Dry Season 2015-2016 Outlook: El Niño and Potential Impacts

Robert Molleda
Warning Coordination Meteorologist
National Weather Service
Miami Forecast Office
Water Conditions Summary
South Florida Water Management District
Governing Board Meeting
October 8, 2015

Paul Linton, PE, Section Administrator,
Water Management Section
South Florida Water Management District
2013-14 DRY SEASON:
- Only January above average
- Dry Season ended 92% of average

2014 WET SEASON:
- May 26th – Oct 4th
- Near average (108%)

2014-15 DRY SEASON:
- May was 51% below average
- Dry Season 86% of average

2015 WET SEASON:
- Driest May-July since 2004
- Slightly below average
SFWMD
September 2015 Rainfall
(02-Sep to 01-Oct)

DISTRICT-WIDE: 8.01”
(117% of Avg, or +1.18”)

- Above average but with an uneven spatial distribution of rainfall
- Largest surplus was for the WCA 3 (153%) 
- Largest deficits appear for Upper Kissimmee (89%) and for Eastern Palm Beach (88%)
SFWMD
Wet Season Rainfall
(02-Jun to 06-Oct 2015)

DISTRICT-WIDE: 29.39”
(96% of Avg, or -1.12”)

- Upper Kissimmee, Lower Kissimmee, Lake Okeechobee and Southwest Coast are at or above average
- All other District basins exhibit large rainfall deficit for the wet season up to date
- Lower East Coast and EAA show largest deficits
Lake Okeechobee Water Level Comparison

6-Oct-2015
Stage = 14.77 feet, NGVD

Federal Regulation Schedule
LORS-2008 adopted by USACE 28-Apr-2008

Lake Elevation (feet above Sea Level)

Current stage is:
at elevation 14.77 ft, NGVD
0.26 ft above average
0.81 ft below 2014
1.20 ft below the Intermediate Subband

Record Minimum: 8.82' (02-Jul-2007)
Record Maximum: 18.77' (02-Nov-1947)

Water Shortage Management Band
Kissimmee Basin

- Maximum potential storage (filling lakes to winter pool maximum elevation) is 125,000 acre feet (approximately 3 inches on Lake Okeechobee)
- Lake stages are at or just below regulation schedule and rising
- Most structures in the Upper Lakes are closed. S-65 is discharging about 1,300 cfs
- S-65E is currently discharging over 3,100 cfs to Lake Okeechobee

**Regulation Schedule:**

When stages are above this line, make releases to return lake stage to schedule.

**Winter Pool maximum**
Lake Okeechobee in Low Operational Sub-band and rising. Outlook is for wet conditions. Regulation schedule calls for releases to the estuary. Up to 3,000 cfs to Caloosahatchee (Measured at S-79) Up to 1,170 cfs to St Lucie (Measured at S-80)

Reduced capacity in Caloosahatchee (C-43) Canal due to high basin run-off. Structure S-79 discharging approximately 1,150 cfs. (24 hr avg. 10/06)

Up to last week releases south from Lake Okeechobee constrained due to reduced capacity in Miami, Hillsboro, North New River and West Palm Beach Canals (conveying basin runoff). As the runoff diminished canal capacity became available to move water south, subject to STA capacity.

Released from Lake Okeechobee to STA 1W and STA 1E and to tide via L-8 and C-51.
There is some capacity in WCA 1. Lake releases to STA 1W and 1E and to tide via L-8 and C-51.

There is low to moderate capacity to receive or pass through lake water in WCA-2A and WCA-3A. Conveyance capacity of the EAA canals is available. STA 2 and STA3/4 also have some capacity available to move water from the Lake to the WCAs.

- Regulation Schedule summarize WCA water level thresholds throughout the year
- Current objective is to keep water level between the red and purple lines
- If water levels rise above the red line, mandatory regulatory releases are made to return to the red line and no additional lake water can be sent to the WCA

Rainfall Plan releases to ENP started again 3 weeks ago. Currently, about 2,600 cfs is being sent south to the Everglades National Park through S-12s and S-333.

Lake Okeechobee in Low Operational Sub-band and rising. Outlook is for wet conditions. Regulation schedule calls for releases to the estuary.
Up to 3,000 cfs to Caloosahatchee (Measured at S-79)
Up to 1,170 cfs to St Lucie (Measured at S-80)
Lake Okeechobee Flood Control Operations

- Lake stage has been rising since mid August
- LORS recommending releases by last week August
- Runoff hindered releases to estuaries
- Runoff in EAA using most canal and STA capacities
- Releases south to WCAs are being increased
SFWMD Lake Okeechobee Watershed Rainfall Anomaly (Nov-Apr) vs Nino3.4 (NDJ) 1951-2015

2014-15: 13.7” (3.3” above-average)
NDJ Nino3.4 Index = 0.7

Nino3.4 Index (early Oct 2015) = 2.1
Forecast NDJ Nino3.4 Index = 2.2-2.5
El Nino years typically have above-normal rainfall and inflows to Lake O. Simulations show high likelihood of regulatory releases through the dry season.
El Niño is Here: What Does It Mean For South Florida This Winter?
El Niño Primer

- El Niño is part of natural ENSO (El Niño Southern Oscillation)
- Occurs every 3-6 years on average
- Variations in surface pressure cause Pacific trade winds to weaken, leading to warming of eastern Pacific sea temperatures, which then leads to changes in atmospheric patterns
- Ocean temperatures not all...need to see atmospheric “coupling” for true El Niño
Equatorial ocean temperatures are normally warmest in the western Pacific and coolest in the eastern Pacific.

In the central and eastern Pacific, there is a lot of year-to-year variability. Some years are much warmer and wetter (El Niño) and some years are much cooler and drier (La Niña).
January Ocean Temperatures (°C) Comparing Normal to El Niño

El Niño

El Niño: a periodic warming (every 3-6 years) of the central and eastern equatorial Pacific
Not easy to see effect of El Nino on U.S. in a given weather Map or satellite picture.
Current and Forecast ENSO Conditions

Current:
El Niño virtually guaranteed through early 2016

Forecast:
El Niño virtually guaranteed through early 2016
El Niño and La Niña have the greatest impact when they are strong –

About 50% time Neutral/Near Normal

Slide Courtesy: NWS Melbourne, FL
Strength Matters: Strong El Niño

Mid-Sep 2015 Plume of Model ENSO Predictions
Comparison to Strongest El Niños on Record

Monthly sea surface temperature Niño 3.4 Index values

- 2015
- 1982
- 1997

El Niño threshold

all other strong to moderate El Niño years since 1950
El Niño’s influence on Atlantic hurricane activity is well known. El Niño increases the vertical wind shear over the Atlantic, suppressing hurricane activity.
- Direct relationship between strong El Niño and increased winter storminess in Florida, mainly due to a southward shift in the position of the jet stream over North America
- Increased storminess brings a greater potential for severe weather with significant societal impacts
Florida El Niño Severe Weather Awareness

El Niño Sets the Large-Scale Environmental Stage!

- Strong jet stream winds present much of winter/spring (generates enhanced lift)
- Low Pressure Systems track farther south reaching lower-latitudes (more frequent frontal passages; associated pre-frontal warm/moist air masses, squall lines, etc.)
- More opportunities for instability, moisture, and wind shear to come together across the peninsula to create environments favorable for severe thunderstorms

Key Points

- El Niño doesn’t cause strong/violent tornadoes in Florida, but SETS THE STAGE!
- Environmental conditions become more favorable, more often
The El Nino pattern translates to an increased risk of tornadoes across the Florida Peninsula.
La Nina pattern produces much lower risk for tornadoes across the Florida Peninsula compared with El Nino years.
More than Double EF1+ Tornadoes in Strong El Niños

Key point:
✓ 1983 and 1998 accounted for most of the EF+1 tornadoes
Late winter/early spring favored period for tornado-spawning low pressure systems.
South Florida Time of EF1+ Tornadoes

No clear trend – can happen any time of day or night!
Dade/Broward Counties
February 2, 1998

Miami/Hialeah F2: Strong El Niño

- 21 miles
- 500,000 customers without power
- $205 million in damage

Miami Herald graphic
Collier/Dade/Broward
March 17, 1983

- 53 miles
- $2.5 million in damage
- 2nd longest tornado track south of Lake Okeechobee
March 27, 2003: Moderate El Niño

Liberty City/Brownsville section of Miami
One fatality
March 27, 2003

Everglades in Collier County

Photo by Paul Wilson/Ochopee Fire Rescue
April 5, 1925: El Niño??

North Dade: 5 deaths
Caveats, Or “Not What I Ordered”

- Other intra-seasonal atmospheric cycles such as NAO, PNA and MJO can at least temporarily modulate El Niño effects
- Most intra-seasonal cycles are only reliably predictable up to 14 days in advance
- Conflicting/overriding signals can disrupt expected atmospheric conditions
- El Niño “sets the stage”, not a cause
- 1965-1966 and 1972-1973 were strong El Niños with NO tornadoes in South Florida
North Atlantic Oscillation

Periodic Fluctuation of Pressure Patterns over the North Atlantic Ocean – Scale of Weeks

Primary Impact on Winter Temperature
2006-07 Moderate El Niño: Not What I Ordered

Percent Of Normal Precipitation

South Florida: Warm and Dry in El Niño Year
2009-2010: Cold Winter and Freeze in Moderate El Niño

Heart of cold air across SE U.S. and Florida

Near normal precipitation
# South Florida 2015-2016 Dry Season Outlook

<table>
<thead>
<tr>
<th>Element</th>
<th>Outlook Nov-Apr</th>
<th>Long-Term Normal Values/Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Below Normal</td>
<td>64-66F Interior/W 67-69F East</td>
</tr>
<tr>
<td>Precipitation</td>
<td>Above Normal</td>
<td>12-15” Interior/W 15-21” East 32-41 precip days</td>
</tr>
<tr>
<td>Storminess/Severe Weather</td>
<td>Above Normal</td>
<td>5-6 events per season (wind/hail/tornado/flood)</td>
</tr>
<tr>
<td>Freeze</td>
<td>Below Normal</td>
<td>At least one per season</td>
</tr>
</tbody>
</table>
More Rainy Winter Days

Number of days with precipitation >0.1"

Difference in rainy days

Southwest Florida

1957 El Niño
1965 El Niño
1972 El Niño
1982 El Niño
1991 El Niño
1997 El Niño

El Niño average
non-El Niño average

NOAA Climate.gov
South Florida 2015-2016 Dry Season Outlook

- Increased storminess (tornadoes, severe t’storms, hail, flooding)
- Below normal temperatures due in larger part to cooler daytime temperatures than cold night/morning temperatures. Source air masses tend to be of Pacific rather than Arctic origin. Also increased clouds keep days cooler & nights milder.
- Freeze likelihood lower
- Average of 5-10 more days with measurable precipitation
Florida El Niño Severe Weather Awareness

Are People Prepared?

**Increasing Vulnerability**

- 4.7 million new residents since 1998 outbreak!
- Many unaware of Florida (winter) severe weather risks

<table>
<thead>
<tr>
<th>1995</th>
<th>2005</th>
<th>2015</th>
</tr>
</thead>
</table>
| ![Graph showing population increase](image)

- High percentage of mobile homes
- Much lower threshold for damage
- High winter occupancy
- Greater casualty rate

**Time of Day**

- Most of the tornado deaths during El Niño have occurred between 11 PM and 5 AM!

**Overnight Tornadoes**

- Lower perception of threat
- Decreased Awareness (asleep)

**Plantation, FL October 2011 EF1 damage**

- Hourly Distribution of 86 EF2 Tornado Deaths During 11 Strongest El Niño’s Since 1950

http://www.weather.gov/melbourne

Facebook.com/NWSMelbourne

@NWSMelbourne

October 14, 2015
Florida El Niño Severe Weather Awareness

Public Awareness & Safety

- Monitor local television and radio for severe weather situations
  ✓ Such evolving threats are typically identified a few days in advance, with more specific information about the most likely time(s) and location(s) of impact provided one day in advance

- Have the ability to receive timely weather warnings
  ✓ This can save lives, especially with dangerous, night-time tornadoes

- Have a dependable alerting feature or device
  ✓ Ensure that you have a *NOAA Weather Radio* (programmed, with fresh batteries) and/or the *Wireless Emergency Alert* feature on your cell phone (or NWS warnings relayed by text message from Emergency Management or Media, or another reliable app)
IF A THREAT FOR DEADLY TORNADOES EXISTS FOR YOUR LOCATION (ESPECIALLY OVERNIGHT):

- If living in a mobile home, RV, or boat, make plans to stay with family or friends. Leave before the severe weather arrives. If you can’t leave, identify the closest sturdy shelter such as a clubhouse or laundry room and go there immediately if a warning is issued for your location; [last resort (link)]

- Identify your shelter location and “safe place” in advance of a threat (i.e. small interior room on the lowest floor of your home or business, far from windows); ensure everyone is aware of the location

- Words of advice from those who have survived tornadoes include: “putting on your shoes, placing your (charged) cell phone in your pocket, making good use of any kind of helmet and/or pillow to protect your head, and holding tightly on to one another.” These actions must be done quickly and prior to the arrival of the tornado

IF A TORNADO WARNING IS ISSUED FOR YOUR LOCATION:

- Take immediate action and move to your shelter, remain in place until the threat passes
Florida El Niño Severe Weather Awareness

Partnerships

- A strong partnership exists between the National Weather Service, Emergency Management, and Media
  - By working together, these partners can deliver and share timely and accurate information ahead of, during, and after weather events to help minimize significant impacts to lives and property
  - Unified messages (verbal, textual and via social media) are critical for evoking desired public responses
High visibility Storm Prediction Center (SPC) outlooks will be issued during times of increased overnight risk of strong tornadoes (“pre-watch” period).

SPC will issue a Public Severe Weather Outlook (PWO) following the 3pm or 8pm EST Day 1 Convective Outlook when a 10 percent or greater probability of significant tornadoes is expected to occur at night (“enhanced” threat or greater, with EF2 or greater).
NWS Miami Contact Information

(305) 229 – 4525 (24 hours/7 days)

E-mail: sr-mfl.ops@noaa.gov

http://weather.gov/southflorida

http://twitter.com/NWSMiami

http://facebook.com/NWSMiami

http://www.youtube.com/NWSMiami

Questions??