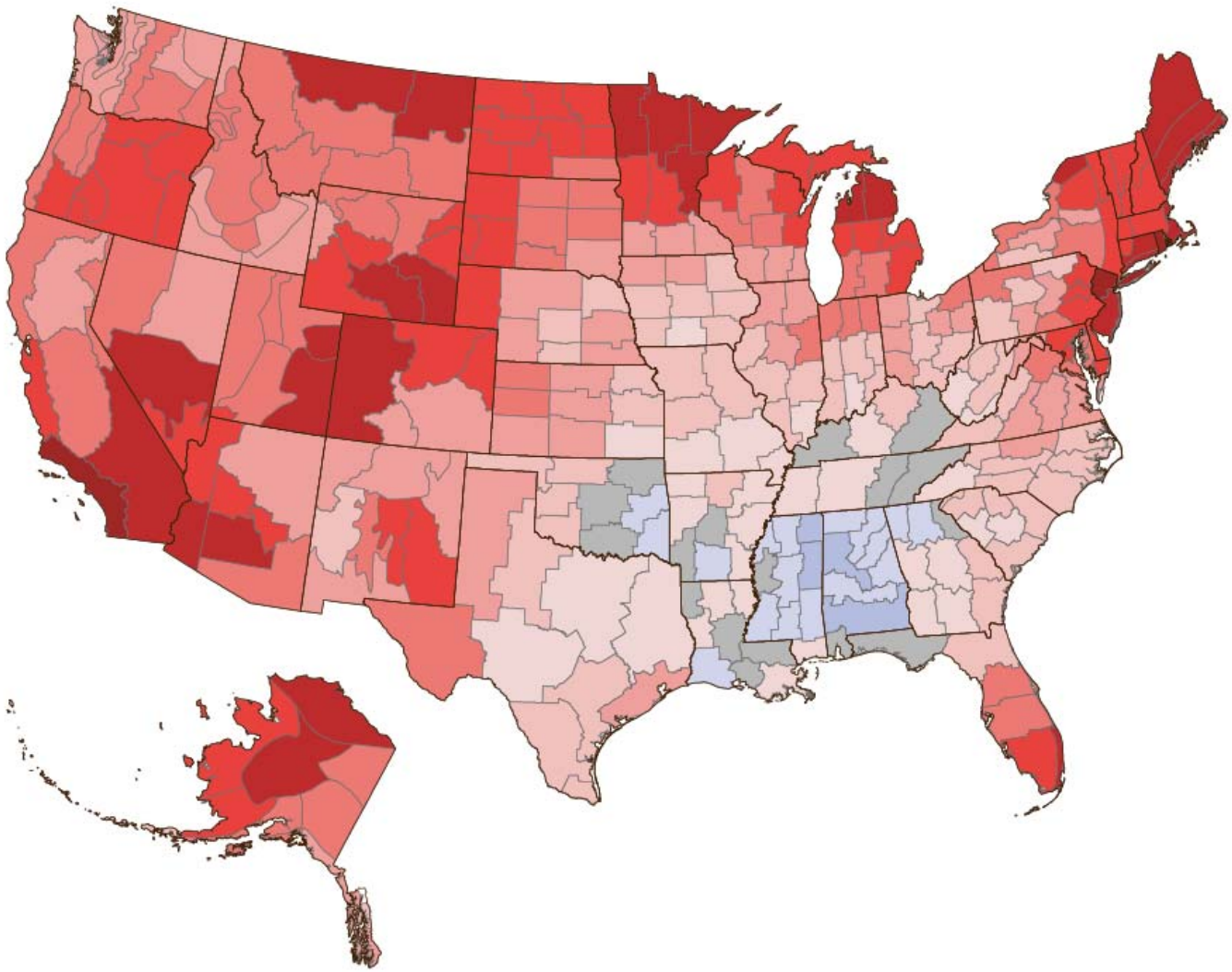
- The climate is warming in ways that are globally disruptive
- Phenomena is caused by humans
- More CO2 in the atmosphere from burning of fossil fuels

Human Influence





Rate of Temperature Change in the United States, 1901–2015

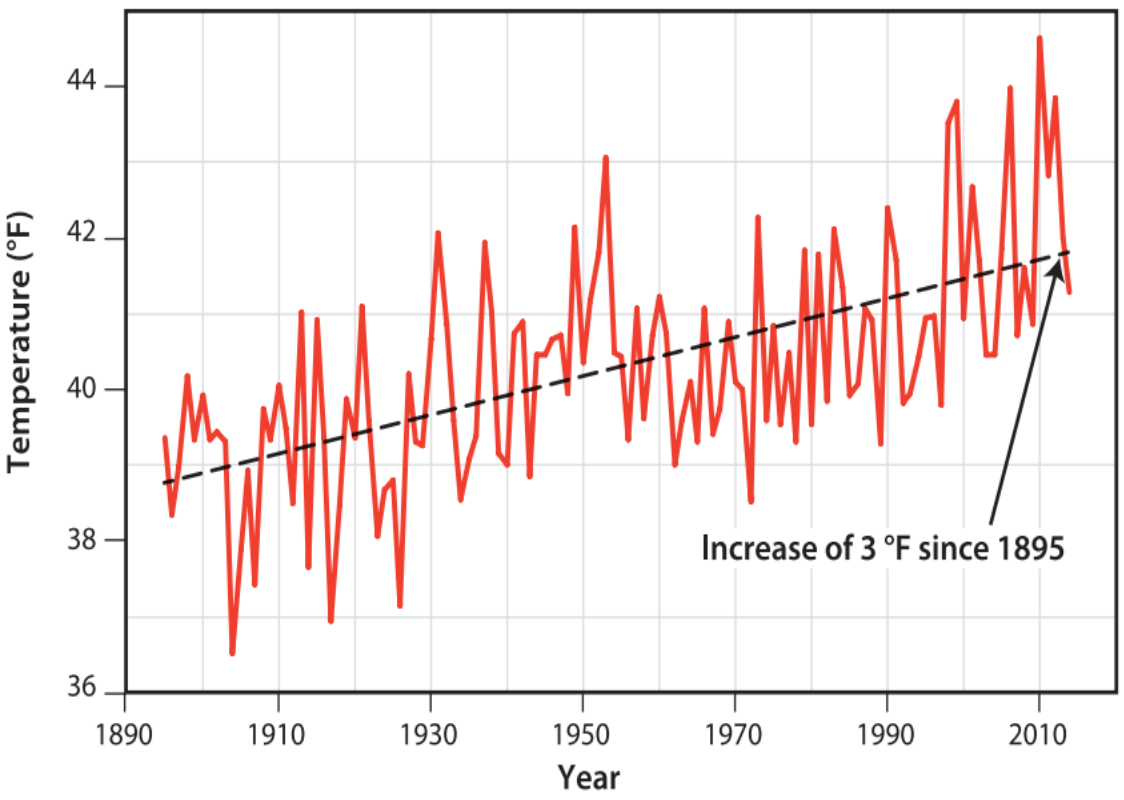


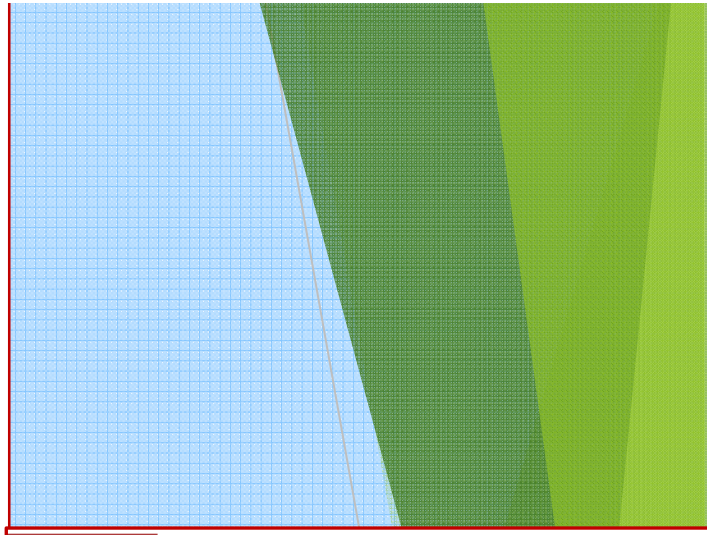
Rate of temperature change (°F per century):

-3.5 -3 -2 -1 0 1 2 3 3.5

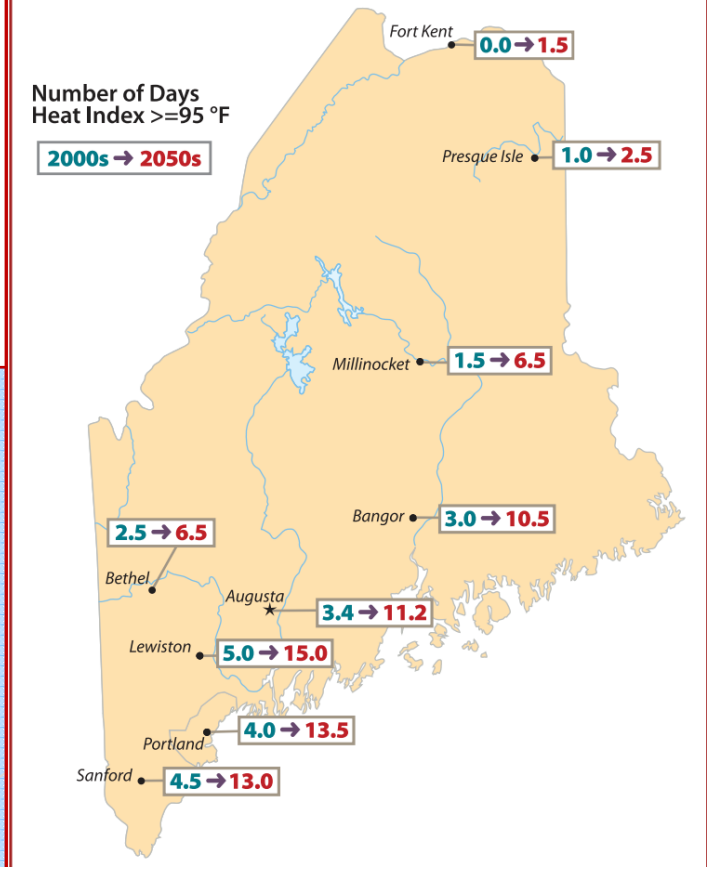
Gray interval: -0.1 to 0.1°F

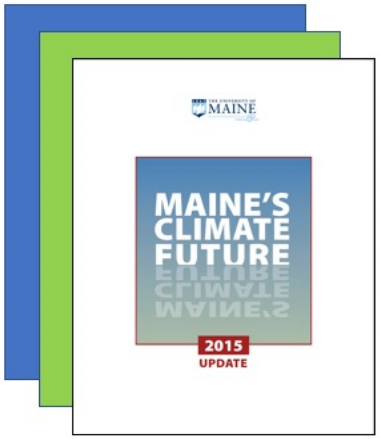
Maine's Average Annual Temperature





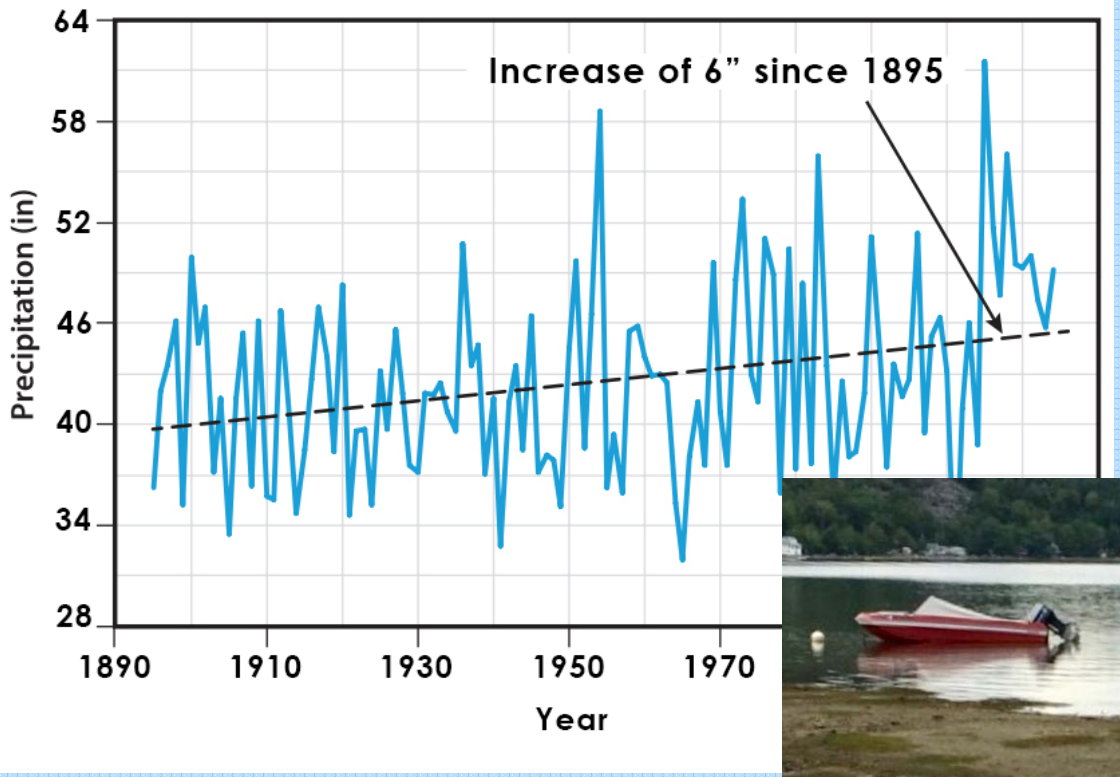
More Hot Days





www.climatechange.umaine.edu

Maine is getting warmer



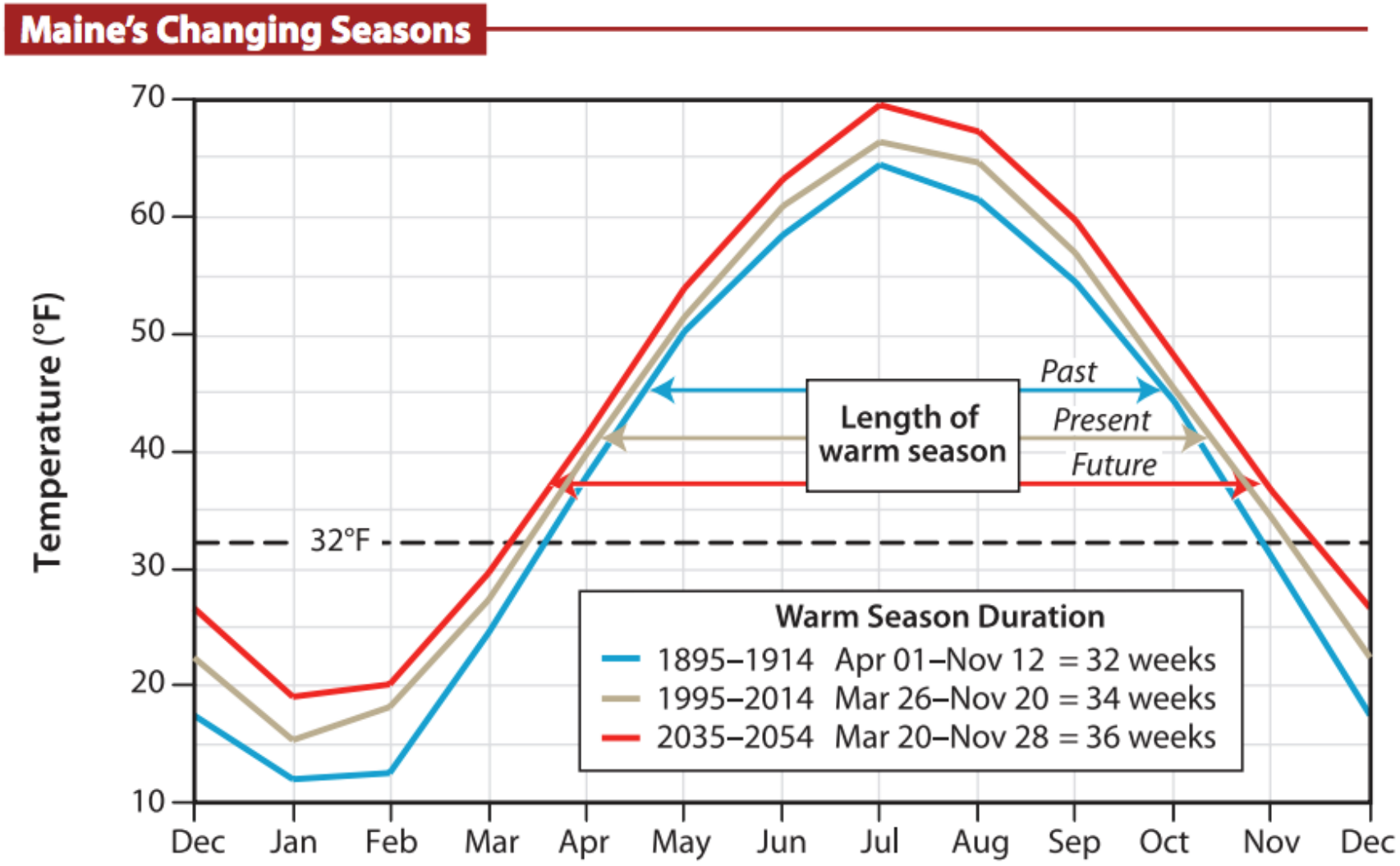
- **Wetter winters & springs**
- **Drier summers**

Swan Lake, Swanville, Sept. 2016

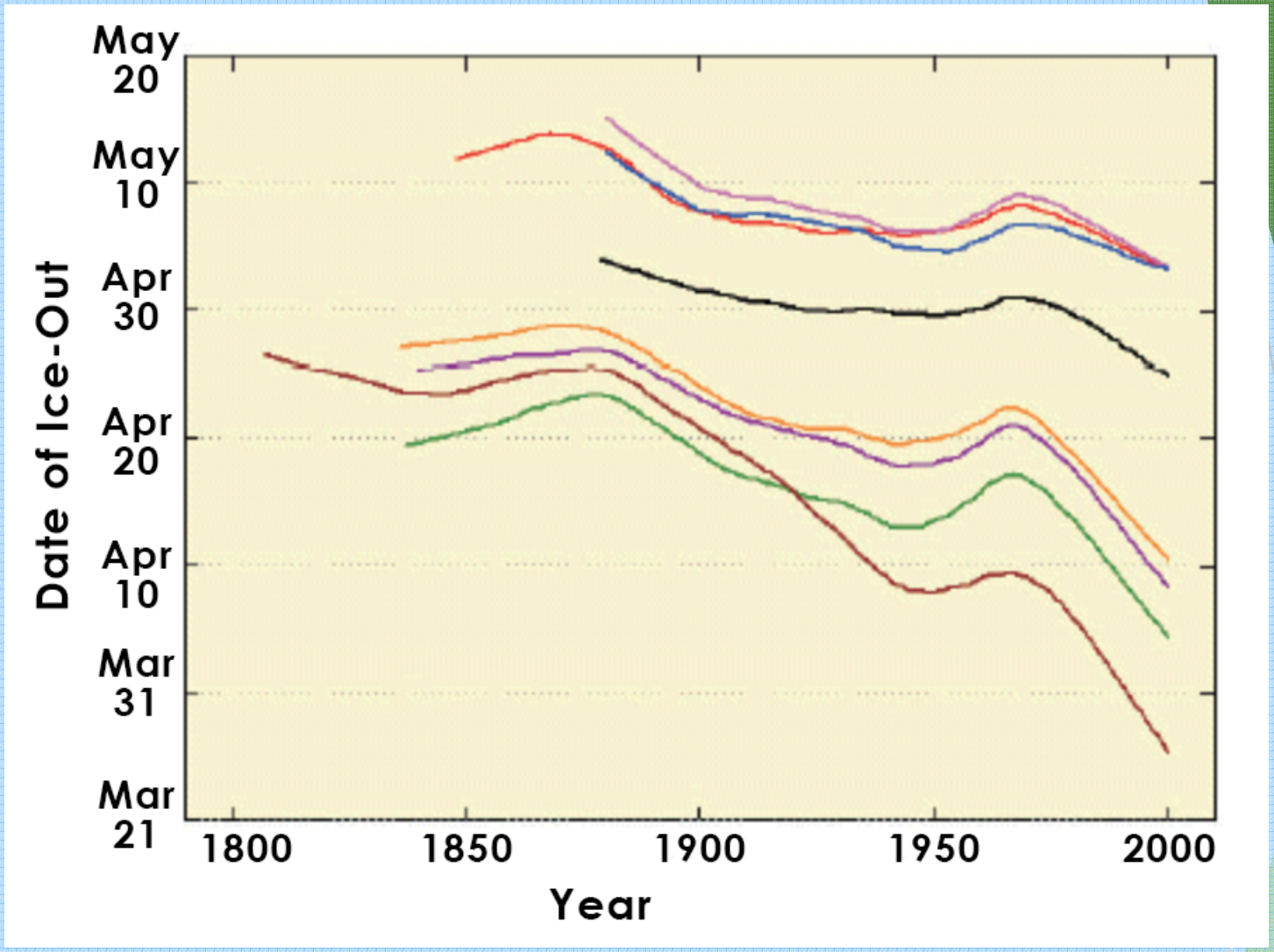
Pittston Maine, April 2016

Lisbon Maine, April 2019

More frequent extreme weather events (floods and droughts)



Growing seasons are getting longer



Shorter periods of ice cover on lakes

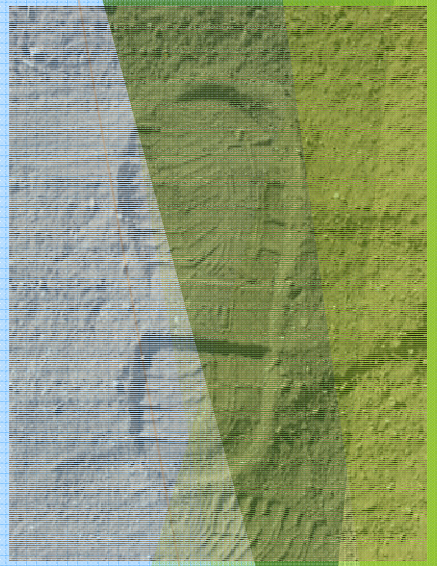
All Pose Challenges For Lakes

East Pond alum treatment, Smithfield, 2018

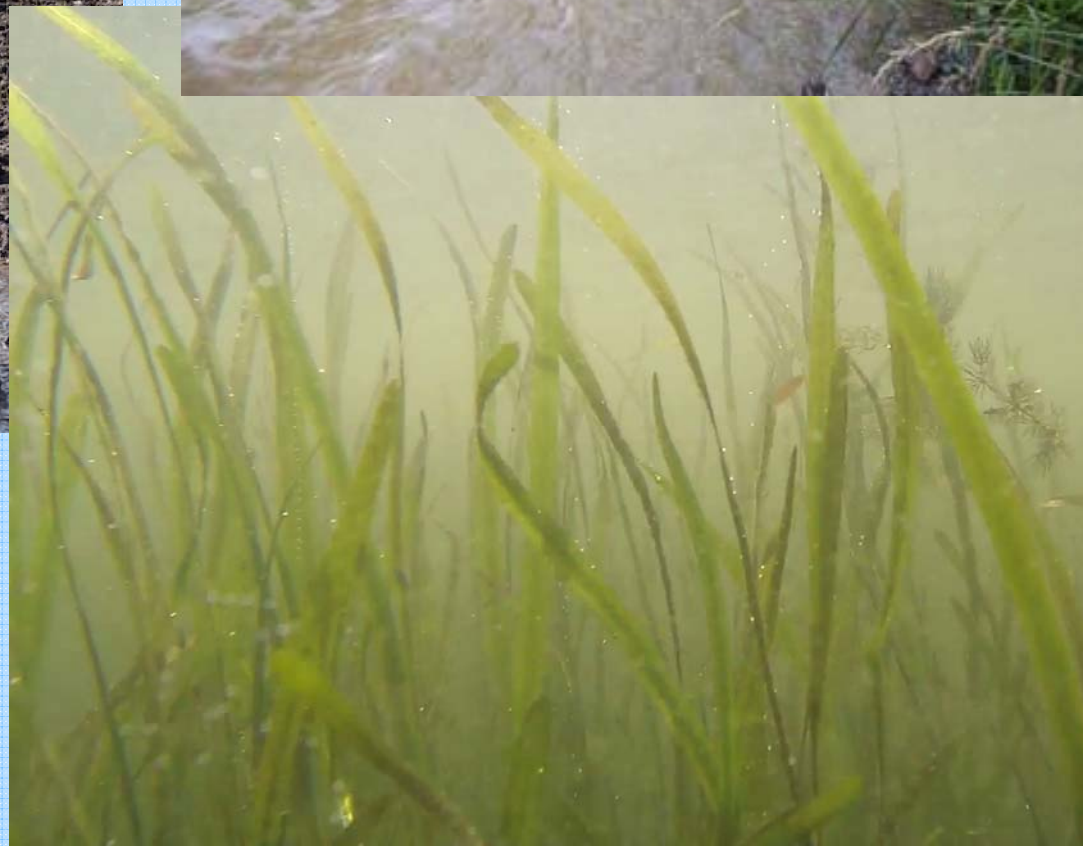
Higher Precipitation
in Winter & Spring

- **Water uptake by the trees & other vegetation in the watershed at minimum**
- **Increased runoff**
- **Higher risk of eroded soils and nutrients being washed into lakes**

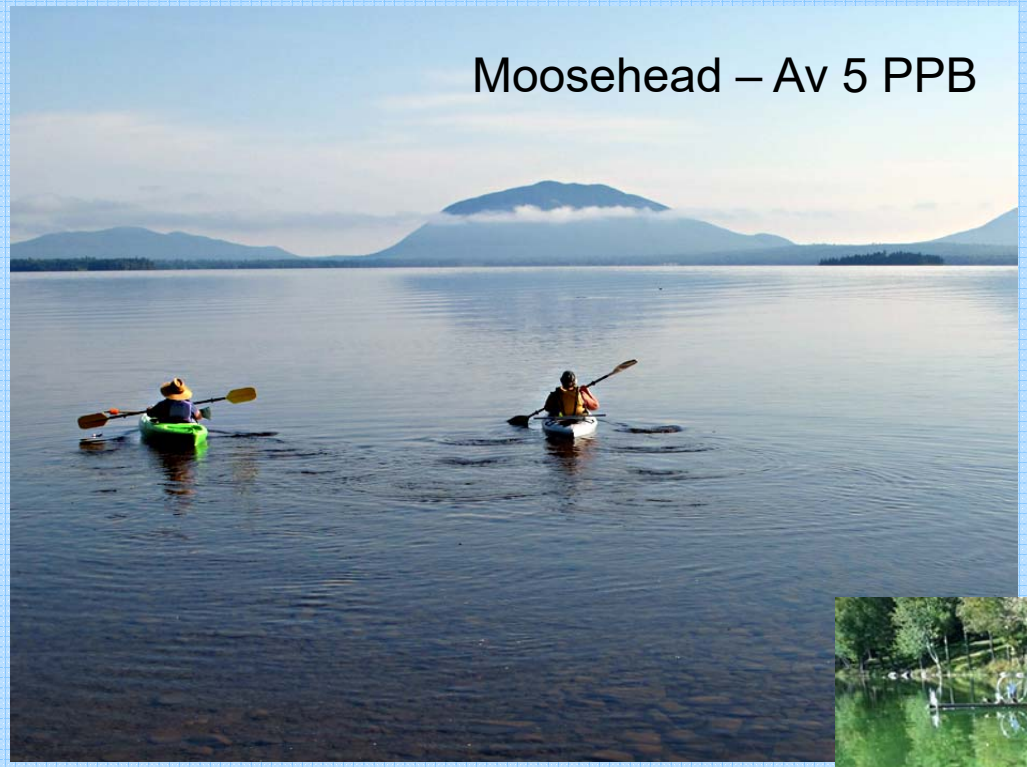
Runoff Challenges Exacerbated



- **Increased frequency of extreme weather events**
- **Torrential rains, floods, *and* periods of drought**
- **Drought makes some soils**
  - ✓ **more impermeable (and less absorptive),**
  - ✓ **others less consolidated, setting loose the finer particles**



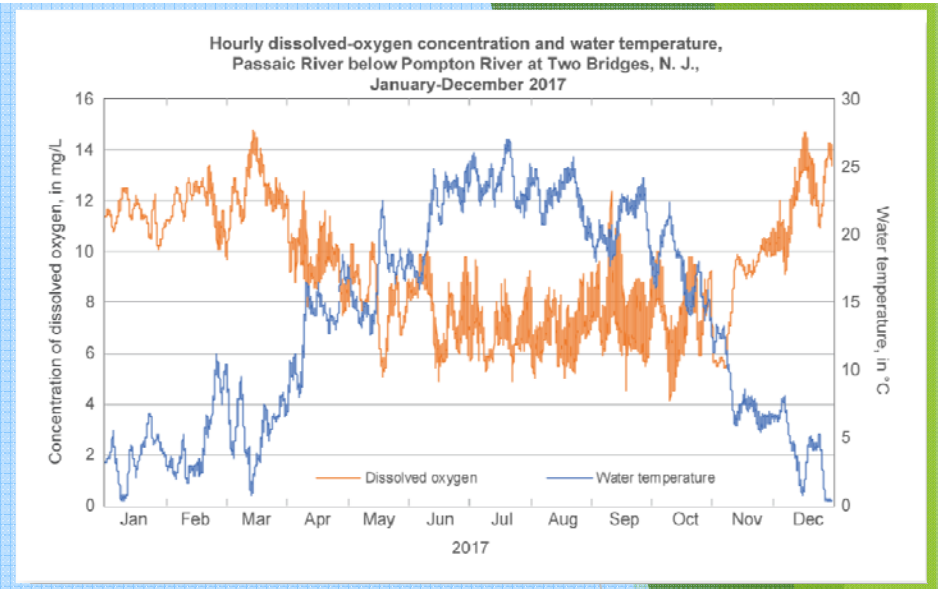
Fines most likely to carry phosphorus & sediment to lakes



Sabattus– Av 44 PPB

Phosphorus is the limiting factor for planktonic algal growth in most Maine lakes

Impacts on Biota & Invasive Species



- **Warmer water holds less dissolved oxygen**
- **Places stress on many native lake inhabitants**

FISH CONSUMPTION ADVISORY

Warning About Eating Freshwater Fish

Mercury in Maine freshwater fish may harm the babies of pregnant and nursing mothers, and young children.

- Pregnant and nursing women, women who may get pregnant, and children under age 8 **should not eat any** freshwater fish from Maine's inland waters. Except for brook trout and landlocked salmon, one meal per month is safe.
- All other adults and children older than 8 **can eat** two freshwater fish meals per month. For brook trout and landlocked salmon, the limit is one meal per week.

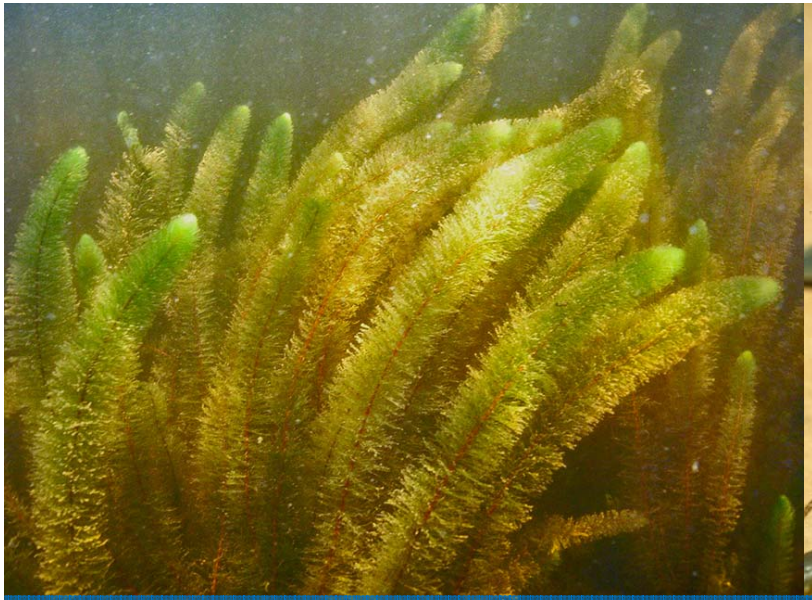
Warning: Some Maine waters are polluted, requiring additional limits to eating fish.

Fish caught in some Maine waters have high levels of PCBs, Dioxins or DDT in them. These chemicals can cause cancer and other health effects. The Maine CDC recommends additional fish consumption limits on the waters listed below. Remember to check the mercury guidelines. If the water you are fishing is listed below, check the mercury guideline above and follow the most limiting guidelines.

Warmer water:

- **Increases bioavailability of toxins such as lead and mercury**
- **Increases the risk that these toxins will be taken up in even greater quantities by aquatic life**

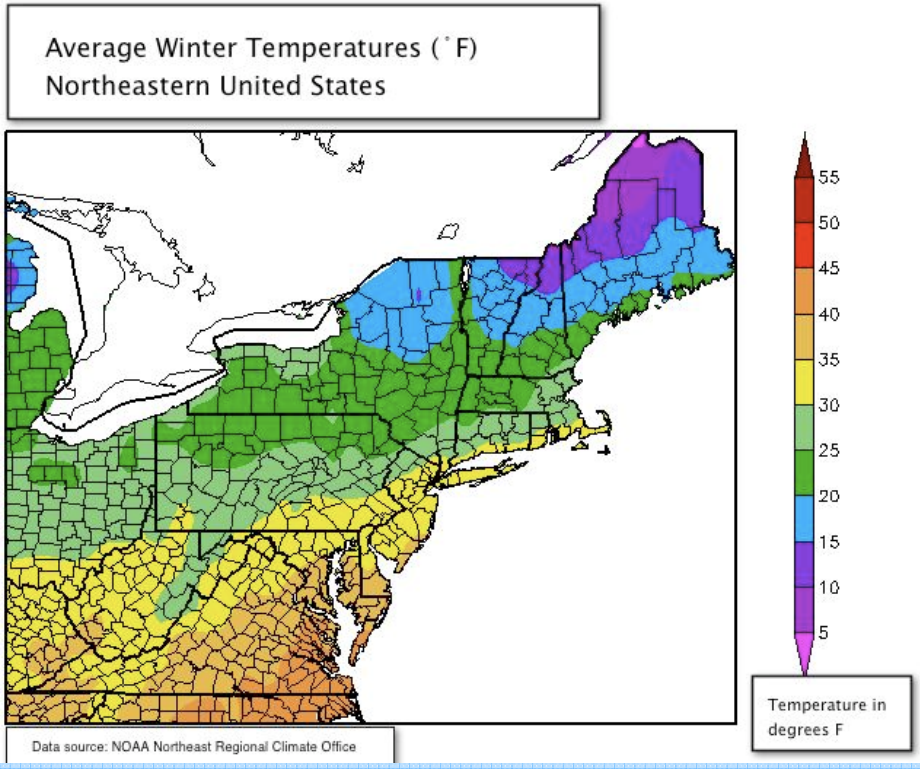

Somes-Meynell Wildlife Sanctuary

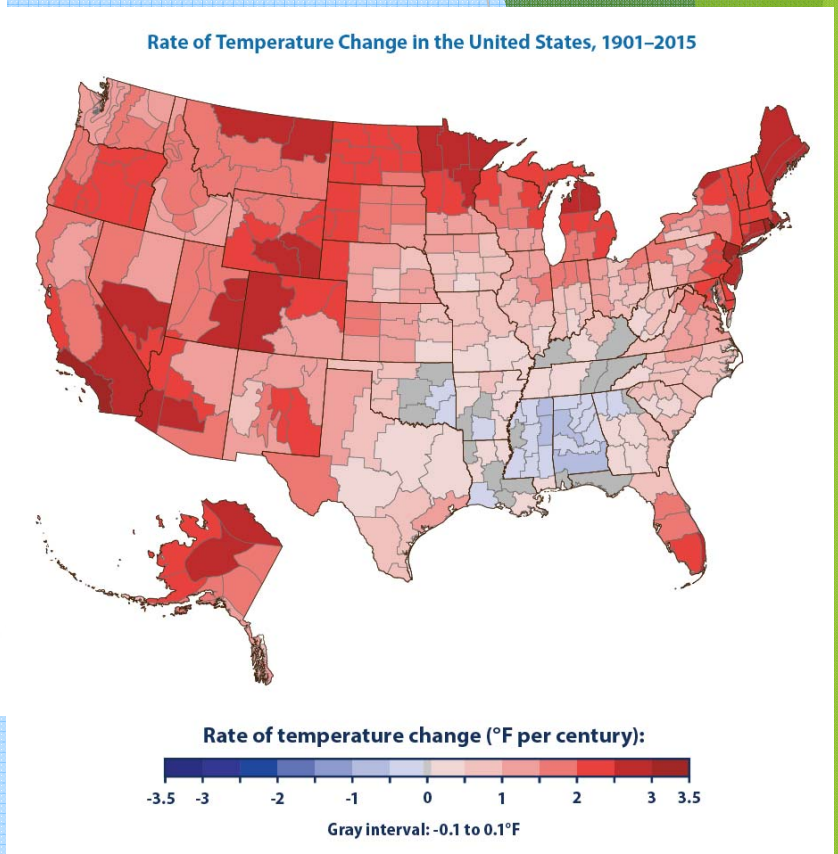


- **Organisms naturally adapted to a wide range of conditions (includes most aquatic invaders), will be most resilient**
- **Invaders will exploit new conditions to their advantage**

Cold water species will be disadvantaged in a warming Maine

Impacts on Aquatic Plants





- **The further north one is, the faster the annual minimum temperatures will warm**
- **Maine's winter minimums are provide natural protection for native plants and animals**

- Climate-driven range expansion already happening
- Implications for aquatic ecosystems are very serious

water hyacinth
Eichhornia crassipes

water primrose
Ludwigia peploides



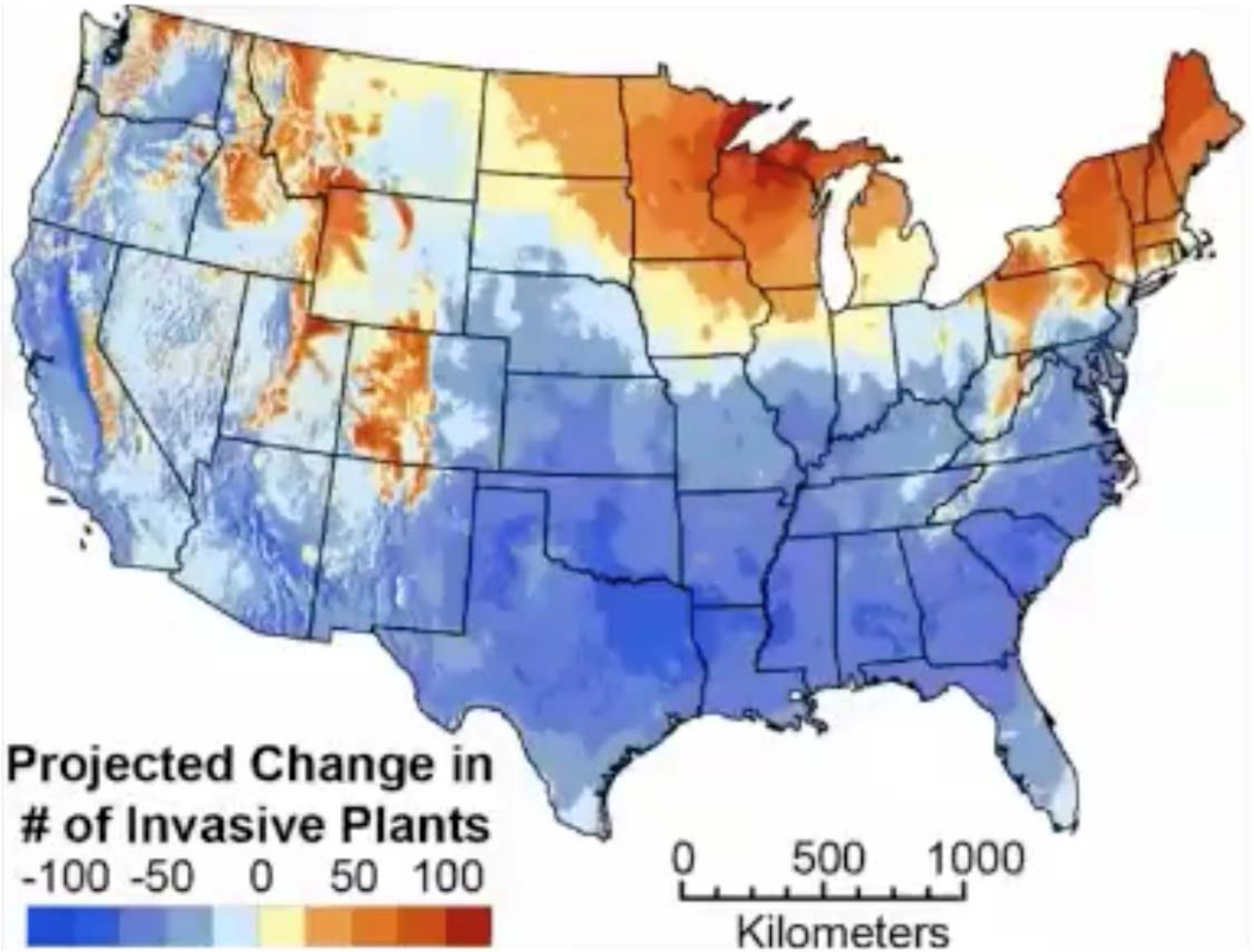


Maine's Invasive Aquatic Plants List

Eurasian watermilfoil
Hydrilla
European naiad
Curly leaf pondweed
Variable watermilfoil
European frogbit
Brazilian elodea
Fanwort
Parrot feather
Yellow floating heart
Water chestnut





Allen & Bradley, 2016

Hundreds of new plant species (terrestrial and aquatic) are headed our way

Forest Pests & Watersheds

Exceptional water quality found in many Maine lakes depends upon the health of heavily-forested lake watersheds

- Would not have been able to survive here few decades ago, when winters more severe
- With Maine's warming climate, cold-intolerant invader poised to decimate our hemlocks

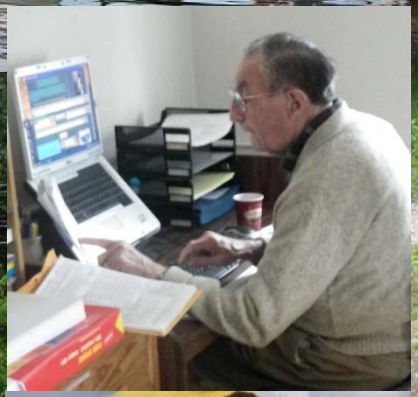
southern pine beetle

emerald ash borer

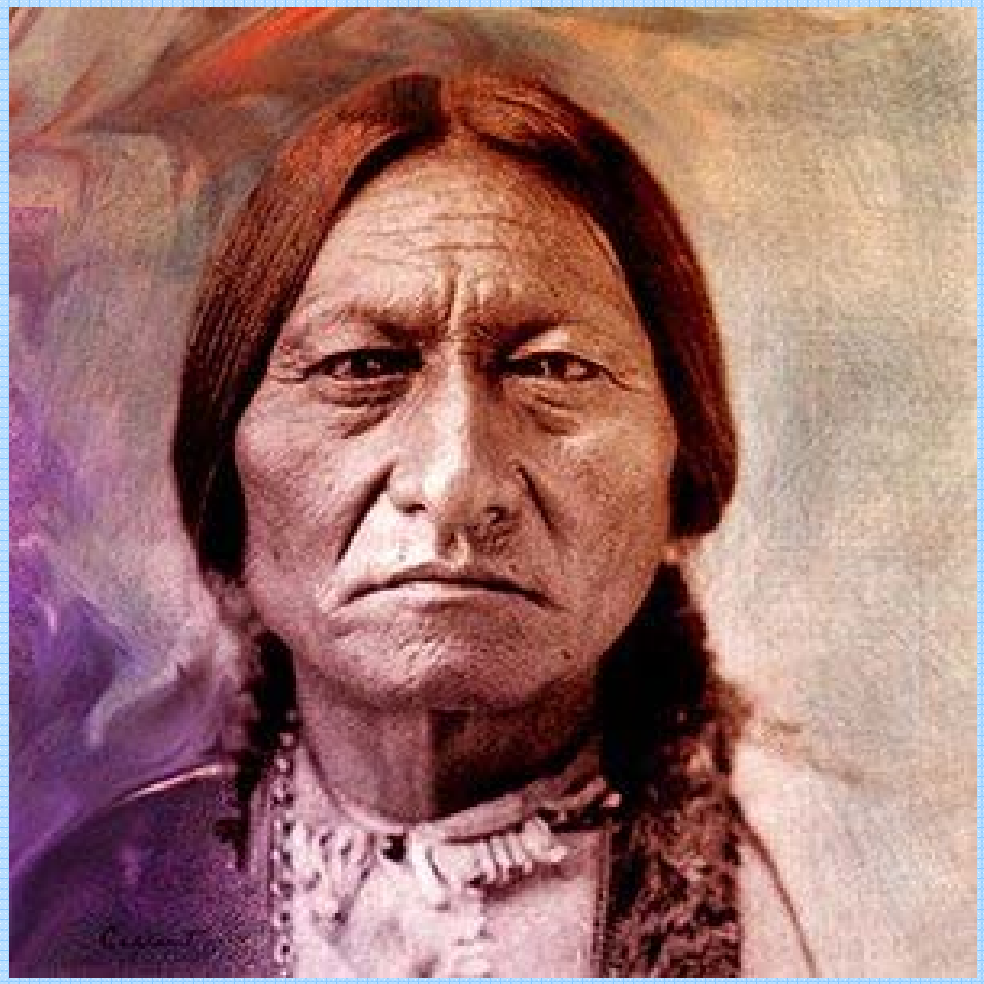
In Summary

Climate change is going to exacerbate (amplify, & accelerate) all threats to lakes

In addition to doing what we are already doing . . .




NRS



Let us put our minds together
to see what kind of future we can make for our children . . .

- Sitting Bull