Tools to inform management decisions

USFS Tree Atlas online tool
www.fs.usda.gov/nrs/atlas/tree/

Tree habitat is expected to shift due to climate change

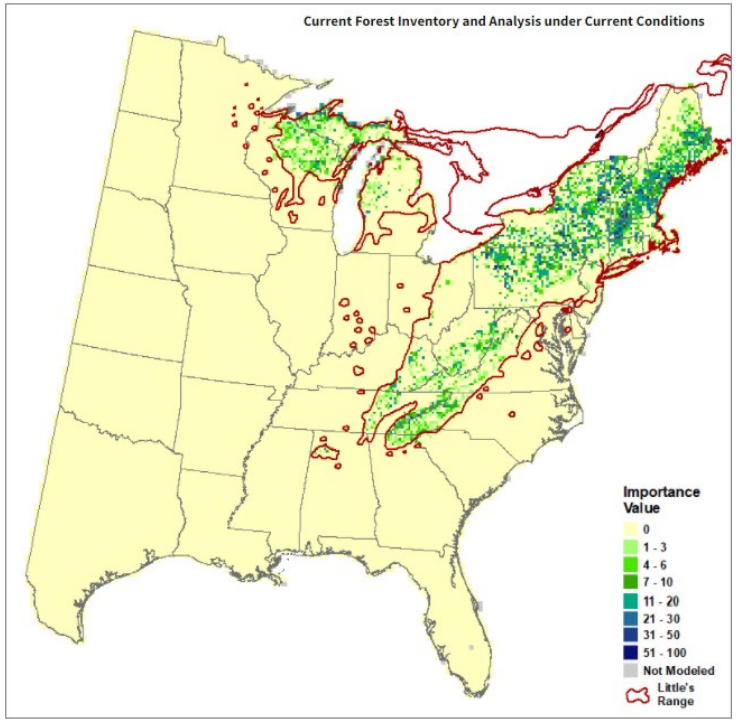
Eastern Hemlock habitat

Current (present day, based on USFS FIA)

Importance Value

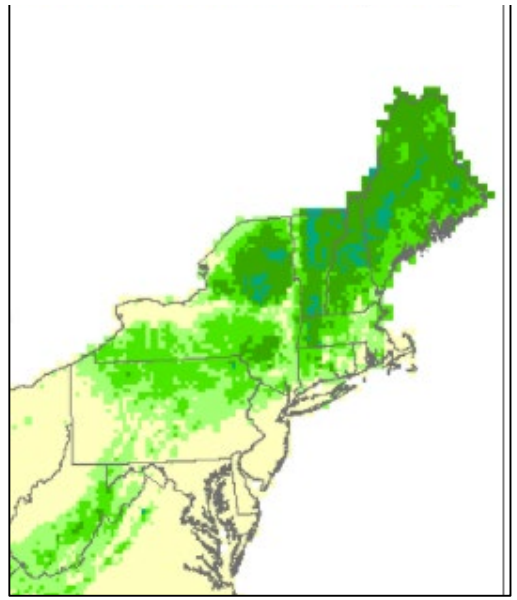
Low

High



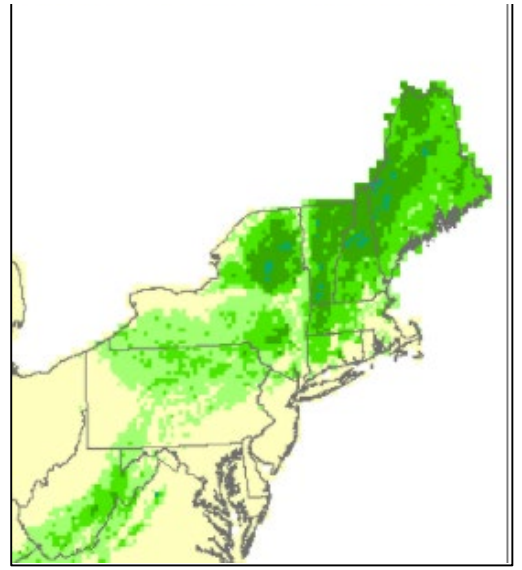
Low emissions (less warming)

2070-2100 Low (less warming)



High emissions (very warm)

2070-2100 High (very warm)



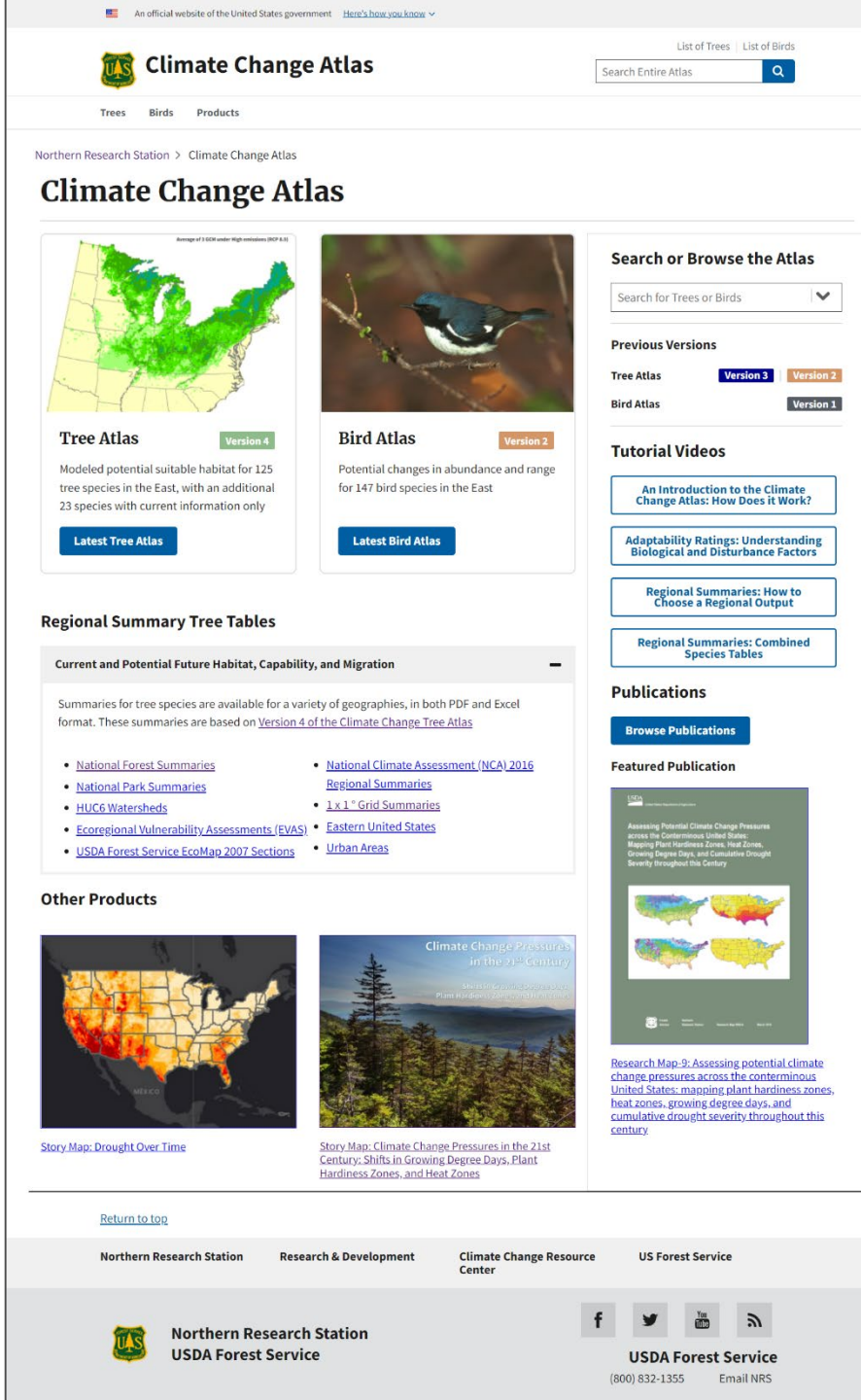
Images from the US Forest Service Tree Atlas tool.

Visit: www.fs.usda.gov/nrs/atlas/tree/

Climate Change Tree Atlas

- A tool used to describe tree habitat distribution and colonization under changed climate.
- Model results for 125 tree species (and relative abundance for 24 tree species)
- Information about colonization potential (SHIFT) and overall ability to tolerate future conditions (Capability)
- New tutorials and explanations throughout the site.

www.fs.usda.gov/nrs/atlas/tree/



Climate Change Tree Atlas: Data Summaries

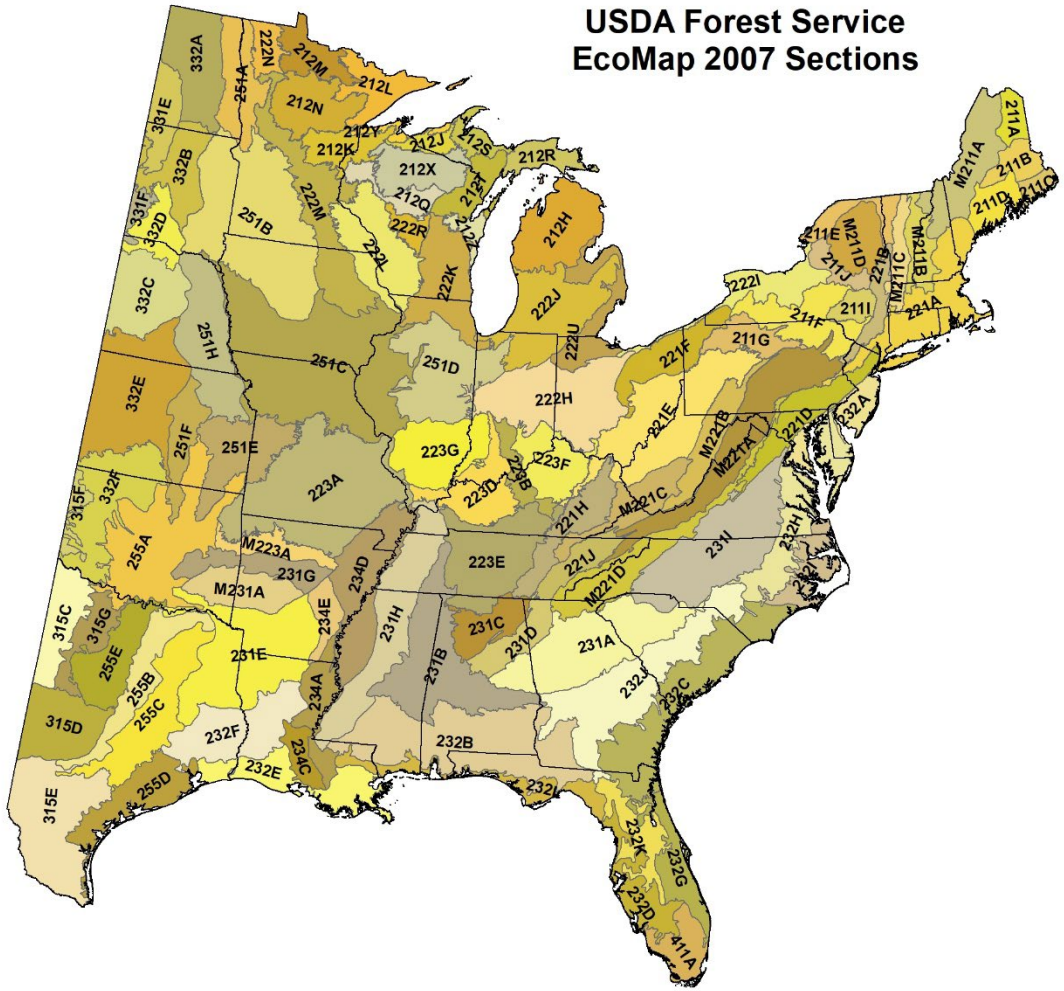
Summaries describe tree-species trends

- Tabular, excel documents

Tree species specific information

- FIA data
- Climate projected habitat
- Projected capability to thrive
- And more!

Note: Rare, nonnative, or cultivar species are likely not included in these results.

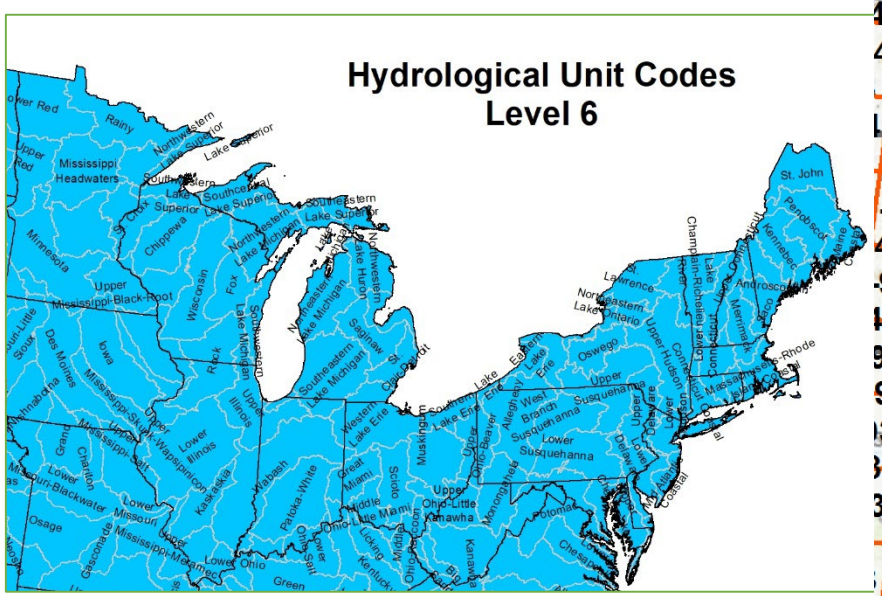


www.fs.usda.gov/nrs/atlas/tree/

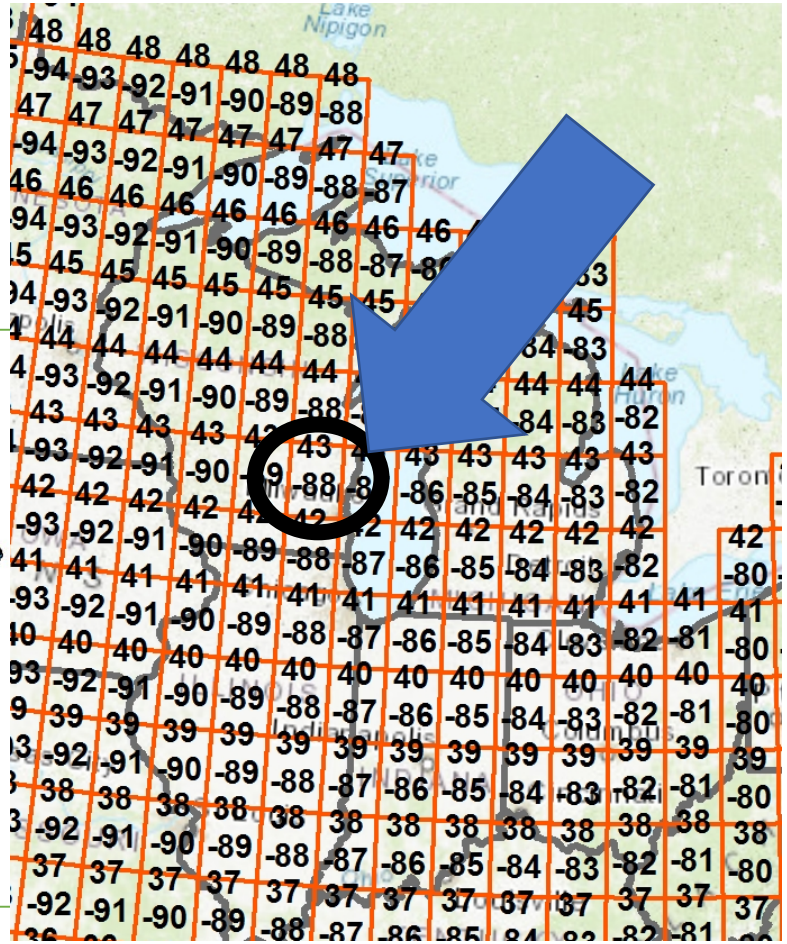
Climate Change Tree Atlas: Data Summaries

Summary results are available for:

- 1x1 degree grid
- Eco-sections
- HUC 6 Watersheds
- Urban Areas
- National Forests
- National parks



Grid 1x1 Degree summaries



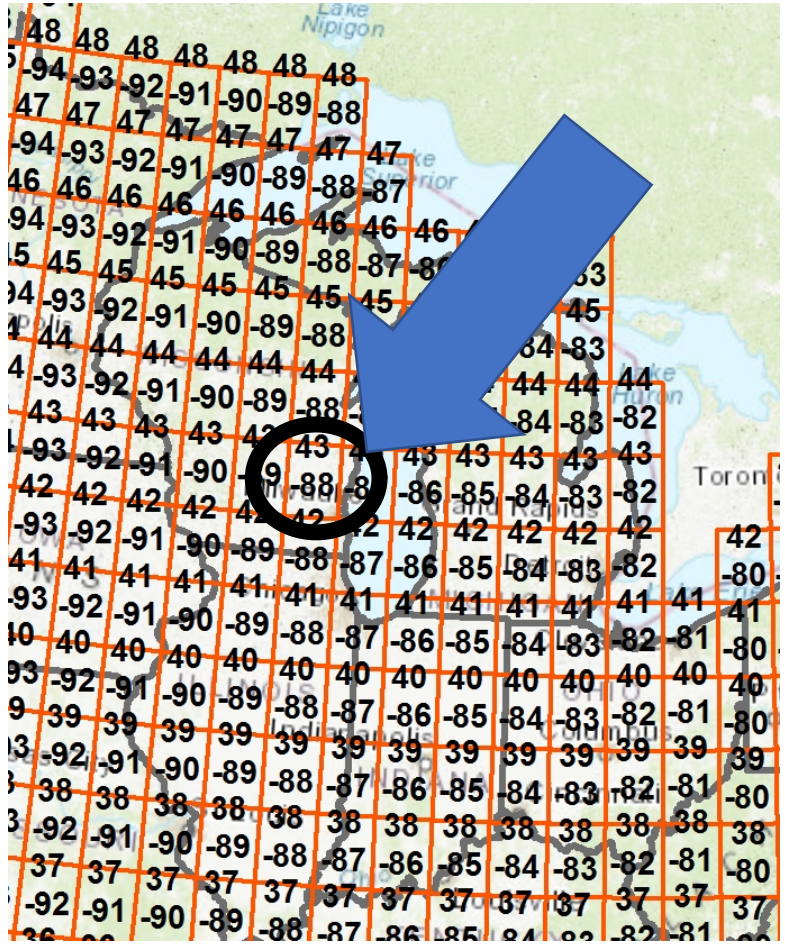
www.fs.usda.gov/nrs/atlas/tree/

Climate Change Tree Atlas: Data Summaries

Let's look at results for your area!

- Tree Atlas summary for lat. 43, long. 88
- Estimate of the capability of species to cope with the changing climate (in HIGH emissions scenario (RCP 8.5))

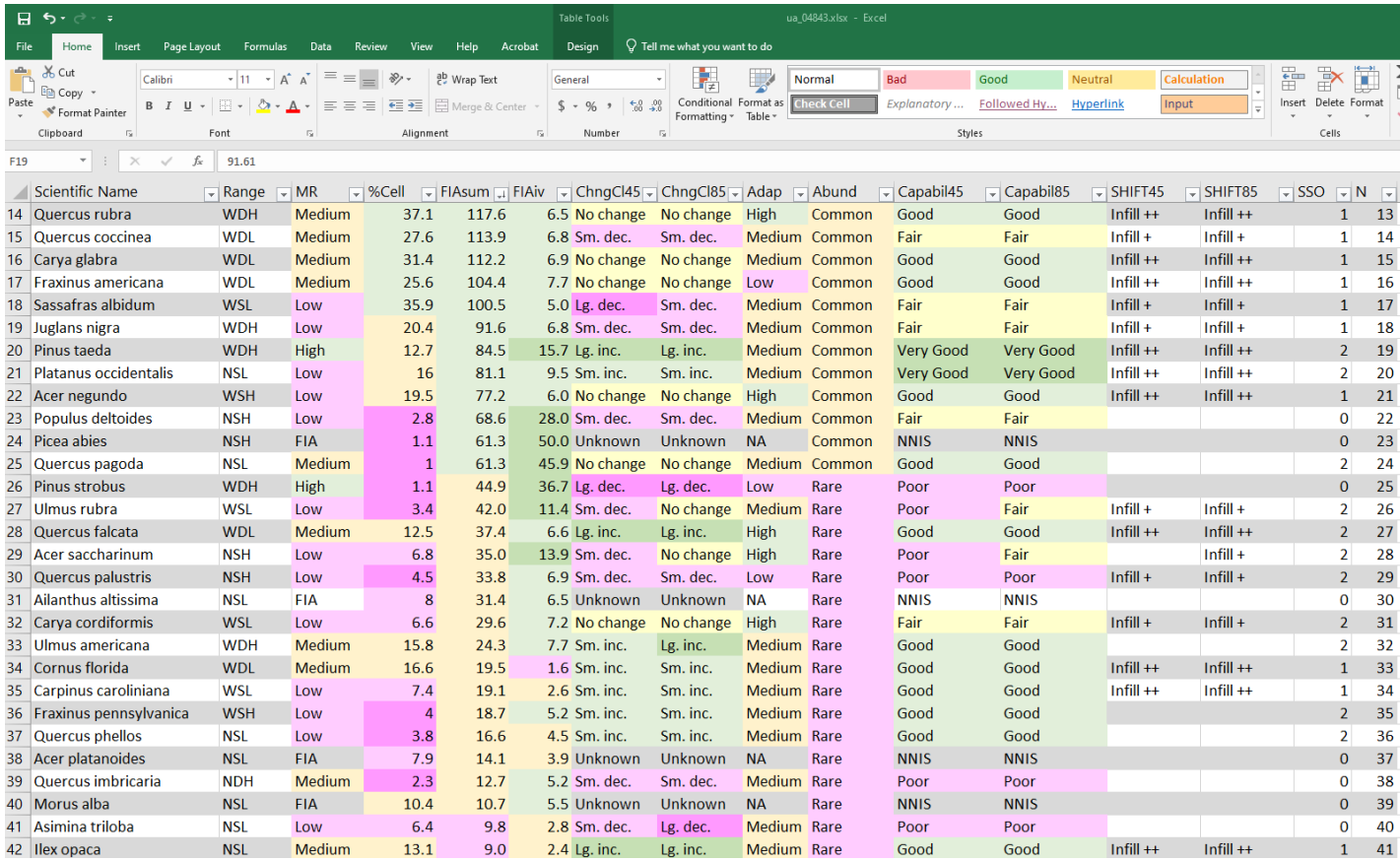
Note: Rare, nonnative, or cultivar species are likely not included in these results.



www.fs.usda.gov/nrs/atlas/tree/

Climate Change Tree Atlas: Data Summaries

- Common and scientific names
- Range
- Model reliability
- FIA sum
- Habitat change class
- Adaptability
- Capability
- SHIFT



	Scientific Name	Range	MR	%Cell	FIAsum	FIAiv	ChngCl45	ChngCl85	Adap	Abund	Capabil45	Capabil85	SHIFT45	SHIFT85	SSO	N
14	Quercus rubra	WDH	Medium	37.1	117.6	6.5	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	13
15	Quercus coccinea	WDL	Medium	27.6	113.9	6.8	Sm. dec.	Sm. dec.	Medium	Common	Fair	Fair	Infill +	Infill +	1	14
16	Carya glabra	WDL	Medium	31.4	112.2	6.9	No change	No change	Medium	Common	Good	Good	Infill ++	Infill ++	1	15
17	Fraxinus americana	WDL	Medium	25.6	104.4	7.7	No change	No change	Low	Common	Good	Good	Infill ++	Infill ++	1	16
18	Sassafras albidum	WSL	Low	35.9	100.5	5.0	Lg. dec.	Sm. dec.	Medium	Common	Fair	Fair	Infill +	Infill +	1	17
19	Juglans nigra	WDH	Low	20.4	91.6	6.8	Sm. dec.	Sm. dec.	Medium	Common	Fair	Fair	Infill +	Infill +	1	18
20	Pinus taeda	WDH	High	12.7	84.5	15.7	Lg. inc.	Lg. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	2	19
21	Platanus occidentalis	NSL	Low	16	81.1	9.5	Sm. inc.	Sm. inc.	Medium	Common	Very Good	Very Good	Infill ++	Infill ++	2	20
22	Acer negundo	WSH	Low	19.5	77.2	6.0	No change	No change	High	Common	Good	Good	Infill ++	Infill ++	1	21
23	Populus deltoides	NSH	Low	2.8	68.6	28.0	Sm. dec.	Sm. dec.	Medium	Common	Fair	Fair			0	22
24	Picea abies	NSH	FIA	1.1	61.3	50.0	Unknown	Unknown	NA	Common	NNIS	NNIS			0	23
25	Quercus pagoda	NSL	Medium	1	61.3	45.9	No change	No change	Medium	Common	Good	Good			2	24
26	Pinus strobus	WDH	High	1.1	44.9	36.7	Lg. dec.	Lg. dec.	Low	Rare	Poor	Poor			0	25
27	Ulmus rubra	WSL	Low	3.4	42.0	11.4	Sm. dec.	No change	Medium	Rare	Poor	Fair	Infill +	Infill +	2	26
28	Quercus falcata	WDL	Medium	12.5	37.4	6.6	Lg. inc.	Lg. inc.	High	Rare	Good	Good	Infill ++	Infill ++	2	27
29	Acer saccharinum	NSH	Low	6.8	35.0	13.9	Sm. dec.	No change	High	Rare	Poor	Fair		Infill +	2	28
30	Quercus palustris	NSH	Low	4.5	33.8	6.9	Sm. dec.	Sm. dec.	Low	Rare	Poor	Poor	Infill +	Infill +	2	29
31	Ailanthus altissima	NSL	FIA	8	31.4	6.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	30
32	Carya cordiformis	WSL	Low	6.6	29.6	7.2	No change	No change	High	Rare	Fair	Fair	Infill +	Infill +	2	31
33	Ulmus americana	WDH	Medium	15.8	24.3	7.7	Sm. inc.	Lg. inc.	Medium	Rare	Good	Good			2	32
34	Cornus florida	WDL	Medium	16.6	19.5	1.6	Sm. inc.	Sm. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	33
35	Carpinus caroliniana	WSL	Low	7.4	19.1	2.6	Sm. inc.	Sm. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	34
36	Fraxinus pennsylvanica	WSH	Low	4	18.7	5.2	Sm. inc.	Sm. inc.	Medium	Rare	Good	Good			2	35
37	Quercus phellos	NSL	Low	3.8	16.6	4.5	Sm. inc.	Sm. inc.	Medium	Rare	Good	Good			2	36
38	Acer platanoides	NSL	FIA	7.9	14.1	3.9	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	37
39	Quercus imbricaria	NDH	Medium	2.3	12.7	5.2	Sm. dec.	Sm. dec.	Medium	Rare	Poor	Poor			0	38
40	Morus alba	NSL	FIA	10.4	10.7	5.5	Unknown	Unknown	NA	Rare	NNIS	NNIS			0	39
41	Asimina triloba	NSL	Low	6.4	9.8	2.8	Sm. dec.	Lg. dec.	Medium	Rare	Poor	Poor			0	40
42	Ilex opaca	NSL	Medium	13.1	9.0	2.4	Lg. inc.	Lg. inc.	Medium	Rare	Good	Good	Infill ++	Infill ++	1	41

www.fs.usda.gov/nrs/atlas/tree/

Tree Atlas summary for 43,88 (1x1): Estimate of the capability of species to cope with the changing climate (in HIGH emissions RCP 8.5 scenario)

Lost
white spruce
pin cherry
serviceberry

Very Poor
red pine
eastern white pine
black ash
American beech
paper birch
black spruce
American hornbeam; musclewood

Poor
American basswood*
black cherry*
black willow*
tamarack (native)*
northern white-cedar
bigtooth aspen
black locust*
northern pin oak*
yellow birch*

**** Star species:*** *A species currently present and likely to* ***spread out within the zone****. Strength of signal *, ***

Fair
white ash*
red mulberry*

Results show "Capability" of species in the RCP 8.5 (High emissions scenario)

Estimate of capability for the species to cope with the changing climate, at RCP 8.5, within the study area.

Based on its current abundance (Abund) within the zone, change class (ChngCl85), and adaptability (Adap).

Ranks are coded Very Good, Good, Fair, Poor, Very Poor, Unknown (insufficient data to model), and New Habitat (potential to migrate into the zone).
https://www.fs.fed.us/nrs/atlas/combined/resources/summaries/ecomap/

Very Good
bitternut hickory**
black walnut**
bur oak**
white oak**
silver maple**
red maple**
eastern hophornbeam; ironwood**

Good
green ash**
American elm**
Boxelder**
sugar maple**
northern red oak**
quaking aspen**
shagbark hickory**
eastern cottonwood**
slippery elm**
black oak**
hackberry
eastern redcedar
swamp white oak

**** Star and bolded species:*** *A species currently present and likely to* ***spread out within the zone****. Strength of signal *, ***

New Habitat
Ohio buckeye
Cittamwood/gum bumelia
Pignut hickory*
Black hickory
Mockernut hickory*
Eastern redbud*
Common persimmon
Honeylocust*
Yellow-poplar*
Osage-orange*
Sycamore*
Shingle oak*
Blackjack oak
Chinkapin oak*
Pin oak*
Shumard oak
Post oak**
Sassafras*

Bolded species: *A species not reported in the zone but has* ***potential to migrate*** *within the next 100 years, could be considered a candidate for translocation Strength of signal *, ***

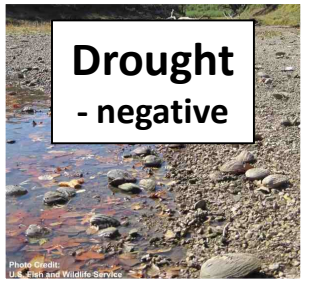
Climate Change Tree Atlas: Modifying factors

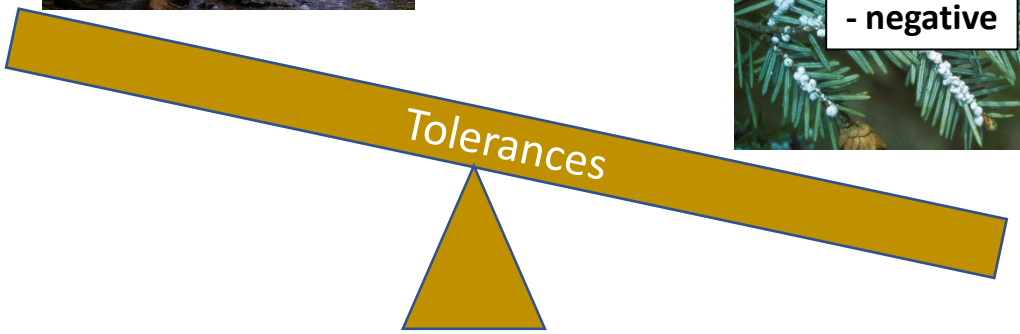
Disturbance Factors

Tolerance to: Pests, diseases, drought, flood, wind, ice, salt, air and urban pollution, heat, browsing, invasive species

Biological Factors

Shade tolerance, edaphic specificity, invasive potential, habitat specificity, nursery propagation, maintenance required, planting establishment, restricted rooting conditions

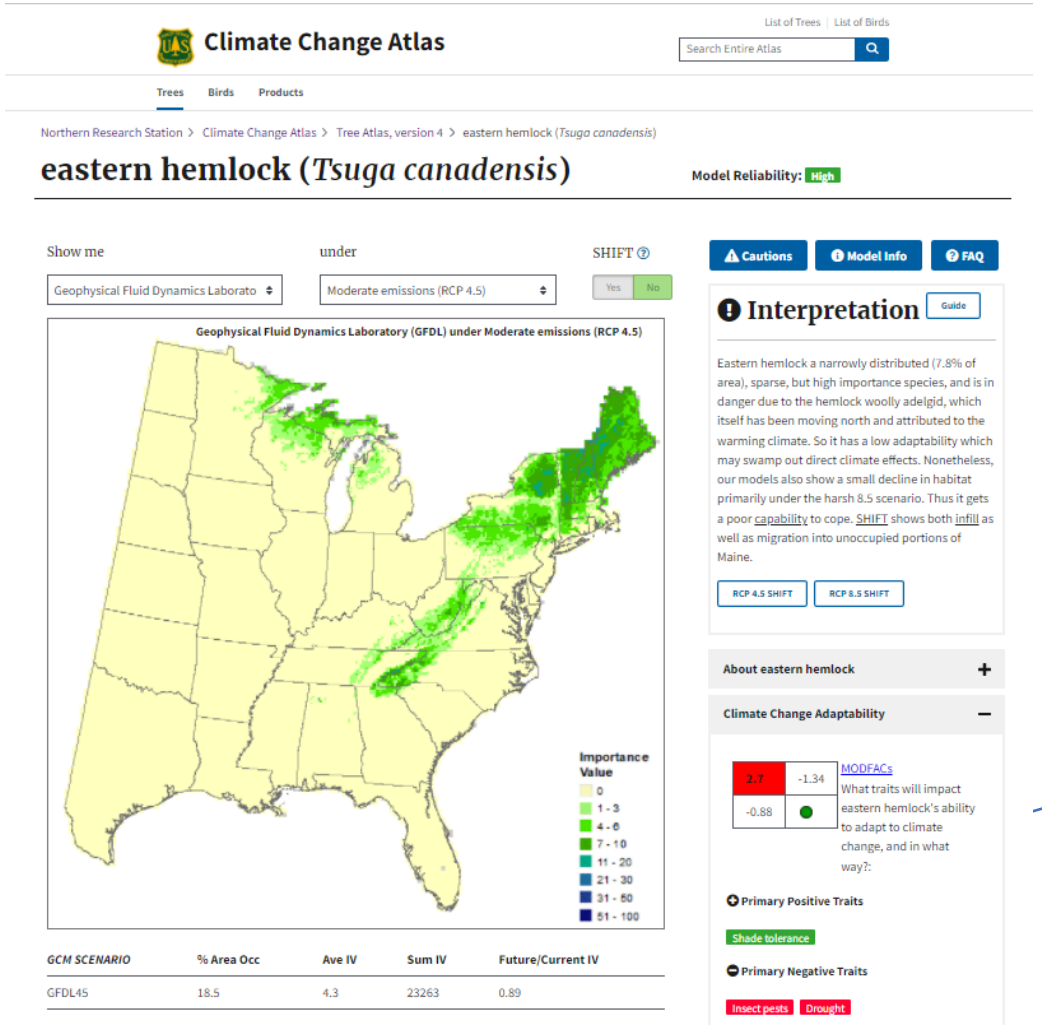


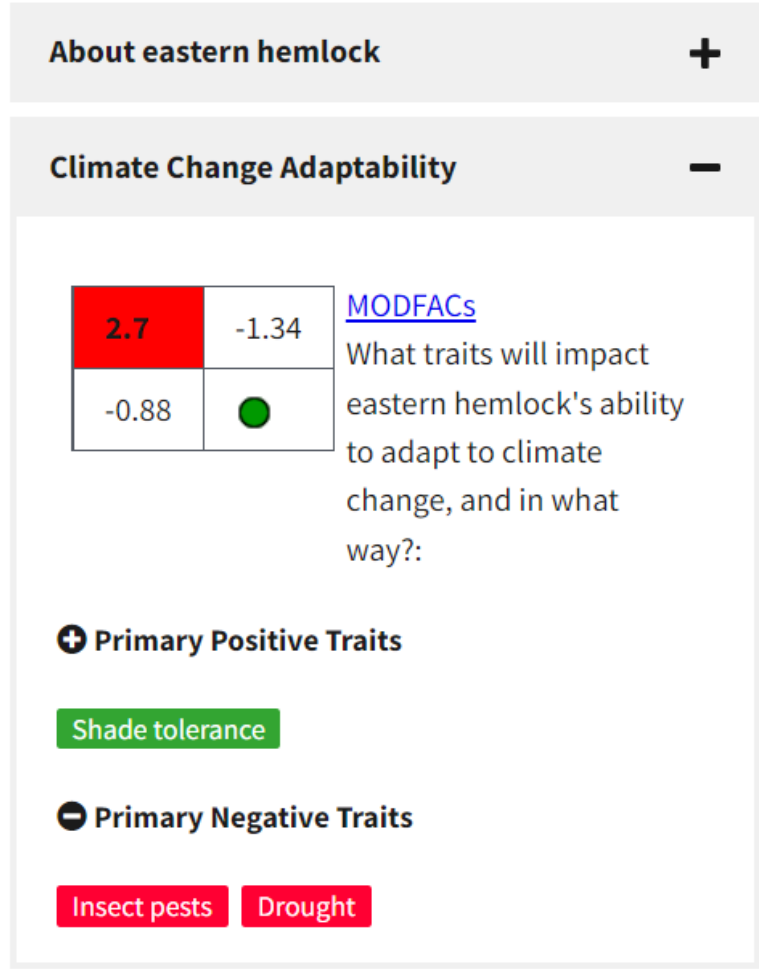


Eastern hemlock

www.fs.usda.gov/nrs/atlas/tree/

Climate Change Tree Atlas: Modifying factors

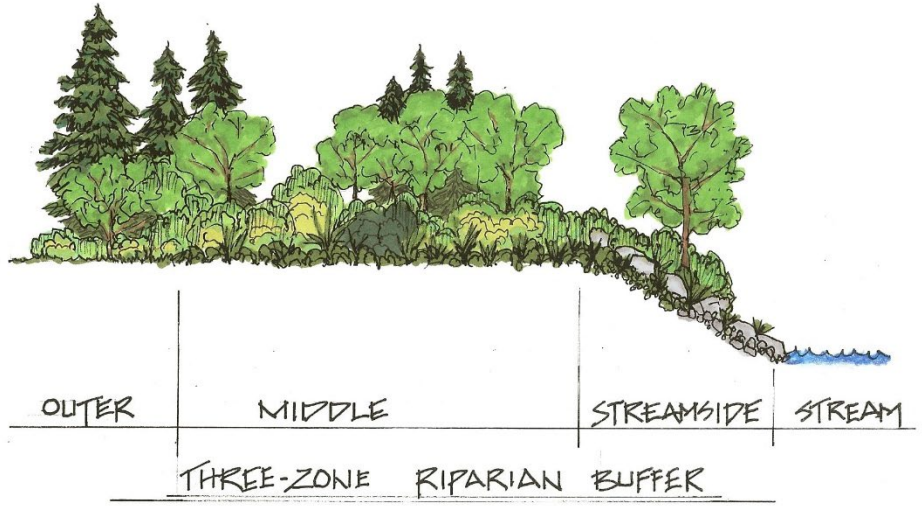




How modifying factors are shown on the website ^

www.fs.usda.gov/nrs/atlas/tree/

Using Tree Species Projections in Management decisions



Tree species projections can be useful when:

- Assesses the **vulnerability** of a local forest using local tree inventory data
- Informing **decision-making** and long-term planning
- Supporting climate **adaptation** strategies, and tactics in site-specific project plans

Requires local site-level expertise and judgement when interpreting results!

Climate-informed inventory

What can commonly collected forest inventory data tell us about climate change risks or adaptability?

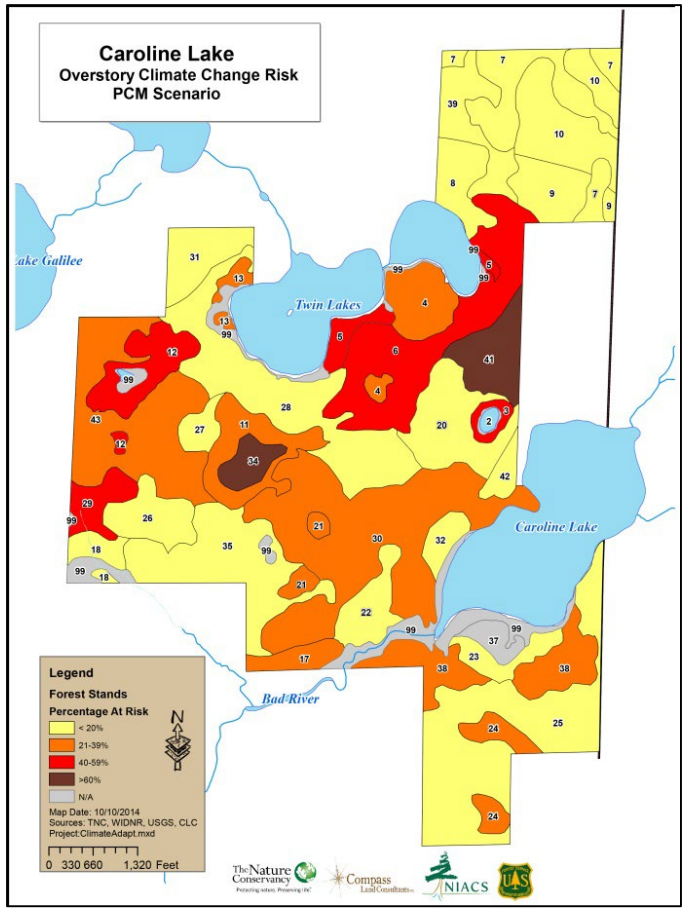
Repurposed metrics:

Inventory Metric	Normally would be used to…	In the context of climate change…
Tree Species Richness *Tree Species Evenness*	Give an indication of stand- or forest-level diversity	Higher species evenness and richness may have greater adaptive capacity/ lower risk
Regeneration	Show effectiveness of regen treatments; inform future actions	Regeneration may be most influenced by climate change; potential early indication of change or future issues

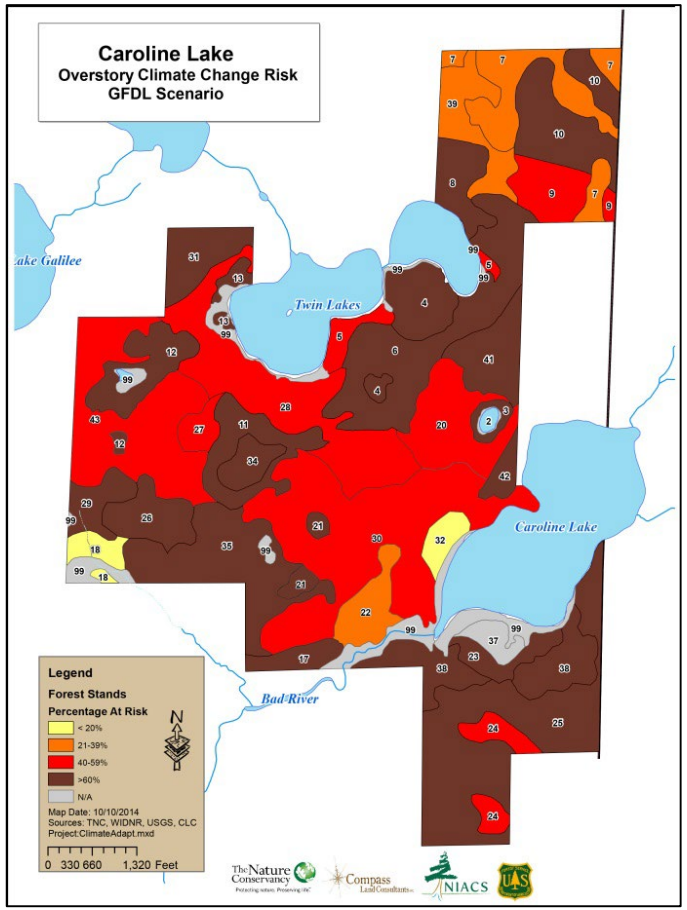
Climate-informed inventory: risks by stand

Overstory

Low warming scenario



High warming scenario



- Integrate climate change Tree Atlas projections into stand-level data
- Classify inventory by predicted risk level (e.g. *decrease, large decrease*)

IMPORTANT: Classification may only signal that a species is at risk of decline across a general region, but it is up to manager to evaluate this information given local knowledge and expertise.

Janowiak et al. 2017: Assessing stand-level climate change risk using forest inventory data and species distribution models