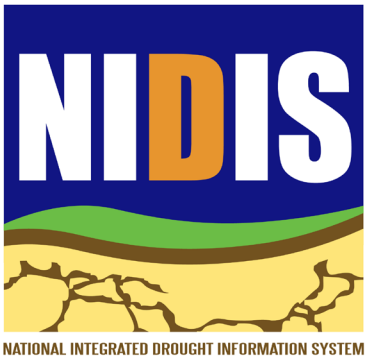
National Integrated Drought Information System – NIDIS



National Integrated Drought Information System (NIDIS)
Southeast-ACF Drought Early Warning Information System Development Workshop
with special emphasis on the Apalachicola River & Bay

April 27-28, 2010, Apalachicola, Fl

Meeting Notes

Introduction

NIDIS Background:

The National Integrated Drought Information System (NIDIS) is an interagency and interstate effort to establish a national drought early warning information system. NIDIS builds on existing products and service networks like the U.S. Drought Monitor (http://drought.unl.edu/DM/MONITOR.html) and Seasonal Outlooks (http://www.cpc.noaa.gov/products/predictions/90day/) to provide fuller coordination of monitoring, forecasting, and impact assessment efforts at national, watershed, state and local levels. NIDIS is providing a better understanding of how and why droughts affect society, the economy, and the environment, and is improving accessibility, dissemination, and use of early warning information for drought risk management. NIDIS incorporates numerous federal agencies, tribal nations, emergency managers and planners, six Regional Climate Centers, Regional Integrated Sciences and Assessments (RISA), state climatologists, and local NOAA Weather Forecast Offices.

NIDIS Early Warning Information System Pilots:

NIDIS is undertaking several pilot projects to prototype and develop a drought early warning information system for the U.S. The goal of the NIDIS pilots is to explore and demonstrate a variety of early warning and drought risk reductions strategies that incorporate drought monitoring and prediction information in partnership with users and federal, state, regional, tribal and local agencies. Over the next five years, NIDIS will build on the successes of the U.S. Drought Monitor, Seasonal Outlooks, and other tools and products through better coordination of relevant monitoring, forecasting, educational and impact assessment efforts tailored to watersheds, regions, and local levels to design and establish a drought early warning information system. The guiding framework for designing each pilot will be completed over two years and will contain the following steps:

Year 1: Scoping the Drought Early Warning Information System

- Gap analyses: What information exists and how is it being coordinated and used?
- Characterize and communicate risks across timescales-with existing information for 2-3 critical issues.
- Develop subteams to assess (1) Monitoring and forecasting; (2) Impact indicators and triggers (3) Preparedness and education
- Assemble a drought-sensitive planning indicators and management triggers database; Assess present drought information coordination partnerships and processes
- Identify Federal and state-level partnerships, decision support tools and actions needed to improve information development, coordination and flow for preparedness and risk reduction

- Develop an operational plan for designing and implementing an early warning system process

Year 2. Implementation of the Drought Early Warning System (seasonal, multi-year, longer term trends):

- Develop drought sub-portals
- Embed information into preparedness and adaptation plans
- Establish network for ongoing briefings on impacts and projections across climate timescales
- Initiate development region or basin specific Drought Information Monitor and Portal (as a subset of the U.S. Drought Portal [www.drought.gov])
- Develop decision support tools for demand projections and revise triggering criteria
- Prototyping: Given better data and information coordination would responses have been improved for past events? Assess (1) value of improved information using past conditions, (2) responses for projections/ scenarios (decadal, climate change), (3) feedback on priorities (e.g. data gaps) to the NIDIS Executive Council.
- Feedback into regional Drought Monitor and Portal. Early Warning System maintenance (Fed-state-tribal) and transfer to other sub-basins

Purpose of the Southeast-ACF Scoping Workshop:

The goal of the workshop is to prioritize and design the NIDIS Early Warning System pilot over the next two years in the ACF Basin. The ACF Basin will serve as one of three in the first round of NIDIS pilots. The other two pilot projects include the Upper Colorado Basin and California.

Southeast NIDIS Workshops: Key Findings

In developing a drought early warning system in the Southeast, NIDIS has conducted several knowledge assessment workshops. These have included workshops in Peachtree City, GA, Chapel Hill, NC, and Columbus, GA. Also, in June 2008, a workshop was held in Kansas City, Missouri, to discuss the status of Drought Early Warning Systems across the United States. Summaries from most of these meetings can be found under "Events & Announcements" on the NIDIS Drought Portal (www.drought.gov).

AGENDA

National Integrated Drought Information System – NIDIS

Southeast-ACF Drought Early Warning Information System Development Workshop:
Apalachicola River & Bay

April 27-28, 2010, Apalachicola, FL
Apalachicola National Estuarine Research Reserve
261 7th Street
Apalachicola, FL 32320
850.653.8063

Tuesday, April 27th

8:30 – 8:35 Welcome, Logistics and Introductions – *Seth Blitch and Jenna Wanat (Apalachicola National Estuarine Research Reserve)*

8:35 – 8:50 Introduction to NIDIS, Pilot Goals and Workshop Goals – *Chad McNutt and Lisa Darby (NOAA/NIDIS)*

8:50 – 9:05 Overview of Lake Blackshear meeting – *Lisa Darby (NOAA/NIDIS)*

9:05 – 9:20 Update on the NIDIS ACF Pilot Data Committee Activities – *Chad McNutt (NOAA/NIDIS)*

9:20 – 9:35 Climate and Drought in the Apalachicola River & Bay – *Dave Zierden (Florida State Climatologist, Florida State Univ.)*

9:35 – 9:50 Drought Monitoring and Forecasting for the Apalachicola River & Bay – *Joel Lanier (NWS, Tallahassee Weather Forecast Office)*

9:50 – 10:05 Drought Early Warning and Information Tools – *Keith Ingram (Univ. of Florida)*

10:05 – 10:30 **Coffee Break**

Lessons from recent droughts
10:30 – 10:45 The Importance of Riverflow to Salinity in the Bay – *Lee Edmiston (Florida Department of Environmental Protection)*

10:45 – 11:00 Oysters and Salinity – *Laura Petes (NOAA/Climate Program Office/NIDIS)*

11:00 – 11:15 Impacts on Fish and Mussels in the Apalachicola River Due to Recent Droughts – *Ted Hoehn (Florida Fish and Wildlife Conservation Commission)*

11:15 – 11:30 Effectiveness of Existing Drought Indicators – *Doug Lecomte (NOAA/Climate Prediction Center)*

11:30 – 11:45 Offshore Impacts of Drought - *Felicia Coleman (Florida State University Coastal and Marine Laboratory)*

11:45 – 12:00 What were the Gaps in Data and Hydrologic Forecasting Needs? – *Ron Bartel (Northwest Florida Water Management District)*

12:00 – 1:30 **Catered Lunch at Apalachicola NERR**

1:30 – 4:45 **Breakout 1** (with coffee break from 3:00 to 3:30) – *Victor Murphy (NOAA/NWS)*

What are the critical information needs related to drought (e.g. gaps in monitoring and forecasting)?
What is the effectiveness of existing drought indicators and management triggers?
How can education, communication and transparency related to current and future drought status be improved in the region?

4:45 – 5:00 Meeting wrap-up

6:30 - ? **Group Dinner – Low Country Boil at Apalachicola NERR**

Wednesday, April 28th

8:30 – 8:45 Overview of Day 1

8:45 – 11:30 **Breakout 2** (with coffee break from 10:00 to 10:15) – *Chad McNutt and Lisa Darby (NOAA/NIDIS)*

Drought Planning in the Apalachicola River & Bay: What mechanisms are currently in place? How well are they working?
What is needed to improve drought planning and response in Apalachicola?

Next Steps: Developing a drought early warning information system – *Bethney Ward (NOA/ Coastal Service Center)*

A customized ACF drought monitor: Audience and purpose
For the design of a customized ACF drought early warning information system, what is needed for the Apalachicola River & Bay? What are the building blocks for the design of this drought early warning information system?
What actions can local, state, federal and tribal agencies take to lay the groundwork for this drought early warning information system? How best might these be coordinated for information sharing?

11:30 – 12:00 Develop a **plan of action and timeline**: Developing and implementing a drought early warning formation system for the ACF Basin – needs of the Apalachicola River & Bay – *Keith Ingram (Univ. of Florida)*

12:00 Meeting Adjourns

Optional post-meeting Boat Tour hosted by ANERR
The Boat Tour will begin at 1:30 pm on Wednesday.
The duration of the tour will be ~2.5 hours.
The tour is limited to 28 people.

April 27, 2010 - Review of Presentations

Climate and Drought in the Apalachicola River & Bay
Dave Zierden (Florida State Climatologist, Florida State Univ.)

The El Niño/La Niña cycle is the predominant mode of year-to-year climate variability in the Southeast U.S. Because of the shifts in the storm tracks associated with El Niño and La Niña (as opposed to neutral conditions) David showed there is a direct impact on flow rates on the Apalachicola River (as measured at Chattahoochee): In warm SST years (El Niño) the river flow tended to be above normal (Oct – Jun) and in cold SST years (La Niña) river flows tended to be less than normal in most months, especially during the late winter/early spring recharge season. Therefore, La Niña forecasts are key to predicting the possibility of drought and changes in crop yield.

Drought Monitoring and Forecasting for the Apalachicola River & Bay
Joel Lanier (NWS, Tallahassee Weather Forecast Office)

The NWS Tallahassee, FL WFO uses the following products to assess the drought possibilities:

- U.S. Drought Monitor
- 2-week soil moisture anomaly
- Constructed Analog Soil Model
- Climate Prediction Center (CPC) short-range and medium-ranges forecasts
- Palmer 4-month probabilities
- CPC Long-lead precipitation outlook
- U.S. Seasonal Drought Outlook
- USGS WaterWatch (FL, AL, GA)
- Phone contact with agricultural specialists and ag bulletins
- Fire conditions, using Keetch-Byram Drought Index (KBDI)
- Current water restrictions as mandated by local water agencies

What is needed from NIDIS:

- *Need County Specific Drought Information*
- *Single Source: State Climatology Maps*
  - *Agricultural conditions*
  - *Crops and Hay*
  - *Water supply conditions (Surface and Groundwater)*
  - *Soil Moisture*
  - *Fire conditions*
  - *Drought Declarations and Water Restrictions*

Drought Early Warning and Information Tools
Keith Ingram (Univ. of Florida)

There are different definitions of drought (climatological, hydrological, agricultural). Drought can be local or there can be indirect effects of drought.

Keith provided an overview of sources of drought information for the basin:

- US Drought Portal (www.drought.gov)
- National Drought Monitor (http://drought.unl.edu/dm/monitor.html)
- NWS Southeast River Forecast Center (http://www.srh.noaa.gov/serfc/)
- USGS (http://waterwatch.usgs.gov/)
- State climate offices (Alabama - http://nsstc.uah.edu/aosc/, Florida - http://www.coaps.fsu.edu/climate_center/index.shtml and Georgia - http://climate.engr.uga.edu/)
- Southeast Climate Consortium/AgroClimate (http://agroclimate.org/)

The Importance of Riverflow to Salinity in the Bay
Lee Edmiston (Florida Department of Environmental Protection)

The East Bay is the nursery of Apalachicola Bay

The Apalachicola System –Florida Watershed

- Largest river in Florida (21st in flow in US).
- Accounts for 35 percent of fresh water flow on the western coast of Florida.
- River flow is variable annually and seasonally
- River flow affects/controls residence time in the bay
- River flow is the most important determinant of salinity in Apalachicola Bay

The range of recorded flows at Chattahoochee, FL is 4,750 cubic feet per second (cfs) to 290,000 cfs, with an average of 22,300 cfs

Impacts of upstream drought on downstream oysters in Apalachicola Bay
Laura Petes (NOAA/Climate Program Office/NIDIS)

- Apalachicola Bay provides 90% of the oysters for the state of Florida, 10% of the oysters for the US
- They have rapid growth rates and high reproductive output
- They have adapted to brackish conditions (mix of fresh and salt water)
- During the drought in 2007 there was a large increase in salinity of the water in Apalachicola Bay
- This increased salinity reduced oyster survival and growth and increased the prevalence of disease
- At the same time, the range and health of oyster predators (e.g., oyster drills) increased with the increased salinity
- Thus, drought and reduced freshwater input will lead to more summer die-offs of oysters

Impacts on Fish and Mussels in the Apalachicola River Due to Recent Droughts
Ted Hoehn (Florida Fish and Wildlife Conservation Commission)

Low Water = Dead Critters

Sturgeon

1. Reduced flow resulted in decreased habitat available for Sturgeon Spawning in mid-March through May.
2. Spawning occurred at deep areas closer to higher velocity current.

Mussels

3. Extreme die-off in many sloughs and side channel habitat areas due to dewatering.
4. Swift Slough fat threeridge population virtually eliminated- highest population on river.
5. Extreme loss of greatest purple bankclimber population on Apalachicola River located at Race Shoals.
6. USFWS/COE/FWC cooperated in conducting riverwide mussel surveys. Additional fat threeridge sites located along river.

Spawning nests for freshwater fisheries become exposed during low flows.

Effectiveness of Existing Drought Indicators
Doug Lecomte (NOAA/Climate Prediction Center)

Desired Features of a Drought Index

- Understandable (what it means and how it's calculated)
- Available daily (short term index) or weekly (long-term index)
- Correlates with impacts
- Range of values easy to understand (e.g., percentiles, anomalies)
- Appropriate spatial resolution
- Can be imported into GIS (e.g., GeoTIFF)
- Has a long history and the archive is easy to find

Doug LeComte's Top 5 Drought Indices:

#5 Keetch-Byram Drought Index (KBDI, http://flame.fl-dof.com/fire_weather/KBDI/index.html)

#4 CPC Drought Indicator Blends
http://www.cpc.ncep.noaa.gov/products/predictions/tools/edb/droughtblend-access-page.html

#3 CPC Soil Moisture Model
(http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)

#2 North American Land Data Assimilation System (NLDAS)
(http://www.emc.ncep.noaa.gov/mmb/nldas/drought/)

#1 USGS Streamflow (http://waterwatch.usgs.gov/)

Offshore Impacts of Drought – Linking Coastal Watersheds to Fish & Fisheries
Felicia Coleman (Florida State University Coastal and Marine Laboratory)

The loop current and pinch-off eddies supply warm water to the Gulf of Mexico, enhancing diversity among the sea life present in the Gulf, including thousands of species of coral, sponges and fish.

Drainage from the Mississippi River Basin and the ACF supply nutrients and fresh water to the Gulf – linking terrestrial and marine ecosystems.

The nutrient loading from the Mississippi River can cause a decrease in dissolved oxygen (DO), leading to dead zones where fish, etc. cannot flourish.

On the other hand, nutrient loading from the ACF, flowing into the Apalachicola Bay and beyond, supports highly productive offshore fisheries, e.g., grouper, that deliver billions of dollars to coastal communities and those industries that depend on them.

When the flow in the Apalachicola River is reduced due to drought, so is the delivery of nutrients to these fisheries. Thus, the benefits of river flow extend far beyond the boundaries of Apalachicola Bay.

What were the Gaps in Data and Hydrologic Forecasting Needs?
Ron Bartel (Northwest Florida Water Management District)

8 Gaps in forecasting and monitoring:
#1 Climate and precipitation forecasting:
An important gap is forecasting changes from wet conditions to dry conditions;
We need improved El Niño and La Niña predictions
#2 Hydrologic modeling:
Real-time hydro model for floodplain inundation and salinity;
Need a good runoff model
#3 Coupling of upstream conditions with downstream conditions
#4 Upstream real-time consumptive use reporting:
Real-time water demand (muni and ag most important)
#5 Monitoring sites and data:
The Corps has discontinued some gages – more gages are needed
Real-time winds for hydrodynamic model
#6 One-stop-shop:
There are a lot of web sites with information (e.g., NOAA, Corps, USGS and NWFWMD). It would be useful to have access to this information from one web site.
#7 Biological relationships are 20/20
#8 The $ Gap
There is no real commitment to finance monitoring and forecasting in the ACF

Group Discussion led by Victor Murphy

- *What are the critical information needs related to drought (e.g. gaps in monitoring and forecasting)?*
- *What is the effectiveness of existing drought indicators and management triggers?*
- *How can education, communication and transparency related to current and future drought status be improved in the region?*

Input from Attendees:

- When asked if anyone in the group used any of Doug LeComte's top 5 drought indices the response was "no." It was stated that these indices are useful when looking at the bigger picture and to explain to the general public what is happening in the bay.

- We need basin inflow information. The Corps defines basin inflow as what is left after they make their withdrawals, but there is more to account for than that, such as reservoir evaporation and farm ponds.

- Soil moisture sensors:
  - There is much heterogeneity in the soils.
  - Who are the end users? Hydrologists (models), satellite calibration, state of Georgia for Mar 1 decision for the Flint River Protection Act.

- The key question – Are we entering a dry period?

- In summer, the dry period, we have the least skill in forecasting and the most variability. In spring, some skill in March and April, maybe in May.

- The Corps refills the reservoirs in April – June when the conditions are drying. They release earlier in the season for flood control.

- November – March – good skill for El Niño/La Niña forecasting and better precipitation forecasts.

- We need:
  - Buy-in from the public regarding drought declarations
  - Upstream conservations and other actions to help the downstream situation

- We can deal with short duration dryness. We need help with long-term dryness – assessing the trends and finding out what the Corps' response is.

- Ultimately the decision makers are the governors and the general (Corps). NIDIS can provide the information and the states can decide what to do.

- NIDIS could inform the state drought planning process.

- The USGS allows other agencies to submit well data to the Climate Response Network. They will compute stats, etc.

- NIDIS could provide information for the general public. People could sign up for updates by topic.

- What about a regional team for drought monitor updates (as in North Carolina and the NIDIS Upper Colorado River Basin pilot)?

Major Themes of Day 1

DATA NEEDS & ISSUES

- Water budget
- Basin inflow information – the Corps defines basin inflow as what is left after they make their withdrawals, but there is more to account for than that, such as reservoir evaporation and farm ponds
- Water use information, particularly agricultural use
- Good reservoir evaporation measurements, as well as easily accessible reservoir level data
- Groundwater pumping rates from GA
- QA/QC issues for the 3 gages on the Apalachicola that are maintained by the Corps
- USGS has invited other agencies to submit well data to the US Climate Response Network; USGS will compute stats, etc.
- Socio-economic assessments, e.g., valuation of ecosystem services

TOOLS & MECHANISMS

- Need groundwater and Corps lake levels available at one web site, with enough data to provide historical context
- Tri-state webinars for a regional team to review met and hydro data; could feed into the drought monitor via drought monitor author participation
- Public discussion boards for drought
    - Something for the general public
    - Something for more technical folks

EDUCATION & OUTREACH

- Ascertain who the end users of the information are
- Buy-in from the public regarding drought declarations
- Upstream conservation and other actions to help the downstream situation
- In the midst of all we are doing, we should remember that increasing awareness about drought is helpful

INDICATORS

- Develop indicators for entering a dry period
- Learn more about how to relate the timing of drought onset to impacts – connect to physical data
- It is possible to develop a drought indicator for the basin?

COMMUNICATION IN THE BASIN

- The Corps has changed from conference calls to providing information on their web site

BASIN MANAGEMENT IMPACTS and DECISION MAKING

- The Corps refills the reservoirs April-June when the conditions are drying
- The Corps releases earlier in the season for flood control
- Need to know more about the Corps' response to drying conditions
- Ultimately the decision makers are the governors and the General (Corps). NIDIS can provide the information and the states can decide what to do

Notes from the group discussion on the second day of the meeting

- *Drought Planning in the Apalachicola River & Bay: What mechanisms are currently in place? How well are they working?*
- *What is needed to improve drought planning and response in Apalachicola?*

- Ecological models and ecological impacts could possibly be used as drought indicators
- Drought planning:
    - Without a water control plan [from the Corps] there can't be a drought plan
    - Threatening endangered species is the only "drought plan" in existence. There is disagreement on the 5000 cfs number.
    - From the 2007 drought, FL is ok with 5000 cfs as long as there's shared pain; there is a problem with refilling the reservoirs and keeping the flow at 5000 cfs once it starts raining upstream; there is still drought and suffering at the lower end of the basin.
    - Part of the drought plan must deal with coming out of the drought too
    - Industries up and down the system need to be in the loop; during the last drought Meadwest had to store effluent in a pond until the flow was great enough to discharge.
    - Q: How can you influence the Corps pre-drought? A: There are contacts within all 3 states that coordinate and stay on top of ACF issues, e.g., DEP staff, Tom Littlepage; James Hathorn and Sandy Tucker (USFWS); they potentially set in motion various management actions.
    - Unofficially there have been changes since the drought of 2007; Corps has kept reservoir levels extremely high, above the rule curve. This is a problem if there's a rain event, but helpful if dry. …It all comes down to the water control plan. So, the Corps has made changes, but will these changes stick once they have the water control plan?
- The ACF Stakeholders has been looking at natural and unmanaged flows. In the Apalachicola River the flow can naturally go as low as 2900 cfs for short periods of time, so the Apalach actually gets more water because of the management.
- Federal fishery management gets interested if a habitat is in trouble, but has no teeth to do anything about the problem
- NOAA/NMFS started to do some work, but the priorities shifted and they ran out of money, pulled out of research here.
- In the Potomac River basin, drought monitor levels can trigger increased coordination
- It would be interesting to look historically at Drought Monitor levels and drought conditions
    - Could we use upstream Drought Monitor levels as a trigger?
- Do people use the Ensemble Streamflow Prediction System (ESP)?
    - Some people with more experience may have looked at the ESP, but some people might not know about it or may not have known how to use the information. Some managers may know. Most folks need plainer English/interpretation of NWS products.
- Corps conference calls during the previous drought

    - Before the calls the Corps would send out reservoir storage info, and that's it.
    - Not so much came out of the Corps calls – mainly sharing of information, but not coordination.
- If there is normal precipitation this summer, drier conditions this fall, and the long-range forecast indicates above normal chances for below normal precipitation– is this same or different from what you saw in fall 2007?
    - If it does look like this scenario is going to occur, there will be discussions about dumping the water vs. keeping the water levels up.
    - Would the Corps involve the stakeholders earlier in the process?
    - The best models show La Niña is forming; they could be wrong, but the chance is increasing. We know this now but nobody is taking an official stand. They won't declare a La Niña until right before it happens.
- In the last 5-7 years, an education process occurs with a new general. Just when the general understands the issue, there's a new general. Turnover at the Corps seems to be increasing.
- When does the Corps do their long-range planning for the water year? They seem to be reactive.
    - What about the SECC, CPC and the Corps having a meeting about the next 6 months or water year? We could assist the Corps.
    - Someone expressed that this is a good idea and could NIDIS help coordinate such a thing?
    - The ACF Stakeholders would be very receptive to an in-person presentation at each of their quarterly meetings about what we know.
    - What about the challenge of conveying uncertain information – could NIDIS work on this? There are ways to do that.
- What about socioeconomic aspects?
    - If you're talking about people then there's an upstream-downstream disconnect
    - Are there impacts on economically important fisheries offshore? We don't know the answer on that. It's answerable, but it will take some time.
    - There are models; economic impacts could be inferred
    - Ag impacts may be immediate, but it could be years before you see a fisheries impact (up to 3 years for some fish) on economics.

Information System Needs

Next Steps: Developing a drought early warning information system
Bethney Ward (NOAA/ Coastal Service Center)

- *A customized ACF drought monitor: Audience and purpose*
- *For the design of a customized ACF drought early warning information system, what is needed for the Apalachicola River & Bay? What are the building blocks for the design of this drought early warning information system?*
- *What actions can local, state, federal and tribal agencies take to lay the groundwork for this drought early warning information system? How best might these be coordinated for information sharing?*

- Who is the audience? Who are the providers of information?
    - Outlooks: One for hydro, one for ag
    - Indicators: Run-off index; streamflow fcsts based on ESP or other products
- Who uses drought information – by sector or job title;
    - People need the information before the drought
    - Agriculture; individual citizens need to be making decisions about things like landscaping. We all need to be more aware; back to NIDIS' role in education
- What information does ag need?
    - Drought resistant crops, what to plant, when to plant.
    - Hay transportation and sharing
    - Conservation in Atlanta impacted by drought because there's a huge urban landscaping business there (green industry). Lots of job losses. Green industry needs to information for planning purposes.
- Utilities/municipalities – usage
- Recreational needs
- Hydro Climate Information– providers and users
    - Natural resources managers (inc. fisheries, land managers who do prescribed fires). If F&W knows drought is coming, maybe they could work with the Corps on the ramping rates (e.g., how quickly they are going to drop the river – try not to strand the fish).
    - Fisherman – industry and recreational; are they harvesting or doing their "other business" because the situation doesn't look good. Harvesting locations may shift according to conditions.
    - Water resource management
    - Political support – e.g., governor has to make a decision; science advisors; education; shaping policy
    - WMD – riparian ownership (conservation land ownership)
    - Timber industry in the flood plain – their activities (harvesting window) may vary a lot due to wet/dry conditions
    - Transportation of goods; tupelo honey producers use barges to transport hives (something people here really care about)
    - Corps of Engineers – provider and consumer. Dredger got stuck in the river when the flow got too low.
    - Flow stage data
    - Conservation organizations, e.g., Apalachicola Riverkeeper to protect health of the river and bay
    - Media outlets
    - Emergency responders (state EOC) (although more likely to be needed during flood), help displaced workers
- What are key things that the users/audience, etc need? What are the key information pieces?
    - Water availability for drought early warning and forecasting
    - Flow information
    - Is there going to be enough for tomorrow? Projected availability?
    - Projected duration of conditions

- Bounds around potential impacts (next 2 weeks, next month…) Target specific user groups.
- People wait too long before they do something, especially water conservation. Public doesn't understand what we are accomplishing by following water restrictions. e.g., Maybe you're saving 1 foot of water on Lake Lanier.
- Products geared to experts and geared to general public (same info, different conveyance). For example, river levels on local tv news – some don't know what it means, others know they can or cannot fish or use certain boat docks.
- Descriptors for different stages of drought/lessons learned
- National Phenology Network – people enter information about blooming plants, etc.
- Community Collaborative Rain, Hail and Show network (CoCoRaHS) – can now enter drought impacts that will feed into the National Drought Mitigation Center drought impact reporter
- The role of NIDIS – coordination of information

Closing Summary

Develop a plan of action and timeline: Developing and implementing a drought early warning formation system for the ACF Basin – needs of the Apalachicola River & Bay
Keith Ingram (Univ. of Florida)

- Establish an ACF basin discussion group for input to the national Drought Monitor, the Corps and state officials (a local group that regularly interacts with the Drought Monitor authors); alert people to impending drought when the time comes. Examples of participants from this part of the basin include Victor Murphy, Ron Bartel, David Zierden, Joel Lanier; the group decides the trigger for having a call

- Present climate information to the ACF Stakeholders; stakeholders need to be coordinated and all on-board with the final message.

- General Public: Communication from NIDIS through the drought portal. Include historical comparisons, basic educational materials.

- Provide information to the local media when it's starting to get dry. Use public information to trigger water conservation. For Atlanta, they do a rolling 365-day (and a 180-day and a 90-day) precipitation average to get past the drought going away on Jan 1st because they're comparing precipitation to the calendar year annual average.

- The media is important because not everyone looks at web sites.

- We need to do face-to-face meetings with people to educate them about what information and tools are available. There are people whose job it is to disseminate information.

- Need to indicate consistent science is backing up decisions

- Coordinate with DEP, FWC and WMD – then decide what information to release, or at least have the information out there. Address information breakdown within agencies.

Gaps we need to fill:

- Seasonal precipitation forecasts for mid-Nov (for the recharge season) with a mid-February follow-up for the key decisions that have to be made Mar 1 and around then.

- What about continuous forecasts? They occur monthly from CPC.

- Can we have input to Corps water management plan? Will they be accepting inputs? The public comment period is over and was not a very satisfactory process. It was perfunctory.

- Will there be a NIDIS scope of work based on all of these meetings we've had so far?
    - NIDIS needs to have all of the sub-basin meetings first