

# The Monitoring Trends in Burn Severity Project

## Historical Fire Severity Data for the Pacific Southwest and Pacific Northwest Regions of the United States

SPIE

Remote Sensing of Fire: Science and Application  
August 10, 2008



# MTBS Background

- Consistently map the burn severity and perimeters of large fires on all lands in the United States from 1984 to 2010
- Sponsored by the interagency Wildland Fire Leadership Council
  - ◆ One element of a strategy monitoring the effectiveness of NFP and HFRA
  - ◆ Provide an information base to synoptically assess environmental impacts and trends
  - ◆ Required for all lands in conterminous US, AK, and HI
- GAO recommendation that land management agencies develop and implement comprehensive burn severity assessments
- Jointly implemented by USGS EROS and USFS RSAC



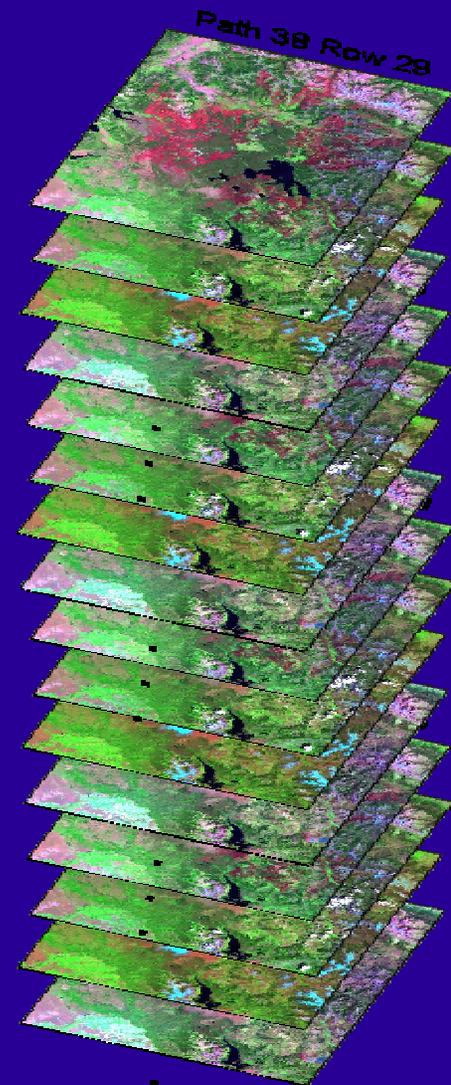
# MTBS Objectives

- Provide for a national analysis of trends in burn severity for the NFP
- Provide information about wildfire effects to land managers and the scientific community
  - ◆ Consistent information across all lands in the U.S.
  - ◆ Consistent information spanning a significant historical period

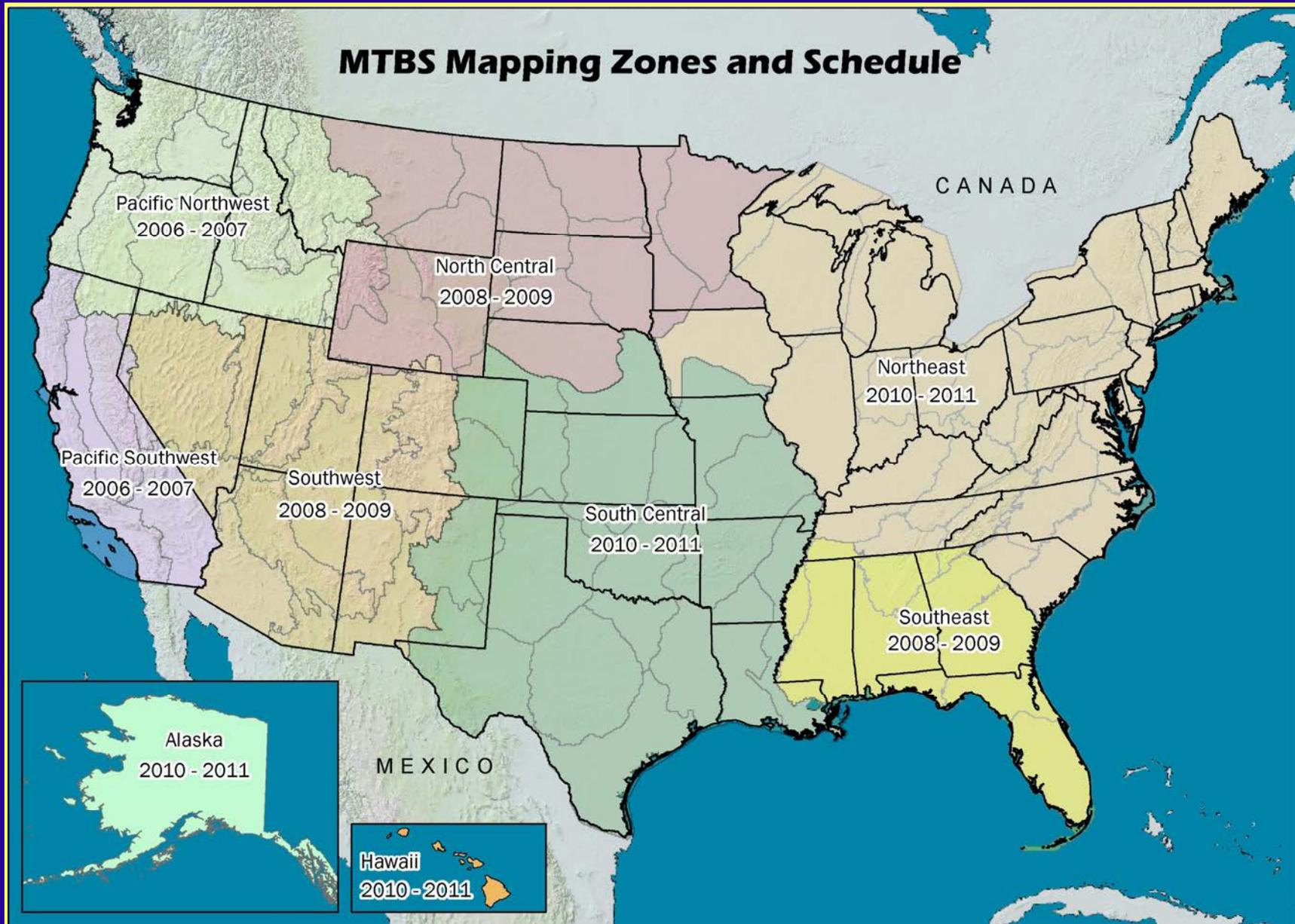


# MTBS Product Overview

- Burn severity data on all fires >1,000 ac in the west and >500 ac in the east
  - ◆ Thematic and continuous 30m raster layers
  - ◆ Subset to map extent of the fire + 3km
- Fire perimeters/Fire centroid locations
- Fire Occurrence Database
- Tabular data summarizing burn severity acres by class
- Metadata
- Expanded Landsat archive
  - ◆ 7,000+ scenes!!!



# MTBS Schedule



# MTBS Methods

Burn severity products are based on Landsat data and the differenced Normalized Burn Ratio (dNBR) approach

$$\text{NBR} = (\text{NIR} - \text{Mid IR}) / (\text{NIR} + \text{Mid IR})$$
$$\text{dNBR} = \text{pre NBR} - \text{post NBR}$$

- Mature science established in the literature
  - ◆ Lopez-Garcia and Caselles, 1991; Brewer et al., 2005; Coker et al., 2005; others
- Operational precedent
  - ◆ Implemented by Key and Benson for development of NPS fire atlases
- Landsat data record
  - ◆ Consistent data record spanning ecologically and possibly climatically significant time frame
- Resolution synergy
  - ◆ Spatial and spectral resolutions comparable to other national scale data



# Validation Results

- Independent JFS study by Zhu et al. looked at Landsat derived dNBR severity characterizations across a range of ecosystems

Regions	N	dNBR R-square	RdNBR R-square
Northern Rockies <sup>1</sup>	1,000	.721	.687
Southwest <sup>2</sup>	580	.728	.763
California	407	.691	.676
Alaska	262	.799	.764
Southeast	106	.760	.760
All Regions	2,355	.657	.663

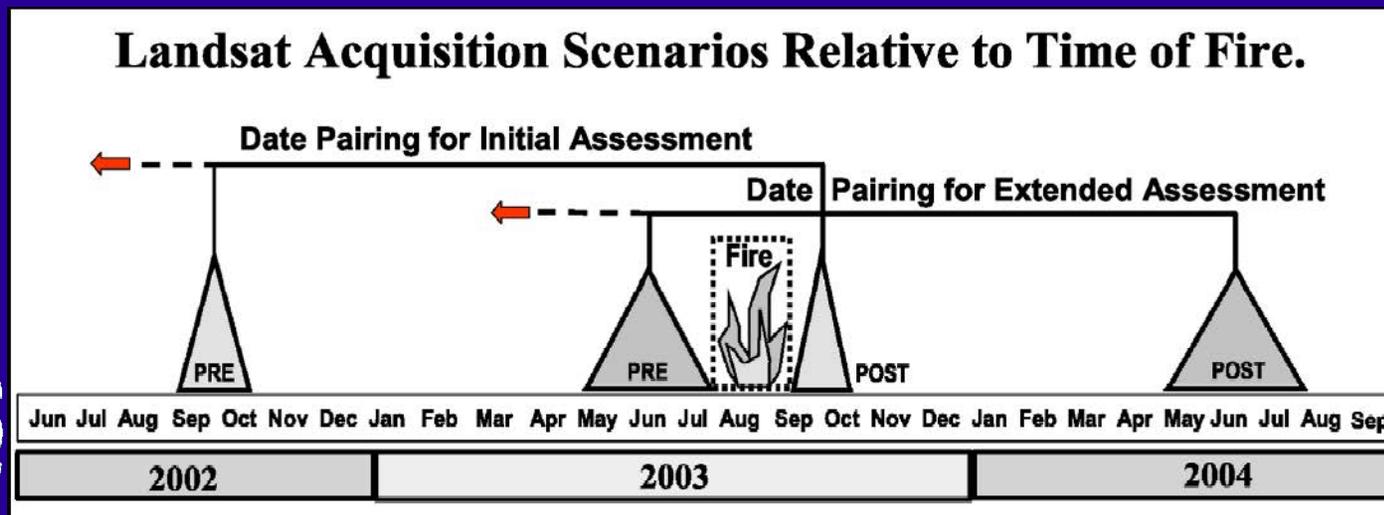
Pre-fire vegetation	N	dNBR	RdNBR	Reg. model
Conifer Forest	947	.696	.673	Cubic
Deciduous Forest	39	.723	.631	Cubic
Conifer/Deciduous Mixed	195	.744	.760	Cubic
Non-Forest/Forest Mixed	308	.495	.590	Cubic
Grassland	52	.500	.437	Quadratic
Non-Forest Mixed (grass/shrub)	73	.613	.644	Quadratic
All Non-Forest	142	.579	.589	Quadratic



# MTBS Methods - Assessment Strategy

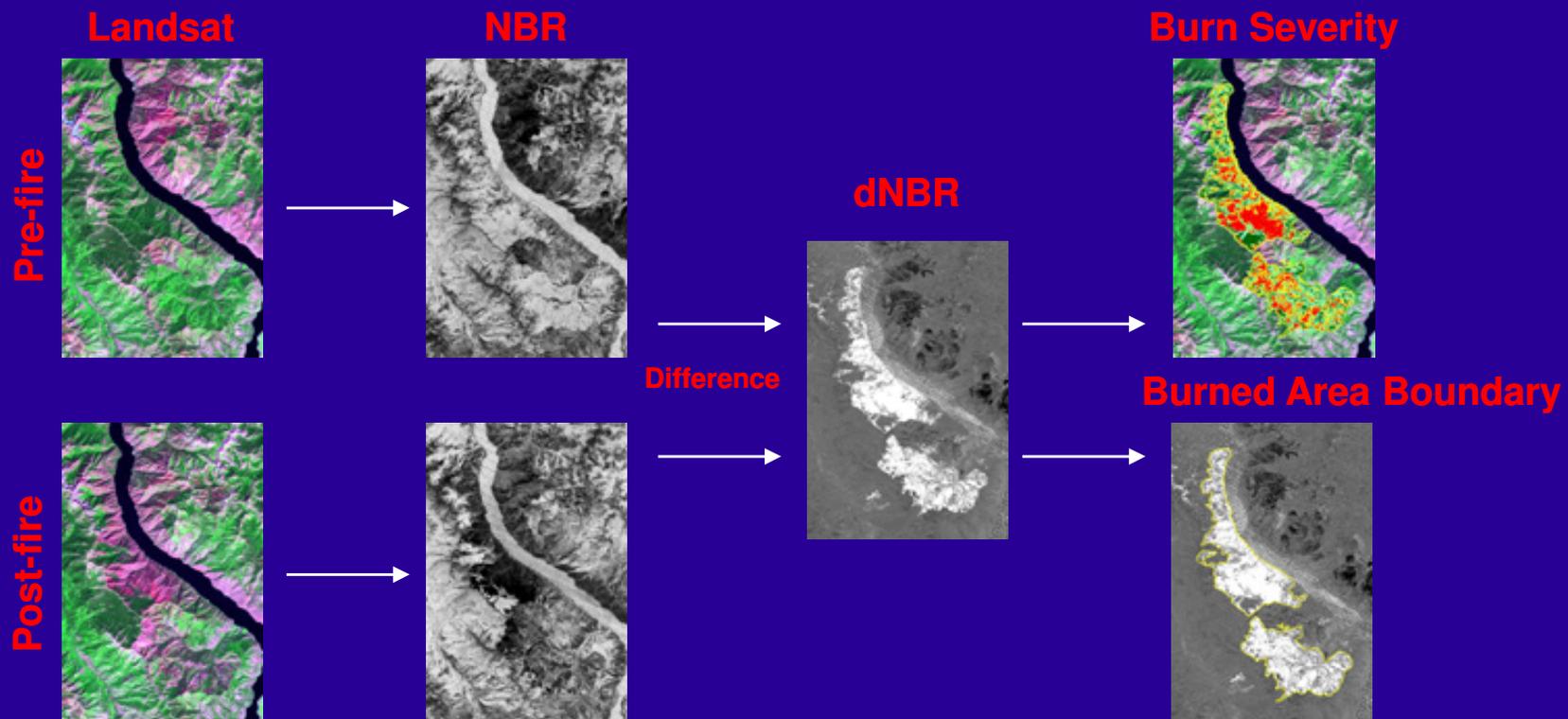
- Based on fire type
  - ◆ Extended Assessment (EA)
    - Severity based on post-fire assessment at peak of green of next growing season
    - Forests/shrublands
  - ◆ Initial Assessment (IA)
    - Severity based on immediate post-fire assessment
    - Grasslands/shrublands
  - ◆ "Single Scene" Assessment
    - Pre fire imagery not available; use NBR
    - Conducted on a limited basis (EAs and IAs)

## Landsat Acquisition Scenarios Relative to Time of Fire.

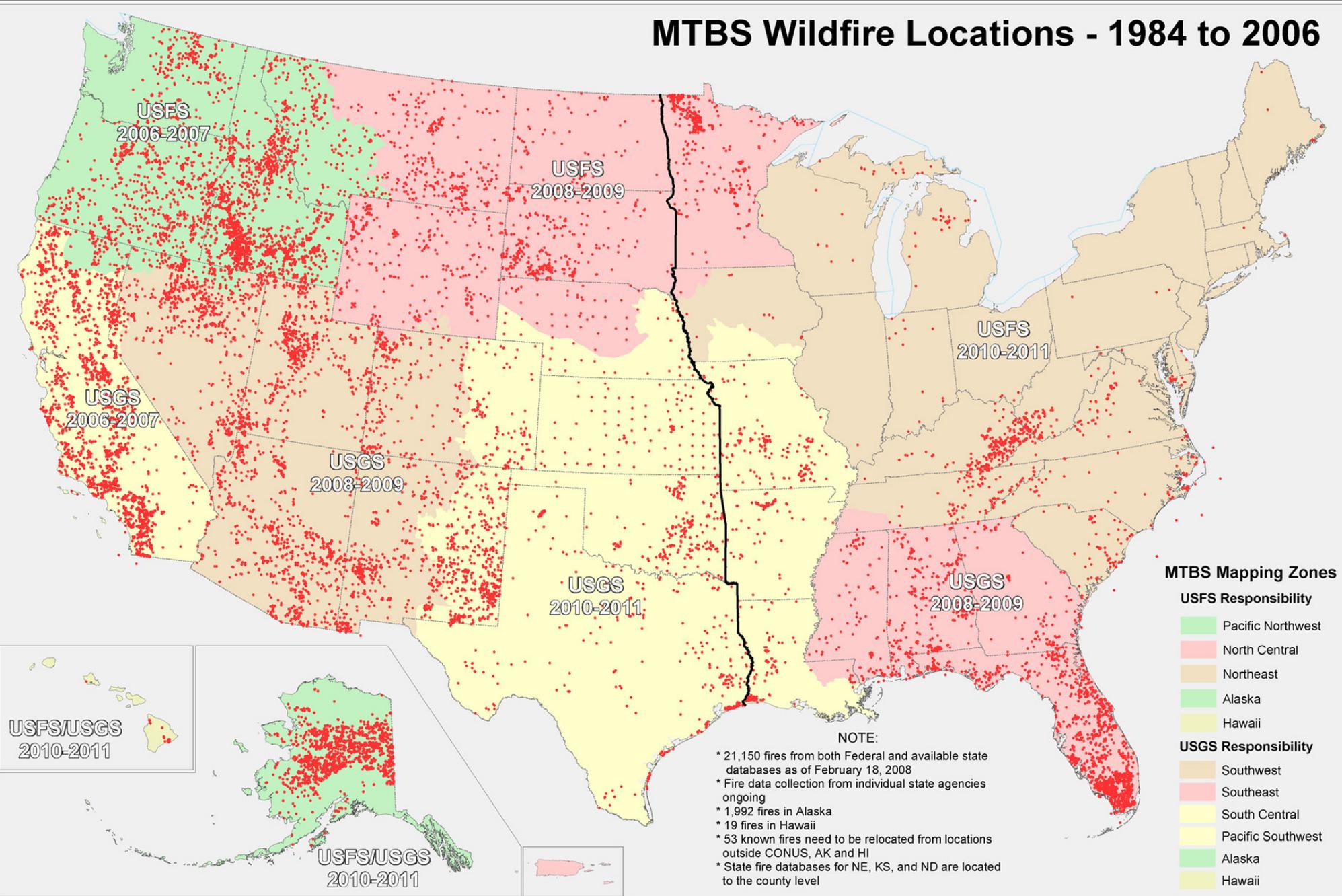


# MTBS Methods Outline

- Compile a single MTBS fire occurrence database (FOD) from existing data sources
- Based on FOD, select pre and post-fire Landsat scenes
- Landsat data processed at EROS-terrain correction through NBR calculations
- EROS and RSAC analysts perform differencing and threshold dNBR images into burn severity classes
- Metadata, map products, burn severity data summary and reporting



# MTBS Wildfire Locations - 1984 to 2006



# MTBS Methods - Data Summary & Reporting

- Burn severity data are summarized with key geographic strata
  - ◆ Summary of severity acres by land cover classes, administrative ownership, watersheds, etc.
  - ◆ Summary of severity acres by fire, state and national extents
- Reporting documents and trend analysis summaries are generated at end of reporting cycles for current year and historical fires
  - ◆ Reporting documents are available at MTBS website
- Web-based electronic reporting available
  - ◆ Access through MTBS website
  - ◆ Support standard queries
  - ◆ Includes tables and graphics in printer friendly version



# MTBS Data Distribution

- Web-based data portal hosted by USGS to distribute fire-level MTBS data
- Available via MTBS website
  - ◆ <http://mtbs.cr.usgs.gov/viewer>
- Alternative download option to support large data volume requests/downloads
  - ◆ Segmented and bundled temporally & spatially
    - Eastern U.S., Western U.S. and Alaska
  - ◆ Access to data, metadata, MTBS FOD and fire map PDFs

**MTBS - Interactive Data Viewer** (Return to MTBS)

Scale Information: Scale = 1:63,816,310

Fire Data: Places (Names), Boundaries, Transportation, Hydrography, Elevation

**MTBS - Interactive Data Viewer** (Return to MTBS)

Scale Information: Scale = 1:721,479

Fire Data: 2004 Fire Index, Places (Names), Boundaries, National Atlas State Labels, National Atlas States

Available Datasets

Fire Data

Fire Name: UNNAMED  
 Fire ID: BLM-CABBD-AS1G-20040625  
 State: California  
 Agency: BLM  
 HUC4 Code: 16050302  
 MTBS Zone: Pacific Southwest  
 Year: 2004

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Fire Name	Fire ID	State	Agency	HUC4 Code	MTBS Zone	Year
UNNAMED	BLM-CABBD-AS1G-20040625	California	BLM	16050302	Pacific Southwest	2004
UNNAMED	BLM-NVCCD-BDM2-20040825	Nevada	BLM	16050102	Pacific Southwest	2004
UNNAMED	FS-0417-034-20040714	Nevada	Private	16050201	Pacific Southwest	2004
UNNAMED	FS-0503-109-20041006	California	USFS	18040012	Pacific Southwest	2004
UNNAMED	FS-0503-111-20041013	California	Unclassified	18020129	Pacific Southwest	2004

**MTBS Data Access**

Overview

Data Distribution

Eastern US (includes Puerto Rico) | Western US (includes Hawaii) | Alaska

Select Year: 1985

Fire Datasets [Download]  
 Fire Occurrence Database [Download]

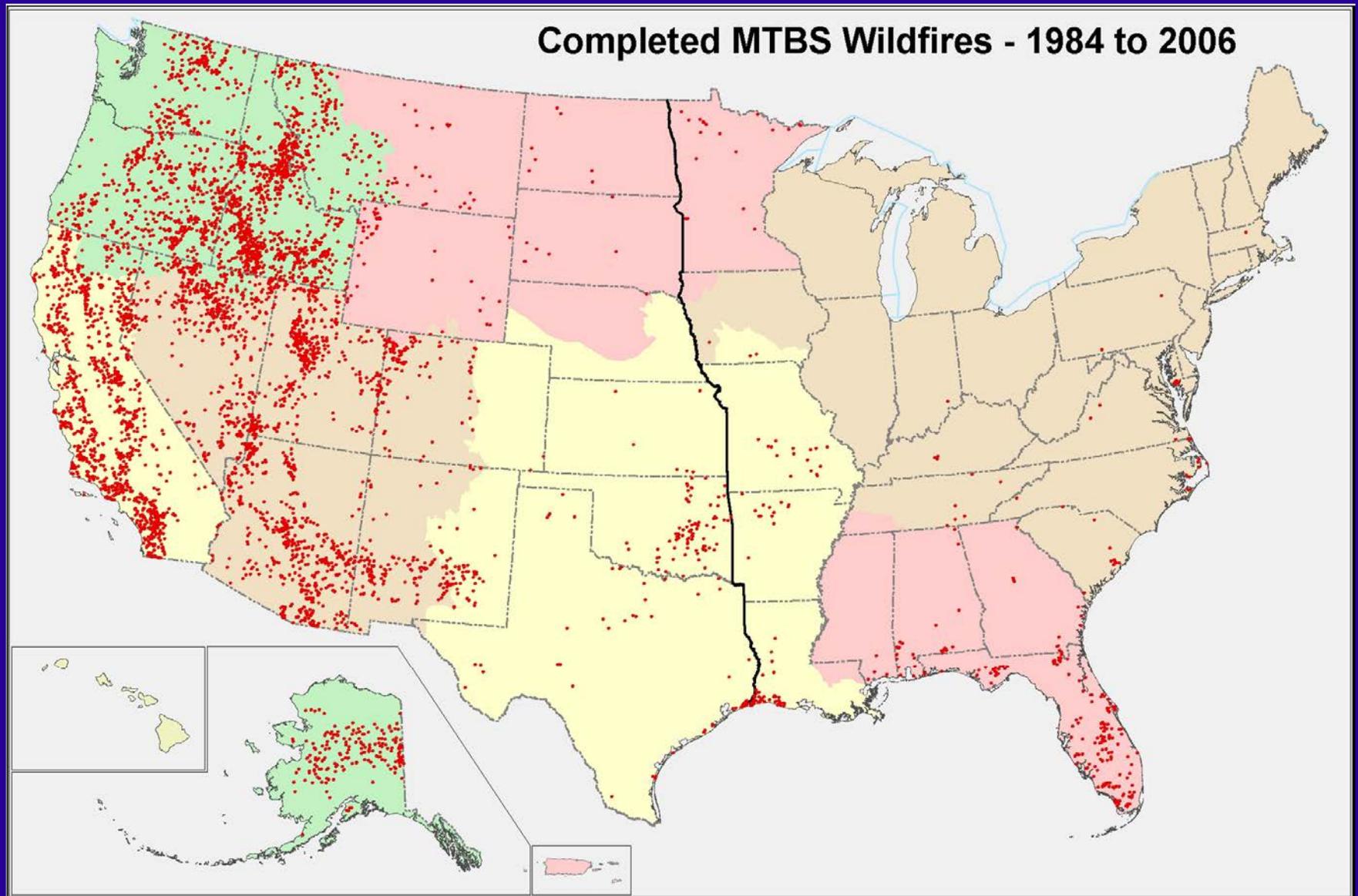
Revision Explanation  
 A - Explanation  
 B - Explanation  
 C - Explanation  
 D - Explanation

Listing of MTBS fires mapped for year 1985

Fire ID	Fire Name	Vintage	Revision	Fire Maps
AFS-312-2004	312	Unknown	A	<a href="#">View Map</a>
AK-TAS-413889-2004062	TAYLOR_COMPLEX	Unknown	B	<a href="#">View Map</a>
AK-TAS-413889-2004062	TAYLOR_COMPLEX	Unknown	B	<a href="#">View Map</a>



# MTBS Project Status

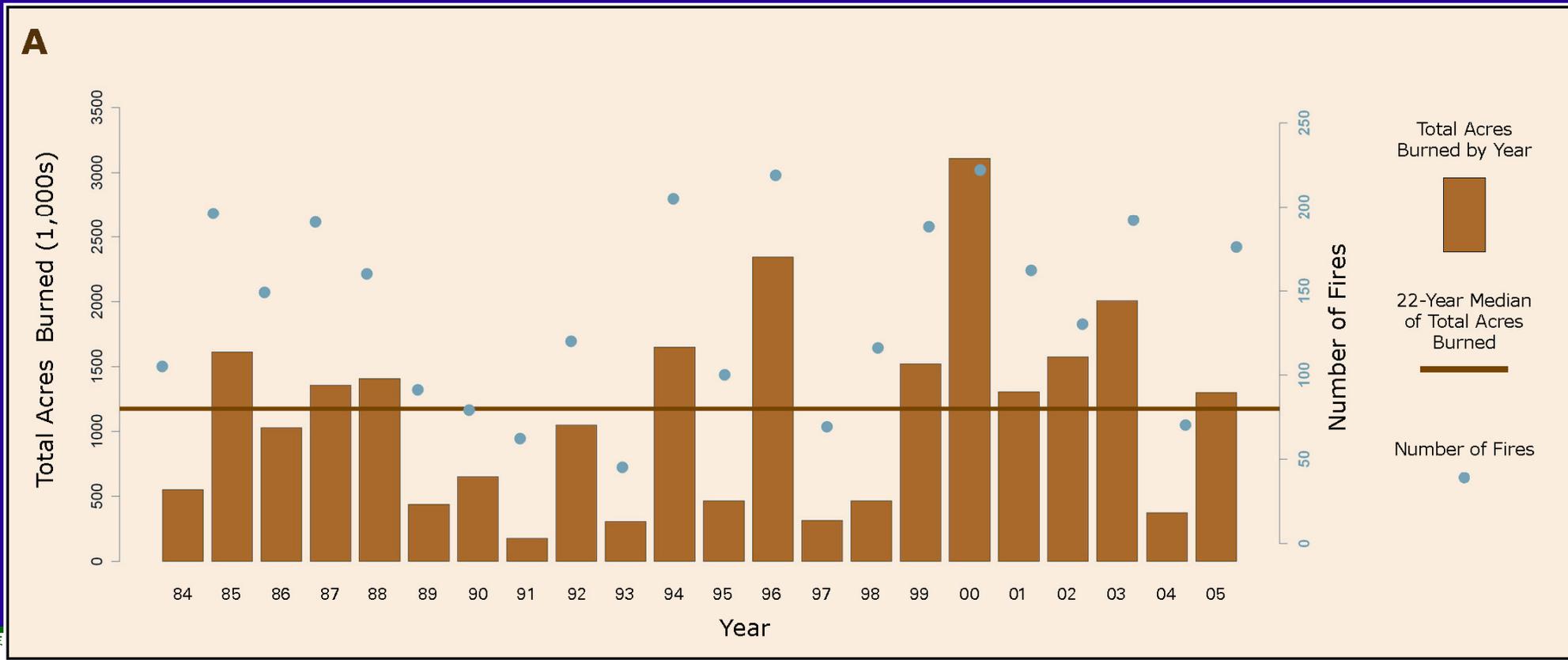


# MTBS Results - Historical Data for PNW & PSW

- 3050 fires mapped for the 1984-2005 period in PNW & PSW
  - ◆ 25,019,130 acres
    - 28% unburned-low severity
    - 36% low severity
    - 21% moderate severity
    - 15% high severity

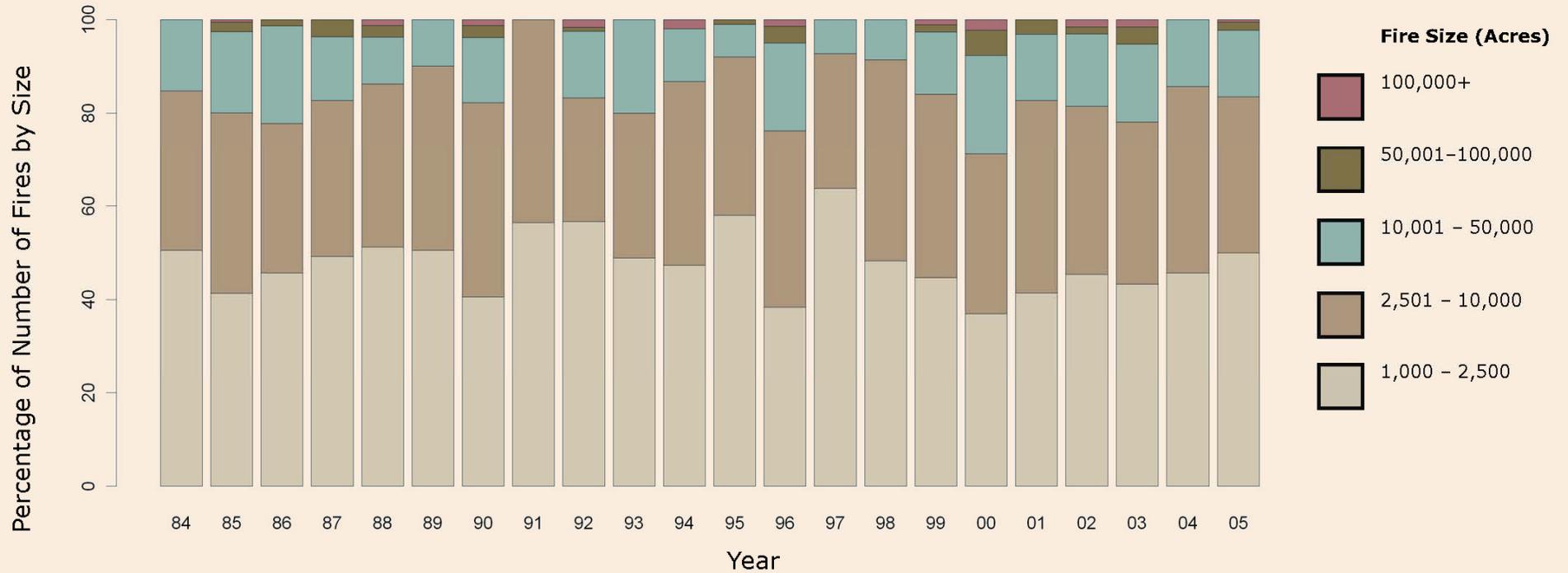


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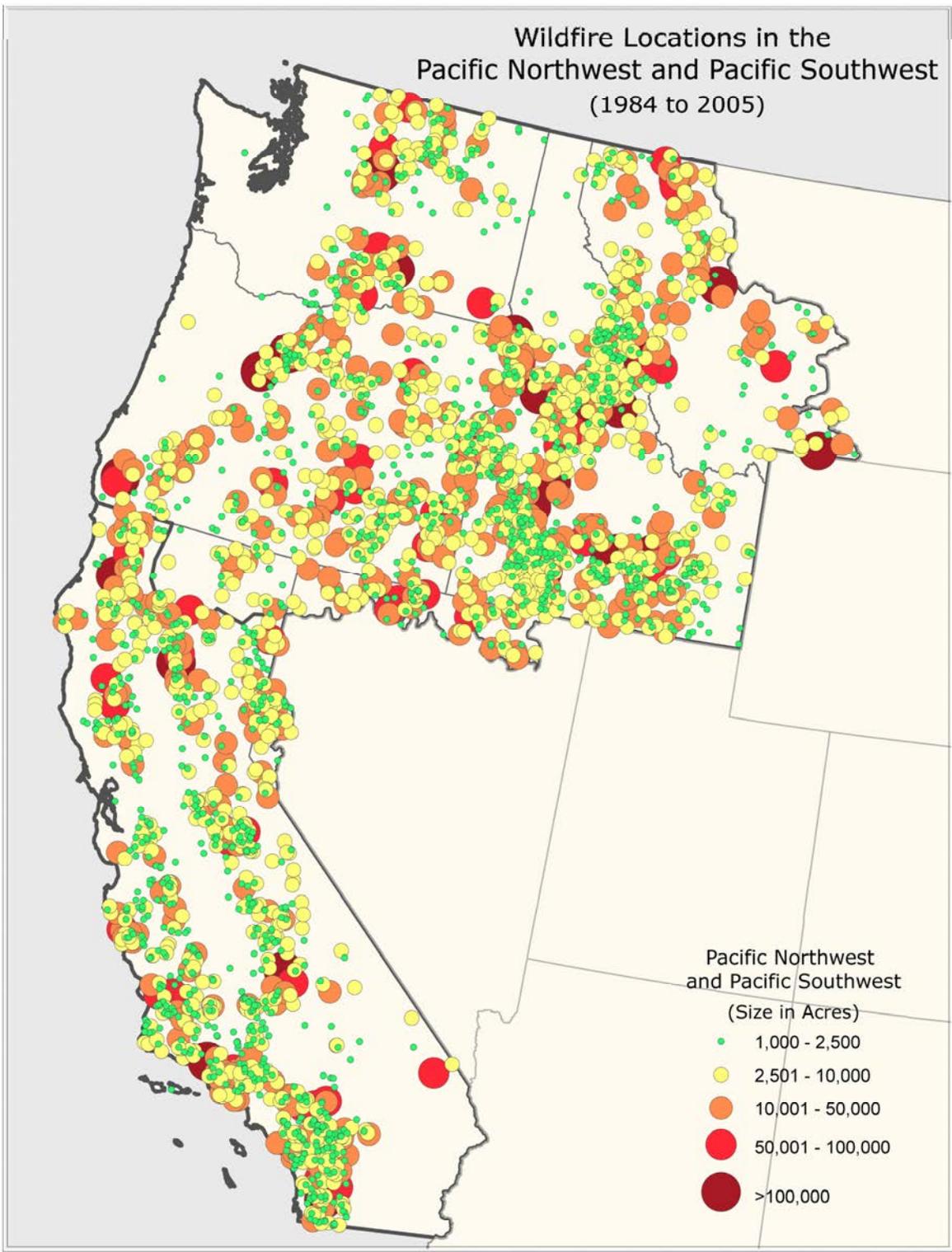


# MTBS Results - Historical Data for PNW & PSW

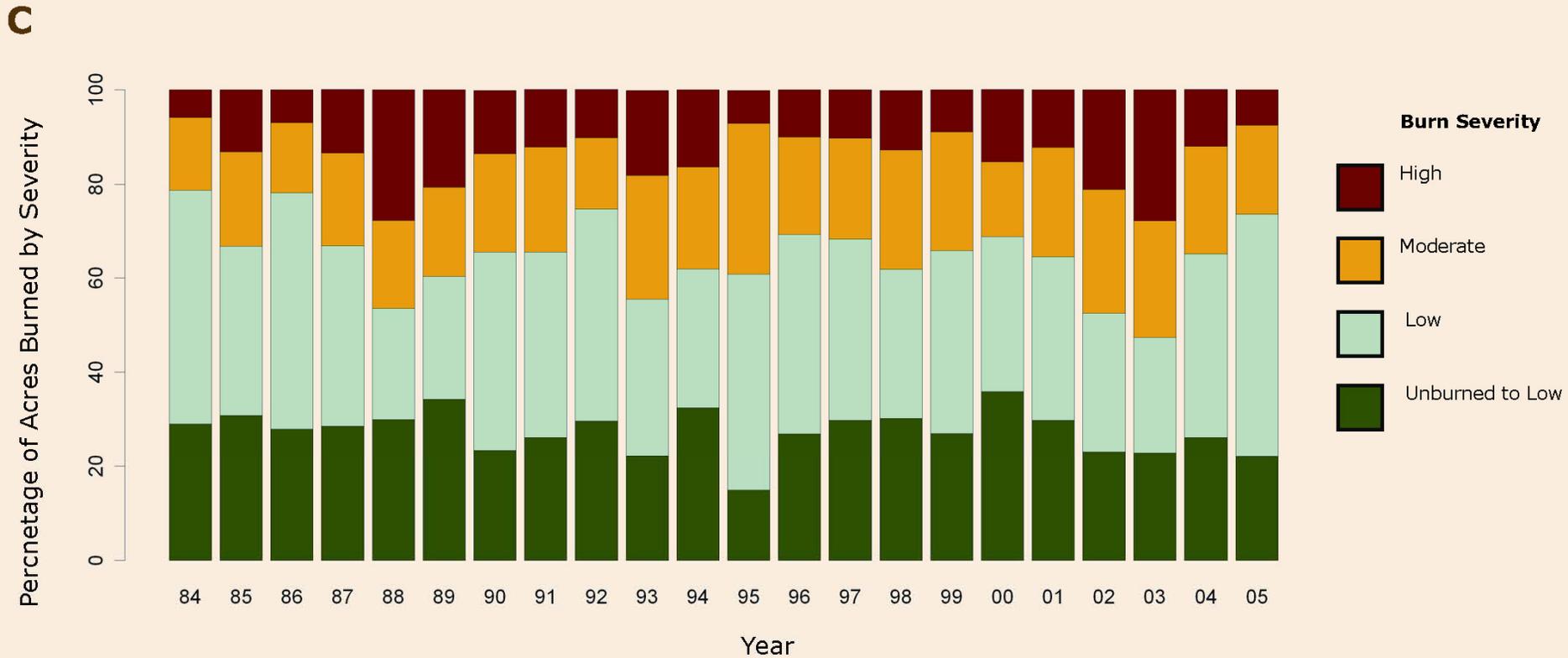
**B**



# Wildfire Locations in the Pacific Northwest and Pacific Southwest (1984 to 2005)

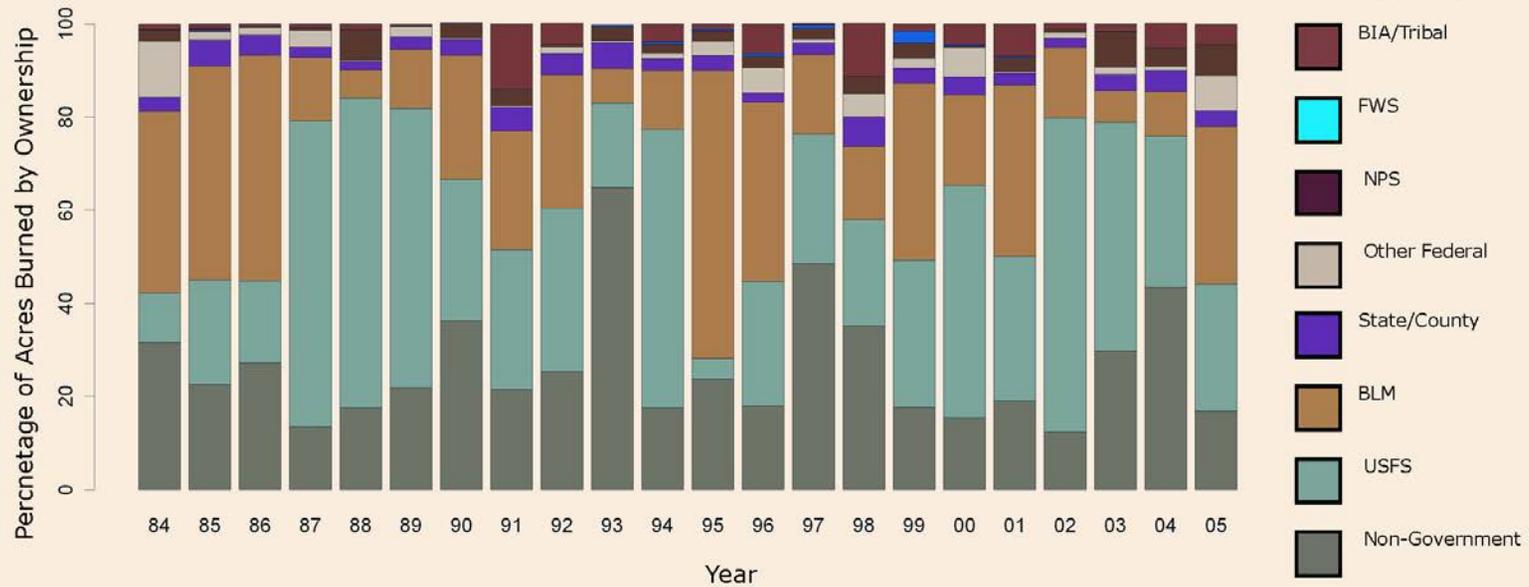


# MTBS Results - Historical Data for PNW & PSW

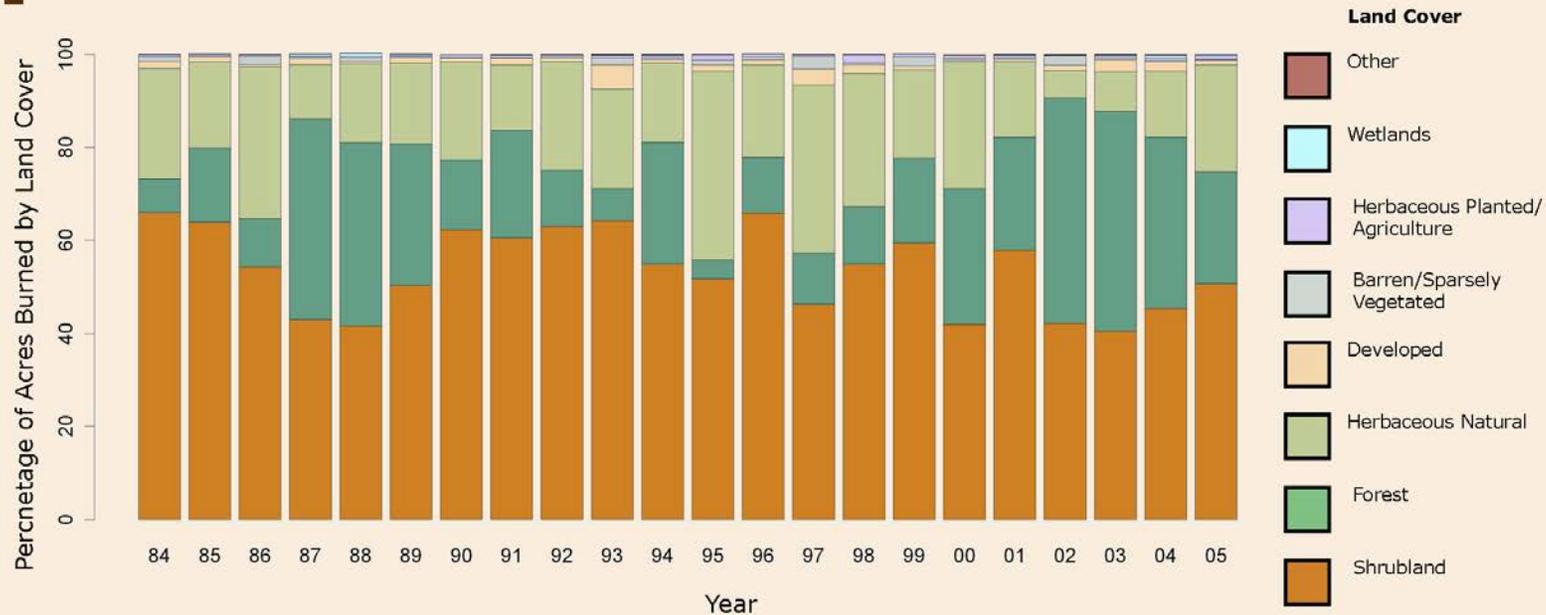


# MTBS Results - Historical Data for PNW & PSW

**D**



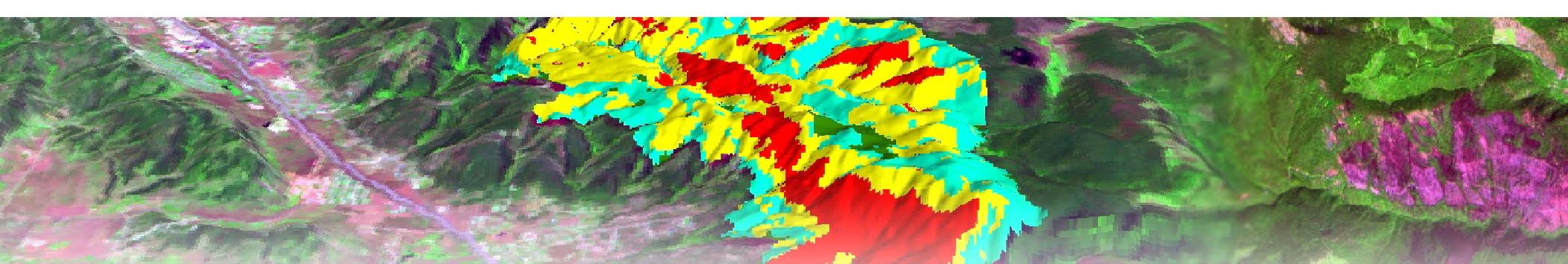
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# Future MTBS Analysis & Production

- Spatial-temporal analysis at finer scales
  - ◆ Administrative units
  - ◆ Ecological units
  - ◆ Land cover strata
- Management activity and disturbance relationships
  - ◆ Fuel treatments
  - ◆ Insect and disease activity
  - ◆ Invasives
- Climate, weather, and fuel condition relationships and trend causation
- Historical analysis of succession trajectories
  - ◆ Fire regime
  - ◆ Type conversion
- Extension of the data record backward and forward





# MTBS Contact Information

## Project Leads

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