

Challenges in Communicating Scientific Information about Global Climate Change and Forests to Nonscientific Audiences

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Scientific information related to climate change and forests

- ❑ Increasing demand
- ❑ Originally small cadres of specialists in climate change
- ❑ Topic now spreading into many specialties



Types of scientific information

- Modeling and predicting
- Responses to climate change
- Effects of climate change
- Adaptation and mitigation



Change related to information

- Type of scientific information being generated slowly expanding
- Demand for scientific information dramatically increasing by policymakers, media, land managers, and the public



Pacific Northwest Research Station (PNW) experience

- 15 plus years of climate change research related to forests Primarily modeling-one of three worldwide vegetation models developed at Station: Ron Neilson lead scientist



Initial Communications

- Journals
- Conferences
- Briefings
- Testimony

Nonscientific publications-one color



Science

FINDINGS

"Science affects the way we think together."
—Lewis Thomas

INSIDE

Are We Seeing the Globe is Warming? 2

View From the Crystal Ball? 4

Is There or Is There Not? That is the Question 4

Too Many Variables or Not Enough? 4

Recognizing Forest's Limits 8

Can We Manage for Global Warming? 8

Issue Fourteen / May 1999

MORE RAIN, MORE DROUGHT:
WILL THE FORESTS THRIVE OR DIE?



A Flooding is expected to increase in many areas under most climate change scenarios, and has already done the same in the western United States, where disaster patterns have increased over the last decade.

IN SUMMARY

Global Warming: Is it real or not? Ron Nelson, PNW Research Station hydrobiologist, has been studying the phenomenon for about 25 years. He also is the lead author on one of three models in the world designed to track climate-driven vegetation change patterns on the planet.

Nelson's findings, featured in this issue of "Science Findings," may be able to assist land managers to prepare for global warming impacts. Nelson and his colleagues developed a model called the mapped atmosphere-plant-soil system (MAPSS).

The MAPSS model can simulate changes in vegetation distribution and runoff under altered climate and carbon dioxide concentrations. Key findings from Nelson's work reveal that the Pacific Northwest is an area of uncertainty.

Other key findings reveal that there is a shifting of vegetation in the north, dieback of boreal forests, and continued warming temperatures that have the potential to strain water resources. Future forest management plans should take into account the range of possibilities under climate change scenarios.

Conversion happened at a water fountain.

Man: Hey, that global warming stuff. Should I believe that, or is it just another crack?

Woman: You better believe it, buddy. The insurance companies do.

A s any gathering formal or informal of people discussing global warming and climate change, there are guaranteed to be devils. Even satans.

The evidence, however, is starting to mount. "The overwhelming majority of scientists agree that the planet is warming,



Science

FINDINGS

"Science affects the way we think together."
—Lewis Thomas

INSIDE

A Range of Possibilities 2

Hot and Hot or Hot and Dry? 2

The Economy of Warming 4

State's Call 4

Issue Seventy-Five / August 2003

CLIMATE CHANGE AND CALIFORNIA: POTENTIAL
IMPLICATIONS FOR VEGETATION, CARBON, AND FIRE



Over woodland (left) and alpine meadow (right) are two ecosystems threatened by climate change.

IN SUMMARY

Modelers simulate how land-use scenarios in the United States could contribute to estimate how California's environment and economy would respond to global climate change. A scientist from the PNW Research Station led efforts to estimate effects on vegetation, carbon, and fire.

To quantify the range of the possible impact of climate change over the next century, researchers used data of the current climate change simulation coupled with a dynamic vegetation model to gauge amenability of natural ecosystems in California under several climate scenarios.

The results suggest that climate change would have a more pervasive impact on the vegetation community diversity than would precipitation. Implications are estimated to include higher evaporation, which would reduce soil moisture in the area covered by active meadows and alpine flowers. The area of commercially important agricultural crops and the state's signature woodlands and shrublands are predicted to decline with warming.

Climate change would also affect fire frequency and the area burned annually, with most of the increased burning in increased fire. Finally, the simulations showed that reducing emissions of carbon dioxide over the next several decades could buffer the longer-term impacts of global warming.

warmer in its conduct. The study was unique in that it didn't ask, so used the "What will the impacts of climate change be?" Instead the researchers sought a more nuanced perspective. They asked, "What are the consequences of following each of the divergent pathways of greenhouse gas emissions?" California was the focus.

And although climate change is a global phenomenon, California made an ideal case study. "There is more diversity in the state's landscapes, climate, ecosystems, and species than in any comparable region in the United States," says Lewis J. Carlton, a forest ecologist at the PNW Research Station in Corvallis, Oregon. "In addition, California has large urban centers, such as 2 of 3 Angeles and San Francisco, is home to 3.5 million people, and has the 100th largest economy in the world. By examining the effects of climate change on such a wide diversity of human and ecological systems,

Nonscientific publications-color

Note, this comes up as Page One Item One on Google for “Climate Change and Forest Fire”



Pacific Northwest Research Station

Science Update

WESTERN FORESTS, FIRE RISK, AND CLIMATE CHANGE



IN SUMMARY

Change coming may first show up in forests as increased growth, which occurs as warmer temperatures, increased carbon dioxide, and more precipitation encourage higher rates of photosynthesis. The second way that climate change may show up in forests is through changes in disturbance regimes—the long-term patterns of fire, drought, insects, and diseases that are basic to forest development.

Advanced computer models are producing the first national-scale simulations of how ecosystems and fire regimes could change in the 21st century. In six of seven future scenarios run through one model, the Western United States gets wetter, windier, and warmer throughout the 21st century (as compared to current climate), with expanded woody growth across the West and thus, increased fire risk. These results have been used in national and global assessments of global climate change.

The computer model can now produce forecasts of possible fire risks for the conterminous United States, made possible by incorporating year-to-year changes in climate, fuel loadings, and moisture into the model. The accuracy of 2002 and 2003 forecasts has validated the model's approach, suggesting it can eventually be a useful planning tool for fire managers.

Research results were produced by scientists from the USDA Forest Service Pacific Northwest (PNW) Research Station, working with others from Oregon State University and from around the world. The team's research has led to the key insight that fire and fuel load issues in Western forests are linked to global carbon balance issues. The full story is online.



United States Department of Agriculture



Forest Service



Pacific Northwest Research Station

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Intense demand for information

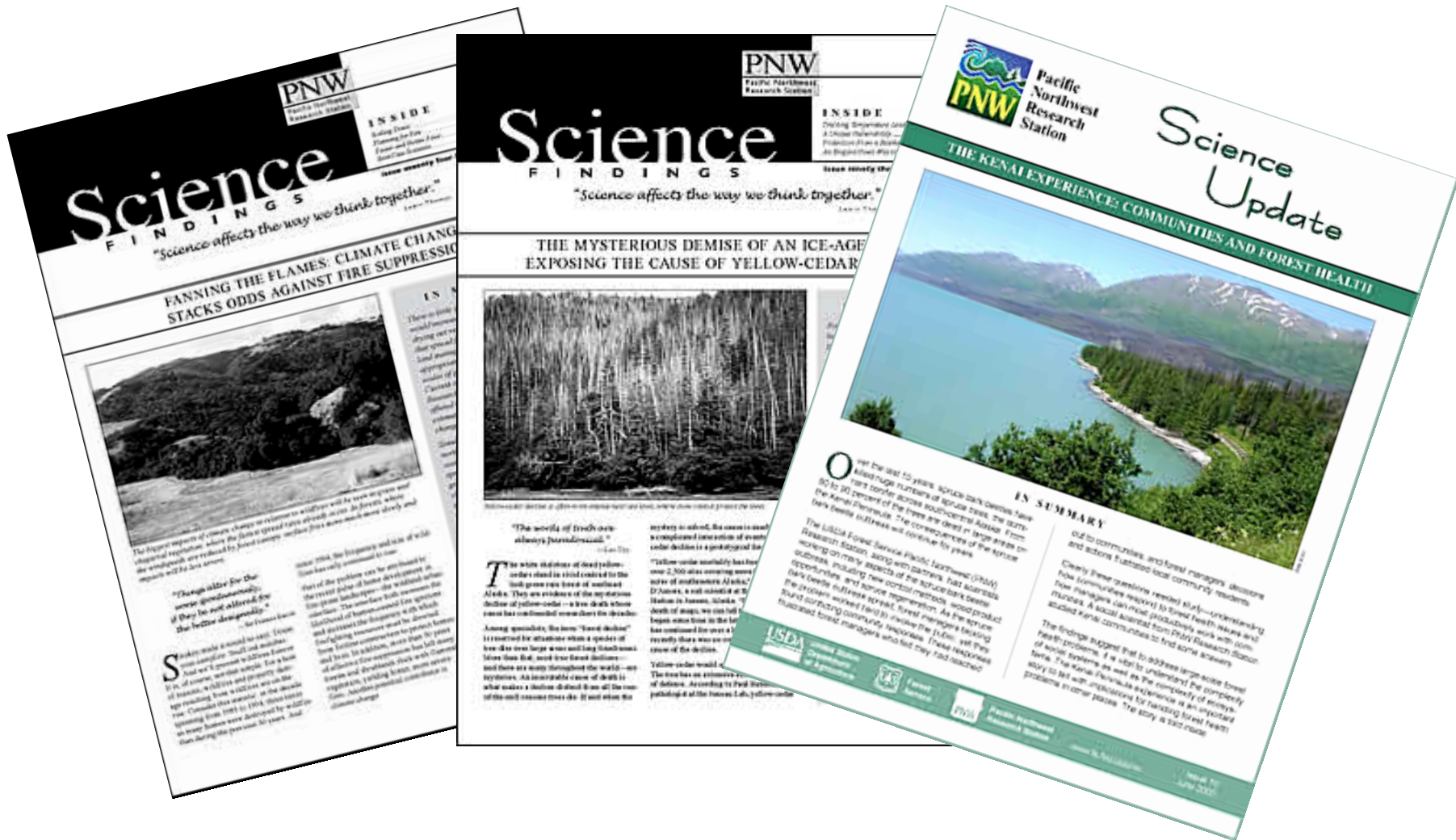
- ❑ Balancing generation of information with its communication
- ❑ Lead scientist and team members share responsibility
- ❑ Station communication products help meet demand



PNW generates many kinds of climate change information

- Modeling results
- Topic of climate change emerging in many areas of study
 - In relationship to fire
 - Relationship to yellow-cedar decline in Alaska
 - Human response to catastrophic tree mortality in Alaska
 - And many others

Publications for nonscientists



Nonscientific publication at Pacific Southwest Research Station



Pacific Southwest Research Station
FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

Climate Change



Detecting Climate's Imprint on California Forests

Hiking the rocky, treeless slopes of western Nevada's Snake Range, researcher Leslie Miller found dead timber pine throughout the watershed. Where snowy forests were present, the dead wood occurred above treeline. An analysis of these wood remnants, scathed by the elements over hundreds of years, revealed a critical pattern of timber pine colonization and retreat tied to climate change.

Climate Cycles

Over the past two decades, scientists have made great strides in deciphering the story of climate that is recorded in tree rings, lake and ocean bottom sediments, coral reefs, and ice cores. When analyzed, the studies paint a dramatic and unexpected picture of climate change—nested oscillating cycles whose influence affects every other average temperature (p. 10), (continues on page 8)

As well as the 20th century average global temperature increase that occurred during the 20th century.

However, rather than simply being gradual, climate shifts have often been abrupt, with marked changes in temperature and precipitation taking place over periods as short as a few years or decades.

Climate peaks and valleys often reshape landscapes and rapidly change the nature of the habitats they contain. In turn, these physical changes evoked sharp adjustments in animal and plant populations and the regions they occupy. Forest climate change, explains researcher Dr. Corwin Miller, is a significant force that may affect many small areas or large swaths of

continents and adjacent oceanic waters. Sea level changes may affect only individual populations or species. In contrast, it may displace entire plant and animal communities.

Climate change continually tests the limits on which ecosystems operate such as fire, flood, insect infestations, and disease (p. 10), notes Miller. Scientists and managers may assume that these secondary effects—in conjunction with changing fire suppression, and other human-induced causes—have actually induced ecological change. "Consequently, viewing climate change as the key player is a paradigm shift for scientists and managers alike," Miller says.

Occurring on several different scales, climate change is driven by factors as varied as ocean currents, solar flares, and earth's orbit around the sun.

Climate Scale

The shortest oscillations occur on a scale of a few years, like the often-mentioned El Niño to Niño cycle, to several decades. "The last time the Pacific Decadal Oscillation oscillated, climate changes every 25 to 40 years in temperature, snowpack, forest productivity, and salmon abundance, among others," says Miller.

Continued on page 8

Science
Perspectives

April 2003
www.pswr.fs.fed.us



Communication challenges

- ❑ Understand purpose of communications
- ❑ Assure use of information that is generated
- ❑ Communicate limits of today's knowledge about climate change
- ❑ Keep up with demand for information
- ❑ Provide understandable information that is complex
- ❑ Use today's technologies



Suggested purpose of communications

- Provide awareness of information as it emerges with context and explicit description of relevancy to policy issues
- Assure use of information by public, policy makers, and natural resource managers
- Help people to understand what is known and unknown, certain and uncertain. Mass media do not do well at this.



Framework that reflects current scientific thinking

- Create resistance to effects of climate
- Increase resilience to climate
- Allow ecosystems to respond to climate change
- Realign altered ecosystems



Use of information-print media

- Print media reaches thousands of people
- Limits of science can be described
- Example: Science Findings and Science Update are read by about 9,000 people



Move beyond print

- Workshops that reach small numbers of people (20 to 500 people)
- Limits of science can be discussed.
- Example: Western Wildland Ecosystem Threat Center held workshop this spring that brought together resource managers and scientists to help define issues, build common understanding, and continuing dialogue about of climate change



One-on-one communications

- Consultations: 1 to 5 people
- Thorough discussion can be held on limits of science
- Example: Congressman consulted with two ecologist from PNW Research Station in July 2007. Next day testimony before Congress included scientific information about spruce budworm and climate change. Stayed within bounds of science.



New media

- ❑ Internet-based media can reach millions of people
- ❑ Younger audiences are “digital natives”
- ❑ Limits of science can be displayed

- ❑ Example: Web site on climate change being developed to host electronic presentations, selected readings, links to large amounts of searchable scientific information.

Video Presentations about Climate Change and public wildlands management are delivered via the web, CD ROM, or local networks

Pacific Northwest Research Station

Climate Change Research in the US Forest Service

-  **ReThinking Forest Management in the West**
-  **Options for Natural Resource Management under a Changing Climate**
-  **Climate Change, Uncertainty and Forecasts of Global to Landscape Ecosystem Dynamics**
-  **Holocene Climate Variation and Drought in the Great Basin: Impacts on Past, Present, and Future Vegetation**

USFS PNW PSW TUS

Climate Change Research in the US Forest Service

ReThinking Forest Management in the West



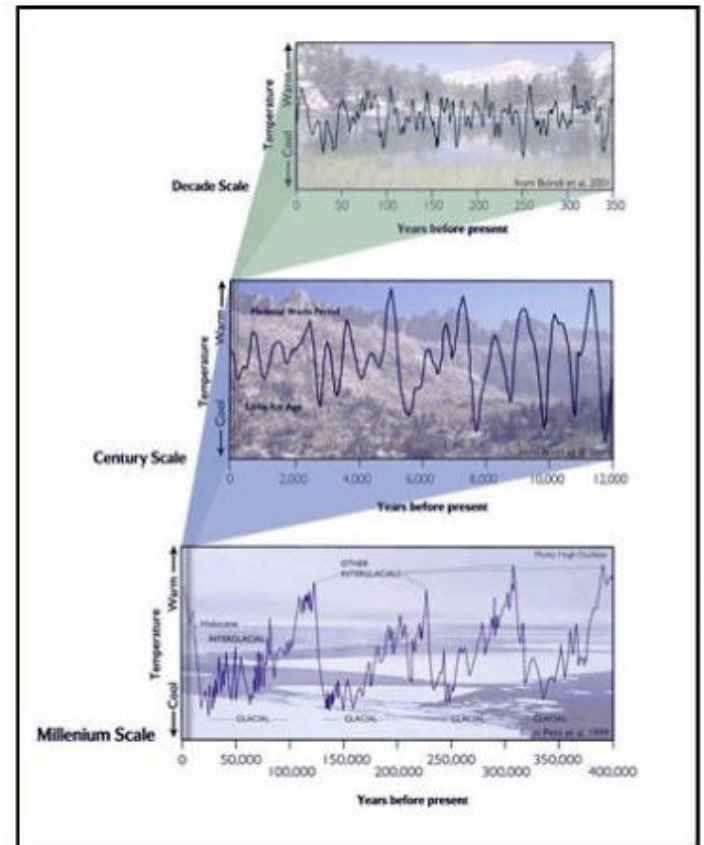
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- Title Slide
- Natural Climate Cycles
- IPCC Overview Highlights
- IPCC Temperature and Co2 Projections
- West: Temp and Precip
- West: Drought Cycles
- West: Snowpack and Streamflow
- West: Glaciers
- West: Forest Densification
- West: Forest Mortality
- West: Climate and Fire
- California: 2100 Climate Projection
- Current Mgmt Paradigms
- Question: Are Current Concepts OK?
- Limitations of Current Premises 1. HRV
- 2. Ecologic Sustainability
- 3. NDVI

CLIMATE: The Bigger Picture

Earth's Natural Climate System

- Continuously Changing; Cyclic
- Nested Cycles: Annual, Decadal, Century & Millennial Scales
- Different Physical Mechanisms
- Changes: Gradual & Directional to Abrupt & 'Chaotic'



Climate Change Resource Center

Information and Tools for National Forest Managers in the West

United States Department of Agriculture Forest Service

CLIMATE CHANGE RESOURCE CENTER

Information and Tools for National Forest Managers in the West

Back to Forest Service >> Home About News Jobs Maps

Back to WWETAC >>

Threats

- What's New?
- Climate Basics
- Management Opportunities

Want to learn about...

Climate and climate change
Effects of change on ecosystems
Resource planning and management options
Case studies and on-the-ground examples
Climate and vegetation models and scenarios

Toolbox and Library

FAQ about Climate and Resource Management
Primers on Climate and Effects
Technical Literature
Video Demonstrations
Talks and Presentations
Briefs and Fact Sheets

Projects

Information and Tools for National Forest Managers in the West

The Climate change resource center is a web portal on climate change developed for natural-science managers of public lands in western North America. Sponsored by the Westwide Climate Initiative, a project of the western USFS Research Stations (PNW, PSW, RMRS) and Western Threat Center, the site provides a select reference library on climatology, climate change, ecological impacts, and carbon relations. You can also find a toolbox of applications to resource management, including educational primers, verbal and quantitative models, case studies, maps, and other decision-support material to help resource managers respond to the question,

"What can I do about Climate Change?"

Goal: Promote greater understanding of climate science among natural resource managers and provide tools and support needed for managers to develop adaptation and mitigation strategies for climate change.

Climate Research and Support Organizations

Would you like to understand more about existing research and management support organizations? Check out [Primer on climate-science institutions](#)

Links to Climate Research and Decision-Support Institutions and Projects

IPCC	CIRCOCOUNT
CCSP	WMI
SAP - National Forests	Regional Climate Initiatives
RPA - Climate Assessment	More

Workshops

Maps & Tools

Current Projects

- Case Studies
- Planning Tools and Management Strategies
- Climate Maps, Current & Future Scenarios
- Vegetation Maps, Current & Future Scenarios

Contacts & Climate Sites

- WO Climate
- PNW Climate
- PSW Climate
- RMRS Climate

The Climate Change Resource Center welcomes and suggestions to improve usefulness of the website by natural-resource managers. Contact email@email.com

USDA USFS PNW RPA



Conclusions

- Climate change has rapidly become an issue of primary public interest worldwide
- Science is central to this issue
- Communication challenges need to be met by scientists, communicators, and science leadership in a variety of forms and media

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