Reducing Risks in Agriculture: Adapting to Seasonal Climate Variability

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Agricultural and Biological Engineering
University of Florida

CAMI – Pest and Disease Modeling
April 4–5, 2011
Barbados




Outline

- Quick introduction to Florida's climate and agriculture
- Drivers of climate variability in Florida
- Impacts of climate variability on Florida's agricultural industry
- Strategic versus tactical decisions: Adapting to seasonal climate variability
- Introduction to AgroClimate
- Exercises
- Our vision for the future of the University of Florida Climate Extension program

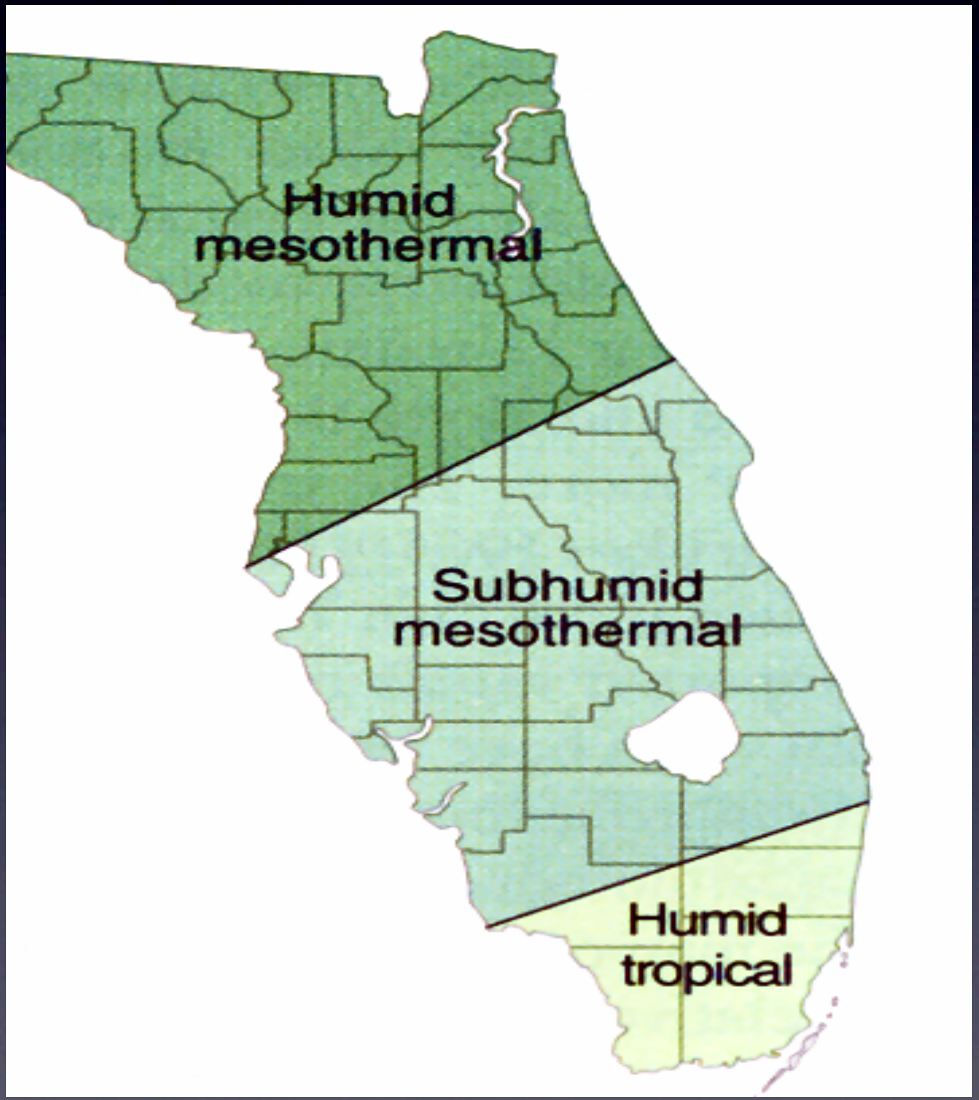
Florida

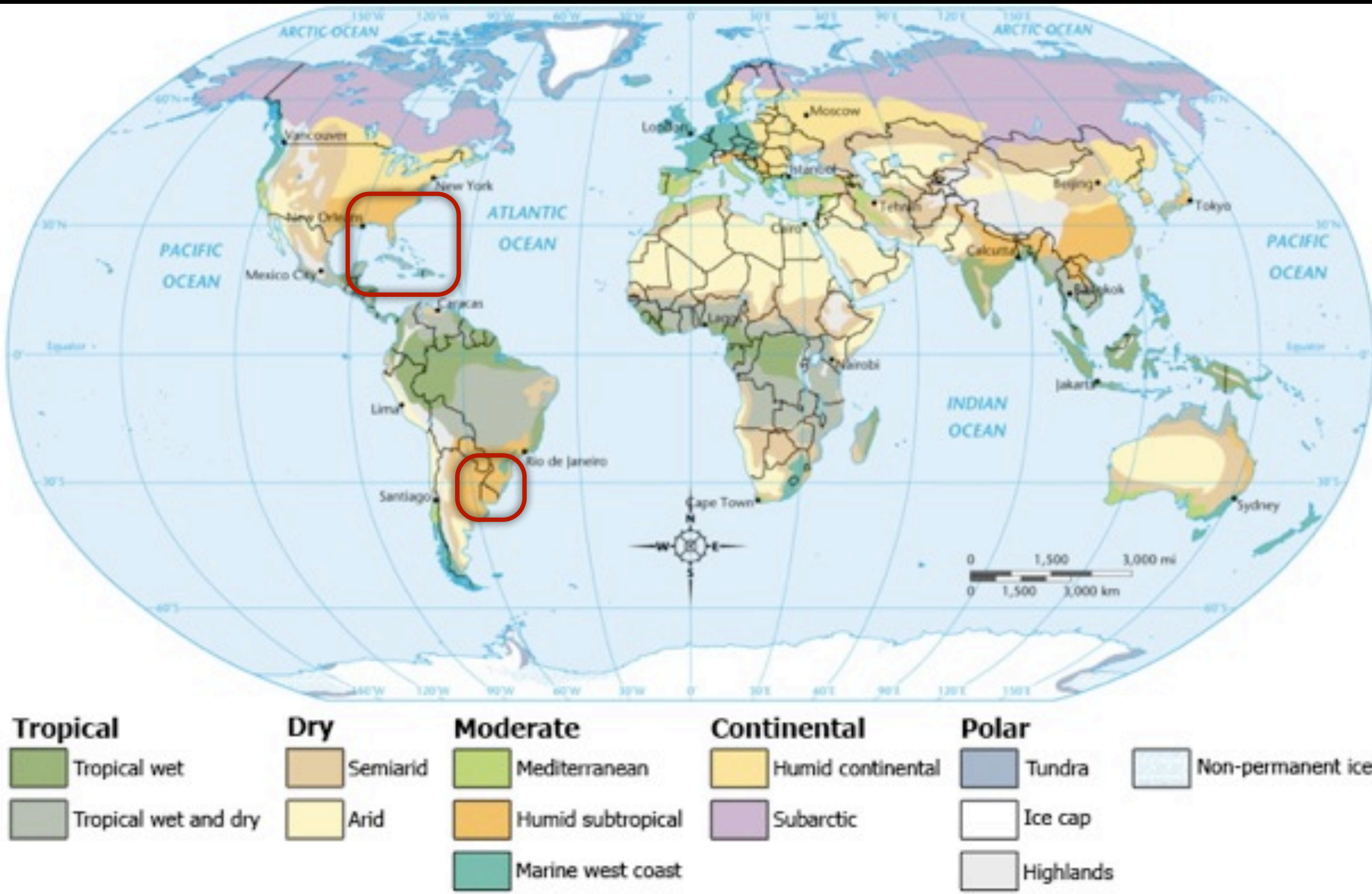
Area: 151,670 km^2
Population: ~17 M
Latitude: 25-30 N
Longitude: 80-87 W
Elevation: 0-105 m

Barbados
Lat: 13N - Long: 59W

Climate of Florida

- Humid subtropical, with hot and humid summers, mild winters
- Southern portion more like a tropical savannah with well defined wet and dry seasons
- A good analog is southern Brazil, South Africa



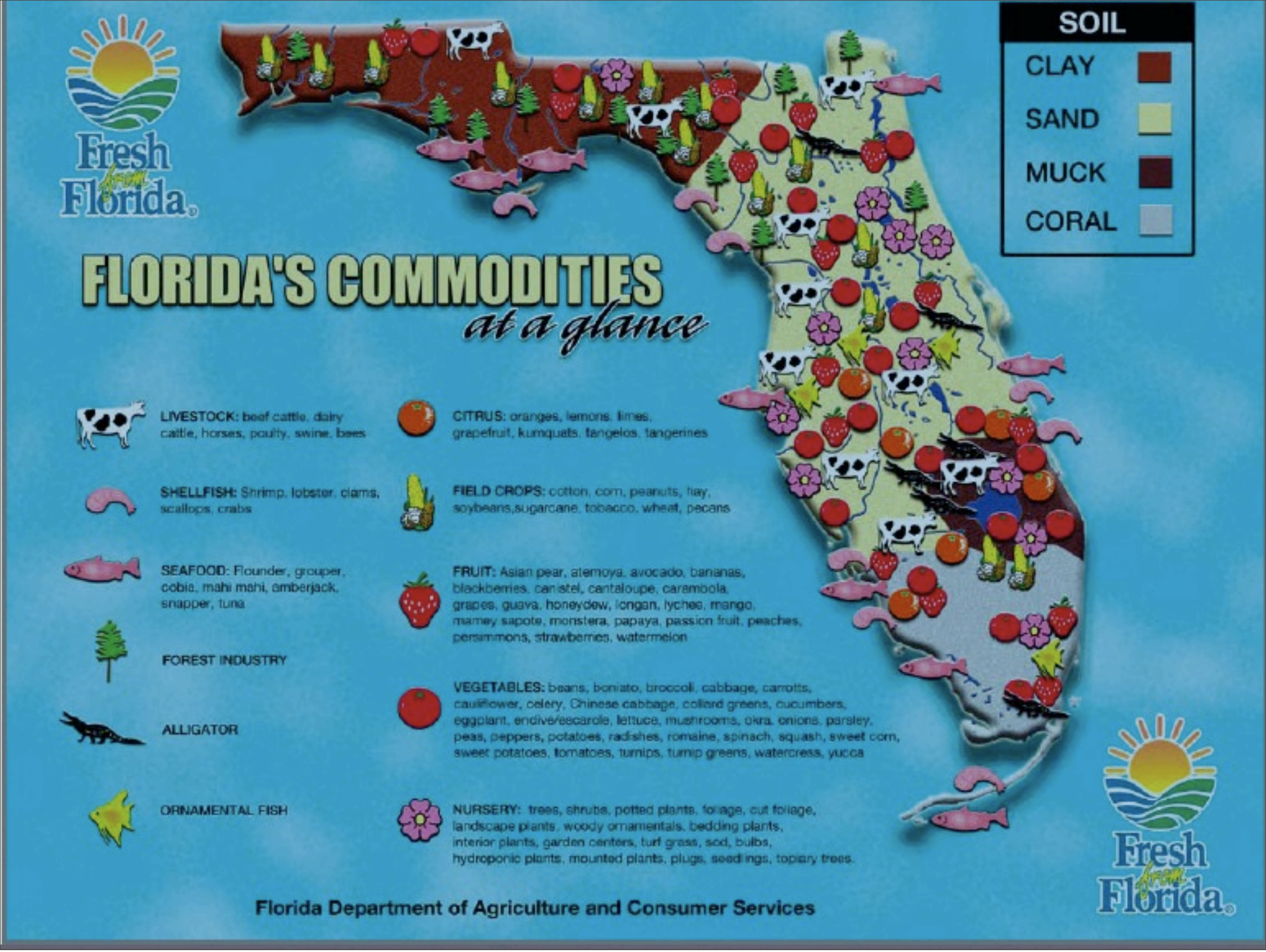

ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
INDIAN OCEAN
Vancouver
New York
New Orleans
Mexico City
Caracas
Lima
Rio de Janeiro
Santiago
London
Moscow
Istanbul
Tehran
Cairo
Lagos
Nairobi
Cape Town
Beijing
Tokyo
Calcutta
Bangkok
Jakarta
Sydney
Tropical
Tropical wet
Tropical wet and dry
Dry
Semiarid
Arid
Moderate
Mediterranean
Humid subtropical
Marine west coast
Continental
Humid continental
Subarctic
Polar
Tundra
Ice cap
Highlands
Non-permanent ice

Climate: Florida's most important physical resource!

- Monthly average temperature:
  - Min: 10-20 C
  - Max: 27-30 C
- Average rainfall: 1300-1500 mm
- Mild winters have turned to great advantage since most of the state is covered by infertile sandy soils!

Agribusiness in Florida (Census 2008)

- 47,500 commercial farms
- Florida ranked first in the U.S. in the value of production of oranges, grapefruit, tangerines, sugarcane, squash, watermelons, sweet corn, fresh-market snap beans, fresh-market tomatoes, and fresh-market cucumbers
- Florida ranked second in the value of production of strawberries, bell peppers, and cucumbers


SOIL
CLAY
SAND
MUCK
CORAL
Fresh from Florida
FLORIDA'S COMMODITIES
at a glance
LIVESTOCK: beef cattle, dairy cattle, horses, poultry, swine, bees
CITRUS: oranges, lemons, limes, grapefruit, kumquats, tangelos, tangerines
SHELLFISH: Shrimp, lobster, clams, scallops, crabs
FIELD CROPS: cotton, corn, peanuts, hay, soybeans,sugarcane, tobacco, wheat, pecans
SEAFOOD: Flounder, grouper, cobia, mahi mahi, amberjack, snapper, tuna
FRUIT: Asian pear, atemoya, avocado, bananas, blackberries, canistel, cantaloupe, carambola, grapes, guava, honeydew, longan, lychee, mango, mamey sapote, monstera, papaya, passion fruit, peaches, persimmons, strawberries, watermelon
FOREST INDUSTRY
VEGETABLES: beans, boniato, broccoli, cabbage, carrotts, cauliflower, celery, Chinese cabbage, collard greens, cucumbers, eggplant, endive/escarole, lettuce, mushrooms, okra, onions, parsley, peas, peppers, potatoes, radishes, romaine, spinach, squash, sweet corn, sweet potatoes, tomatoes, turnips, turnip greens, watercress, yucca
ALLIGATOR
ORNAMENTAL FISH
NURSERY: trees, shrubs, potted plants, foliage, cut foliage, landscape plants, woody ornamentals, bedding plants, interior plants, garden centers, turf grass, sod, bulbs, hydroponic plants, mounted plants, plugs, seedlings, topiary trees.
Florida Department of Agriculture and Consumer Services
Fresh from Florida

Climate Variability in the Southeast U.S.A.

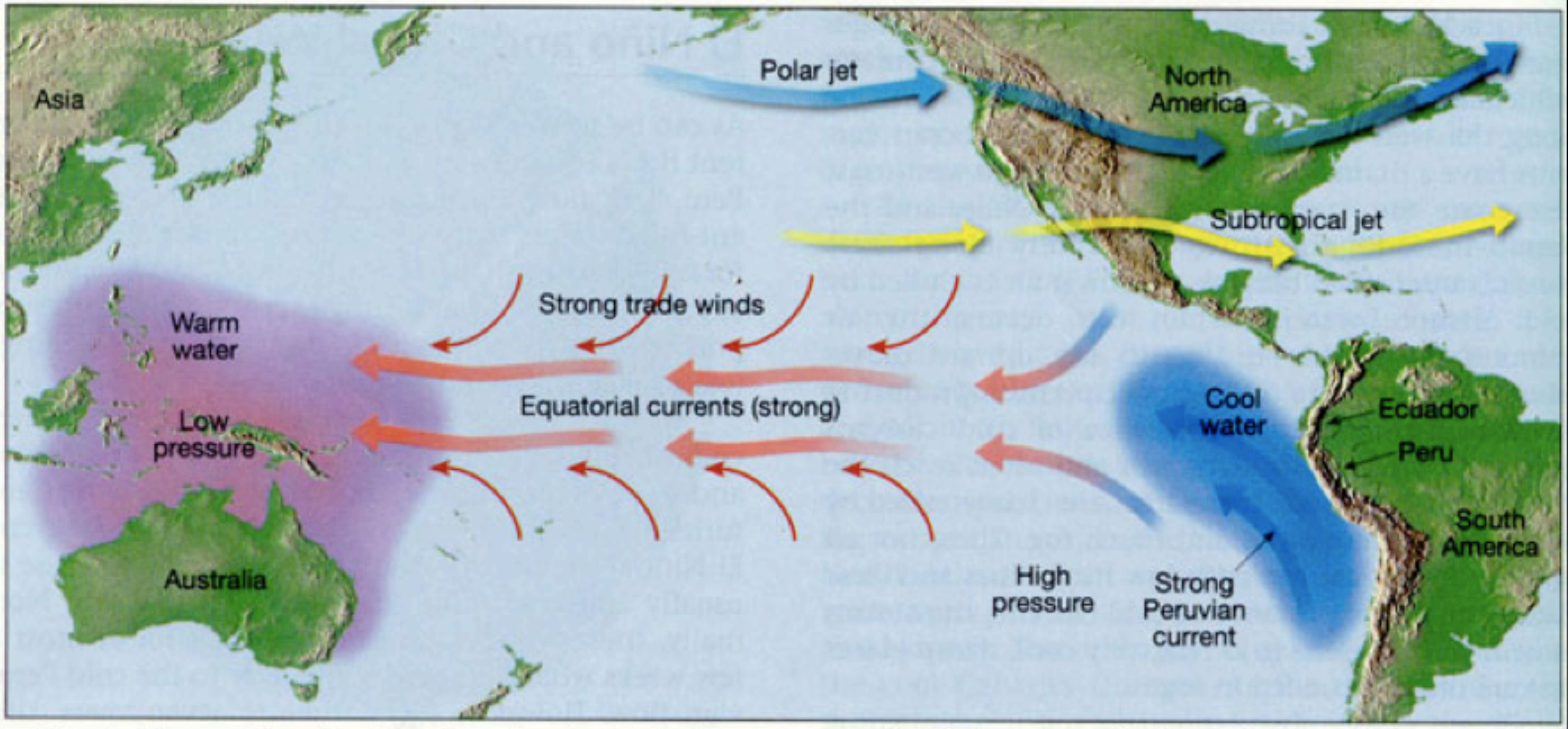
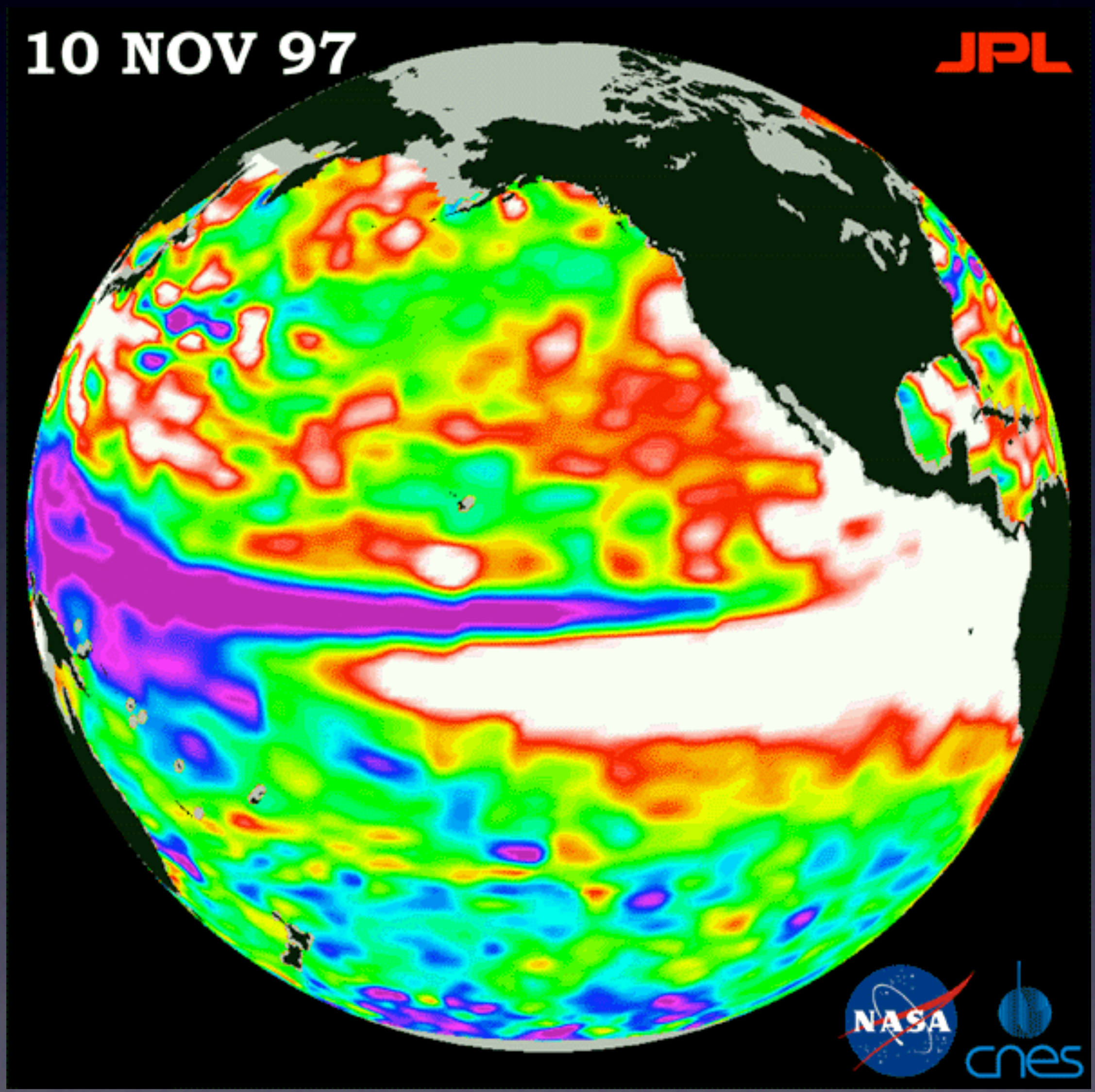


Fig.6 Normally, the trade winds and strong equatorial currents flow toward the west. At the same time, an intense Peruvian current causes upwelling of cold water along the west coast of South America.

Normal Conditions in the Tropical Pacific Ocean

El Niño - Southern Oscillation (ENSO)

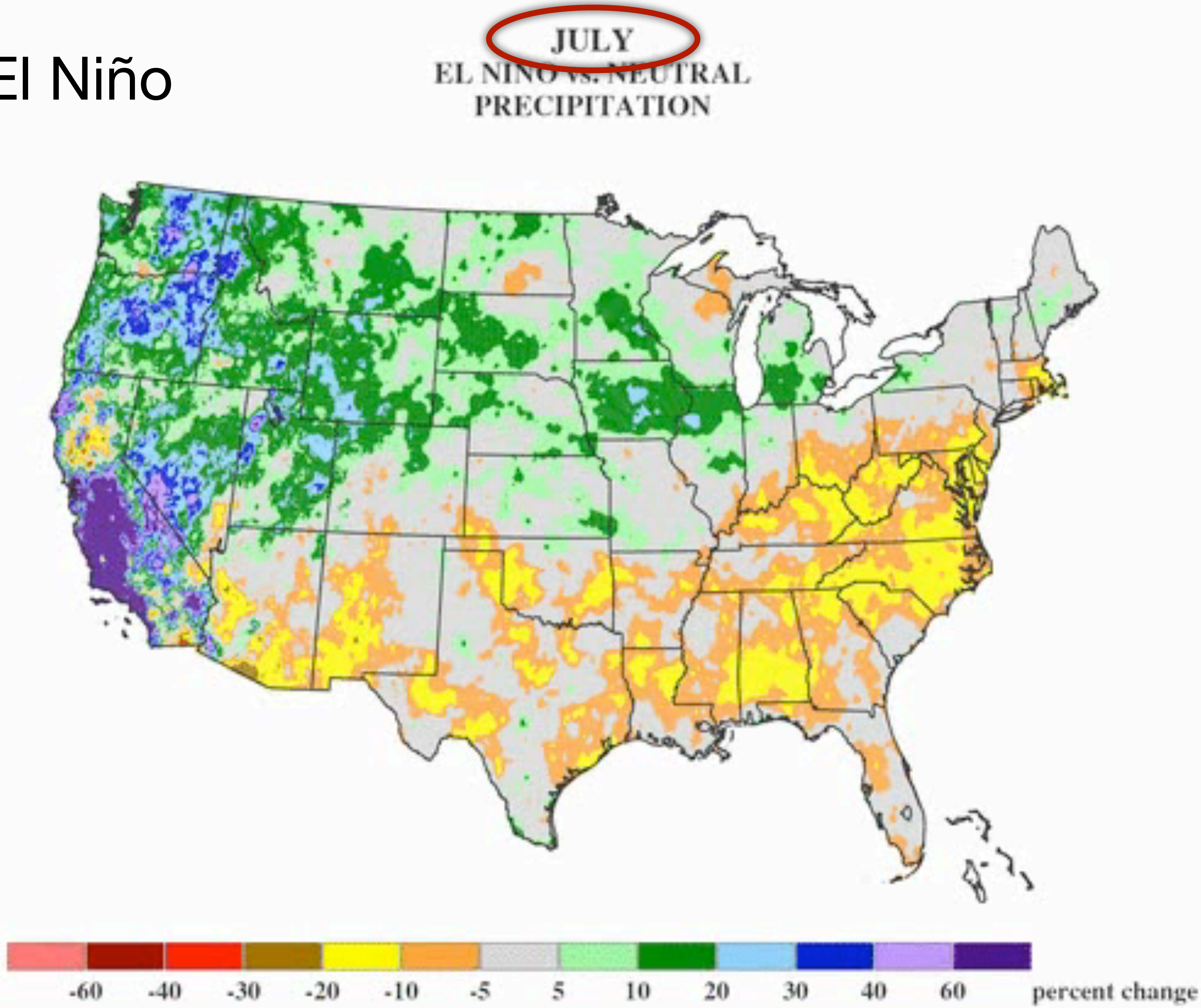
The El Niño / La Niña cycle is the predominant mode of year to year climate variability in the Southeast U.S.



El Niño

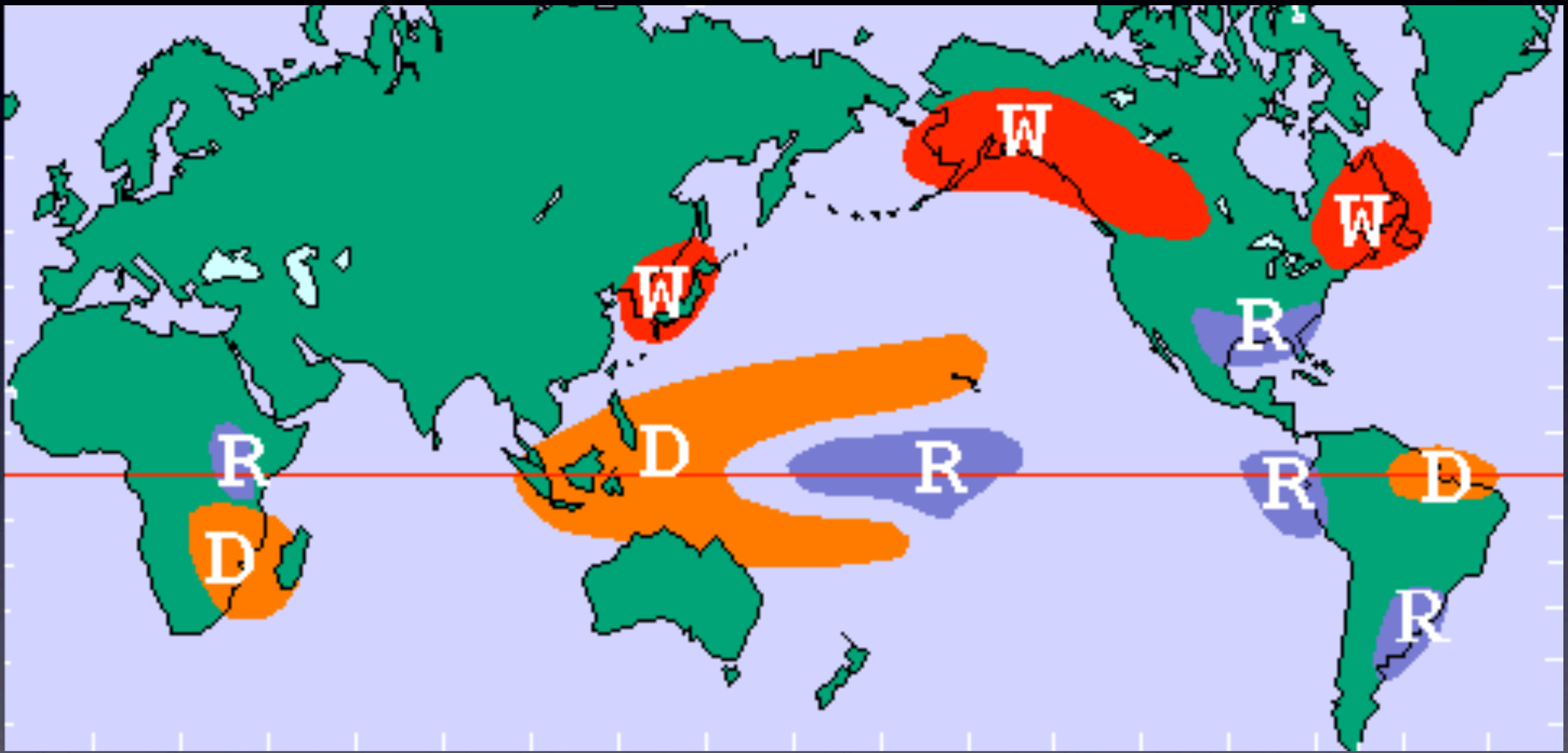
- Warmer than normal sea surface temperature (SST) across the eastern tropical Pacific
- Wetter and cooler winter and springs in the Southeast U.S.
- Fewer Atlantic hurricanes

El Niño



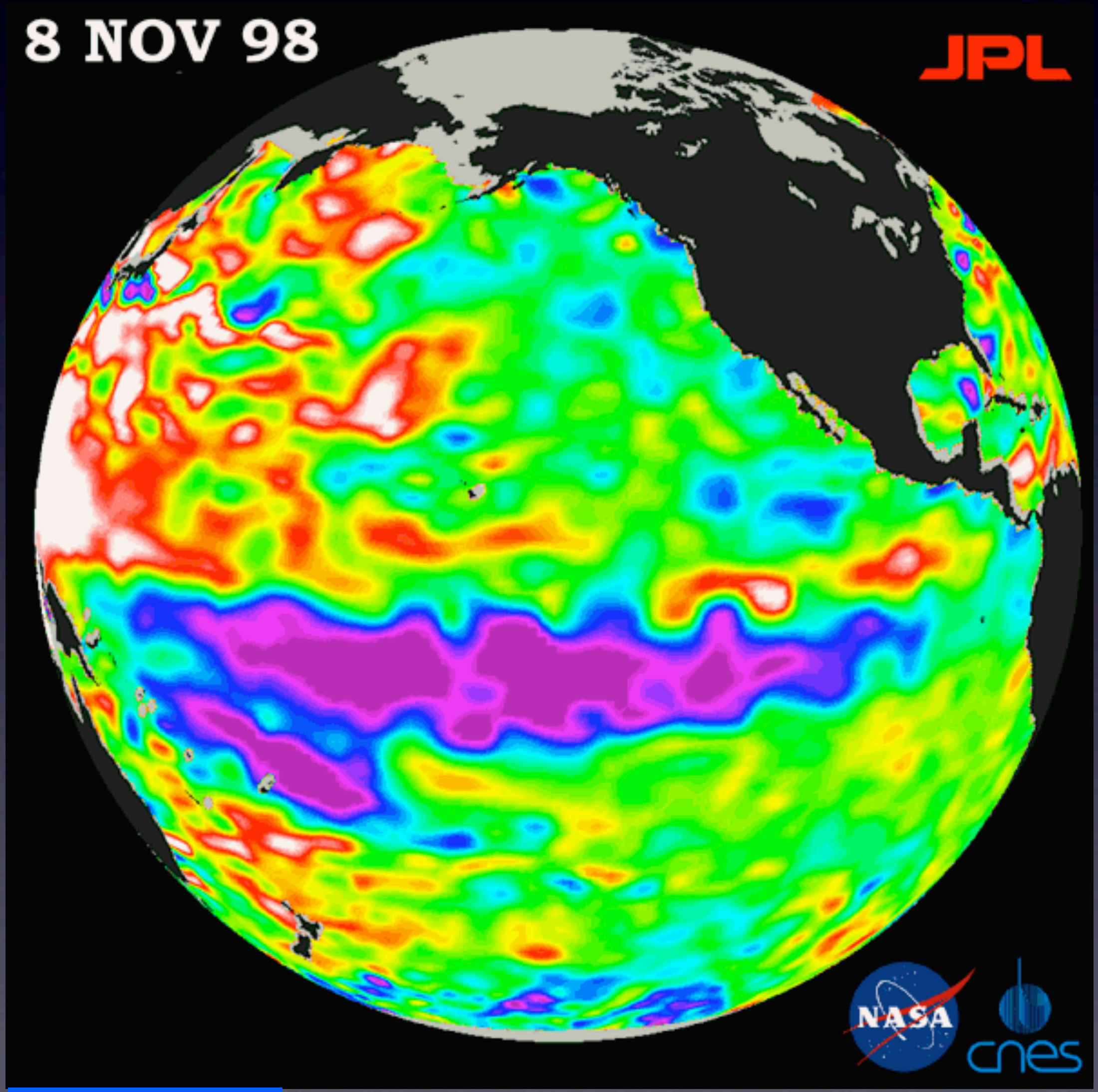
JULY
EL NINO vs. NEUTRAL
PRECIPITATION
-60
-40
-30
-20
-10
-5
5
10
20
30
40
60
percent change

El Niño - Global impacts



Source: Sustainable Development Department
UN - Food and Agriculture Organization (FAO)

Climate Variability in the SE
La Niña

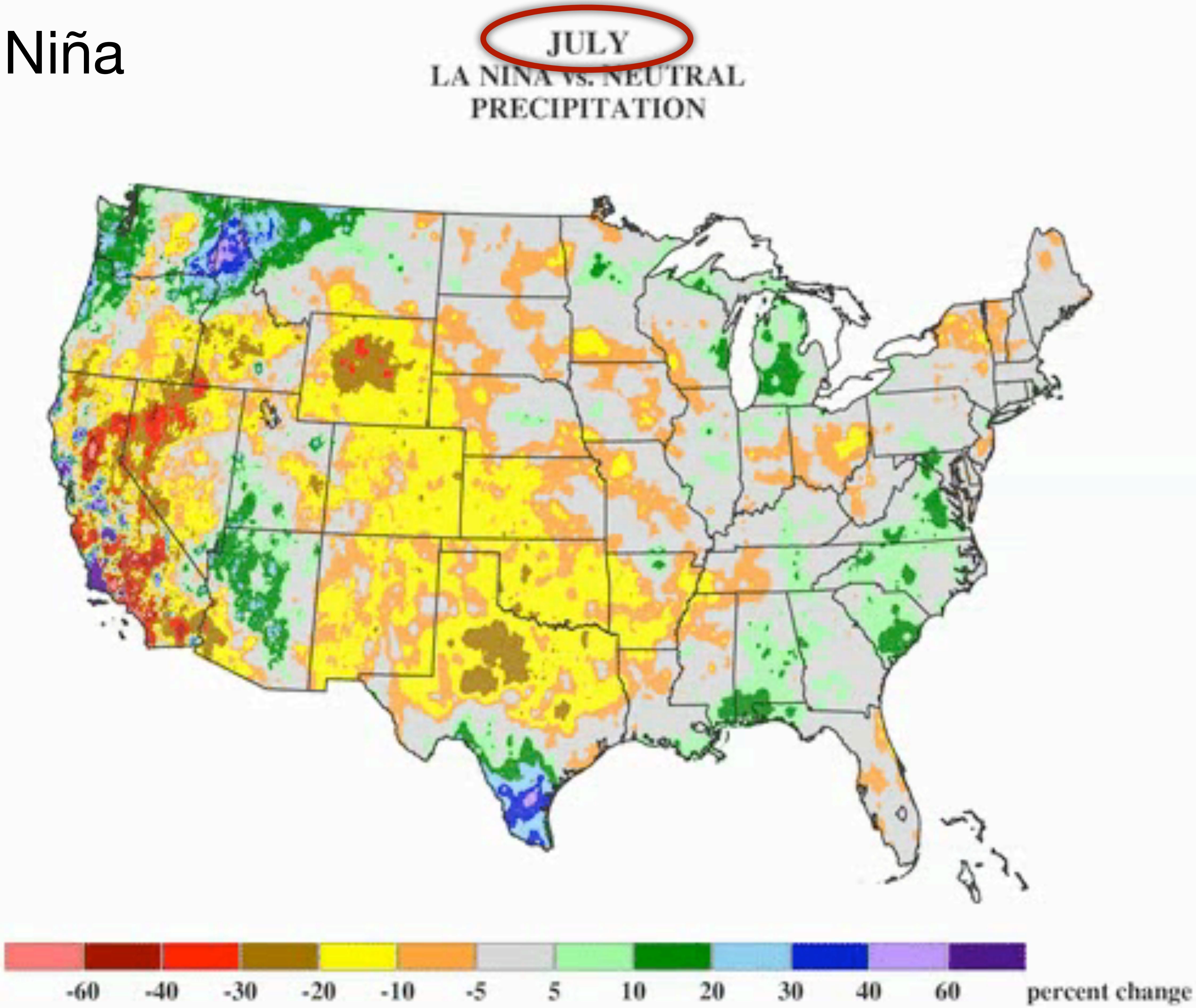


La Niña

- Below average sea surface temperature (SST) across the eastern tropical Pacific
- Warmer and drier winter and springs
- More active hurricane season

Neutral years: SST across the eastern tropical Pacific within +- 0.5 C

La Niña



JULY
LA NINA vs. NEUTRAL
PRECIPITATION
-60
-40
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5
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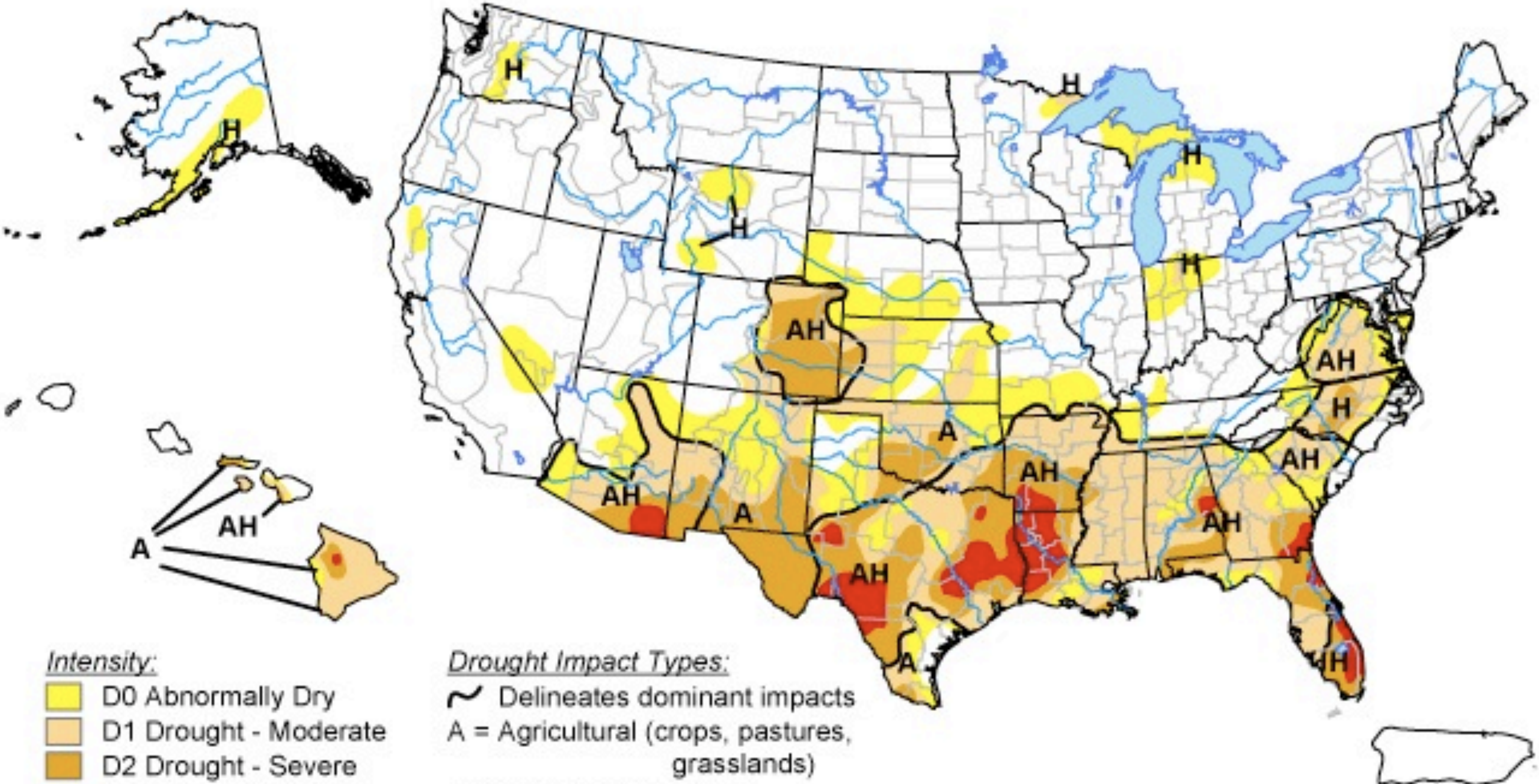
20
30
40
60
percent change

U.S. Drought Monitor

March 8, 2011
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- ~ Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

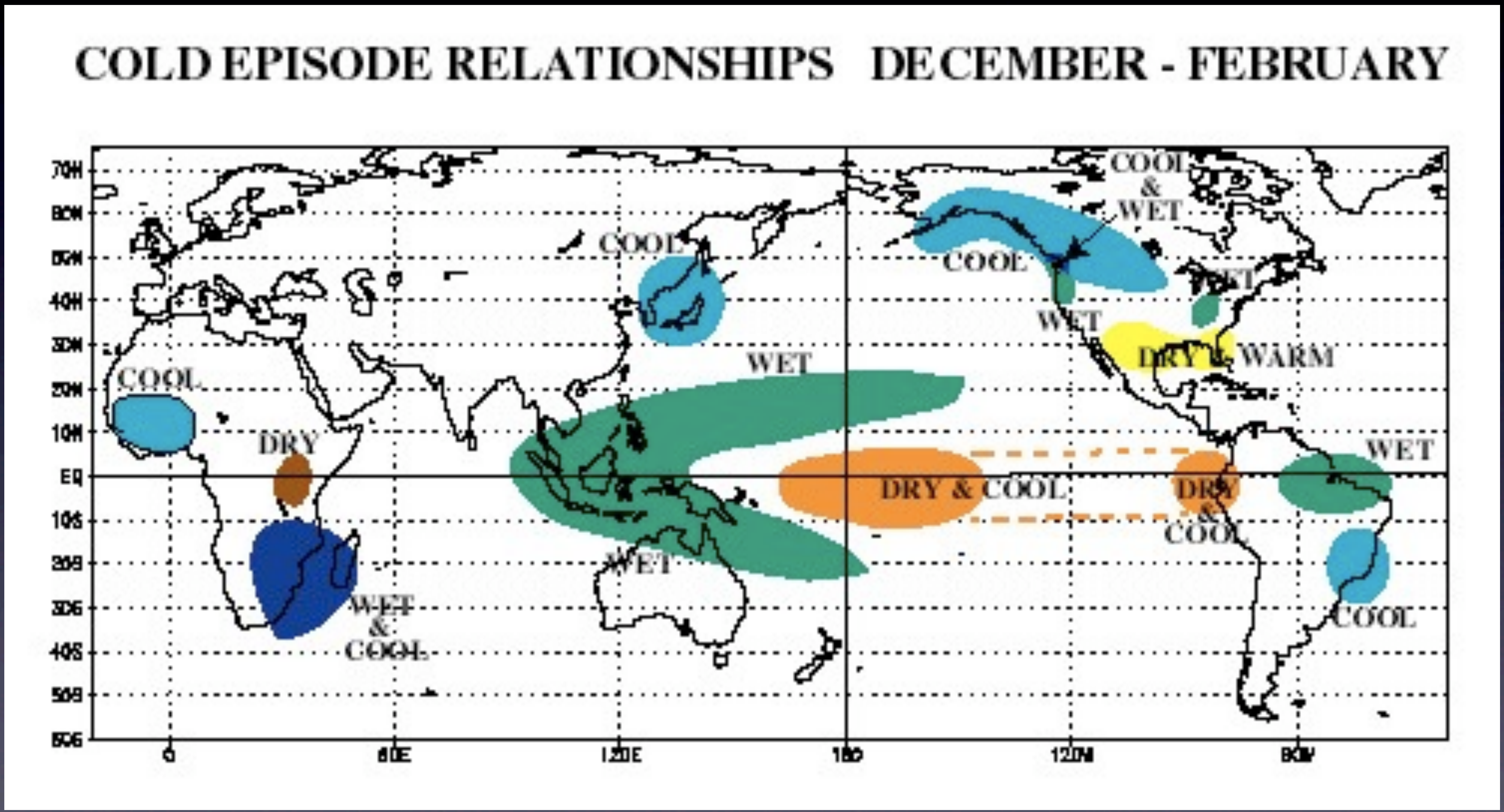
http://drought.unl.edu/dm

USDA National Drought Mitigation Center

Released Thursday, March 10, 2011

Author: Laura Edwards, Western Regional Climate Center

La Niña - Global Impacts



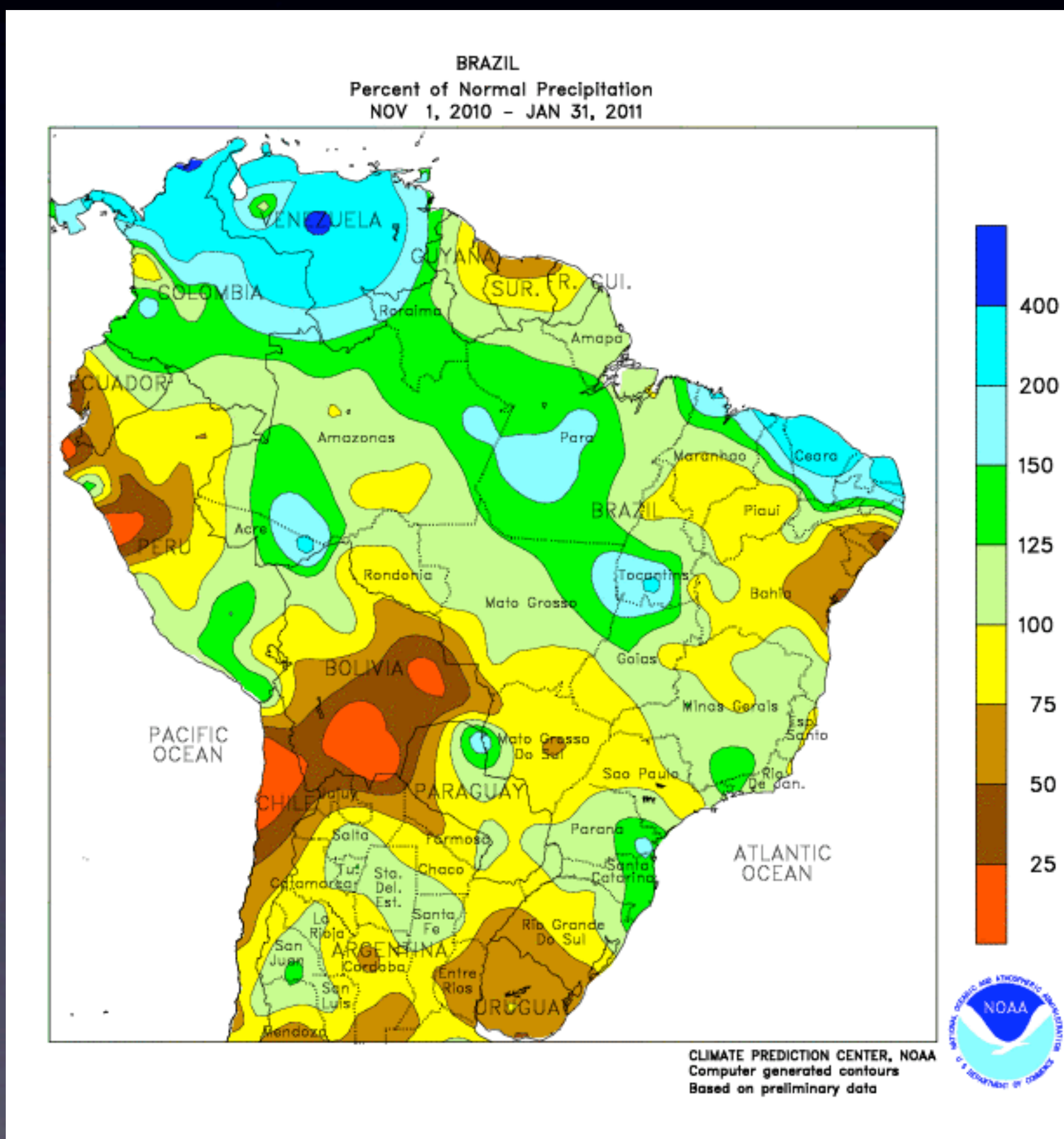
Source: The International Research Institute for Climate and Society - IRI

La Niña 2010-11
Recent Floods in Australia

- Thousands of Brisbane residents were stockpiling food and stacking sandbags or fleeing their homes as the worst floodwaters to hit Queensland for 50 years surged towards Australia's third largest city (January 11, 2011)

Source: The Guardian, January 11, 2011

La Niña 2010-11
South America Rainfall



BUSINESS RECORDER
Founded by M.A. Zuberi

Tuesday January 04, 2011 | Back Issues [From 2011-01-01] 2011-01-04 Get

LATEST INDIAN POLICE MAKE NEW ARREST IN CITIBANK SCAM

7 ↑ 0.55 | BATA 680.00/01 ↑ 5.00 | BOC 92.00/100 ↑ 2.16 | BOP 9.55/2219 ↑ 0.13 | DAWH 194.00/15 ↑ 1.53 | DC

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La Nina dryness threatens Argentina's corn crop

BUENOS AIRES (January 02, 2011) : Parched, hot conditions caused by the La Nina weather phenomenon are threatening corn yields in Argentina, the world's No 2 exporter of the cereal, and rains are urgently needed, the government said on Friday. Argentine farmers gathered a record corn crop of 22.7 million tonnes last season, but the dry weather is raising concerns that production could be hit this season and US corn futures have risen in recent weeks due to supply fears.

"The high temperatures coupled with almost zero rainfall are threatening yields, especially in corn that has started pollinating," the Agriculture Ministry said in a weekly crop report, referring to Bolivar in Buenos Aires province. "As far as the rest of the crops go (such as soya), the situation is similar, though not as threatening," it added. Buenos Aires is the top soya-, corn and wheat-growing region in the country.

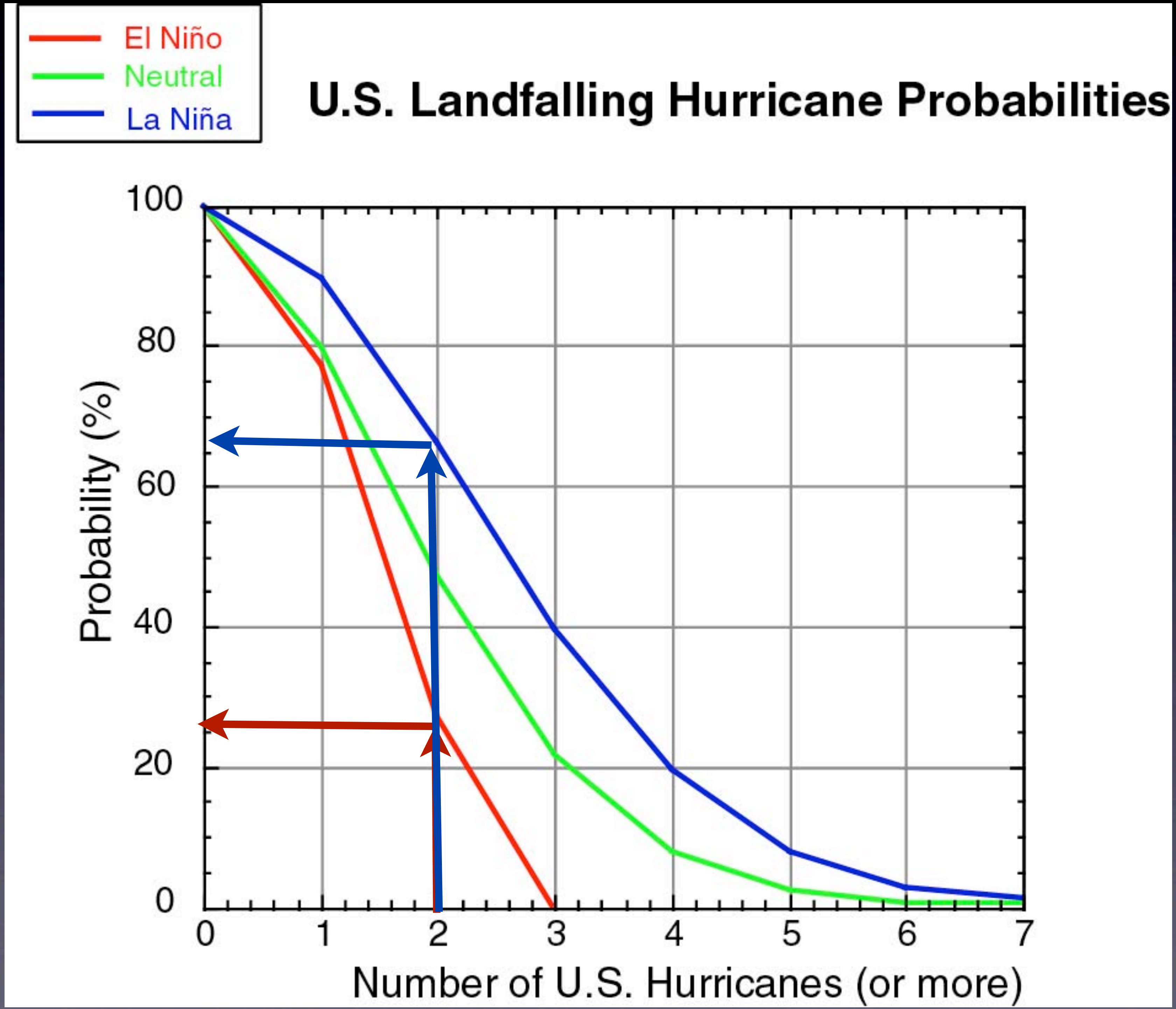
Agriculture Minister Julian Dominguez has forecast 2010/11 corn output at a record 26 million tonnes, but output could fall if dry weather persists as more and more crops enter the pollination stage of development when yields are defined. The dry, hot weather reported in Buenos Aires is causing similar problems for crops in parts of Cordoba and Santa Fe, other leading corn regions, the report said.

By Thursday, corn farmers had seeded 87 percent of the 4.04 million hectares estimated for planting, just 2 points more than the previous week but matching last season's tempo. Argentina is also the world's No 3 soyabean exporter and the government has forecast 2010/11 area at 18.7 million hectares (46.20 million acres), slightly above last season despite the impact of La Nina.

Argentina Corn Crop

ENSO and Hurricanes

- Probability of a more active Atlantic hurricane season is higher during La Niña and neutral events

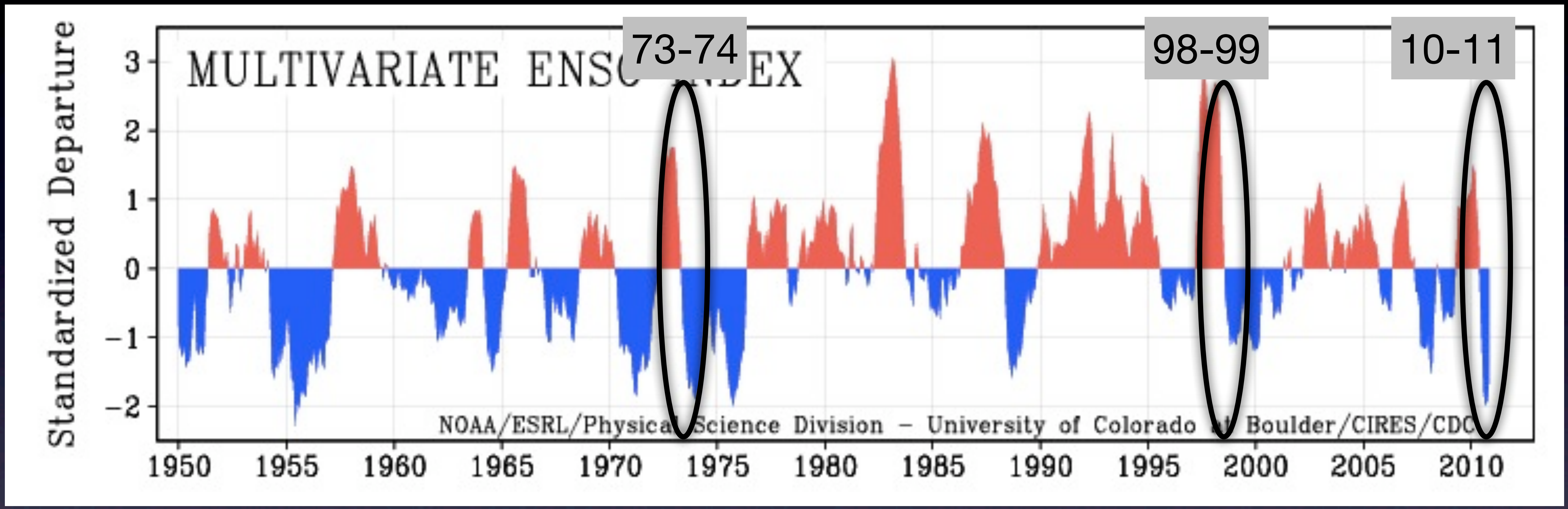


2010 Hurricane Season

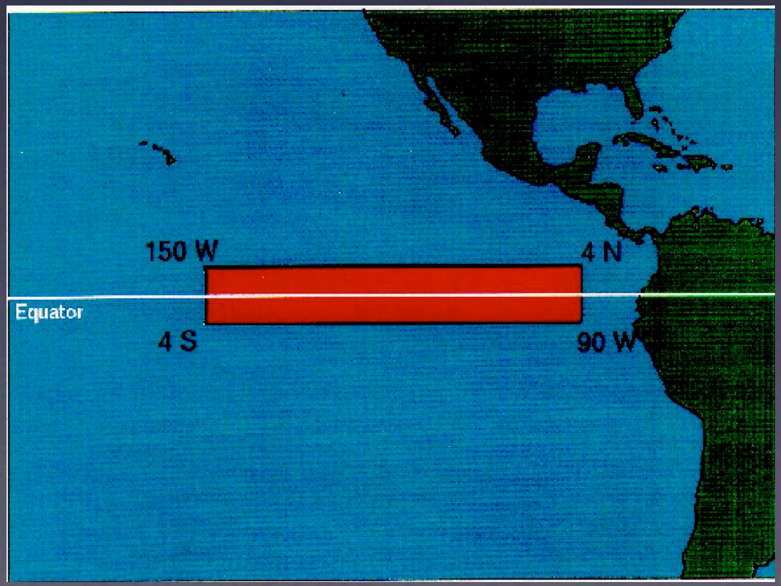
- Above average hurricane season with 19 named storms (second to 2005 since 1950), 12 classified as hurricanes
- No direct US impacts

MONITORING ENSO

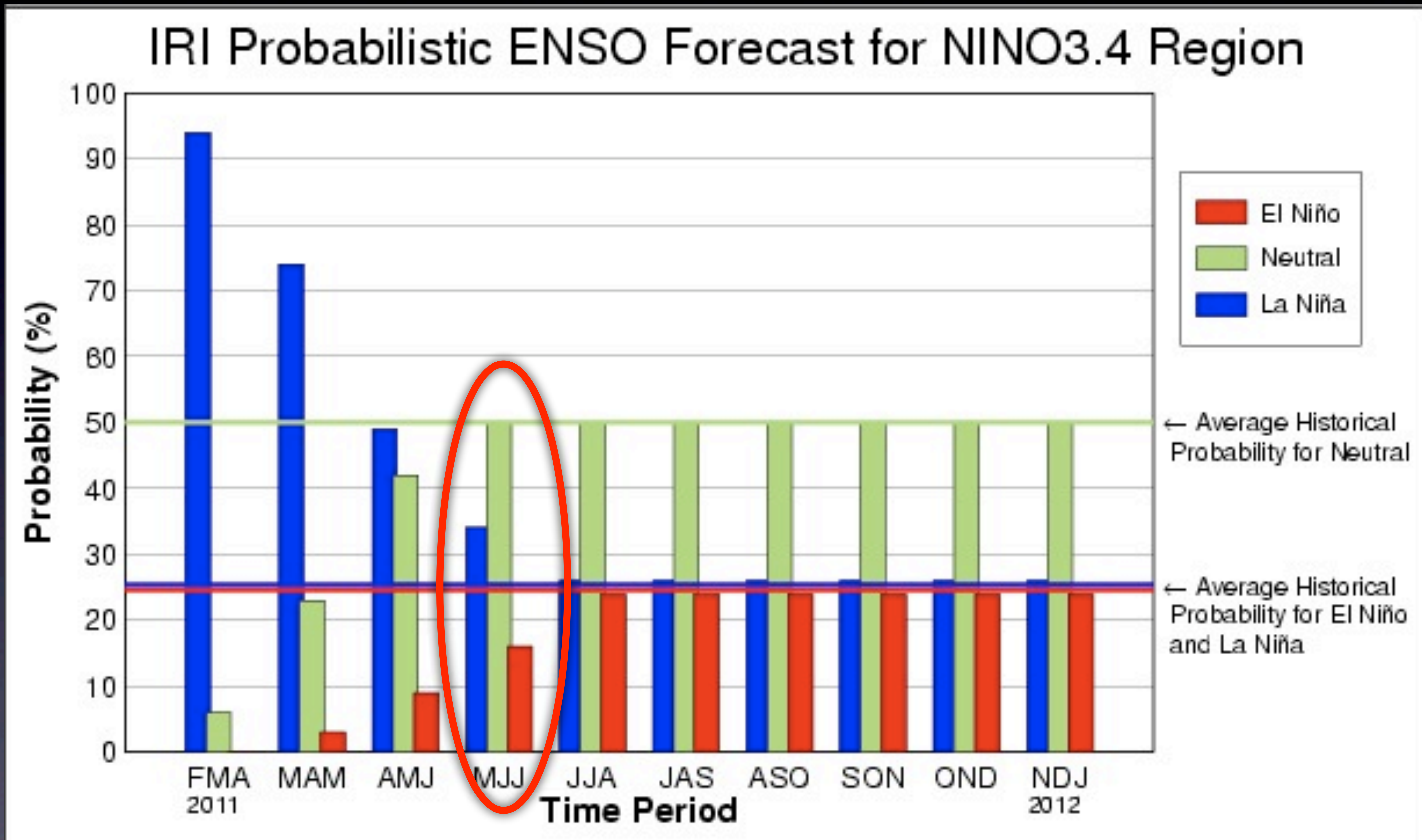
Multivariate ENSO Index



- MEI takes into account not only sea surface temperature (SST) but also sea-level pressure, surface wind, air temperature, and cloudiness



ENSO Forecast



La Niña is expected to last until May-June 2011

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid Spring (March-May) 2011

Released March 3, 2011

KEY:

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

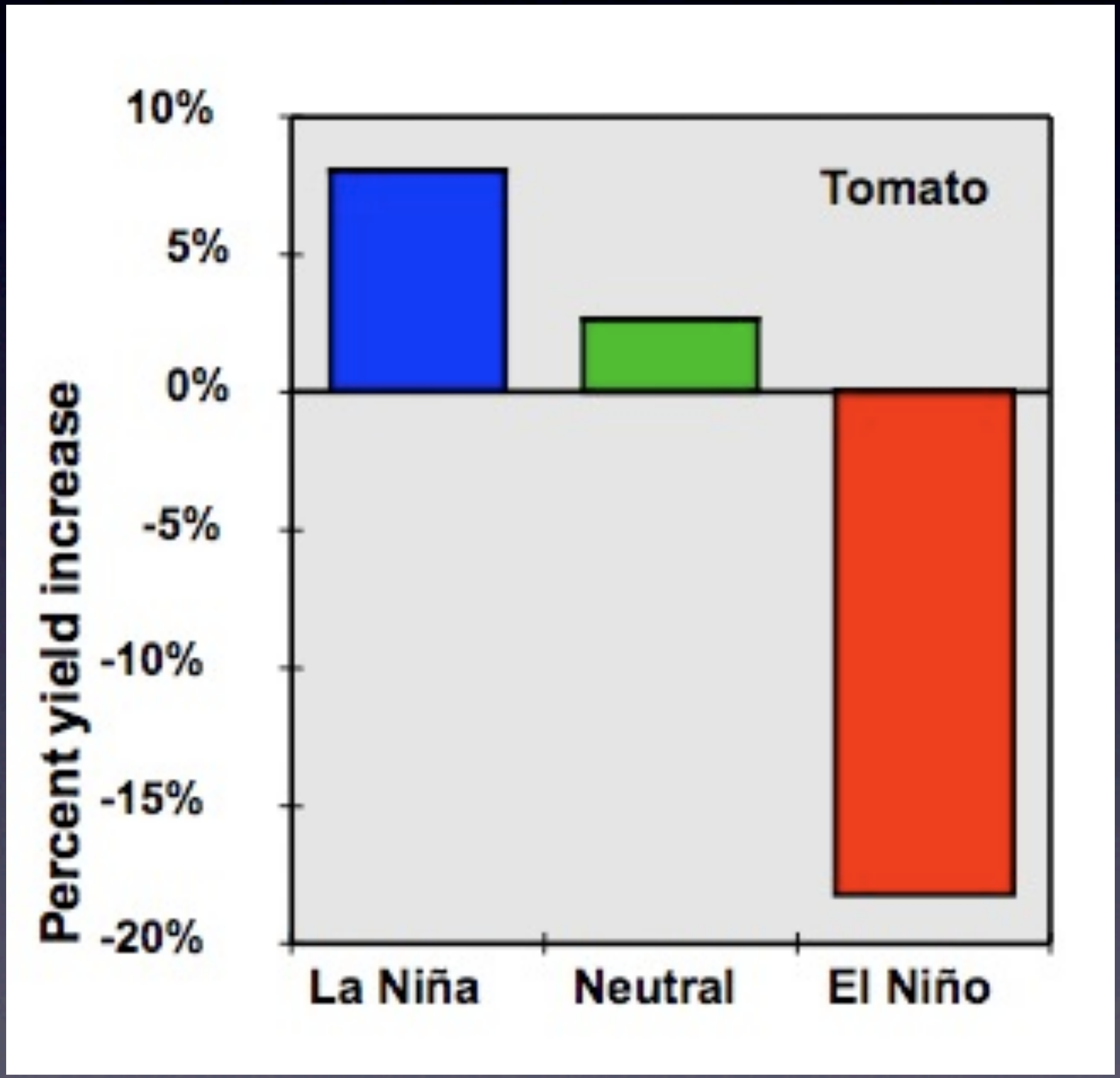
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

Impacts on Agriculture
&
Adapting to Climate Variability

Winter Vegetables Yield

Yield Differences (%)

- Lower yields for winter vegetables have been observed during El Niño years
- Higher yields during La Niña



Hansen et al. 1998. El Nino – Southern Oscillation Influences on Florida Crop Yields

Potential adaptation strategies?

Disease Pressure
Botrytis - Plant City, FL

Pre-harvest

Potential adaptation strategies?

Post-harvest

Phase	Low	Avg	High
Neutral	29%	34%	37%
El Niño	8%	23%	69%
La Niña	61%	32%	7%

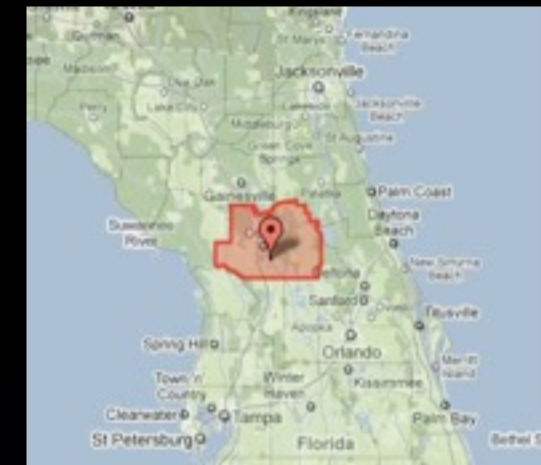
Number of years with low, average, and high disease pressure (Fraisse et al., preliminary results)

Strawberry Industry

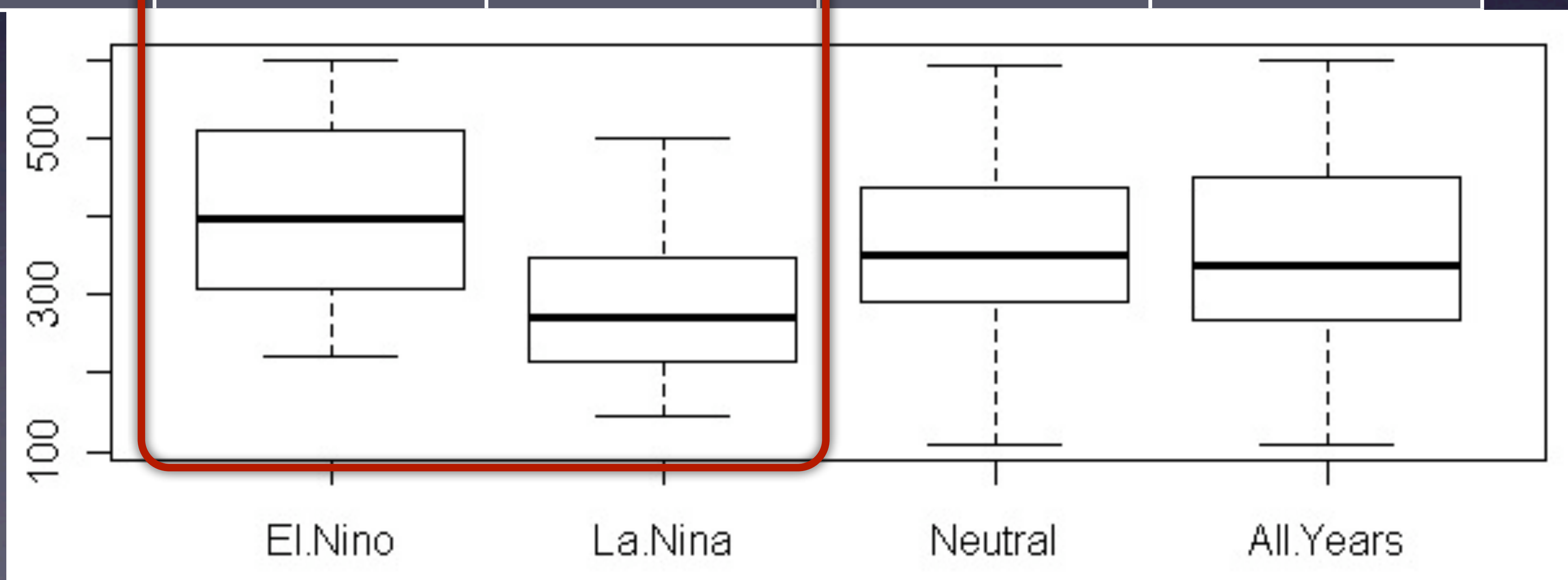
- 15% of the U.S. production but 100% of winter strawberry
- 8,000 acres (3,250 ha)
- $250 M industry

Chill Accumulation

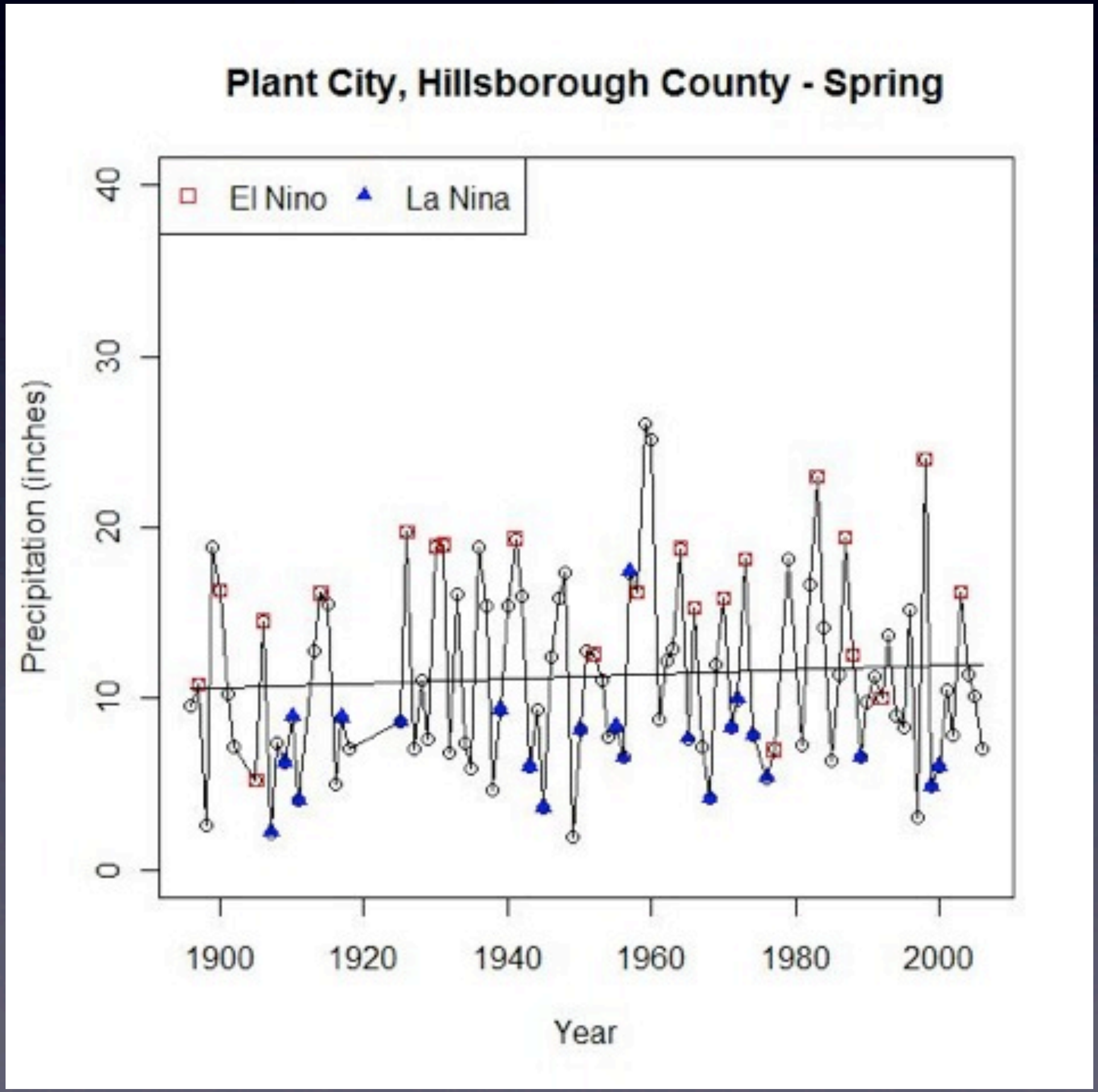
Marion County, FL: 1948 - 2007



Hours 32-45F	El Niño	La Niña	Neutral	All Years
Average	405	286	352	340
Minimum	222	146	110	110
Maximum	598	500	593	598



Leaching Rains during El Niño years



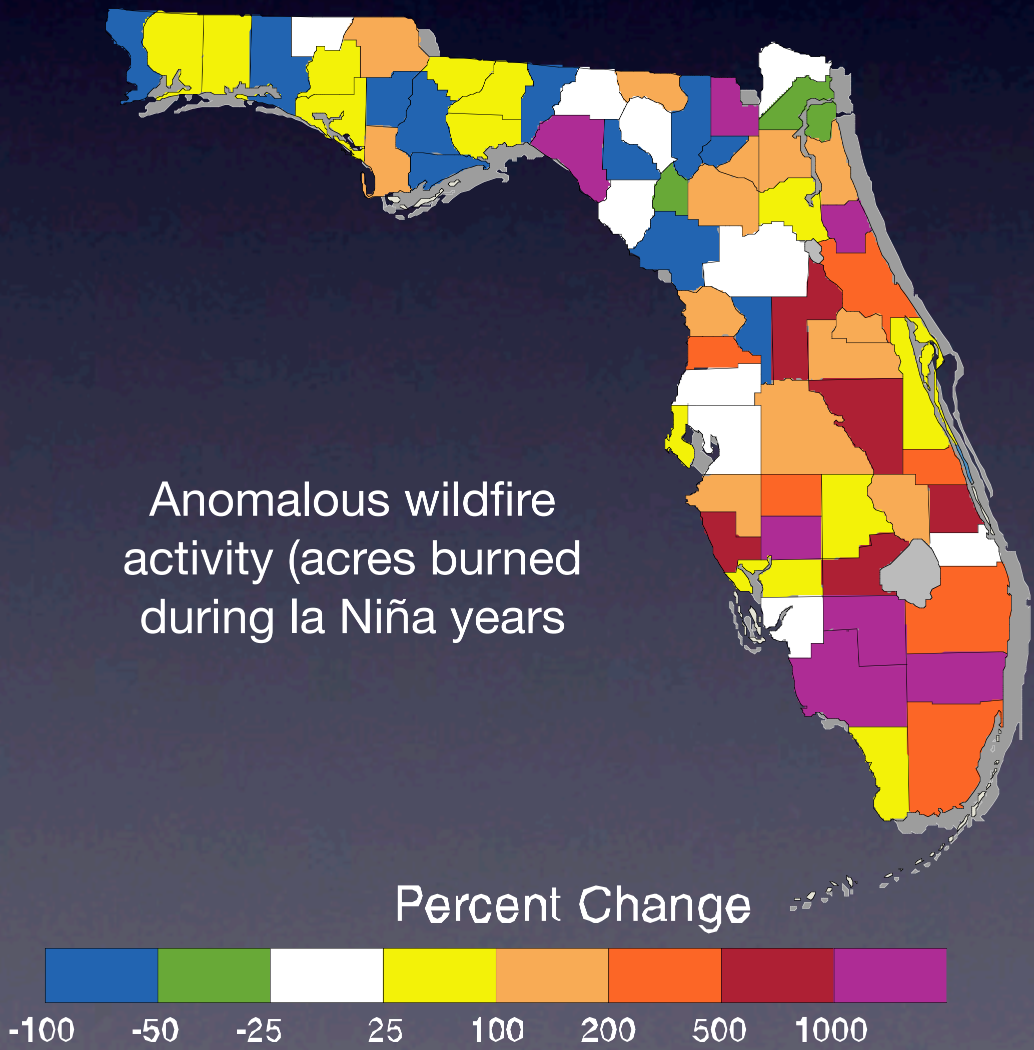
Total rainfall (in) during the spring tomato season (16 weeks) (Fraisse et al, 2009)

Flooded potato fields in NE Florida

Potential adaptation strategies?

Wildfires during La Niña Years

- La Niña typically increases acreage burned in Florida from around 60,000 acres to 200,000 or more (Jones et al., 1999)
- Effective mitigation (suppression, controlled burns, herbicides) has bias historical burn records

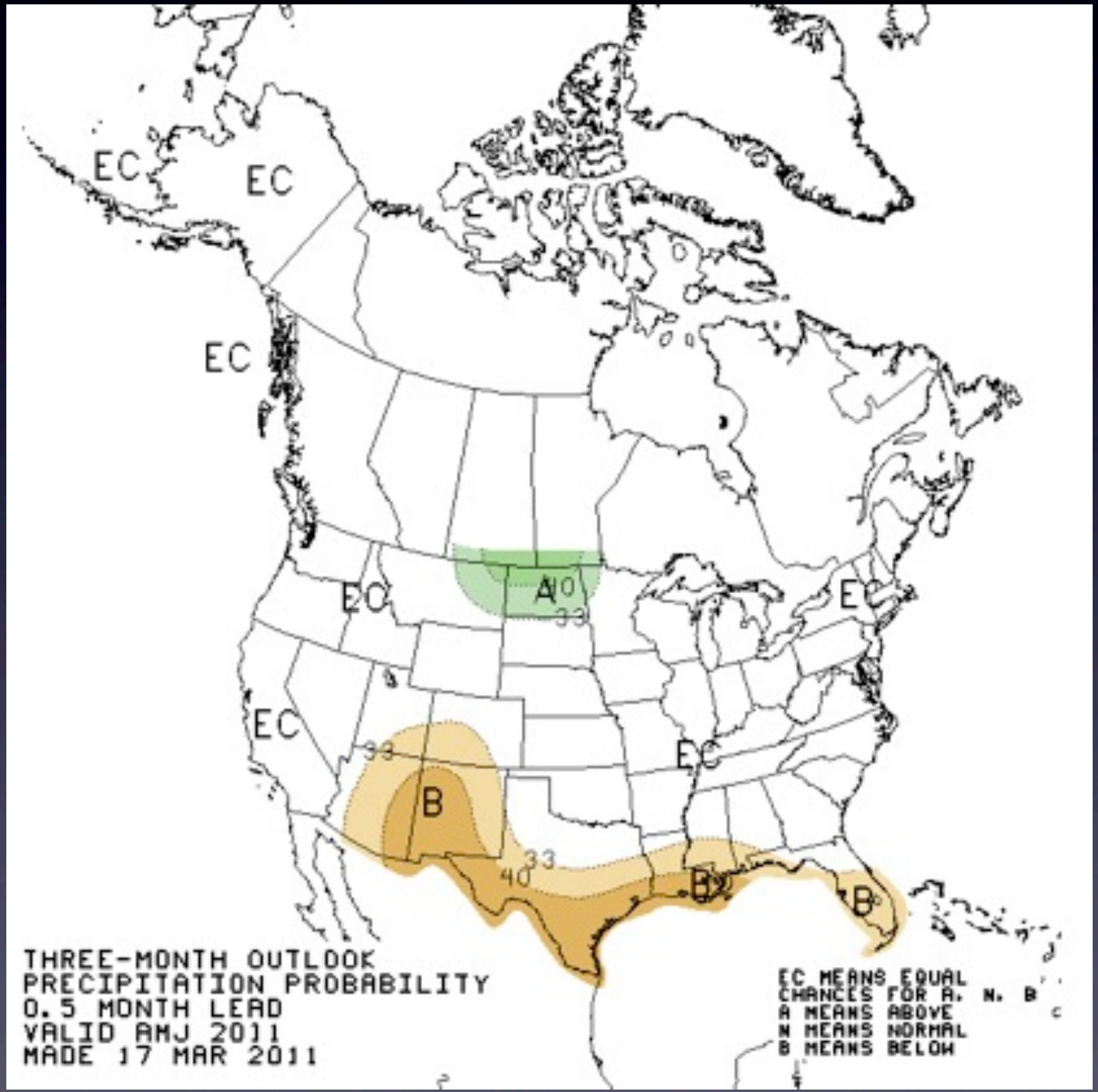


Hard Freezes

Freeze Date	ENSO Phase
Dec 1894	Neutral
Feb 1899	Neutral
Dec 1934	Neutral
Jan 1940	Neutral
Dec 1961	Neutral
Jan 1977	El Niño
Jan 1981	Neutral
Dec 1983	Neutral
Jan 1985	Neutral
Dec 1989	Neutral

Adaptating to Climate Variability

- Agricultural, forestry, and water resource managers will better cope with uncertainty and climate associated risks through routine and effective use of climate forecasts and climate-related decision support tools



The task requires going well beyond simply producing good climate forecasts. For climate information to benefit society, it must fit into a decision making process and must affect actions of decision-makers

Weather vs Climate-based Decisions in Agriculture

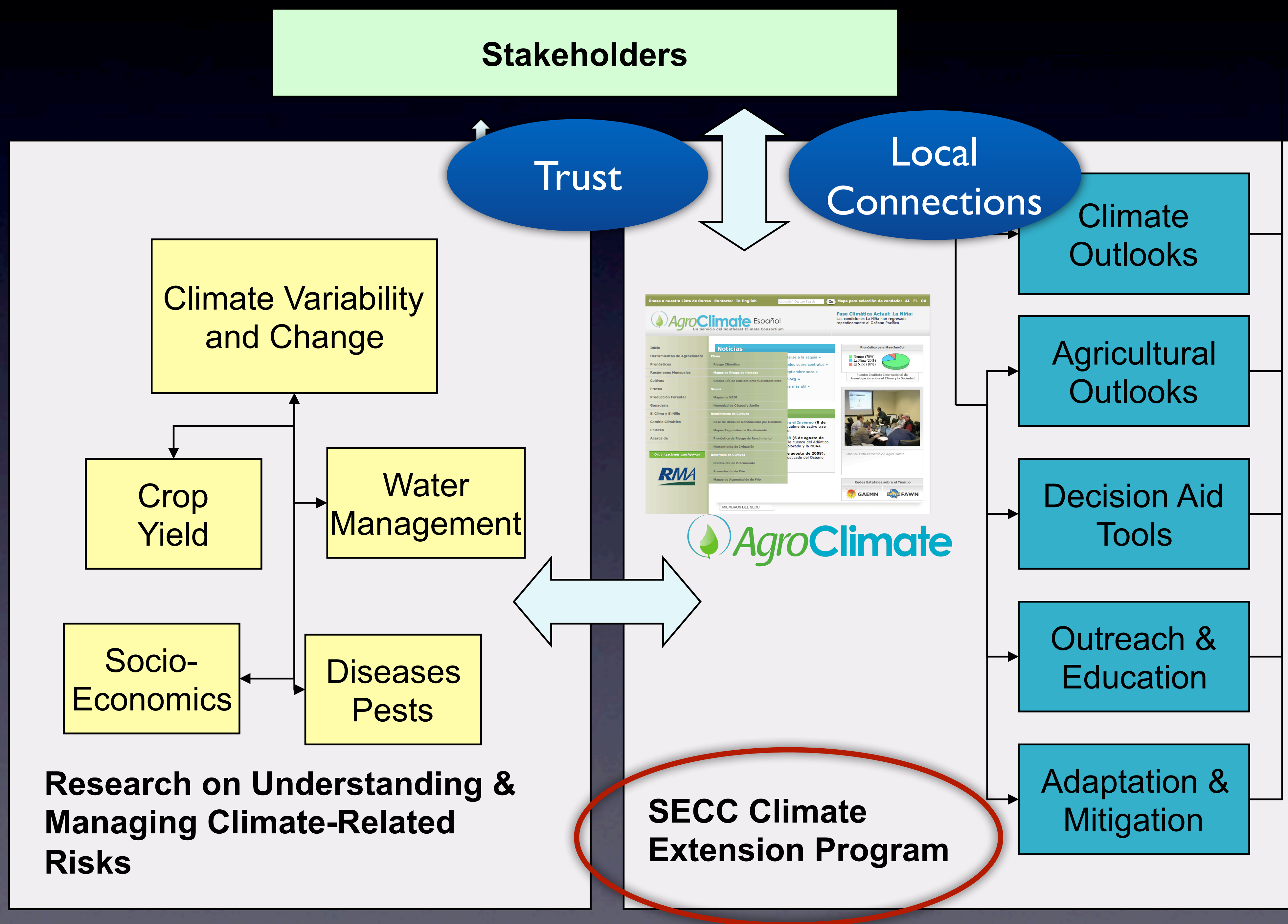
Weather Forecast Operational or tactical decisions	Climate Forecast Strategic Decisions
Planting	Variety selection
Spraying	Best planting dates
Fertilizing	Acreage allocation
Irrigation timing and amount	Crop insurance
Harvesting	Marketing
Cutting hay	Purchase of inputs
Cold protection	Winter pasture & Feed purchase

Engaging Stakeholders

- How to communicate this knowledge to producers?
- How to modify behavior by including seasonal forecasting in their decision making process?

Early interviews to understand how producers use weather and climate information (N. Breuer, 2002)

Partnership with Extension

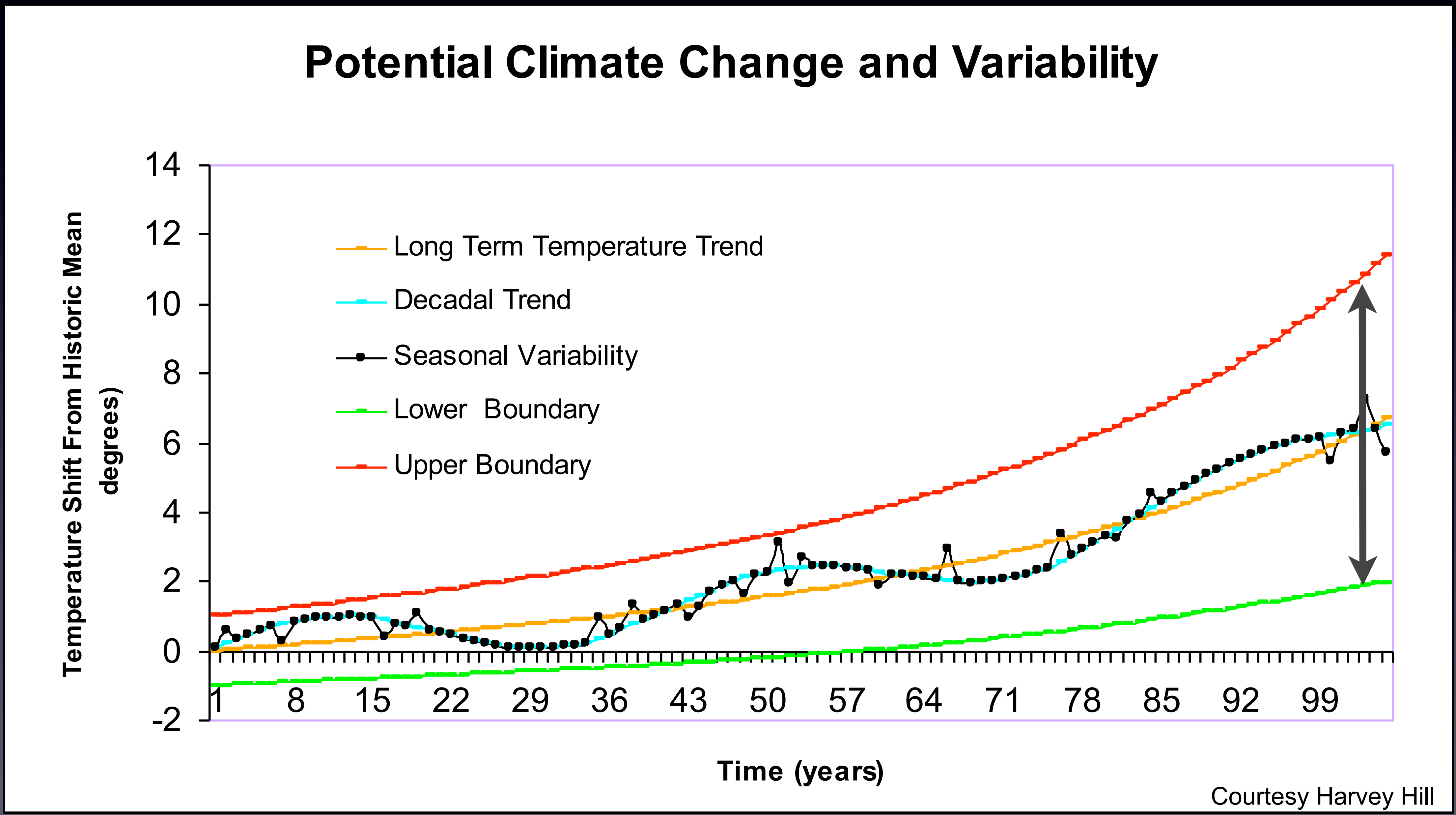


From Climate Variability to Climate Change

- Understanding seasonal climate variability and learning to adapt to it is the first step towards starting a discussion about climate change

AgroClimate workshop - Headland, AL, March 2007

Adapting to Climate Variability and Change



Resilient adaptation must account for natural and potential man made variability

Climate Change Activities
Climate Working Groups

- Row Crop Agriculture Working Group

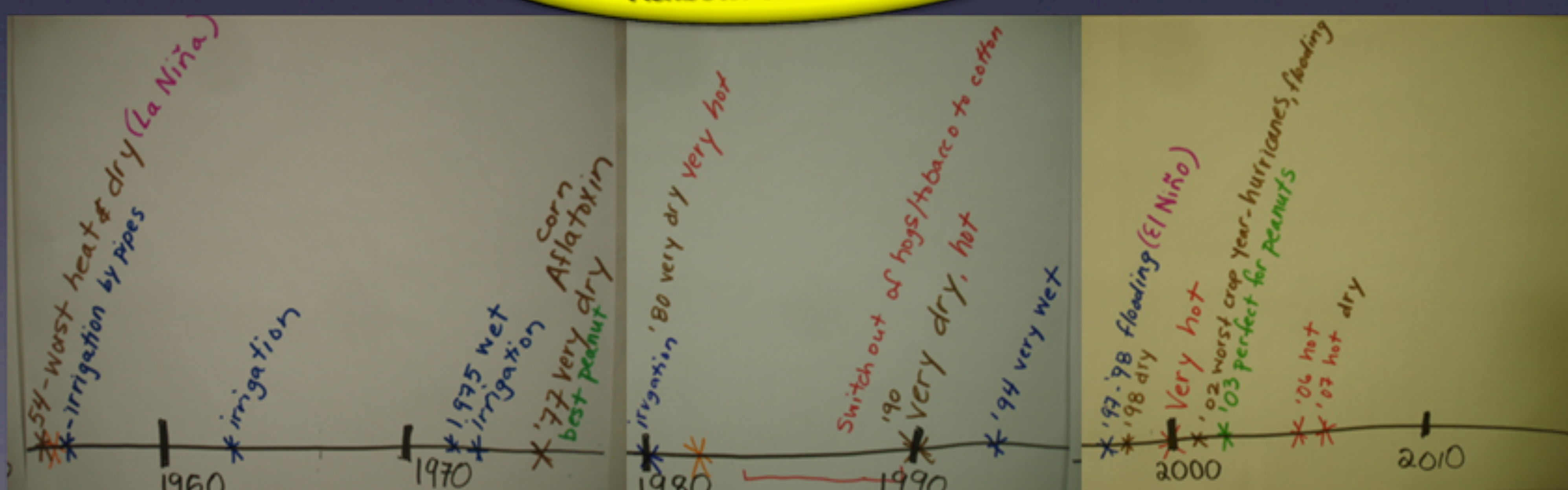
  UGA Stripling Irrigation Research Park
  April 12, 2010

Initial Engagement Activities

- Share past production experiences to initiate a discussion on how to prepare for an uncertain future
- Examine historical climate cycles and extremes
- Explore adaptation used to past climate conditions
- Discuss how climate information can support a more adaptive approach to row crop management decisions

Sharing experiences of past production successes & challenges

Farmer-led Story Telling Process Tools: Fishbowl & Timeline



Remembering the Past

- 1938: Very wet, government issued a “mud check”
- 1954: Very dry, very poor season
- 1980: Bad year, wet Jan-Mar and then hot and dry
- 2003: Near perfect rainfall distribution, great year
- 2007: Hot and dry

Adaptation Strategies
Group Discussions of Hypothetical Scenarios

Preparing for the Future: Using Climate Information to Reduce Risks

Opportunities for Adaptation

Warmer than Normal

- Change planting date, start earlier, consider different peanut varieties
- Resist planting a full circle of high water demanding crops
- Tighten up peanut spray schedule

Drier than Normal

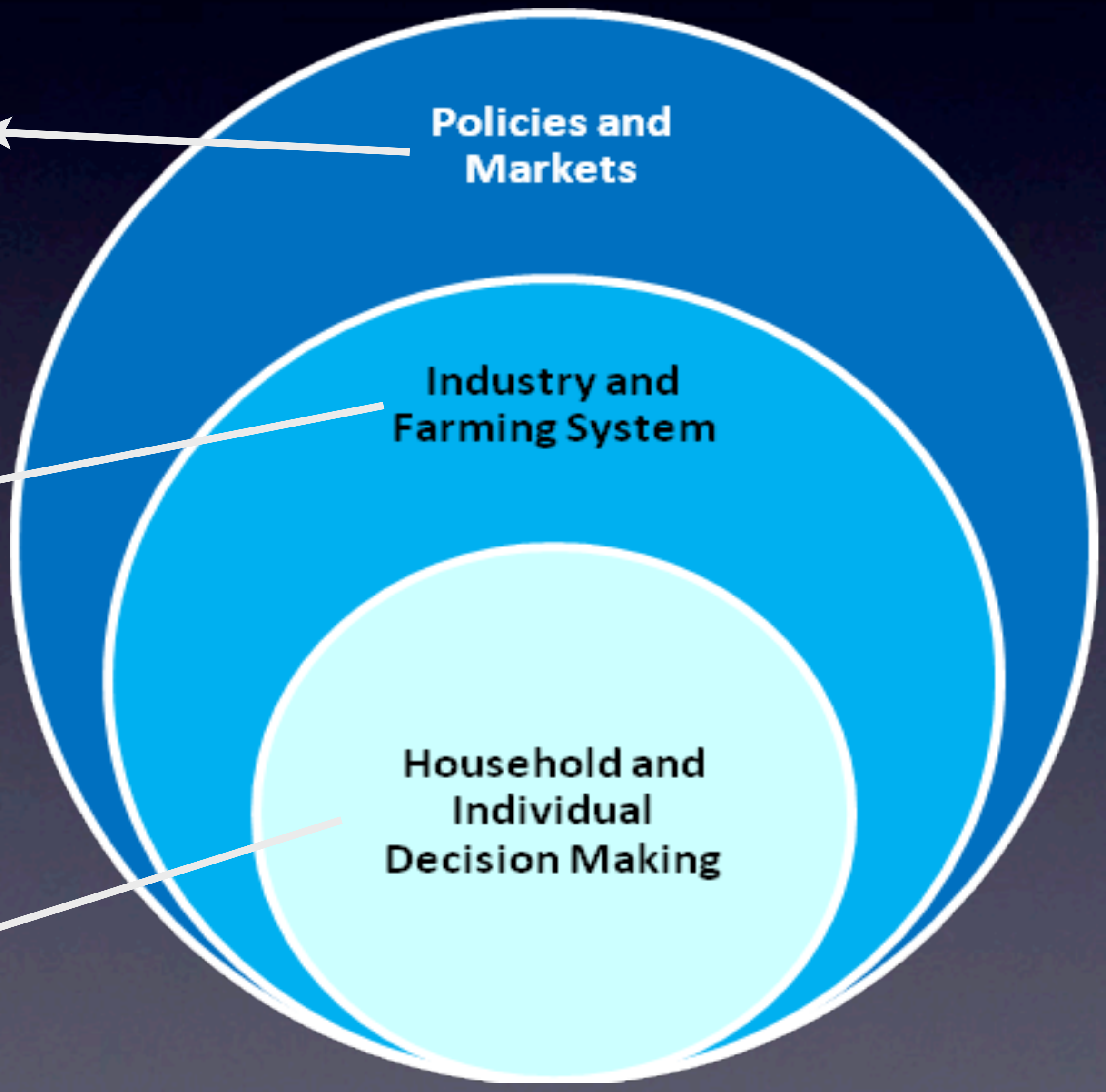
- Prepare irrigation equipment and harvest more water in ponds
- Till less to conserve soil moisture
- Shift rotation, avoid planting corn

Perceived Constraints to Adaptation

“The farm bill probably impacts what farmers grow more than anything”

“You can’t buy a cotton picker for just one year”

“Climate information may not change your decision but it will be in the back of your mind ”

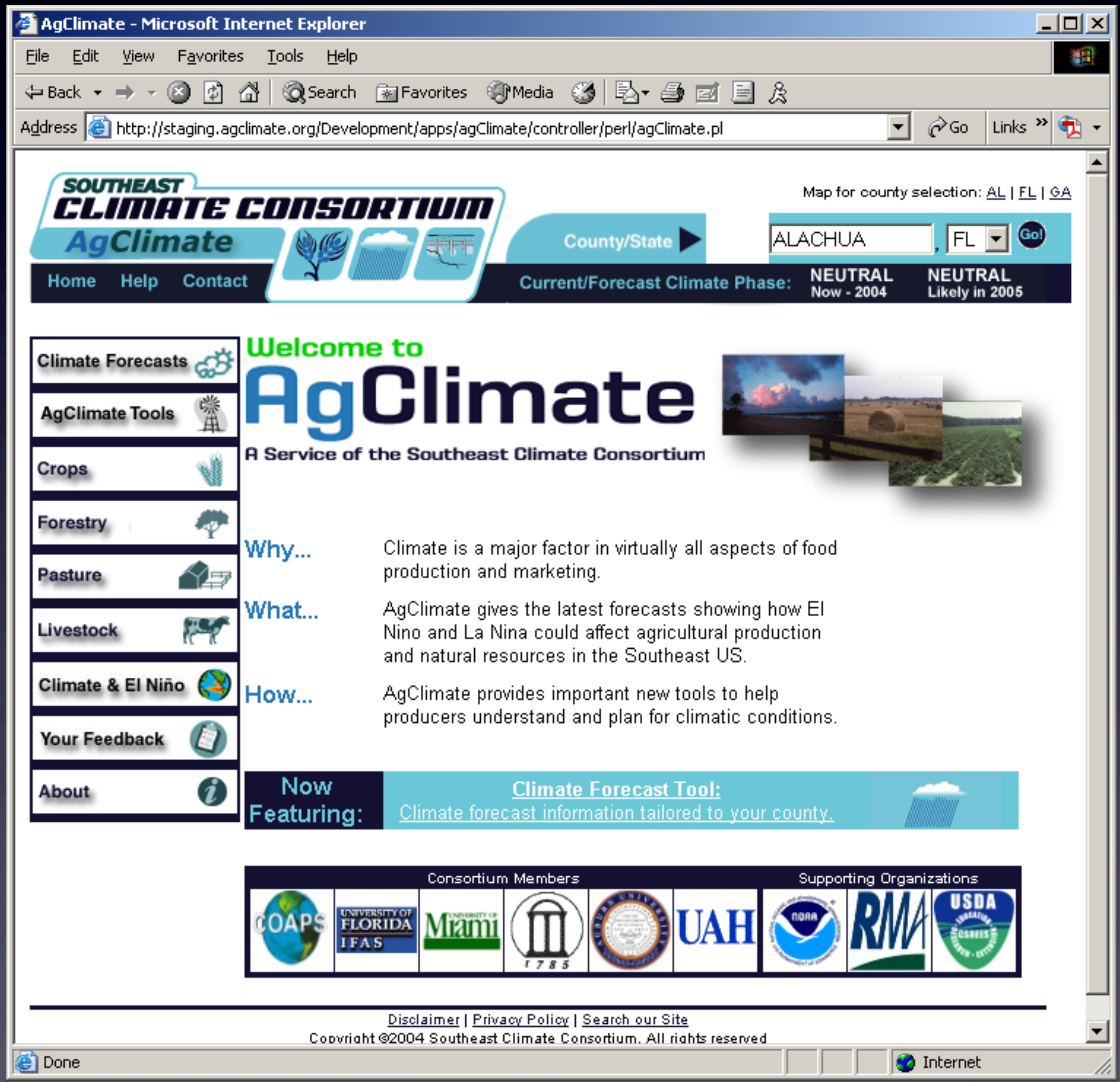


Updates

- Task force was formed to address the need to improve summer forecasts (ENSO signal improves forecast in the winter)
- Farmers asked for periodical meetings with SECC Extension to update forecasts at critical times
- We recently had our 3rd meeting with the group, so far focus has been of seasonal variability
- Next meeting will focus of crop modeling and climate scenarios

How to communicate this knowledge to producers?

- In 2005 we started creating a web-based climate information system under a project funded by the USDA - Risk Management Agency



First version of AgroClimate (AgClimate) released in January of 2005.

AgroClimate
A Service of the Southeast Climate Consortium

Current Climate Phase: La Niña
La Niña develops as the Pacific Ocean continues a rapid transition.

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News

Drought conditions expand into west, south Georgia - (September 16, 2010 - PDF)

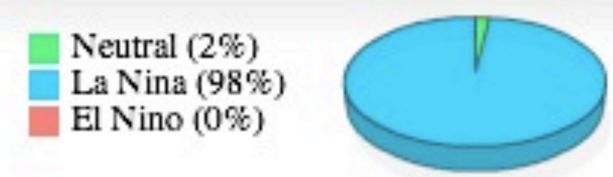
Georgia sees warmest summer nights ever - (September 8, 2010 - PDF)

La Niña weather pattern expected this fall (September 7, 2010)

Shaping up your carbon footprint (August 20, 2010)

News Archive»

Climate Phase Forecast for Oct-Nov-Dec



Source: The International Research Institute for Climate and Society

AgroClimate Español

AgroClimate
Now available in Spanish
Click here to view

Outlooks

SECC Fall Climate Outlook is now available (Sept. 19, 2010)

Monthly Climate Summary for Georgia and Florida now available (Sept. 8, 2010)

SECC Agricultural Outlook (August 30, 2010):

Monthly Climate Summary (August 4, 2010): La Niña Conditions Return to the Pacific Ocean How can it affect your crops?

Climate Phase Update (July 16, 2010): La Niña develops as the Pacific Ocean continues a rapid transition.

SECC Summer Climate Outlook (May 20, 2010): El Niño is over in the Pacific Ocean

SUPPORTING ORGANIZATIONS

RMA

AgroClimate Outlooks

SECC Fall Climate Outlook

Date updated: September 19, 2010

DOWNLOAD PDF

Current Conditions: Drought setting in for much of the Southeast. After a summer that can be characterized as one of the hottest on record, drought has begun to develop over much of the Southeast, with the exception of the Florida peninsula. The three-month period of May-July ranked as the hottest on record (since 1895) for the states of North Carolina, South Carolina, Georgia, and Alabama, while Florida ranked as the second hottest. Rainfall was generally below normal for much of the region, but was characterized by many observers as being more scattered or localized than in previous years. Large differences in daily, weekly, and monthly rainfall totals were seen not only from county to county (which is somewhat typical for summer rainfall), but also from field to field. Southeast Alabama and inland areas of the Florida Panhandle are feeling the drought most strongly, as most fields in this area are non-irrigated, leaving row crops and pastures suffering. The extent of drought conditions is shown in the current U.S. Drought Monitor, where most of the Southeast is depicted as being in drought conditions ranging from abnormally dry to severe.

U.S. Drought Monitor

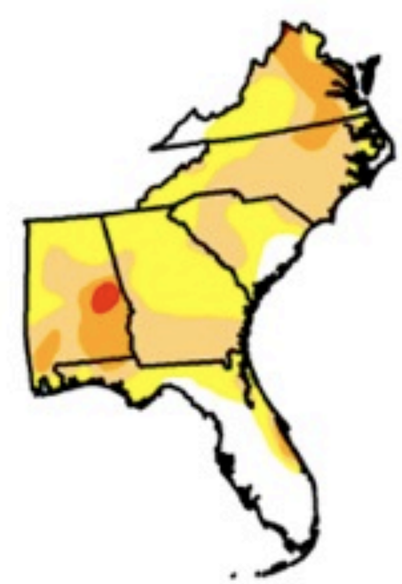
Southeast

September 21, 2010

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	14.4	85.6	47.4	11.7	0.9	0.0
Last Week (09/14/2010 map)	26.3	73.7	29.7	7.1	0.1	0.0
3 Months Ago (06/29/2010 map)	75.3	24.7	0.1	0.0	0.0	0.0
Start of Calendar Year (01/05/2010 map)	99.5	0.5	0.0	0.0	0.0	0.0
Start of Water Year (10/06/2009 map)	82.6	17.4	5.5	1.0	0.0	0.0
One Year Ago (09/22/2009 map)	72.9	27.1	10.0	1.7	0.0	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

SECC Agricultural Outlook

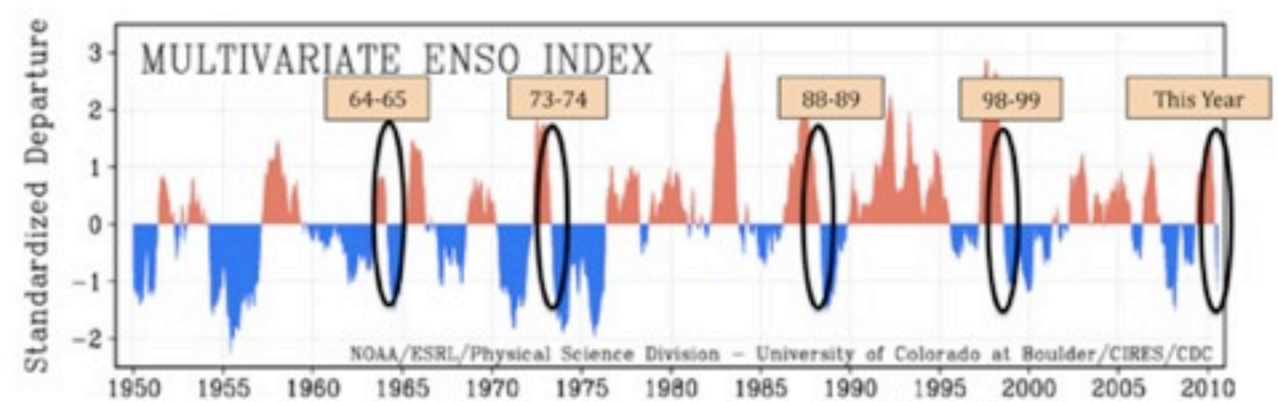
Date updated: August 30, 2010

Prepared by Clyde Fraisse

La Niña Conditions Return to the Pacific Ocean How can it affect your crops?

DOWNLOAD PDF

The El Niño-Southern Oscillation (ENSO) phenomenon is the biggest player in the game of year-to-year climate variability. El Niño and La Niña events tend to develop during April-June and tend to reach maximum strength during December-February. Typically they persist for 9 to 12 months. After a winter of moderate to strong El Niño conditions, ocean temperatures have cooled very quickly in the last 3 months and have now reached thresholds consistent with the La Niña phase (Sea surface temperatures more that 0.5 ºC colder than normal). If we look back in our climate records, years in which there were similar quick transitions to a La Niña phase included 1964-65, 1973-74, 1988-89, and 1998-99.



La Niña conditions usually bring a **warmer and drier winter and spring seasons** (November through March) to Florida, central and lower Alabama and central and southern Georgia. La Niña events in 1999 and 2000 and in early 2006 were associated with an increase in forest fires across Florida and Georgia.

Hurricanes: La Niña is known to bring a more active hurricane season to the Atlantic basin, so we anticipate that the 2010 hurricane season will produce more storms than normal. The most recent NOAA forecast calls for an 85% chance of an above normal season with 14-23 named

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Current Climate Phase: La Niña

La Niña develops as the Pacific Ocean continues a rapid transition.

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- Monthly Climate Summary
- Crops
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- Forage & Livestock
- Climate and El Nino
- Climate Change
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SUPPORTING ORGANIZATIONS

RMA

News

Drought conditions expand into west, south Georgia - (September 16, 2010 - PDF)

Georgia sees warmest summer nights ever - (September 8, 2010 - PDF)

La Niña weather pattern expected this fall (September 7, 2010)

Shaping up your carbon footprint (August 20, 2010)

News Archive»

Outlooks

SECC Fall Climate Outlook is now available (Sept. 19, 2010)

Monthly Climate Summary for Georgia and Florida now available (Sept. 8, 2010)

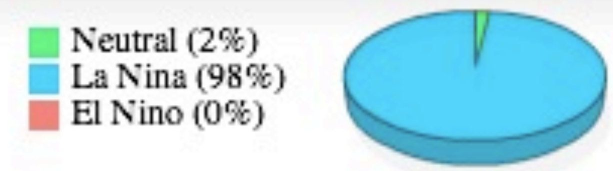
SECC Agricultural Outlook (August 30, 2010):

Monthly Climate Summary (August 4, 2010): La Niña Conditions Return to the Pacific Ocean How can it affect your crops?

Climate Phase Update (July 16, 2010): La Niña develops as the Pacific Ocean continues a rapid transition.

SECC Summer Climate Outlook (May 20, 2010): El Niño is over in the Pacific Ocean

Climate Phase Forecast for Oct-Nov-Dec



Source: The International Research Institute for Climate and Society

AgroClimate Español

AgroClimate
Now available in Spanish
Click here to view

Sunday, March 27, 2011

AgroClimate Tools

- **Climate Risk**
  - County climatology
  - Freeze risk maps
  - Cooling/Heating degree days
- **Drought**
  - Keetch-Byram Drought Index
  - Lawn & Garden Moisture Index
  - Agricultural Reference Index for Drought
- **Carbon Resources**
  - Carbon calculator

- **Crop Diseases**
  - Strawberry Advisory System
    - Anthracnose and Botrytis
  - Citrus Advisory System
    - Copper Model, PFD

- **Crop Development**
  - Growing degree days
  - Chil accumulation
- **Crop Yield**
  - County Yield Database
  - Yield Risk

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Climate Risk

« Back to tools

HELP

Variable Type
Total Rainfall (in)

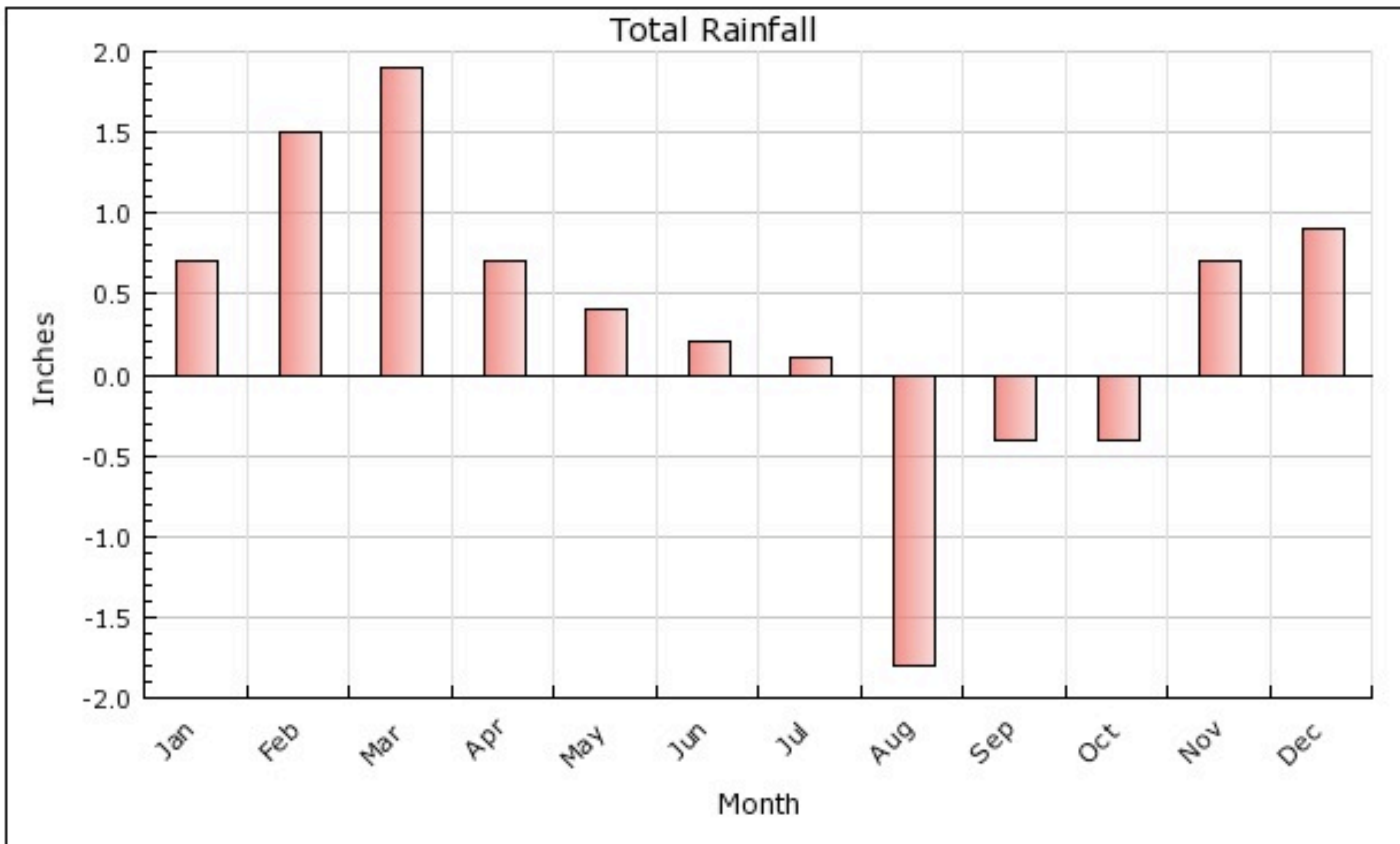
State + County
FL | ALACHUA

ENSO Phase
- ○ Neutral
- ◉ El Niño
- ○ La Niña
- ○ All Years

Graph All

Average and Deviation | Probability Distribution | Probability of Exceedance | Last 5 Years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	4.1	5.1	6.1	3.3	3.8	6.9	6.8	5.4	4.5	2.1	2.7	3.9
Deviation	0.7	1.5	1.9	0.7	0.4	0.2	0.1	-1.8	-0.4	-0.4	0.7	0.9



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Current Climate Phase: La Niña
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Strawberry Advisory System (SAS)

« Back to Tools

Select station/county:

Balm/Hillsborough

Display County Boundary

Disease Risk Levels:

High | Moderate | Low

Fungicide List: Click here

Publications:

Fruit Rot of Strawberry - Anthracnose fruit rot, caused by the fungus Colletotrichum acutatum...

Botrytis Fruit Rot or Gray Mold of Strawberry - Botrytis fruit rot, also known as gray mold, is caused by...

A Web-based Decision Support Tool - Plant disease decision support systems are management tools to help...

Balm Station

Recommendations | Disease Simulation | Weather | Contact | Disclaimer

Spray Recommendation

» When was your last fungicide application?

○ Last 7 days ◉ More than 7 days ○ None

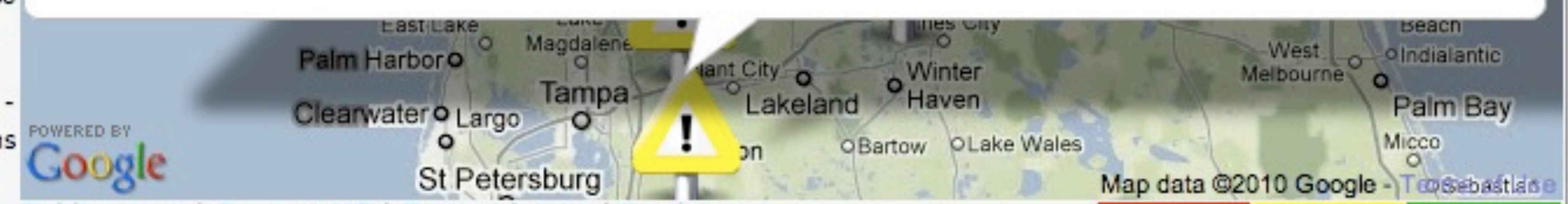
» Select product(s) used*:

* Use Ctrl or Shift to select more than one.

- Abound (Anthracnose) – Systemic
- Cabrio (Anthracnose) – Systemic
- Captan (Anthracnose, Botrytis) – Contact
- Captevate (Botrytis) – Systemic

View Recommendation

Botrytis: No Spray!
Anthracnose: Spray Contact Fungicide (Products recommended: Captan)



Publications | Contact US | Fungicide List | Disclaimer

High | Moderate | Low

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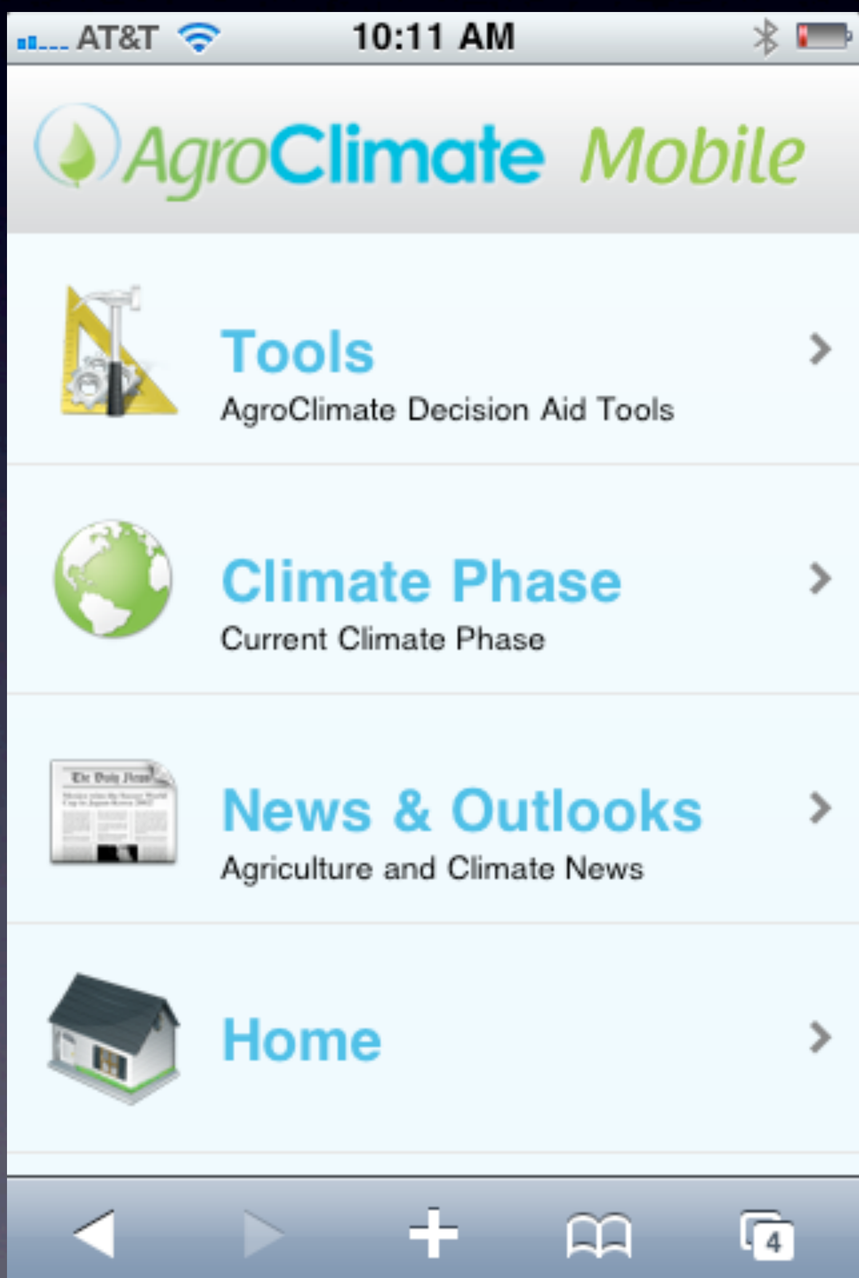
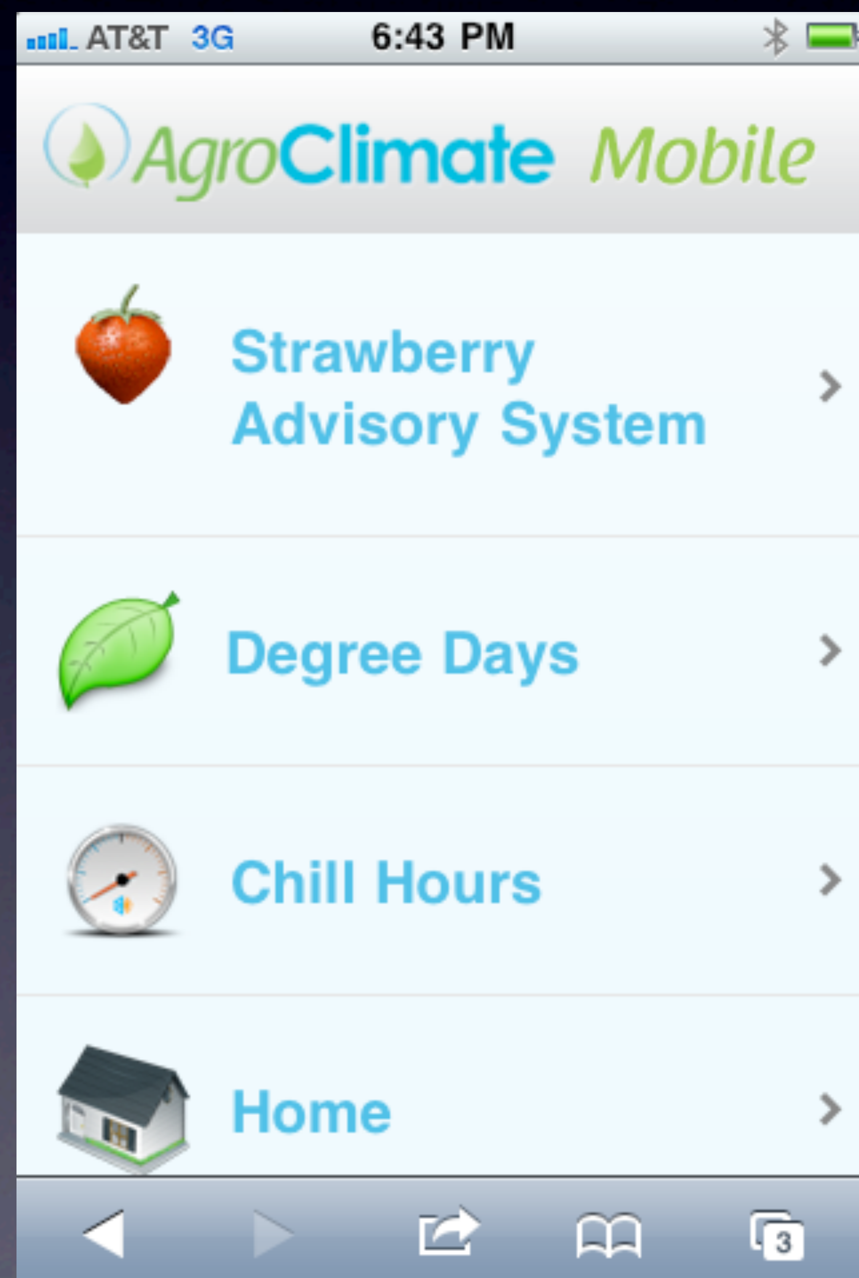
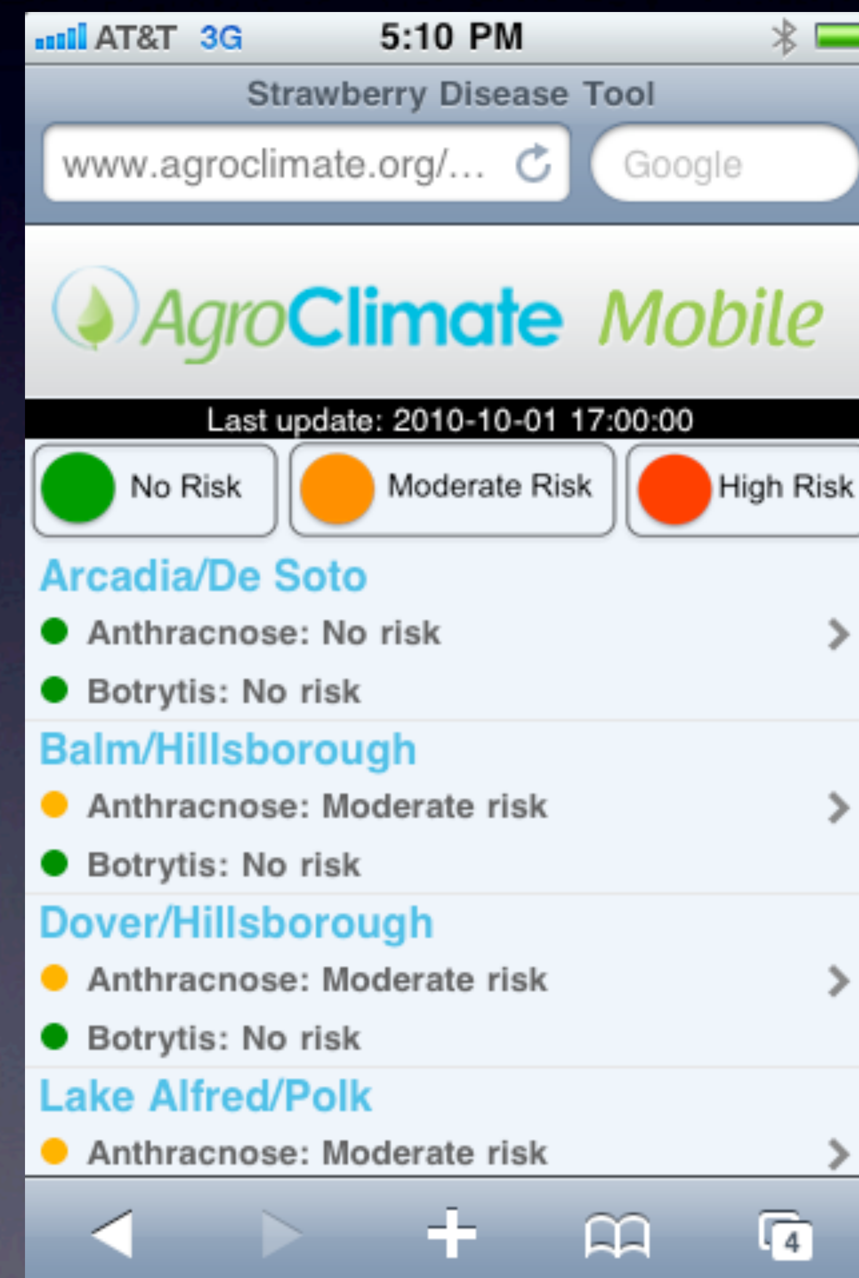
AgroClimate Mobile
Strawberry Advisory System







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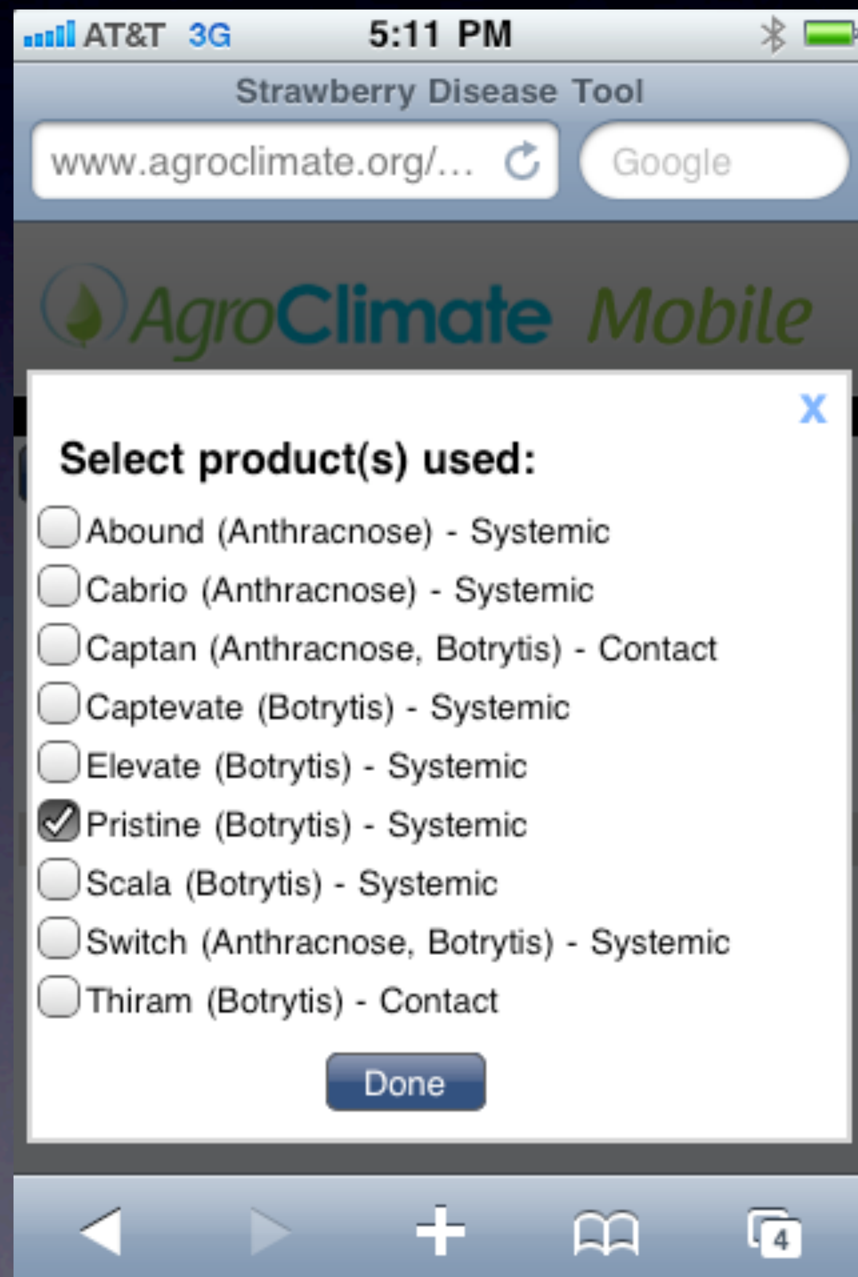
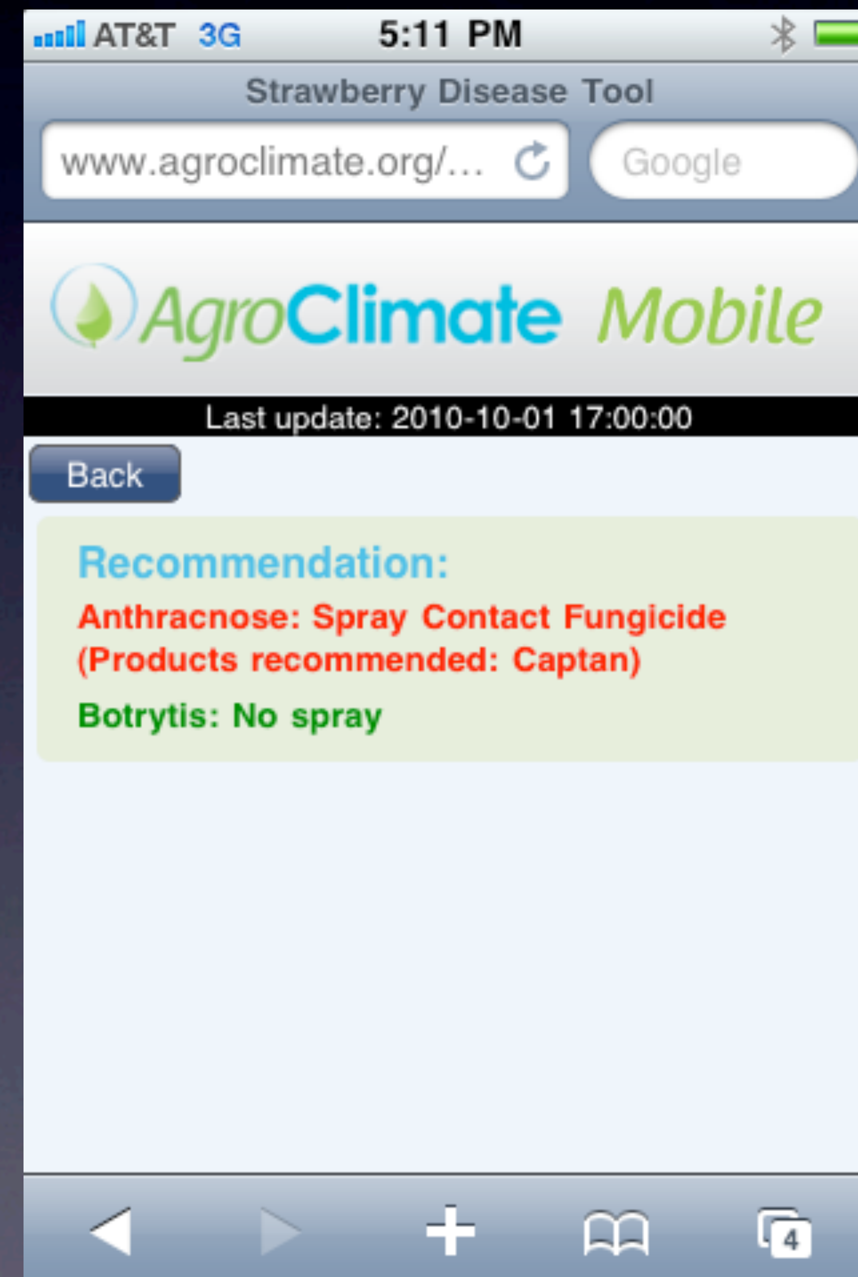
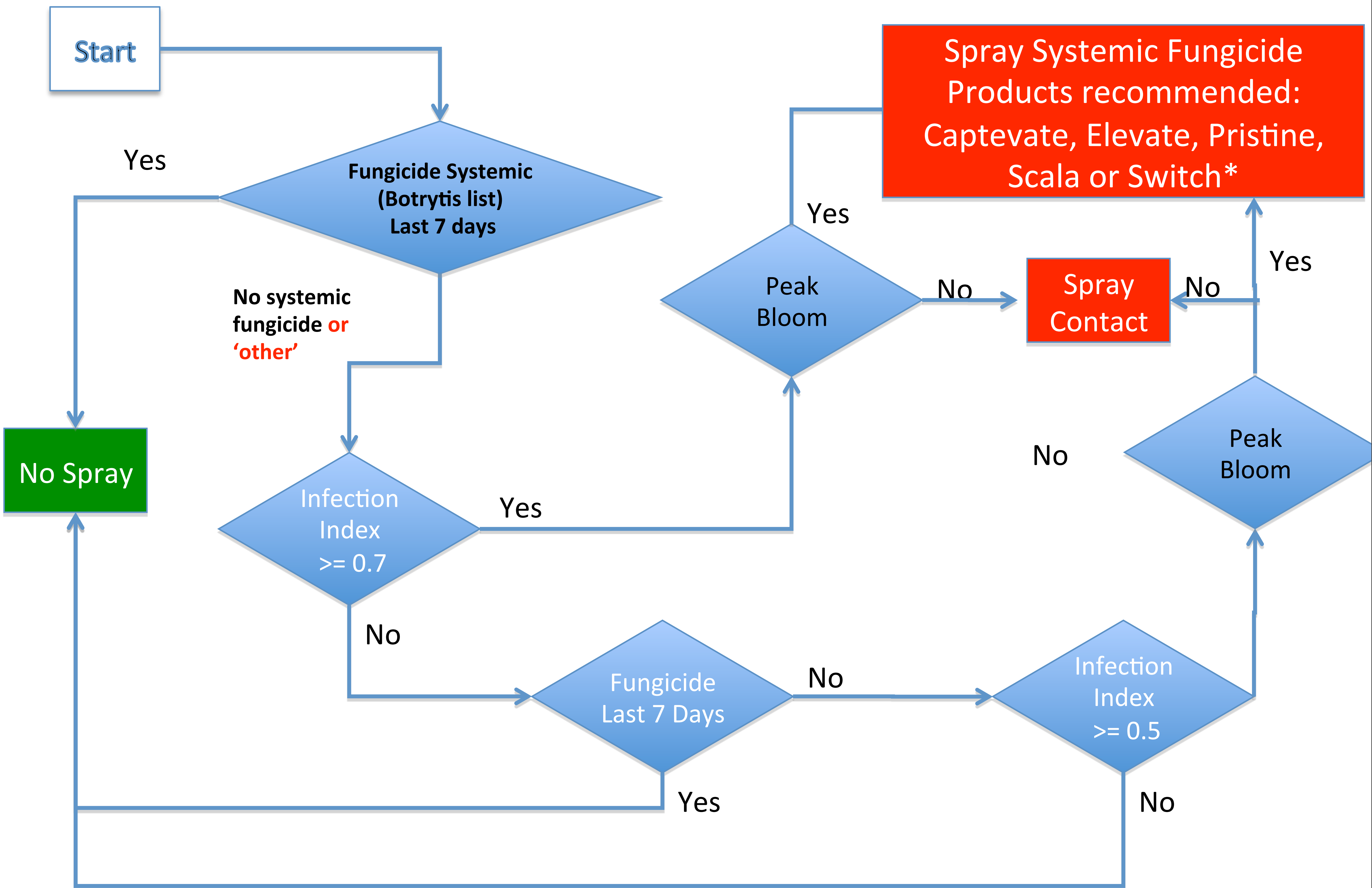
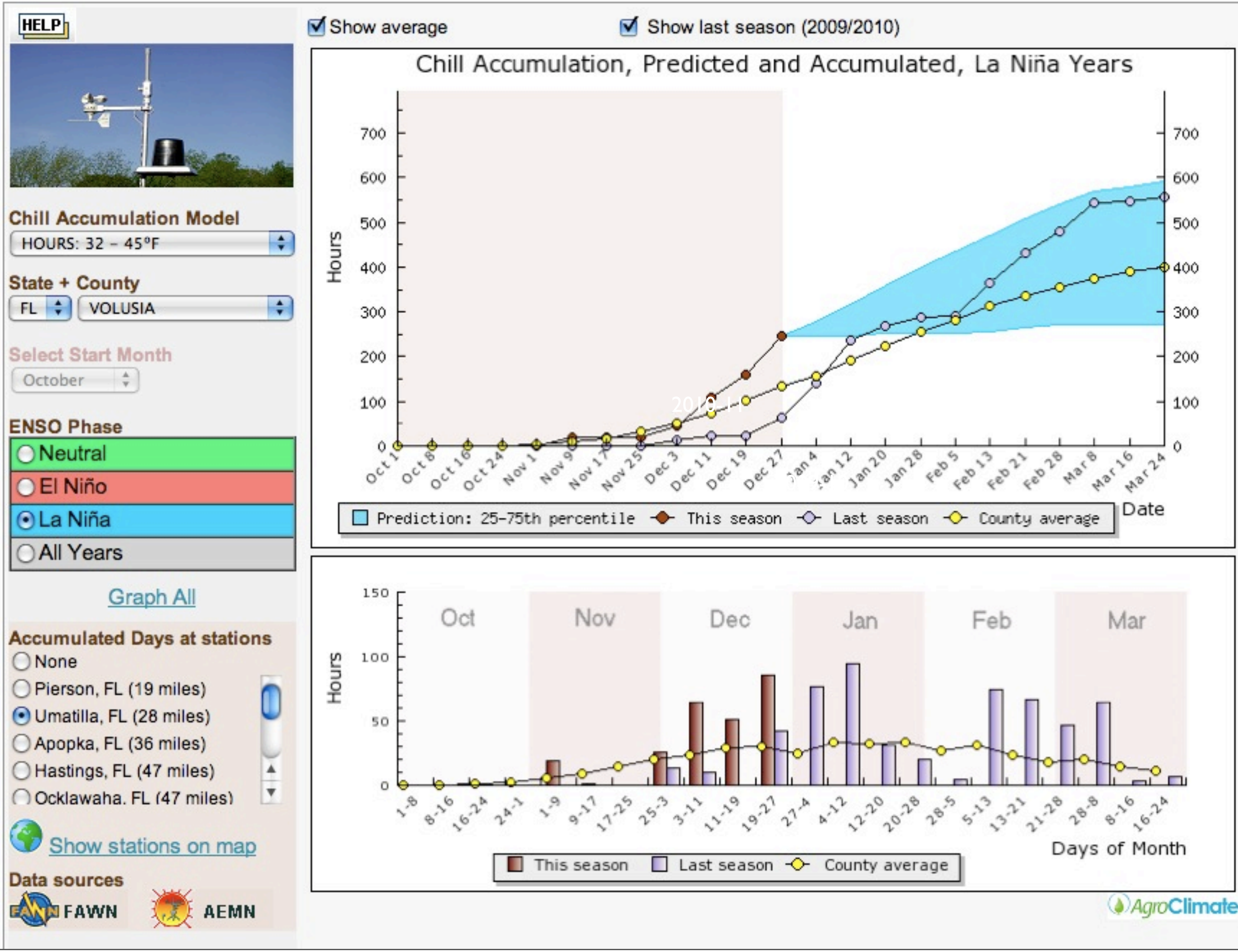
Strawberry Advisory System





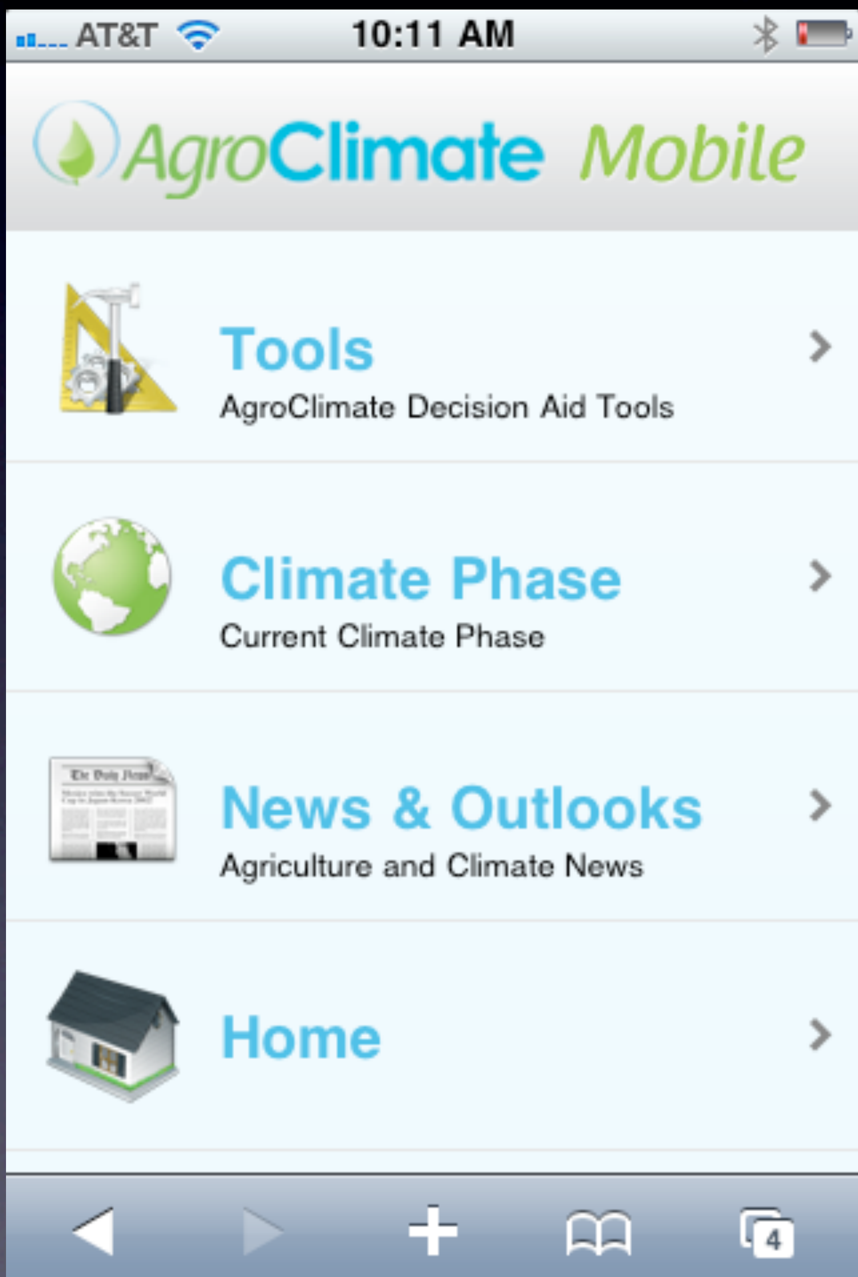
Botrytis Recommendation

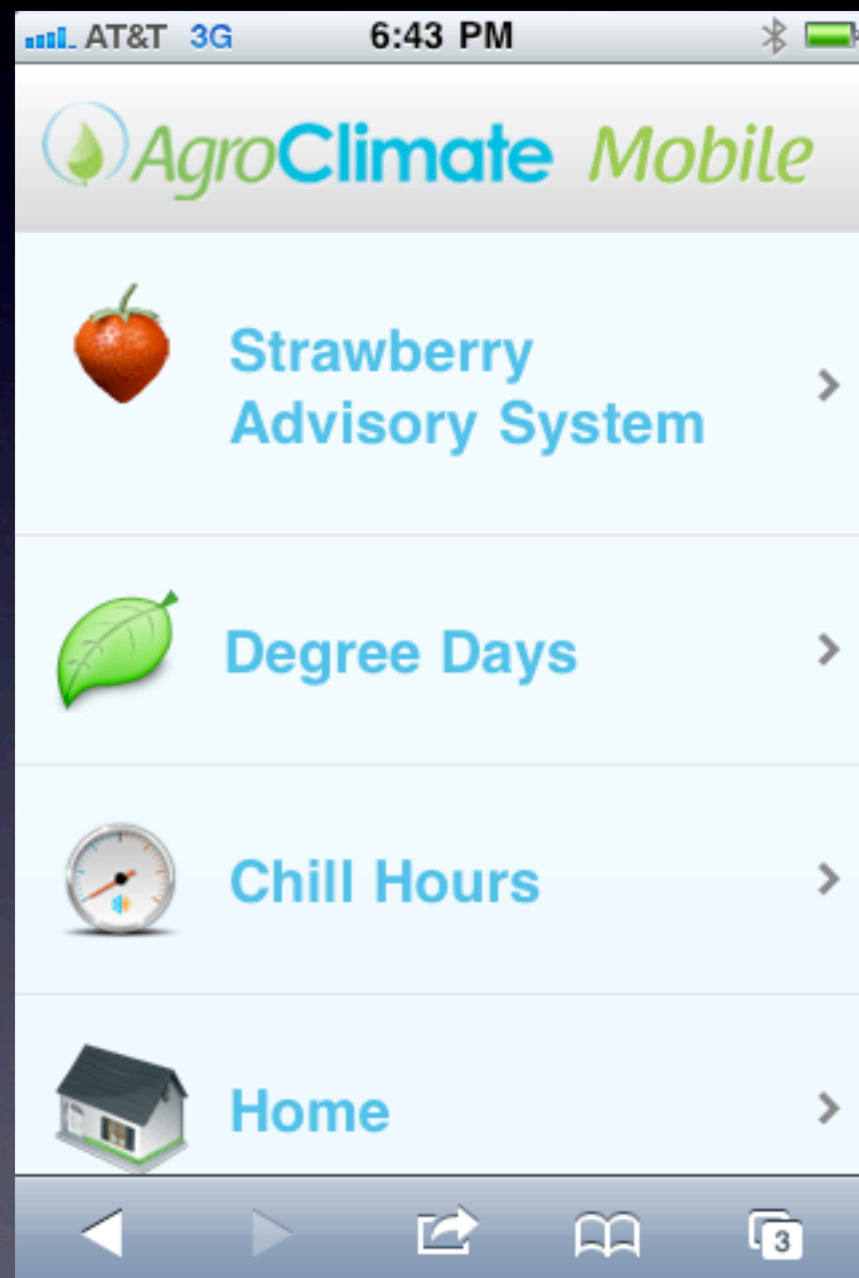


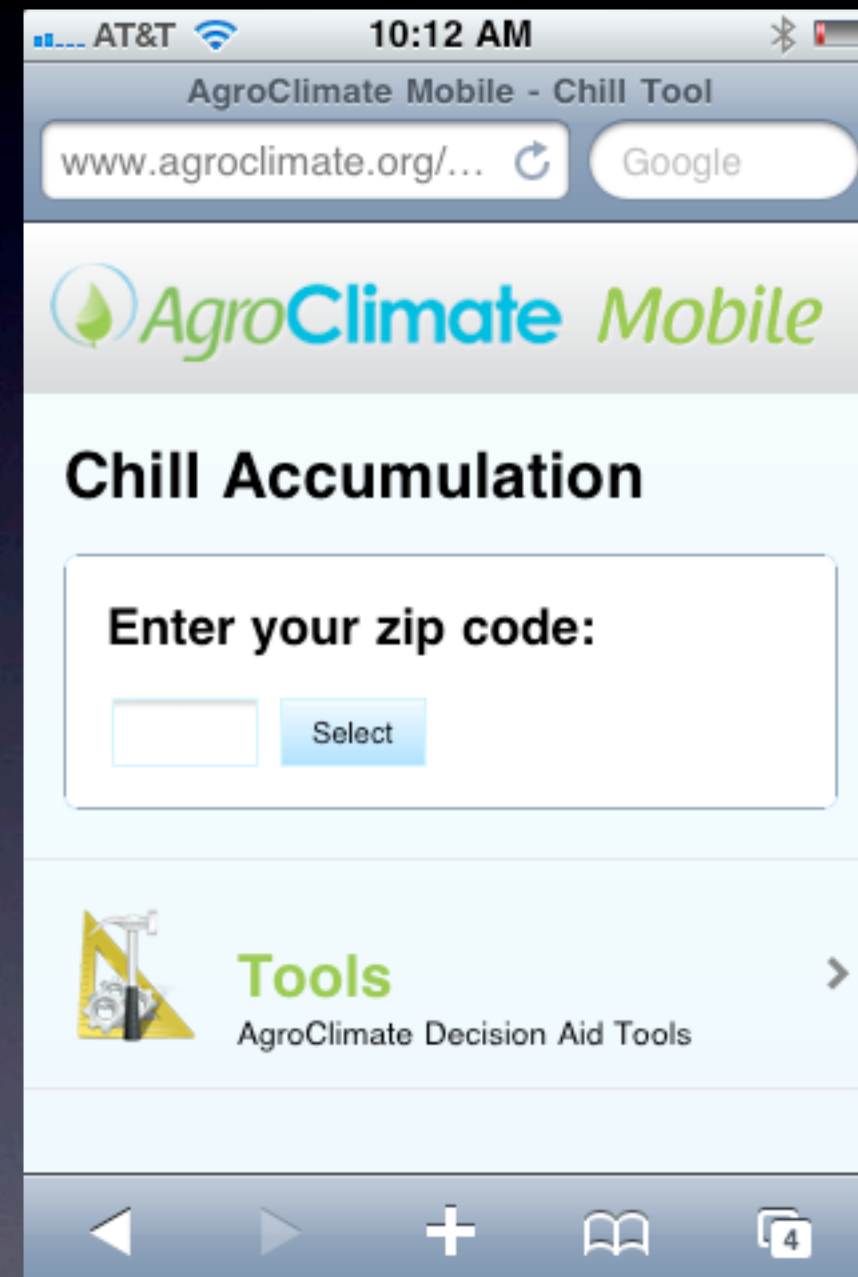


Sunday, March 27, 2011

AgroClimate Mobile
Chill Hours







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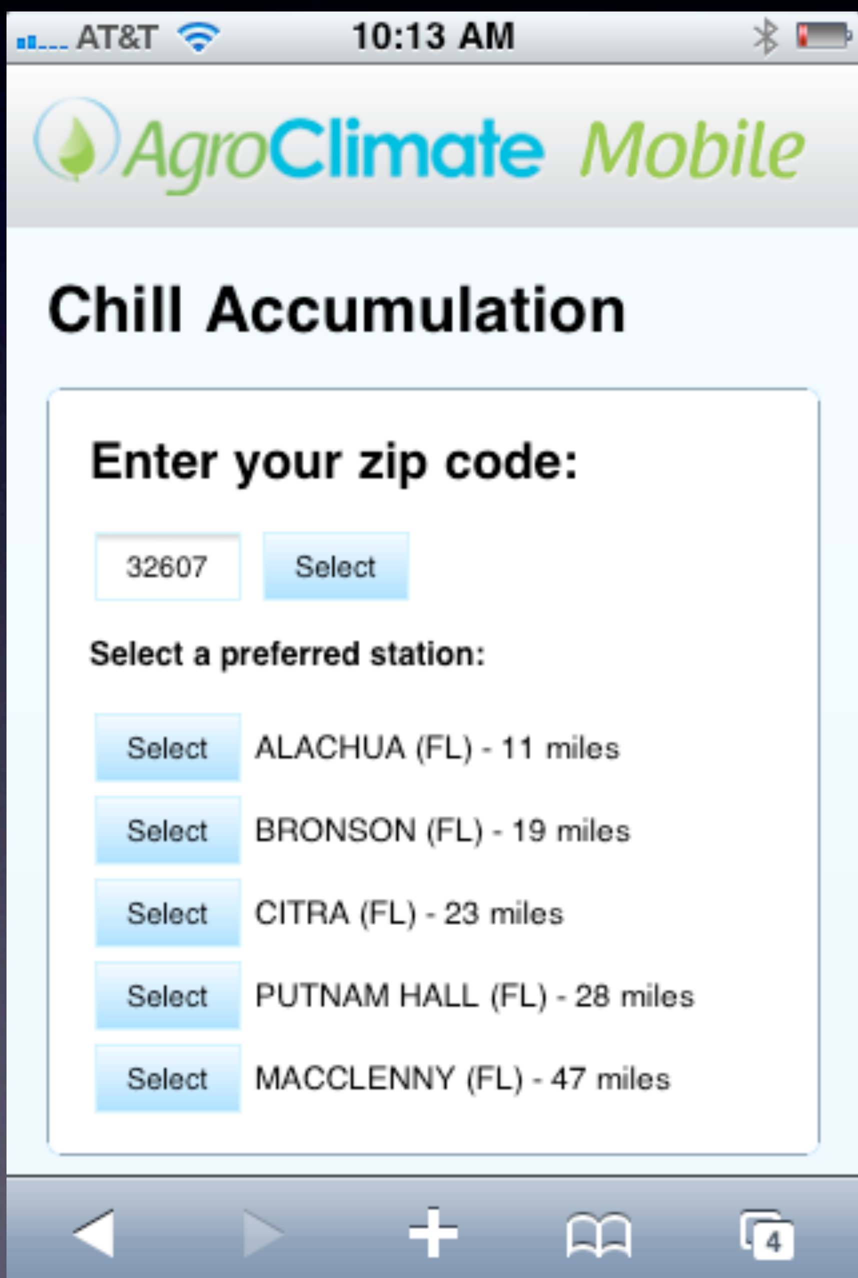
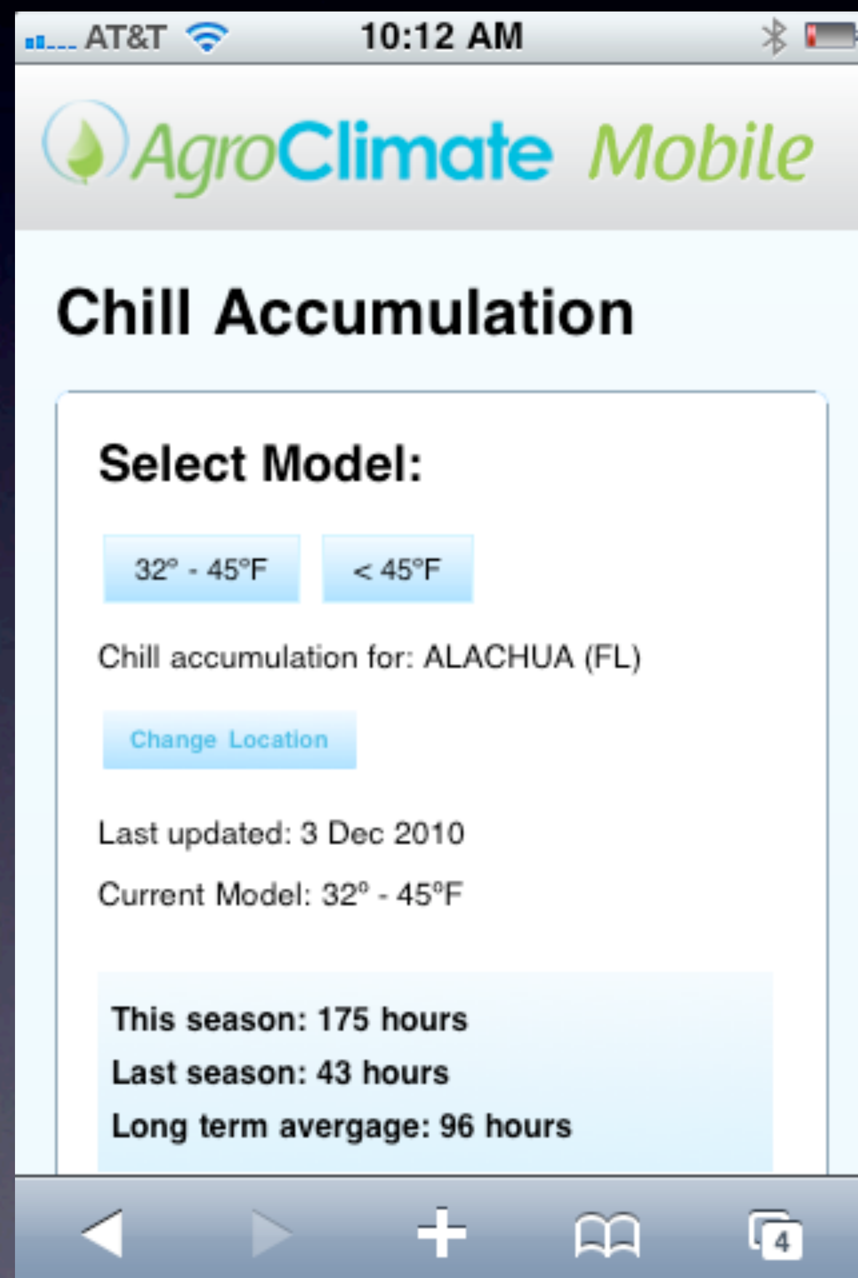
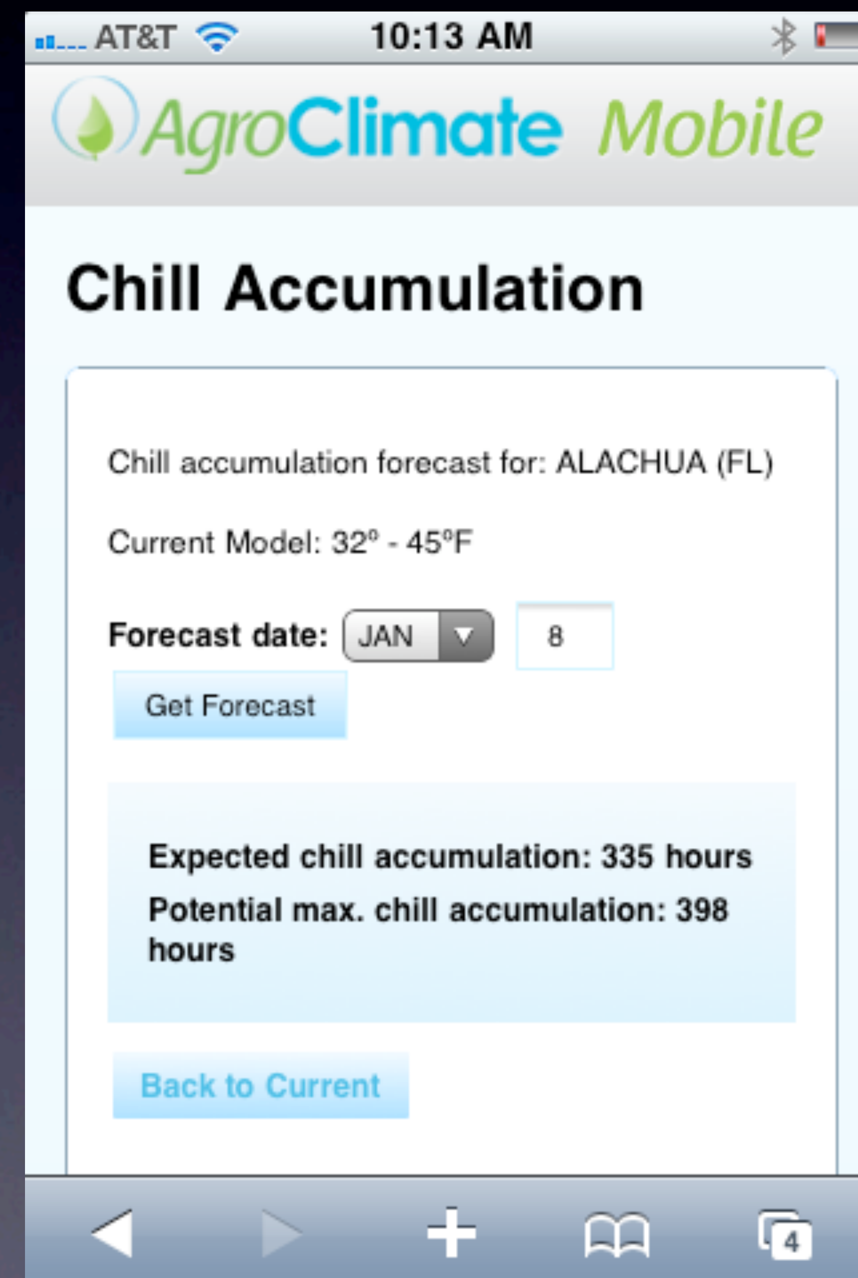
Chill Hours







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Current Climate Phase: La Niña
La Niña develops as the Pacific Ocean continues a rapid transition.

ARID Drought Index

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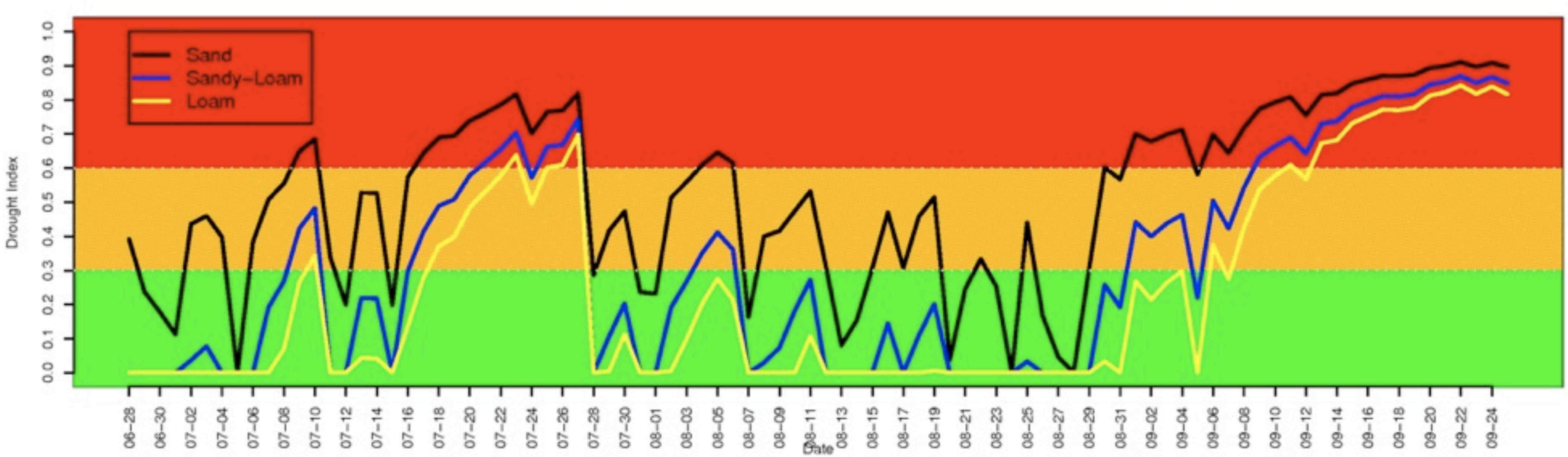
Drought Index Tool

Drought Index Output

Stress Warning | Stress Watch | Little or No Stress

..:: Click here to close this window ::..

Agricultural Reference Index for Drought – Alachua



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Carbon Footprint Calculator

« Back to Tools

1 Select commodity | **2 Select footprint** | **3 Select / edit present values and use our Calculators**

Strawberry

Production

Transportation to Market

Packaging

Storage

Total Strawberry

Farm Machinery

Transportation

Irrigation

AgroChemicals

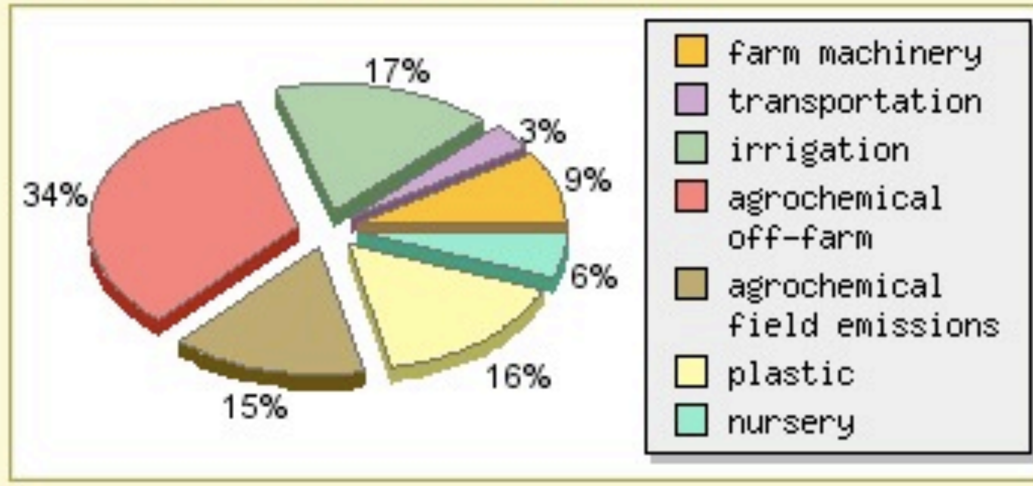
Plastic

Nursery

Total Production

Strawberry Production - Footprint

	CO_2e (lbs/acre)
Farm Machinery	742.5
Transportation	275.9
Irrigation	1367.1
AgroChemicals: Off-Farm	2717.9
AgroChemicals: Field Emissions	1210.6
Plastic	1271.2
Nursery	469.0



Total emission lbs CO_2e/acre	8054.3
Total emission kg CO_2e/ha	9027.4
Total lbs CO_2e*/lb Strawberry	0.336

*CO_2e = Carbon dioxide equivalent.

Field Info: adjust to your farm

Strawberry weight per flat	8.0	lbs
Plants per acre	18000	
Average yield per acre	3000	flats

Recalculate

Open AgroClimate

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Test It...
Test our tools to see how they work

Deploy It...
Deploy your own Wordpress site with our tools and templates

Join In...
Join the community to give feedback and talk to other members

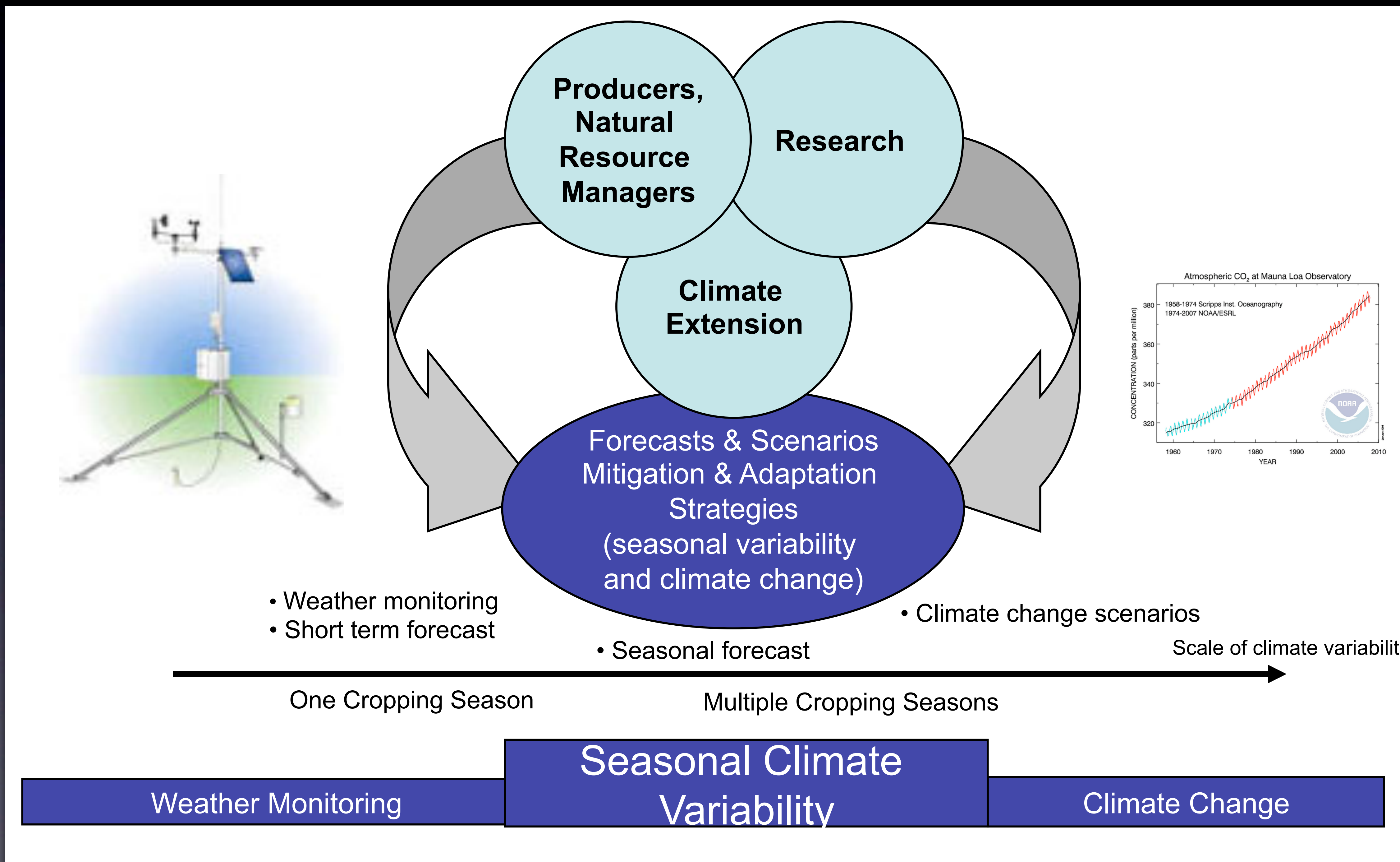
Develop!
Participate in the development process through coding or translation

WELCOME

Welcome to *Open AgroClimate*! This is an Open Source initiative for A*groClimate.org*, a climate information and decision support system for managing agricultural and natural resources in the Southeast USA.

The main objective of *Open AgroClimate* is to help ensure that AgroClimate continues to evolve to address a wide range of climate-based crop risk management issues after the original implementation project ends. It will also ensure that that codes are fully documented and follows the best programing standards and database design, facilitating its transfer to other states, countries, and organizations with a minimum effort and at a reduced cost.

Vision for our Climate Extension Program



Thank You!

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  cfraisse@ufl.edu
  352-392-1864 ext. 271

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