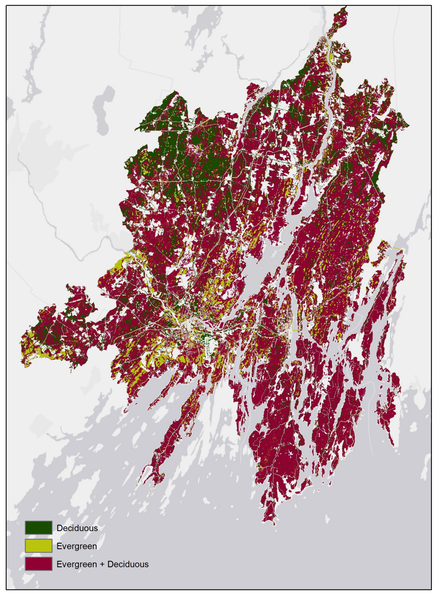
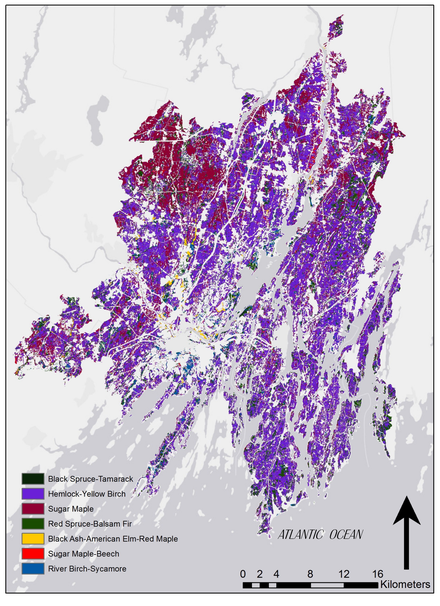
CLIMATE CHANGE VULNERABILITY IN MAINE FORESTS

Sagadahoc County and towns of Brunswick and Dresden

MAP 1: REGIONAL DECIDUOUS AND EVERGREEN FORESTS

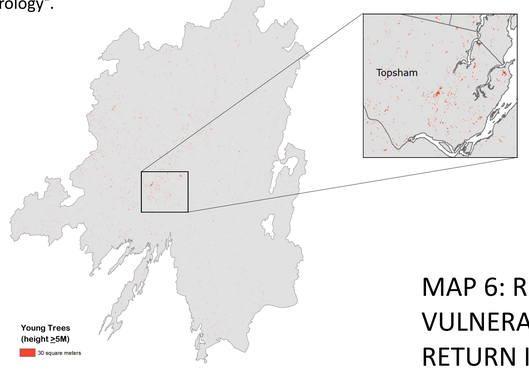


MAP 2: REGIONAL FOREST TYPES VULNERABLE TO CLIMATE CHANGE



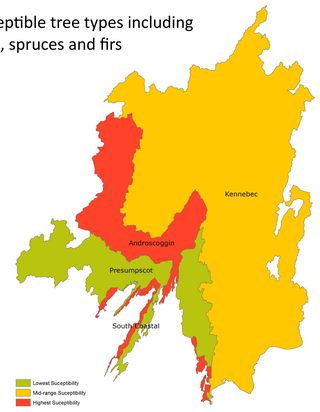
MAP 3: SUSCEPTIBLE AREAS BY FOREST AGE

Forest age is determined by height. Mapped points are 30 sq. meter areas with young trees determined by height of ≥5m. Watersheds with >30% of trees >20 feet are more vulnerable to alterations in natural hydrology[1].



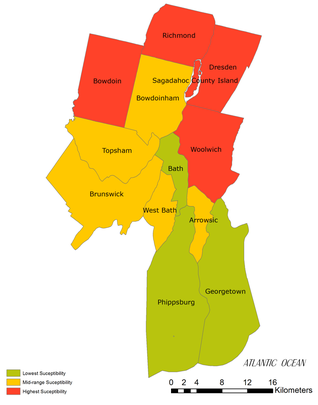
MAPS 4 : WATERSHED VULNERABILITY BASED ON VULNERABLE TREE TYPES

Density of susceptible tree types including maples, birches, spruces and firs

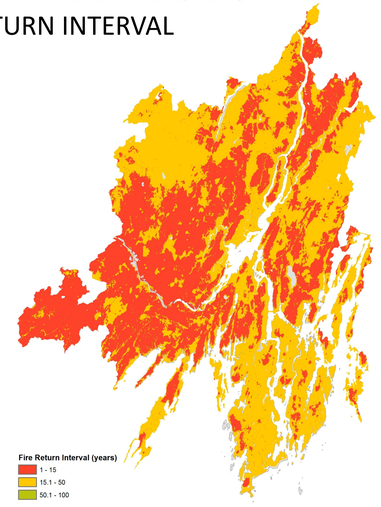


MAPS 5 : TOWN VULNERABILITY BASED ON VULNERABLE TREE TYPES

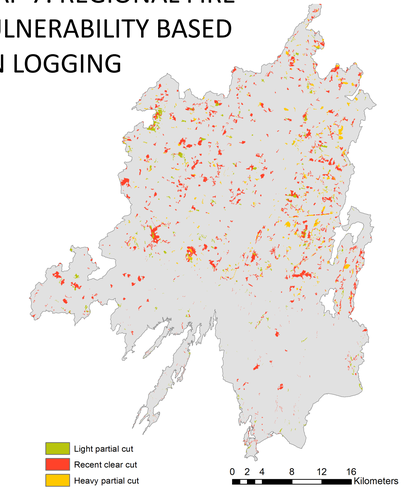
Density of susceptible tree types including maples, birches, spruces and firs



MAP 6: REGIONAL FIRE VULNERABILITY BASED ON FIRE RETURN INTERVAL



MAP 7: REGIONAL FIRE VULNERABILITY BASED ON LOGGING



CLIMATE CHANGE VULNERABILITY

With changing climates forests are responding to shifting seasons and weather patterns that produce drought and flood conditions. These changing factors affect soils, fire frequency, insect populations, stormwater, and biomass, among other ecosystem elements. These changes alter forest habitat and threaten ecosystem service functions – including recreation, timber, water filtration and carbon storage. Furthermore, the threat of increased wildfires is a significant concern to towns and property owners. Climate change vulnerability and resiliency in forests can be analyzed using a variety of variables. Using this analysis to gain an understanding of potential effects of climate change on forests may contribute to forest management tactics that can better address and mitigate changing conditions.

METHODOLOGY AND RESULTS

The study area includes Arroswic, Bath, Bowdoin, Bowdoinham, Richmond, Topsham, and Woolwich towns in Sagadaoch County in addition to Brunswick in Cumberland County and Dresden in Lincoln County. The study region also includes the Kennebec, Presumpscot, South Coastal and Androscoggin River watersheds. This is a preliminary analysis that begins to describe the state of the forests in this region based on several variables including:

Tree types vulnerable to climate change

For this analysis I mapped seven tree types defined by the Manomet Center for Conservation Science as especially susceptible to temperature changes (see *Map 2)*. I analyzed the vulnerable tree types using raster data with a 5 meter cell size. The map illustrates that Hemlock Yellow Birches are the dominant vulnerable tree type in the southern area of the region and Sugar Maples are the dominant vulnerable tree type in the Northwest corner of the region.

Maps 4 and *5* reveal the level of temperature change vulnerability within watershed and town boundaries based on their density of vulnerable tree types. The maps show that the Androscoggin watershed and northern towns are most vulnerable based solely on the density of vulnerable trees within their boundaries.

Vulnerable tree ages

Tree heights are used as a proxy for age. The literature states that forests with a higher density (threshold of >30%) of young trees (defined as >20 feet) are more vulnerable to alterations in natural hydrology[1]. For this analysis I used raster data with a 30 meter cell size and a height of ≥5 meters (16.4 ft) to determine young age. *Map 3* shows no vulnerable areas, as defined by town and watershed boundaries, in the study region. However, there is a notable cluster of young trees in the town of Topsham around Merrymeeting Bay.

Fire Return Interval

A fire return interval of >50 years is considered high risk forest by Manomet. When mapping the fire return interval data over the study region, I discovered that very little of the forest has a fire return variable of >50 years (see *Map 7*). I divided the high risk interval into 1-15 years and 15-50 to delineate the most frequent return variables within the high risk category.

Tree Cuts

Forest areas with clear cutting and heavy partial cutting are especially vulnerable to wetter conditions. *Map 7* shows areas in the region that have been recently clear-cut, lightly partially logged and heavily partially cut.

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Cartographer: Molly Cooney-Mesker
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Projection: NAD_1983_UTM_Zone_19N (5m) and NAD_1983_Albers (30m)

Data Sources: State of Maine - Vulnerable Tree Type (2004), County and Town boundaries (2011)
USDA - Watersheds (2010)
LandFire (US Government interagency mapping program), Fire, Tree Age Deciduous and Evergreen

[1] Roberts, J. 2001. Catchment and process studies in forest hydrology : implications for indicators of sustainable forest management. Pp. 259-310 In : Raison, R., A. brown, and D. Flinn (eds.) Criteria and Indicators for Sustainable Forest Management.. CAB International, New York, New York.