

VQ2 overarching question:

Ecosystem Function, Physiology and Seasonal Activity

Not for Distribution

What are the **seasonal expressions and cycles** for terrestrial and aquatic ecosystems, functional groups, and diagnostic species?

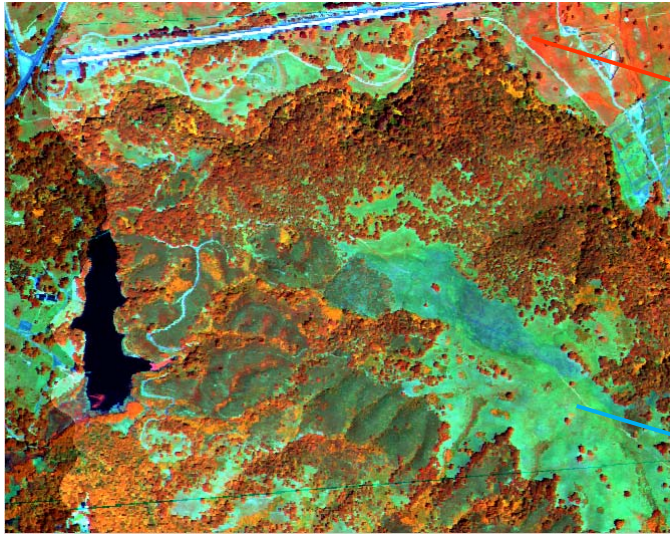
How **are these being altered** by changes in climate, land use, and disturbances? [DS 191, 195, 203]

Jasper Ridge, CA

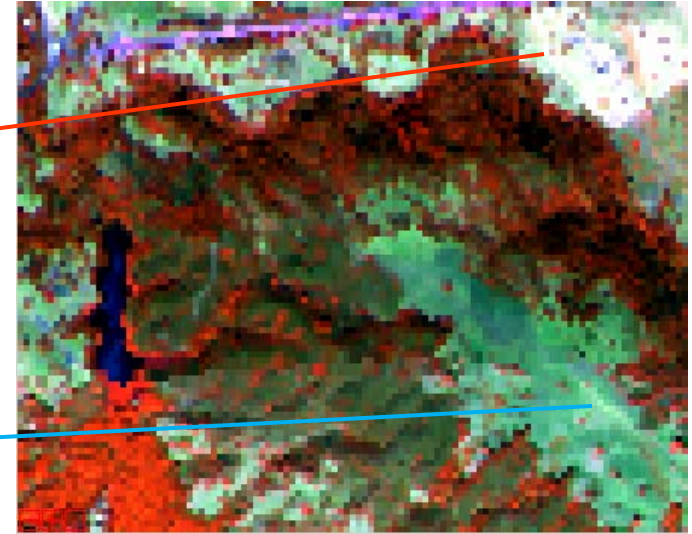
Seasonal Changes in a Mosaic of Plant Functional Types



May, 14, 2006; 3.3 m pixel

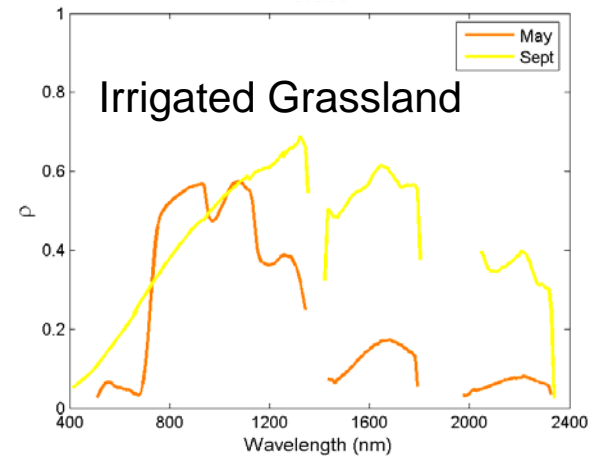
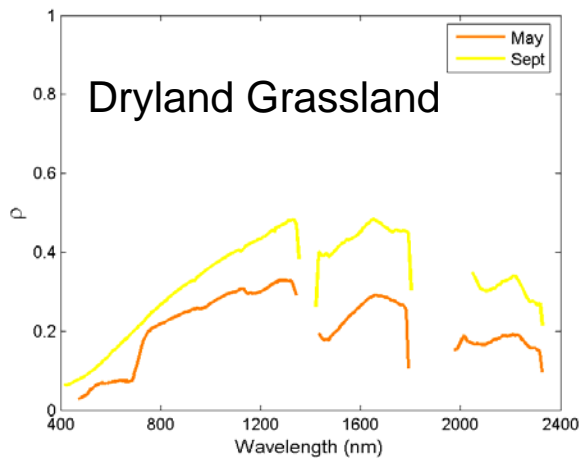


September, 22, 2006, 20 m pixel



0 500 m

CIR Composite: 850 nm:1652 nm:668 nm



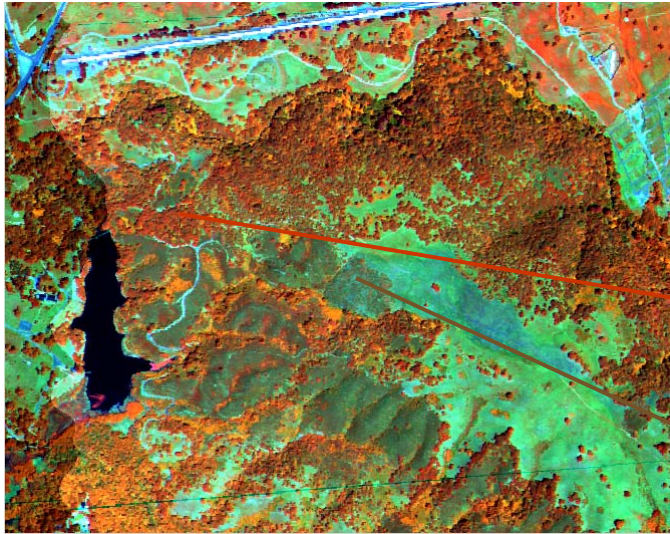
Riaño & Ustin, in pre

Jasper Ridge, CA

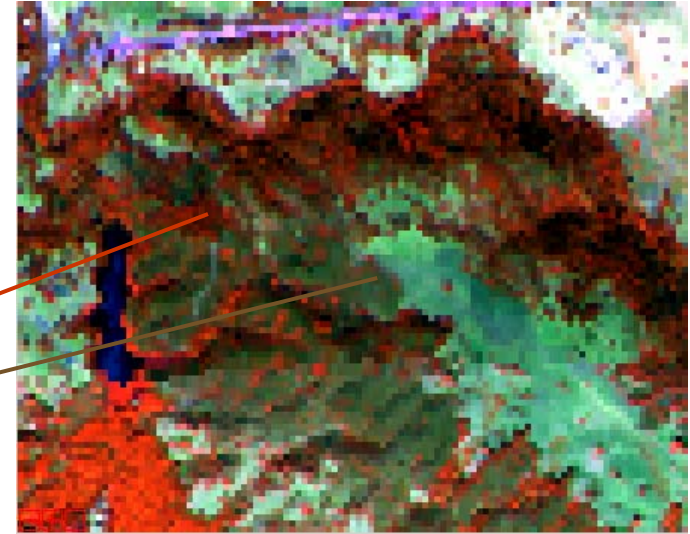
Seasonal Changes in a Mosaic of Plant Functional Types



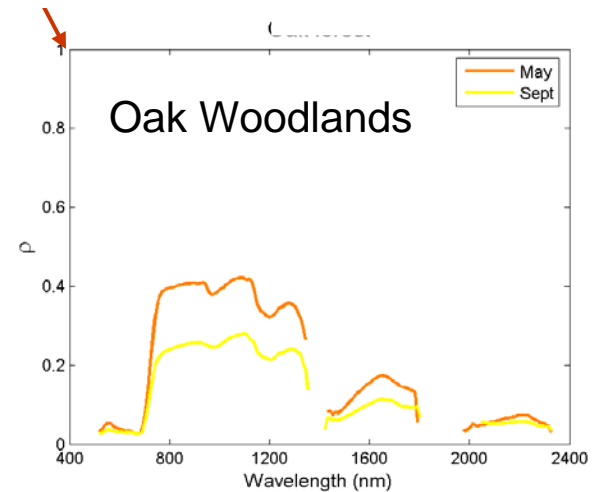
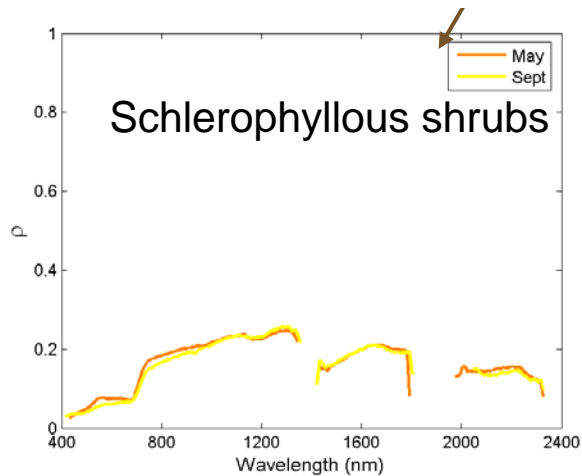
May, 14, 2006; 3.3 m pixel



September, 22, 2006, 20 m pixel



CIR Composite: 850 nm:1652 nm:668 nm



Riaño & Ustin, in prep

VQ2 overarching question:

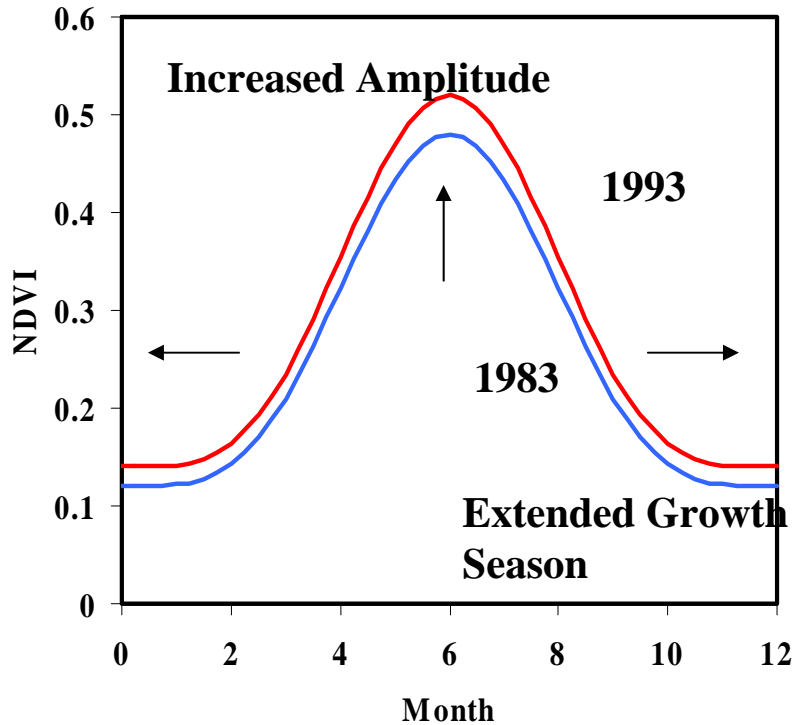
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What are the **seasonal expressions and cycles** for terrestrial and aquatic ecosystems, functional groups, and diagnostic species?

How **are these being altered** by changes in climate, land use, and disturbances? [DS 191, 195, 203]

High Latitude Phenology

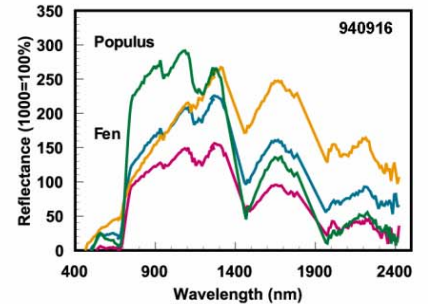
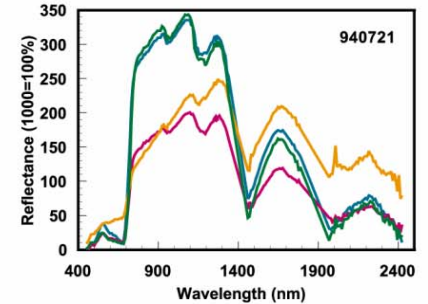
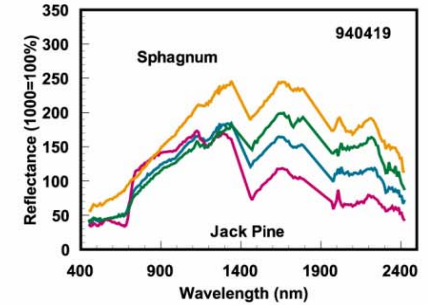
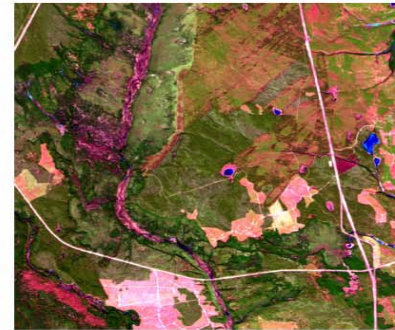


Myneni et al., 1997: Nature
 Tucker et al., 2001: Int. J. Biometeorol

Extended time & magnitude of NDVI are likely response to higher temperatures.

Important species changes cause climate feedbacks such as Δ albedo

Transect J: Temporal Changes in Spectra



665, 836, 1603 nm: RGB

Roberts et al., 1999

VQ2 overarching question:

Ecosystem Function, Physiology and Seasonal Activity

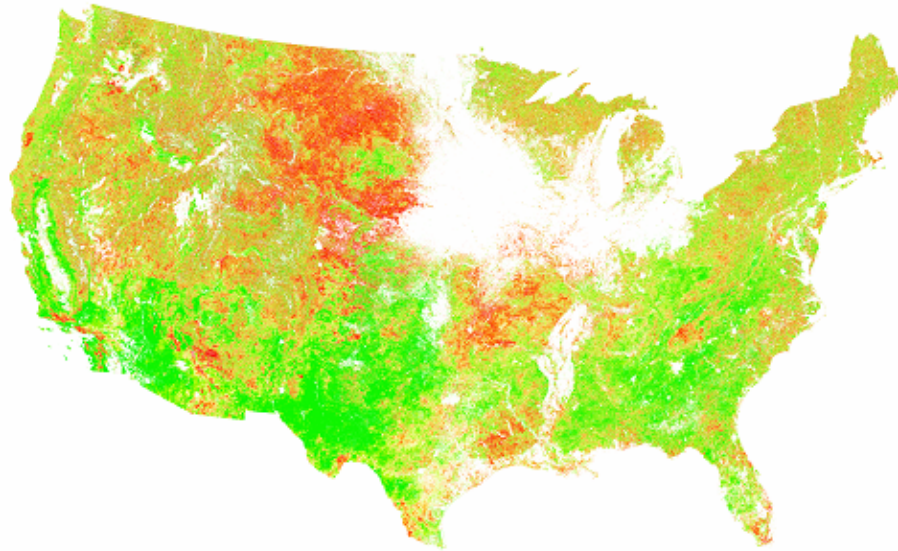
Not for Distribution

VQ2 Subquestion #1:

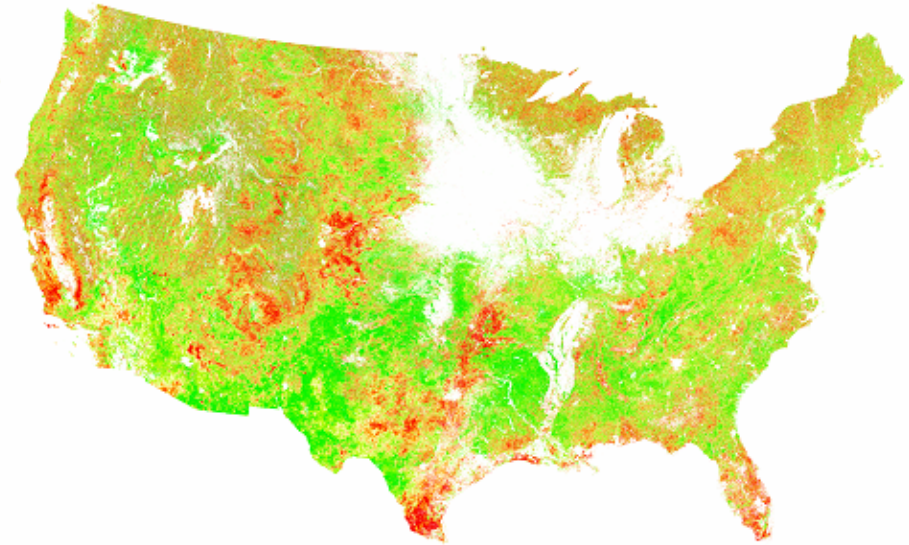
- How does the seasonal activity of ecosystems and functional types vary across biomes, geographic zones, or environmental gradients between the equator and the poles?
- How are seasonal patterns of ecosystem function being affected by climate change? [DS 205, 206, 210]

Climate Interactions w/ Canopy Water Content , 2000 to 2007

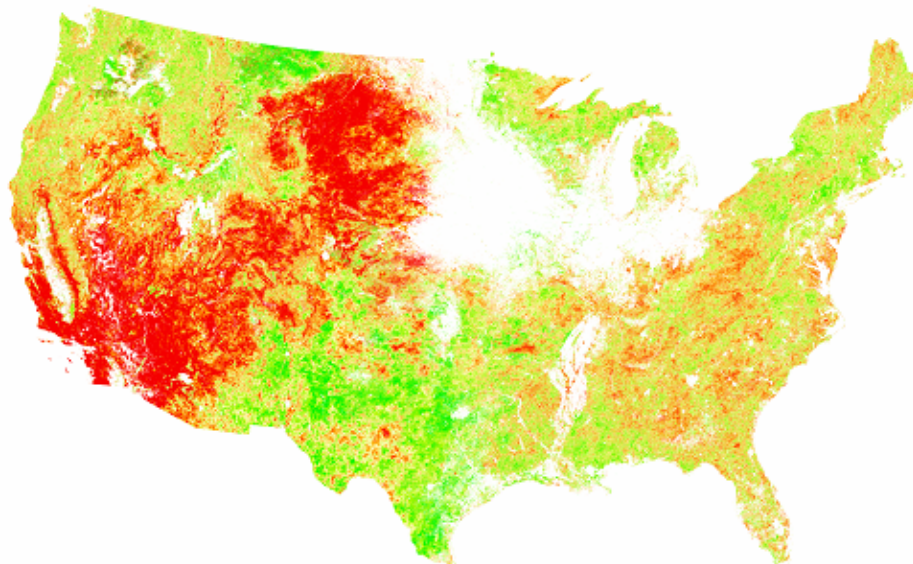
Niño periods – Normal periods (Winter)



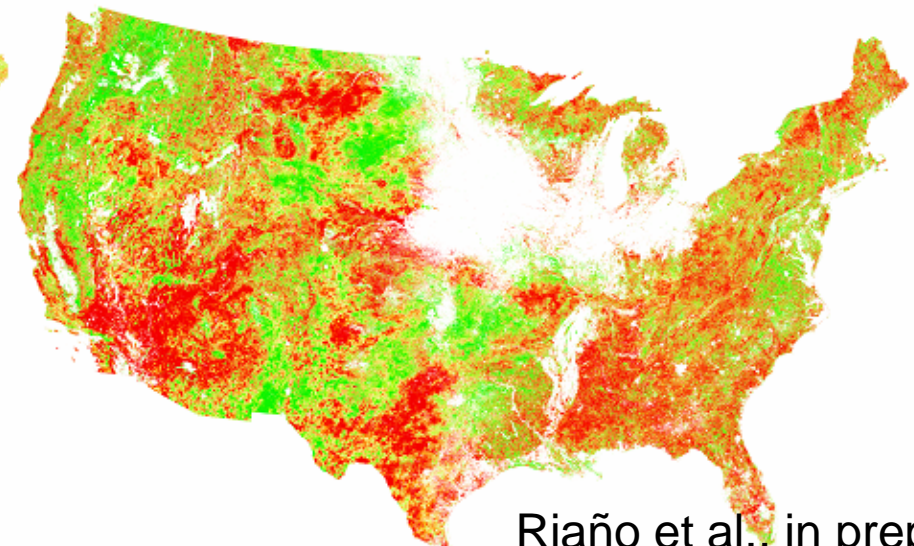
Niña periods – Normal periods (Winter)



Niño periods – Normal periods (Summer)



Niña periods – Normal periods (Summer)



Riaño et al., in prep.

VQ2 overarching question:

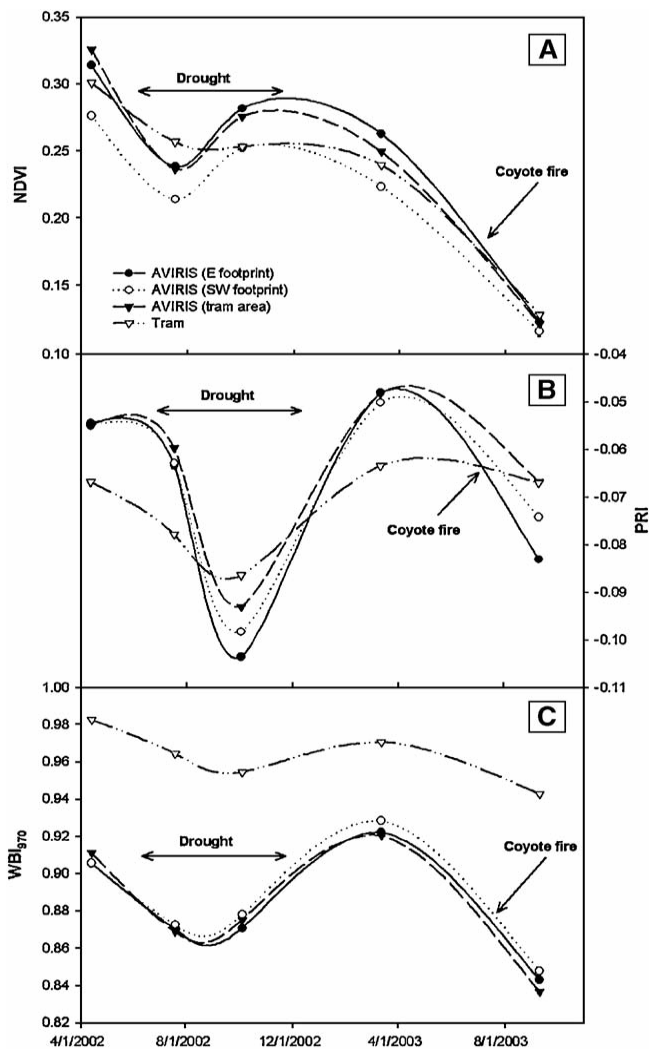
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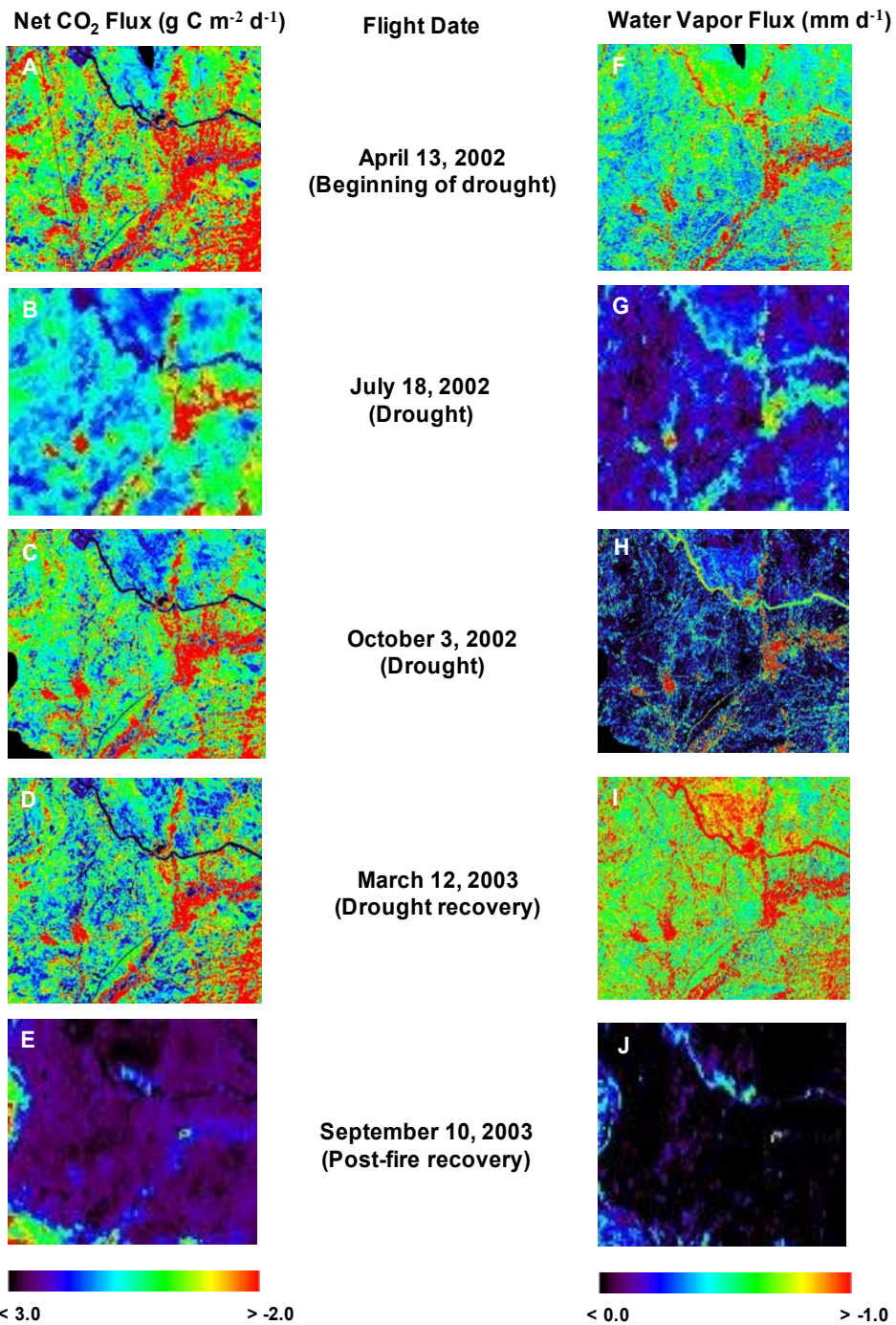
VQ2 Subquestion #2:

- How does the seasonal activity of ecosystems and functional types vary across biomes, geographic zones, or environmental gradients between the equator and the poles?
- How are seasonal patterns of ecosystem function being affected by climate change? [DS 205, 206, 210]

Spatial and temporal patterns of carbon and water vapor fluxes, Sky Oaks, CA



Fuentes et al. 2006



VQ2 overarching question:

Ecosystem Function, Physiology and Seasonal Activity

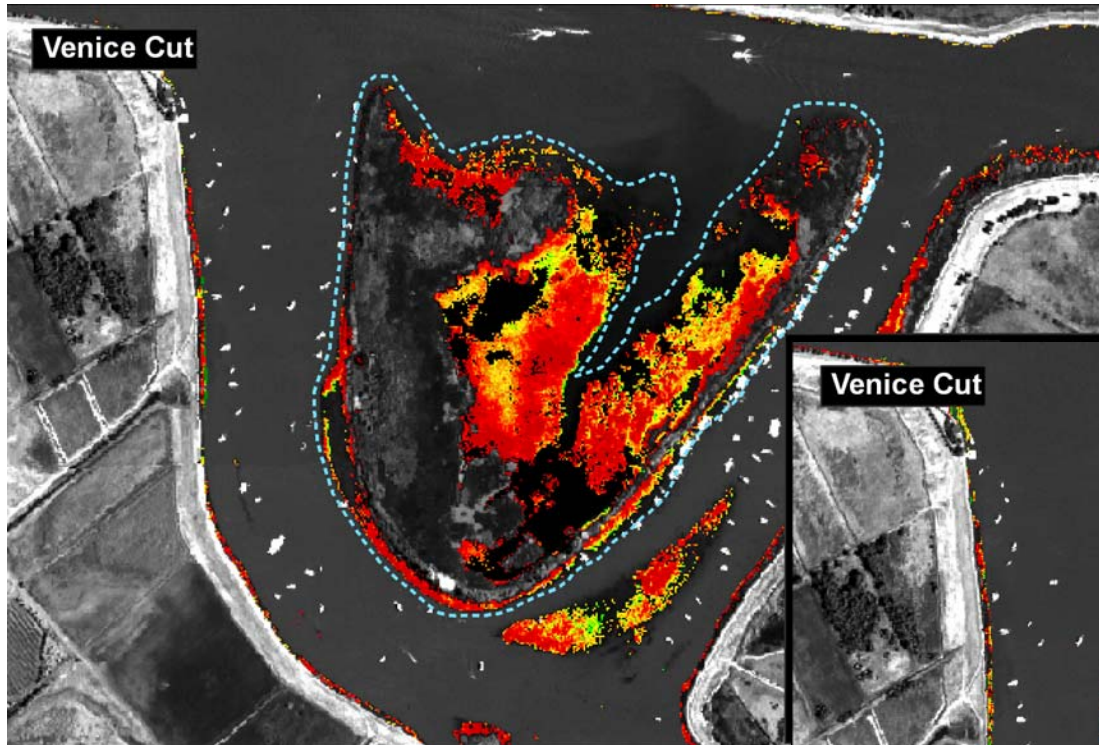
Not for Distribution

VQ2 Subquestion #3:

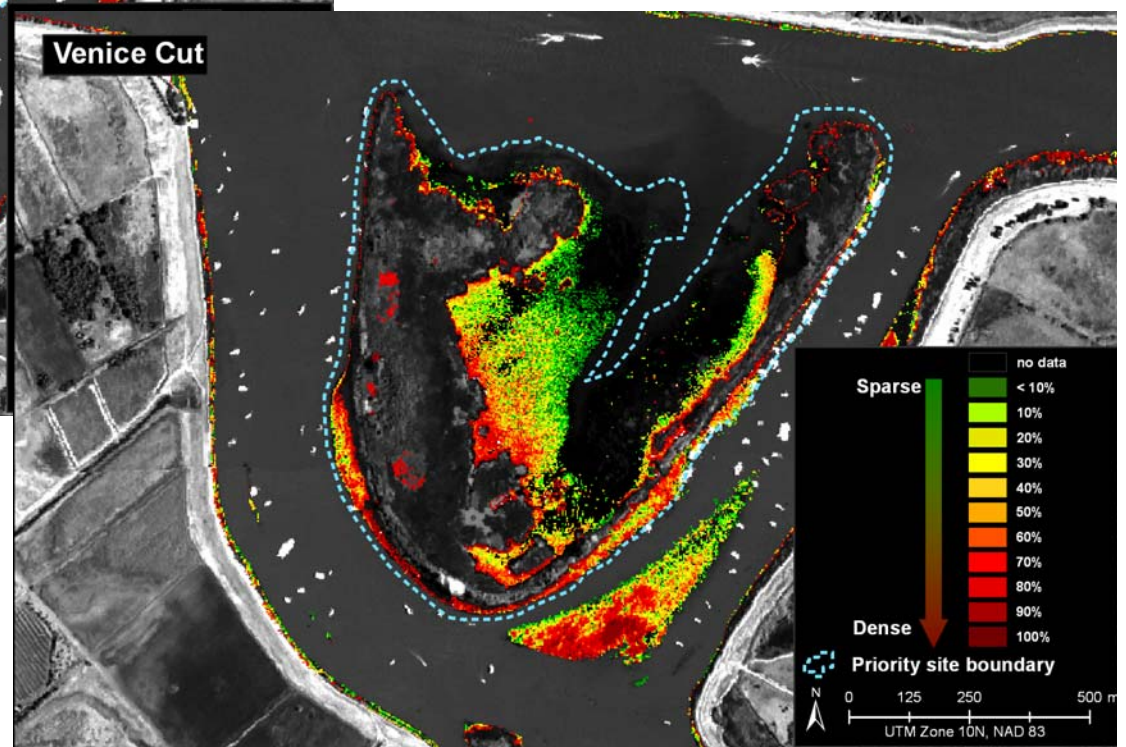
- How do changes in phenology affect productivity, carbon sequestration, and hydrological processes across ecosystems and agriculture? [DS 195, 205, 210]

Seasonal Changes in Invasive Aquatic Plants Sacramento-San Joaquin River Delta

Submerged aquatic weed density – June 2005



*Submerged aquatic weed density –
October 2005*



Estimated >75% Egeria densa

Ecosystem engineers

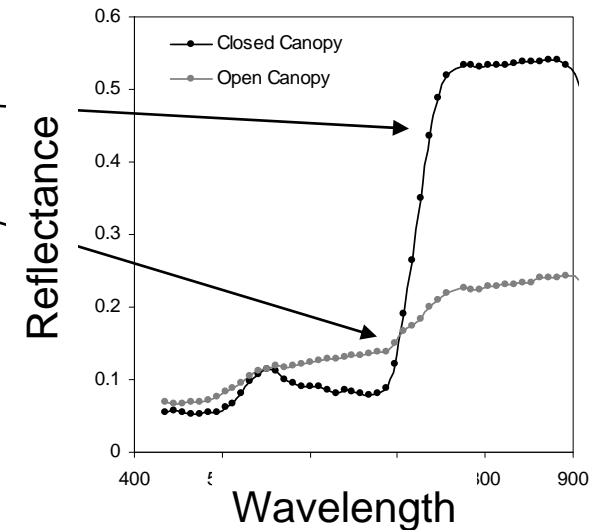
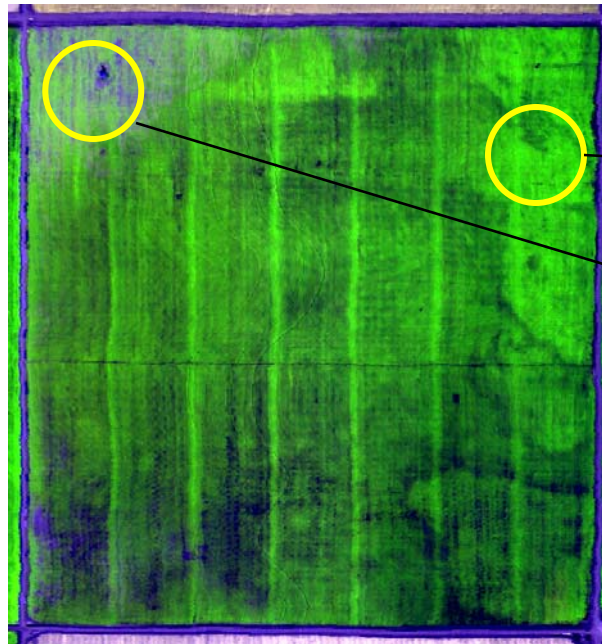
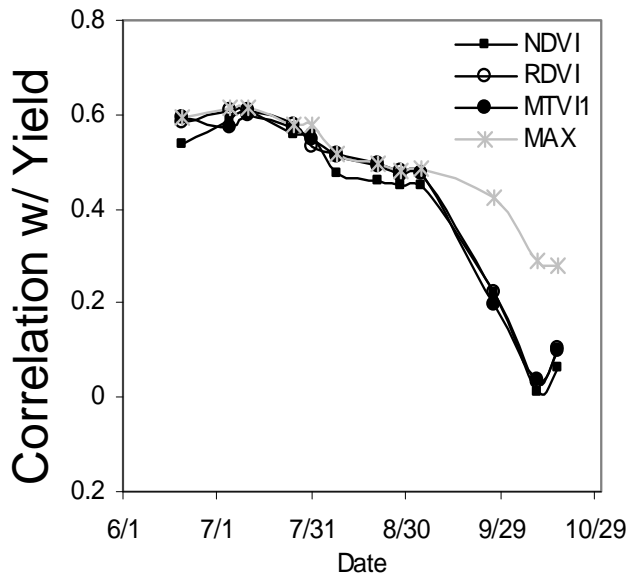
VQ2 overarching question:

Ecosystem Function, Physiology and Seasonal Activity

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VQ2 Subquestion #4:

- What is the seasonal pattern in physiological function (e.g., photosynthetic light use efficiency) for communities and functional types within major biomes, including agriculture? [DS 195]

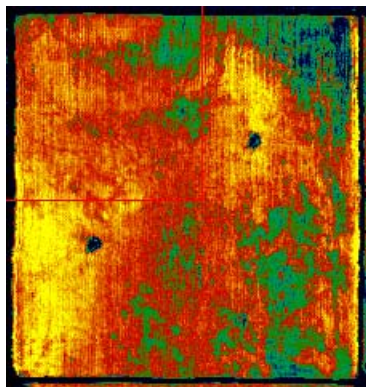


Zarco-Tejada et al., 2005

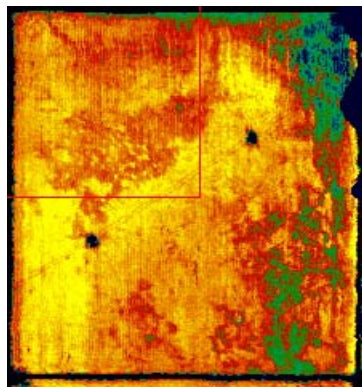
SubTeam: Susan Ustin, Betsy Middleton, John Gamon

Not for Distribution

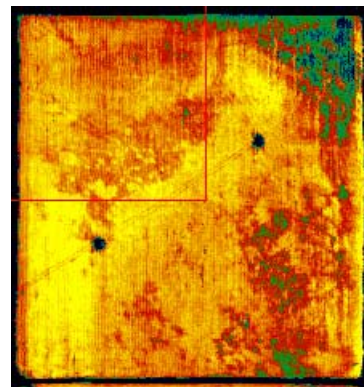
Time Series of Red Edge Spectral Index over Growing Season. Relationships with Yield. Field 6-4.



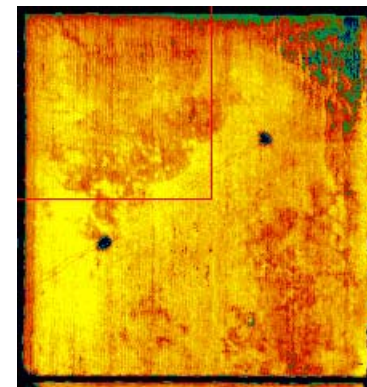
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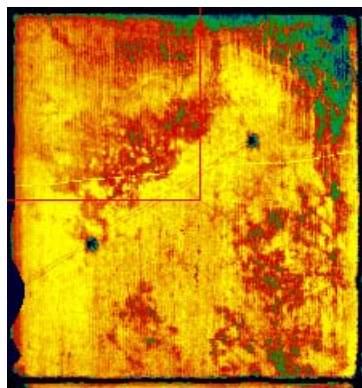
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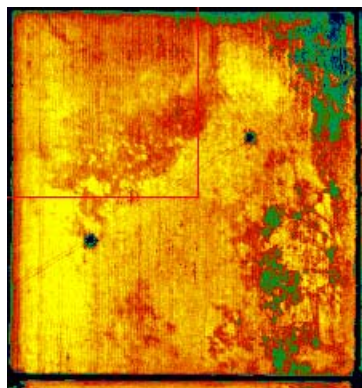
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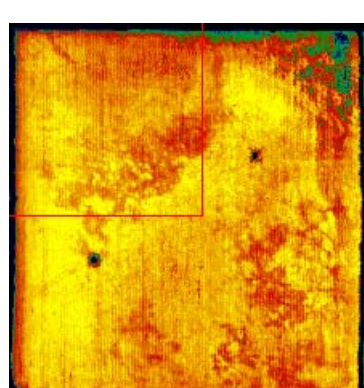
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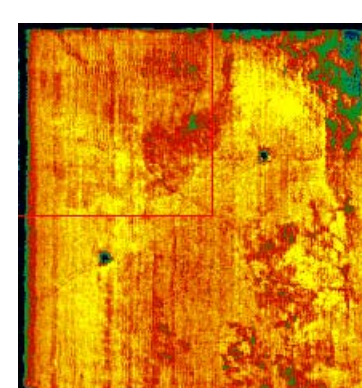
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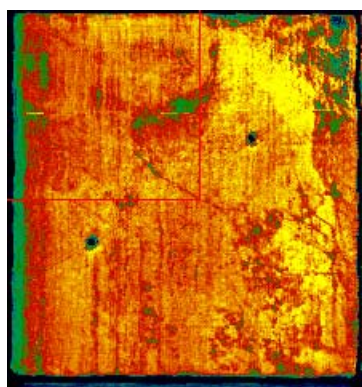
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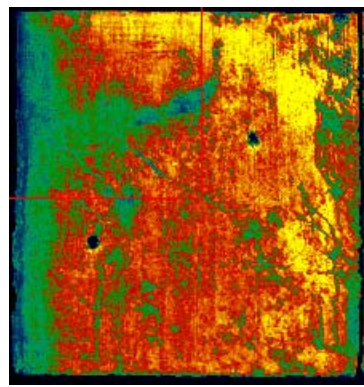
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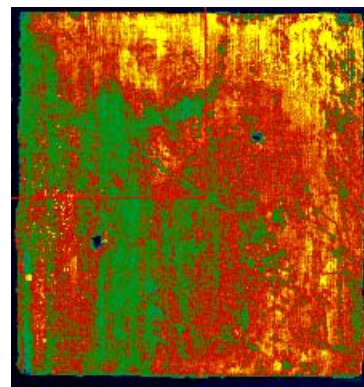
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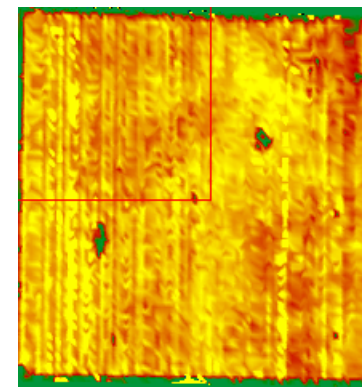
09/27



10/11



10/17



YIELD MAP

Zarco-
Tejada
& Ustin,
Unpubl.

VQ2 overarching question:

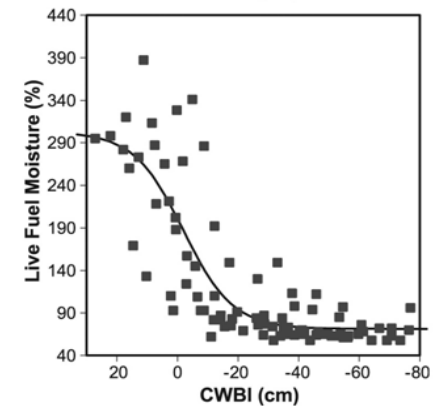
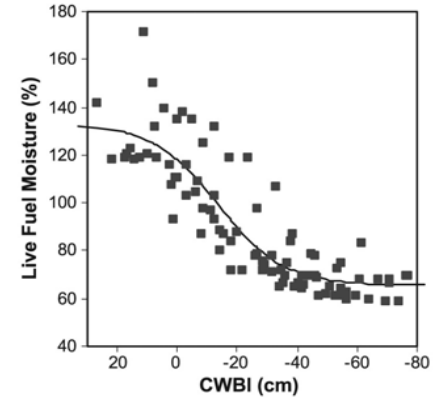
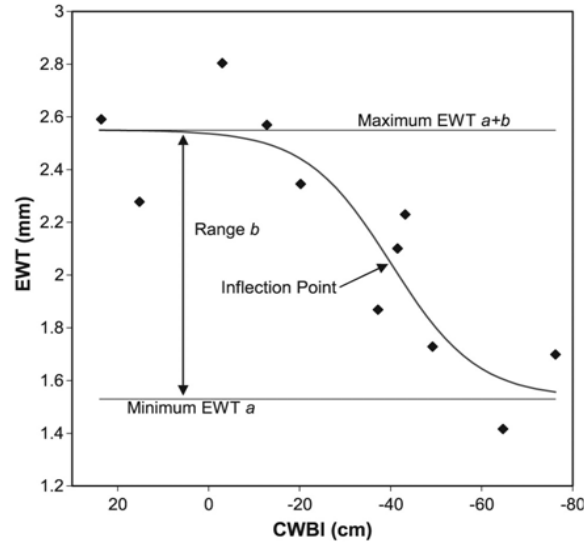
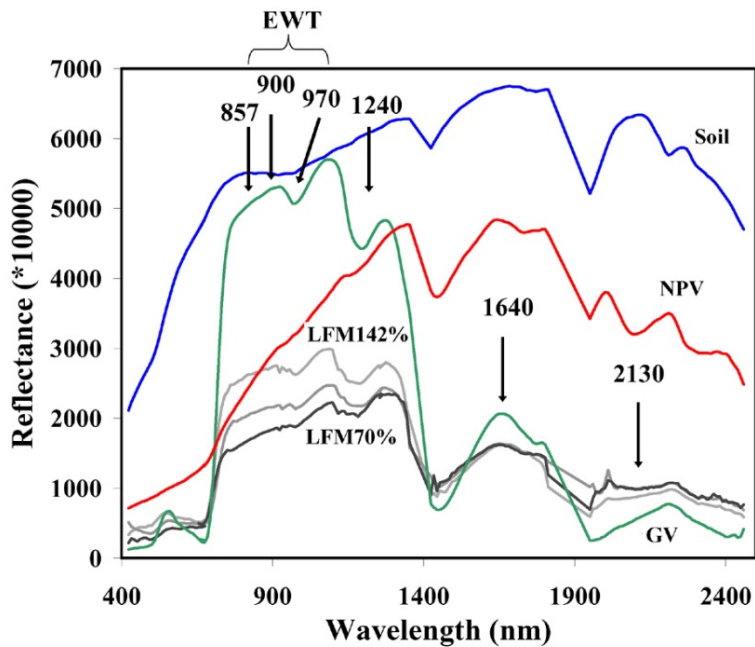
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VQ2 Subquestion #5:

- How do environmental stresses affect the seasonality of physiological function of water and carbon exchanges within ecosystems? [DS 203, 206, 210]

Canopy Water Stress



The dominant control on plant growth in Mediterranean ecosystems is water. Water stress decreases live fuel moisture and increases fire danger.

Dennison et al., 2003
Roberts et al., 2006

Chuvieco et al. 2002

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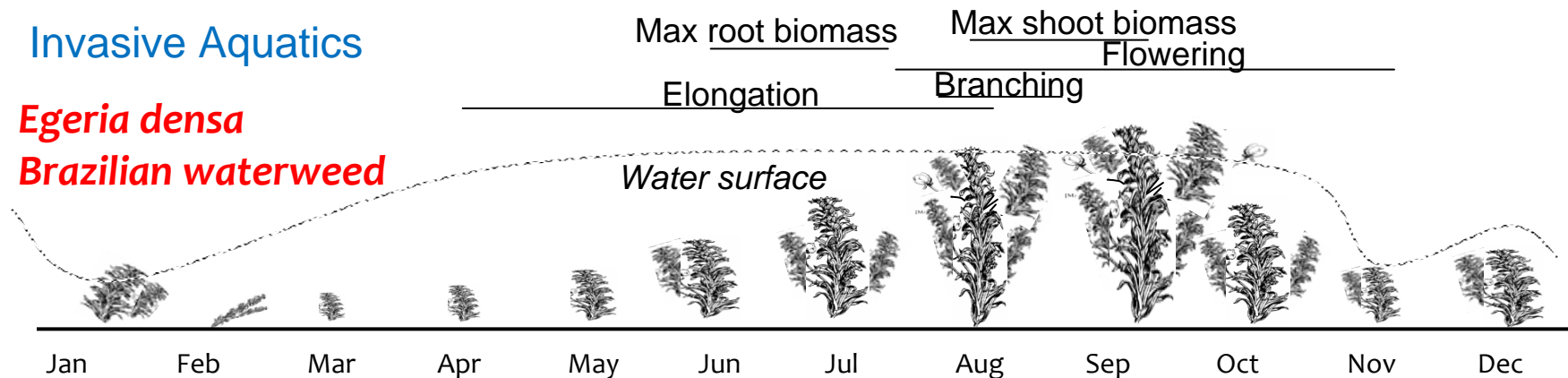
Not for Distribution

VQ2 Subquestion #6:

- What is the seasonality and environmental impact of algal blooms in shallow water environments? [DS 201, 208]

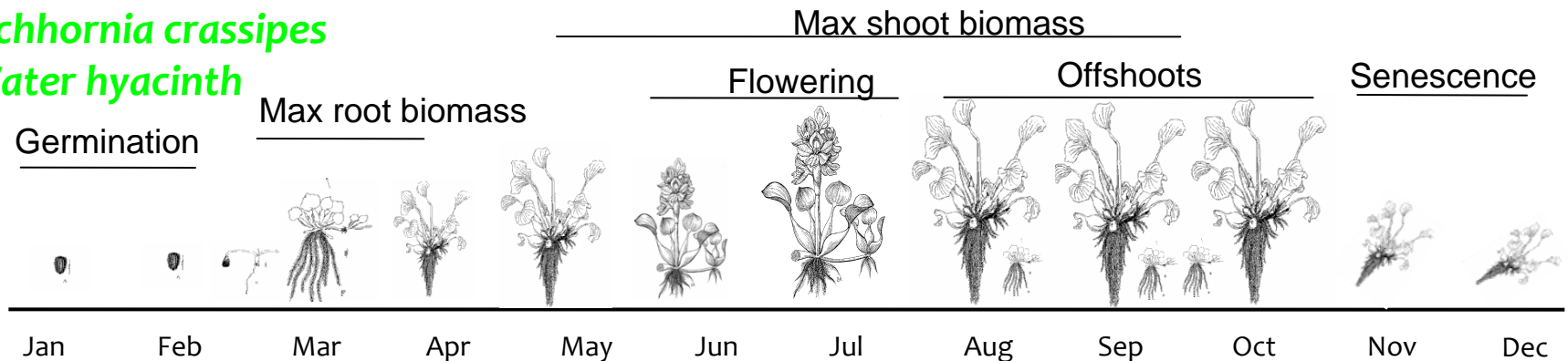
Invasive Aquatics

Egeria densa
Brazilian waterweed



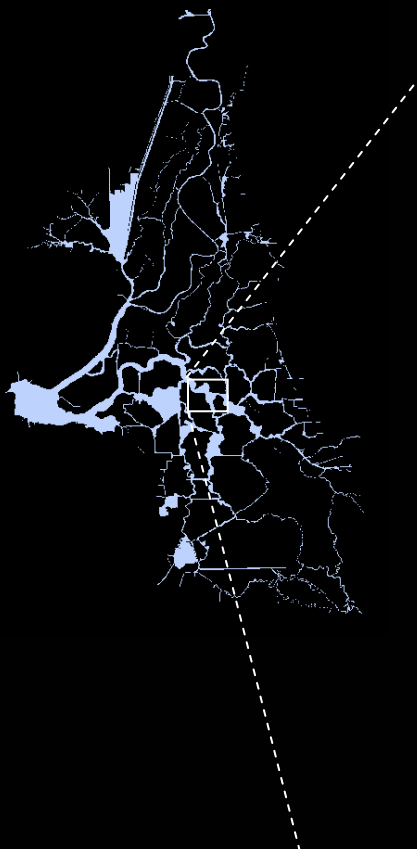
Eichhornia crassipes

Water hyacinth



Monitoring Invasive Aquatic Weeds

Venice cut. Sacramento Delta

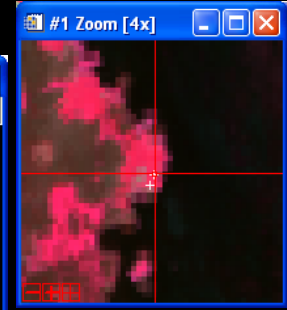
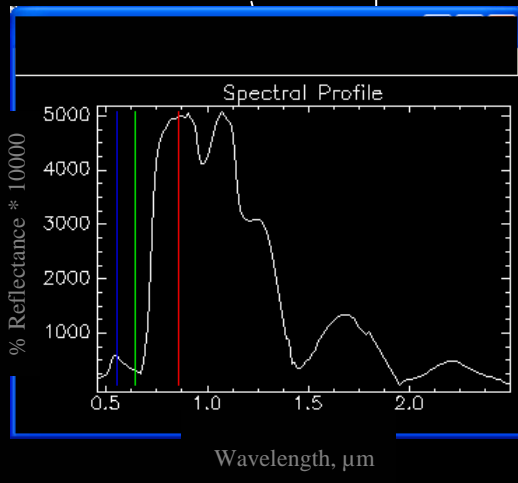
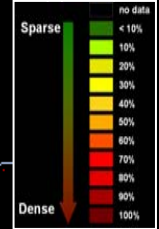
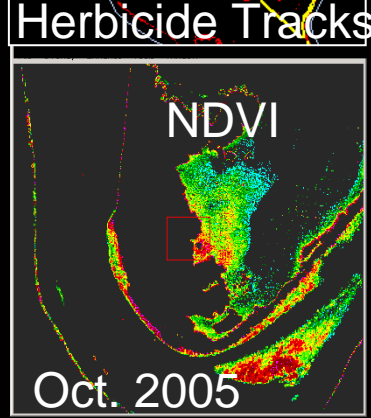
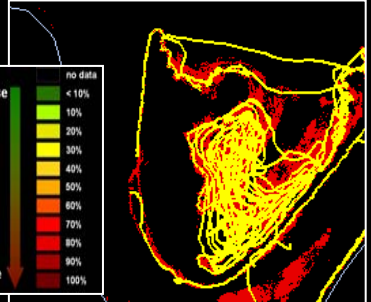
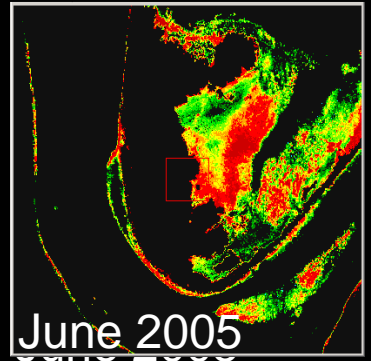


Field data points

LIFEFORM

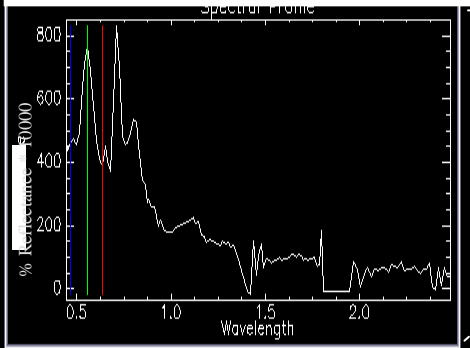
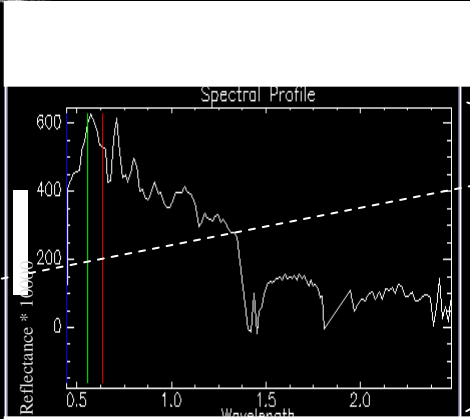
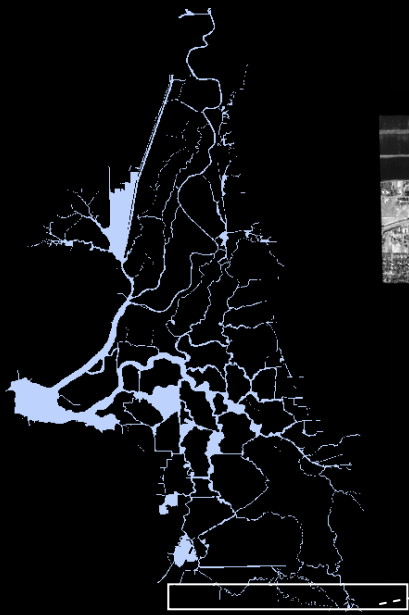
- G SAV emergent
- G water
- Hyacinth 2006
- SAV
- waterways

00.51 2 3 4 Km

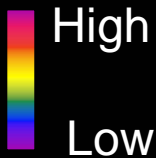


June 2005
SAV
Presence

Identifying toxic algal blooms



Relative concentration



Microcystis bloom density

Microcystis presence/absence