

# RAPID ASSESSMENT



## REFERENCE CONDITION MODELING WORKSHOPS BACKGROUND MATERIAL

JUNE 2004



## Introduction

Thank you for agreeing to be a modeler in the LANDFIRE Rapid Assessment! The enclosed background material is designed to give provide introductory material on LANDFIRE and the Rapid Assessment. A complete manual, including the material presented here, will be provided at the workshop.

The creation of reference condition models is a critical component of LANDFIRE and the Rapid Assessment, and only with expert help like yours can we succeed in the refinement, development, application, and testing of such models.

### How Models Will be Used

- Models will be used in the Rapid Assessment to map Fire Regime Condition Class (FRCC) at a mid-scale for the nation.
- Models will replace and/or supplement existing Fire Regime Condition Class Guidebook models as reference conditions for calculating departure.
- Models will be used as first-draft models in the LANDFIRE project. They will be refined and improved in subsequent expert workshops for their mid-scale application in LANDFIRE.
- Models can be used in local and regional planning and management, including project scale FRCC assessments, testing alternative management scenarios, and for developing consensus and a shared vision of the management objectives and desired future conditions for landscapes.

### Expectations of Workshop Participants

- learn VDDT modeling techniques as they apply to the Rapid Assessment
- complete models for all PNVGs in the Rapid Assessment Model Zone
- provide peer review of other expert's models
- define spatial rules for mapping PNVGs
- define cover types for each PNVG
- develop understanding of the applications and importance of LANDFIRE, the Rapid Assessment, and Fire Regime Condition Class Guidebook

For more information, see Appendix A, which contains links and additional resources. Please direct questions or comments to:

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## Chapter 1: Background

On August 8, 2000, the President asked the Secretaries of the U. S. Department of Agriculture (USDA) and the Department of the Interior (DOI) to prepare a report recommending how to respond to severe, ongoing fire activity, reduce impacts of fires on rural communities and the environment, and ensure sufficient firefighting resources in the future. The report, officially titled *Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President In Response to the Wildfires of 2000*, became known as the National Fire Plan (NFP). On October 13, 2000, the USDA Forest Service (USFS) delivered *A Cohesive Strategy: The Forest Service Management Response to the General Accounting Office Report GAO/RCED-99-65*. The National Association of State Foresters and the U.S. Department of the Interior participated with the USFS in developing this report. This report is referred to as the Cohesive Strategy.

In May of 2002, the Secretary of the Interior, Secretary of Agriculture, Director of the Council on Environmental Quality, and the Governors of the States of Montana, Arizona, Oregon, and Idaho met to approve an implementation plan for the *10-Year Comprehensive Strategy, A Collaborative Approach for Reducing Wildland Fire Risks to Communities and Environment*. A total of 17 Governors have since adopted this plan as way to tackle the complex problems of wildland fire. The NFP, the Cohesive Strategy, and the 10-Year Comprehensive Strategy identify the need to invest in long-term solutions to the buildup of excessive hazardous fuels that threaten lives, property, and resources. Three nationally consistent, strategic data and inventory projects are being implemented to address the need for long term solutions: LANDFIRE, the Rapid Assessment, and project-scale Fire Regime Condition Class Guidebook.

### LANDFIRE

The LANDFIRE prototype project was conceived in 1999 and funded in 2002 to develop a comprehensive suite of standardized, multi-scale spatial data layers and software (Box 1.1) needed to support the National Fire Plan, the Western States' 10-year comprehensive plan, and the President's Healthy Forest Initiative. The prototype is currently being completed by the USFS, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (MFSL) and USGS EROS Data center in Sioux Falls, South Dakota (EDC) for two large areas in Central Utah and the Northern Rocky Mountains.

The LANDFIRE products are designed to be nationally consistent, locally relevant, and based on current, peer-reviewed scientific methods. The General Accounting Office described LANDFIRE in a 2003 report as “the only proposed research project so far that appears capable of producing consistent national inventory data for improving the prioritization of fuel projects and communities” and has recommended national implementation of the LANDFIRE Project.

#### Box 1.1: Example LANDFIRE Products

##### Data Layers

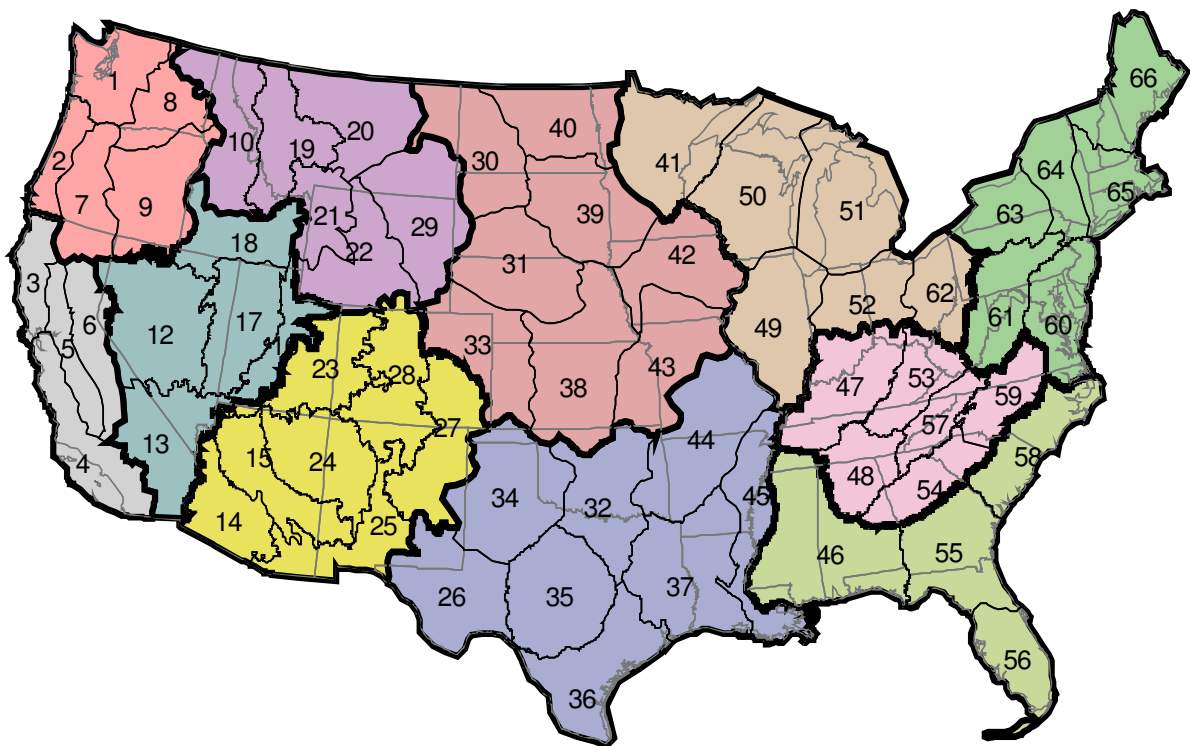
- ▶ Historical fire regimes
- ▶ Fire Regime Condition Class (FRCC)
- ▶ Biophysical settings
- ▶ Potential vegetation
- ▶ Existing vegetation
- ▶ Existing structural stages
- ▶ FARSITE data layers

##### Computer Models

- Landscape Simulation (LANDSUM)
- Vegetation Dynamics (VDDT)

In October of 2003, the Wildland Fire Leadership Council sanctioned national implementation of LANDFIRE, and a national organizational structure was developed. National implementation will apply methods developed, tested, and refined through the western U.S. prototypes. The full suite of LANDFIRE products includes over 100 goespatial data layers and computer models (Box 1.1), including vegetation dynamics state-transition models. Products will be delivered by mapzone (Figure 1.1) from 2005 through 2009.

The LANDFIRE process includes using remotely sensed imagery and field plot data to determine existing vegetation composition and structure. Quantitative ecological models are created via expert workshops and paired with existing and potential vegetation types to model historical fire regimes and Fire Regime Condition Class (FRCC).



**Figure 1.1:** LANDFIRE map zones (numbered) and Rapid Assessment model zones (colored). Products will be completed for the Rapid Assessment in the summer of 2005. LANDFIRE products will be completed map zone by map zone in 2005-2009.

## The Rapid Assessment

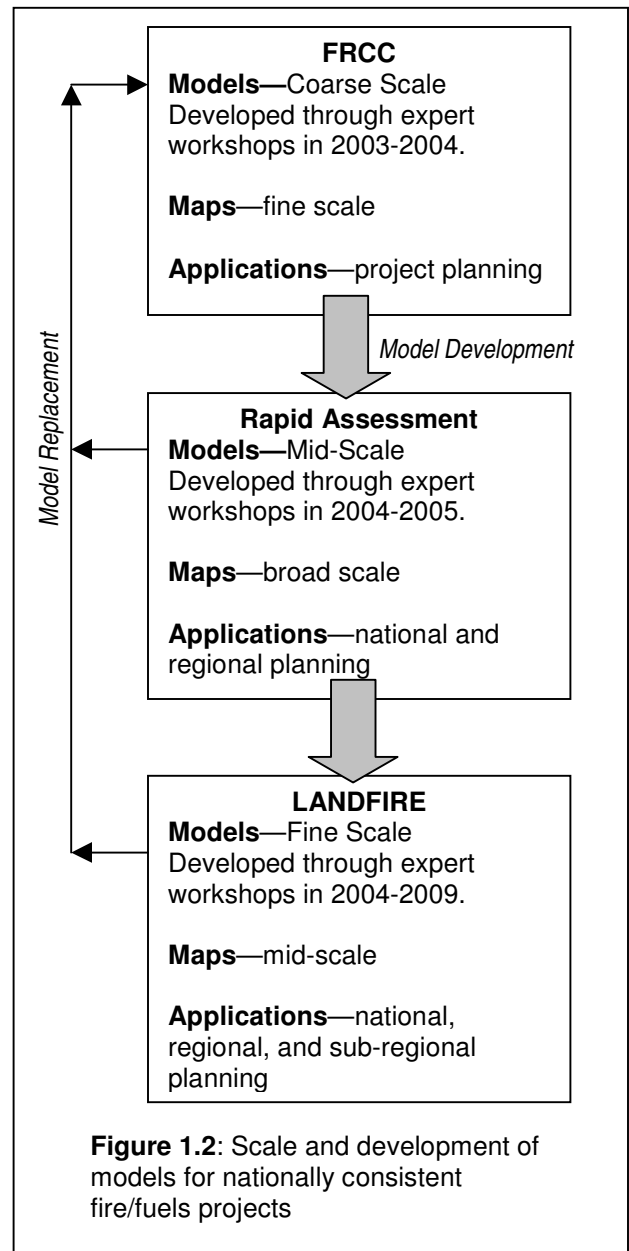
LANDFIRE includes a Rapid Assessment, which will map and model Fire Regime Condition Class (FRCC) at a broad-scale resolution for the entire United States by summer of 2005. The Rapid Assessment is designed to fill data needs before the entire suite of LANDFIRE products is available and will be replaced by LANDFIRE data. Additionally, the Rapid Assessment will help to refine vegetation dynamics models for use in regional and local FRCC assessments and these will provide templates for LANDFIRE vegetation dynamics models (Figure 1.2). The Rapid Assessment also provides technology transfer in the use of LANDFIRE data and the applications of Fire Regime Condition Class.

The Rapid Assessment process includes acquiring existing vegetation data and pairing it with potential vegetation data and quantitative state-transition vegetation dynamics models to map Fire Regime Condition Class.

## Fire Regime Condition Class

Fire Regime Condition Class (FRCC) is an interagency, standardized index for determining the degree of departure from the historic range of variability in vegetation, fuels, and disturbance regimes (Table 1.1). Assessing FRCC can help guide management objectives, help set priorities for treatments, and is mandated by federal agencies and incorporated into the US Healthy Forests Restoration Act as a monitoring measure.

A coarse-scale, national map of Fire Regime Condition Class was created in 2002<sup>1</sup>. Regional and local trainings and assessments of FRCC are currently being conducted across the United States under the protocol of the FRCC Guidebook<sup>2</sup>. The Rapid Assessment and LANDFIRE will provide nationally consistent FRCC data that will allow for national and regional prioritization. The Rapid Assessment and LANDFIRE will not replace regional or local FRCC Guidebook assessments.



<sup>1</sup> Schmidt, Kirsten M., Menakis, James P., Hardy, Colin C., Hann, Wendel J., and Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. General Technical Report RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41 p. Available at: [www.fs.fed.us/fire/fuelman](http://www.fs.fed.us/fire/fuelman).

<sup>2</sup> Hann, Wendel J. et al. 2004. Interagency Fire Regime Condition Class Guidebook. Available at: [www.frcc.gov](http://www.frcc.gov).

**Table 1.1: Definitions of Fire Regime Condition Classes<sup>1</sup>**

<b>Fire Regime Condition Class</b>	<b>Fire Regime</b>	<b>Ecosystem Components</b>
FRCC 1	Fire regimes are within historical range.	Risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range.
FRCC 2	Fire regimes have been moderately altered from their historical range. Fire frequencies are departed from historical frequencies by one or more return interval (either increased or decreased).	Risk of losing key ecosystem components is moderate. Vegetation attributes have been moderately altered from their historical range.
FRCC 3	Fire regimes have been significantly altered from their historical range. Fire frequencies are departed from historical frequencies by multiple return intervals (either increased or decreased).	The risk of losing key ecosystem components is high. Vegetation attributes have been significantly altered from their historical range.

The FRCC Guidebook methodology includes determining the departure in current vegetation composition/structure and fire frequency/severity from the historic range of variability, or reference conditions. Reference conditions are created using quantitative state-transition vegetation dynamics models, generated by experts. Models for the much of the US exist or are being developed through the FRCC Guidebook. Models developed for the Rapid Assessment and LANDFIRE will replace FRCC Guidebook models because they will be finer resolution, have more expert input, and be more accurate (Figure 1.2).

### **Quantitative Vegetation Dynamics Models**

Vegetation dynamics models for the FRCC Guidebook, the Rapid Assessment, and LANDFIRE are quantitative, state-transition (box) models. Modeling is necessary to determine the historic range of variability in vegetation composition and structure. All projects use the modeling software VDDT (Vegetation Dynamics Development Tool; Figure 1.3), which is a public domain, spatial tool (available at [www.essa.com](http://www.essa.com)).

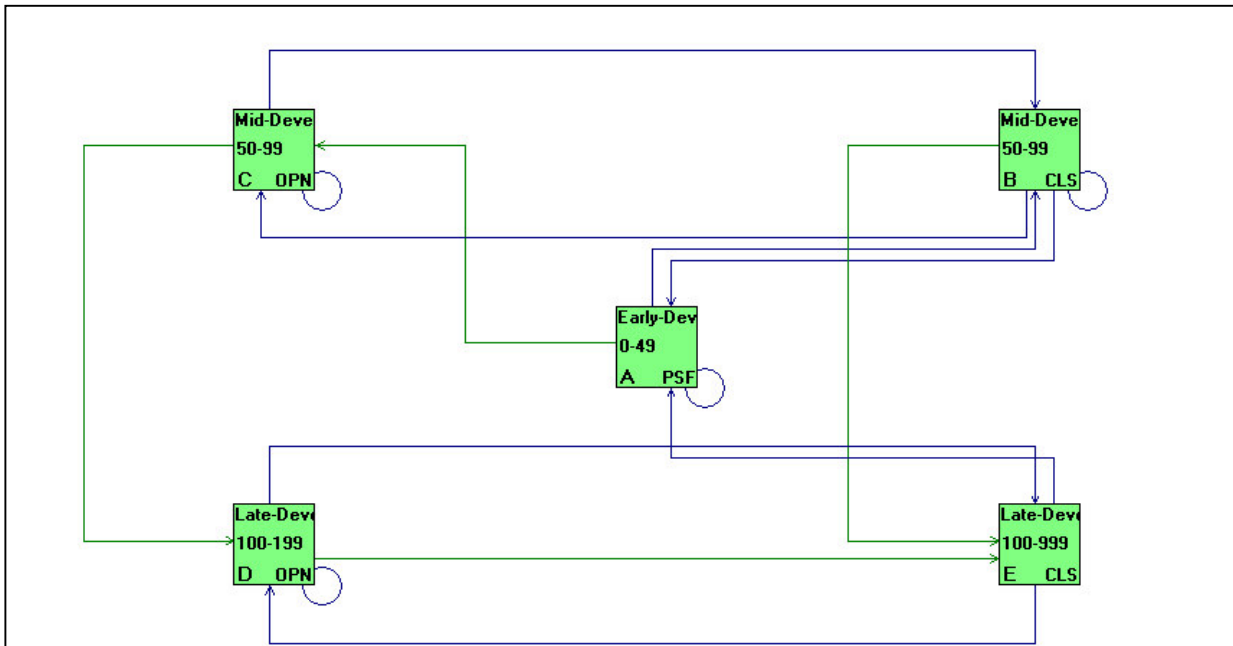
Models for all three projects are developed during workshops where regional vegetation and fire ecology experts synthesize the best available data on vegetation dynamics and disturbance for vegetation groups in their region. Most experts will be trained in VDDT software and generate models during the workshop. For the FRCC Guidebook and the Rapid Assessment, models are based on a simple 5-box model (Table 1.2), which combines two structure classes with three cover type classes. Models for LANDFIRE may be more complex.

Quantitative models are based on inputs like fire frequency and severity, the probability of other disturbances, and the rate of vegetation growth. Models are run for several centuries and outputs

such as percent of landscape in each class and the frequency of disturbance are recorded (Figure 1.4). Inputs are derived from literature review and expert input during and after modeling workshops. Outputs are checked against available data whenever possible and are peer-reviewed during and after expert workshops.

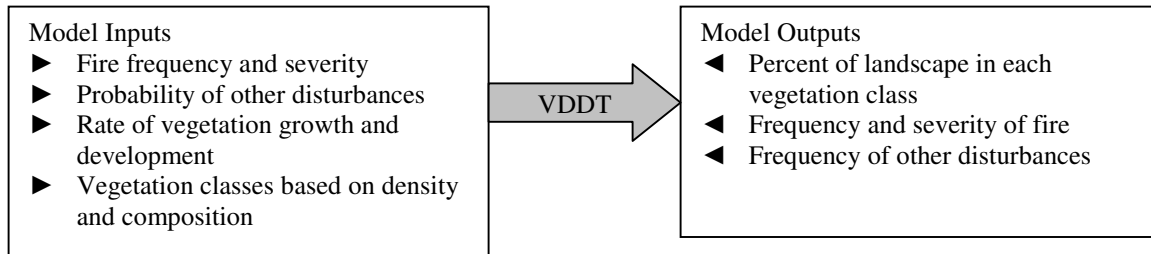
**Table 1.2.** The standard five-box model classes. Models for the FRCC Guidebook and the Rapid Assessment use this standard model with modifications as needed. Letters represent unique classes and correspond to boxes in the state-transition models (Figure 1.3).

<i>Cover Type</i>	<i>Structural Stage</i>	
	<i>Closed</i>	<i>Open</i>
<b>Early development</b>	A	
<b>Mid-development</b>	B	C
<b>Late-development</b>	D	E



**Figure 1.3:** A typical VDDT state-transition model. Each box represents a vegetation class made up of characteristic vegetation composition and structure. Each arrow represents a transition from one class to another based on vegetation growth (succession) or a disturbance (e.g., fire or other).





**Figure 1.4:** Inputs and Outputs to VDDT models.

## Appendix A: Links and Additional Resources

This table highlights links to LANDFIRE and related projects and resources for modelers.

<p><b>LANDFIRE</b> <a href="http://www.landfire.gov">www.landfire.gov</a></p>	<p>The LANDFIRE website, explaining the project's scope, objectives, and deliverables.</p>
<p><b>FRCC Guidebook</b> (Fire Regime Condition Class) <a href="http://www.frcc.gov">www.frcc.gov</a></p>	<p>The Fire Regime Condition Class (FRCC) website, which includes explanations of the project, the entire guidebook, and descriptions of PNVGs modeled to-date.</p>
<p><b>VDDT (Vegetation Dynamics Development Tool)</b> <a href="http://www.essa.com">www.essa.com</a></p>	<p>The website for ESSA, the company that created VDDT. VDDT is public domain and can be downloaded from the web. User's guides, updates, and other software packages are available here.</p>
<p><b>The Coarse-Scale Spatial Data</b> <a href="http://www.fs.fed.us/fire/fuelman">www.fs.fed.us/fire/fuelman</a></p>	<p><i>The Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management</i> (Schmidt et al. 2002, USDA Forest Service General Technical Report RMRS-87) started it all. This document was the precursor to FRCC and LANDFIRE and was a first, coarse-scale attempt at mapping fire regime characteristics, including FRCC, for the entire US.</p>
<p><b>The National Fire Plan</b> <a href="http://www.fireplan.gov">www.fireplan.gov</a></p>	<p>LANDFIRE is part of the implementation of the National Fire Plan, an interagency commitment to the rehabilitation and restoration of fire-adapted ecosystems, among other goals.</p>
<p><b>The Nature Conservancy's Global Fire Initiative</b> <a href="http://nature.org/initiatives/fire">http://nature.org/initiatives/fire</a></p>	<p>The Nature Conservancy's Fire Initiative was designed to address the threat of altered fire regimes on both public and private lands. TNC is taking a leading role in the development of succession models, PNVG refinement, and mapping current cover types in the LANDFIRE project.</p>
<p><b>The Missoula Fire Sciences Laboratory</b> <a href="http://www.firelab.org">www.firelab.org</a></p>	<p>The Fire Lab, a division of the USDA Forest Service Rocky Mountain Research Station, is the scientific and methodological leader in the LANDFIRE project.</p>
<p><b>EROS Data Center</b> <a href="http://edc.usgs.gov">http://edc.usgs.gov</a></p>	<p>USGS's Earth Resources Observation System (EROS) Data Center leads the vegetation data collection in LANDFIRE.</p>
<p><b>FEIS: Fire Effects Information System</b> <a href="http://www.fs.fed.us/database/feis">www.fs.fed.us/database/feis</a></p>	<p>FEIS is a searchable database containing summaries of fire effects, fire ecology, and botanical characteristics of species in North America. Summaries are updated regularly and provide excellent baseline information and literature reviews.</p>
<p><b>Wildland Fire in Ecosystems: Effects of Fire on Flora</b> <a href="http://www.fs.fed.us/rm/pubs/rmrs_gtr42_2.html">www.fs.fed.us/rm/pubs/rmrs_gtr42_2.html</a></p>	<p>This publication is part of the Rainbow Series and contains regional summaries of fire history and effects for ecological systems in the United States. It provides broad information and literature reviews.</p>