Public Engagement Webinar for the **Forests Chapter** of NCA4

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May 11, 2017

AUDIO CONNECTION

1. Phone: mute your computer speakers and call **1-877-369-5243**; access code: **0300501#**

OR

2. Audio through the computer: Make sure your computer speakers are on and listen with speakers or headphones.

Note: Phone audio will allow you to both listen and speak up with questions. *If you listen through the computer, you will not be able to speak up with questions,* but will be able to type questions into the Q&A pod which will be answered by the appropriate speaker.

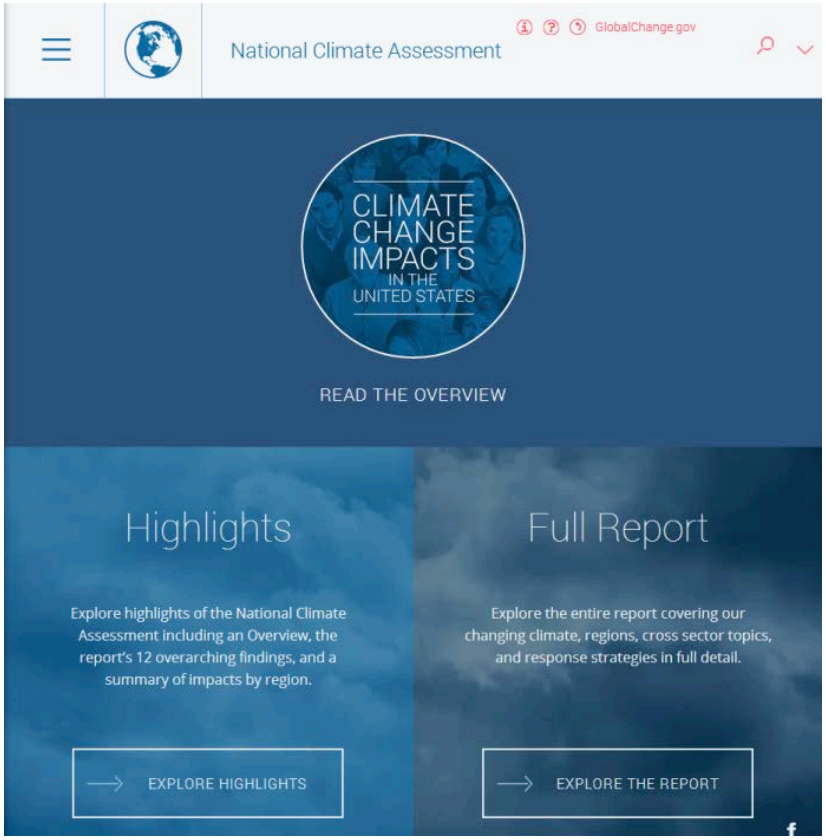
The National Climate Assessment: A Congressionally-Mandated Endeavor

Global Change Research Act of 1990 (Section 106):

…not less frequently than every 4 years, the Council… shall prepare… an assessment which –

- **integrates, evaluates, and interprets** the findings of the Program (USGCRP) and discusses the scientific uncertainties associated with such findings;
- **analyzes the effects of global change** on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and
- analyzes current trends in global change, both human- induced and natural, and **projects major trends for the subsequent 25 to 100 years.**

Building on the Success of NCA3



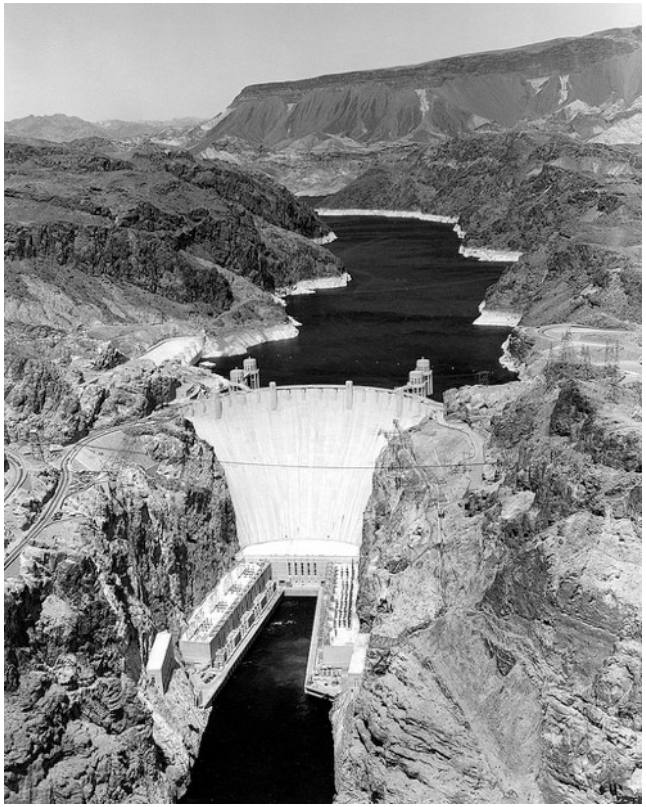
Five aspects of NCA3 (2014) were crucial to its success:

- Assessment based on broad scientific and technical inputs
- Stakeholder engagement
- Clear communication principles
- Transparency of process and information
- An extensive review process

NCA4 Chapters

- **I: Overview**
- **II: Our Changing Climate**
- **III: National Overviews**
  - Water
  - Energy
  - Land Cover and Land Use Change
  - **Forests**
  - Ecosystems, Ecosystem Services, and Biodiversity
  - Coastal Effects
  - Oceans and Marine Resources
  - Agriculture and Rural Communities
  - Built Environment, Urban Systems, and Cities
  - Transportation
  - Air Quality **NEW!**
  - Human Health
  - Tribal and Indigenous Communities
  - Climate Effects on U.S. International Interests **NEW!**
  - Sectoral Interdependencies & Compounding Stressors: The Science of Complex Systems **NEW!**
- **IV: Regional Chapters**
  - Northeast
  - Southeast
  - US Caribbean **NEW!**
  - Midwest
  - Northern Great Plains
  - Southern Great Plains } **EXPANDED!**
  - Northwest
  - Southwest
  - Alaska
  - Hawai`i and Pacific Islands
- **V: Response**
  - Near-term Adaptation Needs and Increased Resiliency
  - Mitigation: Avoiding and Reducing Long-term Risks

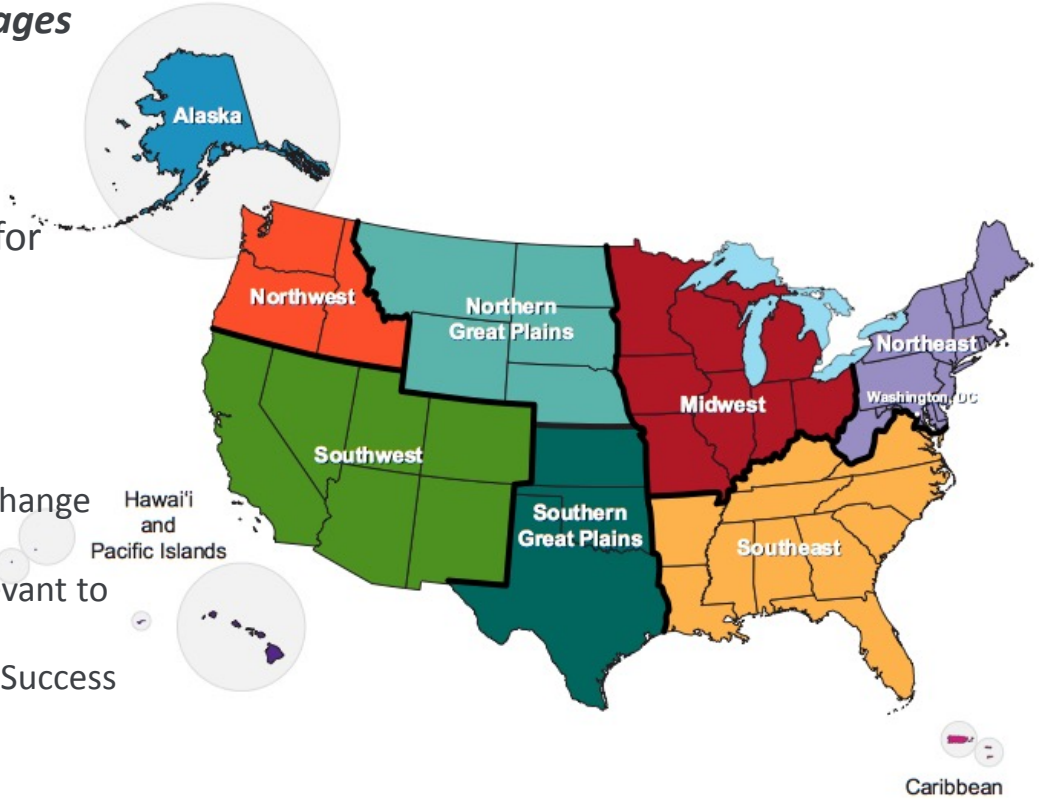
National Overview Chapters



- Short ***(~6 pg)***, national-level overviews of key sectors and cross-cutting topics
  - Encouraged to link to agency resources and existing work
  - Led by one or more agencies
- Chapter Structure:
  - Background/state of the sector
  - Roll-up of information from the regional scale
  - 2-3 national-scale key messages
  - Traceable accounts and references (not part of page limit)
- Response (adaptation and mitigation) will be longer ***(~10 pg)***

Regional Chapters

- The “main course” of NCA4 ***(~20 pages each)***
- Region-specific concerns
- Highlight options, challenges, opportunities, and success stories for minimizing risk
- Chapter Structure:
  - Background
  - 4-6 Key Messages:
    - Linkage between Climate Change and Regional Risks
    - Future Climate Change relevant to Regional Risks
    - Challenges, Opportunities, Success Stories
    - Emerging Issues
  - Traceable accounts and references (not part of page limit)



2016

Processes and guidance developed by the Steering Committee √

Chapter leadership recruited √

Many **author teams** are complete; some are still recruiting authors √

Author teams are scoping out their chapters and developing **chapter outlines** √

2017

Jan 15: Technical Inputs are due √

Jan-Mar: Regional Engagement Workshops and Author Team Meetings √

Apr: Author Meeting √

Jan-Jun: Drafting and Internal Reviews

Jul-Sep: Report Aggregation and Reviews and Author Responses

Sep-Jan 2018: Public and National Academies Reviews

2018

Jan: Responses to Public Review

Jan-Feb: Revisions in response to National Academies comments

Mar-Aug: Reviews and Responses

Sep-Dec: Layout and Final Production

Dec+ : Release and Engagement

Dates are subject to change

Ways to Engage with NCA4

- ✓ **Be a Reviewer / Review Editor**
  - Look for other opportunities to contribute along the way at **globalchange.gov/notices**
- ✓ **Join / Follow NCAnet**
  - NCAnet participants extend the NCA to a broad audience through the development of assessment-related capacities and products. More information at **ncanet.usgcrp.gov**
- ✓ **Follow NCA4-specific news**

  Track updates and other news: **globalchange.gov/nca4**
- ✓ **Share ideas, case studies, or resources**

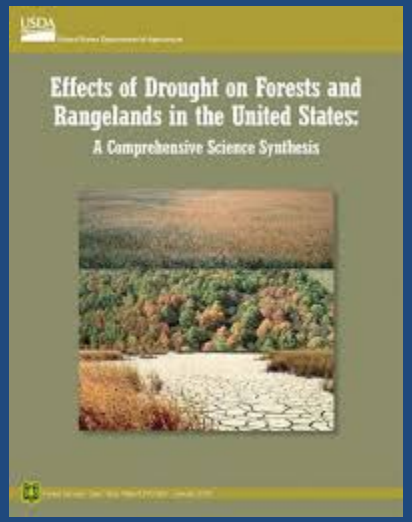
  http://www.globalchange.gov/content/nca4-outline
- ✓ **Join the USGCRP Mailing List**

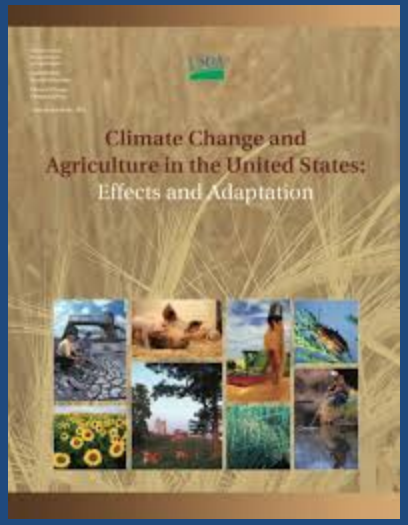
  globalchange.gov/newsletter-signup
- ✓ **Find us at future events!**
  - Ecological Society of America (Aug 2017)
  - American Geophysical Union (Dec 2017)

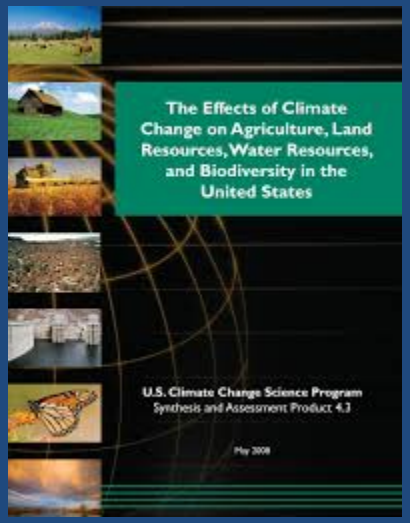
Proposed Guiding Questions

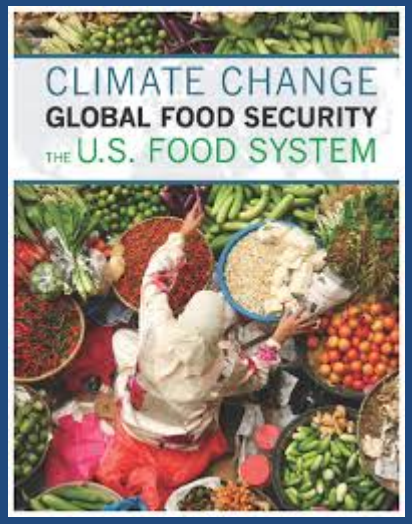
1. How has the **understanding of climate impacts of Forests evolved** since the last assessment (2014)?
2. What are the climate-related **challenges, opportunities or risks** for Forests that should be addressed or emphasized in NCA4?
3. What **adaptation measures** are being taken to address the risks posed to Forests by climate change?
4. Are there specific **case studies** we should highlight?
   - Specific events or impacts (place- or sector-specific)
   - Places where NCA3 was used to inform decisions
   - Examples of successful adaptation actions

Selected Past
USDA Assessments









Process

- Develop *DRAFT* outline of **Key Focus Areas** and associated supporting information for Forest Sector Chapter✓
- Assemble writing team with expertise to address **Key Focus Areas**✓
- Writing team reviews literature and begins drafting **Key Messages** and writing to support **Key Messages**✓
- Obtain stakeholder input to further shape Key Messages – purpose of **TODAY**
- Refine and revise Forests chapter based on stakeholder input
- Deliver to USGCRP June 16, 2017 for review

Writing Team

Convening Lead Authors

- **Jim Vose, USFS Southern Research Station (RS)**
- **Dave Peterson, USFS Pacific Northwest RS**

Co-Authors

• **Grant Domke, USFS Northern RS**	**Carbon cycling**
• **Chris Fettig, USFS Pacific Southwest RS**	**Insects and pathogens**
• **Linda Joyce, USFS Rocky Mountain RS**	**Climate change adaptation; NCA3 lead**
• **Bob Keane, USFS Rocky Mountain RS**	**Fire**
• **Charlie Luce, USFS Rocky Mountain RS**	**Water resources**
• **Jeff Prestemon, USFS Southern RS**	**Economics**

Technical Contributors

• **Larry Band, University of North Carolina**	**Water resources**
• **Jim Clark, Duke University**	**Forest dynamics**
• **Nikki Cooley, Northern Arizona University**	**Tribal perspectives**
• **Tony D'Amato, University of Vermont**	**Forest management**
• **Jessica Halofsky, University of Washington**	**Climate change adaptation**

Building on NCA3

Key Messages

1. Climate change is increasing the vulnerability of many forests to ecosystem changes and tree mortality through fire, insect infestations, drought, and disease outbreaks.

2. U.S. forests and associated wood products currently absorb and store the equivalent of about 16% of all carbon dioxide (CO_2) emitted by fossil fuel burning in the U.S. each year. Climate change, combined with current societal trends in land use and forest management, is projected to reduce this rate of forest CO_2 uptake.

3. Bioenergy could emerge as a new market for wood and could aid in the restoration of forests killed by drought, insects, and fire.

4. Forest management responses to climate change will be influenced by the changing nature of private forestland ownership, globalization of forestry markets, emerging markets for bioenergy, and U.S. climate change policy.

State of the Forest Sector

- Forests are distributed across the spectrum of rural to urban environments, on public and private land, and cover 33% of land in the U.S.

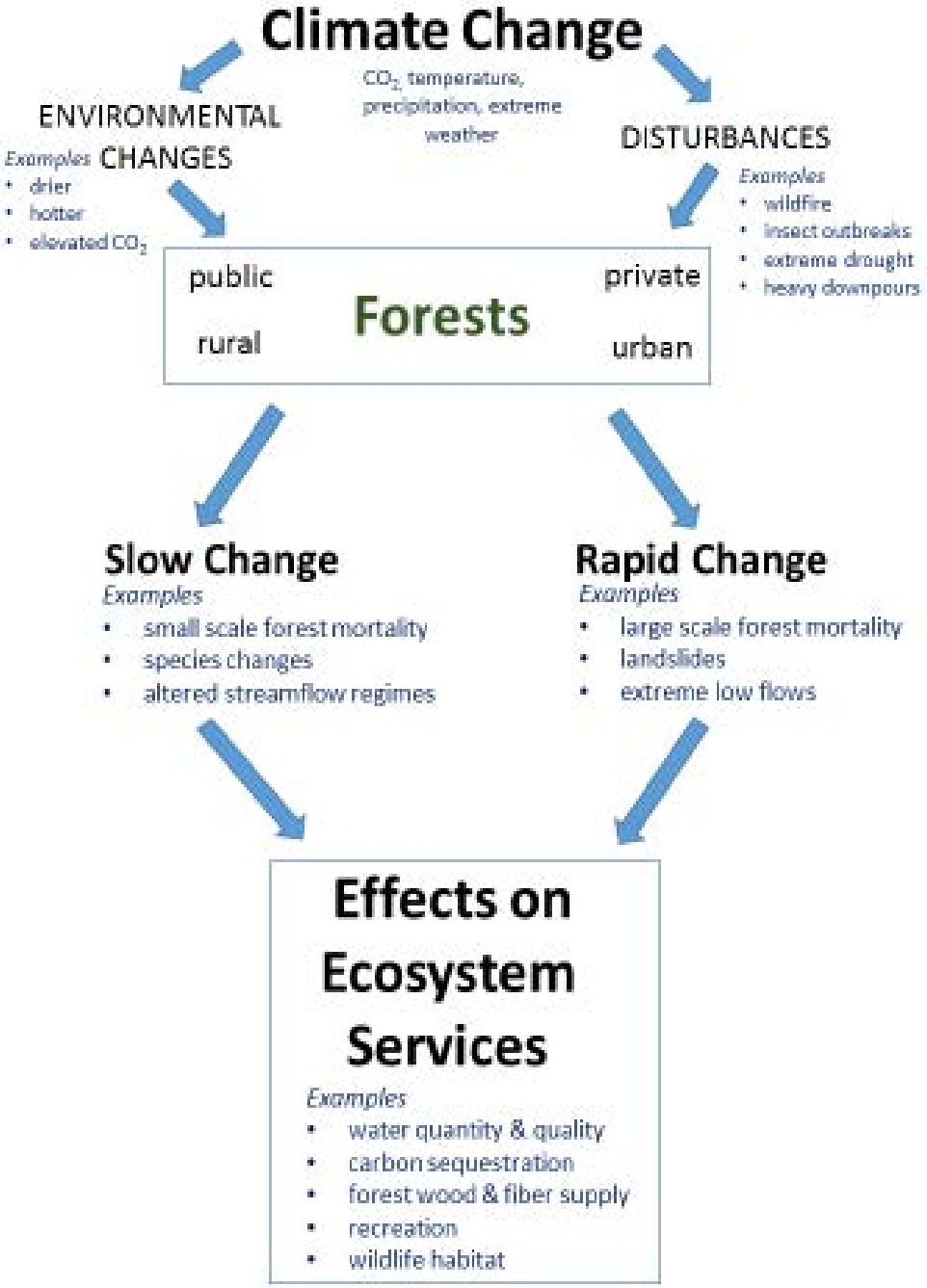
- The ability of U.S. forests to continue to provide goods and services is threatened by both ***gradual climate change*** and ***increases in extreme events and disturbances***.

Forest Responses to Climate Change

- The capability of forests to provide ecosystem services in the face of stress imposed by climate change depends on **keeping trees alive and healthy** across large landscapes.

- The ability of trees to adapt to and survive changing climatic conditions ensures long-term persistence of forest ecosystems – ***adaptive capacity not unlimited.***

- Both gradual changes in climate and changes in climatic extremes and disturbances can affect forest conditions in the short and long term.


Climate Change
CO_2, temperature, precipitation, extreme weather
ENVIRONMENTAL CHANGES
Examples
• drier
• hotter
• elevated CO_2
DISTURBANCES
Examples
• wildfire
• insect outbreaks
• extreme drought
• heavy downpours
public
rural
Forests
private
urban
Slow Change
Examples
• small scale forest mortality
• species changes
• altered streamflow regimes
Rapid Change
Examples
• large scale forest mortality
• landslides
• extreme low flows
Effects on Ecosystem Services
Examples
• water quantity & quality
• carbon sequestration
• forest wood & fiber supply
• recreation
• wildlife habitat

What's happening to forests?

Severe drought (and beetles) killed over 300 million trees in Texas in 2011, and over 100 million trees in the southern Sierra Nevada in 2015.

What's happening to forests?

Wildfire burned 3.7 million acres or more in 12 of 16 years since 2000, including a record of 10.2 million acres in 2015, with annual fire suppression costs ranging from $800 million to $2.1 billion during this time.

What's happening to forests?

Drought, heavy rainfall, altered snowpack, and changing forest conditions are increasing the risk of **low summer streamflow**, **winter flooding**, and **reduced water quality**.

Management Responses and Challenges

- The ability of forests and organizations to adapt to climate change will be determined by socioeconomic factors and human capacity on both public and private lands.

- “Keeping forests as forests” ensures, through appropriate management actions, that the amount and functionality of forest ecosystems will not decline significantly.

Draft Key Messages

DRAFT Key Message 1: More frequent **extreme weather events** will increase the frequency and magnitude of severe ecological disturbances, driving rapid (months to years) and often persistent changes in forest structure and function across large landscapes. Changes resulting from **gradual climate change** and less severe disturbances will occur in the context of altered forest productivity, health, and species distribution and abundance that occur at longer time scales (decades to centuries).

Rapid Forest Change - Fire

- **Fire season has increased** by 80 days in many parts of the Western U.S. because of earlier snowmelt and deeper droughts.
- **Larger and more intense wildfires** are occurring in some locations, making suppression more difficult and increasing risk to people, homes, infrastructure, and firefighters.

Rapid Forest Change - Fire

Annual area burned in the U.S. could increase 2 to 6 times by 2100, depending on geographic area, ecosystem, and local climate.

Rapid Forest Change - Fire

- **In the Southeast US**, by 2060, median annual area burned by lightning-ignited wildfire is projected to increase by 34%.

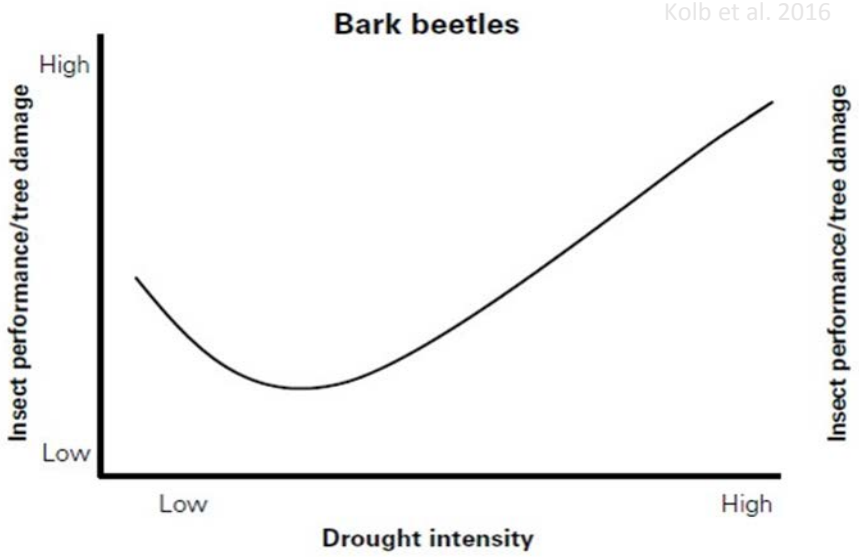
- Extensive wildfires in the Southeast during the past 5 years, including **near urban areas**, may corroborate these projections.

Rapid Forest Change – Insects & Diseases

During the past 30 years, **bark beetle-caused tree mortality** in the Western U.S. has exceeded that of wildfire.

By 2016, more than 102 million drought-stressed trees were killed by mountain pine beetle in central and southern Sierra Nevada.

In some of the most heavily impacted areas, 70% of trees and 93% of basal area were lost in a single year.



Rapid Forest Change – Insects & Diseases

- The range of **mountain pine beetle is expanding** with warming; new breeding populations are now found in parts of the western Plains and in jack pine forests in Alberta.

- Mountain pine beetle populations are also expanding in **high-elevation forests** of the Western U.S., affecting lodgepole pine, whitebark pine, and other species.

Rapid Forest Change – Insects & Diseases

- Outbreaks of diseases caused by **forest pathogens** are generally expected to be more frequent and severe as a result of climate change.

- Insect and disease outbreaks often influence other disturbances, thereby **compounding effects on ecosystem services**. For example, tree mortality associated with beetle outbreaks affects fuel loads, which in turn influence wildfire characteristics.

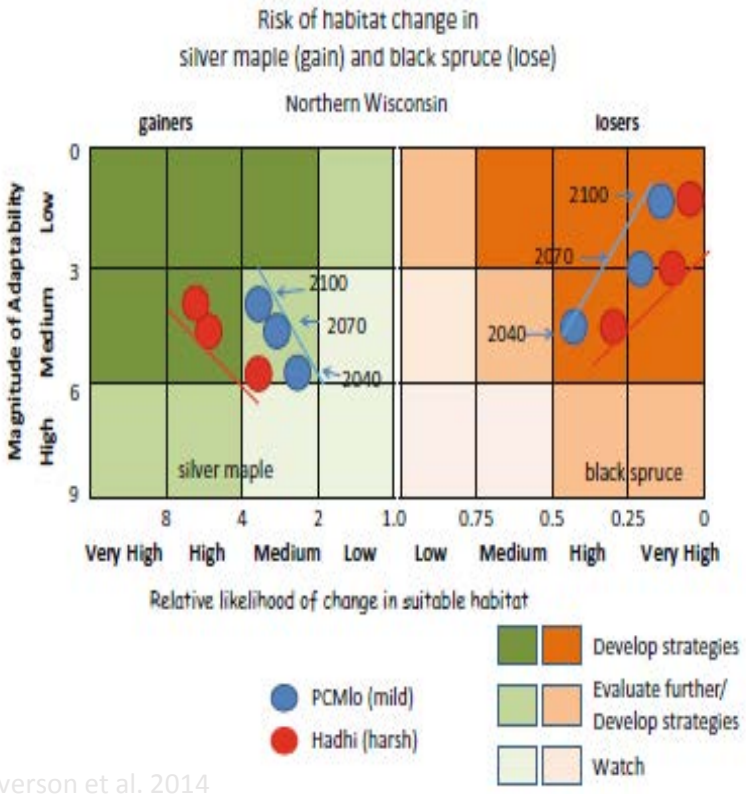
Long-Term Forest Change

- The effects of climate change on **tree mortality and health** can be obscured by slow response times of long-lived trees.

- Climate-related stresses on trees facilitate **morbidity responses** that can go unrecognized for years.

Long-Term Forest Change

- In some locations, the rate of climate change may be outpacing the capacity of tree populations to adjust.
- Failure of some tree species to track changing climate can reduce forest health and competitiveness with other species.



Iverson et al. 2014

DRAFT Key Messages

DRAFT Key Message #2: Climate change will mostly **decrease the ability of forest ecosystems to provide desired ecosystem services** to society, with significant negative effects on **tree growth** and **carbon storage** which will be reduced by chronic higher temperature, more frequent drought, and increased disturbance episodes. The onset and magnitude of climate change effects on **water resources** in forest ecosystems will vary, but are already occurring in some regions.

Tree Growth

- **Atmospheric enrichment from CO_2 and nitrogen** could increase biomass growth by up to 2% annually. However, extreme temperatures can cause **heat-related stress** in vegetation, exacerbating drought effects, and in some cases causing lower forest productivity and higher mortality.

Carbon Sequestration

Disturbances are expected to make it **difficult to retain carbon within forests**, especially where multiple disturbances co-occur.

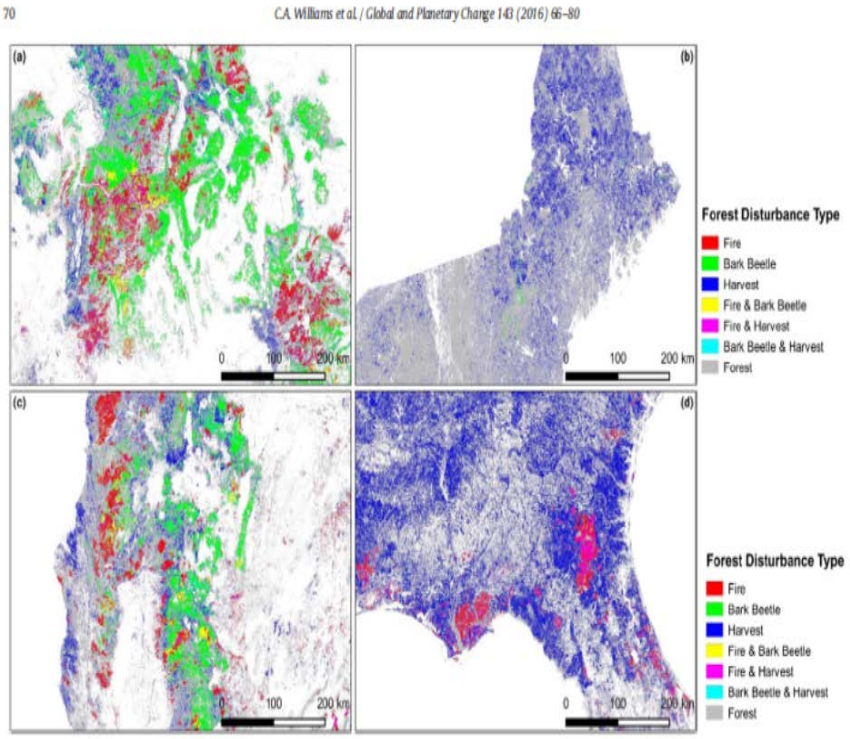
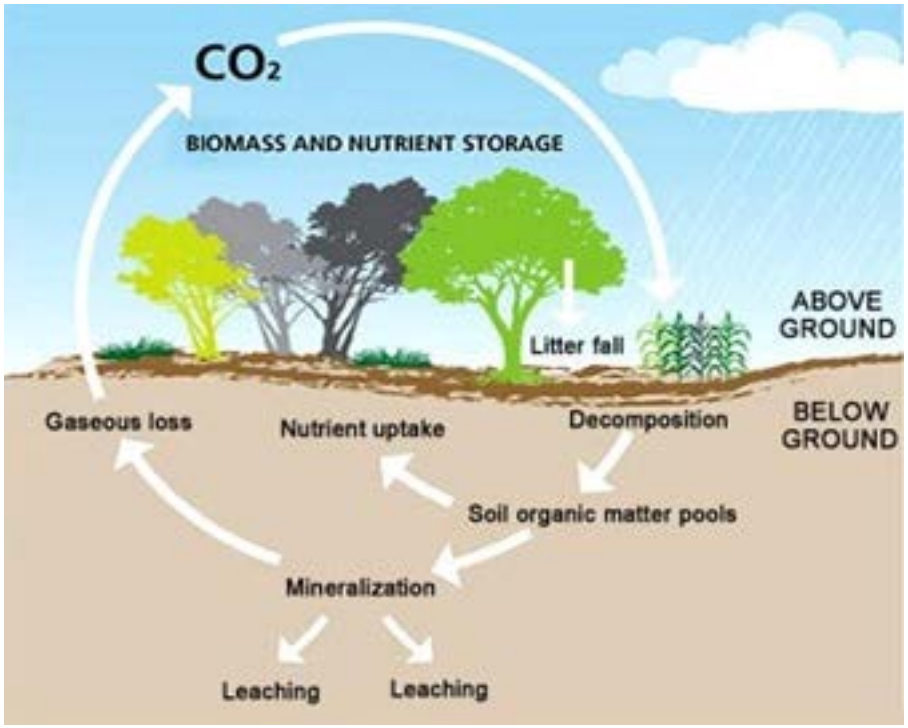


Fig. 2. Disturbances by type for select regions (see Fig. 1) across the conterminous United States based on NAFD, MTBS, and ADS datasets.

Carbon Sequestration

- Net sequestration from forest land in 2014 was 742 Tg CO_2 per year, which offset 11% of CO_2 emissions in the U.S.

- Forests are projected to continue to sequester C, but at declining rates, affected by land use and aging forests.



Water Resources

- **Disturbances and droughts** can affect streamflow and water quality.
- **Changing forest composition** has altered streamflow and increased drought vulnerability in some regions.
- **Changes in snowfall amount, timing, and melt dynamics** are affecting water availability and stream water quality. In the Western U.S., less precipitation is falling as snow and more as rain, leading to a longer and drier summer.

Water Resources

- Warm-weather activities (hiking, camping, etc.) will increase as cold weather and snow decrease (especially in spring and autumn).

- Snow-based activities (skiing, snowmobiling, etc.) will decrease as snow decreases, especially at low-mid elevations.

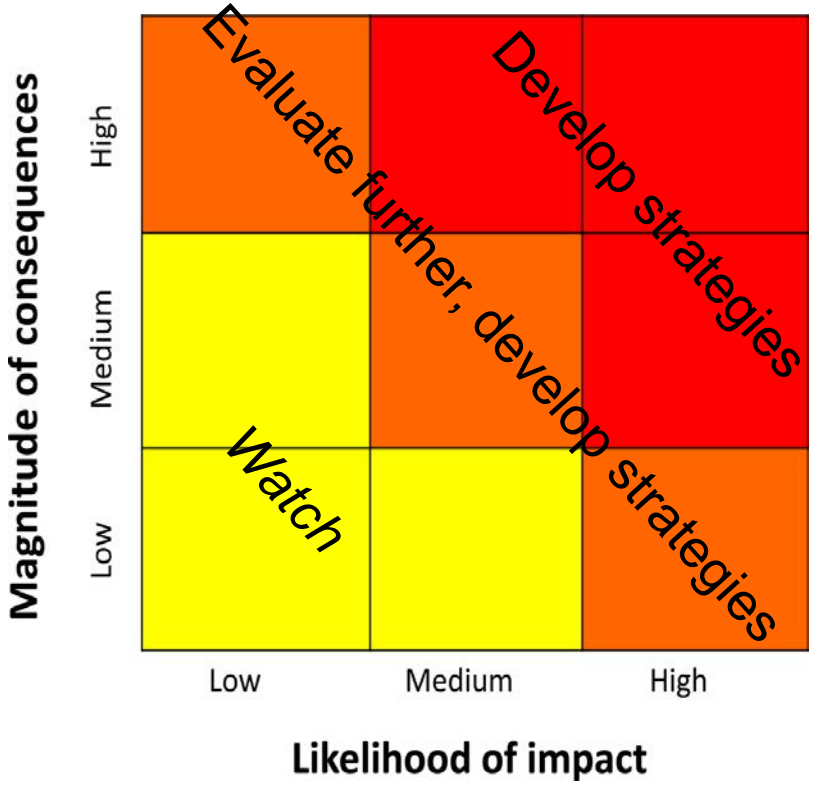
DRAFT Key Messages

DRAFT Key Message #3: Forest management activities that increase climate change adaptation are moving forward in the U.S., with a **broad range of adaptation options for different resources**, including applications in planning and management. The future pace of adaptation will depend on how effectively **social, organizational, and economic conditions** support implementation.

Climate change adaptation

- **Risk assessment** provides the context for evaluating and responding to the effects of climate change (magnitude and likelihood of consequences).

- Adaptation will not occur unless **organizational capacity** exists to facilitate implementation.



Climate change adaptation

- Operational (technical, organizational), economic, and political risks provide the **context for adaptation**.

- Declining budgets, lack of available workforce, regulatory issues, and bureaucratic constraints can **limit the scope and options for implementation**.

Climate change adaptation

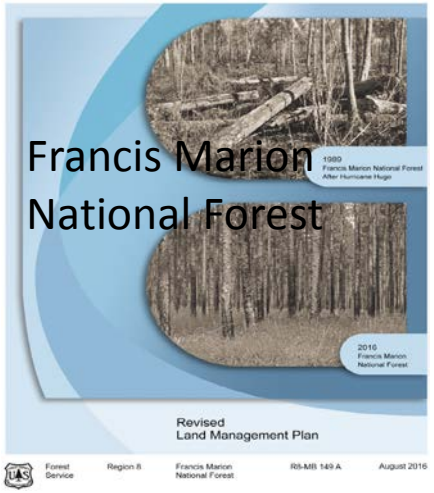
Implementation examples:

- Development of sustainable road systems
- Up-sizing culverts to match projected streamflow
- Using projected stream temperatures to set priorities for coldwater fish conservation and riparian restoration
- Reintroducing beavers to retain cool water in mountain landscapes

Climate change adaptation

- Many ongoing actions that are part of sustainable forest management are already “climate smart,” and **may need only fine tuning**.

- Progress is being made on incorporating climate change into agency **planning, NEPA documents, and on-the-ground projects**.



In conclusion … some highlights

- Increased frequency and magnitude of droughts and ecological disturbances are the major change agents.
- The biggest changes so far are in the hydrologic components of forest ecosystems.
- Carbon sequestration will become increasingly difficult in the future.
- Adaptation is progressing and expected to accelerate in the near future.

We invite you to share information or technical inputs (peer-reviewed literature, gray literature, case studies, etc.) with the chapter author team

http://www.globalchange.gov/content/nca4-outline

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U.S. Global Change Research Program

THANK YOU!

Please send feedback to:

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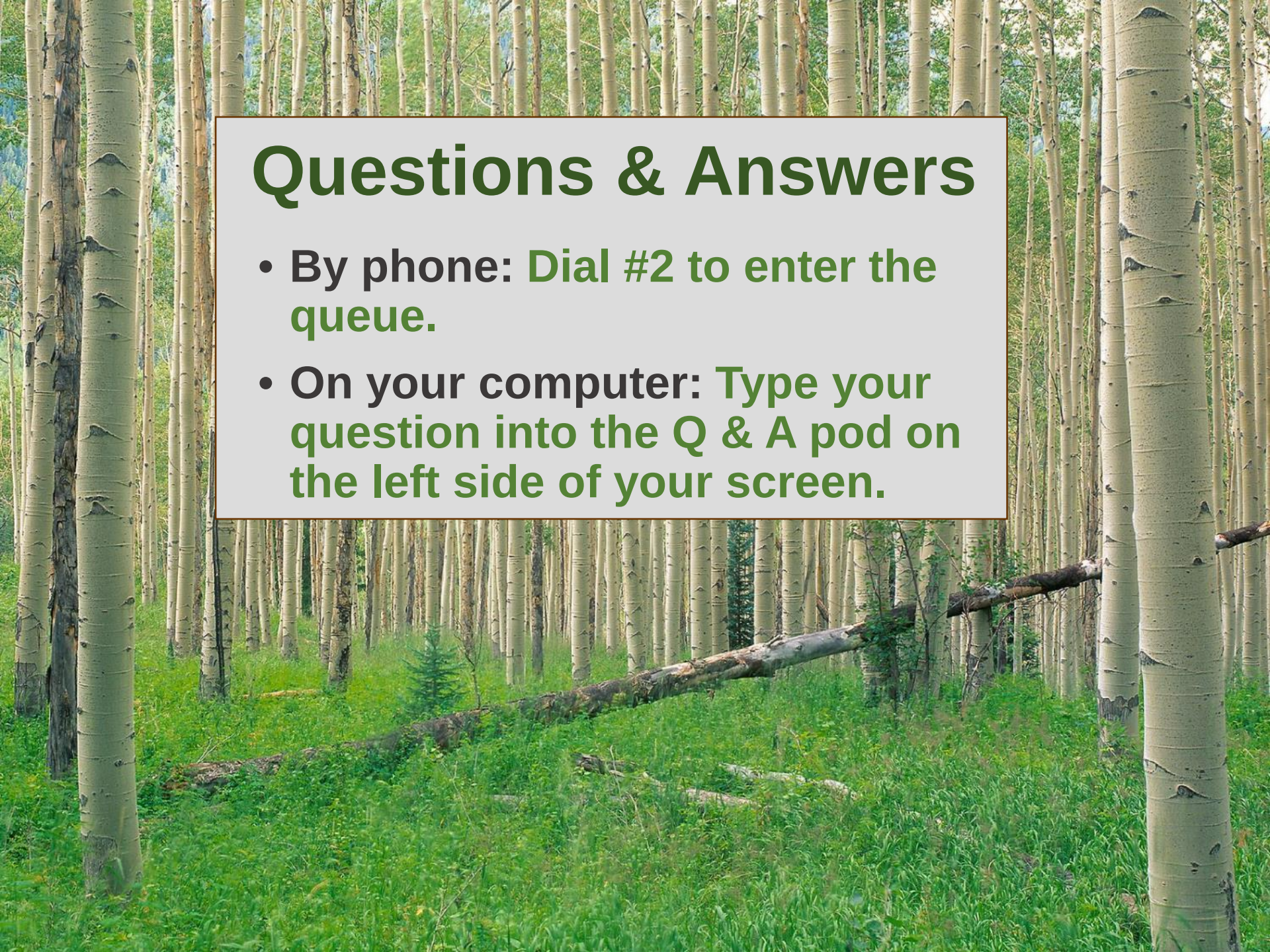

Questions & Answers

- **By phone:** Dial #2 to enter the queue.
- **On your computer:** Type your question into the Q & A pod on the left side of your screen.

Thank you for attending today's webinar!

A recording of this session will be available shortly at the Forestry and Natural Resources Webinar Portal:
http://www.climatewebinars.net/webinars/climate-assessment