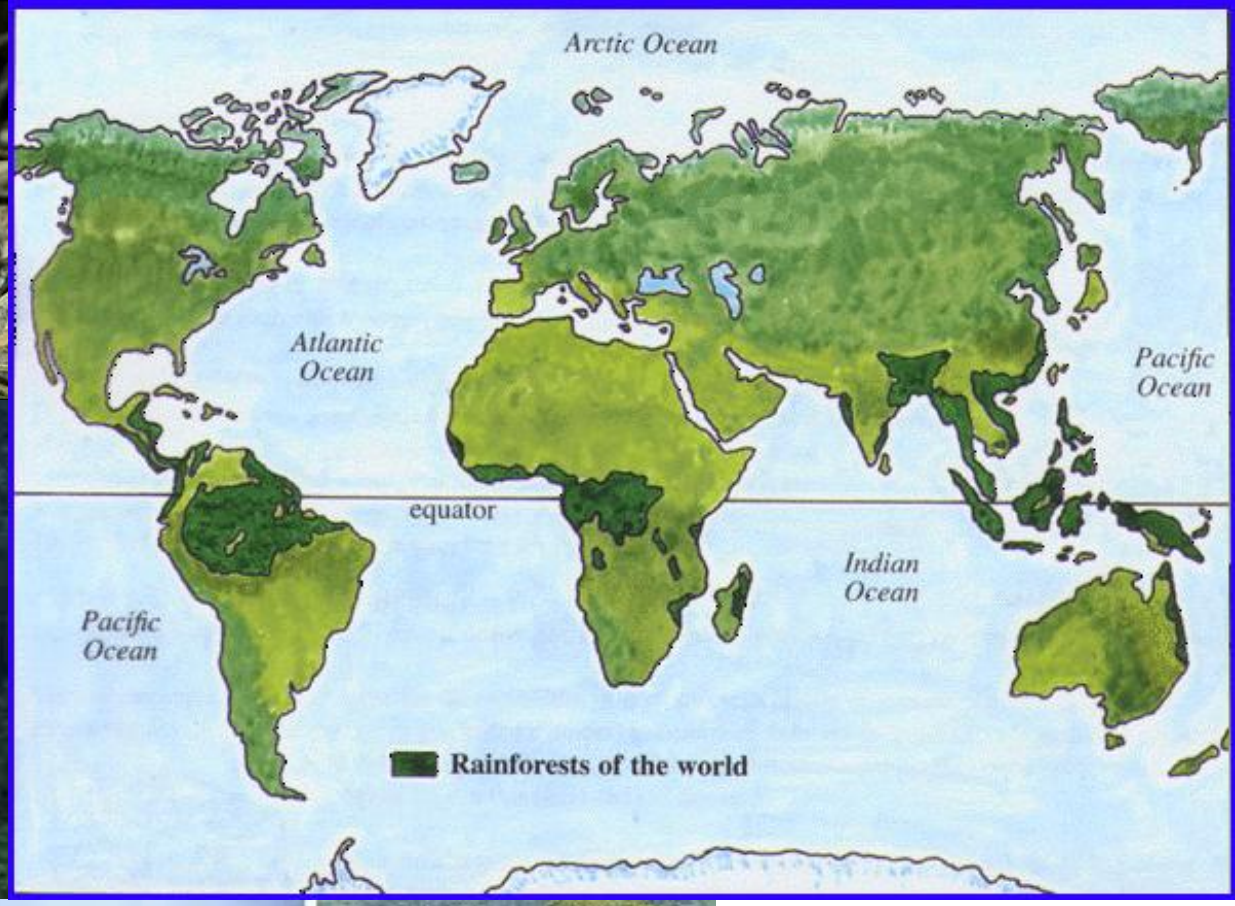
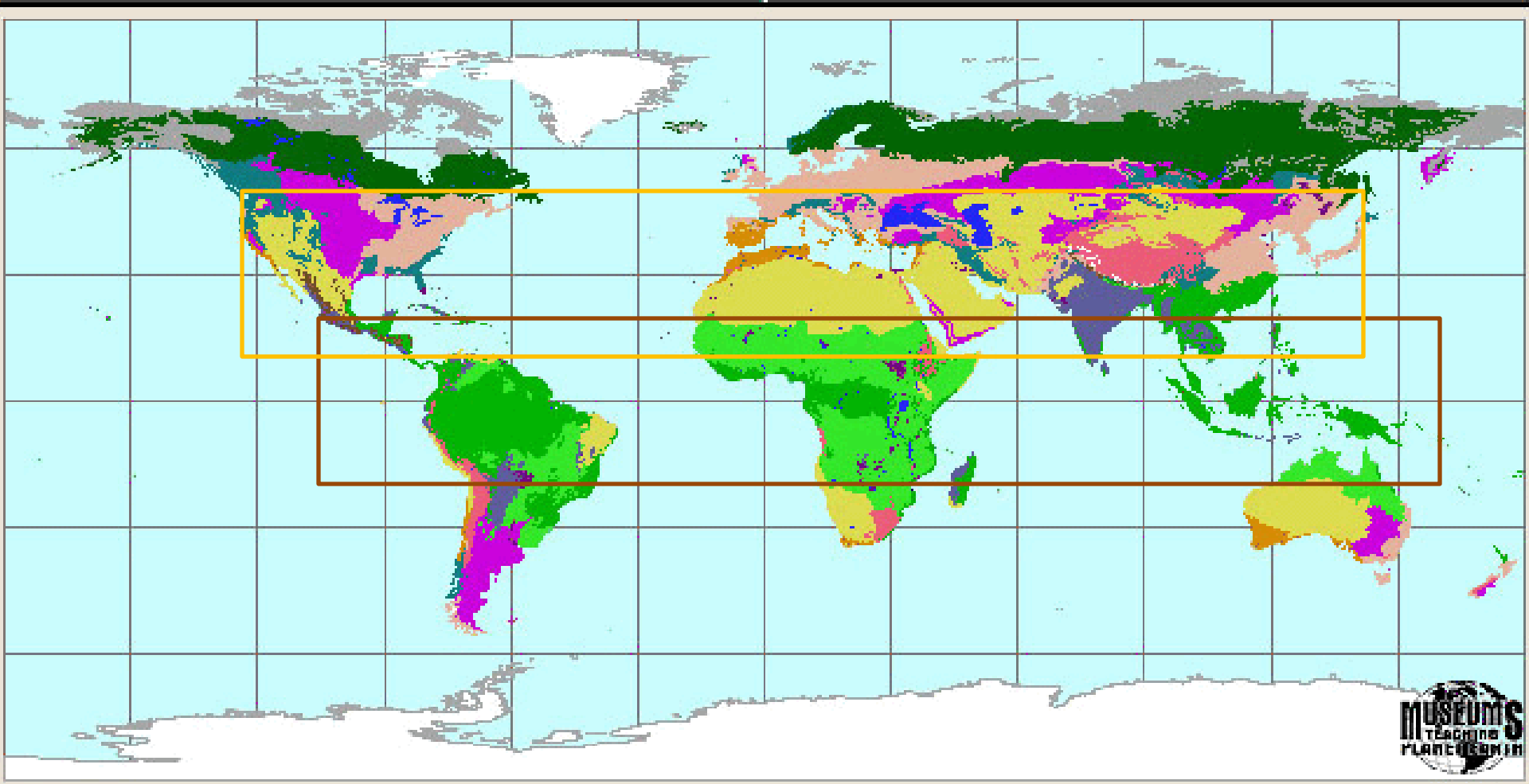
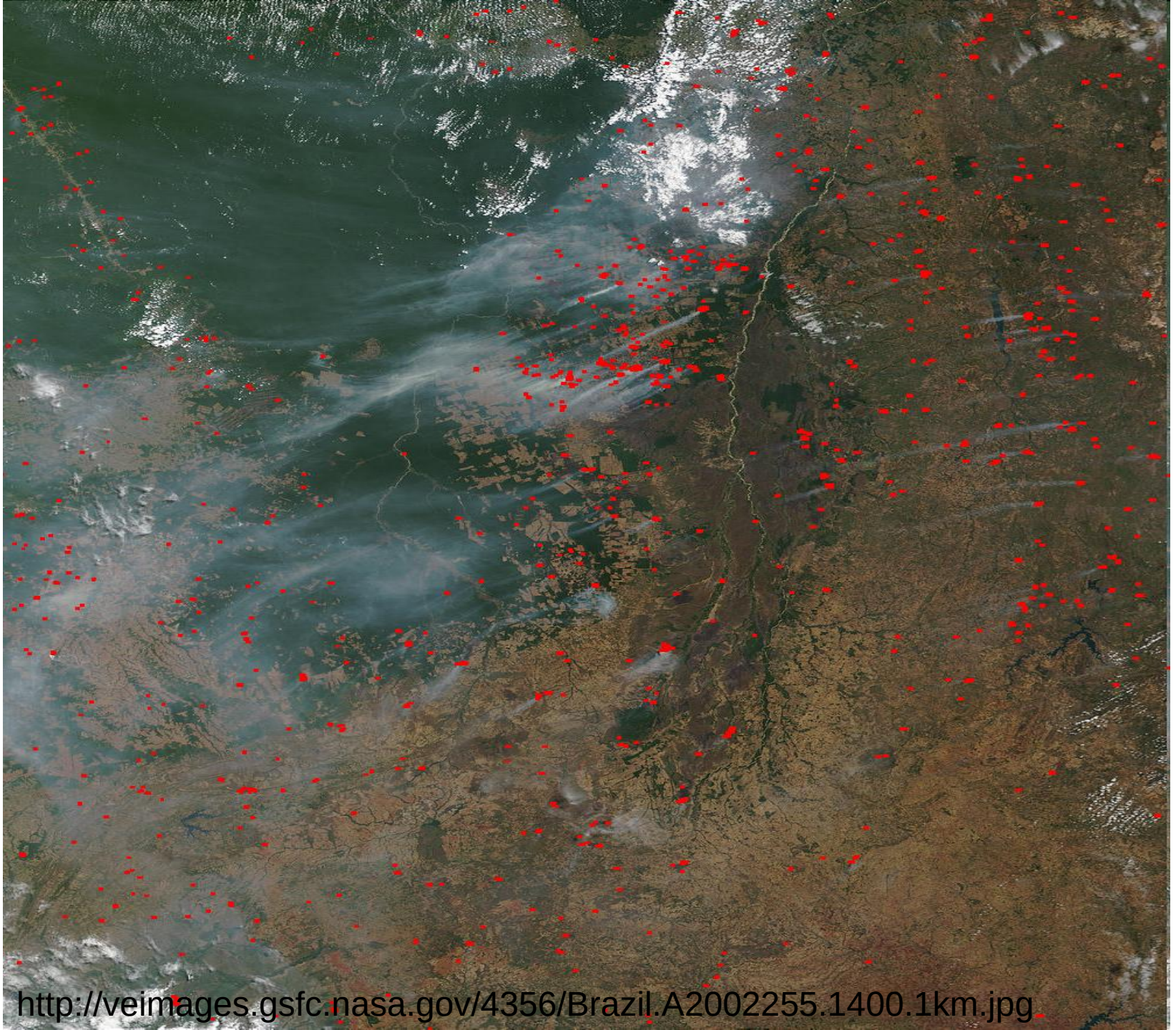
4.7 Fire in tropical forests and deserts

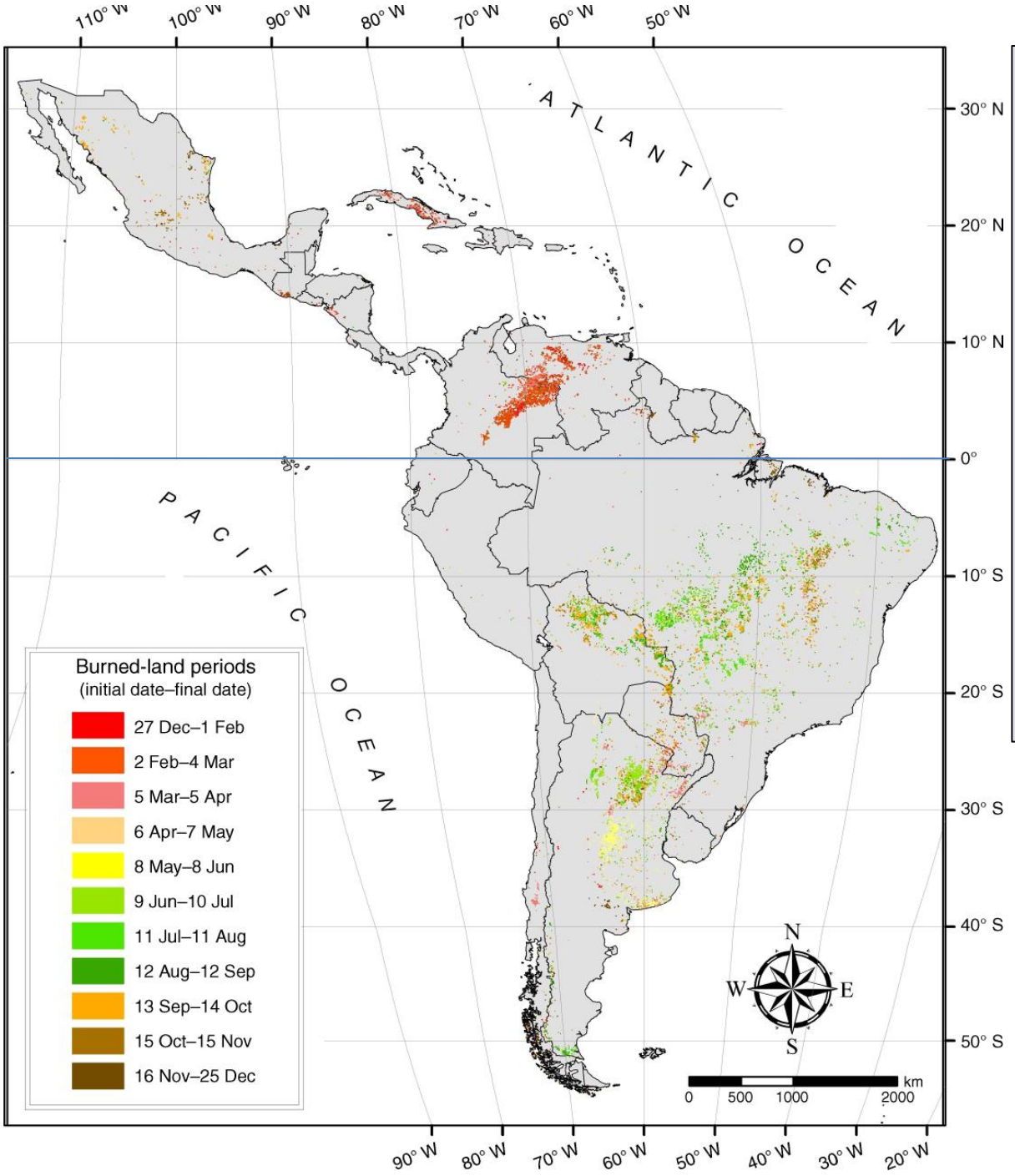
Fire in tropical forests




Earth's Biomes
Boreal forests/taigas
Deserts and xeric shrublands
Flooded grasslands
Mangroves
Mediterranean scrub
Montane grasslands
Snow, ice, glaciers, and rock
Temperate broadleaf and mixed forests
Temperate coniferous forests
Temperate grasslands, savannas, and shrublands
Tropical and subtropical coniferous forests
Tropical and subtropical dry broadleaf forests
Tropical and subtropical grasslands, savannas, and shrublands
Tropical and subtropical moist broadleaf forests
Tundra
Inland Water
earth.rice.edu



http://veimages.gsfc.nasa.gov/4356/Brazil.A2002255.1400.1km.jpg

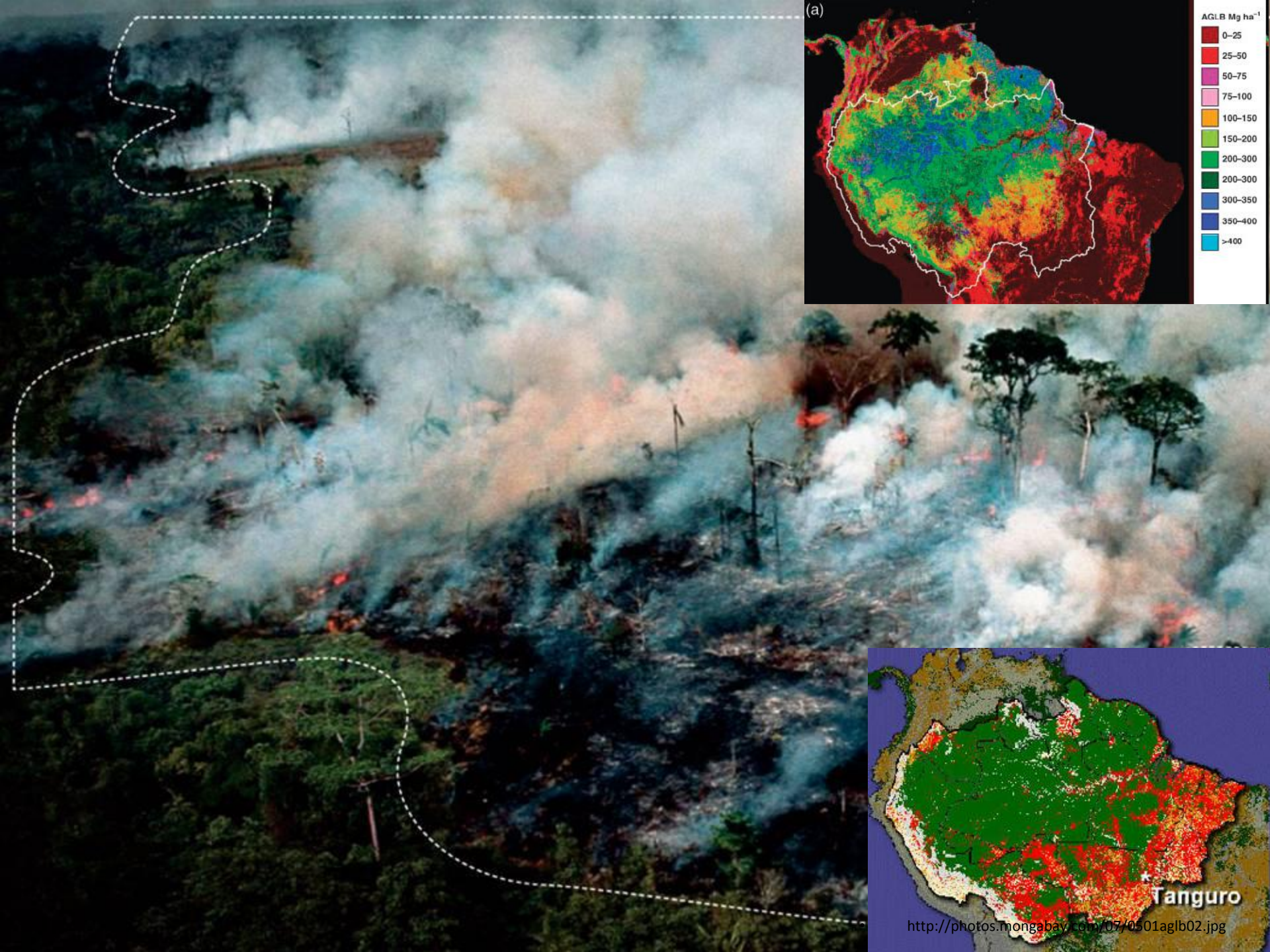


Remote sensing (MODIS) used to estimate burned area in South America during 2004

Total burned area for the entire year was estimated to be 153,215 km^2

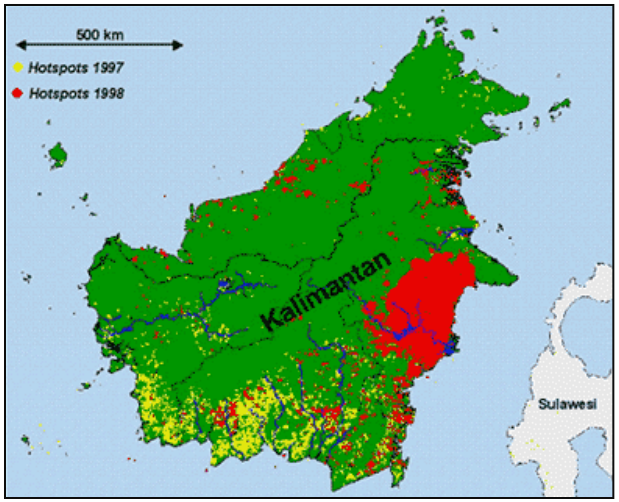
Note the interesting geographic patterns in fire season

Chuvieco et al. (2008)


(a)
AGLB Mg ha^{-1}
0–25
25–50
50–75
75–100
100–150
150–200
200–300
200–300
300–350
350–400
>400
Tanguro
http://photos.mongabay.com/07/0501aglb02.jpg


Many fires in tropical forests are set by people, to clear land for agriculture
mongabay.com

Indonesia fires 1997-8



"…one of the worst man made environmental disasters ever observed in SE-Asia. Fires started by men and driven by the exceptional El- Niño event evolved into uncontrolled wildfires which destroyed huge areas of rainforest and bush land. A cloud of noxious yellow grey haze covered SE-Asia for months extending more than 4000km from east to west and 3000km north to south. Economic damage due to smoke alone was estimated to more than 1.4 billion US$. Release of carbon dioxide amounted 22-33% of the world´s carbon dioxide for one year. Fires raged on all major islands, Borneo, Sumatra and Irian Jaya. The total burnt area was 9.7 Million hectares."

http://www.rssgmbh.de/ESA%20Fire/Methods/index_meth.html

Image: www.miradorbasin.com

(Unintended?) consequences?

"In East Kalimantan hundreds of Orang Utans were driven out of the forests by the fire. As they sought for food in agricultural fields and plantations adults were killed while infants were sold as pets."

Melaleuca and Fire

An invasive tree changes the fire regime in Florida

Michael Weston
Senior Forester
Florida Division of Forestry

Conversion of coastal palmetto savannahs to subtropical forest

Melaleuca adaptations to fire

- Epicormic sprouts
  - Dormant buds-weeks
- Growth from roots/root collar
- Prolific seeding
  - Delayed to survive fire
- Seed germination on mineral soil

Fire behavior in *Melaleuca* stands

- Thick, papery bark (2-3 inches thick)
  - Protects tree
  - Conducts fire to crown

- Volatile oils in crown
  - Supports crown fire in dense stands

- Spotting
  - Airborne pieces of burning bark, debris
  - 2 mile maximum, 1 mile normal
  - Ignition source for more fuel/buildings
  - Big problem with damaged buildings

Melaleuca is now additional carrier of fire

Higher fuel height, more mass

- Grows faster
- More volatile
- Connects palmetto understory to fire-sensitive pine overstory

Normal fuel height

The *Melaleuca* fire regime

- Thick, black smoke
  - Respiratory problems
  - Low visibility
    - Interferes with auto, air travel

- Low mortality after intense fire allows stands to grow again quickly, and increase density.
  - Other plants destroyed or heavily set back.
  - Epicormic branches (flowers)
  - Use of existing roots

- Suppression is difficult and dangerous.
  - Dense stands limit equipment movement
    - FF's stay on side of caution
  - *Melaleuca* fuels require little pre-heating time.
  - Moves with the wind (speed).

The Impact of Melaleuca Stand Fires

Spotting

Spotting advances fire, complicates suppression attempts


▪ Pines died within 6 months of fire
▪ *Melaleuca* survived

The aftermath: 6 months later

Regrowth: A carpet of *Melaleuca* seedlings

What about deserts?

Historically, what factor would have limited fire in deserts?

Why aren't desert species adapted to fire?

- Fuel continuity and mass very limiting (always dry enough)
- Low productivity system
- Invasive species are filling in those open spaces and allowing fire to spread
- Main adaptations are to drought; fire would make species less competitive in most years

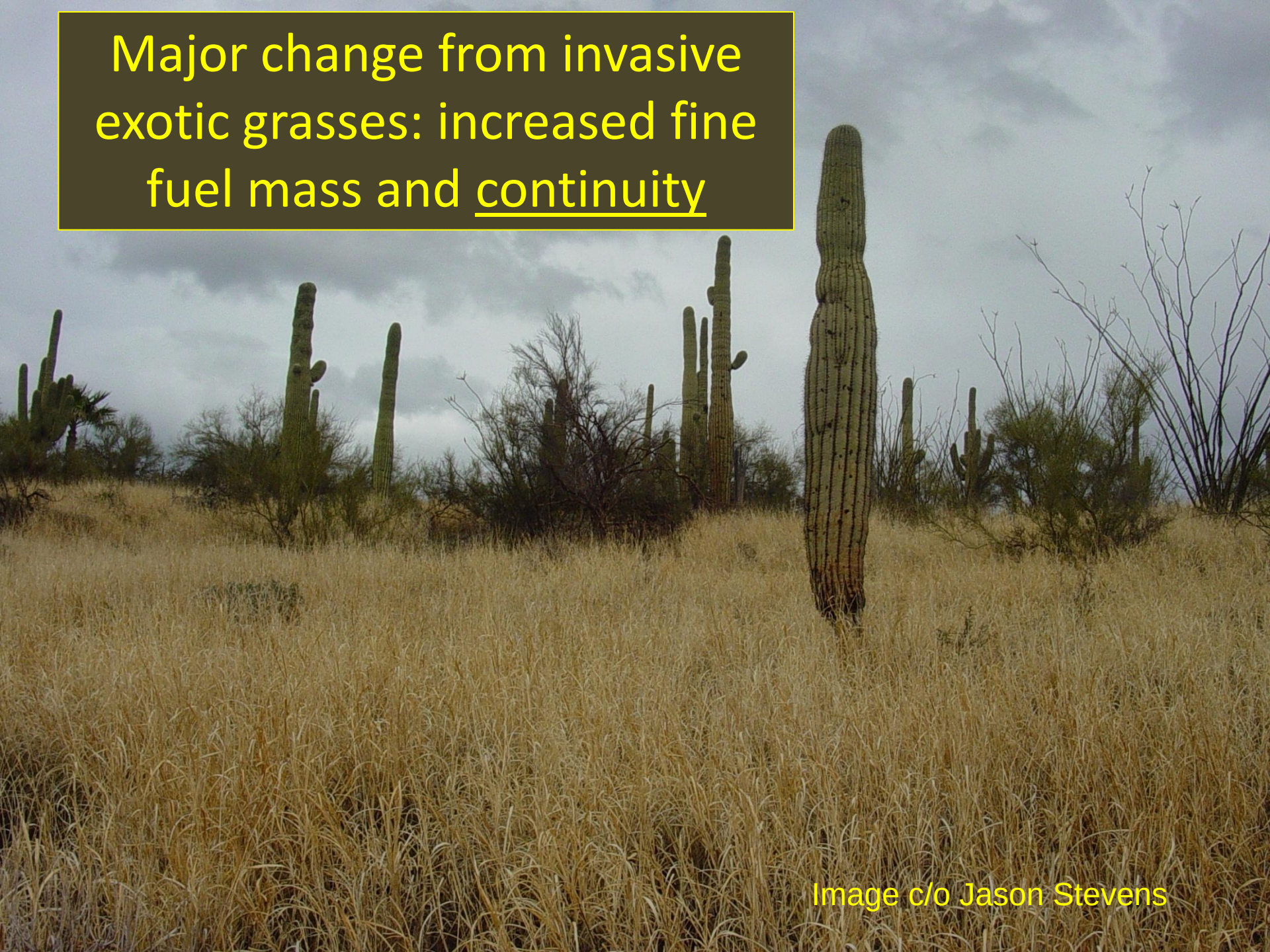

Major change from invasive exotic grasses: increased fine fuel mass and continuity
Image c/o Jason Stevens

Image: USGS

Unit 4 Quiz (fire regimes) Wednesday!

- Review lectures, notes, readings
- Be prepared to think about fire regimes, not just regurgitate

Post Hurricane Charley