

# STREAM NOTES

Rocky Mountain Research Station

April 2010

## Adapting to Climate Change: A Short Course for Land Managers

The U.S. Department of Agriculture (USDA), Forest Service has released an interactive short course, *Adapting to Climate Change: A Short Course for Land Managers*, that presents current scientific knowledge on adapting to climatic variability in wildland management (fig. 1). The goal of this self-paced short course is to help natural resource managers and decision makers plan for future climate-driven uncertainties. It features video lectures with corresponding slide presentations, interactive quizzes, literature citations, and links to additional information. Information in this short course provides natural resource specialists, managers, and decision makers a summary of the state-of-the science on the topics of climate change and variability, future climate projections, and ecological and management responses to climate variability.

The course material information and talks were produced by a group of prominent scientists from the USDA Forest Service, U.S. Geological Survey, University of Washington, and Oregon State University during a July 2008 workshop held at the H.J. Andrews Experimental Forest in Oregon. A select group of USDA Forest Service resource managers

and specialists participated in the workshop as well, providing critical input during the development and review of the course material.

### Video Lectures

The goal of this self-paced short course, *Adapting to Climate Change: A Short Course for Land Managers*, is to help natural resource managers and decision makers plan for future climate-driven uncertainties by providing them with talks from different scientists on a wide range of climate-change related topics. The format of the video lectures allows users to go through the materials as time allows and at their own pace; video lectures can be stopped and started at any point (fig. 2). For each video lecture, a brief description of the material to be presented is provided along with the presentation's length of time. Topic headings for the slides presented in the video lecture are listed, outlining the content of the presentation and allowing the user to track where they are at in the presentation. At the end of each video lecture, natural resource specialists, land managers, and research scientists in the audience ask a series of follow-up questions that the presenter responds to and provides additional

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The PRIMARY AIM is to exchange technical ideas and transfer technology among scientists working with wildland stream systems.

CONTRIBUTIONS are voluntary and will be accepted at any time. They should be typewritten, single-spaced, and limited to two pages. Graphics and tables are encouraged.

Ideas and opinions expressed are not necessarily Forest Service policy. Citations, reviews, and use of trade names do not constitute endorsement by the USDA Forest Service.

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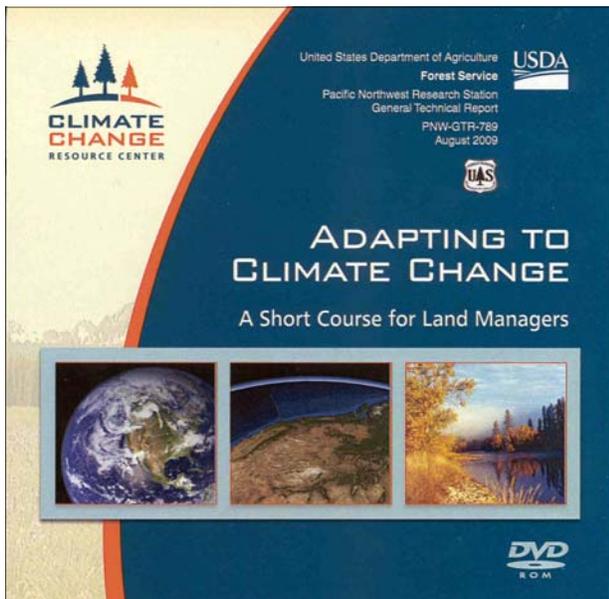


Figure 1. Cover page of the DVD, ***Adapting to Climate Change: A Short Course for Land Managers***.

information on the topic.

The 15 video lectures, which are the core elements of the short course, are organized into three central themes (fig. 3):

- Climate Variability and Projections.
- Ecological Responses to Climate Variability.
- Management Responses to Climate Variability.

### ***Climate Variability and Projections***

The talks presented in the “Climate Variability and Projection” theme (fig. 3) provide background information on the nature of past climates, climate variability, future climate projections, and potential ecological responses to projected future climates. Constance Millar’s presentation highlights some of the natural climate mechanisms that oscillate at multiple and nested temporal scales. She also discusses some of the mechanisms by which plant communities have adapted to historical changes in climate. Philip Mote’s presentation provides background information for understanding current climates, future climates, and the impacts of climate change at global, continental, and regional scales. He also discusses how the human influence on climate is becoming distinguishable from the

noise of year-to-year variation of climate data. Nate Mantua’s presentation describes the pervasive changes to the hydrologic cycle that are occurring and some of the implications that these hydrological changes will have on ecosystems and communities in the future. Ronald Neilson’s presentation provides information about potential vegetation distribution in the West using dynamic vegetation models and downscaled climate data. He also provides some suggestions for improving ecosystem resilience to climate change.

### ***Ecological Responses to Climate Variability***

The talks presented in the “Ecological Responses to Climate Variability” theme (fig. 3) provide information about the ecological consequences of climate change. Linda Joyce’s presentation describes numerous observed responses of plants and animals to climate change in the western United States such as earlier greenup of vegetation in the spring, earlier onset of snowmelt, changes in plant phenology, shifts in the distribution and migration patterns of various animal species, changes in animal breeding cycles, and earlier ends of animal hibernation. David Peterson’s presentation describes how the combinations of biotic and abiotic forest stresses compromise the vigor and ultimate sustainability of forest ecosystems. Doug Ryan’s presentation focuses on carbon and the carbon cycle in forests. He shows that forests in the United States annually store 313 million metric tons of carbon, offsetting about 20 percent of the fossil fuel carbon output in the United States. Boone Kauffman’s presentation discusses the importance of tropical ecosystems in the global carbon cycle, their vulnerability to climate change, and actions that can be taken to mitigate climate change effects in these environments.

### ***Management Responses to Climate Variability***

The talks presented in the “Management Responses to Climate Variability” theme (fig. 3) focus on various potential management responses to climate variability. Linda Joyce’s presentation outlines the purpose of the USDA Forest Service Renewable Resource Assessment and its requirement to include a) analysis of climate change impacts on forest and rangeland resources and b) identification







Figure 3. Screen shot of the 15 video lectures contained in the short course, **Adapting to Climate Change: A Short Course for Land Managers**. The lectures are organized into three central themes: Climate Variability and Projections, Ecological Responses to Climate Variability, and Management Responses to Climatic Variability.

about climate change before or after watching the video lectures. More importantly, the quizzes allow the user to reinforce their understanding of key concepts presented in the different video lectures. Each quiz consists of 10 questions. The results from the quizzes are not recorded.

## Literature Citations and Links

Within each of the video lectures, key literature

citations of the material being presented and links to additional information allow users to further explore topics of interest. Additionally, the Climate Change Resource Center Website link (<http://www.fs.fed.us/ccrc>) provided in the short course gives the user quick access to an extensive list of literature citations on climate-change related topics and links to other Websites having information about climate change.

## Summary

Natural resource specialists, land managers, and scientists will find this short course a useful resource for understanding climate change, climate variability, future climate projections, and ecological and management responses to climate variability. This understanding is critical for natural resource managers and decision makers to effectively plan for future climate-driven uncertainties by developing management actions that increase the adaptive capacity and ecological resilience of natural resources in the United States.

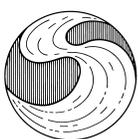
## Additional Information

The short course is available as a DVD or online at the Climate Change Resource Center (<http://www.fs.fed.us/ccrc>). DVD copies of the course can be requested by emailing [pnw\\_pnwpubs@fs.fed.us](mailto:pnw_pnwpubs@fs.fed.us) or calling (503) 261-1211 and referencing "PNW-GTR-789."

*Adapting to Climate Change: A Short Course for Land Managers*, is the latest in a series of web-based presentations known as "portable electronic presentations (PEPs)," which serve as an interactive learning platform and resource for delivering key scientific talks in an on-demand, rich-media environment. Other PEPs can be viewed at <http://www.fs.fed.us/pnw/pep>.

The citation for this publication is:

Furniss, M.J.; Millar, C.I.; Peterson, D.L.; Joyce, L.A.; Neilson, R.P.; Halofsky, J.E.; Kerns, B.K. 2009. Adapting to Climate Change: A Short Course for Land Managers. Gen. Tech. Rep. PNW-GTR-789. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.



# Climate Change Bibliography

by Robert A. Gecy and Michael J. Furniss

The U.S. Department of Agriculture (USDA), Forest Service recently updated its bibliography on climate change. The bibliography now includes nearly 1,800 citations on climate change and its effects on various resources. The papers included in this bibliography address one or more of the following questions:

- How does the Earth's climate system work?
- How does climate change over time and what drives those changes?
- What are the effects of climate change?
- What can be done to mitigate the effects of climate change or adapt to projected climate changes?

In this update, we expanded the topic outline and added nearly 1,200 citations to the original library. The primary topic headings are:

- Policy
- Present Trends
- Global Climate
- Carbon Dynamics
- Climate Variability
- Climate Models
- Effects of Climate Change

Nested within these seven major topic headings are 115 subheadings that help organize the various articles referenced in the bibliography by more specific subject groups. The goal is to have at least 20 to 40 papers for each of the subheadings (as a minimum), but we have not quite reached that goal for all the subheadings. We will address this in future updates to the bibliography. Some of the papers included are only marginally related to climate change, and more directly related to soil science, hydrology, ecology, etc.

Every title in this library is electronically linked. As a rule, links are to the published article home

(abstract) page for journal papers and to either a publisher link or Google book link for books and book chapters. Abstracts are included for those papers that are open access. For a few papers (32 in this version) an abstract is not provided or the abstract was not available except by subscription. Access to article contents also requires a subscription.

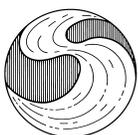
This bibliography is primarily intended as a resource for natural resource professionals, but will also be useful to anyone interested in climate change and its potential impacts. Our goal is to provide information and to make that information as accessible as possible. The bibliography is not exhaustive, comprehensive, or fully contemporary, but rather a representative sample of available published literature. Readers are strongly encouraged to consult other reference resources.

The climate change bibliography can be accessed from the Climate Change Resource Center Website at <http://www.fs.fed.us/ccrc/bibliography/>. The Climate Change Resource Center Website was developed for resource managers and decision makers who need information and tools to address climate change in planning and project implementation.

Acknowledgements: Special thanks are extended to Jennifer Harden of the U.S. Geological Survey for providing access to her library on soil carbon, and to Drew Synan for developing the scripts that facilitated hyperlinking the citation titles.

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# Forest Soil Disturbance Monitoring Protocol Tool

Monitoring soil disturbance from land-management activities allows natural resource specialists to assess the effectiveness of best management practices and whether legal, regulatory, and policy objectives are being met. To do this effectively, a consistent, scientifically sound, and standardized soil monitoring method is needed. Accordingly, the U.S. Department of Agriculture (USDA), Forest Service developed and recently released *The Forest Soil Disturbance Monitoring Protocol (FSDMP) Toolkit*. The FSDMP toolkit provides a rapid assessment method for monitoring soil disturbance from forest management activities during both the assessment (pre-activity) and monitoring (post-activity) phases of a project.

The toolkit includes the following:

- Forest Soil Disturbance Monitoring Protocol (Volume I: Rapid Assessment)
- Forest Soil Disturbance Monitoring Protocol (Volume II: Supplementary Methods, Statistics, and Data Collection)
- Forest Soil Disturbance Monitoring Protocol (Volume III: Scientific Background for Soil Monitoring on National Forests and Rangelands)
- Soil-Disturbance Field Guide – Visual photo Guide

## Forest Soil Disturbance Monitoring Protocol (FSDMP)

### *Volume I: Rapid Assessment*

This report (fig. 1) outlines the step-by-step field protocols needed to conduct a FSDMP rapid assessment of soil characteristics before and after the land-management activity. The FSDMP is intended to be a rapid assessment of pre-activity and post-activity soil characteristics that provides a consistent and repeatable method to describe visual physical soil indicators. The FSDMP rapid assessment uses an undisturbed soil condition and three-level soil disturbance classification system based primarily on morphological (visual) attributes of soil-surface features, soil compaction characteristics, and other soil physical conditions. In this soil-disturbance classification system, an increased severity of soil surface disturbance indicates a change in the disturbance class.

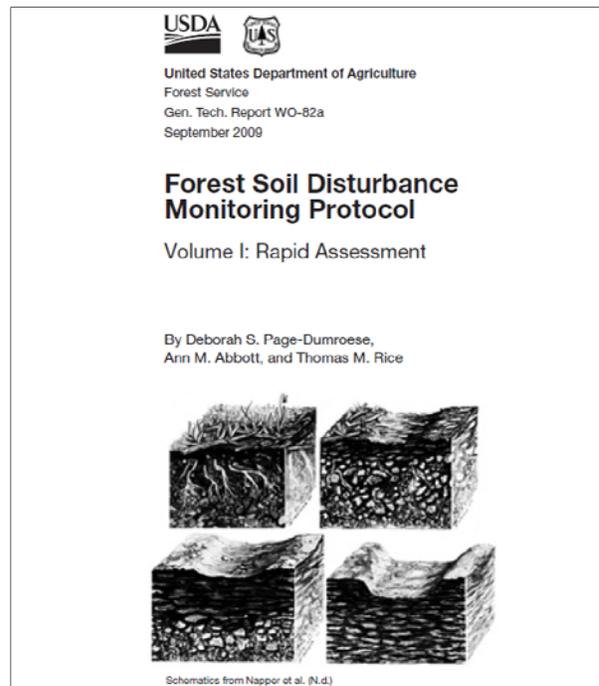


Figure 1. Cover page of the publication, *Forest Soil Disturbance Monitoring Protocol (Volume I: Rapid Assessment)*.

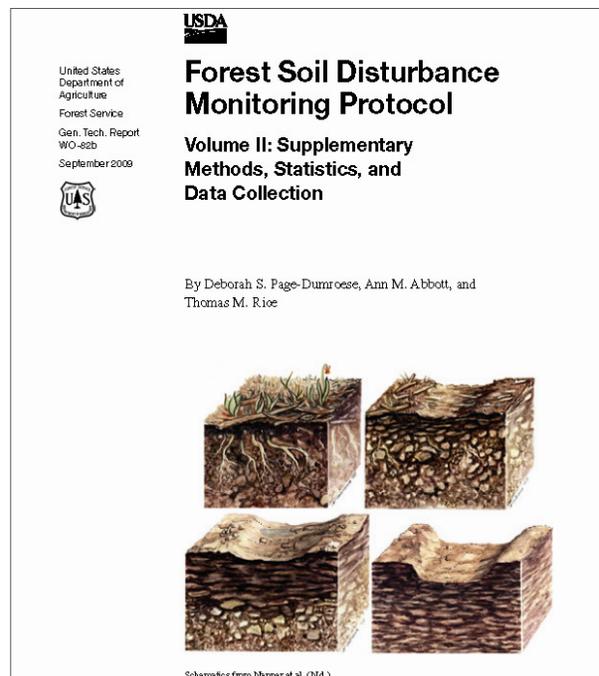


Figure 2. Cover page of the publication, *Forest Soil Disturbance Monitoring Protocol (Volume II: Supplementary Methods, Statistics, and Data Collection)*.



The FSDMP rapid assessment protocol is intended to be used by field soil scientists and watershed specialists when evaluating physical soil disturbance from land-management activities in a forested setting. The rapid assessment tool can also be useful for timber sale administrators, logging contractors, hydrologists, and the general public to help them understand how to monitor soil disturbance using visual soil disturbance classes.

### **Volume II: Supplementary Methods, Statistics, and Data Collection**

This report (fig. 2) provides more detail on the FSDMP rapid assessment method for evaluating soil disturbance, the historical context of forest soil monitoring on National Forest Systems land, the use of statistics in forest soil monitoring, and interpretation of the monitoring results. Included in this report are examples of worksheets for collecting soil disturbance monitoring data. Electronic copies of these worksheets can download from <http://forest.moscowfsl.wsu.edu/smp/solo/InfoPath/monitoring/documents.php#forms>.

### **Volume III: Scientific Background for Soil Monitoring on National Forests and Rangelands**

This report includes the proceedings from a workshop held to define the state of the science on soil disturbance monitoring. This volume (to be published in 2010) will include papers on monitoring for sustainable forestry, examples of international monitoring protocols, definitions of soil quality, and how the FSDMP relates to long-term soil studies.

### **Soil-Disturbance Field Guide**

The field guide (fig. 3) provides detailed descriptions and photographic examples of undisturbed soil conditions and three soil-disturbance classes over a wide range of climatic and vegetative conditions. The field guide is a companion document to the FSDMP rapid assessment procedure for identifying soil disturbance classes and monitoring soil conditions before and after land-management activities. It is intended to promote a high level of repeatability and consistency when conducting the FSDMP rapid assessment. Additionally, the field guide is intended to help soil scientists, watershed

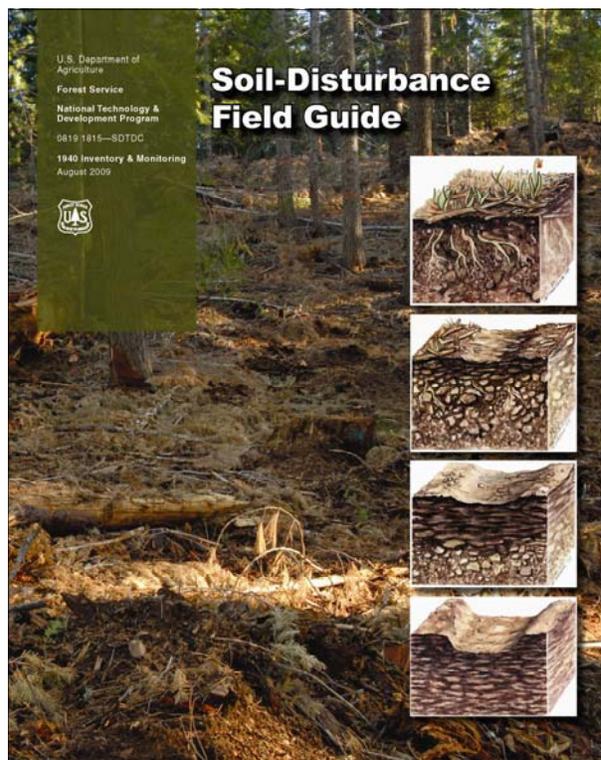


Figure 3. Cover page of the publication, **Soil Disturbance Field Guide**.

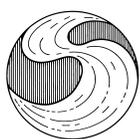
specialists, and land managers better understand the potential effects of soil disturbance on vegetative growth and other ecosystems functions.

### **Additional Information**

The *Soil Disturbance Monitoring Protocol (FSDMP) Toolkit* reports are available online at <http://www.fs.fed.us/biology/soil/index.html#monitoring> or <http://forest.moscowfsl.wsu.edu/smp/solo/InfoPath/monitoring/documents.php>.

The citations for these publications are:

- Page-Dumroese, D.S., Abbott, A.M., Rice, T.M. 2009. Forest Soil Disturbance Monitoring Protocol. Vol I. Rapid Assessment. USDA Forest Service, Gen. Tech. Rep. WO-82a. 31 p.
- Page-Dumroese, D.S., Abbott, A.M., Rice, T.M. 2009. Forest Soil Disturbance Monitoring Protocol. Vol. II. Supplementary methods, statistics, and data collection. USDA Forest Service, Gen. Tech. Rep. WO-82b. 64 p.
- Napper, C., Howes, S., Page-Dumroese, D. 2009. Soil-Disturbance Field Guide. USDA Forest Service. 0819 1815-SDTDC. 103 p.



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To make this newsletter a success, we need *voluntary contributions* of relevant articles or items of general interest. You can help by taking the time to share innovative approaches to problem solving that you may have developed. We prefer short articles (2 to 4 pages in length) with graphics and photographs that help explain ideas.

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