

User Guide to Temporal Changes in LANDFIRE Vegetation, Fuel, and Fire Regime Products

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MAIN TOPICS

- LANDFIRE User Guide Process
- Landscape Change
 - Disturbance Mapping
 - Vegetation Transition Databases (VTDB)
 - Land Change Mapping
 - Updates to Fire Modeling products
 - Examples: Lassen logging, Zaca fire
- LANDFIRE Reference Guide Process



LANDFIRE User Guide Process

- **Foundational Data**
 - Reference Data
 - Remote Sensing Data
 - Bio-physical Data
- **Vegetation Data**
 - Classification
 - Mapping
 - Landscape Change
- **Fire Modeling Data**
 - Fire Behavior
 - Fire Effects
 - Fire Regime



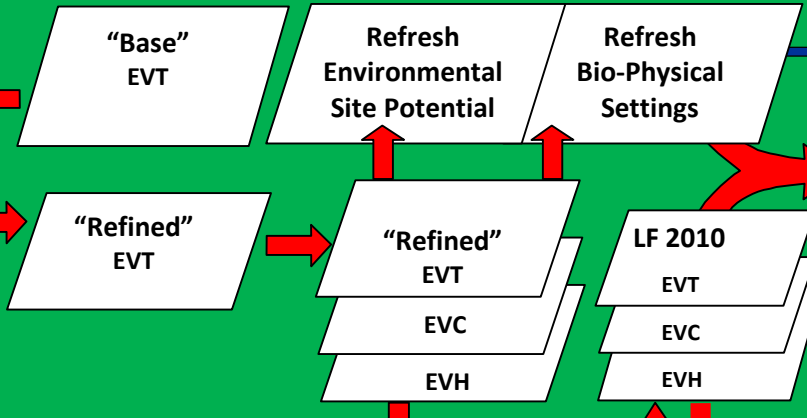
LANDFIRE User Guide Process

- LANDFIRE Methods and Processes
- LF2001, 2008, 2010, 2012 versions
- Compare-contrast methods
- Compare-contrast results
- Regionally specific reporting

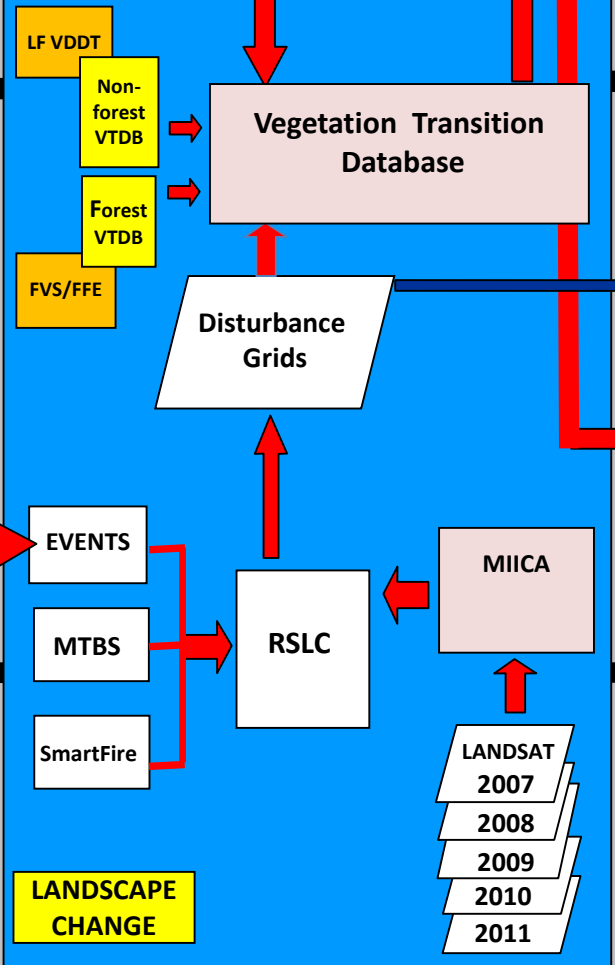
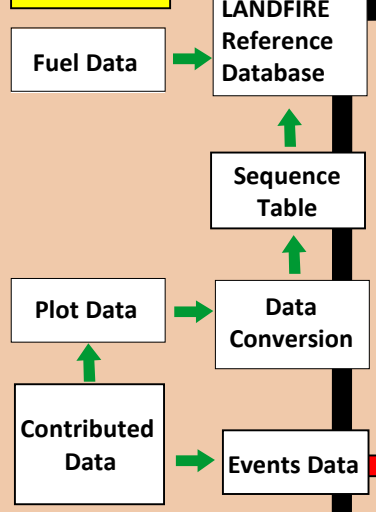


VEGETATION

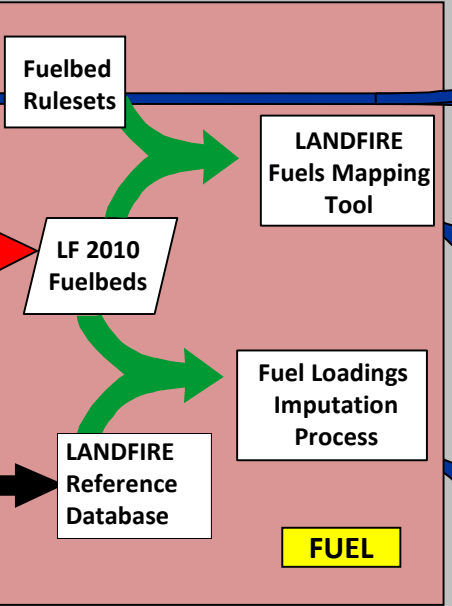
REFINEMENTS
Boundaries
NLCD06
Riparian/Wetland
Agriculture
Urban
Rock/Water
Legend Revisions



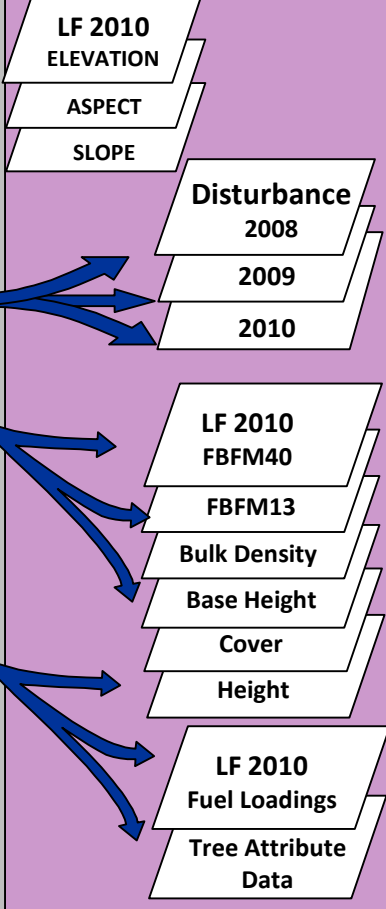
REFERENCE DATA



LANDSCAPE CHANGE



FUEL



DATAHUB

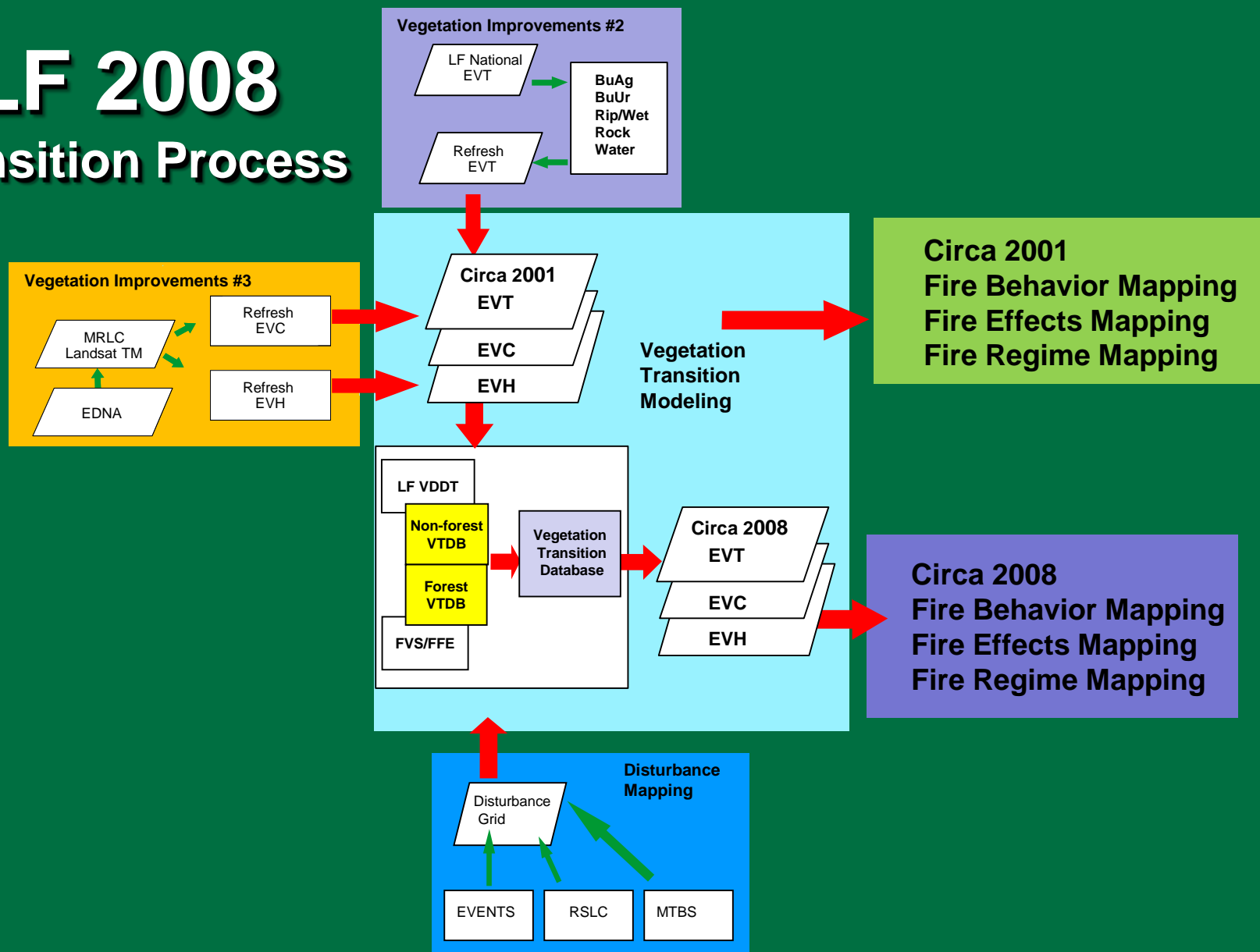
LF 2010

LANDFIRE User Guide Process

- **Foundational Data**
 - Reference Data
 - Remote Sensing Data
 - Bio-physical Data
- **Vegetation Data**
 - Classification
 - Mapping
 - Landscape Change ←
- **Fire Modeling Data**
 - Fire Behavior ←
 - Fire Effects ←
 - Fire Regime ←



LF 2008 Transition Process



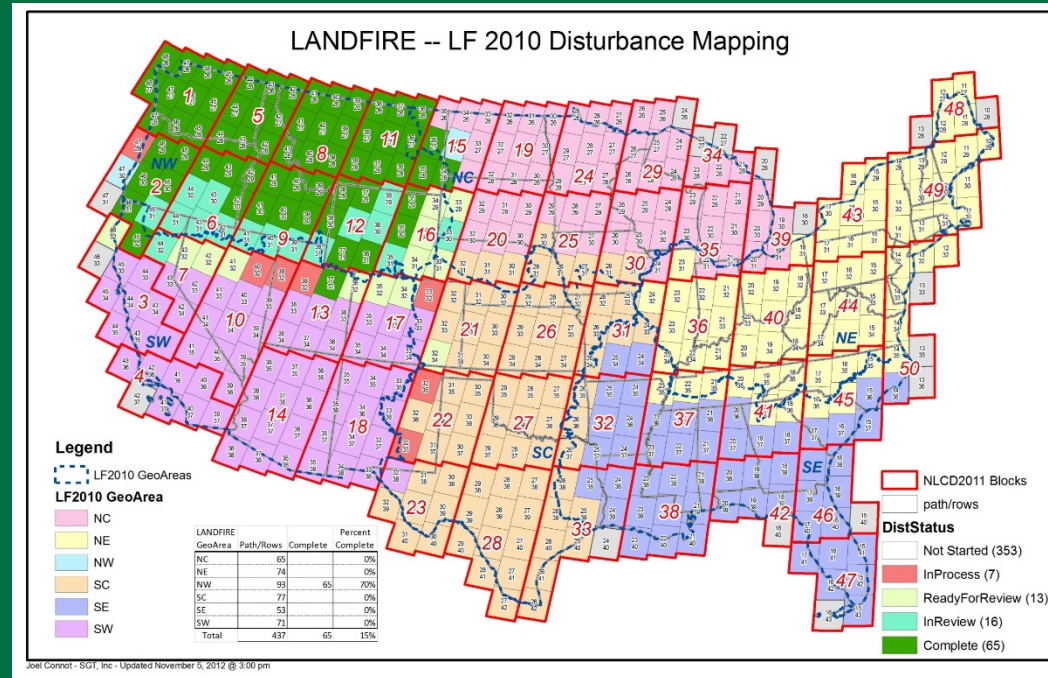
Landscape Change

- **Disturbance Mapping**
 - **Detecting Change**
 - **Change Causality**
 - **Change Severity**
- **Vegetation Transition Databases (VTDB)**
 - **Disturbance Integration**
 - **Non-forest Transition Databases**
 - **Forest Transition Databases**
- **Land Change Mapping**
 - **Updating EVT/EVC/EVH**
 - **Updating Disturbance**
 - **Tracking Disturbance**



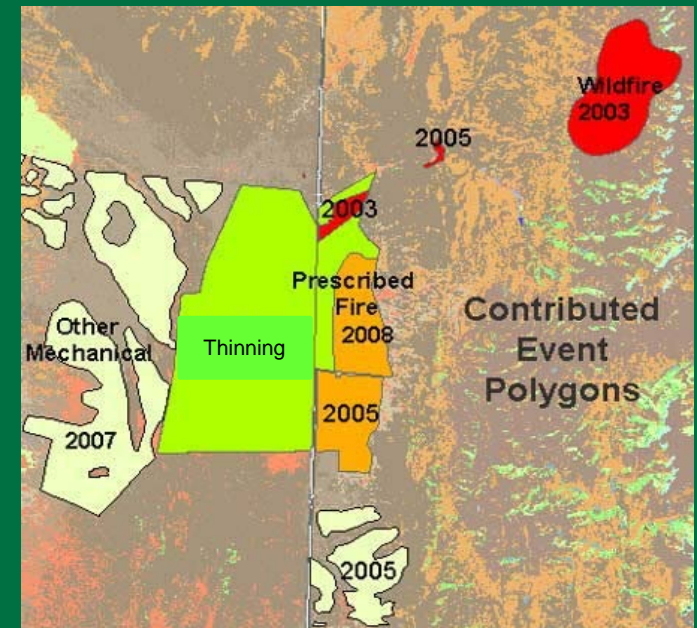
Detecting Change

- Landsat TM Imagery – Stacks consisting of 10 for 438 path rows
- Landsat ETM – When necessary
- Image Preprocessing – LEDAPS Surface Reflectance
- Cloud/Shadow Masking
- Snow/Ice Masking



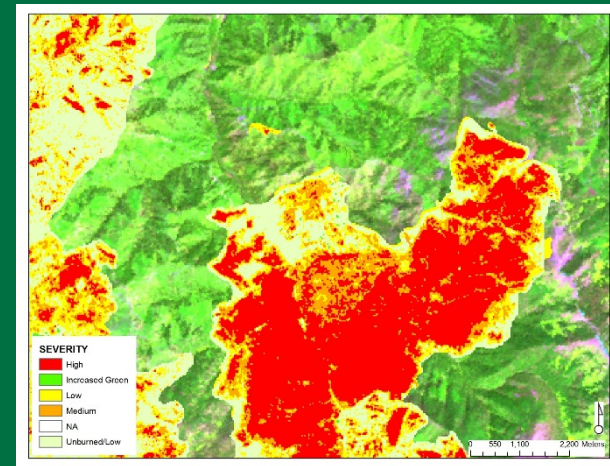
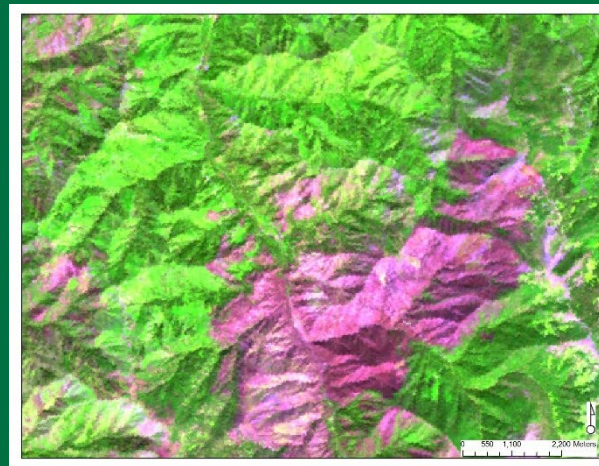
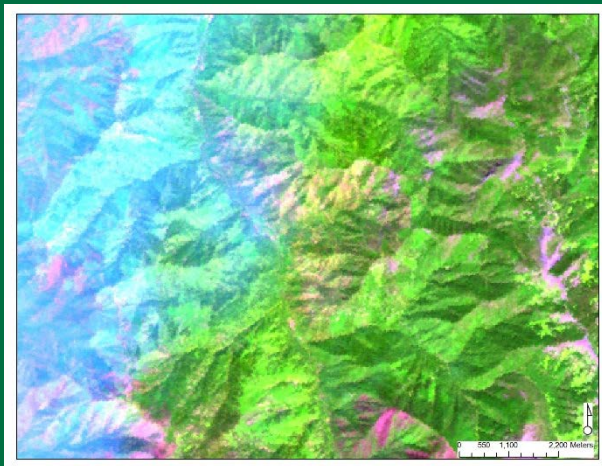
Change Causality

- LANDFIRE Events
- Burn Severity from Wildfire mapping programs (MTBS, BAER, RAVG)
- SMARTFIRE
- Protected Area Database (PAD)



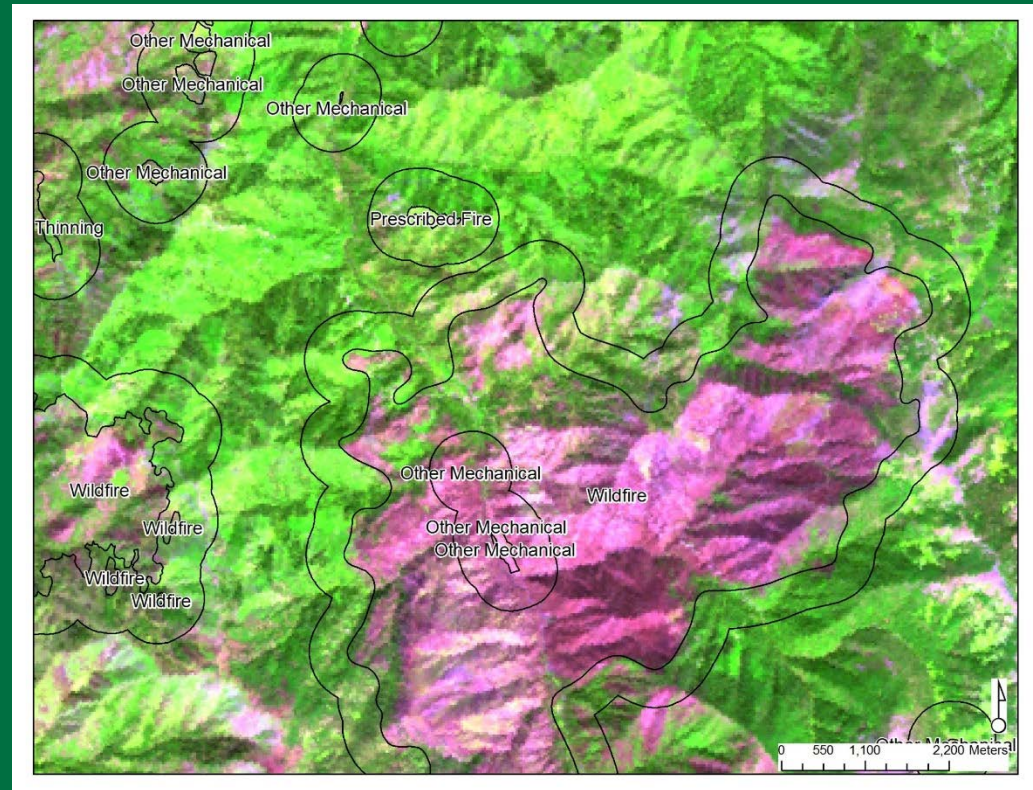
Change Severity

- **LF 2008 – Vegetation Change Tracker** (Huang et al. 2010)
- **LF 2010 – Multi-Index Integrated Change Analysis (MIICA)** (Jin, S., L. Yang, G. Xian, P. Danielson, and C. Homer, (in preparation).)



Disturbance Product

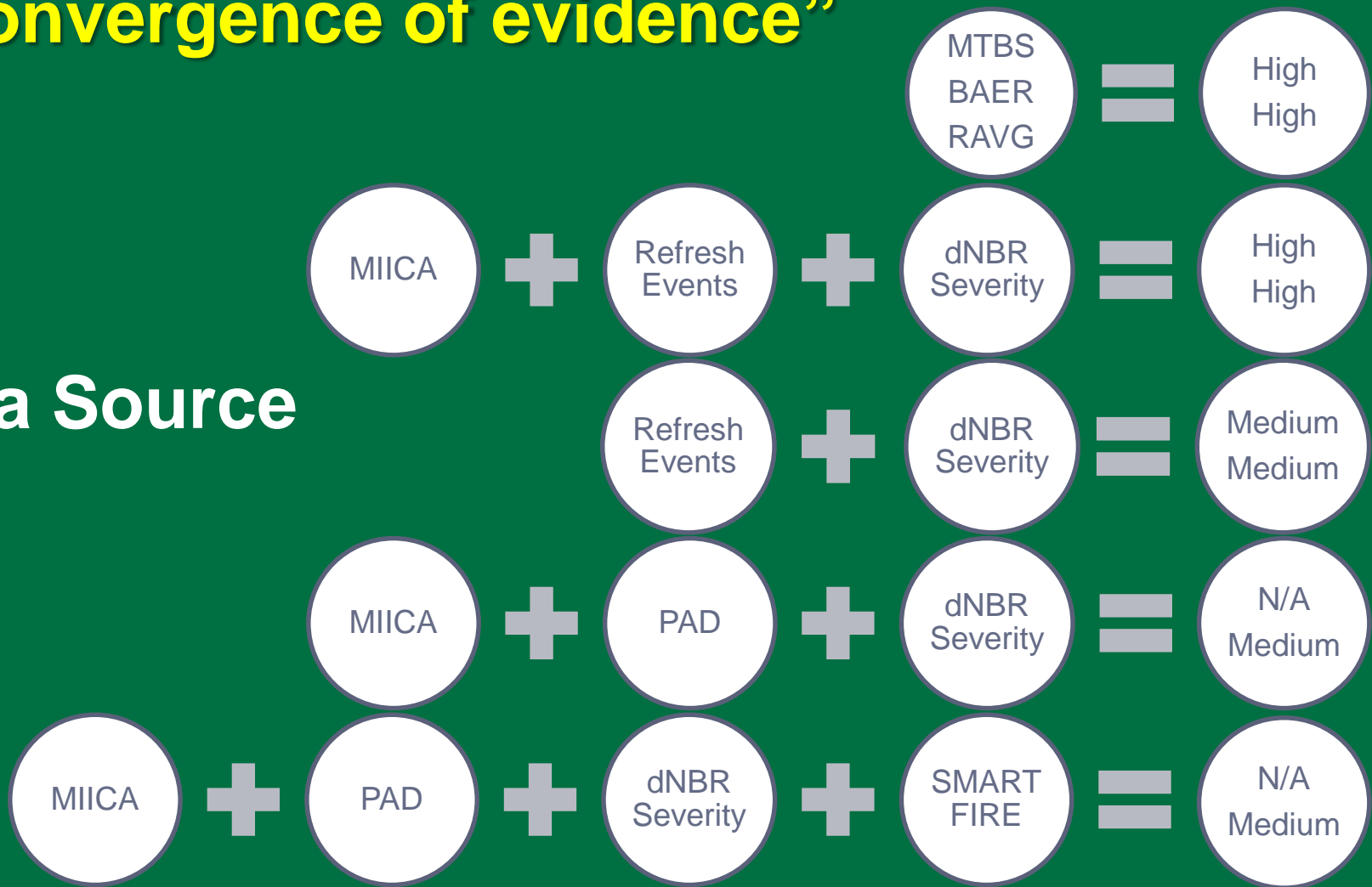
- Identifies Changed Pixels Only - 1 Product / year
- Legend
 - 160 Codes
 - 19 Causes / Events
 - 2 Type Confidences
 - 3 Severity Levels
 - 3 Severity Confidences



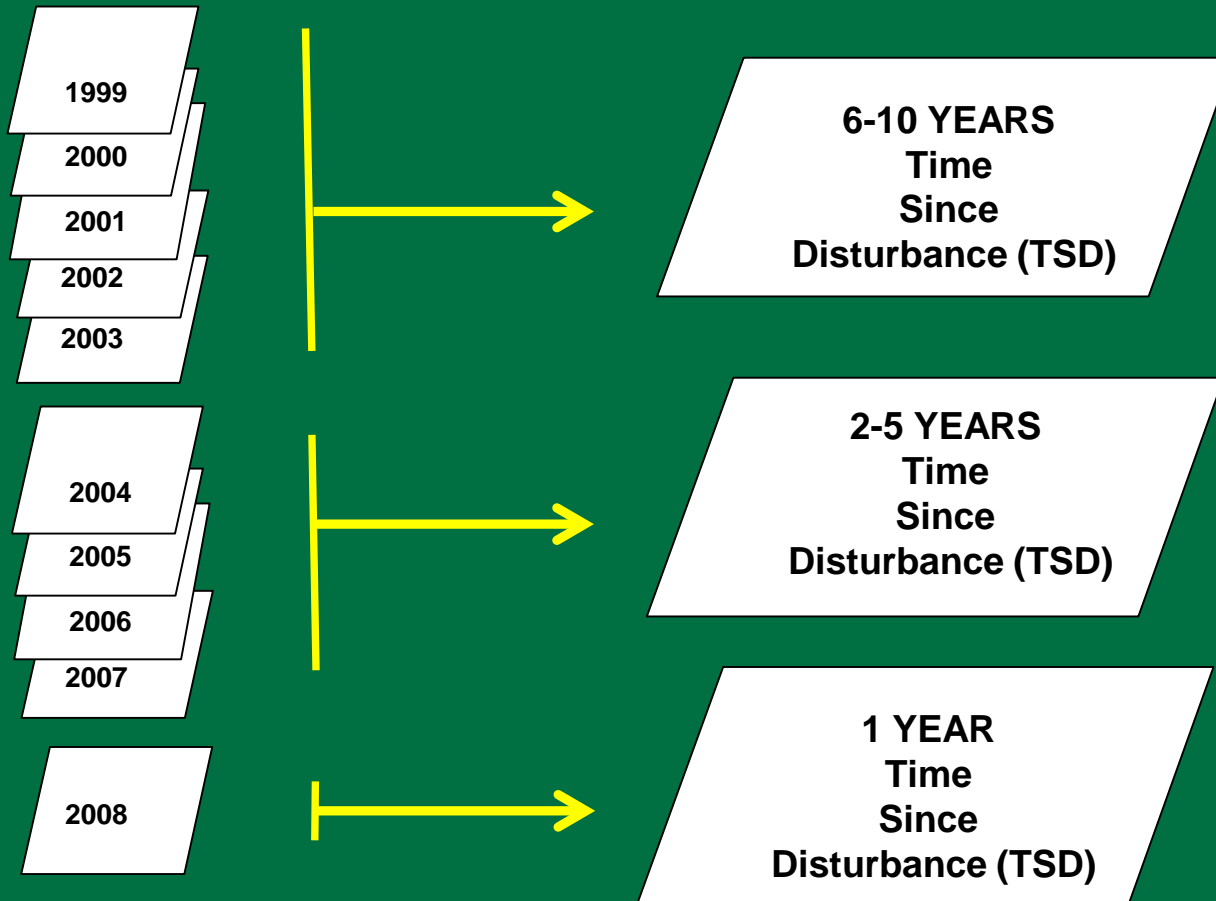
“A convergence of evidence”

Confidence

Data Source



DISTURBANCE INTEGRATION - TSD



DISTURBANCE INTEGRATION - TYPE

Event Code	Event Description
1	Development
2	Clearcut
3	Harvest
4	Thinning
5	Mastication
6	Other Mechanical
7	Wildfire
8	Wildland Fire Use
9	Prescribed Fire
10	Wildland Fire
11	Weather
12	Insecticide
13	Chemical
14	Insects
15	Disease
16	Insects/Disease
17	Herbicide
18	Biological



■ Disturbance Type

- Fire
- Mechanical Remove
- Mechanical Add
- Windthrow
- Insects and Disease
- Chemicals
- Herbicide

DISTURBANCE INTEGRATION - VDIST

FINAL “VDIST”

Code 131: Fire/High Severity/1 year TSD

Code 313: MechAdd/Low Severity/6-10yrs TSD



Non-Forest Transition Databases

- Non-forest VTDB
 - Non forest EVT succession to forest
 - High severity fire, mechanical remove to non-forest EVT
 - Non-forest EVT after fire
 - Non-forest EVT after mechanical add & remove
 - Non-forest EVT after chemical/herbicide
 - VDDT SClass A EVC/EVH
 - Mapzone summaries drive rules



Non-Forest Transition Databases

- **Non forest EVT succession to forest**
 - Forest site potential; EVT based on ESP
- **High severity fire, mechanical remove**
 - Forest to shrub or grass common to MZ
- **Non-forest EVT**
 - After fire; shrub to grass (exotics in WD sage); grass to grass
 - After mechanical remove: shrub to grass common to MZ
 - After chemical/herbicide: exotic to natural



Forest Transition Databases

- **Forest VTDB**
 - Run all plots through FVS-FFE
 - Acquire new cover and height
 - Bin into EVC and EVH classes
 - Group output at 2 levels of EVT
 - Assign majority outcome
 - Create forest lookup tables



FVS/FFE Simulation Parameters

■ Mechanical Remove

- High: Clearcut and burn
- Moderate: Remove 35% stand density; pile and burn
- Thin from below in 0-6"; pile and burn

■ Mechanical Add

- Cut 90%, 75%, and 55% of 0-8" then masticate

■ Fire

- Target 95%, 75%, and 45% mortality

■ Insects and Disease

- 85%, 55%, and 10% fixed mortality

■ Windthrow

- Thin 85%, 55%, and 10% of stand and leave on the ground



FVS/FFE Simulation Parameters

■ Succession

- 10 year run w/ No Disturbance
- All disturbance simulations followed by succession
- Assuming no succession on non-forest vegetation



Updating EVT/EVC/EVH

- Overlay VDIST w/2001 Veg
- Import overlay data
- Import non-forest tables
- Import forest tables
- Format & test update queries
- Run update queries
- Export vegtrans dbf
- Create updated veg grids



Updating Disturbance

- Overlay VDIST w/2001 Veg
- Apply logic rulesets
- Create Fuel Disturbance grid



Tracking Change

- Assign disturbance type
- Assign transition “classes”
- Create Transition Magnitude grid



Fire Behavior Transition Databases

- **Surface Fuel: FBFM 13 and 40**
 - Based on updated EVT, EVC, EVH (and BpS)
 - Conditional on disturbance type, severity, TSD (FDIST)
 - Mapped in the LANDFIRE Total Fuel Change Tool (LTFCT)
- **Canopy Fuel: CH, CC, CBH,CBD**
 - Based on updated EVT, EVC, EVH
 - Same GLM and regression tree equations as undisturbed
 - Mapped in the LANDFIRE Total Fuel Change Tool (LTFCT)



Fire Effects Transition Databases

- **FCCS**

- Disturbed areas mapped into 600 series
- Pull in post-disturbance FBFM40
- Use surface loadings from FBFM40 models
- Mapped in the LANDFIRE Total Fuel Change Tool (LTFCT)

- **FLM**

- Based on updated EVT, EVC, EVH (and BpS)
- Same rulesets for disturbed and undisturbed



Fire Regime Transition Databases

- **Succession Class**
 - Based on updated EVT, EVC, EVH (and BpS)
 - Same rulesets for disturbed and undisturbed
- **Departure (VDEP, VCC)**
 - Changing Sclass distribution may change VDEP, VCC
- **Historical Fire frequency (MFRI, FRG)**
 - No Change
- **Historical Fire severity (PRF, PMS, PLS)**
 - No Change



Example 1: Lassen Forest



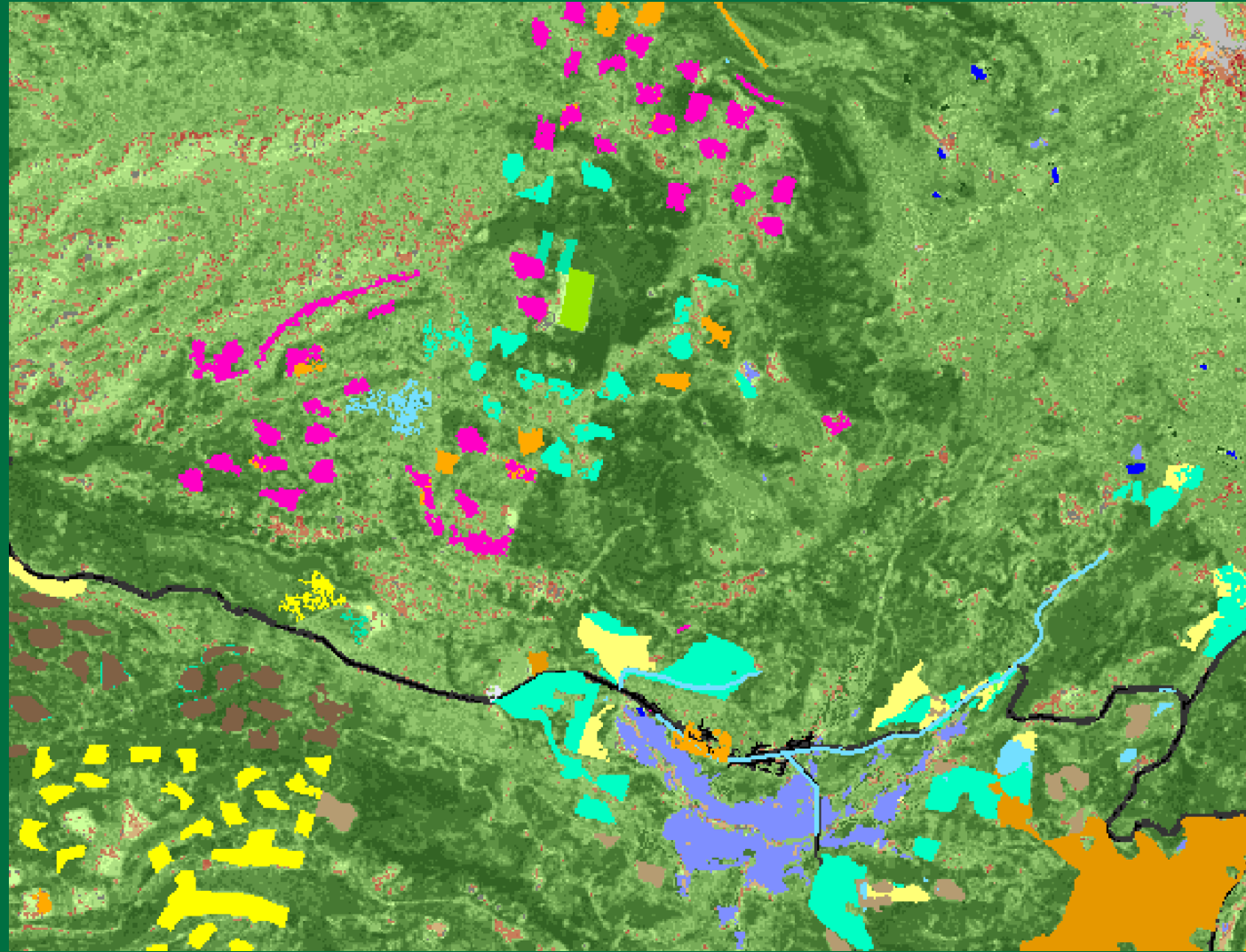
Lassen NAIP - 2006



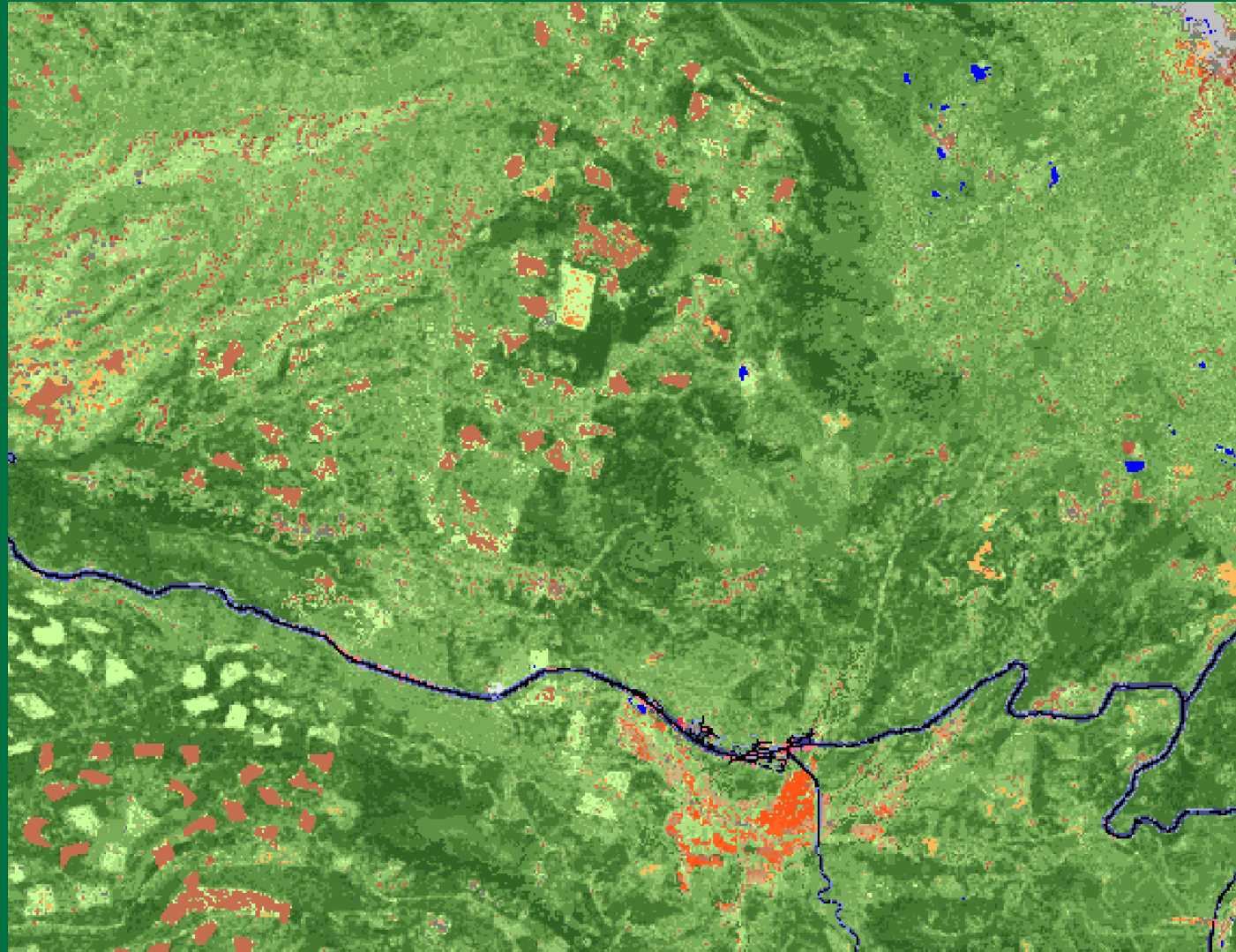
Lassen EVC – LF2001



Lassen Disturbance – 2001-2010



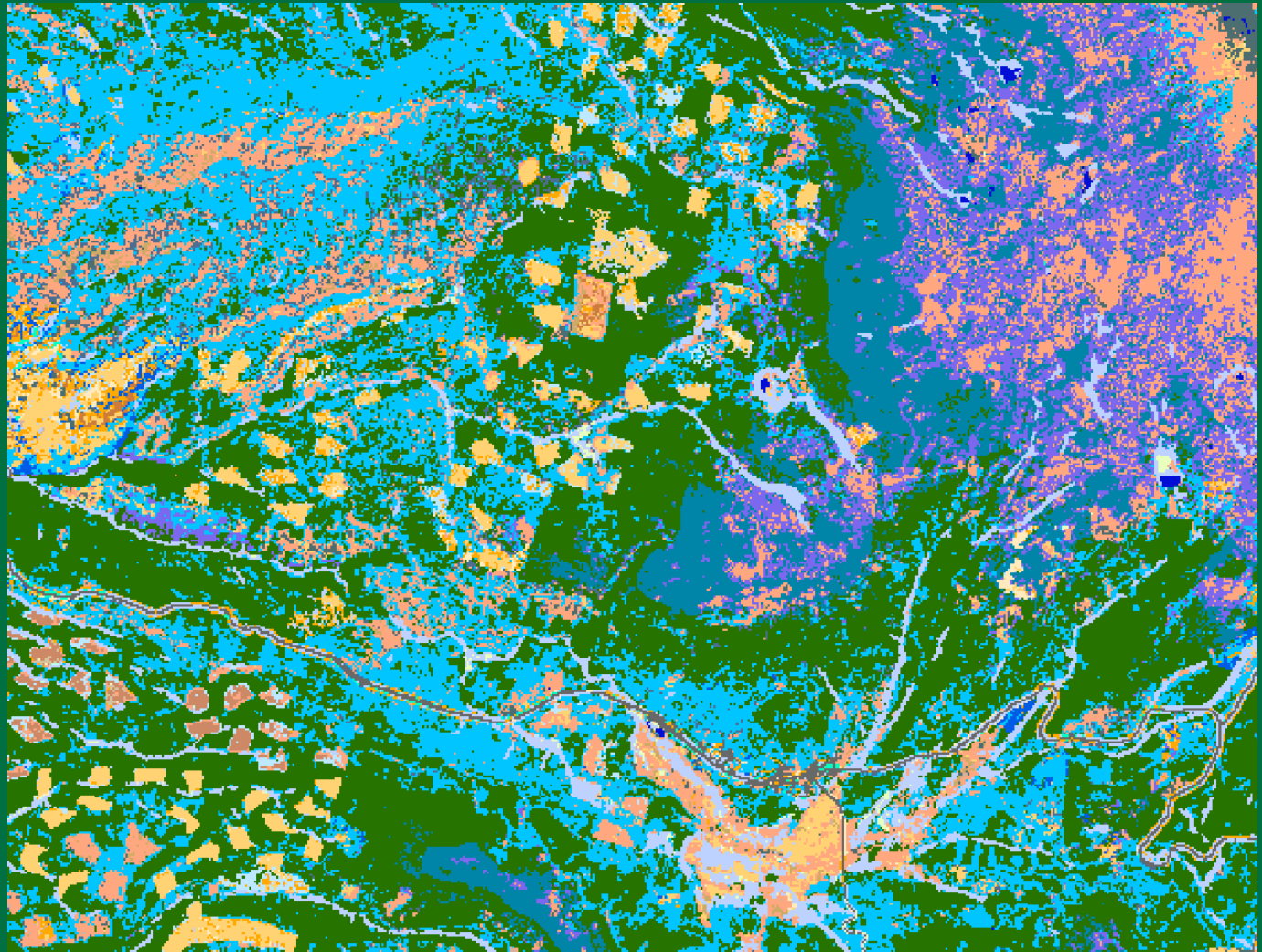
Lassen EVC – LF2012



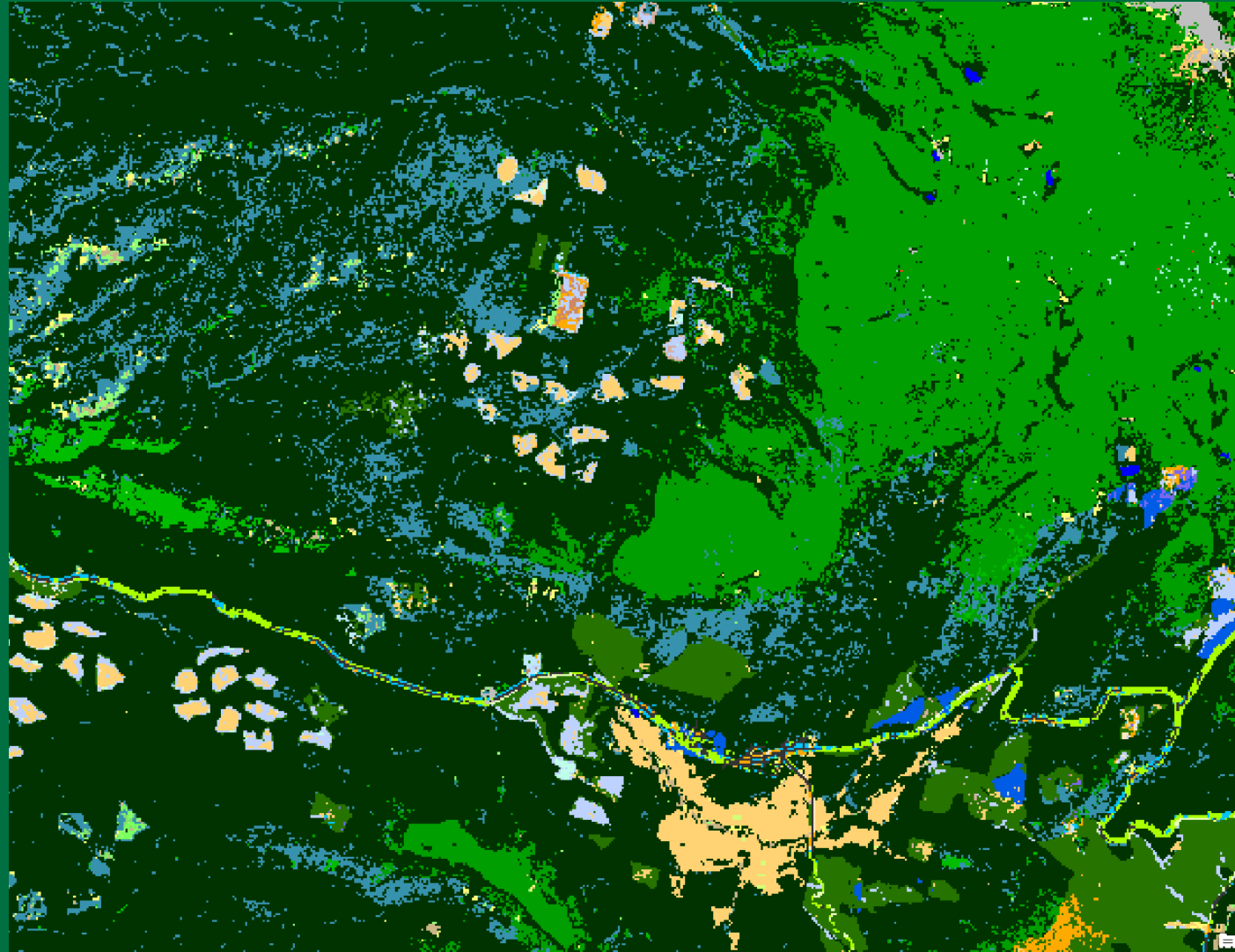
Lassen NAIP 2012



Lassen FBFM40 – LF2012



Lassen FCCS – LF2008



Lassen SClass – LF2012

us_130sclass

LABEL

■ NODATA

■ A

■ B

■ C

■ D

■ E

■ UN

■ UE

■ Water

■ Snow / Ice

■ Non-burnable Urban

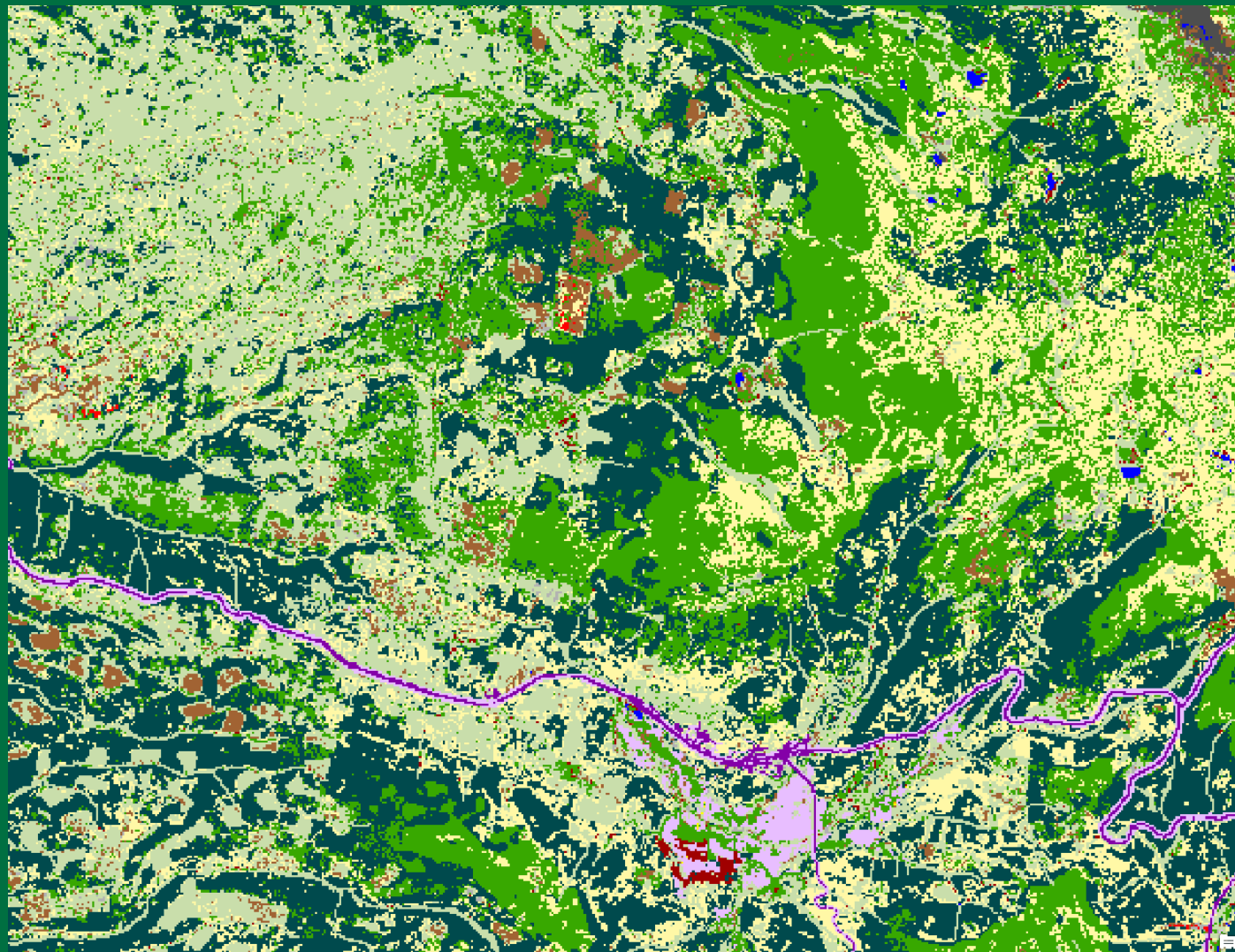
■ Burnable Urban

■ Barren

■ Sparsely Vegetated

■ Non-burnable Agriculture

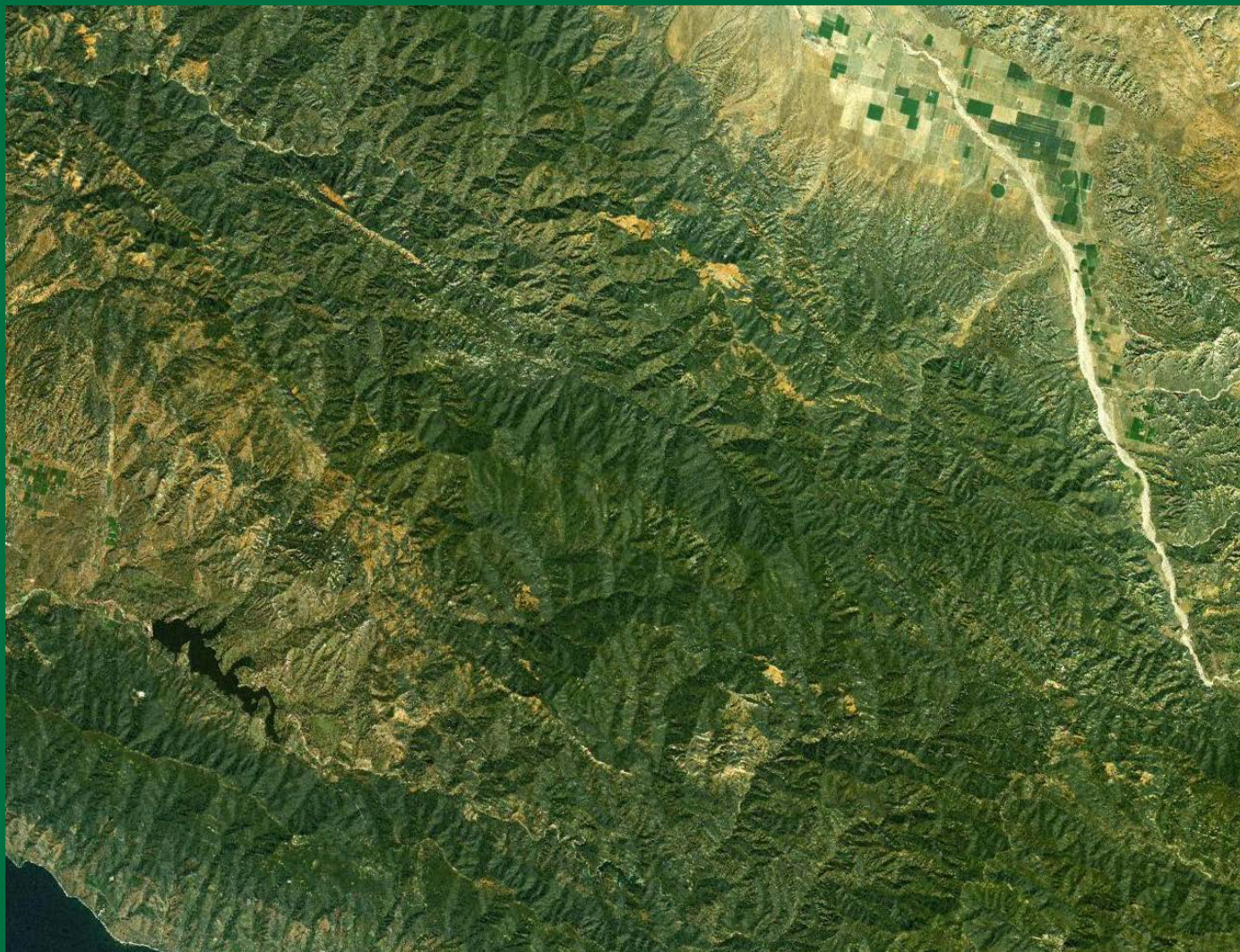
■ Burnable Agriculture



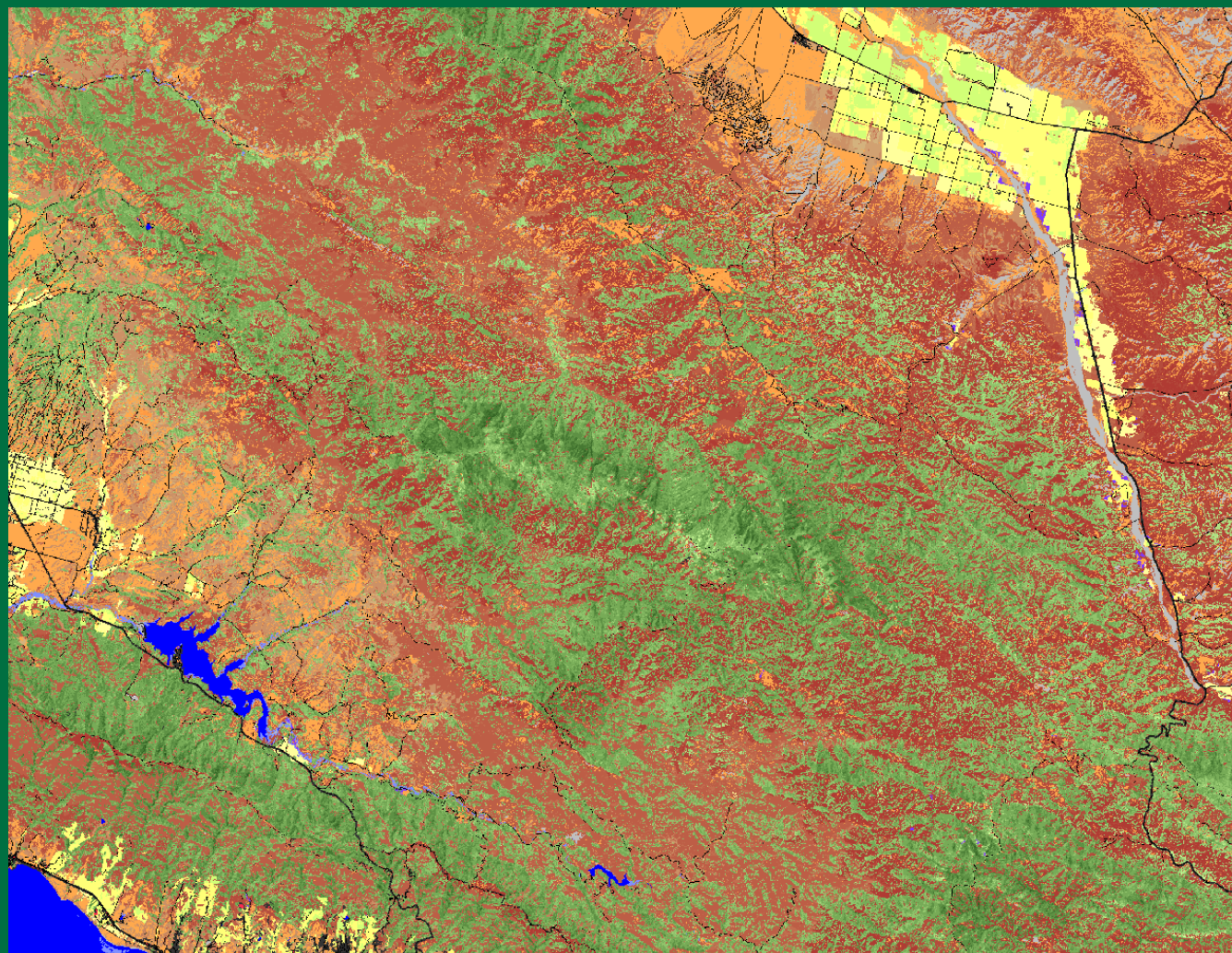
Example 2: Zaca Fire



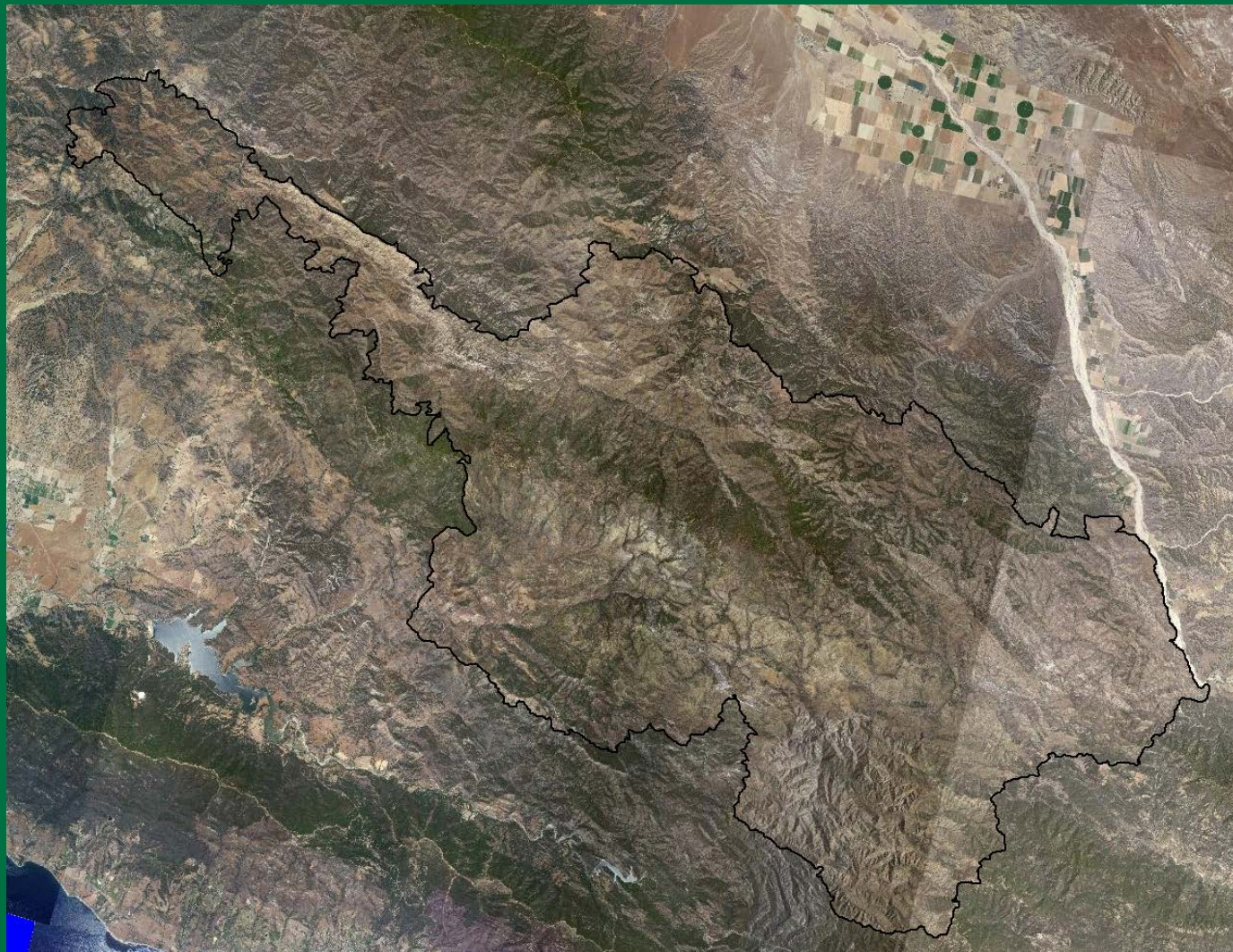
Zaca NAIP 2006



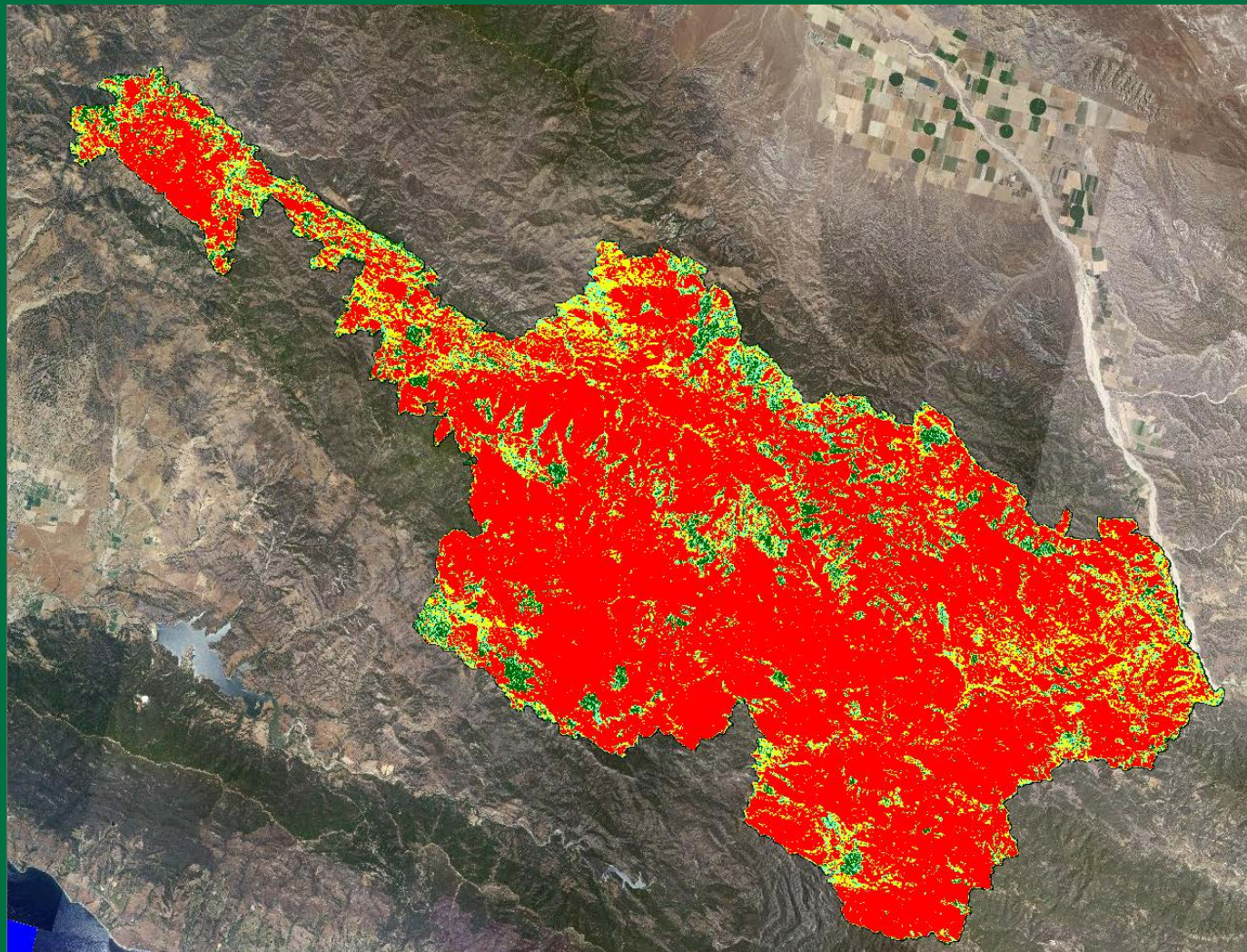
Zaca EVC LF2001



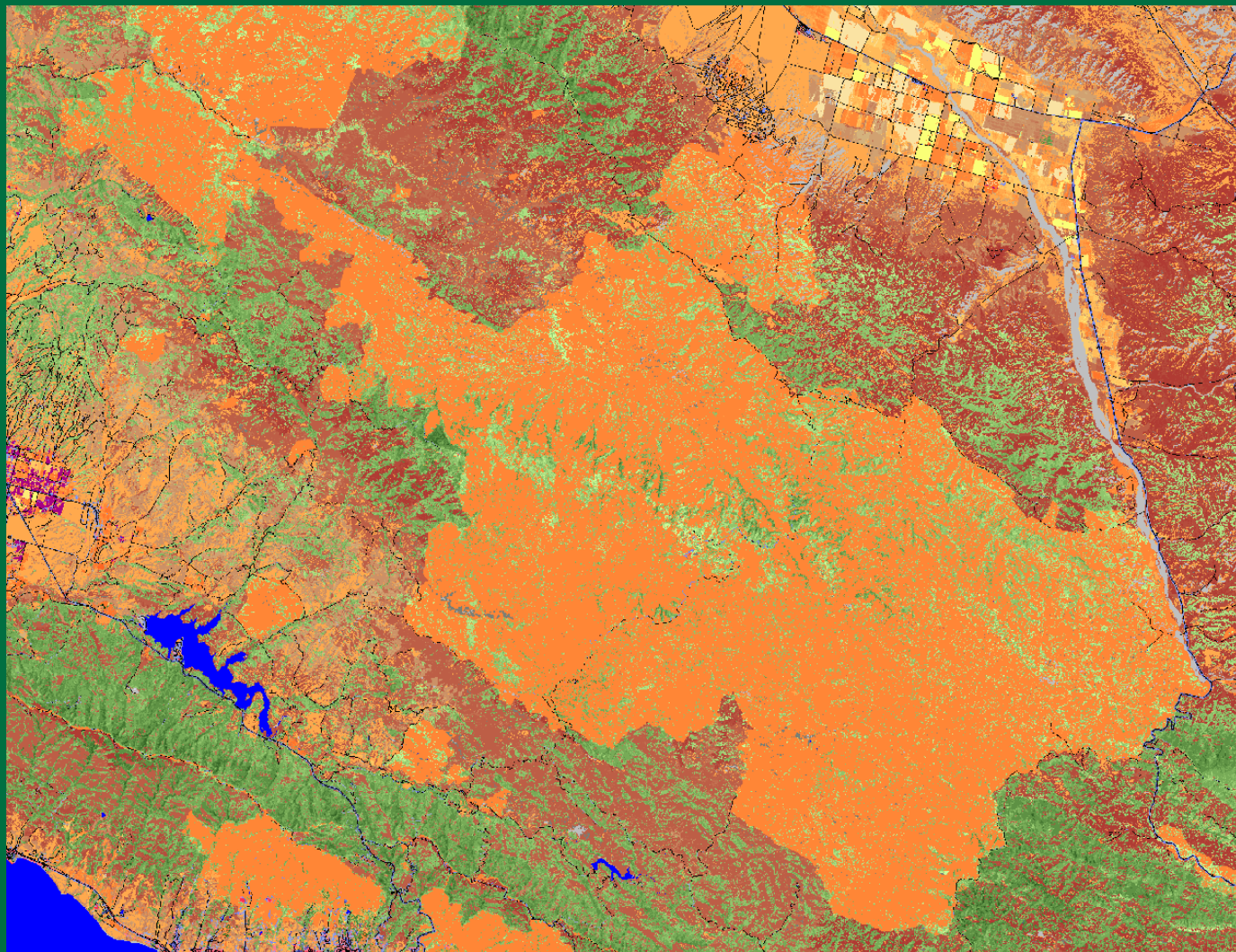
Zaca NAIP 2009



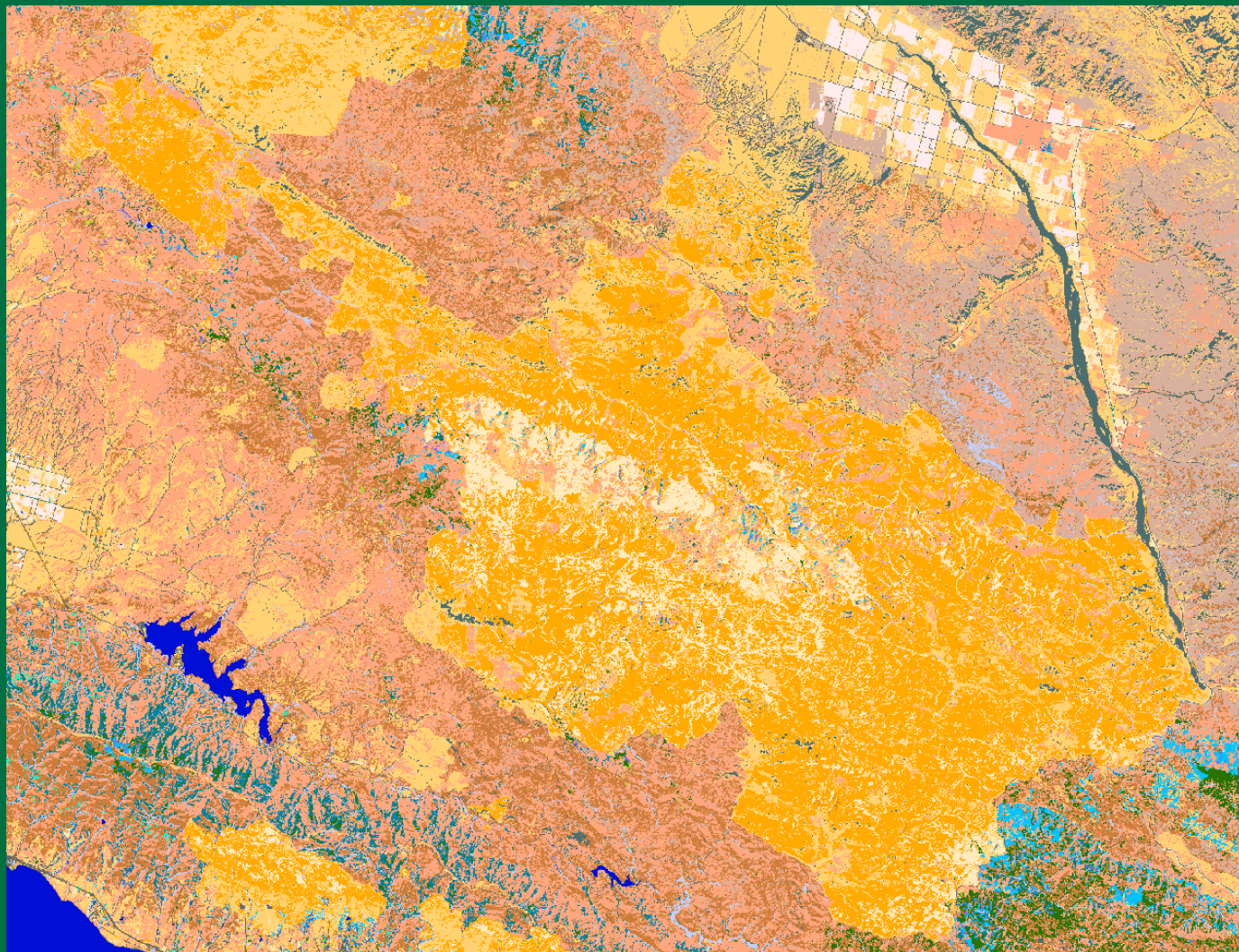
Zaca MTBS



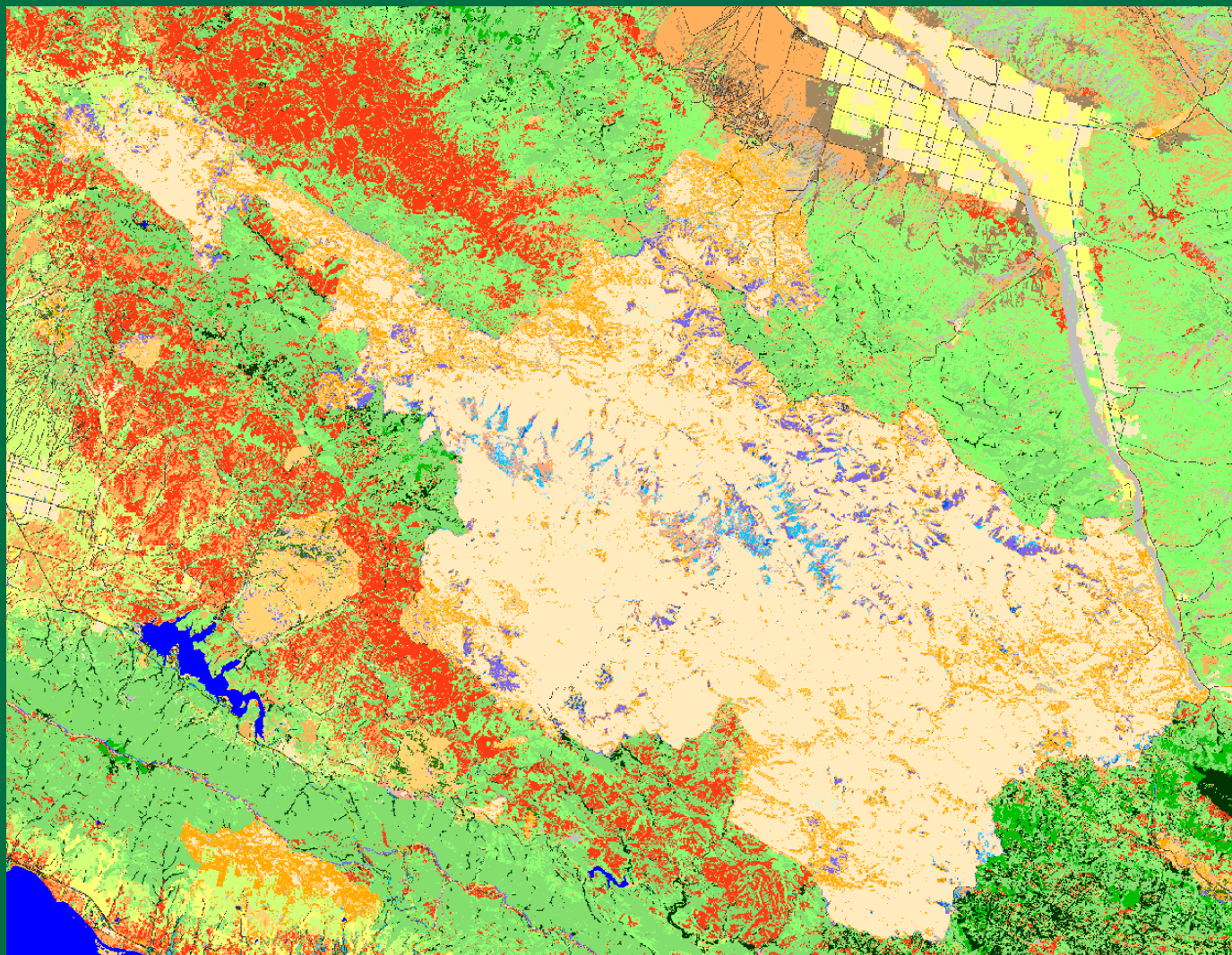
Zaca EVC LF2012



Zaca FBFM40 LF2012



Zaca FCCS 2008



Zaca SClass 2012

us_130sclass

LABEL

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■ Non-burnable Urban

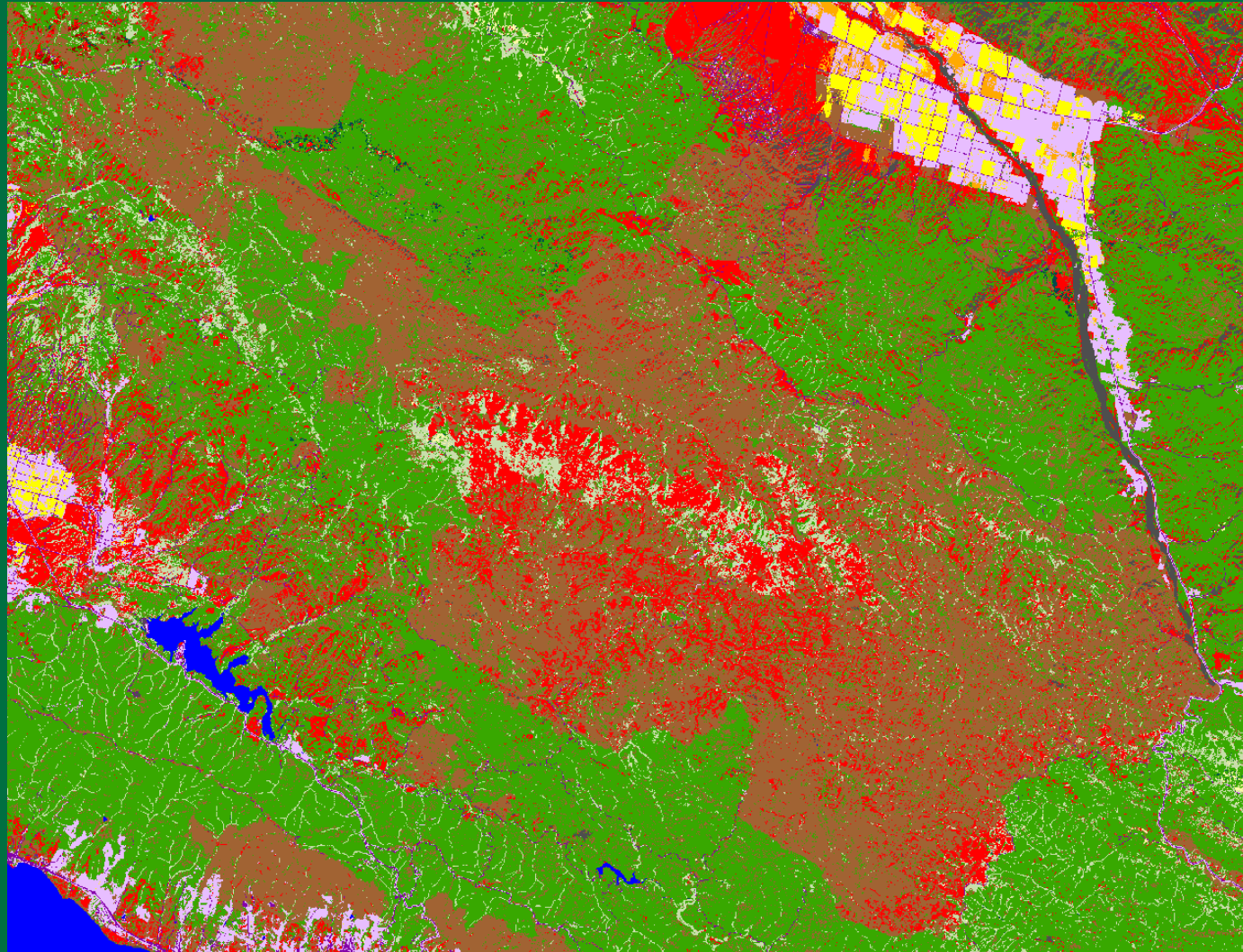
■ Burnable Urban

■ Barren

■ Sparsely Vegetated

■ Non-burnable Agriculture

■ Burnable Agriculture



LANDFIRE Reference Guide Process

- Area Overview
 - Geography, Landforms
 - Site potential
- Non-vegetated and Cultural Vegetation
 - Lithomorphic, hydromorphic
 - Urban
 - Agricultural
- Natural and Semi-natural
 - Herbaceous
 - Shrub
 - Treed



LANDFIRE Reference Guide Process

- **Vegetation Transition logic and rulesets**
 - **Non-forest**
 - **Forest**
- **Fire Modeling product logic and rulesets**
 - **Fire behavior**
 - **Fire effects**
 - **Fire regime**
- **Regionally specific vegetation**



?Questions?

