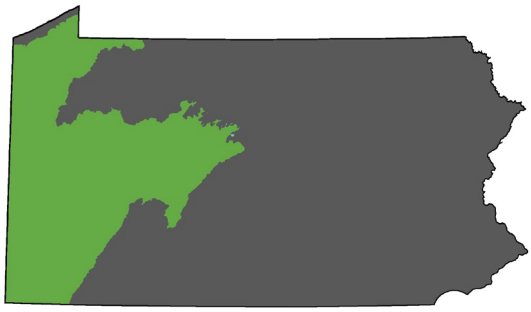
CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES

WESTERN ALLEGHENY PLATEAU (PENNSYLVANIA SUBREGION 1)

Pennsylvania's forests will be affected by a changing climate during this century. A team of forest managers and researchers created an assessment that describes the vulnerability of forests in the Mid-Atlantic region (https://forestadaptation.org/mid-atlantic/vulnerability-assessment). This handout is summarized from the full assessment, but focuses on one region in Pennsylvania. Model results for additional regions can be found online at (https://forestadaptation.org/PA-DISTRIB).



TREE SPECIES INFORMATION:

The DISTRIB model of the Climate Change Tree Atlas uses inputs of tree abundance, climate, and environmental attributes to simulate current and future species habitat under two climate scenarios. Results for "low" and "high" climate scenarios can be compared on page 2 of this handout.

Remember that models are just tools, and they're not perfect. Output from DISTRIB does not consider many biological or disturbance factors which favor or limit tree establishment, growth, or mortality. For example, the susceptibility of ash species to emerald ash borer is causing widespread mortality and it will likely do even worse than the model suggests. For the 30 most common species, we present such factors not included in the model that may cause species to do better or worse than models suggest.

Despite their limitations, models provide useful information about future expectations. It's important to think of these projections as indicators of potential change in the amount of suitable habitat for a species, but that human choices and other factors will continue to influence tree distribution, movement, and forest composition at individual sites.

SPECIES	ADDITIONAL CONSIDERATIONS
LIKELY TO DECREASE	
American beech	Susceptible to beech diseases, very shade tolerant
Bigtooth aspen	Early-sucessional colonizer, susceptible to drought
Chokecherry	Shade intolerant, sensitive to browsing and competition
Eastern hemlock	Hemlock woolly adelgid causes widespread mortality
Quaking aspen	Early-sucessional colonizer, susceptible to heat and drought
Yellow birch	Good disperser, susceptible to fire, insects, and disease
MAY DECREASE	
American basswood	Tolerates shade, susceptible to fire
Black cherry	Susceptible to insects and fire, somewhat drought-tolerant
Chestnut oak	Establishes from seed or sprout, adapted to fire
Eastern white pine	Good disperser, but susceptible to drought and insects
Northern red oak	Susceptible to insect pests
Red maple	Competitive colonizer in many sites, disturbance-tolerant
Serviceberry	Competative colonizer, susceptible to drought
Sugar maple	Grows across a variety of sites, tolerates shade
Sweet birch	Susceptible to drought, fire topkill, and insects
White ash	Emerald ash borer causes widespread mortality
NO CHANGE	
American hornbeam	Tolerates shade, susceptible to fire and drought
Black locust	Early colonizer, but susceptible to locust borer & heart rot
Slippery elm	Shade-tolerant, susceptible to Dutch elm disease & fire
MIXED MODEL RESULTS	
American elm	Grows on a variety of sites, Dutch elm disease
Sassafras	Early-successional colonizer, susceptible to fire topkill
Yellow-poplar	Competitive colonizer tolerant of diverse sites
MAY INCREASE	
Eastern hophornbeam	Grows across a variety of sites, tolerates shade
White oak	Fire-adapted, grows on a variety of sites
LIKELY TO INCREASE	
Black oak	Drought tolerant, susceptible to insect pests and diseases
Black walnut	Good disperser, but intolerant of shade and drought
Blackgum	Shade tolerant, fire adapted
Flowering dogwood	Shade tolerant
Pignut hickory	Susceptible to bark beetles and drought
Scarlet oak	Establishes from seed/sprout, susceptible to fire/disease

SOURCE: Prasad, AM; Iverson, LR; Peters, MP; Matthews, SN. 2014. Climate change tree atlas. Northern Research Station, U.S. Forest Service, Delaware, OH. http://www.nrs.fs.fed.us/atlas.

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FUTURE PROJECTIONS

The DISTRIB model uses Forest Inventory and Analysis (FIA) data to calculate an Importance Value (IV) for each species on the landscape in order to evaluate potential IV's at the end of this century (2070 – 2099). Those changes are classified in the table below as:

- ▲ **INCREASE** — *Projected increase of >20% by 2100*
- ● **NO CHANGE** — *Little change (<20%) projected by 2100*
- ▼ **DECREASE** — *Projected decrease of >20% by 2100*
- ★ **NEW HABITAT** — *Tree Atlas projects new habitat for species not currently present*

ADAPTABILITY

Factors not included in the Tree Atlas model, such as the ability to respond favorably to disturbance, may make a species more or less able to adapt to future stressors. Specific considerations are provided on page 1 for the 30 most abundant species.

- \+ high — *Species may perform better than modeled*
- o medium
- – low — *Species may perform worse than modeled*

SPECIES	FIA IV	MODEL RELIABILITY	LOW CLIMATE CHANGE (PCM B1)	HIGH CLIMATE CHANGE (GFDL A1FI)	ADAPT
American basswood	93	M	●	▼	o
American beech	520	H	▼	▼	o
American chestnut	8	M	●	▼	o
American elm	197	M	▼	▲	o
American hornbeam	139	M	●	●	o
American mountain-ash	3	M	▼	▼	-
Balsam fir	0	H	▼	▼	-
Balsam poplar	2	H	▼	▼	o
Bear oak; scrub oak	2	L	●	●	o
Bigtooth aspen	196	H	▼	▼	o
Bitternut hickory	23	L	●	▲	+
Black ash	5	H	▼	●	-
Black cherry	2021	H	●	▼	-
Black hickory	0	H	★	★	o
Black locust	159	L	●	●	o
Black maple	1	L	▼	▼	o
Black oak	159	H	▲	▲	o
Black walnut	70	M	▲	▲	o
Black willow	54	L	●	▲	-
Blackgum	123	H	▲	▲	+
Blackjack oak	0	M	★	★	+
Blue ash	0	L	▼	▼	-
Boxelder	38	M	●	▲	+
Bur oak	4	M	▼	▲	+
Butternut	9	L	●	▼	-
Chestnut oak	166	M	●	▼	+
Chinkapin oak	2	M	▲	▲	o
Chokecherry	126	L	▼	▼	o
Common persimmon	2	M	▲	▲	+
Cucumbertree	68	H	▲	▼	o
Eastern cottonwood	18	L	●	▲	o
Eastern hemlock	290	H	▼	▼	-
Eastern hophornbeam	121	M	●	▲	+
Eastern redbud	2	M	▲	▲	o
Eastern redcedar	0	M	★	★	o
Eastern white pine	111	H	●	▼	o
Flowering dogwood	183	H	▲	▲	o
Gray birch	2	M	▼	▼	o
Green ash	40	M	▲	▲	o
Hackberry	9	M	▲	▲	+

SPECIES	FIA IV	MODEL RELIABILITY	LOW CLIMATE CHANGE (PCM B1)	HIGH CLIMATE CHANGE (GFDL A1FI)	ADAPT
Honeylocust	1	L	●	▲	+
Jack pine	6	H	▼	▼	o
Loblolly pine	0	H	NA	★	o
Mockernut hickory	68	H	▲	▲	+
Mountain maple	2	H	▼	▼	+
Northern catalpa	2	L	▼	●	o
Northern red oak	540	H	●	▼	+
Osage-orange	9	M	●	▲	+
Paper birch	4	H	▼	▼	o
Pawpaw	2	L	●	●	o
Pignut hickory	80	H	▲	▲	o
Pin cherry	55	M	▼	▼	o
Pin oak	9	L	●	▲	-
Pitch pine	15	H	●	▲	o
Quaking aspen	163	H	▼	▼	o
Red maple	1763	H	●	▼	+
Red pine	27	M	▼	▼	o
Red spruce	5	H	▼	▼	-
Rock elm	5	L	●	▲	-
Sassafras	356	H	▲	●	o
Scarlet oak	73	H	▲	▲	o
Serviceberry	130	M	●	▼	o
Shagbark hickory	32	M	▲	▲	o
Shingle oak	25	M	▲	▲	o
Silver maple	24	M	▼	▲	+
Slippery elm	184	M	●	●	o
Sourwood	1	H	▲	▼	+
Striped maple	59	H	▼	▼	o
Sugar maple	783	H	●	▼	+
Swamp white oak	18	L	●	▼	o
Sweet birch	324	H	●	▼	-
Sycamore	22	M	▲	▲	o
Tamarack (native)	1	H	▼	●	-
Virginia pine	10	H	▲	▲	o
White ash	597	H	●	▼	-
White oak	304	H	●	▲	+
White spruce	13	M	▼	▼	o
Yellow birch	112	H	▼	▼	o
Yellow buckeye	11	M	●	●	-
Yellow-poplar	264	H	▲	▼	+