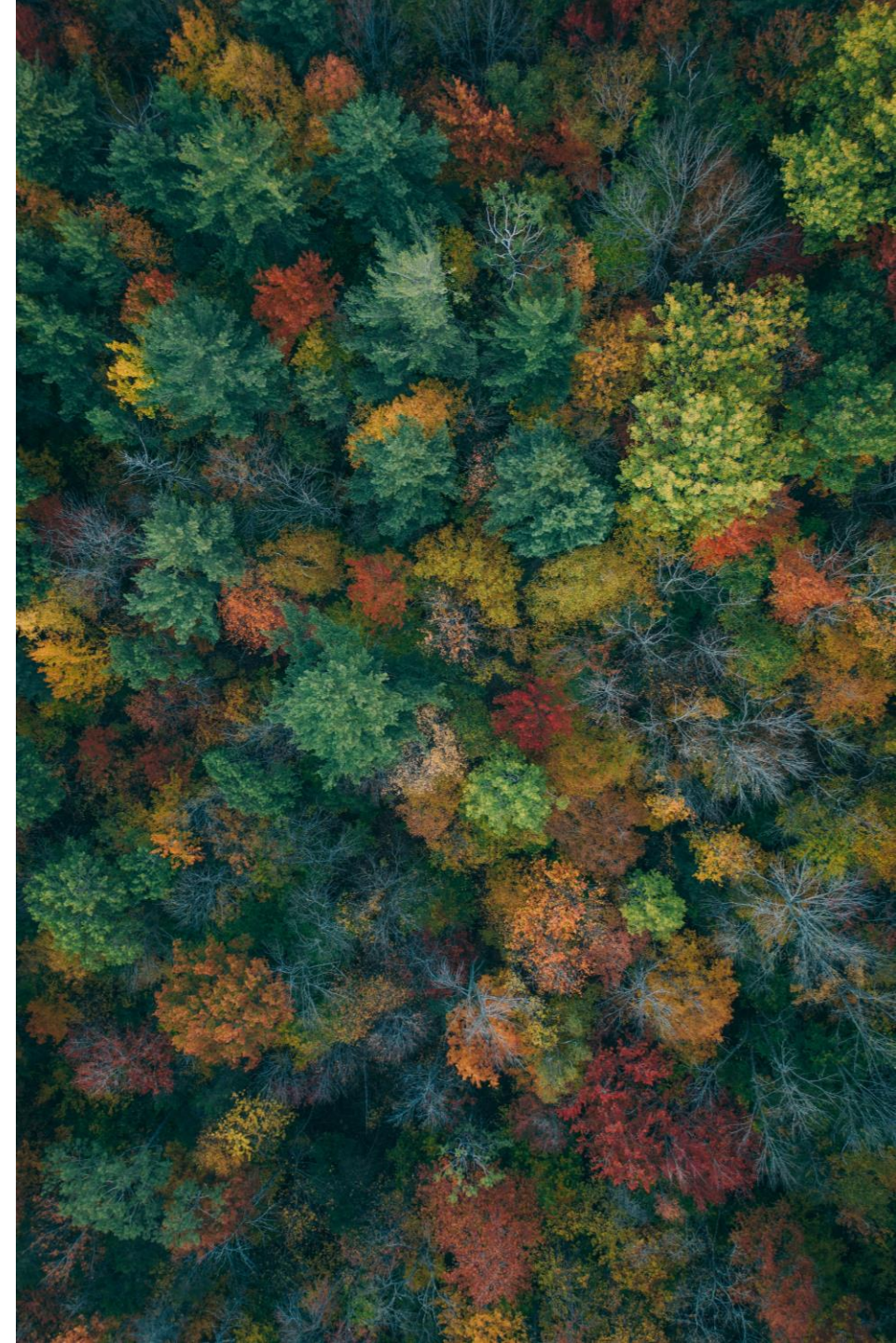


USDA Northeast Climate Hub

# **Informing the development of forest climate change indicator-based tools**

FEMC Annual Meeting 2025 | Vermont

Alyssa Soucy, ORISE Fellow, Northeast Climate Hub



Our mission is to develop and deliver science-based, region-specific information and technologies to enable climate-informed decision-making.



Partnerships: FS, ARS, NRCS, LGUs, NGOs



# Workstreams



## Science and data syntheses

Translating and delivering relevant information



## Tool/technology development and support

Supporting climate-informed planning and decision-making



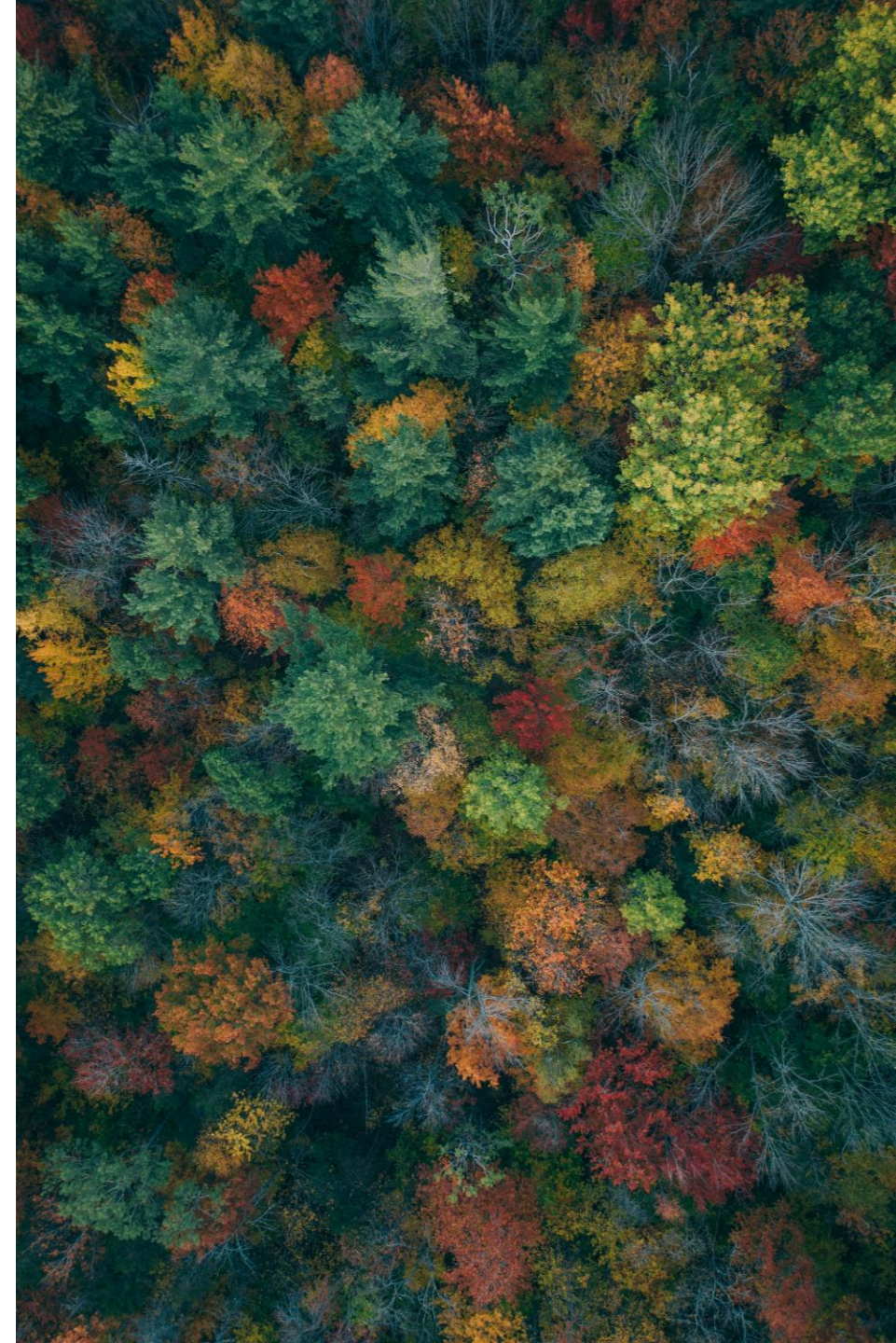
## Outreach, convening, and training

Facilitating engagement, discovery, and exchange



# Working Session Agenda

- Overview of climate change indicators
- Needs assessment findings
- Discussion



# Supporting Adaptation Management and Planning in Forestry: Forest Climate Indicators

Goal: Increase availability of actionable and relevant climate change indicators via an interactive online tool to support forest management and planning.

Tool users: State foresters, Private foresters, Tribal foresters forest planners, land managers, extension professionals

Alyssa Soucy, USDA Northeast Climate Hub

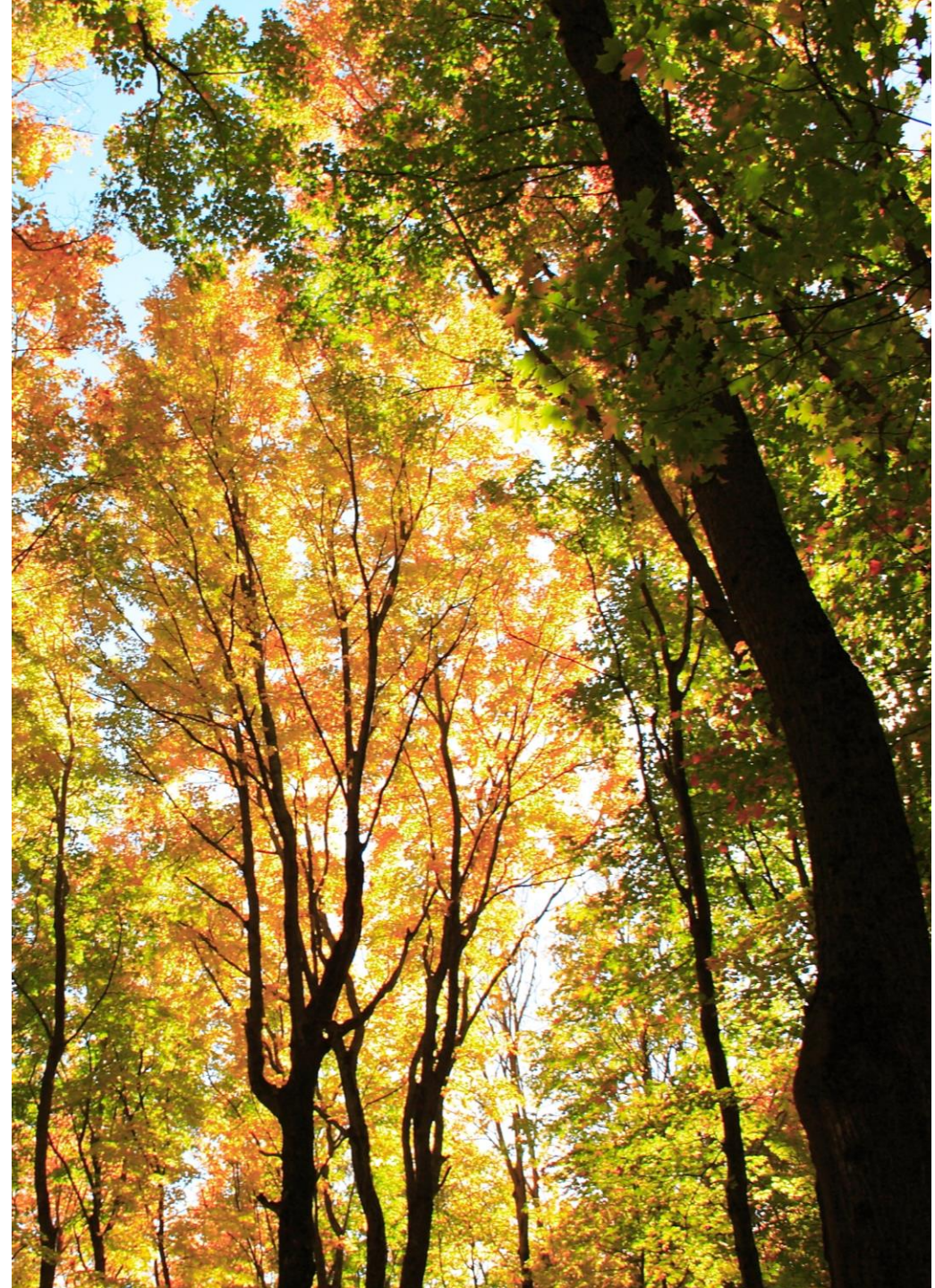
Lindsey Rustad, USDA Northeast Climate Hub

Erin Lane, USDA Northeast Climate Hub

Dennis Todey, USDA Midwest Climate Hub

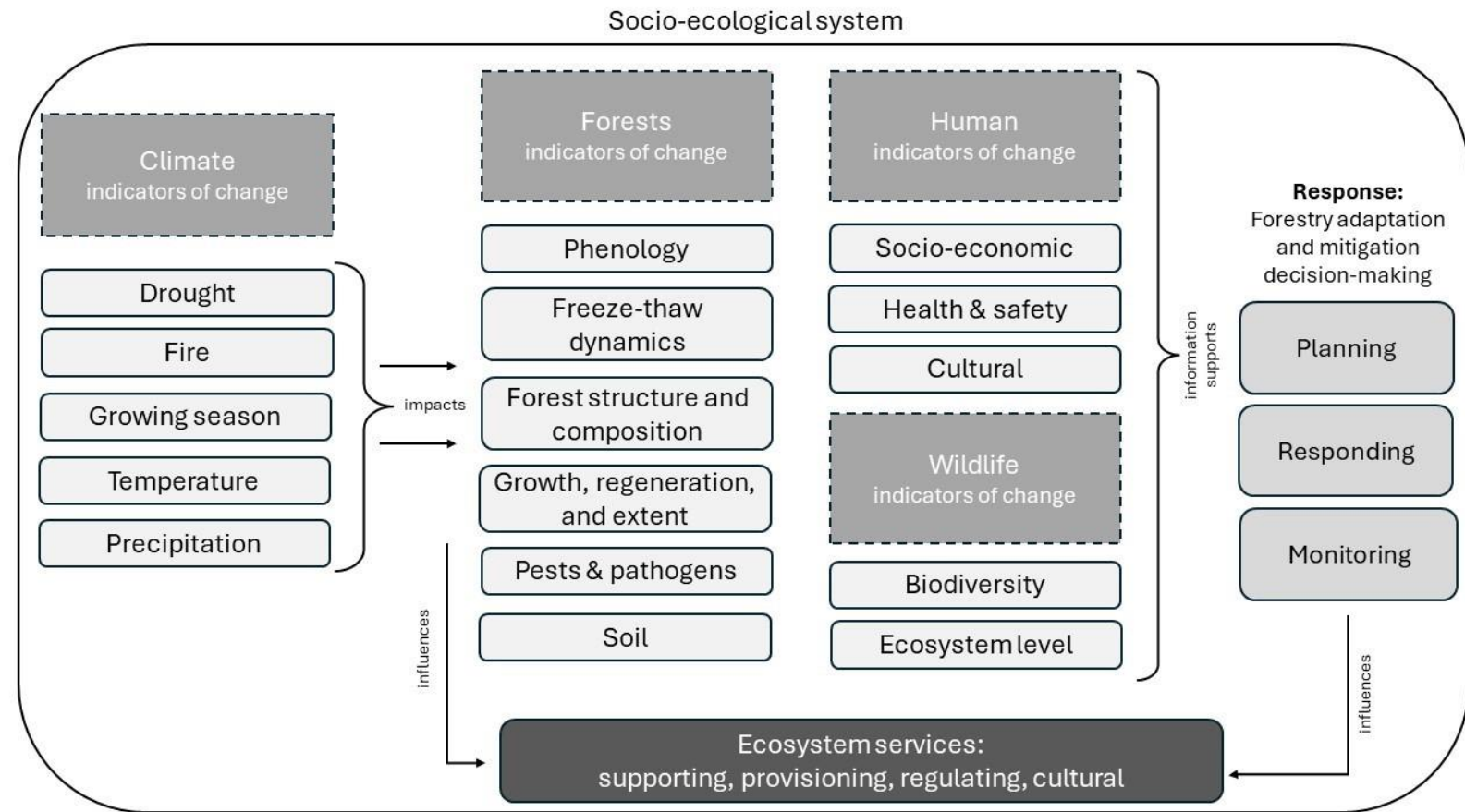
Art DeGaetano, Northeast Regional Climate Center, Cornell University

Natalie Umphlett, Northeast Regional Climate Center, Cornell University



# What are indicators?

- Reference tools that can track rates of change, or trends of a phenomenon using measured data, modeled data, or an index
- Can warn of change, inform decision-making, and communicate and track long-term key social and biophysical changes



# Listening sessions with Forest Service staff

- 12 listening sessions with Forest Service personnel (ecologists, resource managers, foresters, climate change coordinators, etc.), totaling 76 staff across the northeast and Midwest
- Brainstorm climate change indicator needs for forest planning and management
- Developed a list of 7 thematic needs (5 of which are related to indicators), along with ~55+ related indicators



# Key themes

Theme	Challenge	Example Indicators
<b>Timber operations</b>	Winter operations	Snow depth
	Summer operations	Soil moisture Soil temperature Soil moisture
<b>Climate extremes and storms</b>	Ice storms	Tree ice loads Ice storm thickness
	Frost damage	Length and severity of spring cold event
	Flooding and extreme precipitation	Extreme single-day precipitation events River flooding frequency/magnitude (projections)
	High wind events	Straightline wind events
	Drought	Palmer drought severity index Soil moisture index Drought forest damage
<b>Winter recreation</b>	Snowmobiling, skiing, and ice fishing days impacts	Snow depth Soil temperatures
	Shifting visitation	Outdoor recreation revenue (trends and projections)
<b>Pest and pathogens</b>	<i>Invasive</i> insect/pathogen outbreaks (e.g., hemlock woolly adelgid, EAB, spotted lanternfly, spruce budworm)	Insect survival and distribution (current and projected) Insect/pathogen severity
	<i>Native</i> insect/pathogen outbreaks (white pine diseases, southern pine beetle, among others)	
	Oak decline	Drought indices (see above) Spring precipitation
<b>Fire</b>	Increased wildfire risk	Start of fire season End of fire season
	Timing prescribed burning	Soil moisture Fire Weather Index



# Key themes – feasibility and novelty

[add a graphical figure that displays our feasibility and novelty rankings, then allow time for comment/discussion]

Then – facilitate a discussion on what would be most useful – when looking at this list of forest-related climate change challenges, what is most urgent? What tool would be most useful for forest management and planning?

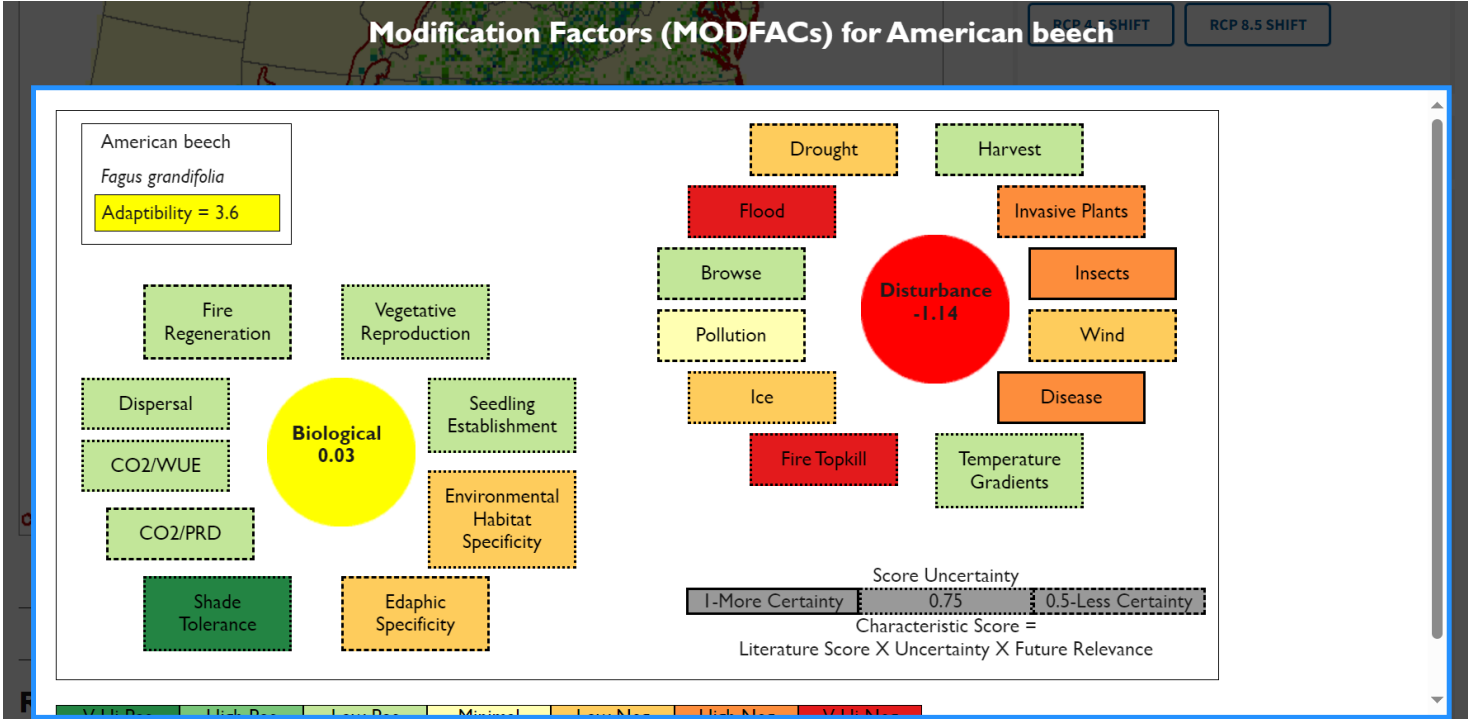
**Let's dive deeper into a potential tool for pests...**



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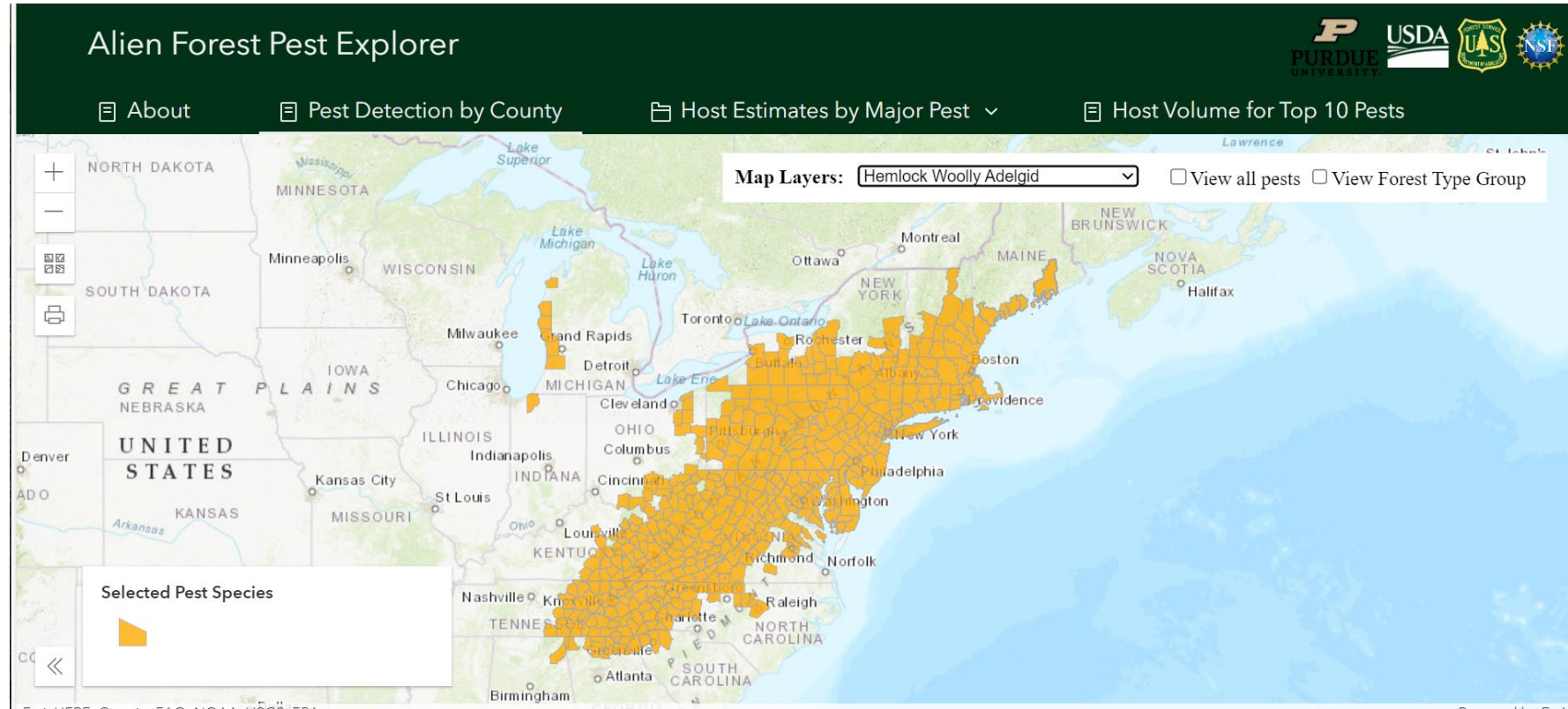
# Tools and resources for pests and pathogens

Climate change tree atlas



# Tools and resources for pests and pathogens

## Alien Forest Pest Explorer



# Tools and resources for pests and pathogens

Pheno forecasts

JUNE 2024

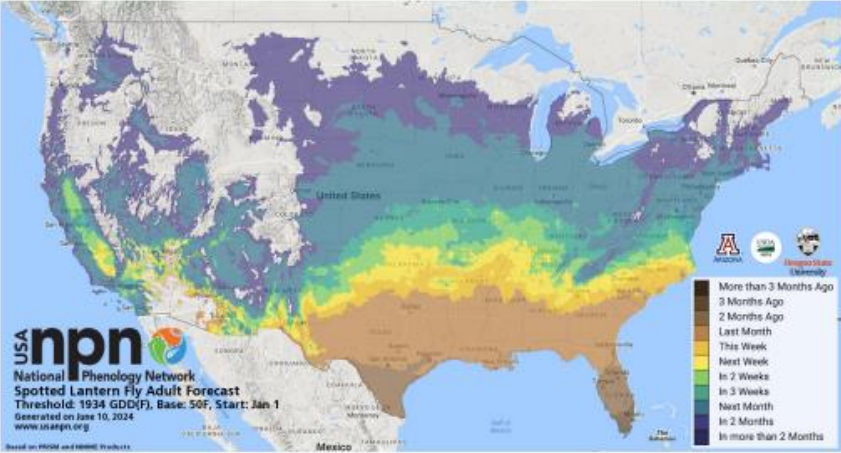


Figure 2. Spotted lanternfly Pheno Forecast, June 10, 2024. Colors indicate the status of adult lanternfly. Dark purple indicates activity is predicted more than 2 months in the future, green: adults expected to emerge in 2 weeks, yellow: adults expected to emerge in 1 week, gold: adults emerging, brown: adults emerged last month, dark brown: adults emerged more than 3 months ago.

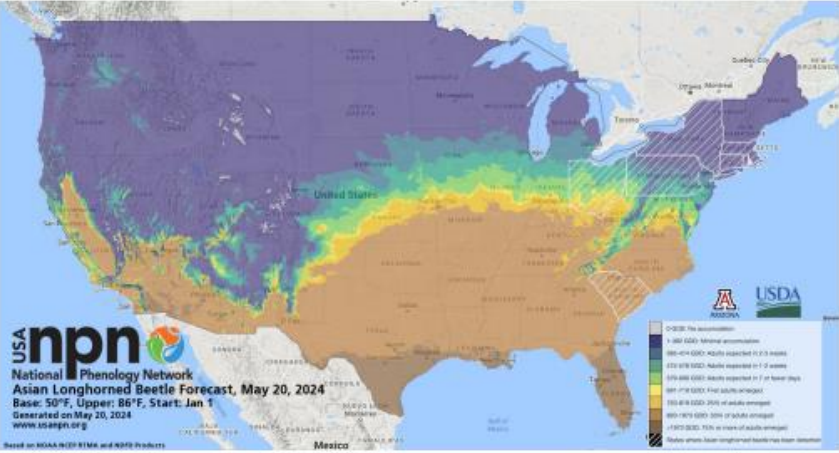


Figure 3. Asian longhorned beetle Pheno Forecast, March 20, 2024. Colors indicate the status of adult emergence. Dark purple indicates minimal accumulation, dark blue-green: adults expected to emerge in 2-3 weeks, dark green: adults expected to emerge in 1-2 weeks, light green: adults expected to emerge in seven or fewer days, yellow: first adults emerging, gold: 25% of adults emerged, brown: 50% of adults emerged, dark brown: 75% or more of adults emerged.

# Pest and pathogen indicators

## Potential tool features could help to understand:

- Insect survival, distribution, and severity (current and projected)
- Insect/pathogen severity
- Novel non-native pest probabilities (projected)
- Host species distribution
- What else?

Based on the following *indicators*:

- Cold winter temperatures, spring precipitation, stand density, temperature variations, etc.



**Let's dive deeper into a potential tool for winter recreation...**



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# Winter recreation indicators

## Potential tool features could help to understand:

- Cross country and snowmobile trail maintenance based on long-term trends in snowpack and snow depth
- Trends in ice-fishing dates
- What else?

Based on the following *indicators*:

- Snow depth, Soil temperatures, Ice-in/ice-out dates, First and last freeze, Soil frost depth





**Let's dive deeper into a potential tool for extreme precipitation...**



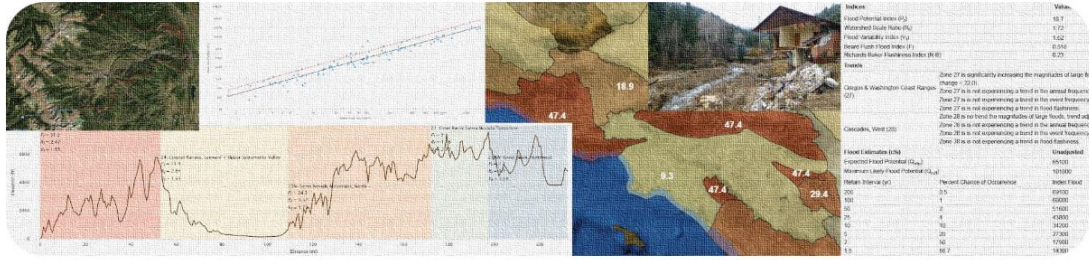
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# Tools and resources for extreme precipitation

## Flood Potential Portal

Flood Potential Portal v. 2.2.5
USER MANUAL
ANON

Overview
Features
Credits



The screenshot displays the Flood Potential Portal interface. It features a map with various colored zones (e.g., 47.4, 18.9, 8.3, 29.6) and a hydrograph showing streamflow over time. A table on the right lists various indices and their values.

Index	Value
Flood Potential Index (FPI)	18.9
Watershed Index (WI)	17.2
Flood Variability Index (FVI)	15.2
Stream Flow Index (SFI)	10.8
Watershed Runoff Index (WRI)	6.77

The Flood Potential Portal is a map-based decision support system for enhancing the understanding and quantification of riverine flood hazards in the United States through use of the observational (streamgauge) record. The [Mapping](#) and [Cross-Section Analysis](#) modules are provided for exploring a variety of characteristics, for professionals to strengthen their understanding of flood variability in space and time. The [Watershed Analysis](#) module provides for the prediction of expected large flood magnitudes and flood frequency relationships at ungaged locations, including adjustments for such non-stationarity mechanisms as climate change. The [Streamgauge Analysis](#) module performs standard logPearson flood-frequency analysis of streamgauge data. Large floods are the focus of the Flood Potential Portal, for infrastructure design and floodplain management.

Mapping and cross section tools utilize a number of indices that quantify flood variability, to illustrate the

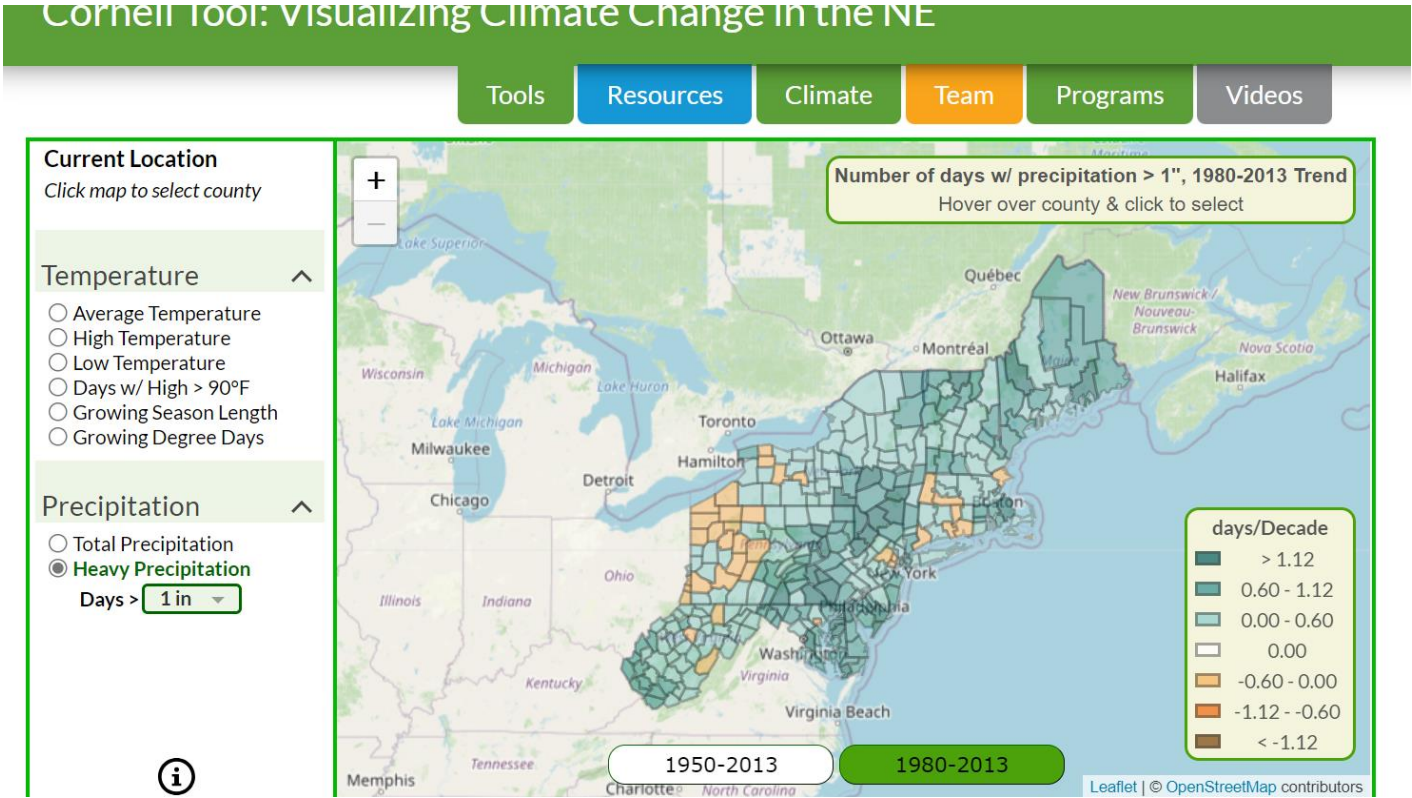
# Tools and resources for extreme precipitation

## Stream Stats

The screenshot displays the USGS StreamStats web application. The top navigation bar includes the USGS logo, the text "StreamStats", and links for "Batch Processor", "Report", "About", and "Help". On the left side, there is a "SELECT A STATE / REGION" dropdown menu and a "Step 2" instruction box. Below the instruction box are buttons for selecting a state or region: Massachusetts, Maine, New Hampshire, New York, Vermont, and Connecticut River Basin. The main area is a map of New Hampshire showing stream networks and numerous streamgages marked with colored triangles. A "Layers" panel on the right lists various data layers, including "Streamgages" (checked) and "National Layers" (checked). The "Streamgages" layer is expanded to show different types of records: Gaging Station, Continuous Record (blue triangle), Low Flow, Partial Record (yellow triangle), Peak Flow, Partial Record (red triangle), Peak and Low Flow, Partial Record (orange triangle), Stage Only (green triangle), Low Flow, Partial Record, Stage (purple triangle), Miscellaneous Record (pink triangle), and Unknown (black triangle). A "Zoom Level: 8" and "Map Scale: 1:2,311,162" are displayed at the bottom of the map. The map also shows major cities like Montpelier, Rutland, Concord, and Manchester, and geographical features like the Green Mountains and White Mountains.

# Tools and resources for extreme precipitation

NRCC – heavy precipitation



# Extreme precipitation indicators

## Potential tool features could help to understand:

- Risk of flooding within forests
- Understanding likelihood of forests being impacted by extreme precipitation
- What else?

Based on the following *indicators*:

- Extreme single-day precipitation events, River flooding magnitude (projections), River flooding frequency (projections)\*



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# *The Pulse*

A weekly digital newsletter sharing forest, climate, and carbon related news clips from a wide variety of sources aimed at forestry professionals. The newsletter content includes science-based information and reflects a balanced variety of perspectives.

Partners: Northeastern Loggers' Association

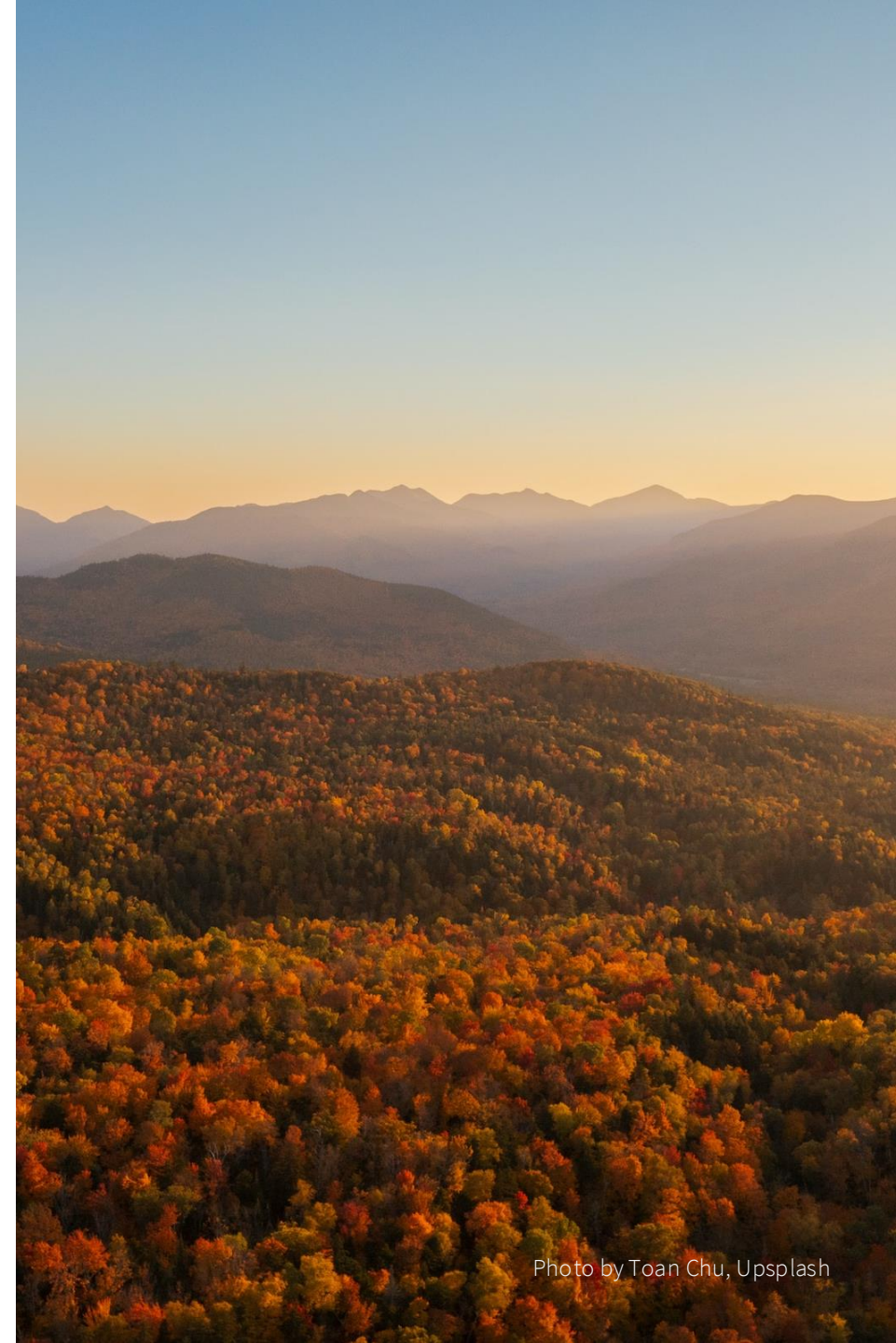


Photo by Toan Chu, Upsplash

# The Quarterly Harvest

In order to share project updates and promote climate-informed decision-making with stakeholders, the Northeast Climate Hub produces a quarterly newsletter. The purpose of this digital newsletter is to share stories and information concerning Northeast Climate Hub projects, climate science, and solution-based practices in the Northeast.

Partners: University of New Hampshire



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Photo by Karrah Kwasnik

# Rooted in Research Webinar Series

Rooted in Research is a webinar series focused on communicating the latest science for land management needs and highlighting key science findings for people who make and influence land management decisions. The Northeast Climate Hub assists in webinar ideation, production and promotion.

Partners: USDA Forest Service - Northern Research Station, Northern Institute of Applied Climate Science, USDA Northeast Climate Hub, USDA Northern Forests Climate Hub





# Questions?

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Twitter | [@USDAClimateHubs](https://twitter.com/USDAClimateHubs)

Quarterly Harvest | [www.climatehubs.usda.gov/hubs/northeast/topic/quarterly-harvest](http://www.climatehubs.usda.gov/hubs/northeast/topic/quarterly-harvest)

Forest Pulse | [www.climatehubs.usda.gov/hubs/northeast](http://www.climatehubs.usda.gov/hubs/northeast)



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