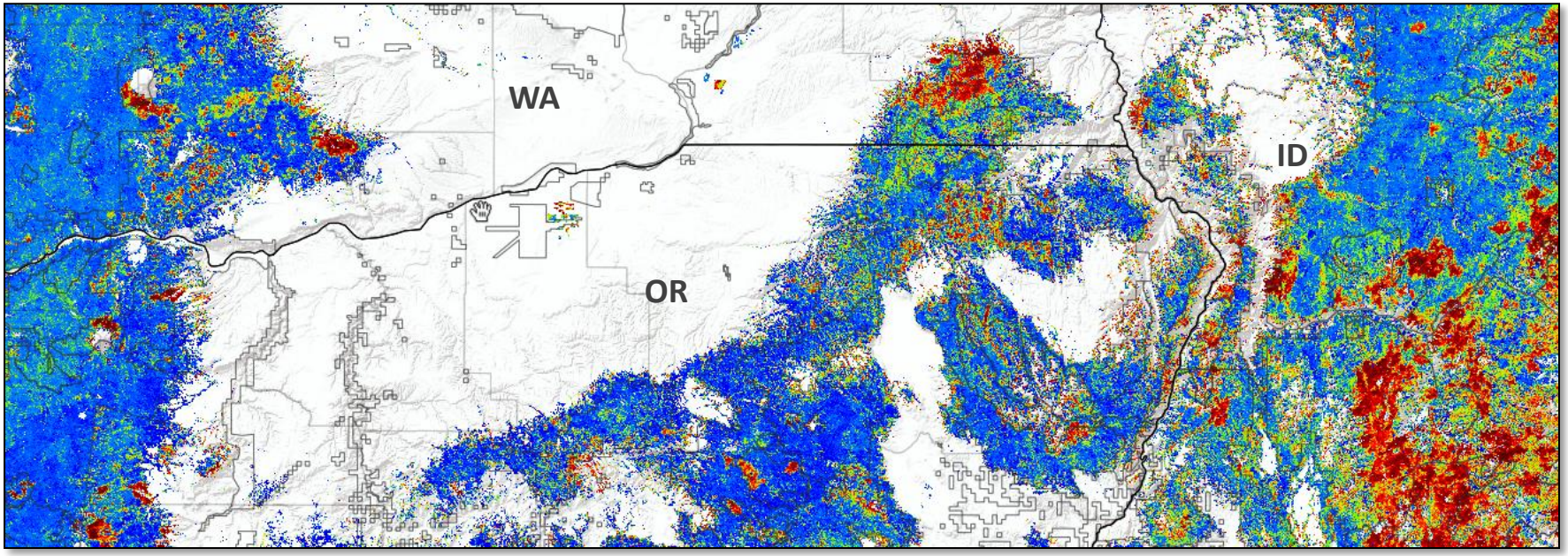


Detecting and tracking forest change in the Blue Mountains of Oregon and Washington using the *ForWarn* system

Blue Mountains Forest Vegetation Workshop
April 3, 2014

Steve Norman - USDA Forest Service Eastern Threat Assessment Center
Bill Christie -
Bill Hargrove -

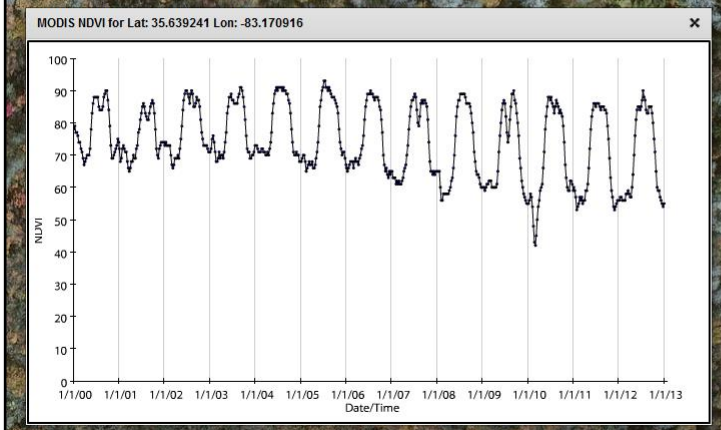
Joe Spruce - NASA-Stennis

ForWarn

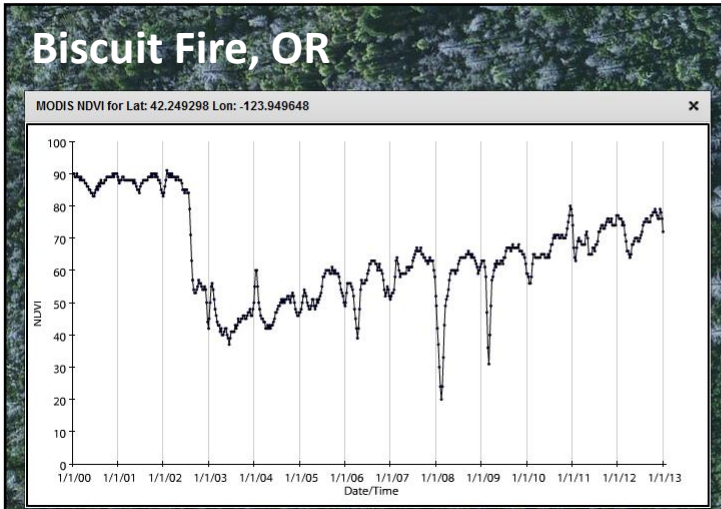
http://forwarn.forestthreats.org

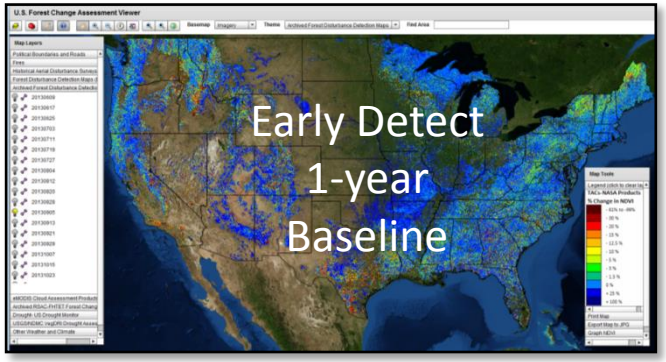
- MODIS resolution NDVI @232m
- NDVI data: 2000-present
- Change maps: 2010-present
- 6 baselines for change context
- 8 day updates (46 periods/yr.)

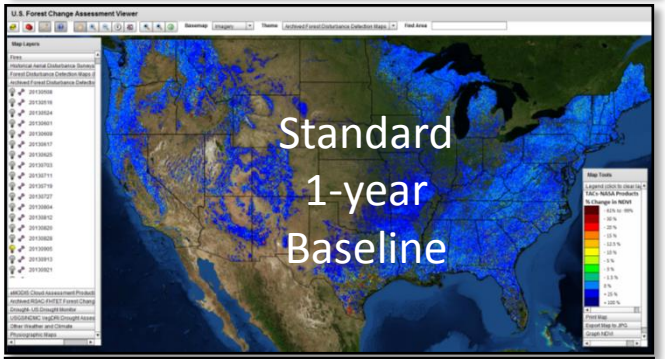
Hemlock Woolly Adelgid mortality, NC

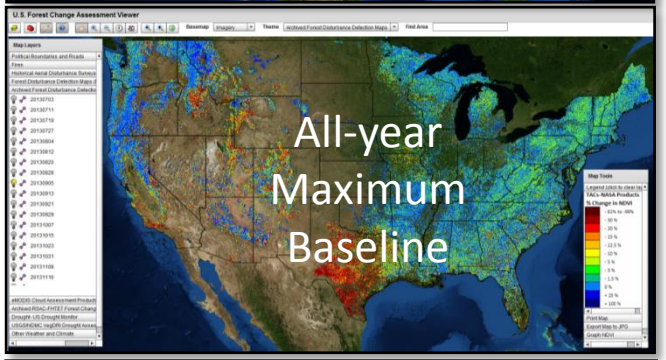


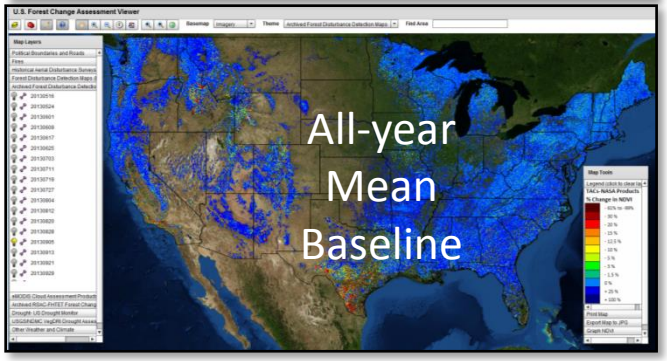
Biscuit Fire, OR



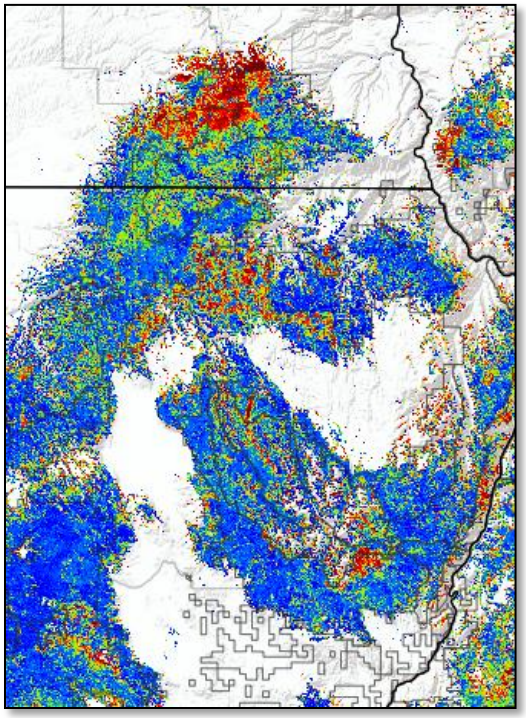




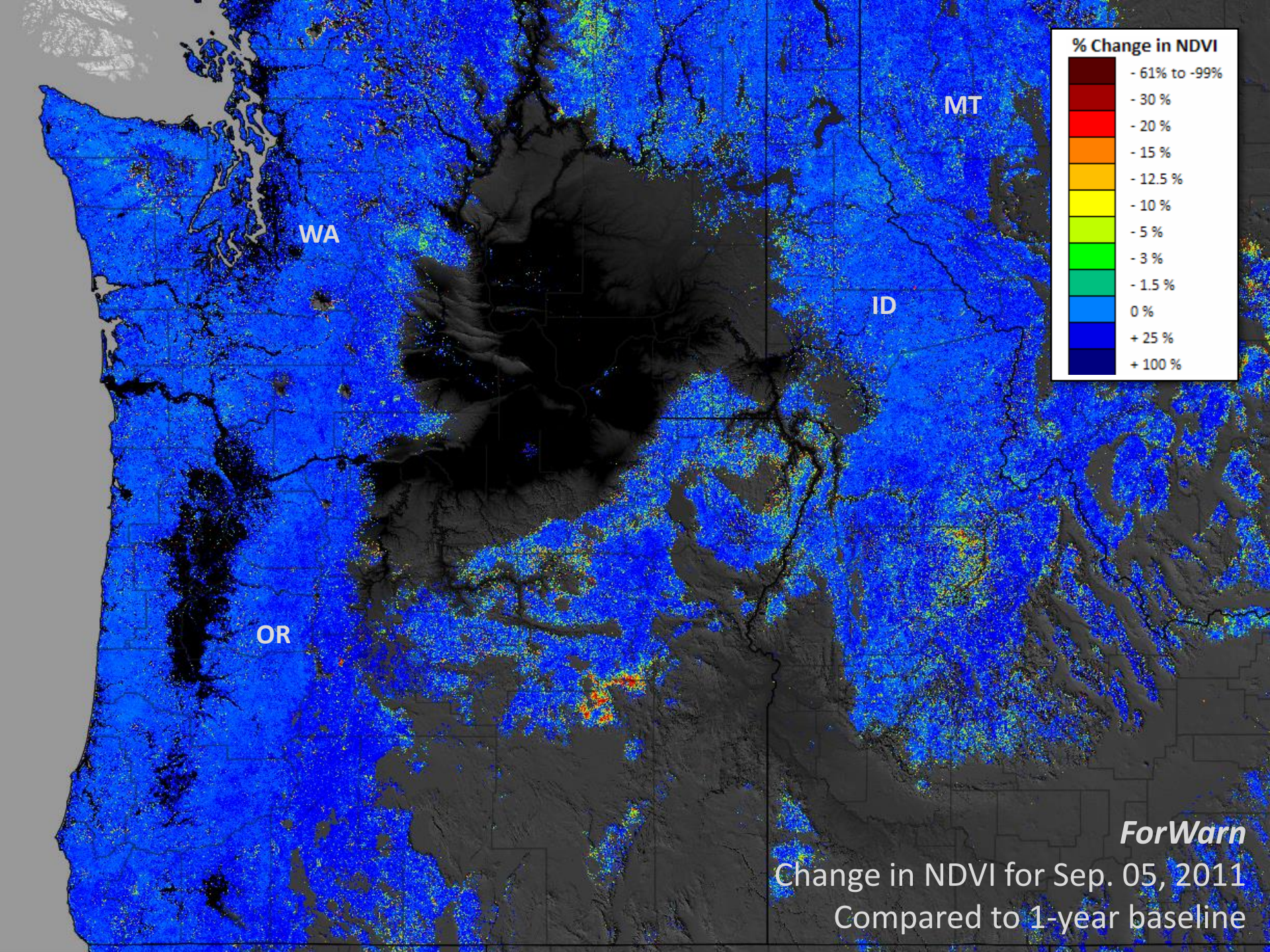


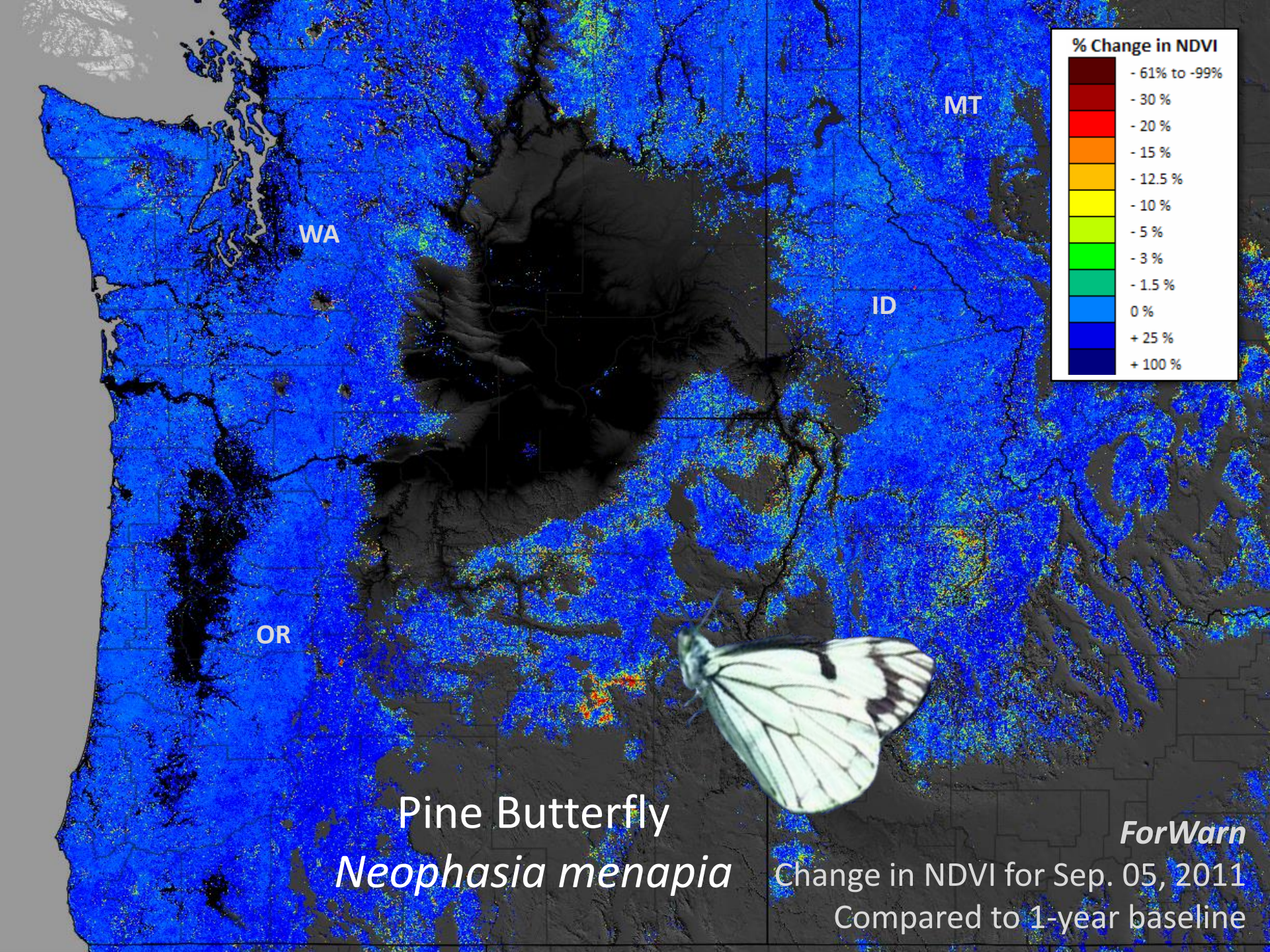


Five Applications of the *ForWarn* System for Monitoring, Assessment and Prediction



1. **Near-real-time disturbance detection.**
2. Assessing seasonal climate impacts on vegetation productivity, such as fuels.
3. Tracking post-disturbance response over the long term.
4. Assessing cumulative effects from multiple disturbances or events across scales.
5. Monitoring vegetation status with respect to desired future conditions.


% Change in NDVI
- 61% to -99%
- 30 %
- 20 %
- 15 %
- 12.5 %
- 10 %
- 5 %
- 3 %
- 1.5 %
0 %
+ 25 %
+ 100 %
MT
WA
ID
OR
ForWarn
Change in NDVI for Sep. 05, 2011
Compared to 1-year baseline

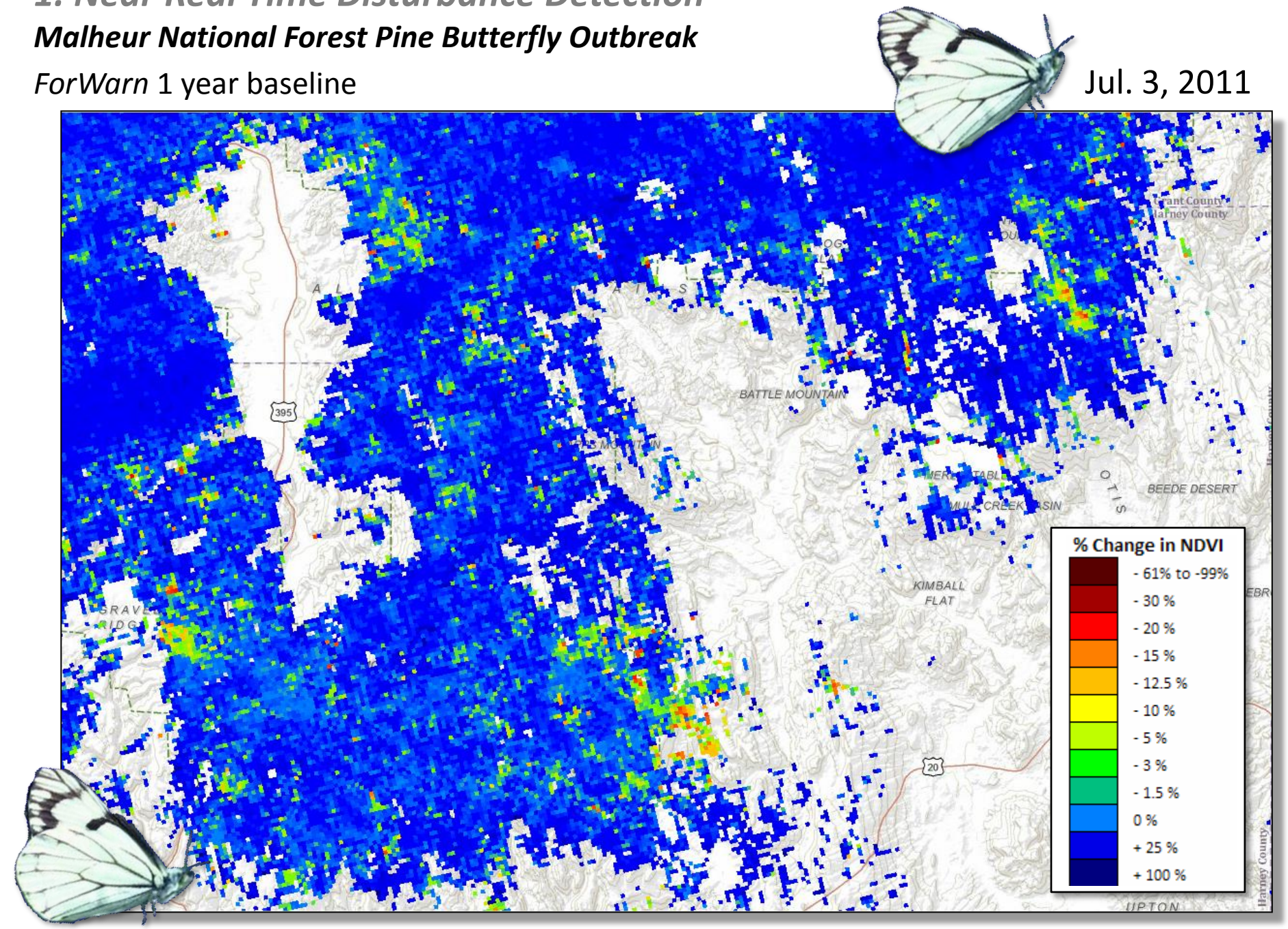

% Change in NDVI
- 61% to -99%
- 30 %
- 20 %
- 15 %
- 12.5 %
- 10 %
- 5 %
- 3 %
- 1.5 %
0 %
+ 25 %
+ 100 %
MT
WA
ID
OR
Pine Butterfly
Neophasia menapia
ForWarn
Change in NDVI for Sep. 05, 2011
Compared to 1-year baseline

1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

ForWarn 1 year baseline

Jul. 3, 2011

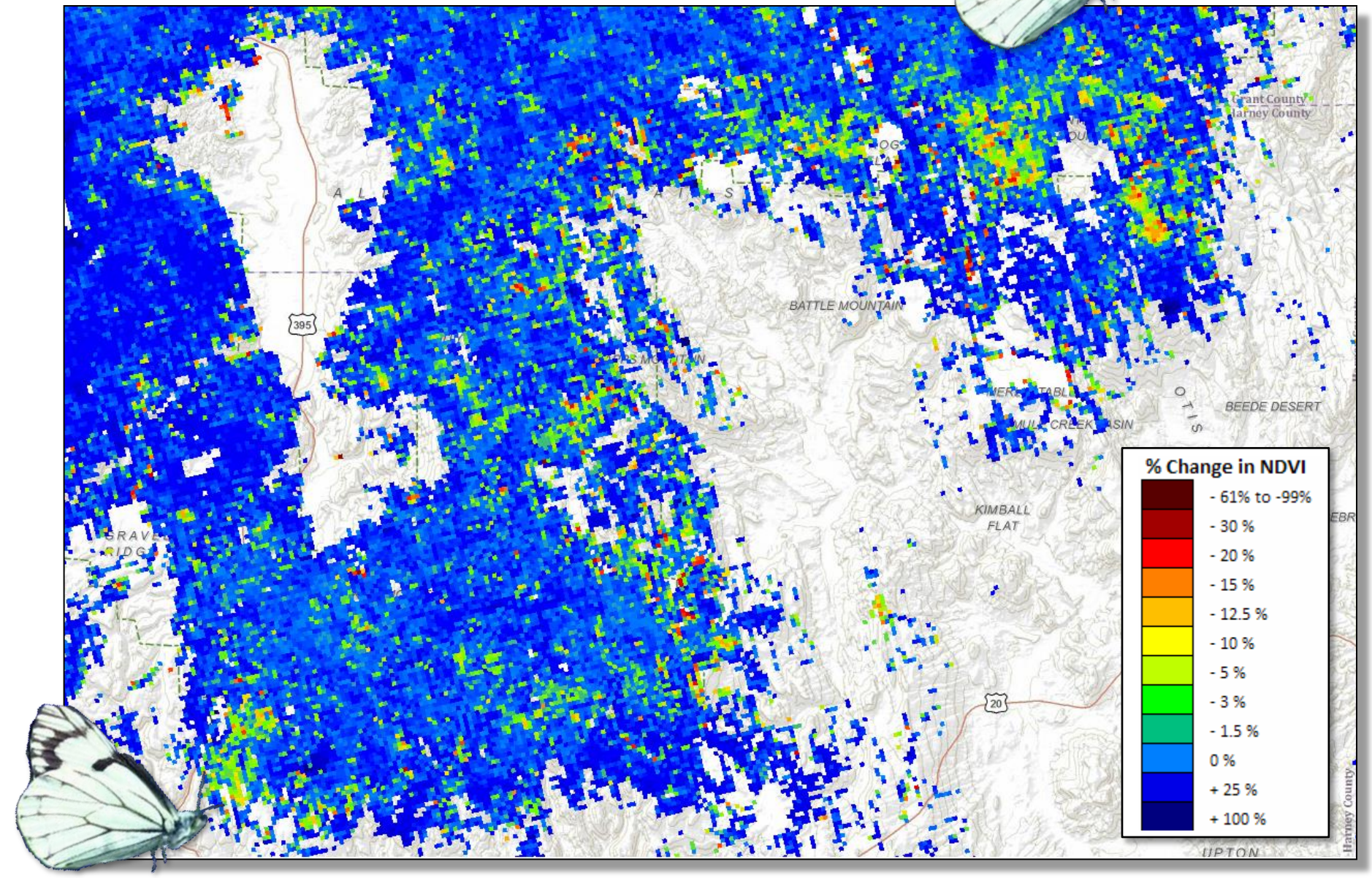


1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

ForWarn 1 year baseline

Jul. 27, 2011

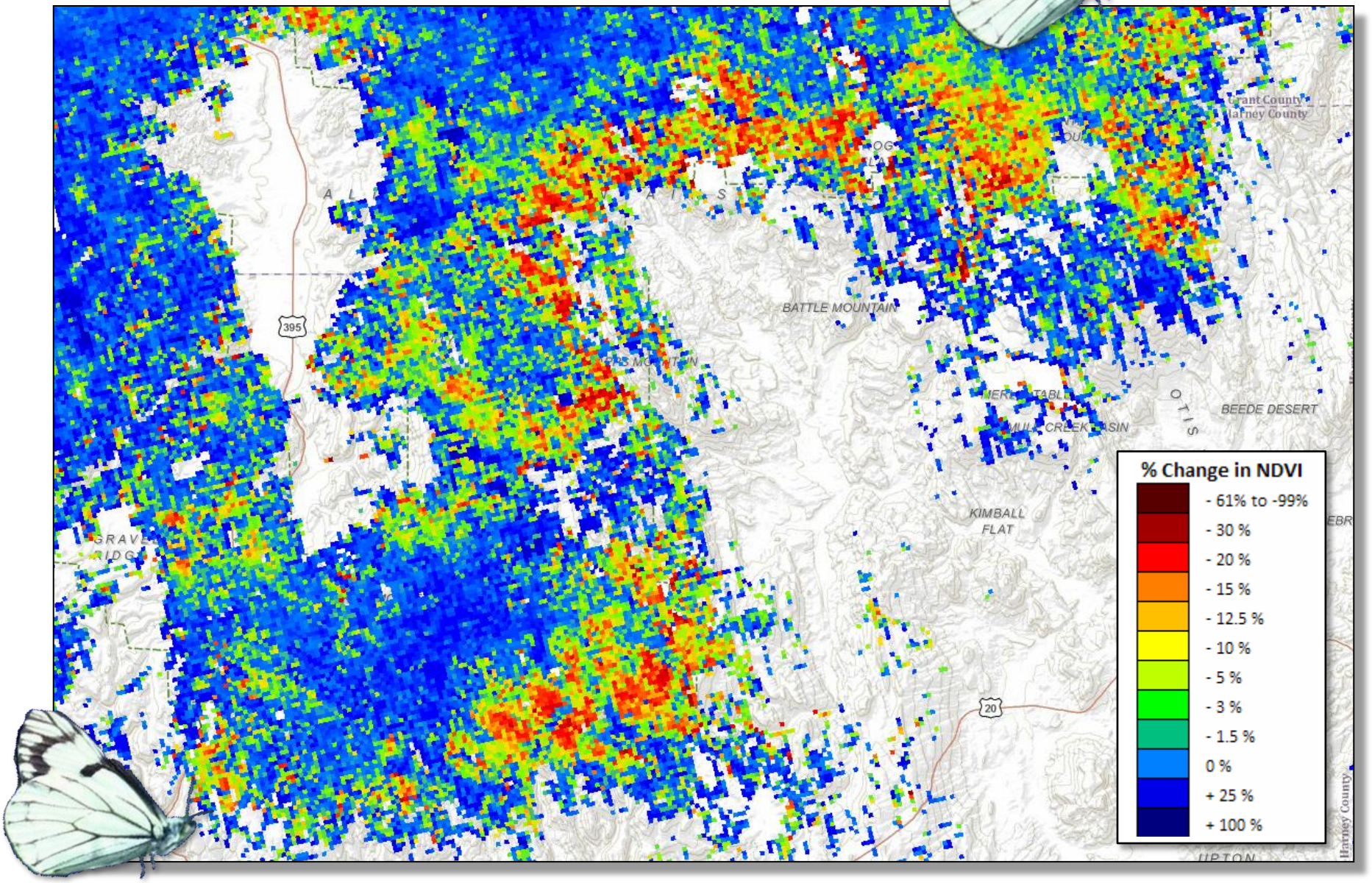


1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

ForWarn 1 year baseline

Aug. 20, 2011

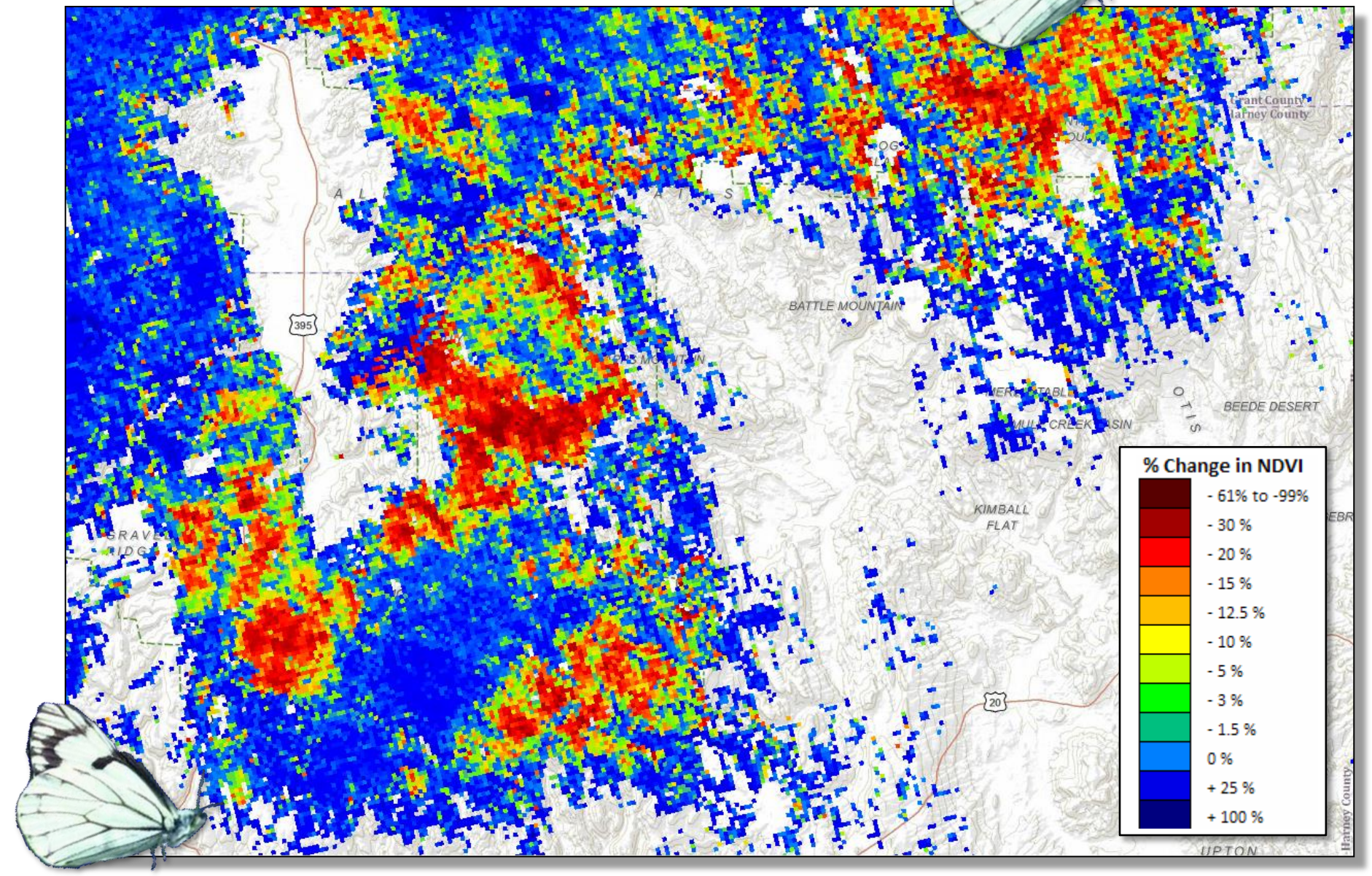


1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

ForWarn 1 year baseline

Sep. 13, 2011

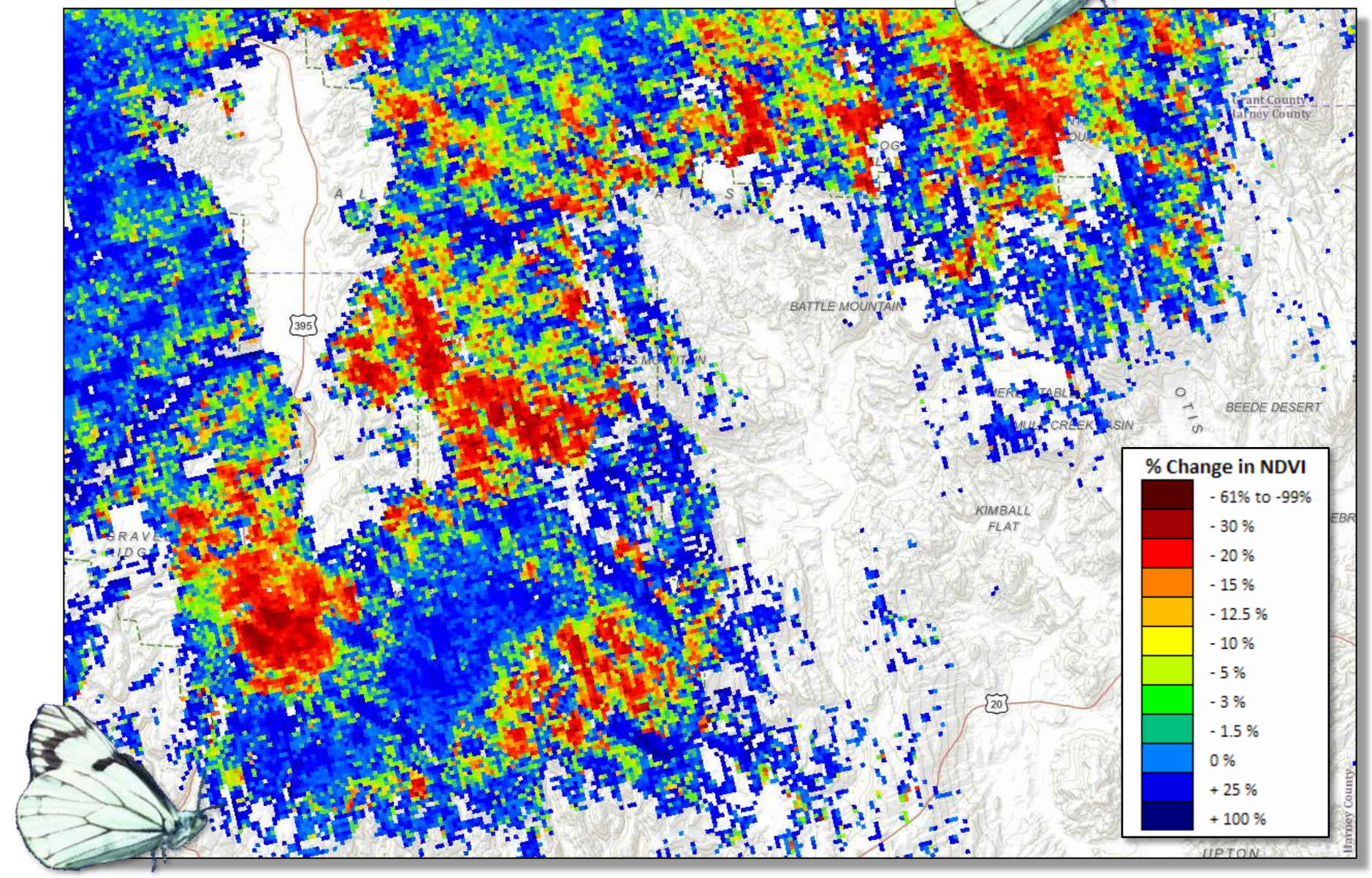


1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

ForWarn 1 year baseline

Oct. 7, 2011

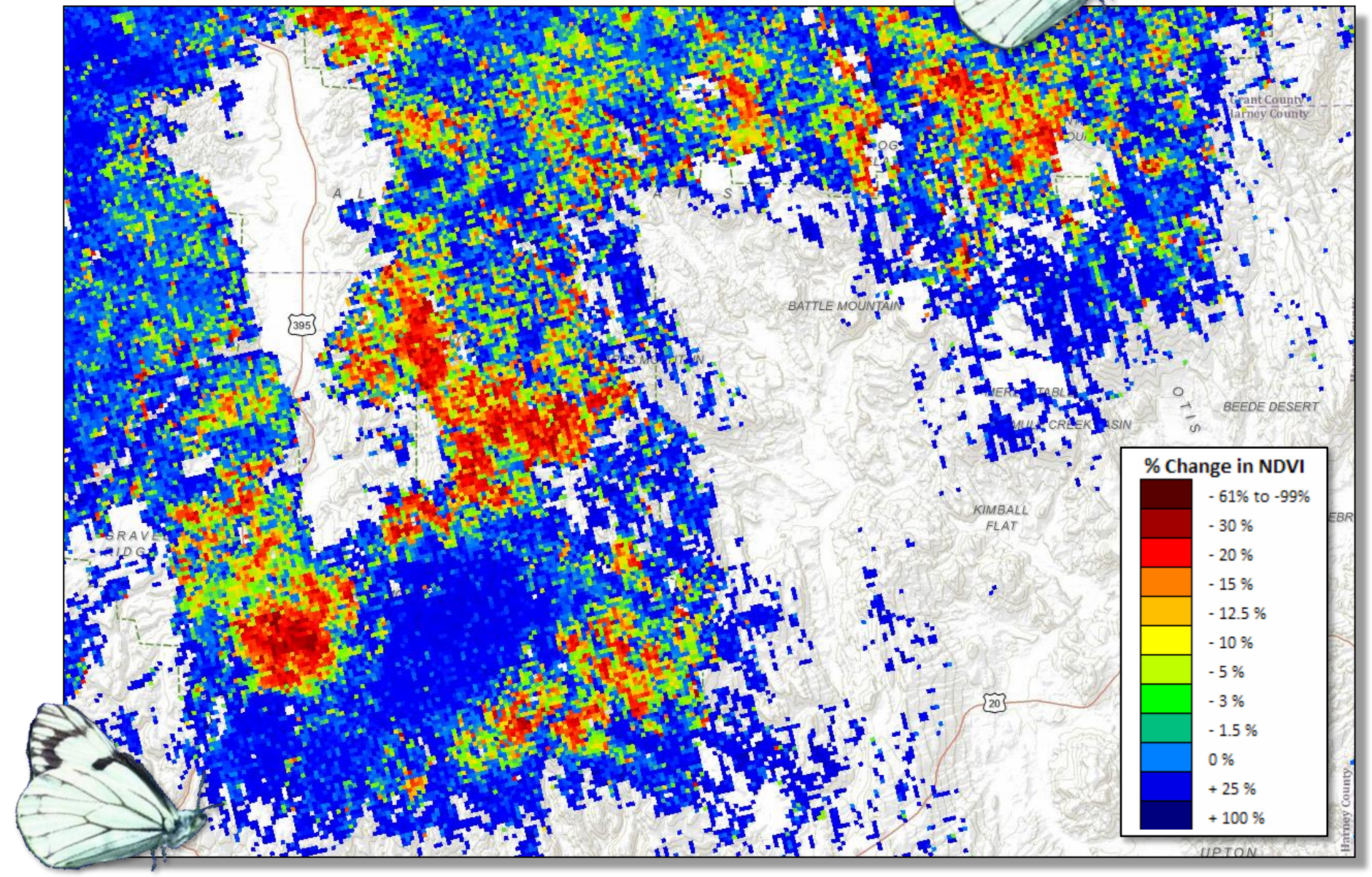


1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

ForWarn 1 year baseline

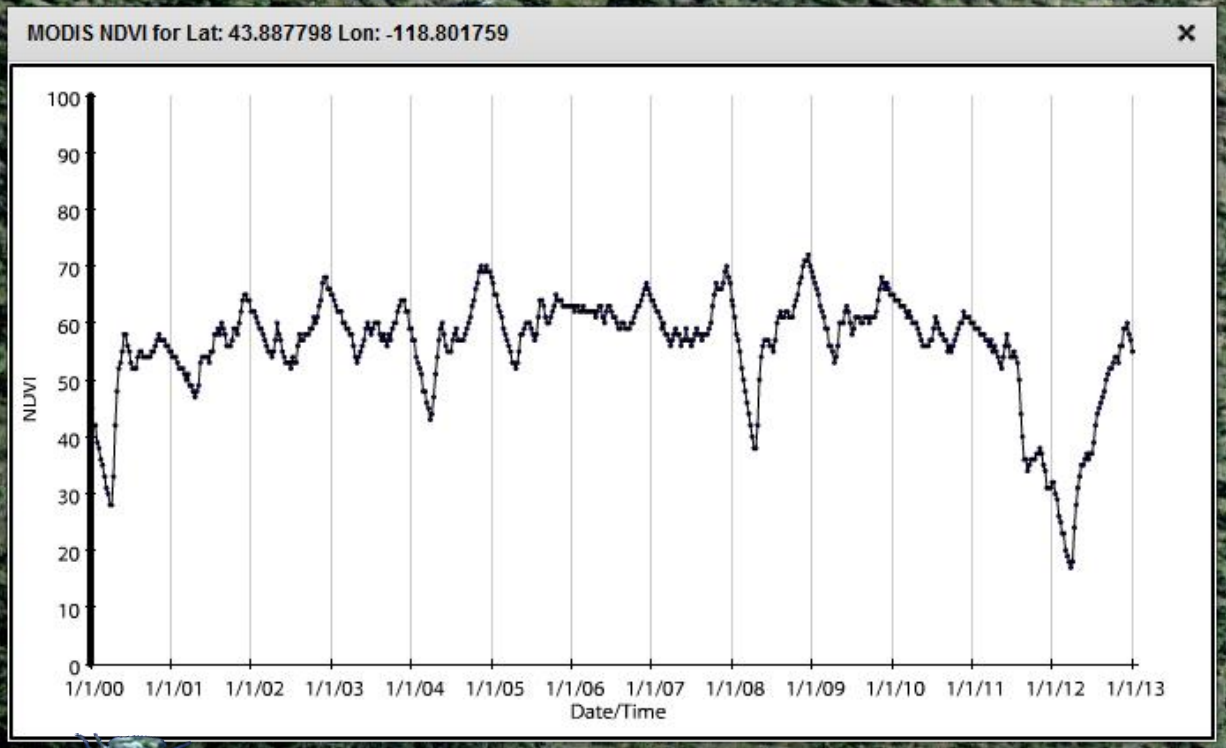
Oct. 31, 2011



1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

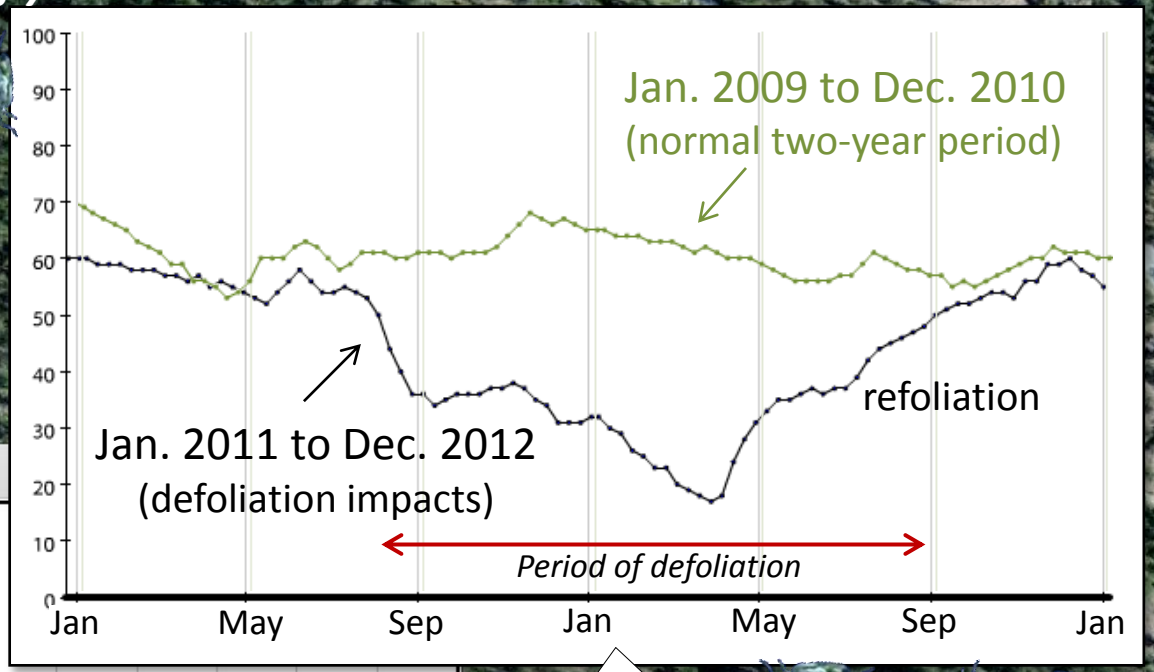
2000-2012 NDVI time series

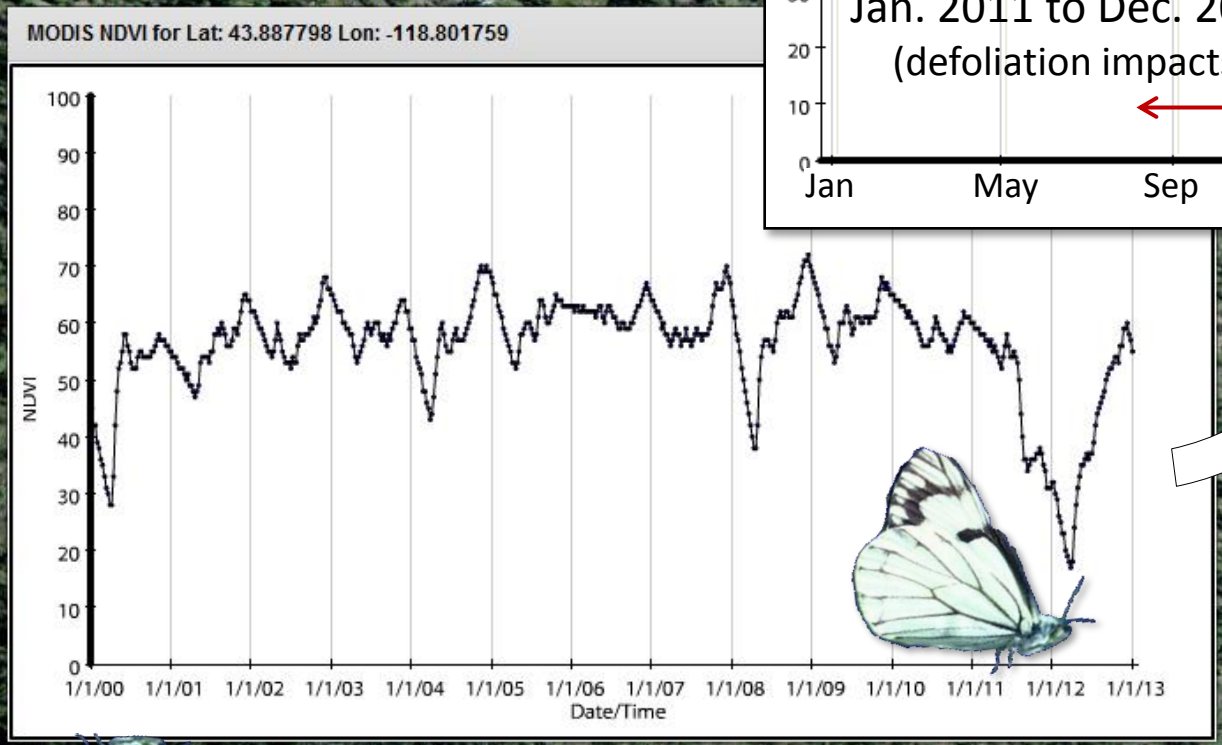


1. Near Real Time Disturbance Detection

Malheur National Forest Pine Butterfly Outbreak

2000-2012 NDVI time series





Expanded

Five Applications of the *ForWarn* System for Monitoring, Assessment and Prediction

1. Near-real-time disturbance detection.

2. **Assessing seasonal climate impacts on vegetation productivity, such as fuels.**

3. Tracking post-disturbance response over the long term.

4. Assessing cumulative effects from multiple disturbances or events across scales.

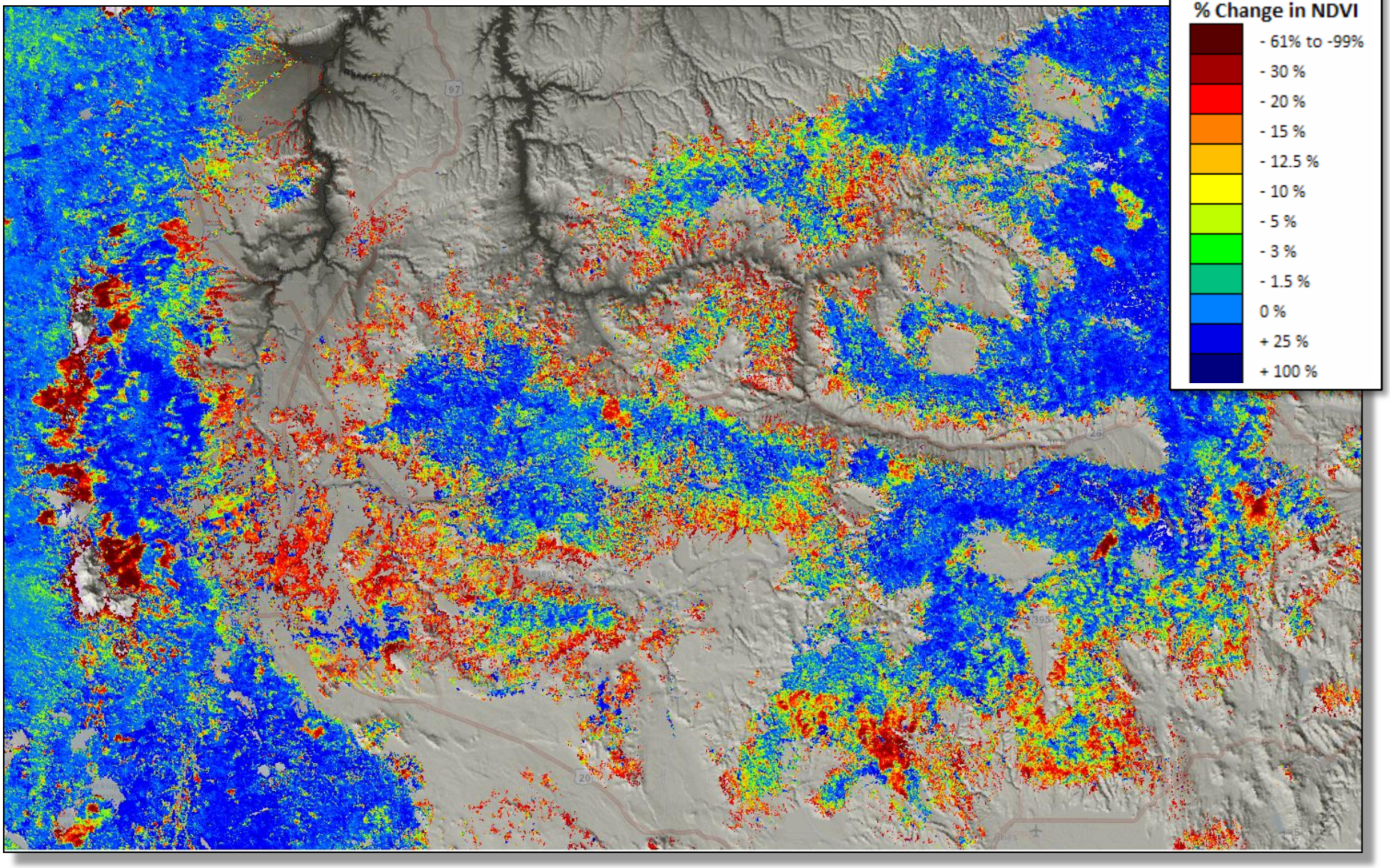
5. Monitoring vegetation status with respect to desired future conditions.

2. Assessing Seasonal Climate Impacts

Central Oregon Drought Sensitivity

ForWarn All-year baseline

Jul. 3, 2013



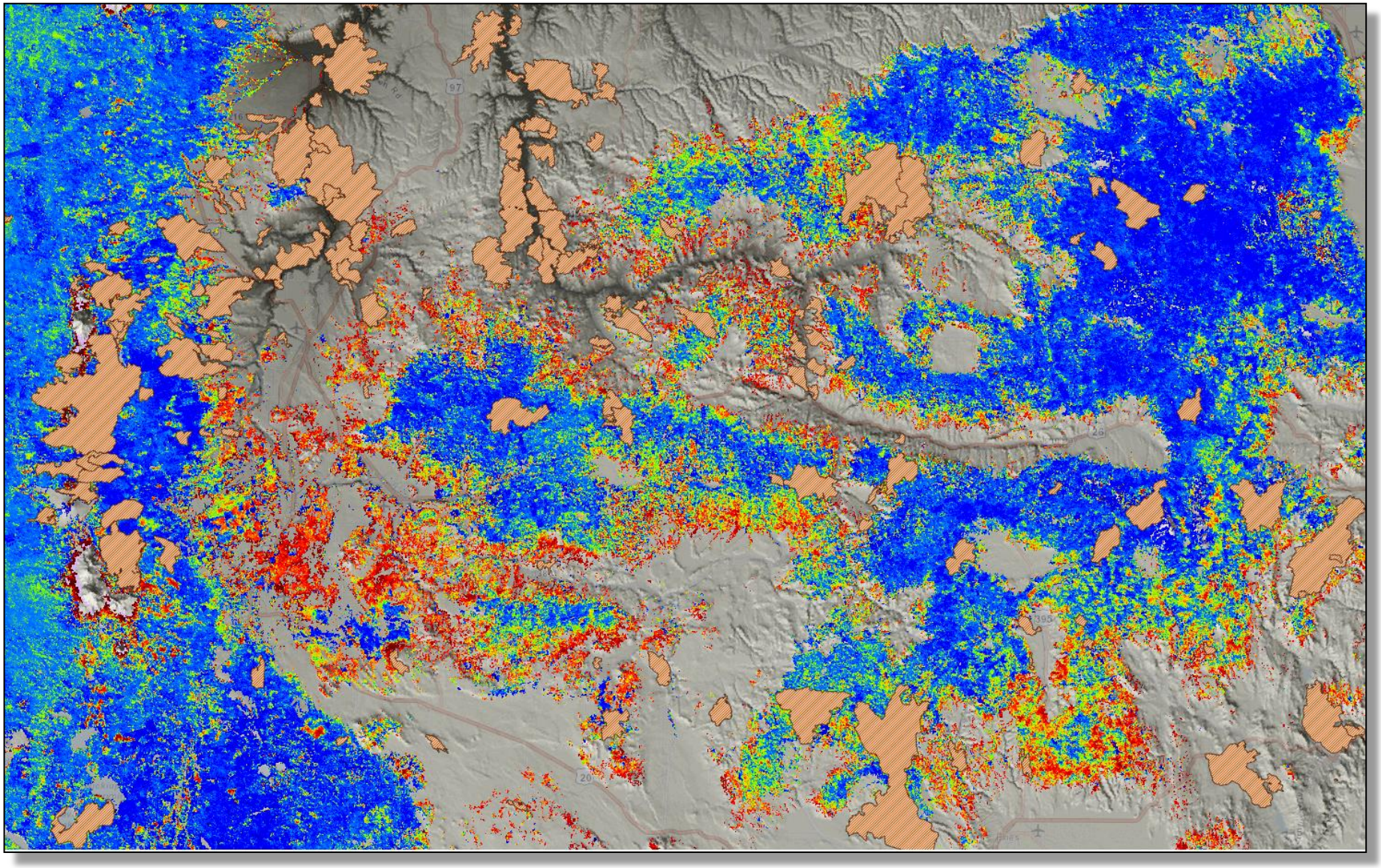
2. Assessing Seasonal Climate Impacts

Central Oregon Drought Sensitivity

ForWarn All-year baseline

Jul. 3, 2013

Large Fires 2000-2013
Wildland fires



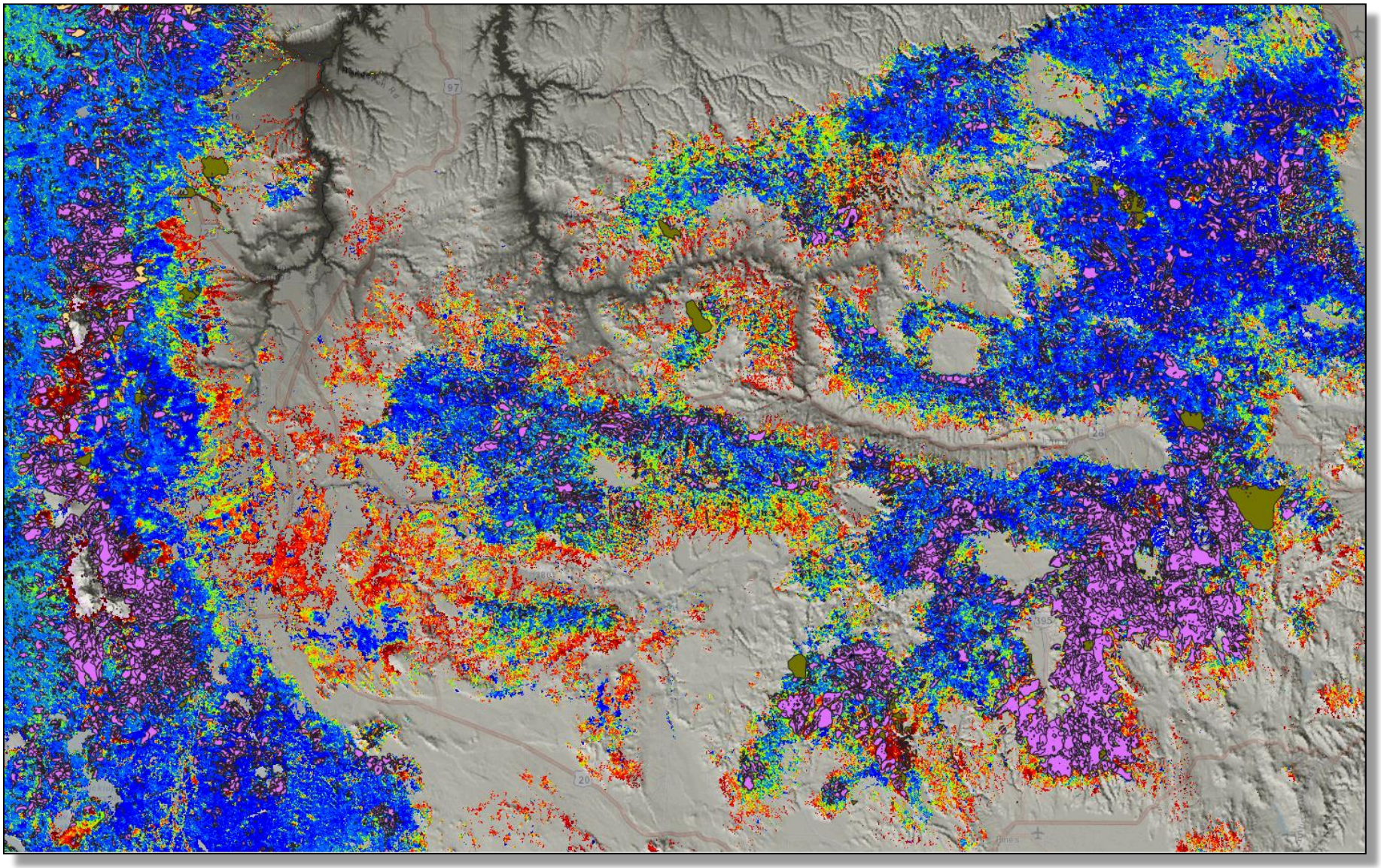
2. Assessing Seasonal Climate Impacts

Central Oregon Drought Sensitivity

ForWarn All-year baseline

Jul. 3, 2013

Aerial surveys 2000-12
- Biotic
- Abiotic

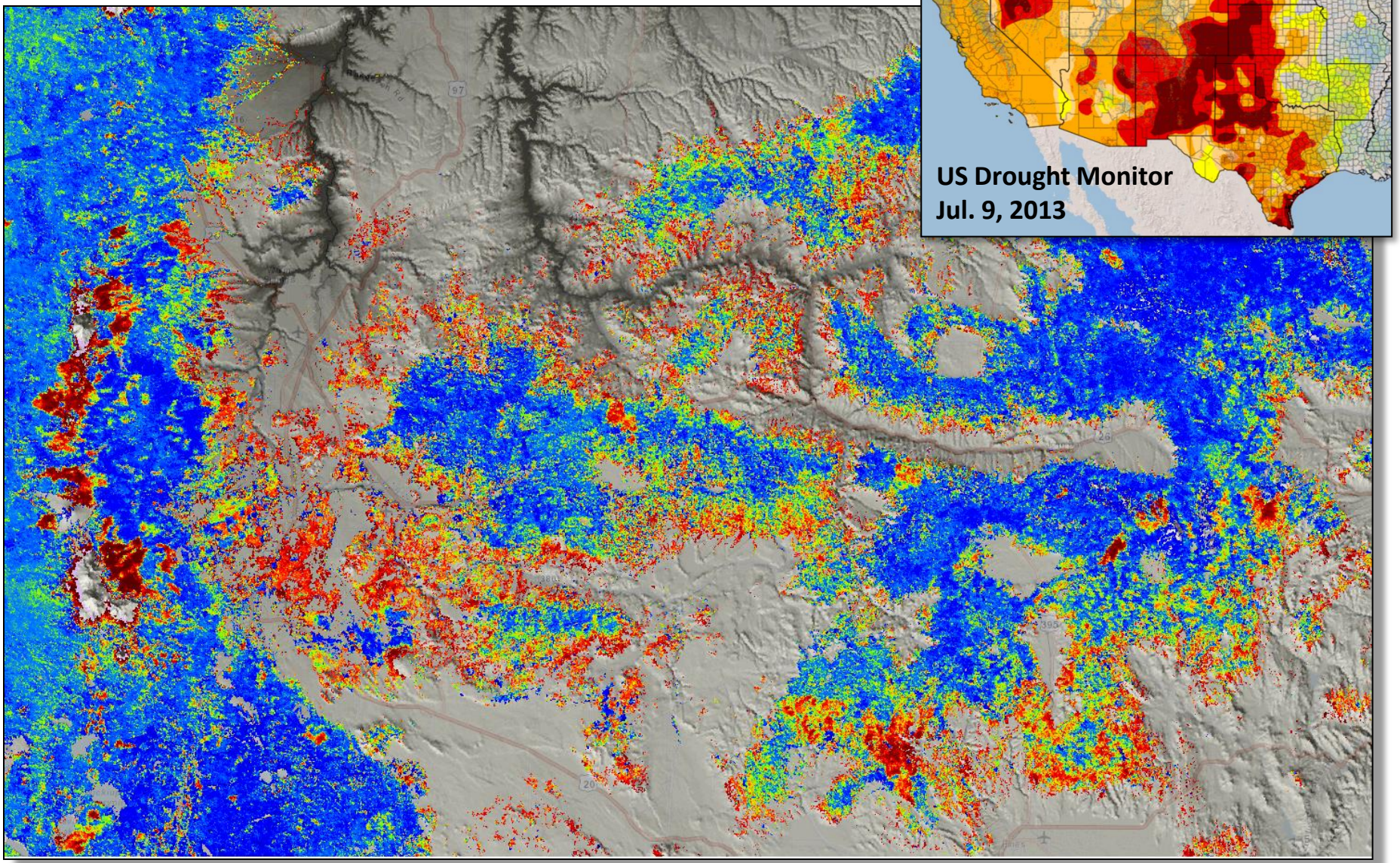


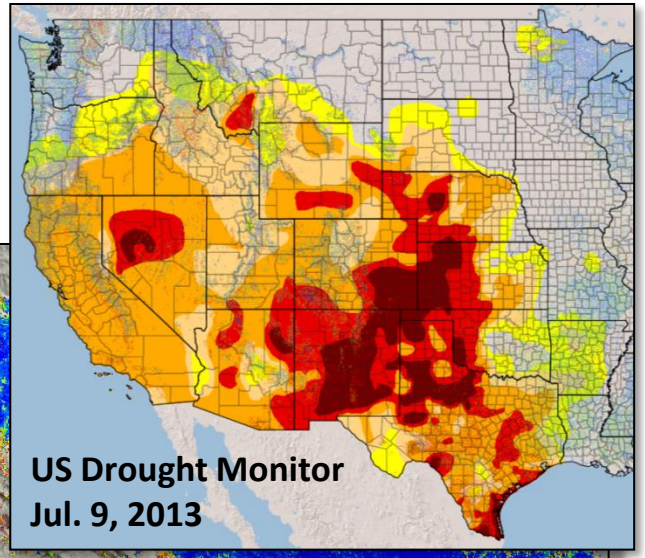
2. Assessing Seasonal Climate Impacts

Central Oregon Drought Sensitivity

ForWarn All-year baseline

Jul. 3, 2013

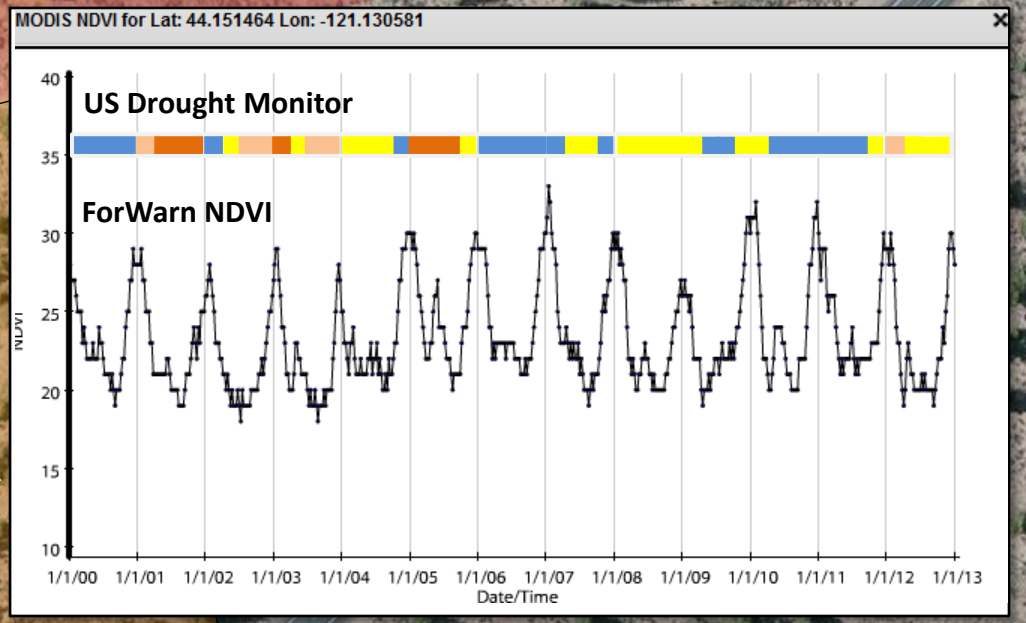




2. Assessing Seasonal Climate Impacts

Central Oregon Drought Sensitivity

ForWarn All-year baseline



D0 - Abnormally Dry
D1 - Moderate Drought
D2 - Severe Drought
D3 - Extreme Drought
D4 - Exceptional Drought

% Change in NDVI

- 61% to -99%
- 30 %
- 20 %
- 15 %
- 12.5 %
- 10 %
- 5 %
- 3 %
- 1.5 %
0 %
+ 25 %
+ 100 %

Crook Co. 15 km NE of Bend, OR
Powell Butte Highway

100 m

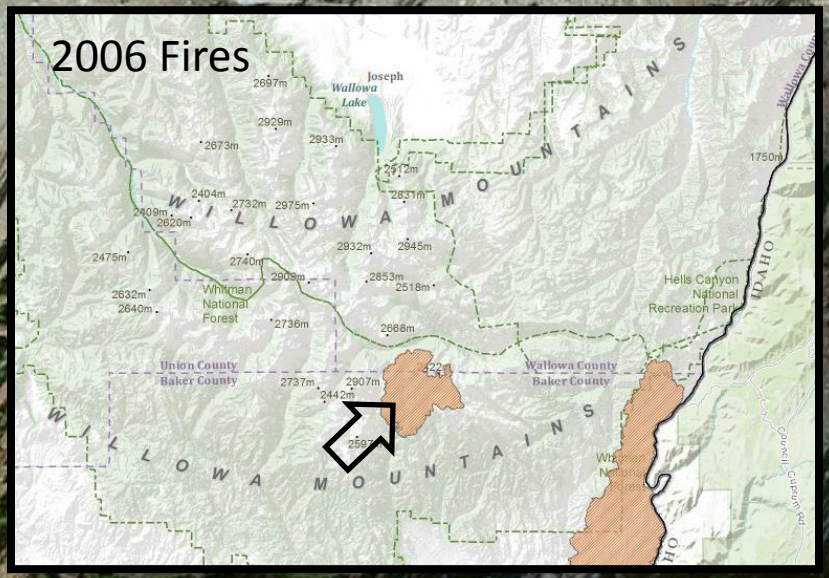
Five Applications of the *ForWarn* System for Monitoring, Assessment and Prediction

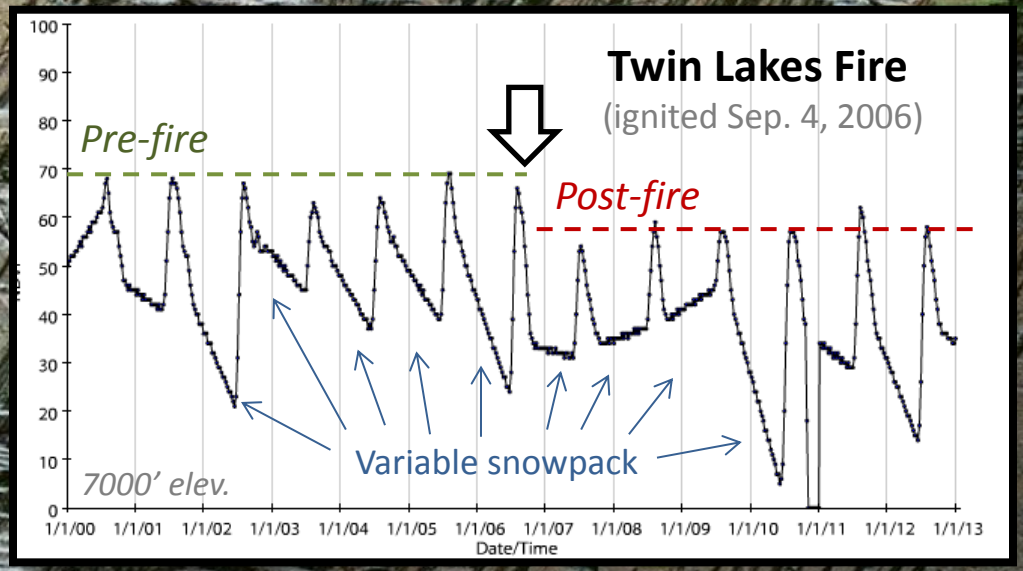
1. Near-real-time disturbance detection.
2. Assessing seasonal climate impacts on vegetation productivity, such as fuels.
3. **Tracking post-disturbance response over the long term.**
4. Assessing cumulative effects from multiple disturbances or events across scales.
5. Monitoring vegetation status with respect to desired future conditions.

3. Tracking Post-Disturbance Response

3. Tracking Post-Disturbance Response

Post-fire monitoring

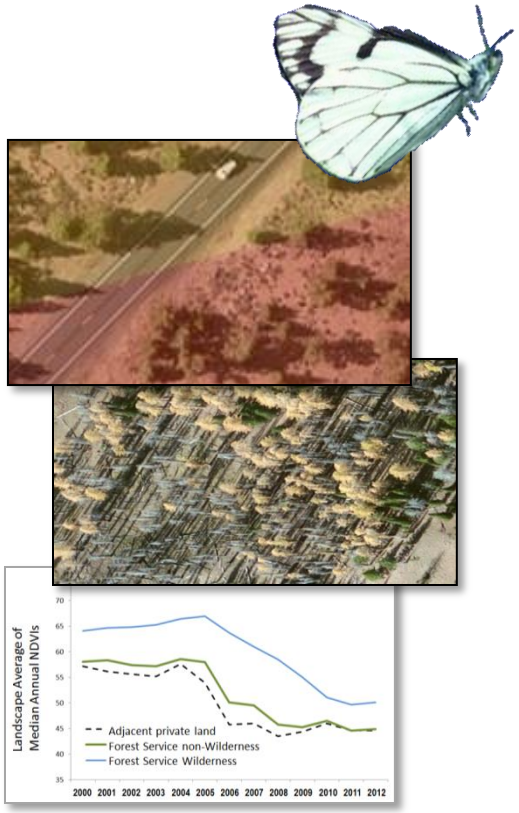




3. Tracking Post-Disturbance Response

Post-fire insect mortality

Five Applications of the *ForWarn* System for Monitoring, Assessment and Prediction



1. Near-real-time disturbance detection.
2. Assessing seasonal climate impacts on vegetation productivity, such as fuels.
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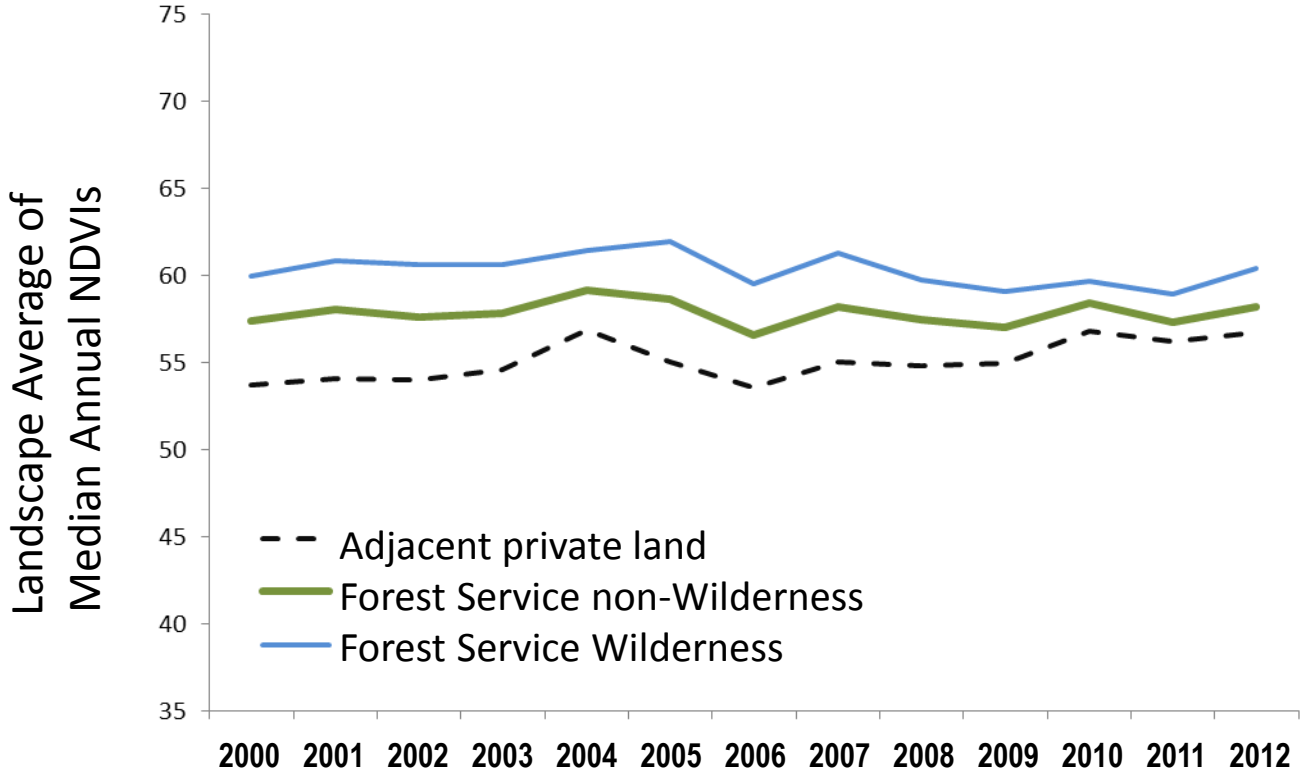
4. Assessing Cumulative Effects

Umatilla National Forest

Change in NDVI for all lands, 2000-2012



Adjacent private: 7,954 MODIS pixels

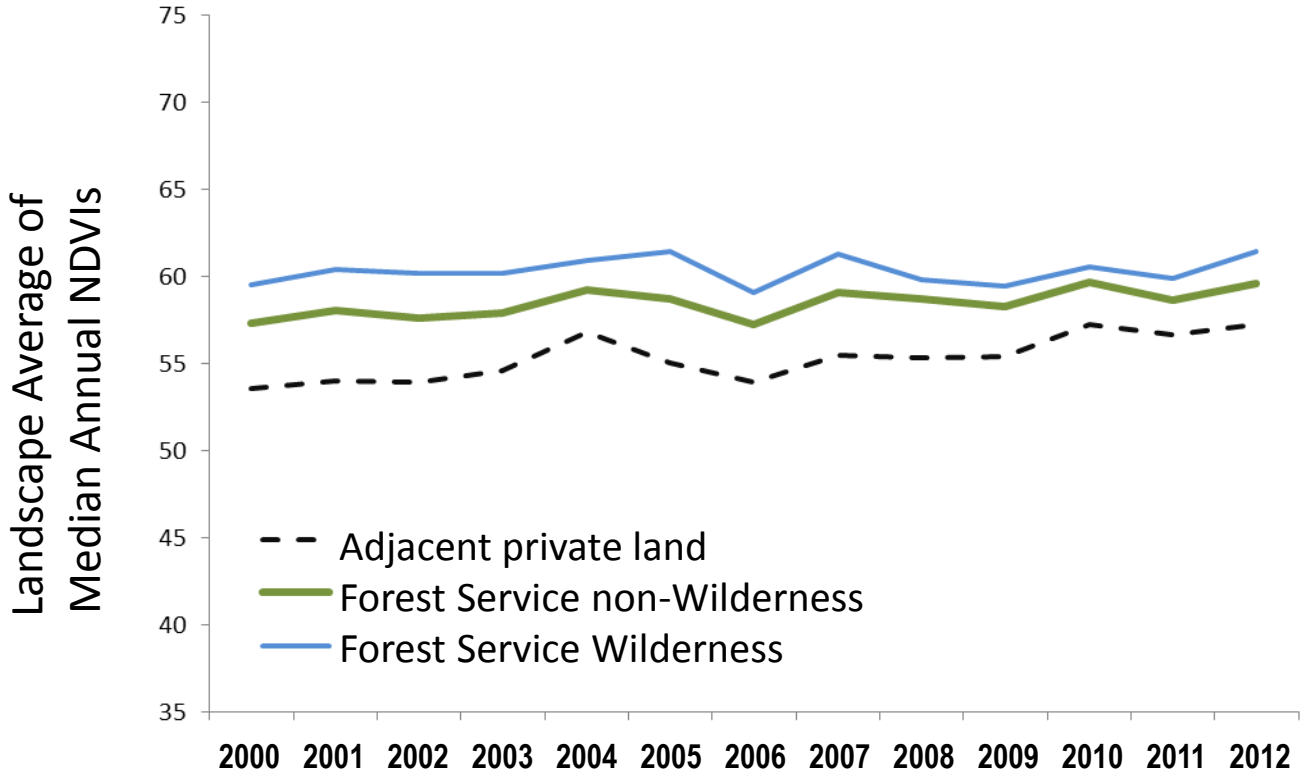
FS non-Wilderness: 82,980 MODIS pixels

FS Wilderness: 22,827 MODIS pixels

4. Assessing Cumulative Effects

Umatilla National Forest

Change in NDVI for all lands that did not burn between 2000 and 2012

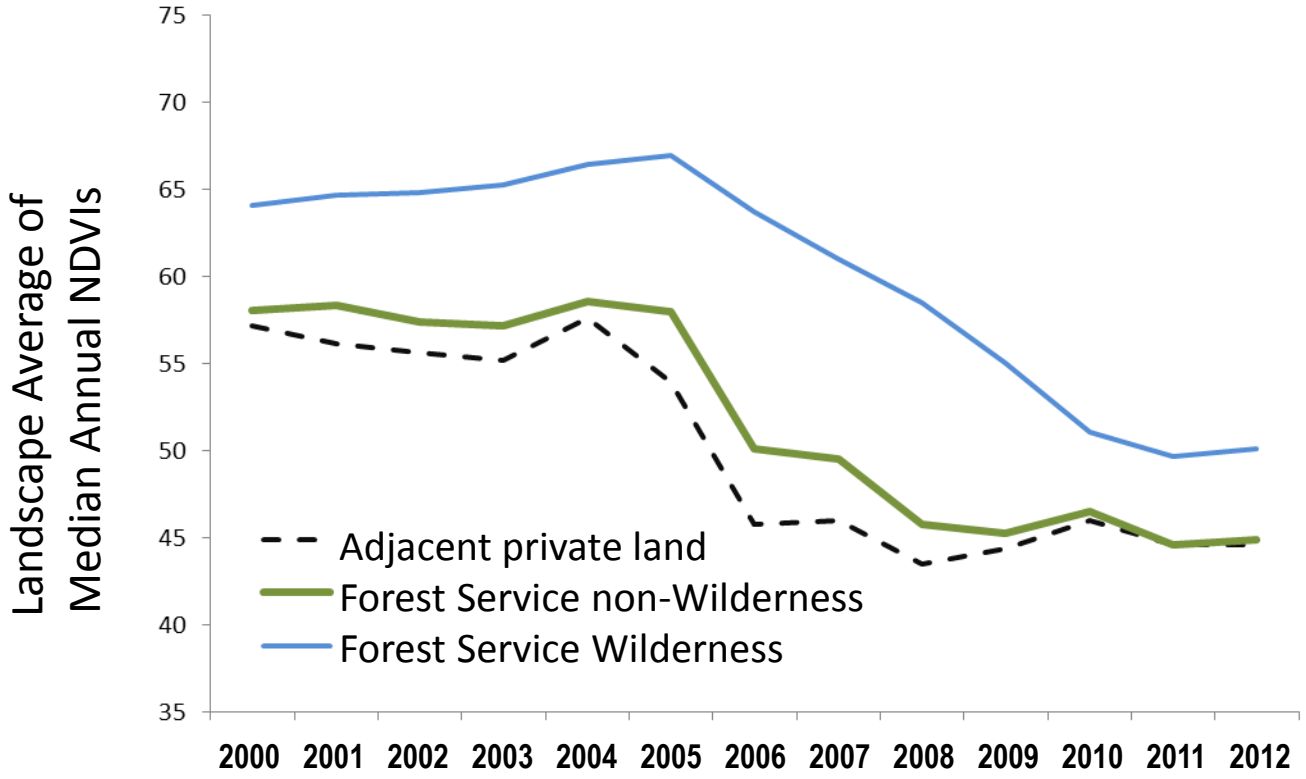


Adjacent private:	7,625/7,954	(96%)
FS non-Wilderness:	75,065/82,980	(90%)
FS Wilderness:	20,706/22,827	(91%)

4. Assessing Cumulative Effects

Umatilla National Forest

Change in NDVI for all lands that burned at least once between 2000 and 2012



Adjacent private: 329/7,954 (04%)

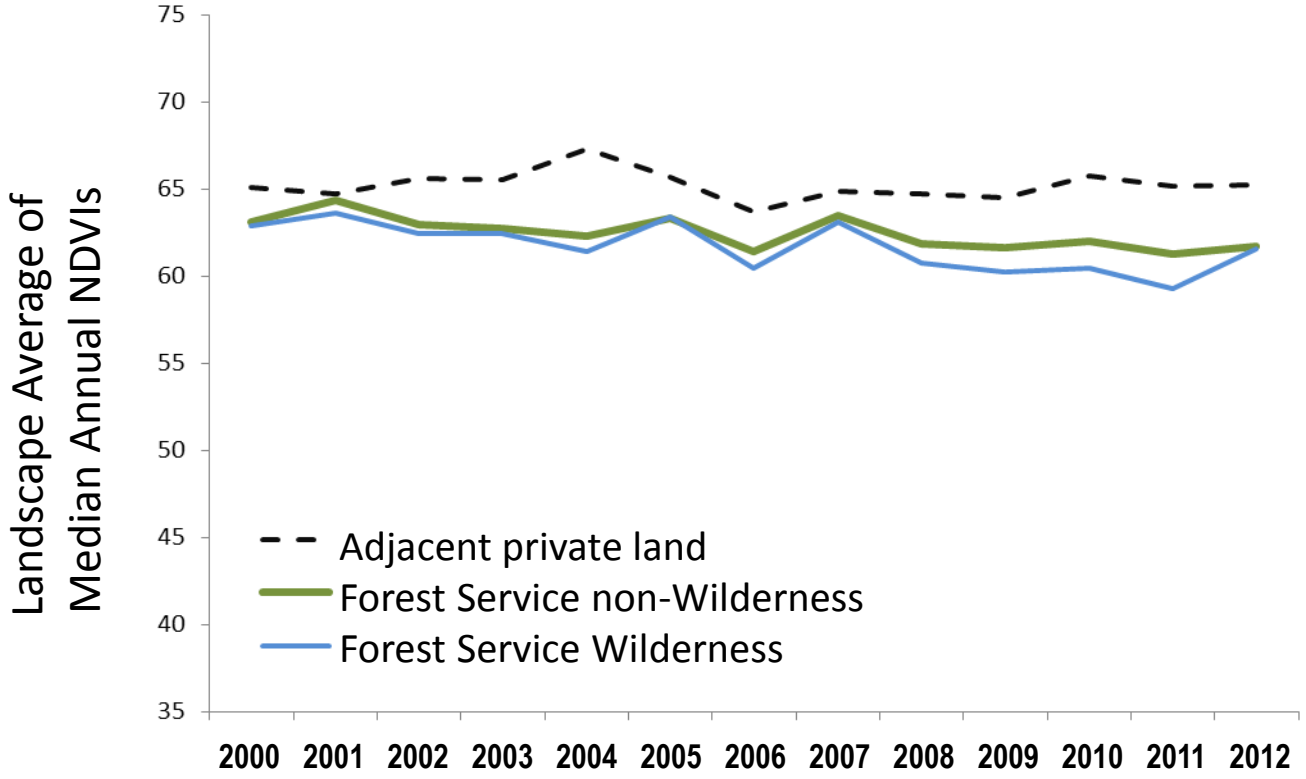
FS non-Wilderness: 7,915/82,980 (10%)

FS Wilderness: 2,121/22,827 (09%)

4. Assessing Cumulative Effects

Umatilla National Forest

Change in NDVI for all unburned lands with 2+ years of aerial insect/disease detections

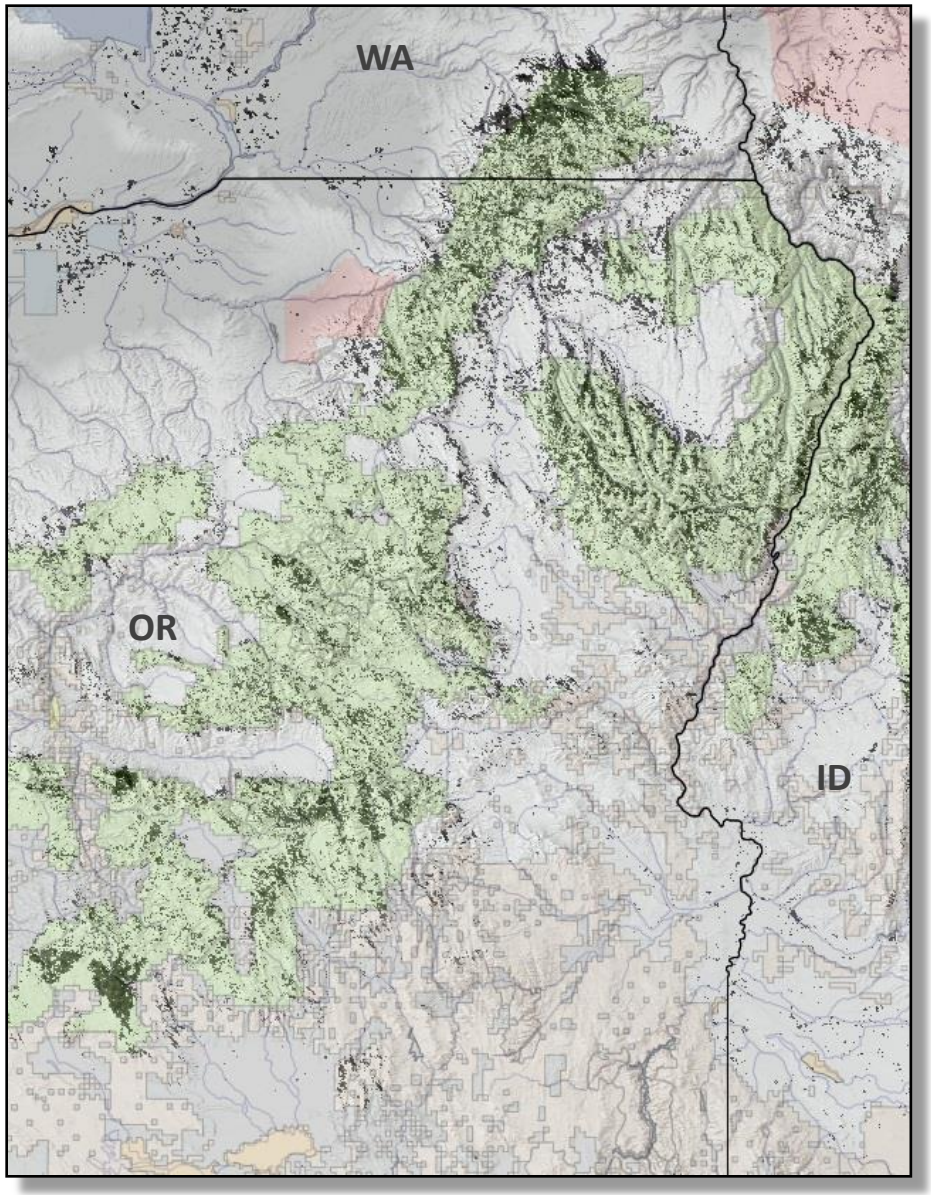


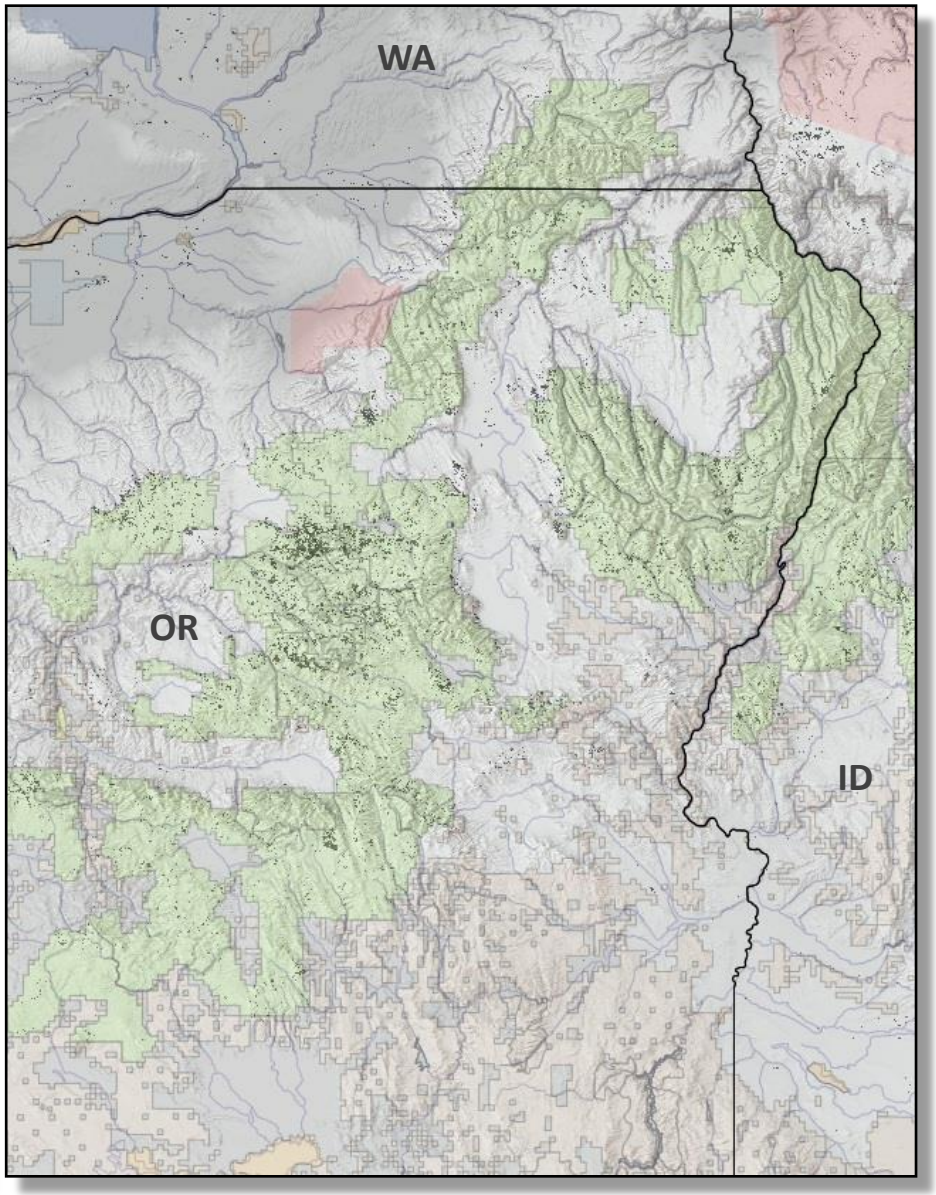
Adjacent private:	243/7,954	(97%)
FS non-Wilderness:	7,066/82,980	(91%)
FS Wilderness:	4,553/22,827	(80%)

4. Assessing Cumulative Effects

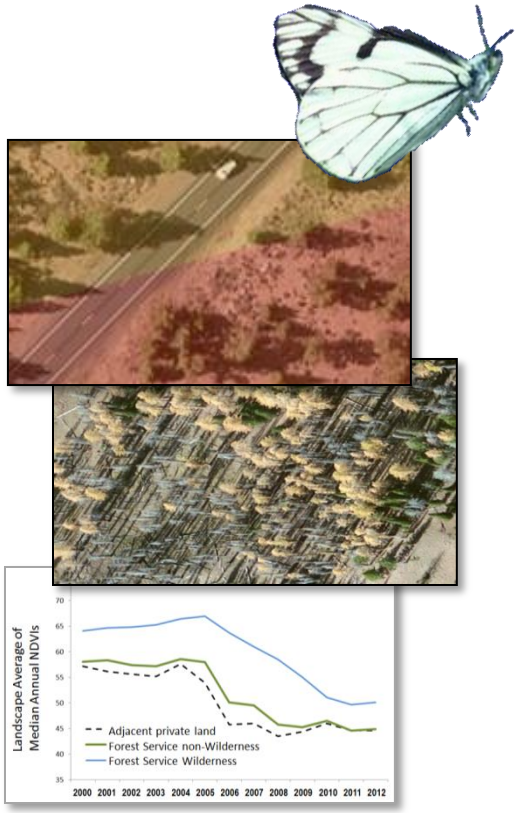
NDVI-derived trends in the Blue Mountains

ForWarn's Evergreen Decline (left) and Evergreen Thrive (Right), 2000-2011





Five Applications of the *ForWarn* System for Monitoring, Assessment and Prediction



1. Near-real-time disturbance detection.
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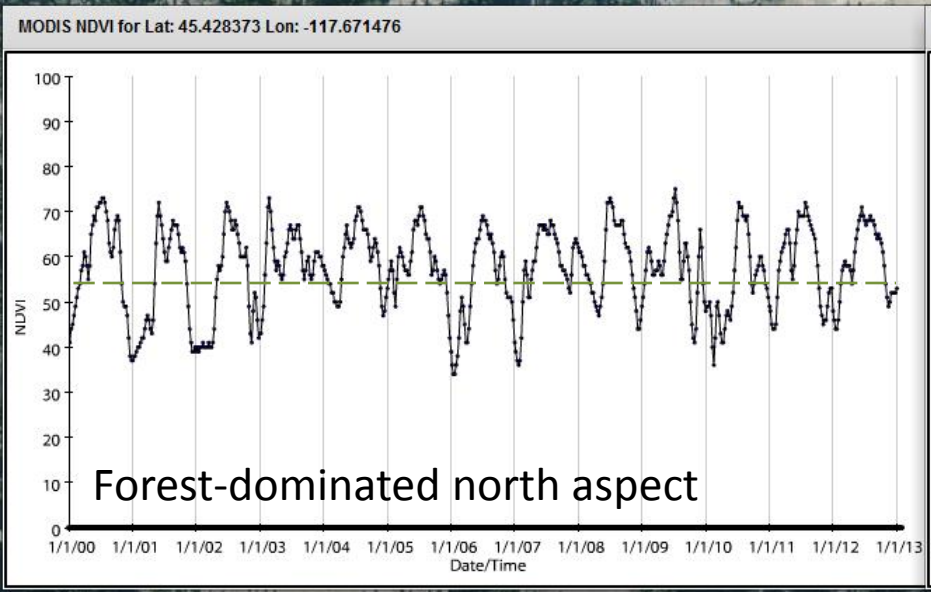
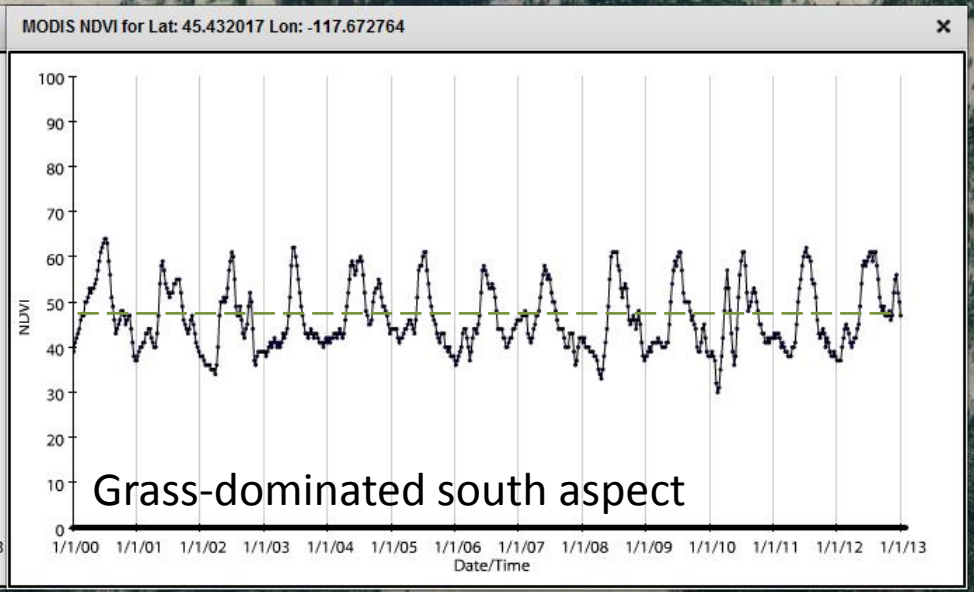
4. Assessing cumulative effects from multiple disturbances or events across scales.
5. **Monitoring vegetation status with respect to desired future conditions.**

5. Monitoring for desired conditions

Vegetation types differ

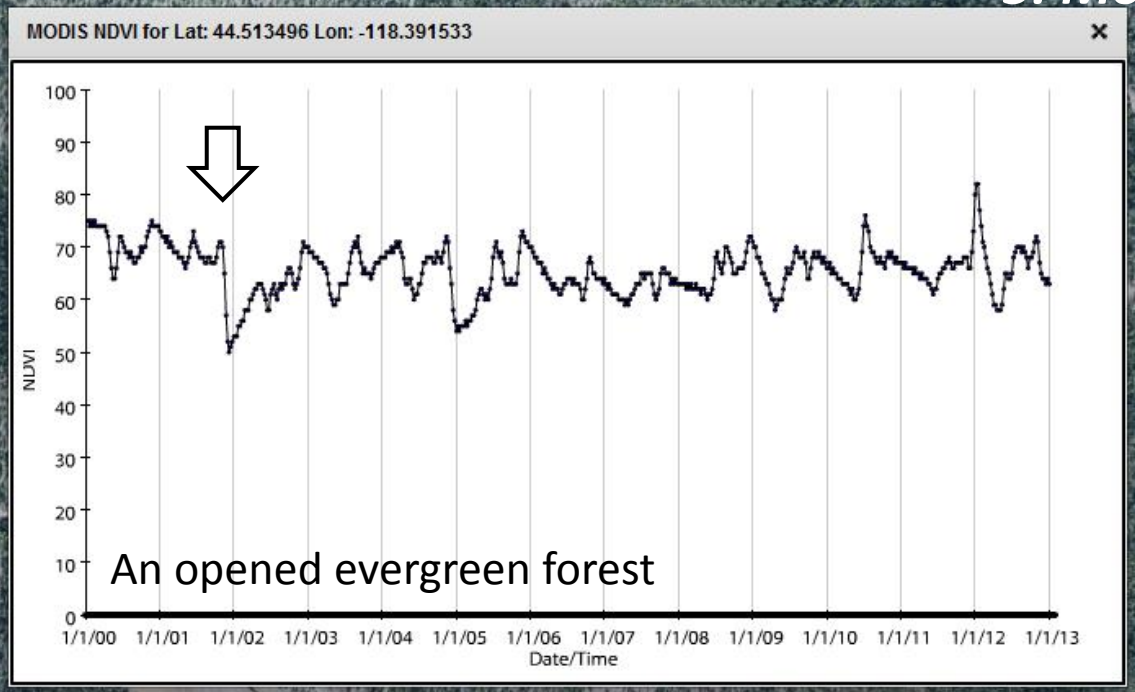




Eagle Cap Wilderness
Wallow-Whitman National Forest
4,200’

5. Monitoring for desired conditions

Restoration of forest structure

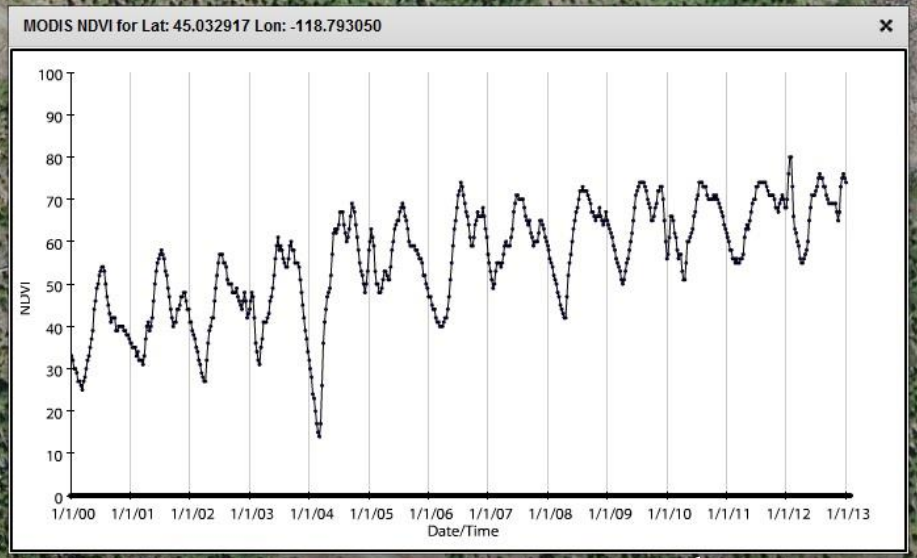


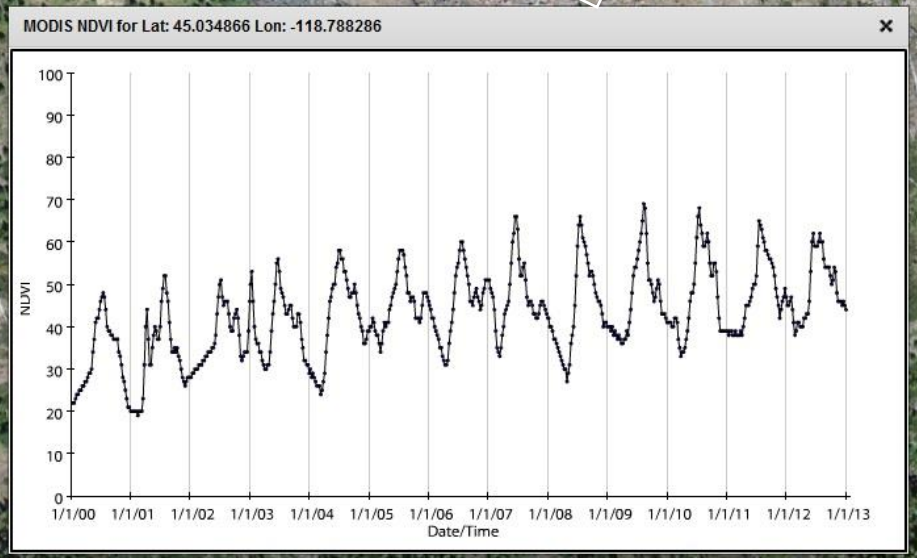
2001 Thinning Project
Squaw Creek, Malheur National Forest
5,200 ft.

1 km
0.5 mi

5. Monitoring for desired conditions

Post-fire succession

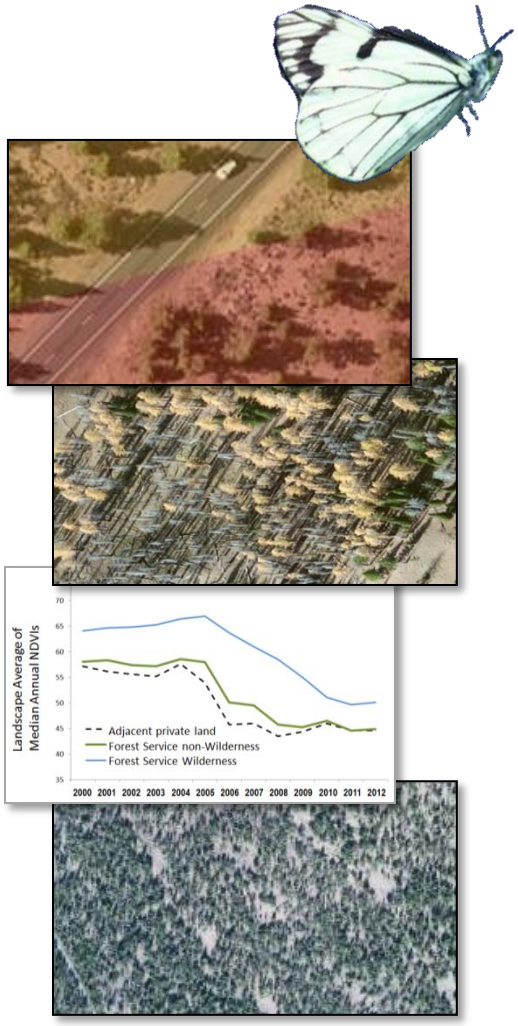




100 m
500 ft

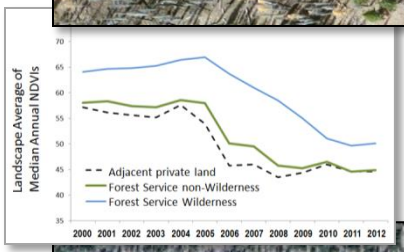
1996 Tower Fire
Texas Bar Creek
4,200 ft.

Five Applications of the *ForWarn* System for Monitoring, Assessment and Prediction



1. Near-real-time <u>disturbance detection</u>.
2. Assessing seasonal <u>climate impacts</u> on vegetation productivity, such as fuels.
3. Tracking <u>post-disturbance response</u> over the long term.
4. Assessing <u>cumulative effects</u> from multiple disturbances or events across scales.
5. Monitoring vegetation status with respect to <u>desired future conditions</u>.

Thank You



stevenorman@fs.fed.us

http://forwarn.forestthreats.org