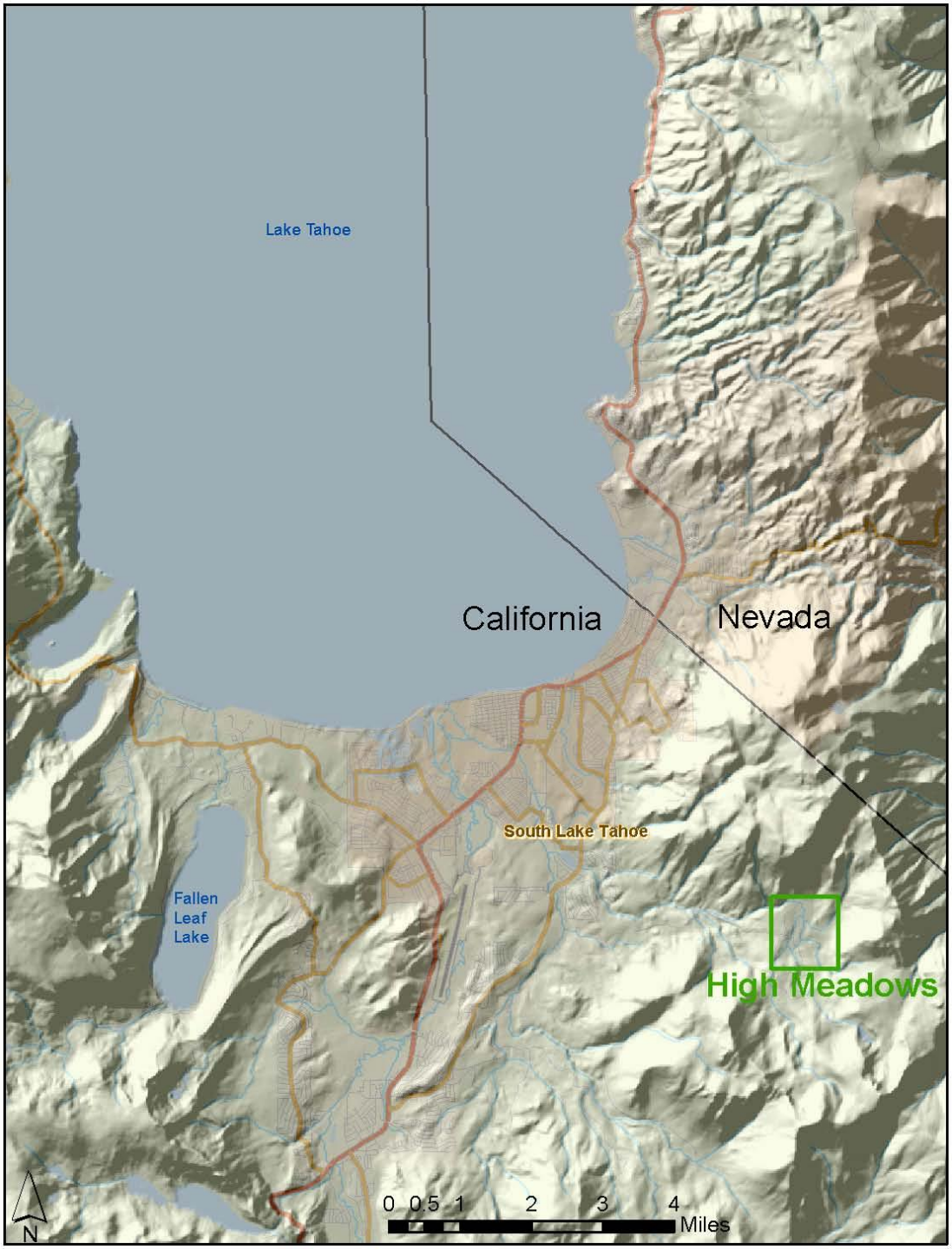
# Simple methods for rapid mapping of tree mortality using readily available imagery: A case study from High Meadows in the Lake Tahoe Basin

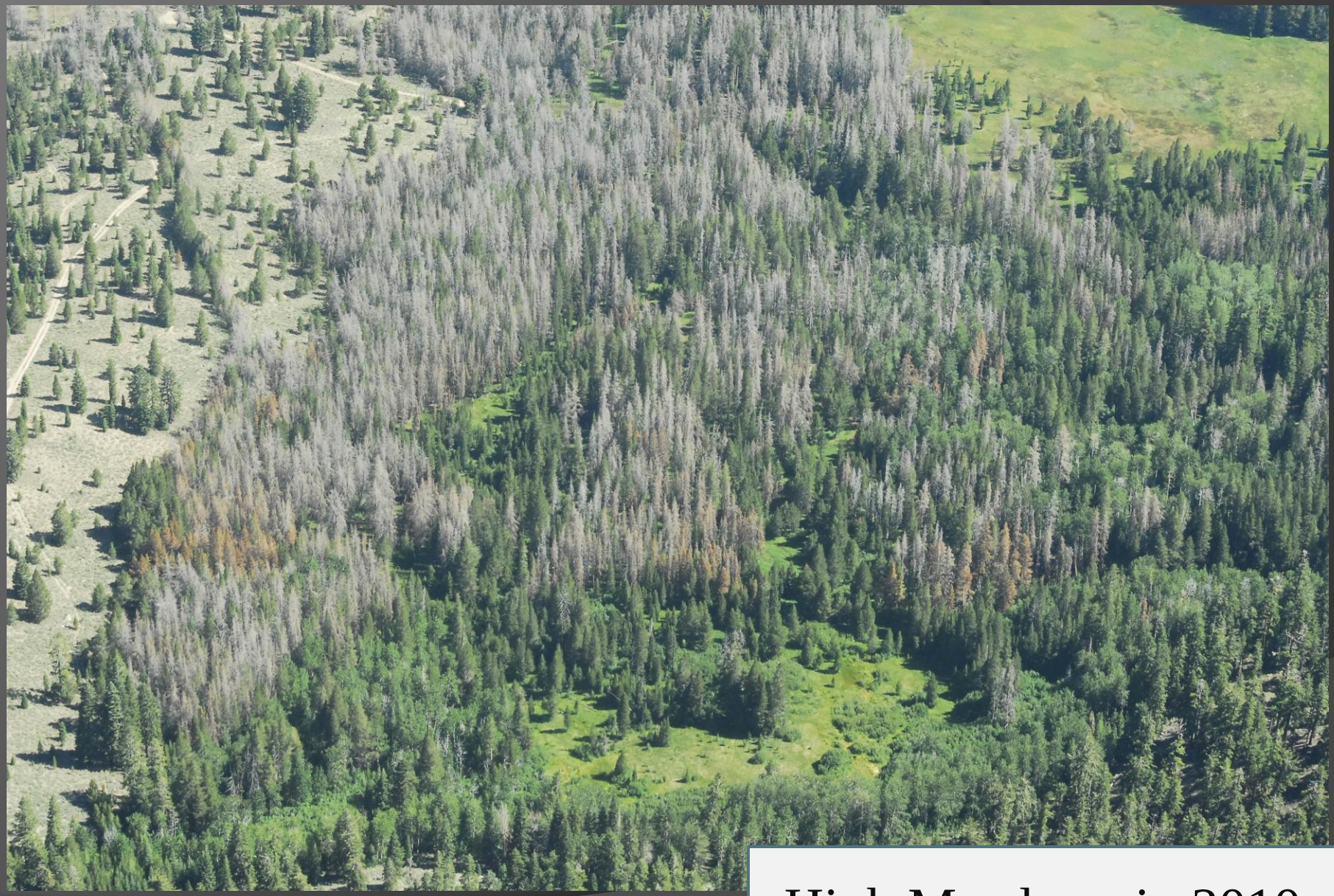
Brent Oblinger, Zhangfeng (Leo) Liu,
Beverly Bulaon & Lisa Fischer

USDA Forest Service – Pacific Southwest Region
Forest Health Protection

# *Objective*

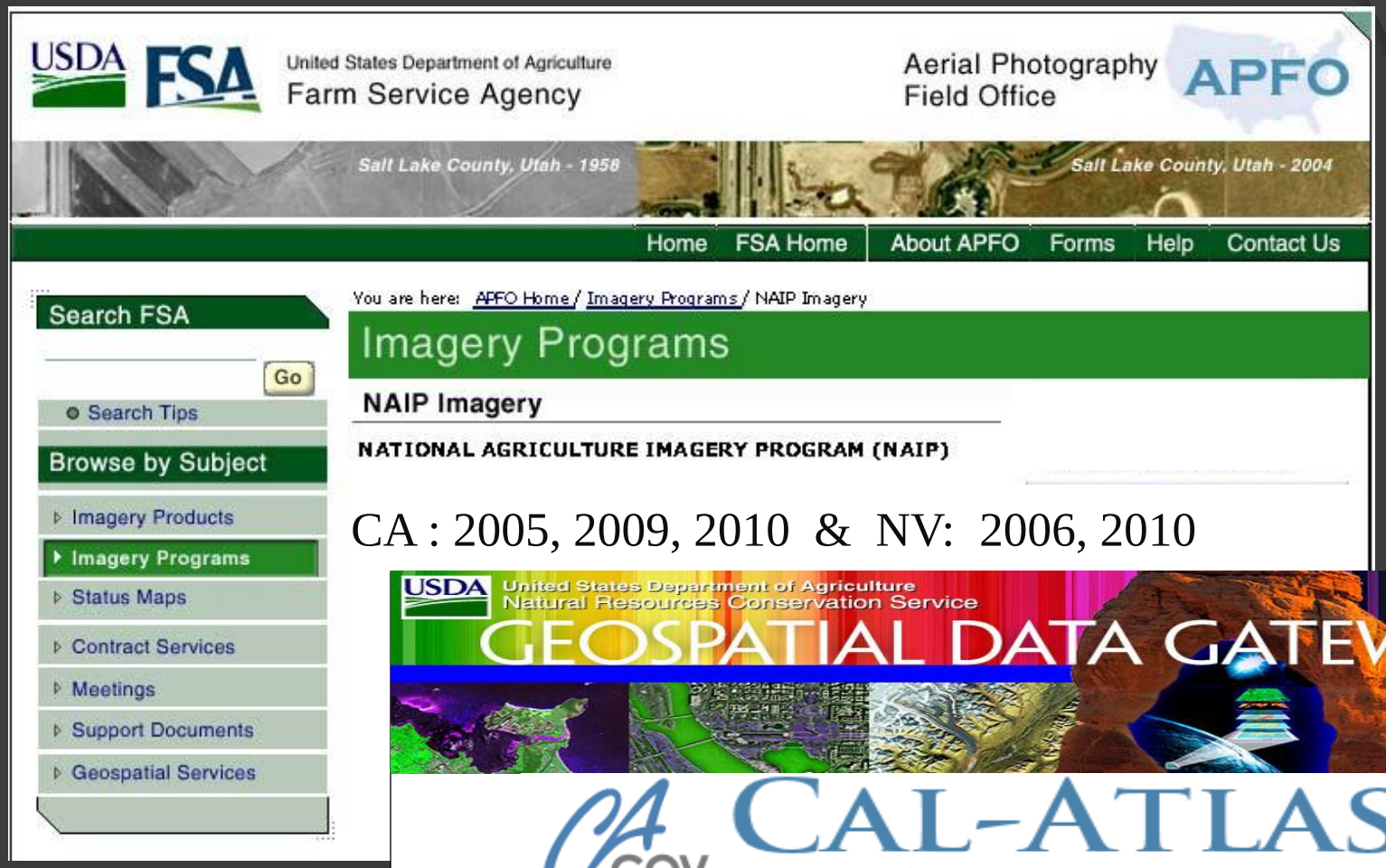
*Provide estimates of tree mortality levels at the local scale using simple GIS tools*


Lake Tahoe
California
Nevada
South Lake Tahoe
Fallen
Leaf
Lake
High Meadows
N
0 0.5 1 2 3 4
Miles



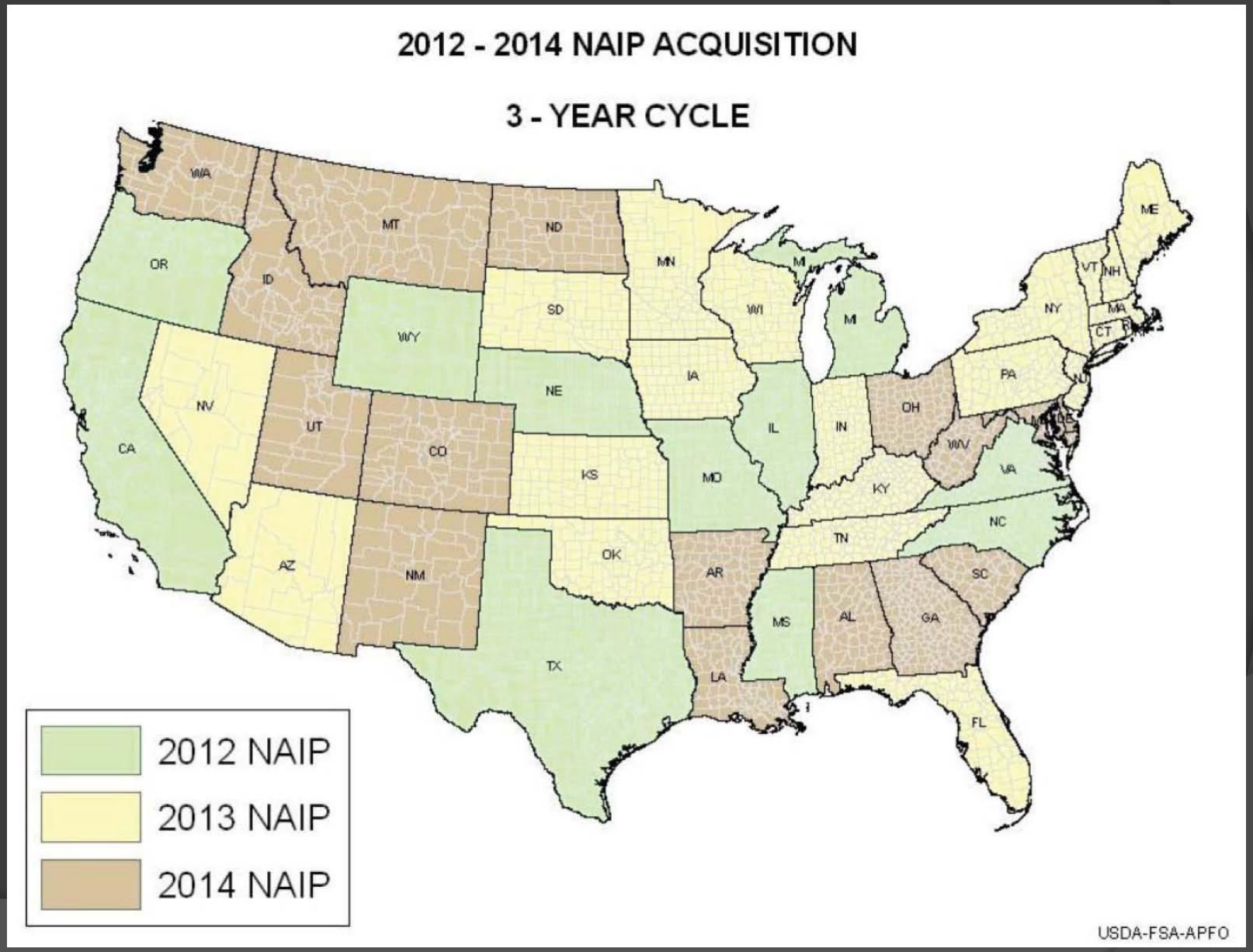
High Meadows in 2010

# NAIP Imagery




CA : 2005, 2009, 2010 & NV: 2006, 2010

# Planned Acquisition of NAIP Imagery



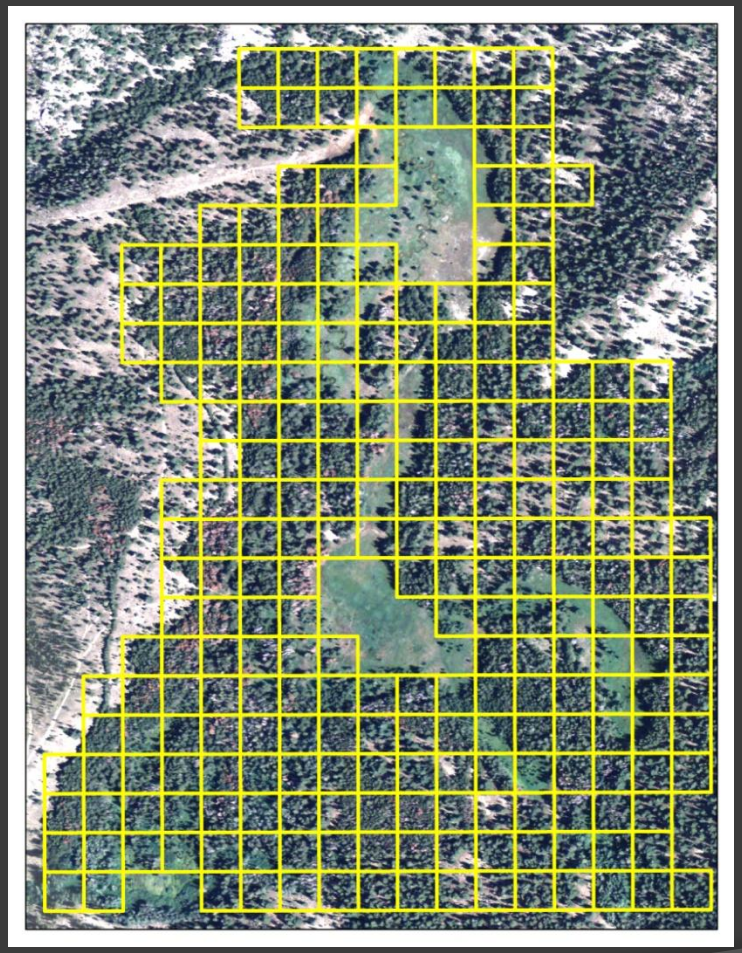
# Mapping Methods

I. Visually rate tree mortality levels across a grid
II. Digitize tree mortality polygons using visual interpretation
III. Use remote sensing software to classify and map tree mortality

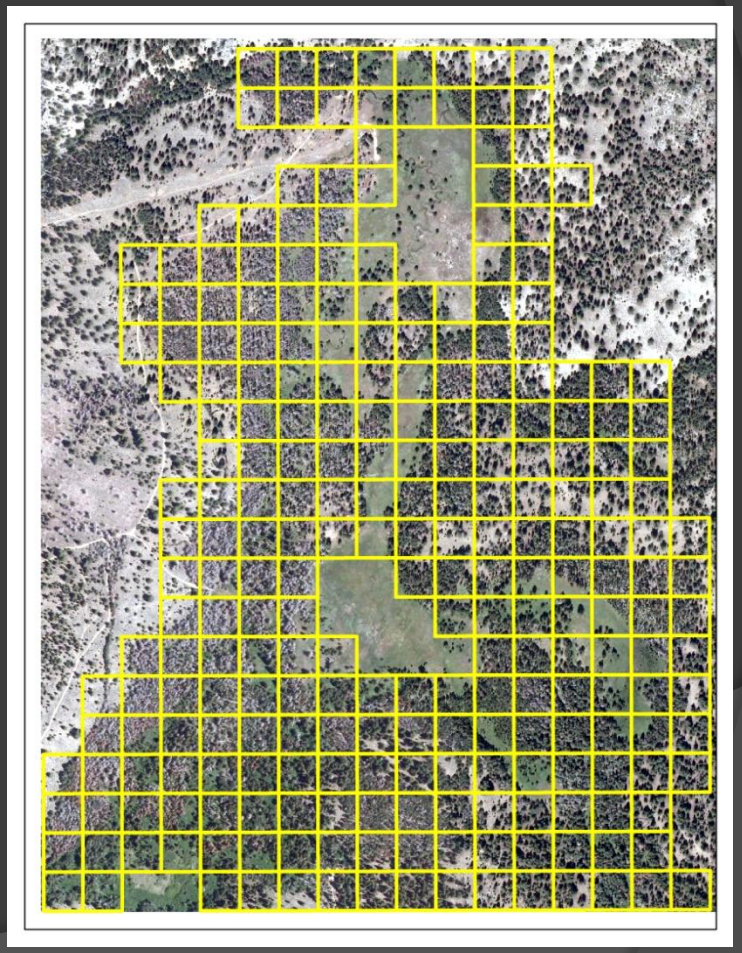
I. *Visually rate tree mortality levels across a grid*

# Grid for Visual Interpretation
# (1 acre cells)

## 2005 NAIP Image



## 2010 NAIP Image



# Develop Severity Rating Scheme for Visual Interpretation of Grid Cells

Example: Percent Mortality Throughout the Canopy (included older and recent mortality)

**Very Low**: None visible – trace or single crown

**Low**: 2 tree crowns – 25% of total canopy present appears dead

**Moderate**: 26% - 50% of total canopy appears dead

**High**: 51% - 75% of total canopy appears dead

**Very High**: 76% - 100% of total canopy appears dead

# Map % Mortality Throughout the Canopy

Legend

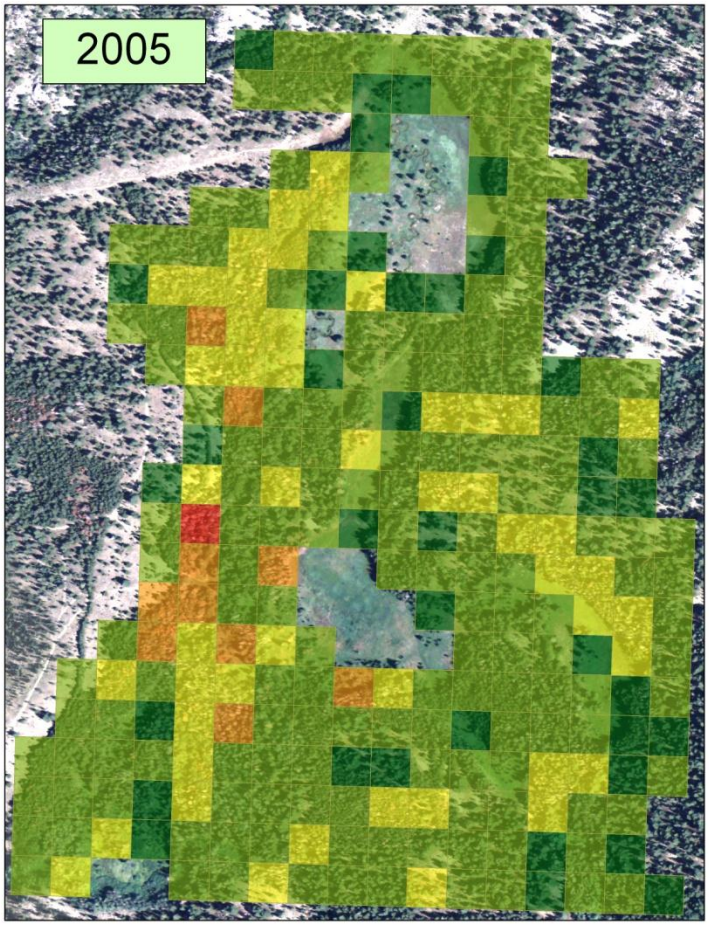
**0 – 1 crown**

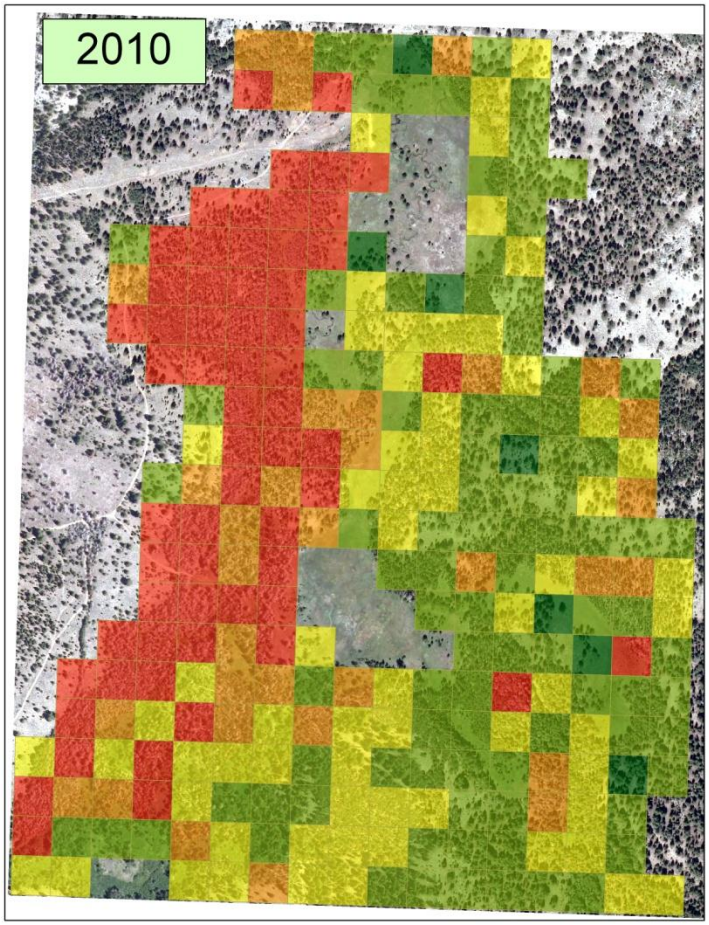
**2 crowns – 25% of canopy**

**26 – 50% of canopy**

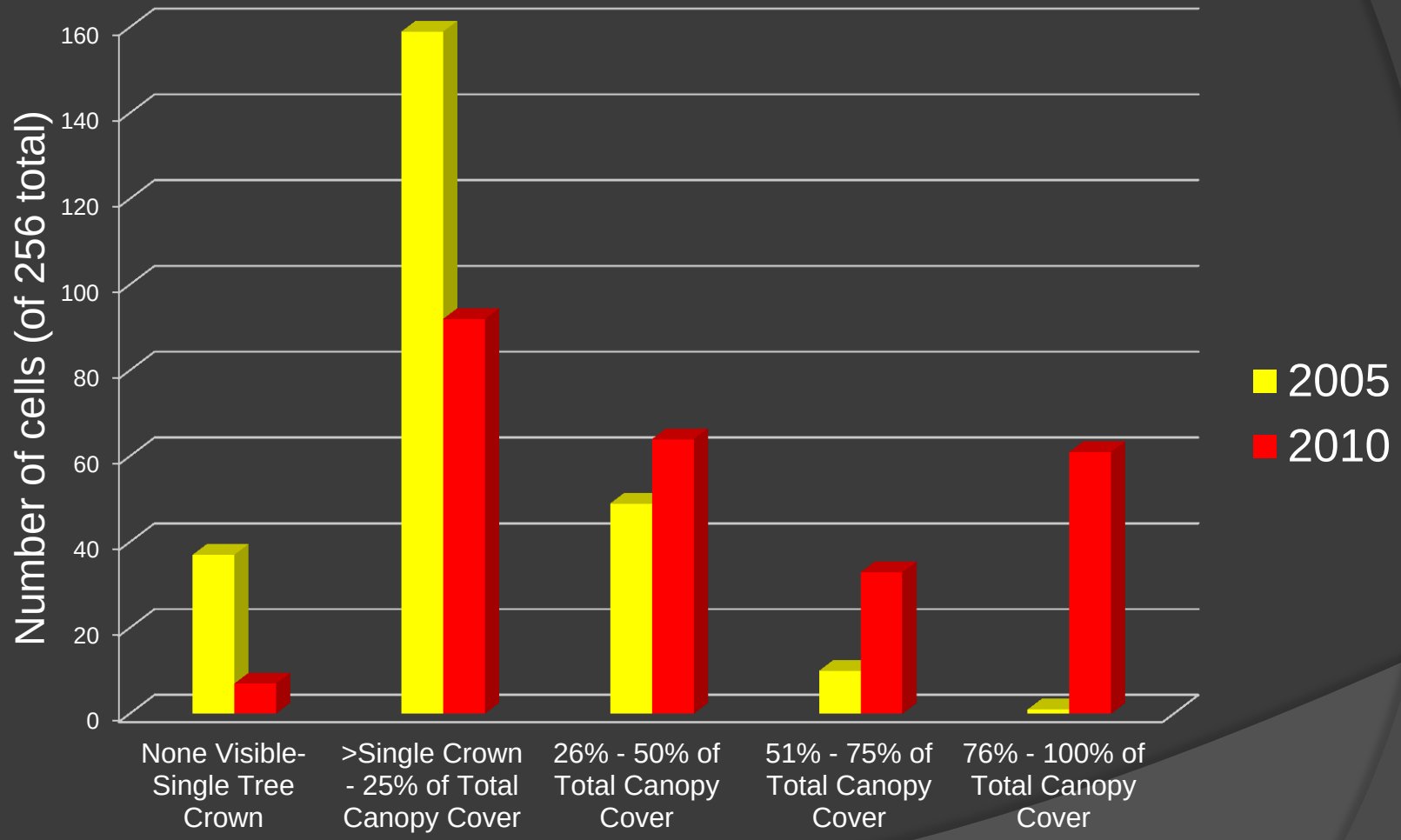
**51 – 75% of canopy**

**76 – 100% of canopy**



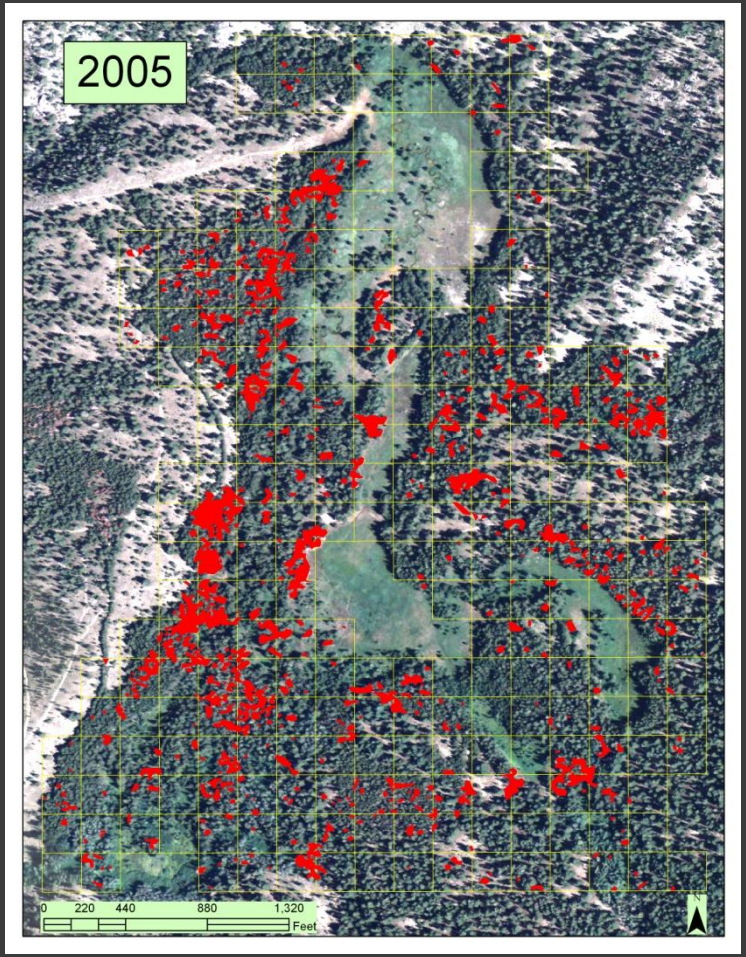



# Comparing % Mortality Throughout the Canopy in 2005 to 2010

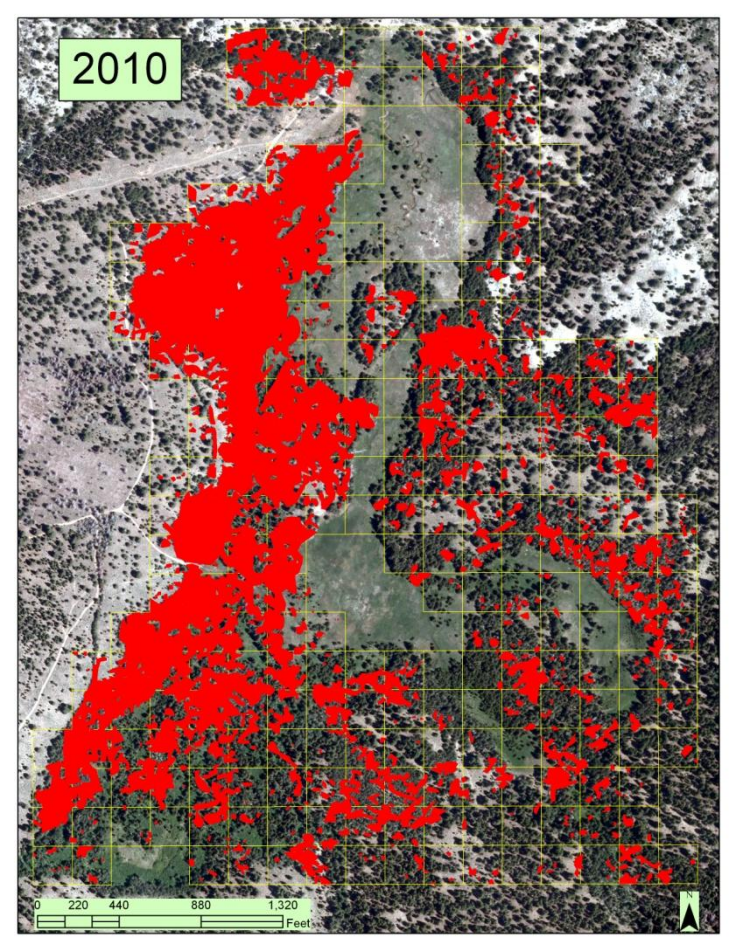


II. Digitize tree mortality polygons using visual interpretation

# Delineation of tree mortality after manually drawing polygons




20 acres with mortality of
256 acres in project area

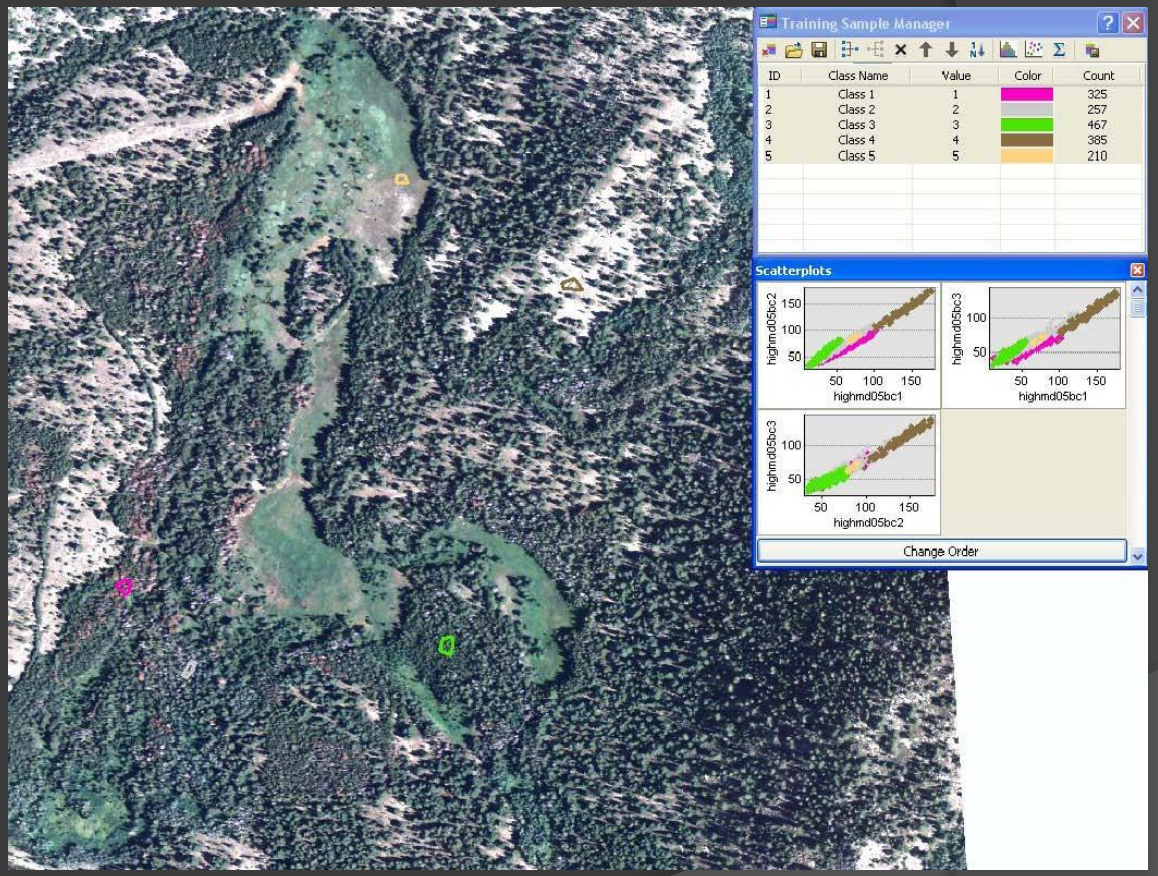



79 acres with mortality of
256 acres in project area

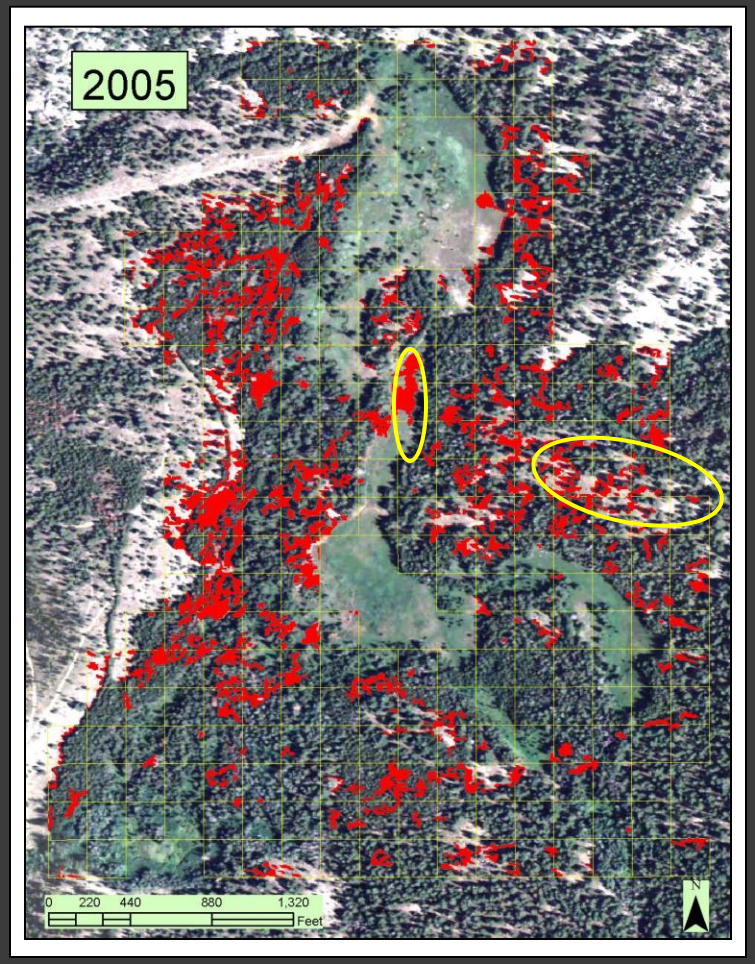
III. Use remote sensing software to classify and map tree mortality

# Image Classification with Remote Sensing Software

- Tools now within ArcGIS make classification available to more users
- Supervised classification example

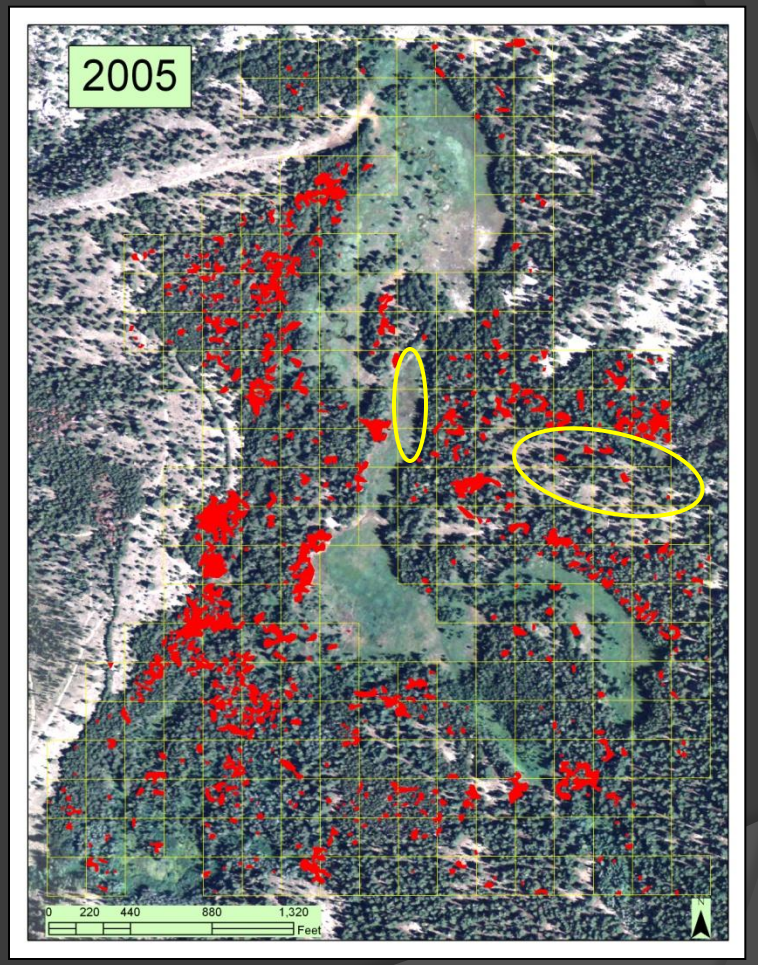


# Image Classification Results




Mapped mortality after image classification ( 29 acres )

vs.




Mapped mortality after digitizing ( 20 acres )

| Grid Approach | Digitizing Approach | Image Classification Approach |
| --- | --- | --- |
| Simple | Very Simple | More Advanced |
| Less time required | More time required | Less time mapping but more time correcting errors |
| Less precise mapping | More precise mapping | Moderate precision-to-more precise mapping |
| Multiple options for data collection | Provides presence / absence of mortality data | Provides presence / absence of mortality data |


http://www.fs.usda.gov/main/r5/forest-grasslandhealth