Monitoring Post-Fire Revegetation & Vegetation Trends: Milford Flat Fire, Utah

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Photo courtesy of: BLM

Discussion Points:

- BLM's post-fire objectives; initial revegetation assessment
- Phenology & climate to monitor vegetation growth
- Cheatgrass intensity mapping
- Juniper mapping using OBIA
- Plant community stability

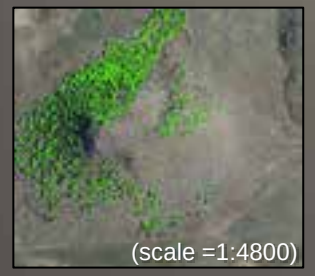
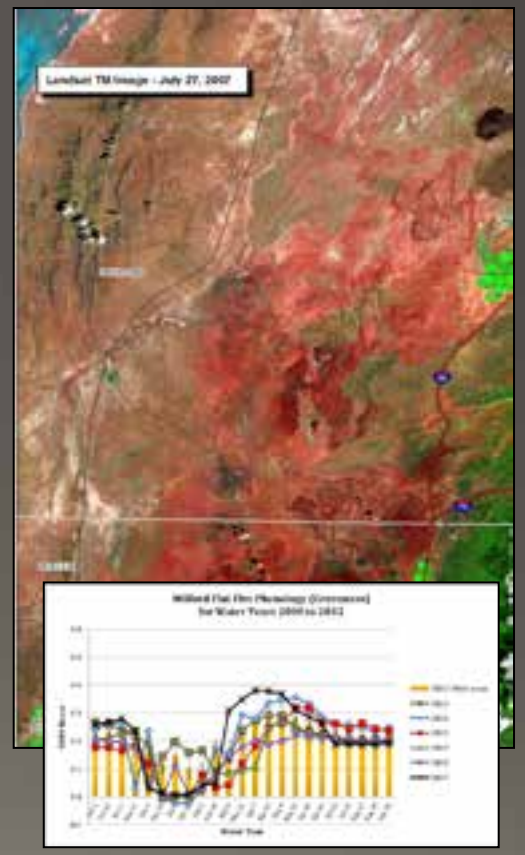



Photo courtesy of: Deseret News



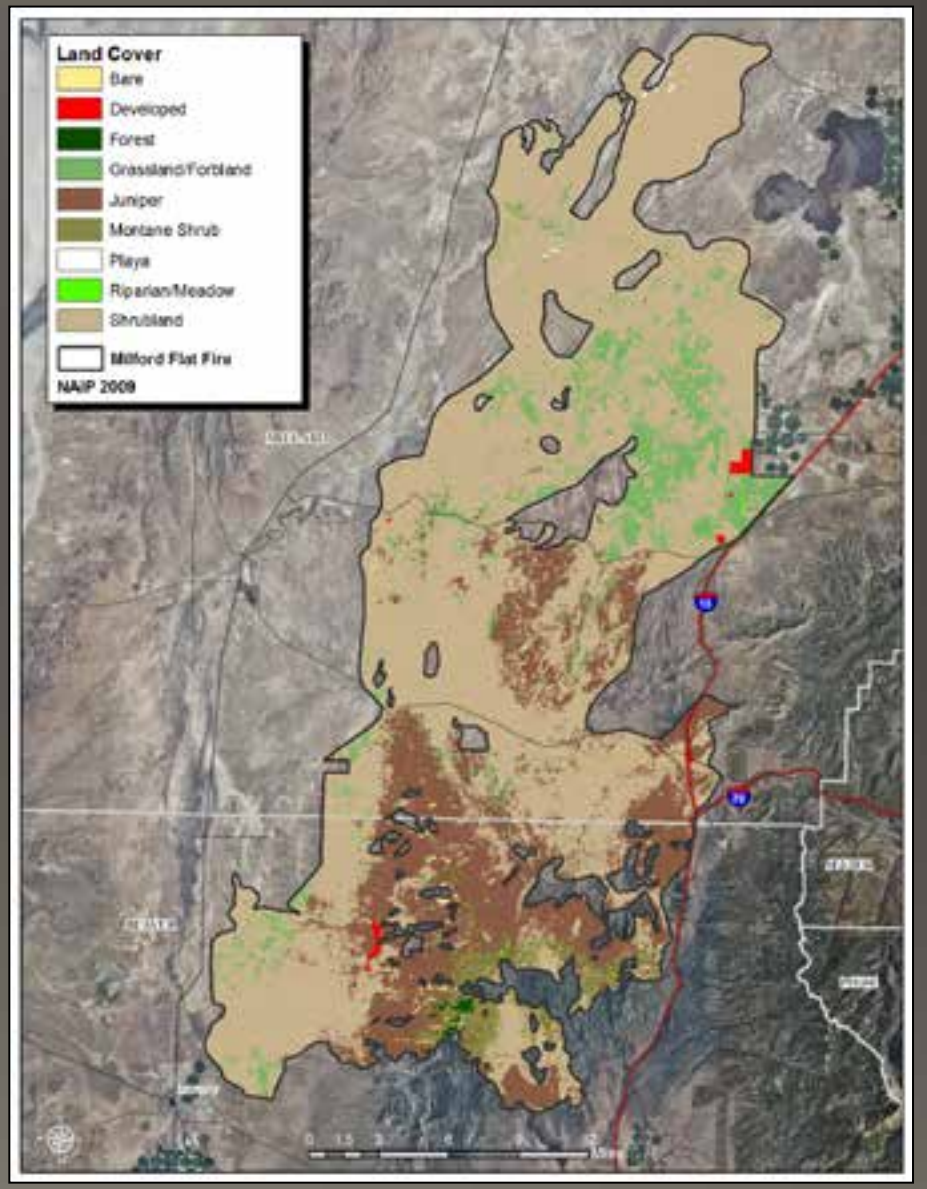
Milford Flat Fire

Dates: 6 July – 15 July, 2007
Location: Started 3 miles No. of Milford, Utah, Millard & Beaver Co
Acreage: ~363,000
Ownership: BLM 75%, Private 17%, State 8%, BIA .2%

Cause: Lightning
Conditions: Drought, high winds, high temps, abundant invasive annual weeds
Fuels: Salt desert scrub, sagebrush, and juniper, annual weeds


Photo courtesy of: NRCS

Pre-fire Land Cover	Acres	%
Shrubland	224,837	67.0
Juniper	70,381	21.0
Grassland/Forbland	28,496	8.5
Montane Shrub	7,911	2.4
Developed	1,341	0.4
Bare	1,151	0.3
Forest	607	0.2
Playa	380	0.1
Riparian/Meadow	272	0.1
Total	335,377	



BLM’s post-fire objectives; initial revegetation assessment

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- Emergency stabilization and rehabilitation (vegetation & soil)

- Primary species lost:
  - mixed salt desert shrubs (shadscale, four-wing saltbush winterfat), sagebrush, juniper
  - also serve as indicators of fire severity and post-fire recovery

- Assessment of seeding treatments (aerial seeding, drilling, chaining)

- Competition with invasives: cheatgrass, halogeton, Russian thistle

- Develop a remote sensing based monitoring program to integrate with existing BLM vegetation I&M protocols

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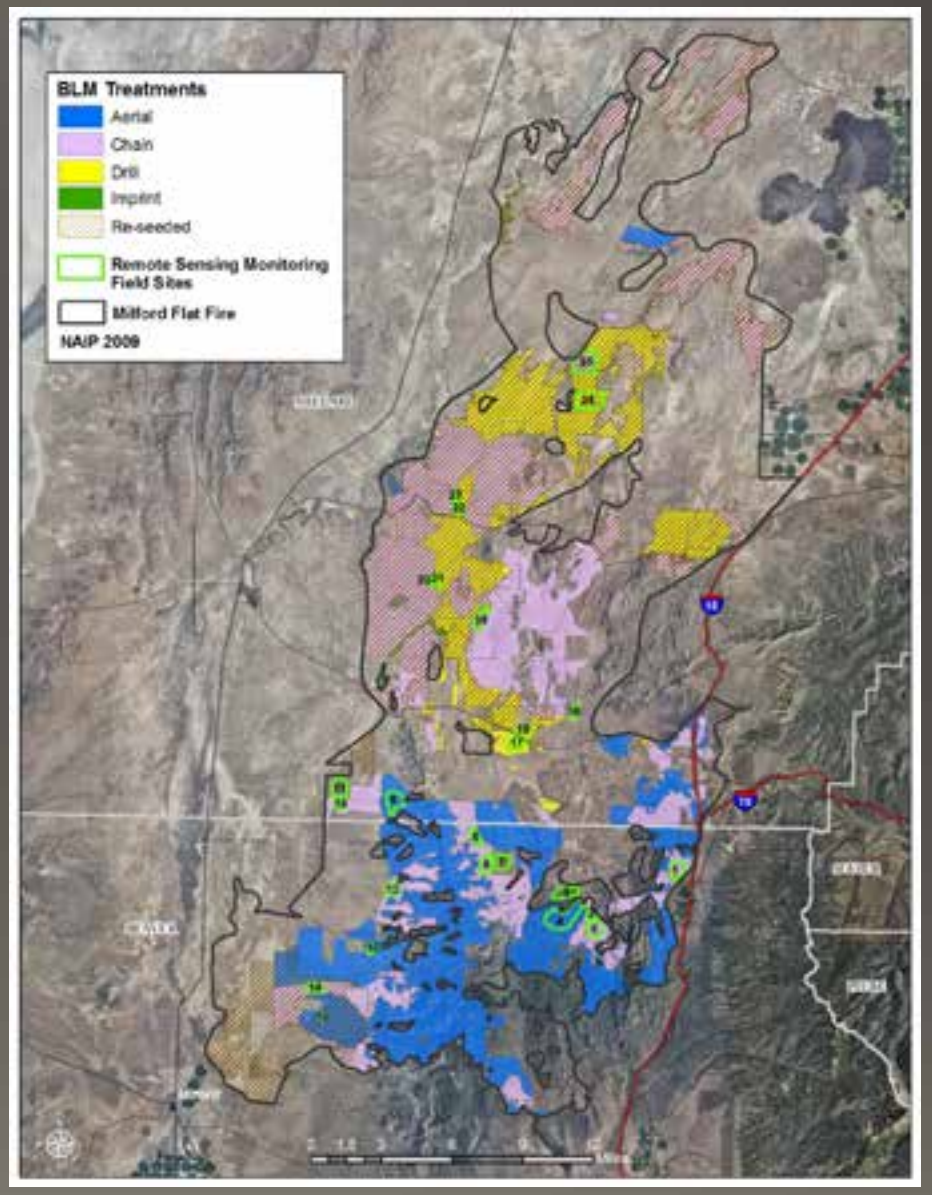

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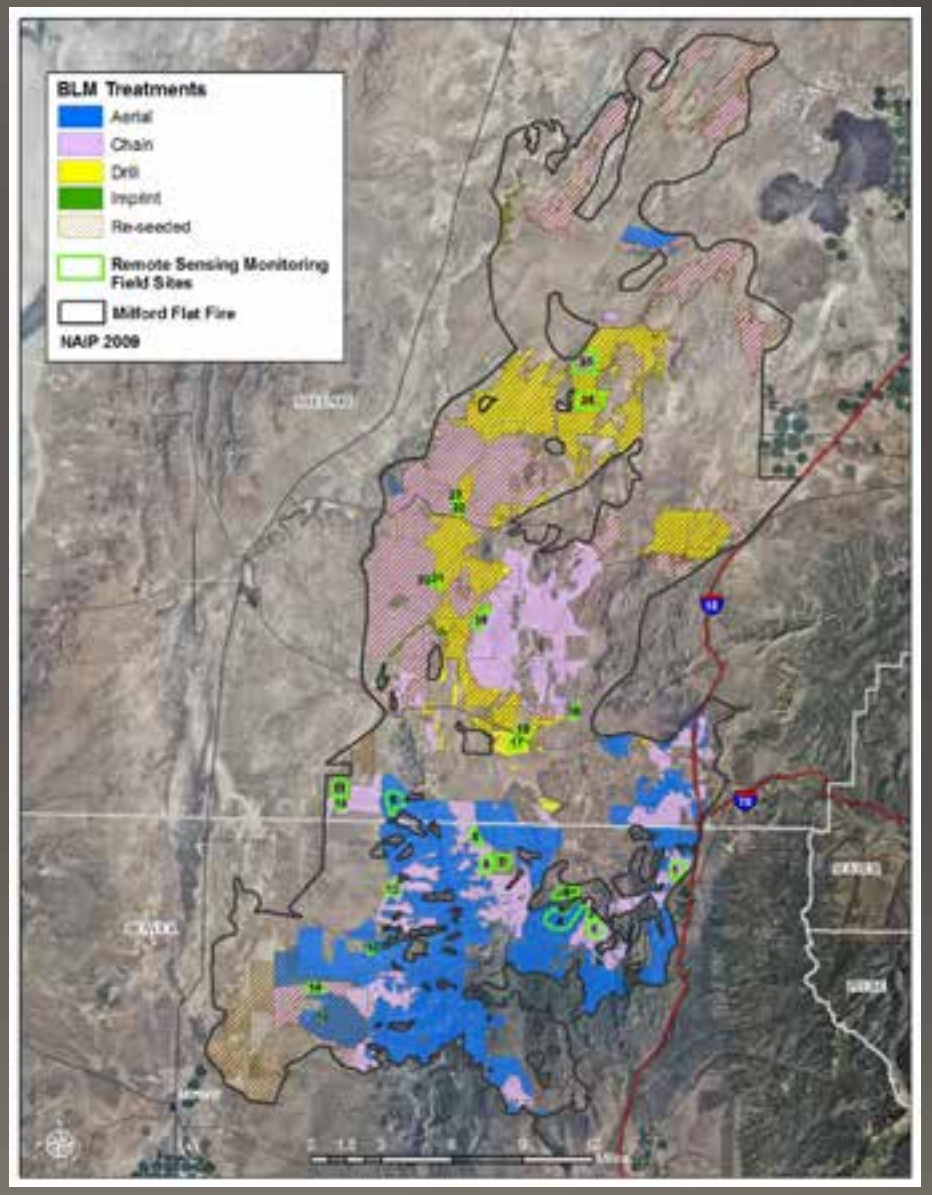

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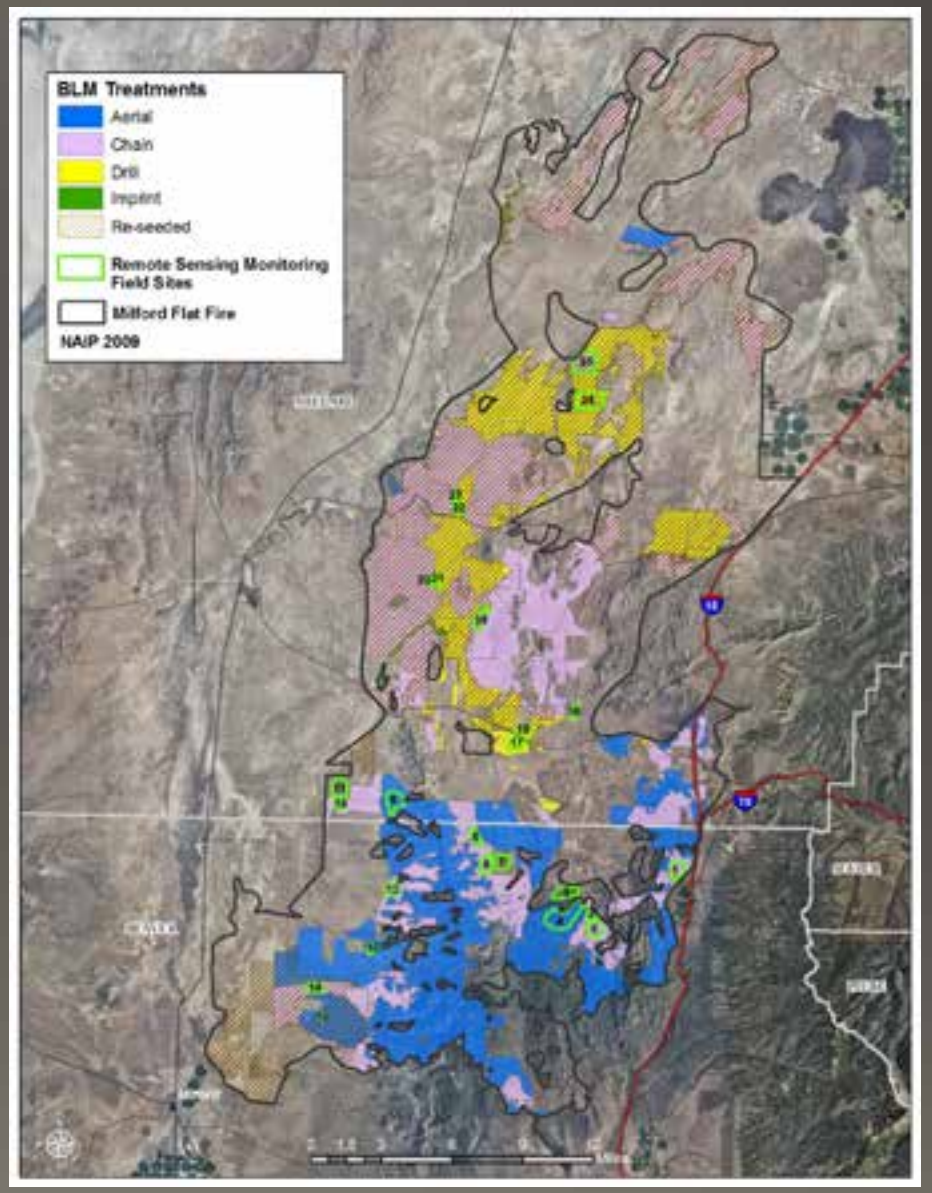

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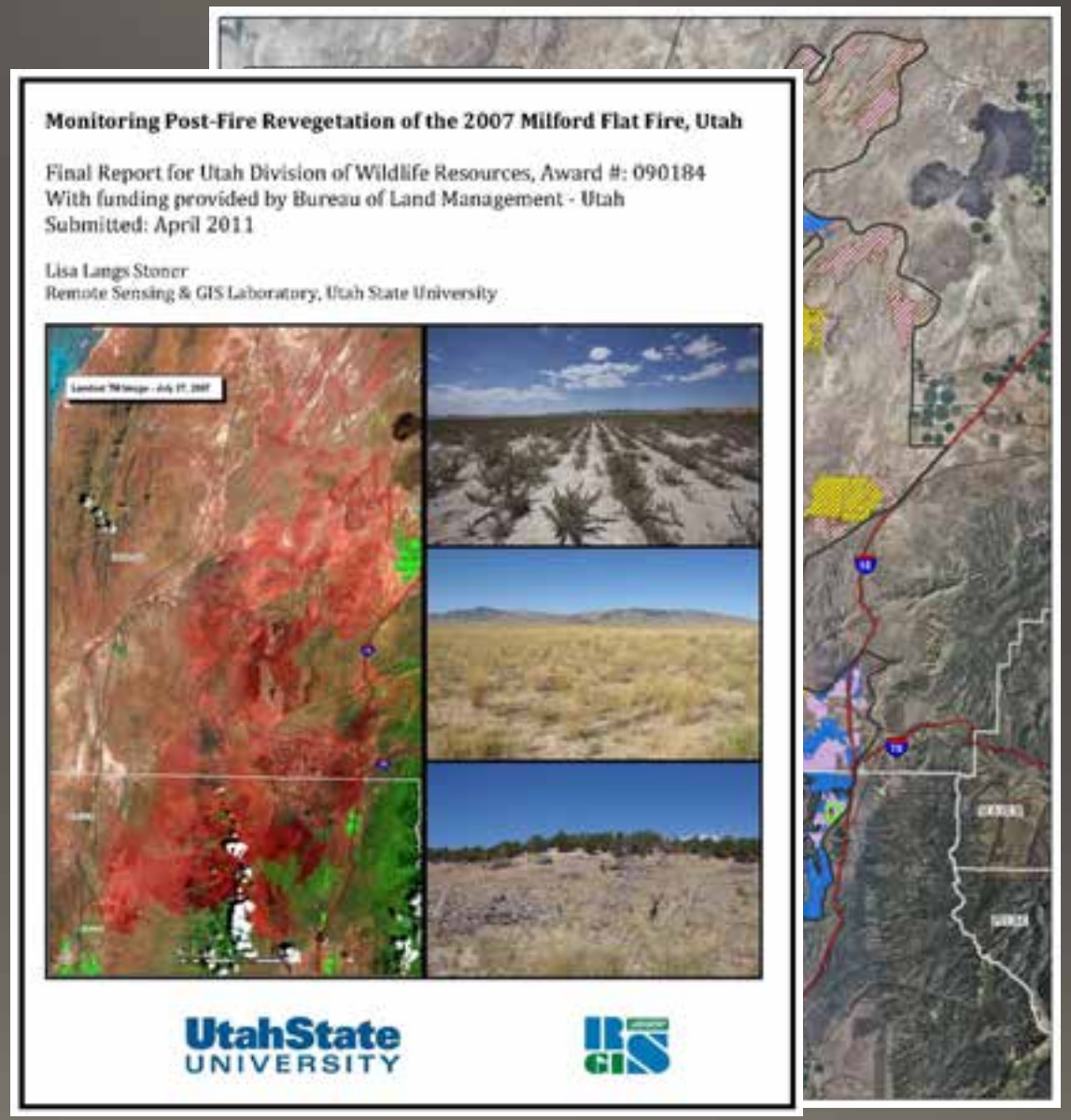

Phenology to Monitor Vegetation Trends

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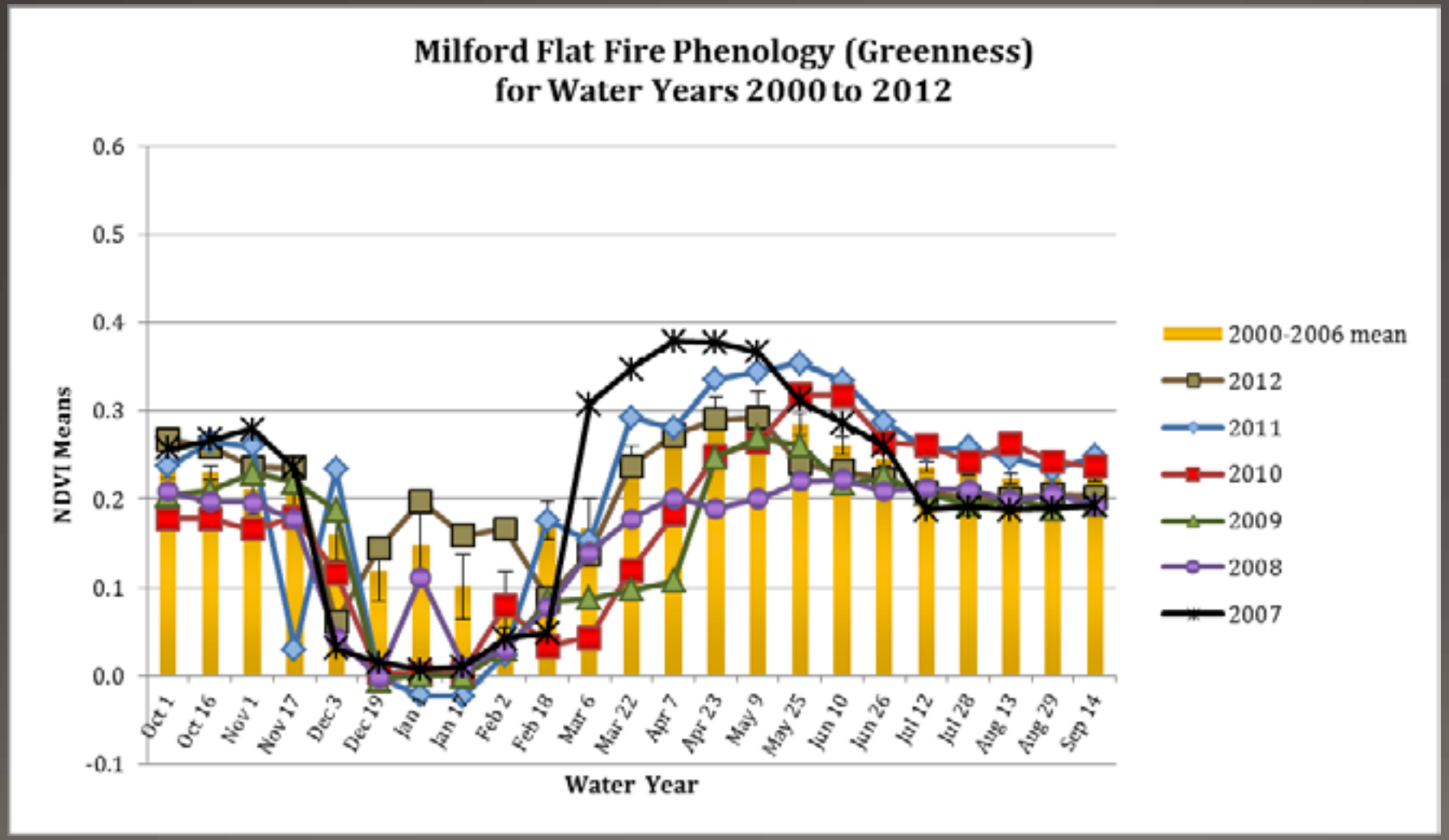
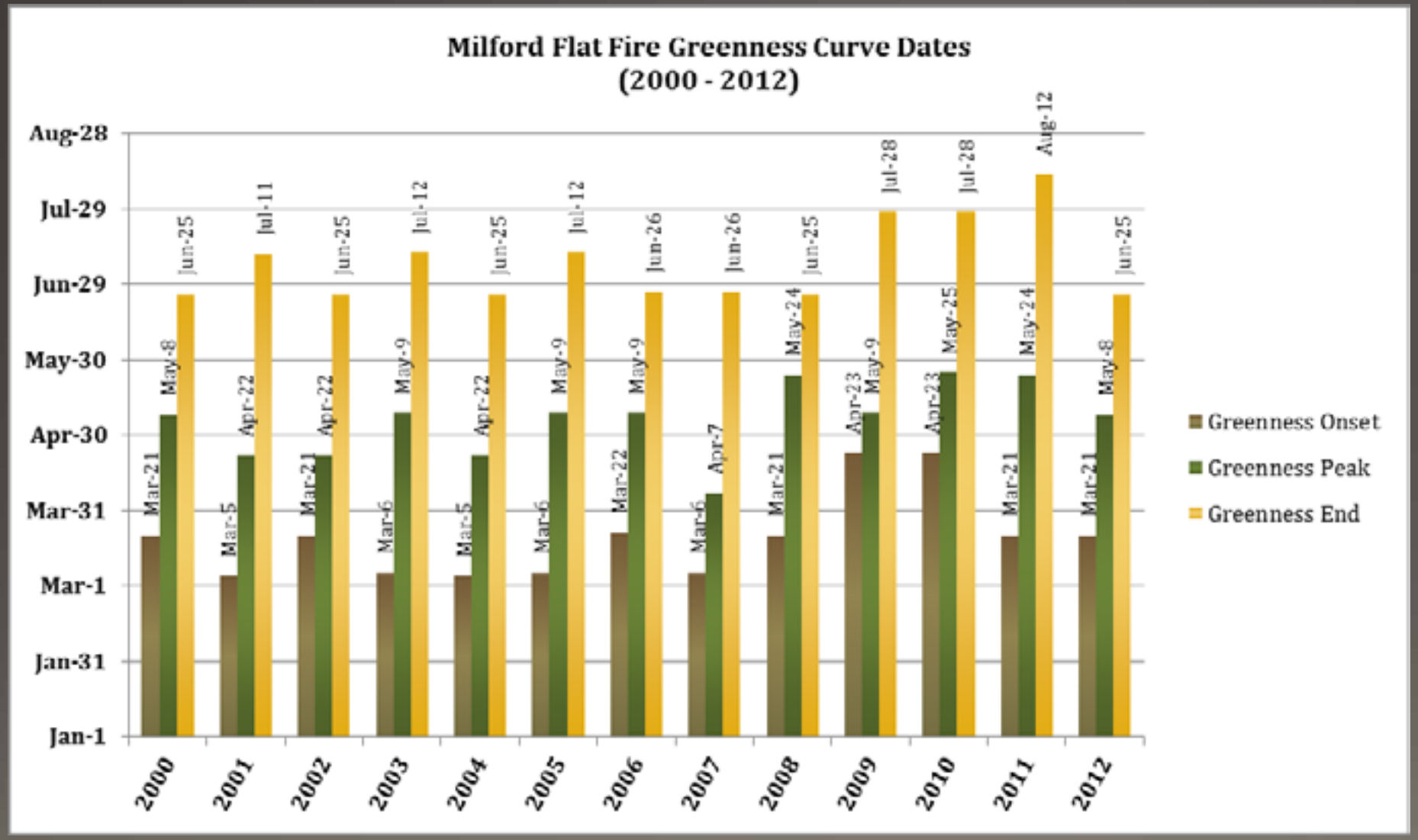
- **Normalized Difference Vegetation Index (NDVI) - MODIS 16-day composite**
  - Red & NIR bands used to identify photosynthetically active vegetation
  - A surrogate for measuring plant growth



Phenology to Monitor Vegetation Trends

- Phenological profiles are used to assess *inter-annual* greenness onset, peak, and end



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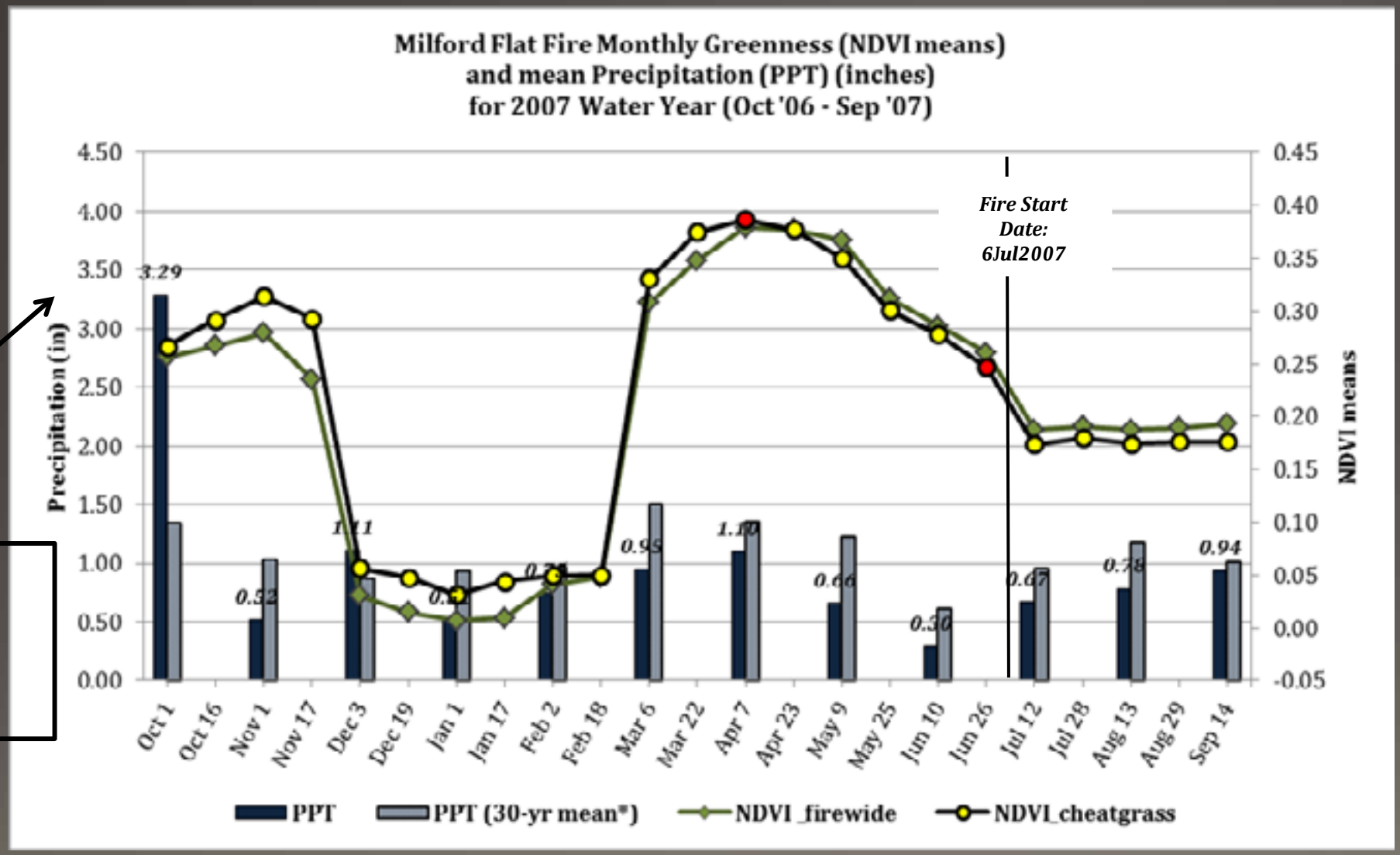

October precip correlated with high spring NDVI values

Cheatgrass Intensity Mapping

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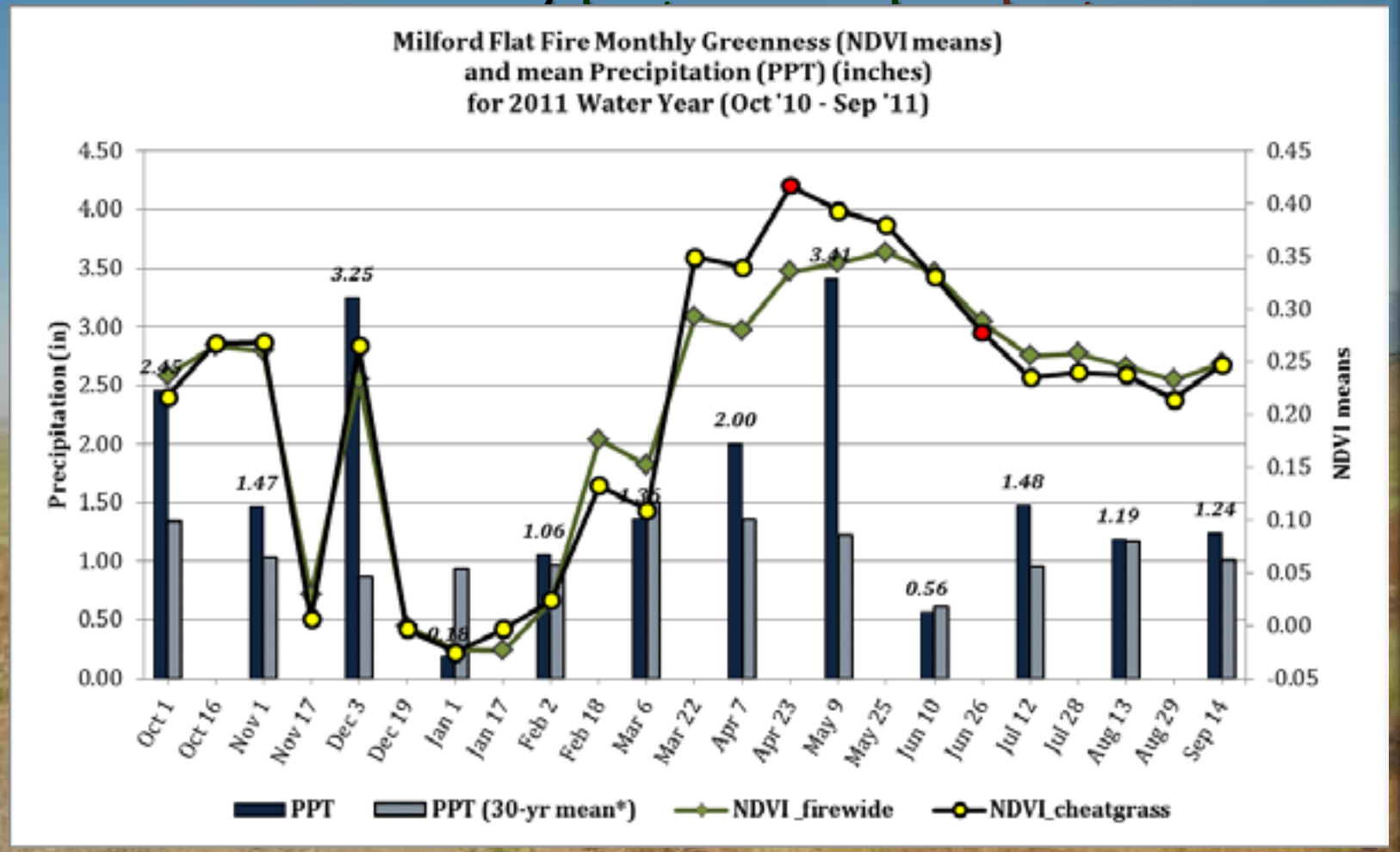
NDVI Differencing = (cheatgrass peak – cheatgrass senescence)

- Cheatgrass phenology is distinct (*generally*)
- Peaks: Apr to mid-May; Senesces: mid-Jun to mid-Jul
- Cheatgrass NDVI Differencing date selection: before perennial bunch grasses begin to grow; when cheatgrass curve diverges from the firewide curve
- Differencing Output: measures change in greenness, higher values = more cheatgrass production



Cheatgrass Intensity Mapping

- NDVI Differencing for Cheatgrass Intensity Mapping

***Bromus tectorum* (BRTE) -- Cheatgrass**

High BRTE Potential

Medium BRTE Potential

Low BRTE Potential

No BRTE potential

Cheatgrass Intensity Mapping - Results

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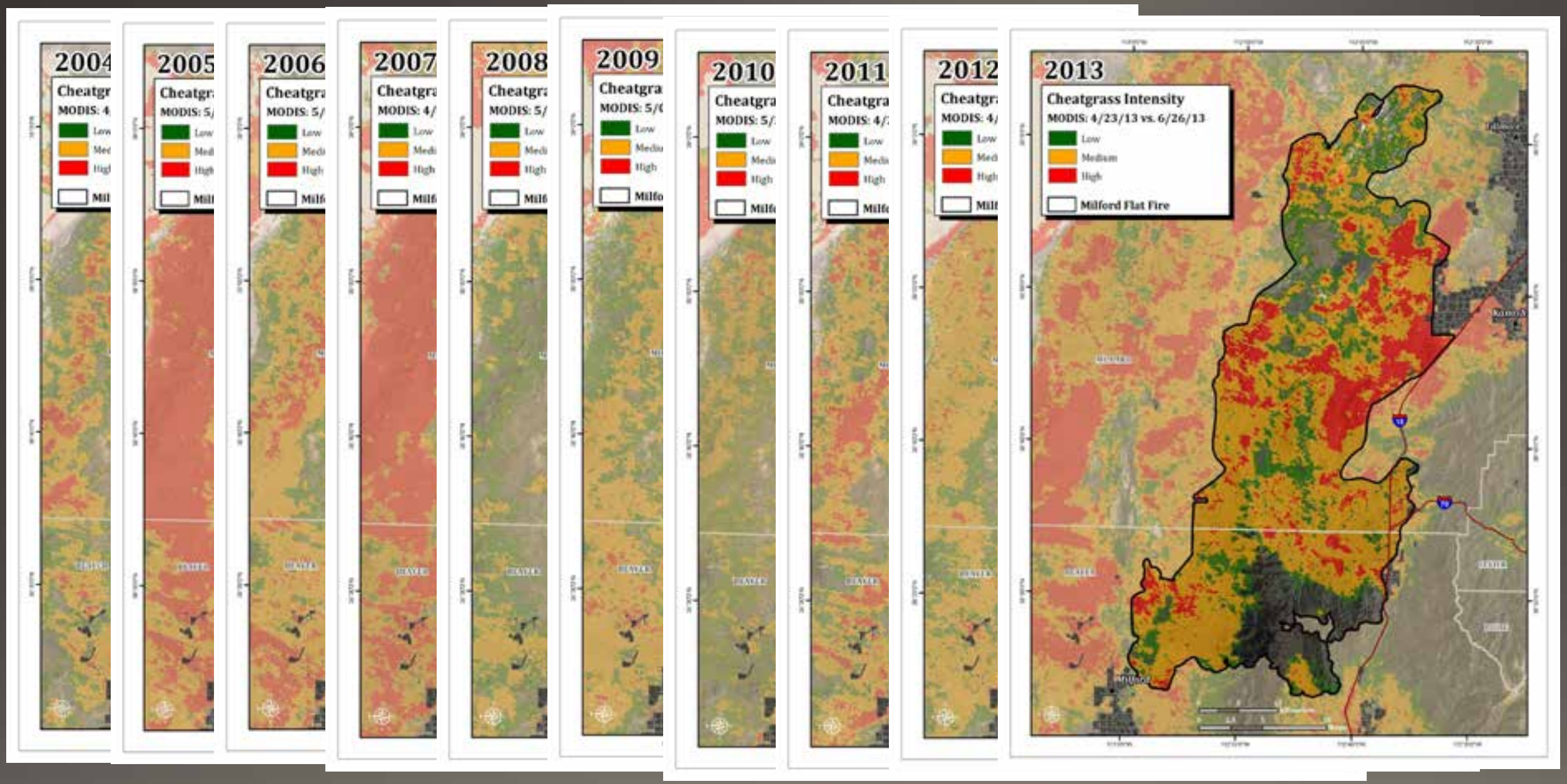


Cheatgrass Intensity Mapping - Results

- Advantages: rapid assessment to identify and target areas in need of management attention

- Problems: without field validation, output could be confused with other species with similar phenology (i.e. early spring annuals) such as forage kochia &/or halogeton

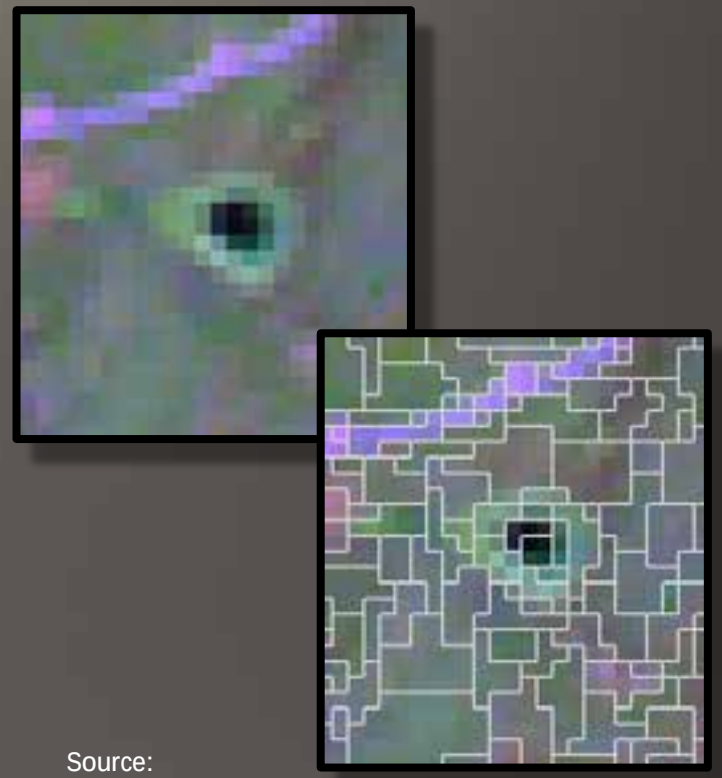
Juniper Mapping

Juniper Mapping

- **Object-Based Image Analysis (OBIA) -- Definiens eCognition**
  - Segments a digital image into discrete image “objects”
  - Exploits image properties:

Spectral (color)	Spatial (shape & size)	Contextual (location)	Textural (pattern)

  - Classifies image objects based on user-defined rules
  - Segmentation involves a hierarchical classification useful for grouping or separating image objects

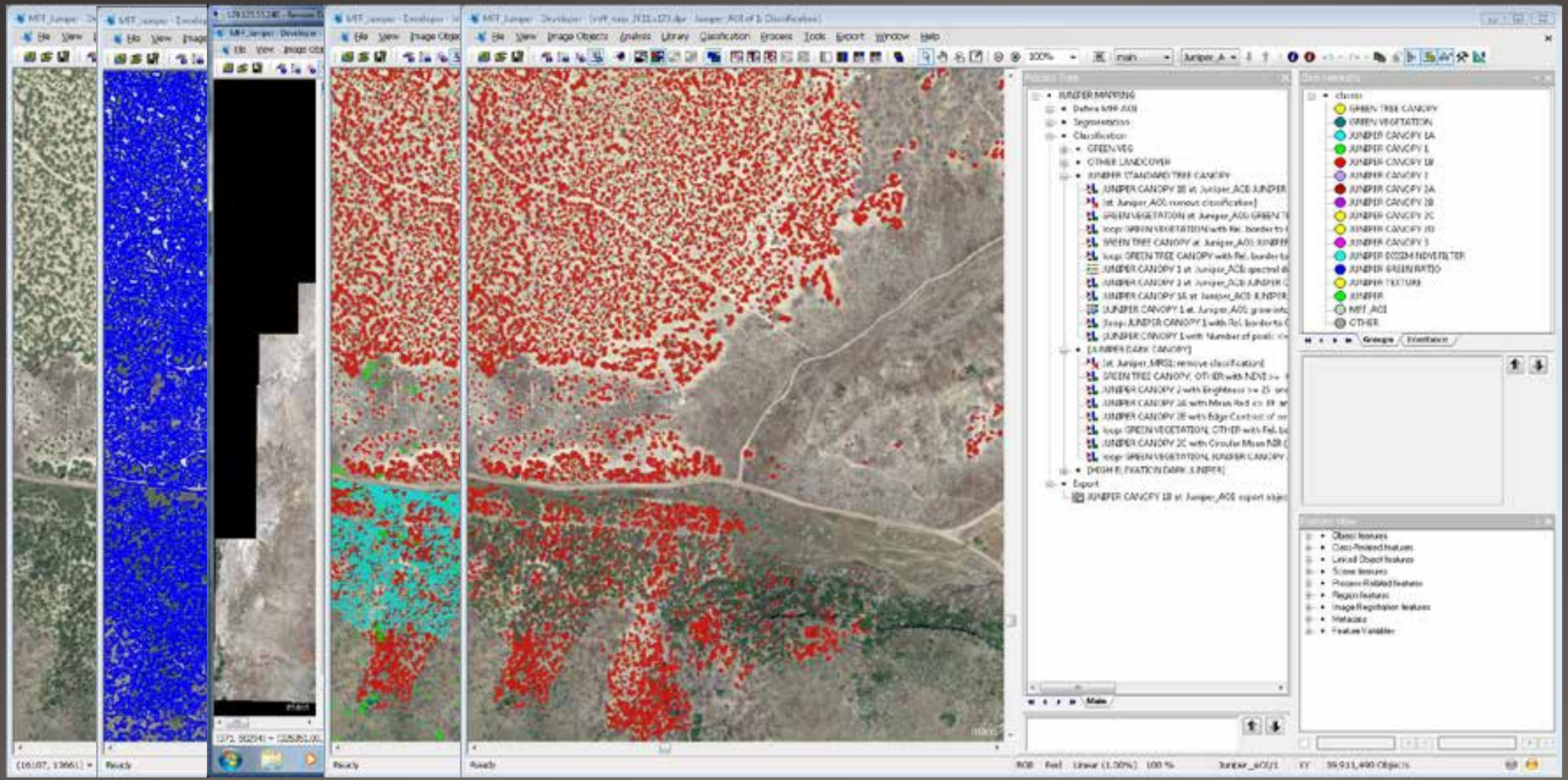


Source: http://www.for.gov.bc.ca/hts/rs/harvest_detection.html

OBIA completed by:
Chris M. McGinty
Ellie L. McGinty
Suzanne Gifford

eCognition®

Juniper Mapping – Segmentation & Classification



Juniper Mapping - Results

2006 NAIP (scale =1:16k)

2008
Remnant juniper woodlands near Cove Fort,
Millard Co., UT

Photo by: goldnberyl

2400)

~40,000,000 objects created
1.5 million classified as juniper
final product imported into ArcGIS

Ecological Sites, States & Transition Models – An approach to assess plant community stability

(work in progress)

Ecological Sites, States & Transition Models – An approach to assess plant community stability

Ecological Sites = a kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in its ability to produce vegetation and to respond to management.

State and Transition Model (STM) = a model that identifies the most prevalent & recurring plant communities & ecological dynamics associated with an ecological site.
STMs illustrate how a reference community & soil-veg relationships evolve when subjected to different environmental conditions & drivers of change (e.g. climate, land use, natural disturbances).
Used to distinguish between current conditions and "desired" conditions. Used to assess state vulnerability relative to ecological thresholds.

Ecological Site: Desert Loam (Shadscale) – R028AY124UT

Goal: to map Ecological States

State 2. "Current Potential"
Shadscale / Introduced Non-native Herbs State

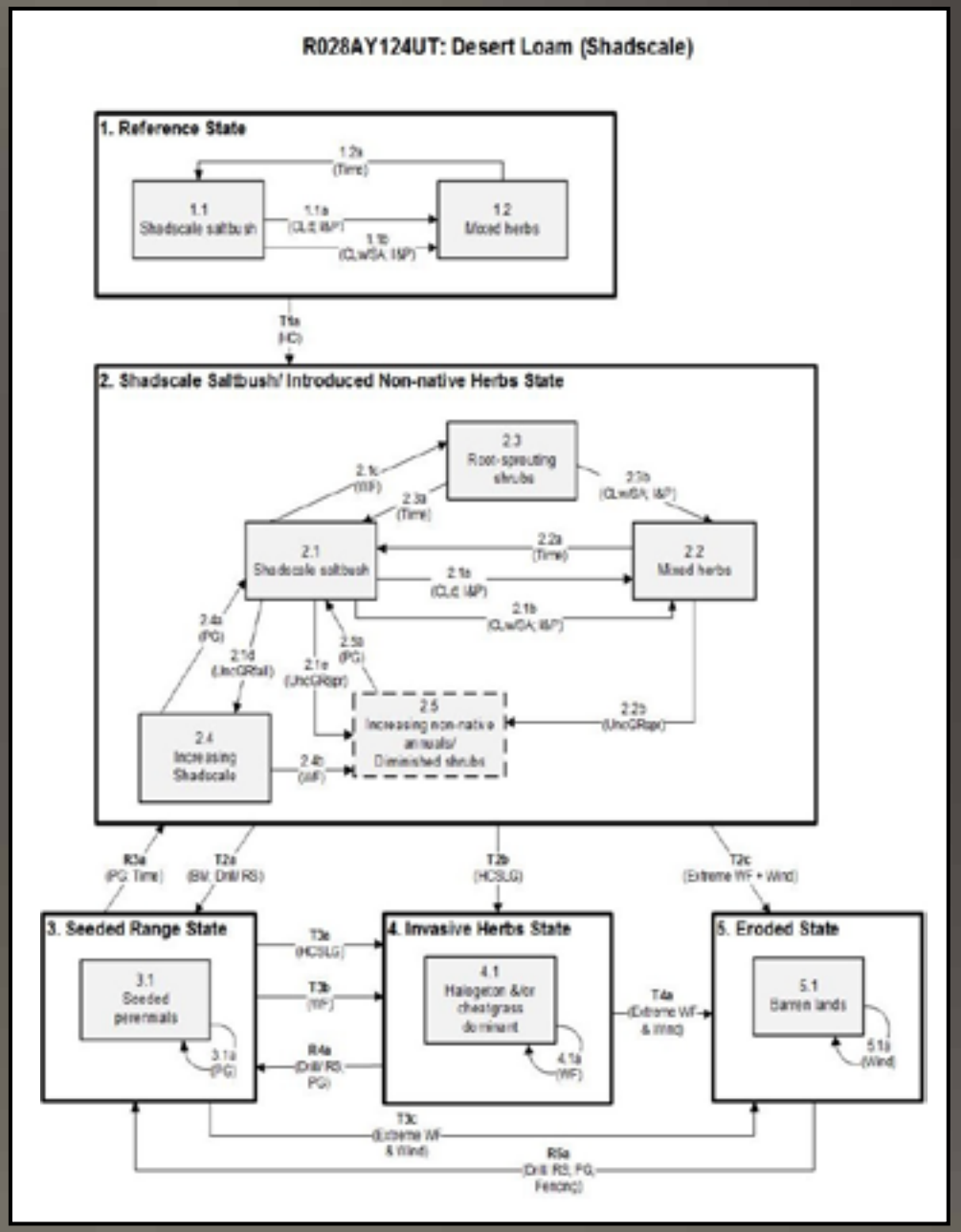
2.4 Increasing Shadscale

2.5 Increasing non-native annuals/ Diminished shrubs

State 3. Seeded Range State

State 4. Invasive Herbs State

State 5. Eroded State



Mineral Range, photo by C.M. McGinty

Thank you