Climate Change Projections for Individual Tree Species
Landscape: Northern Wisconsin & Western Upper Michigan

Background:

Northern forests will be affected by climate change during the 21st century. A team of forest managers and researchers created a report that describes the vulnerability of forests in northern Wisconsin and western Upper Michigan (Janowiak et al. 2014). This report includes information on the current landscape, observed climate trends, and a range of projected future climates. It also describes many potential climate change impacts to forests, and summarizes key vulnerabilities for nine major forest types. This handout is summarized from the full report.

Tree Species Information:

This assessment uses two climate scenarios to "bracket" a range of possible futures. More information about these scenarios can be found in chapters 2 and 4 of the assessment.

The future climate projections were used to run forest impact models (Tree Atlas and LANDIS), which provide information about individual tree species. More information about these forest impact models and the full results can be found in chapters 2 and 5 of the assessment. Results for "low" and "high" climate scenarios can be compared side-by-side in this handout.

It's important to remember that models are just tools, and they're not perfect. For example, model projections don't account for some factors that could be modified by a changing climate, like droughts and floods, wildfire activity, and changes in invasive species or pests. If a species is rare or confined to a small area, the Tree Atlas results may have lower reliability. These factors, and others, could cause a particular species to perform better or worse than a model projects.

Despite these limits, models can provide useful information about future expectations. The model results presented here were combined with information from published reports and local management expertise to draw conclusions about potential risk and change in Wisconsin and Michigan's forests.

Generally expected to decrease
These species are projected to decline 20% or more in suitable habitat (as modeled by Tree Atlas) and 20% or more in landscape-level biomass (as modeled by LANDIS).

Low Climate Change Scenario (PCM B1)		High Climate Change Scenario (GFDL A1FI)		
Balsam fir	Quaking aspen	**Balsam fir**	Jack pine	Striped maple*
Black spruce	Rock elm*	Black ash	**Mountain maple***	Sugar maple
Eastern redbud*	White spruce	**Black spruce**	Northern white-cedar	Tamarack*
Mountain maple*	Wild plum*~	**Butternut*~**	**Paper birch**	**White spruce**
Paper birch		**Chokecherry*~**	**Pin cherry***	**Yellow birch**
		Eastern white pine	**Quaking aspen**	

Little expected change
These species are projected to change less than 20% in suitable habitat (as modeled by Tree Atlas) and landscape-level biomass (as modeled by LANDIS).

Low Climate Change Scenario (PCM B1)			High Climate Change Scenario (GFDL A1FI)
Bigtooth aspen	Northern white-cedar	Sugar maple	Green ash
Chokecherry*~	Pin cherry*	Swamp white oak*	Northern red oak
Eastern white pine	Red maple	Tamarack*	Red pine
Ironwood*	Red pine	Yellow birch	
Jack pine	Striped maple*		
Northern red oak			

Bold = Substantial declines projected (>50%); *modeled by Tree Atlas only; ~ low reliability species in Tree Atlas

Generally expected to increase

These species are projected to increase 20% or more in suitable habitat (as modeled by Tree Atlas) and 20% or more in landscape-level biomass (as modeled by LANDIS).

Low Climate Change Scenario (PCM B1)			High Climate Change Scenario (GFDL A1FI)		
American beech	**Black willow***~	**Red mulberry***~	American basswood	**Black walnut***	**Red mulberry***~
American elm*	Boxelder*	**River birch**+~	American beech	**Black willow***~	**River birch***~
American hornbeam*	Bur oak	**Shagbark hickory***	**American elm***	Boxelder*	**Shagbark hickory***
Bitternut hickory~	Butternut*~	**Silver maple***	**American hornbeam***	Bur oak	**Silver maple***
Black ash	**Eastern cottonwood***~	**Slippery elm***	**Bitternut hickory**~	**Eastern cottonwood***~	**Slippery elm***
Black locust*~	Eastern hemlock	White ash	Black cherry	**Eastern redbud***	Swamp white oak*~
Black oak	**Hackberry***	White oak	**Black locust***~	**Hackberry***	White ash
Black walnut*			**Black oak**	Ironwood*	**White oak**
				Peachleaf willow*~	**Wild plum***~

Bold = Substantial (>100%) increases projected; *modeled by Tree Atlas only; ~ low reliability species in Tree Atlas

Expected to have new habitat

These species are projected to have new suitable habitat in the region by the end of the century. These species were only modeled by Tree Atlas.

Low Climate Change Scenario (PCM B1)			High Climate Change Scenario (GFDL A1FI)		
Chinkapin oak	Mockernut hickory	Sassafras	Black hickory	Gray birch	Sassafras
Eastern redcedar	Ohio buckeye~	Scarlet oak	Blackgum	Honeylocust~	Scarlet oak
Flowering dogwood	Osage-orange	Shingle oak	Blackjack oak	Mockernut hickory	Shellbark hickory~
Gray birch	Pignut hickory	Sweet birch	Chestnut oak	Northern catalpa~	Shingle oak
Honeylocust~	Pin oak	Sycamore	Chinkapin oak	Ohio buckeye~	Sugarberry
	Post oak	Yellow-poplar	Common persimmon	Osage-orange	Sweet birch
			Eastern redcedar	Pignut hickory	Sweetgum
			Flowering dogwood	Pin oak	Sycamore
				Post oak	Yellow-poplar

~ low reliability species in Tree Atlas

Species with greater uncertainty

Forest impact models projected different trends for the following species. Results are presented in the form of (Tree Atlas/LANDIS).

Low Climate Change Scenario (PCM B1)	High Climate Change Scenario (GFDL A1FI)
American basswood (0/++)	Balsam poplar (0/--)
Balsam poplar (--/0)	Bigtooth aspen (0/--)
Black cherry (++/0)	Eastern hemlock (0/--)
Green ash (-/+)	Northern pin oak (0/++)
Northern pin oak (0/++)	Red maple (-/+)

++: greater than 100% increase; +: greater than 20% increase; 0: change <20%; – :greater than 20% decrease; – – : greater than 50% decrease