

Jim Fox, Director
RENCI at UNC Asheville

**REGIONAL ENGAGEMENT, EDUCATION
AND DECISION SUPPORT**
LESSONS LEARNED IN WESTERN NORTH CAROLINA





OPEN HOUSE
OPEN HOUSE

PLEASE JOIN
RENCI AT UNC ASHEVILLE
FOR A DROP-IN

OPEN HOUSE



NOAA in the CAROLINAS National Oceanic & Atmospheric Administration

WEDNESDAY, APRIL 21, 2010
5:00 – 6:30 PM

Exhibits and Displays Include

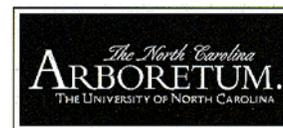
- The 16 x 8 Foot Visualization Wall
 - The GeoDome – an immersive experience
- Touch-screen enabled Geographic Information Systems (GIS) applications
 - Map gallery
 - Poster displays
 - 3D Visualizations

RENCI AT UNC ASHEVILLE IS LOCATED IN SUITE 116 OF THE GROVE ARCADE, ON THE O'HENRY AVENUE SIDE OF THE BUILDING



RENCI at UNC Asheville Downtown Engagement Site

Decision support tools that encourage community engagement



Education, Engagement, and Service Delivery

Stages or Categories

1. Building Literacy
2. Providing Information
3. Serving Data
4. Services

Methods

- Online
- Printed material
- Formal Education
- Informal Education
- Workshops
- Community conversations

- *We sometimes try to do all at the same time, with limited success.*
- *Share some of our experiences and lessons learned.*
- *Set up the breakout session to follow.*

Building Literacy

1. Building Literacy – concepts, education, etc.

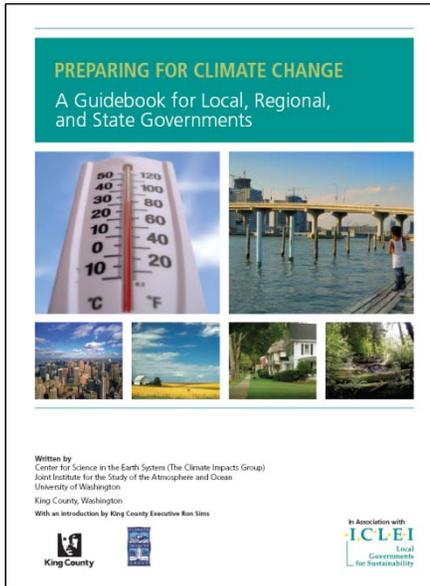
- **Climate adaptation vs. mitigation**
- **Handbook for planners**
- **Variability**

2. Providing Information

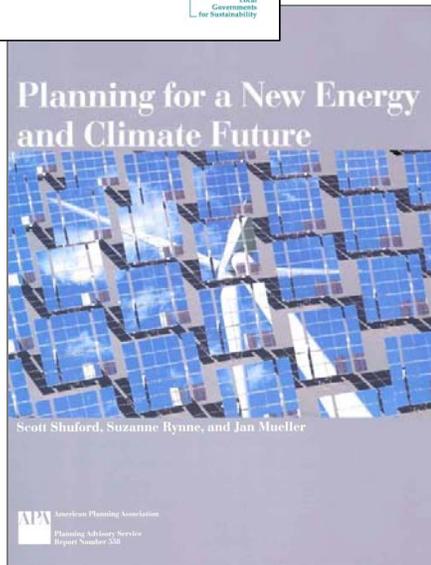
3. Serving Data

4. Services

NOAA is Working with State and Local Governments



- With the American Association of State Climate Offices providing climate services to state and local governments.
- With the Environmental and Energy Study Institute (EESI) and the International Council for Local Environment Initiatives (now called ICLEI, Local Governments of Sustainability) produced a guide book for climate change.



- With the American Planning Association (APA) and the EESI conducted a three-year research project on the integration of energy and climate issues into planning practice which produced a hand book used in Planner's Accreditation.

W El Niño-Southern Oscillation - ...

article discussion edit this page history

El Niño-Southern Oscillation

From Wikipedia, the free encyclopedia

For other uses, see *El Niño* (disambiguation).

El Niño-Southern Oscillation, or **ENSO**, is a climate pattern that occurs across the tropical Pacific Ocean on average every five years, but over a period which varies from three to seven years, and is therefore, widely and significantly, known as "quasi-periodic." ENSO is best-known for its association with floods, droughts and other weather disturbances in many regions of the world, which vary with each event. Developing countries dependent upon agriculture and fishing, particularly those bordering the Pacific Ocean, are the most affected.

ENSO is composed of an oceanic component, called *El Niño* (or *La Niña*, depending on its phase), which is characterized by warming or cooling of surface waters in the tropical eastern Pacific Ocean, and an atmospheric component, the *Southern Oscillation*, which is characterized by changes in **surface pressure** in the tropical western Pacific. The two components are coupled: when the warm oceanic phase (known as *El Niño*) is in effect, surface pressures in the western Pacific are high, and when the cold phase is in effect (*La Niña*), surface pressures in the western Pacific are low.^{[c][9]} Mechanisms that cause the oscillation remain under study.

In popular usage, El Niño-Southern Oscillation is often called just "El Niño". El Niño is **Spanish** for "the boy" and refers to the **Christ child**, because periodic warming in the Pacific near **South America** is usually noticed around Christmas.^[4] "La Niña" is Spanish for "the girl."

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languages

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- Azərbaycan
- संस्कृत
- Bân-lâm-gú
- Беларуская
- Беларуская

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- Early stages and characteristics of El Niño
- Southern Oscillation
 - Walker circulation
- Effects of ENSO's warm phase (El Niño)
 - South America
 - North America
 - Tropical cyclones
 - Elsewhere
- Effects of ENSO's cool phase (La Niña)
 - North America
 - Asia
 - Recent occurrences
- Remote influence on tropical Atlantic Ocean
- ENSO and global warming
- El Niño "Modoki" and Central-Pacific El Niño
- Cultural history and pre-historic information
- See also
- References
- Further reading
- External links

NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

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NOAA's El Niño Page

Weather.gov Forecast
City, ST
GO

What's Happening Today?

Forecasts Observations Research Impacts Links, FAQs, Graphics... Education El Niño Home La Niña Home

Media Contacts
Jana Goldman 301-734-1123
Chris Vaccaro 301-713-0622

Week centered on 10 FEB 2010
SST (°C)

Sea surface temperature in the equatorial Pacific Ocean (above). **El Niño** is characterized by unusually warm temperatures and **La Niña** by unusually cool temperatures in the equatorial Pacific. Anomalies (below) represent deviations from normal temperature values, with unusually warm temperatures shown in red and unusually cold anomalies shown in blue.

NOAA/NESDIS SST Anomaly (degrees C), 4/19/2010

El Niño is a disruption of the ocean-atmosphere system in the Tropical Pacific having important consequences for weather and climate around the globe.

NOAA has primary responsibilities for providing forecasts to the Nation, and a leadership role in sponsoring El Niño observations and research.

NOAA's Role

Today's El Niño status

What is El Niño?

What is La Niña?

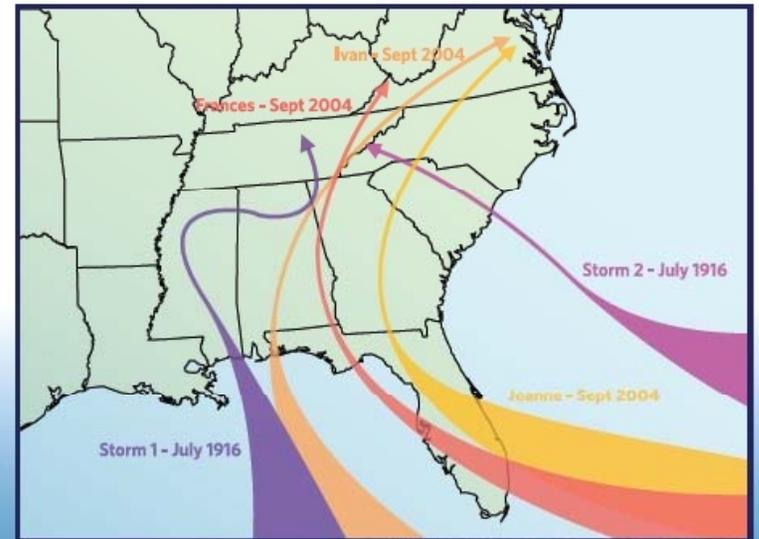
NEWS!
New Look at 1918/1919 Niño Suggests Link to Flu Pandemic

FLOODING & HURRICANES

Separated by 88 years, but the results were the same – major floods in Western North Carolina associated with the remnants of multiple hurricanes that arrived in rapid succession.

In 1916, two hurricanes dumped more than 20 inches of rain across the state (State record set at Altapass, Mitchell County – 22.22" in 24 hours). The rain was concentrated by orographic uplift over the Appalachian Mountains. After the second storm, all the rivers were in flood and there was major destruction. Recent clearing of forests in the area caused major landslides and the debris caught behind bridges and caused them to wash away. Almost all of the rail bridges were destroyed. Damage was estimated at \$22 million (in 1916 dollars) and 80 people lost their lives.

In 2004, three hurricanes had a similar effect. Frances, Ivan and Jeanne flooded many communities, with major damage and loss of life in Canton, Waynesville and Asheville.



HURRICANE TRACKS



Communication of the issues through education and outreach is important. This is a poster created for a local museum in the watershed.

Providing Information

1. Building Literacy

2. Providing Information

- Specific scale and sector
- Requires knowledge of user and need
- Iterative process – prototypes to facilitate enhanced listening
- Viewing vs. Using Information

3. Serving Data

4. Services

Our society will not make decisions based **solely** on climate

- People must be able to integrate information on climate with other value drivers
- They must trust the source of information
- They must also trust the local “source” of information



Water Resources



Development Pressure

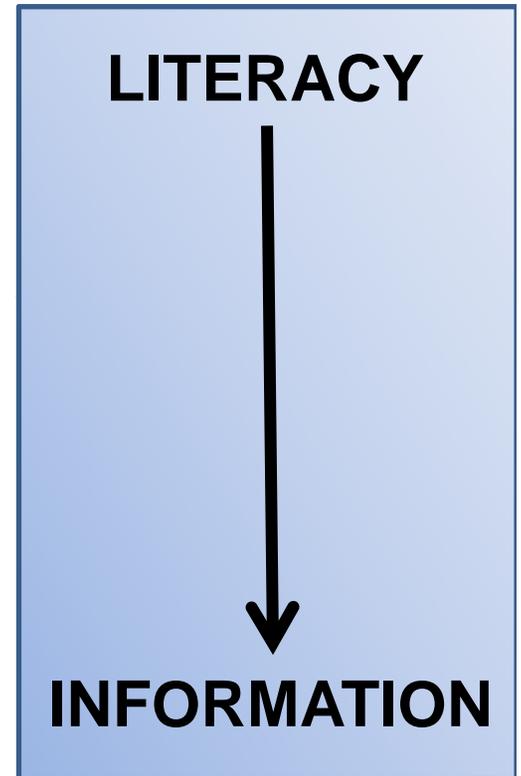


Escalating Energy Costs

Ask the Climate Question – Planning for North Carolina’s Future

Workshop held in Raleigh, March 2-3, 2010

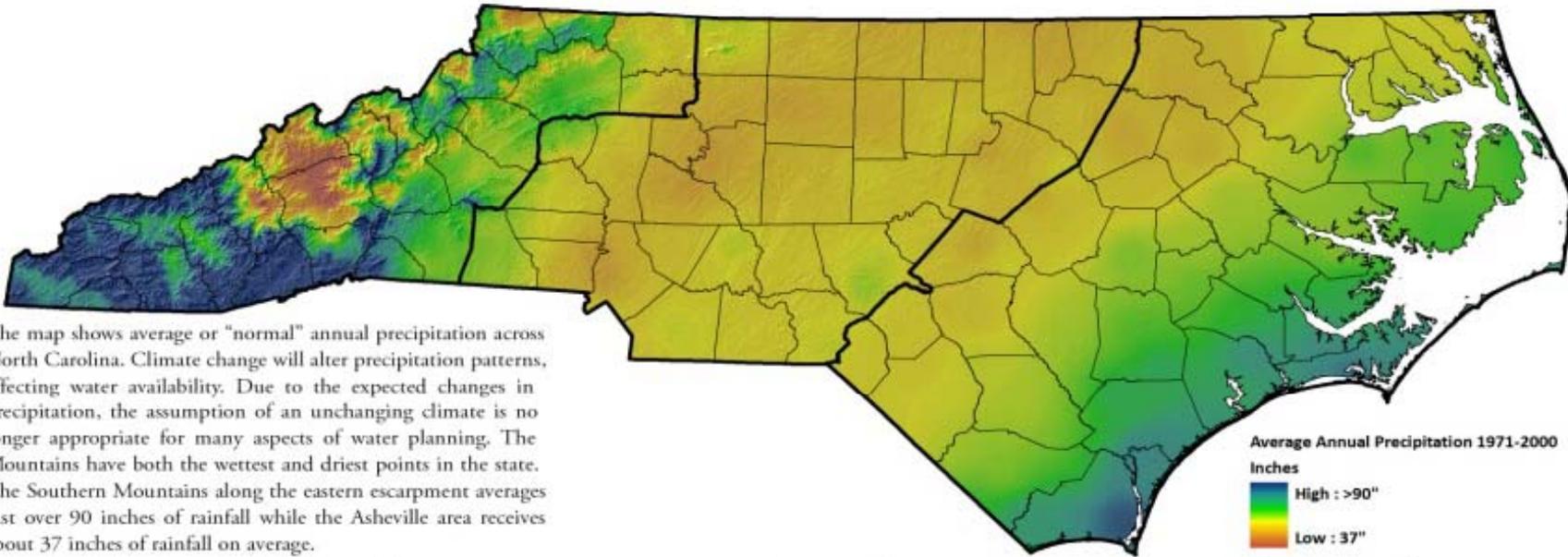
- [Global Climate Change Impacts in the United States](#) - Tom Peterson
- [Important Climate-Related Issues for Communities](#) - Scott Shuford
- [Maryland Climate Change Adaptation Policy & Practice](#) - Zoe Johnson
- [Water| Impacts and Adaptive Responses](#) - Nancy Beller-Simms
- [Transportation & Infrastructure| Impacts and Adaptive Responses](#) - Susan Asam
- [Energy| Impacts and Adaptive Responses](#) - David McNelis
- [Ecosystems| Impacts and Adaptive Responses](#) - Sam Pearsall
- [Public Health| Impacts and Adaptive Responses](#) - Howard Frumkin
- [Society| Impacts and Adaptive Responses](#) - Chris Emrich
- [Communicating Climate Science in a Changing Media Landscape](#) - Heidi Cullen
- [Adaptation and Agency Planning](#) - Rob Verchick
- [Bridging the Hazards Management-Climate Change Adaptation Divide](#)- Gavin Smith
- [Ask the Climate Question| Urban Adaptation](#) - Josh Foster
- [Potential Impacts on 3 N.C. Regions](#) – RENCi team
- [Growing Cooler: The Evidence on Urban Development and Climate Change](#) - Reid Ewing



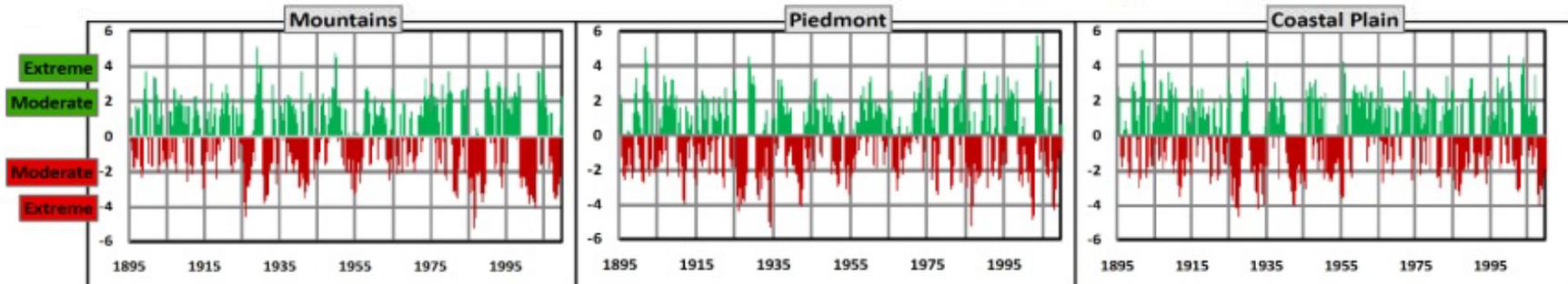


Climate

Average Precipitation



The map shows average or "normal" annual precipitation across North Carolina. Climate change will alter precipitation patterns, affecting water availability. Due to the expected changes in precipitation, the assumption of an unchanging climate is no longer appropriate for many aspects of water planning. The Mountains have both the wettest and driest points in the state. The Southern Mountains along the eastern escarpment averages just over 90 inches of rainfall while the Asheville area receives about 37 inches of rainfall on average.

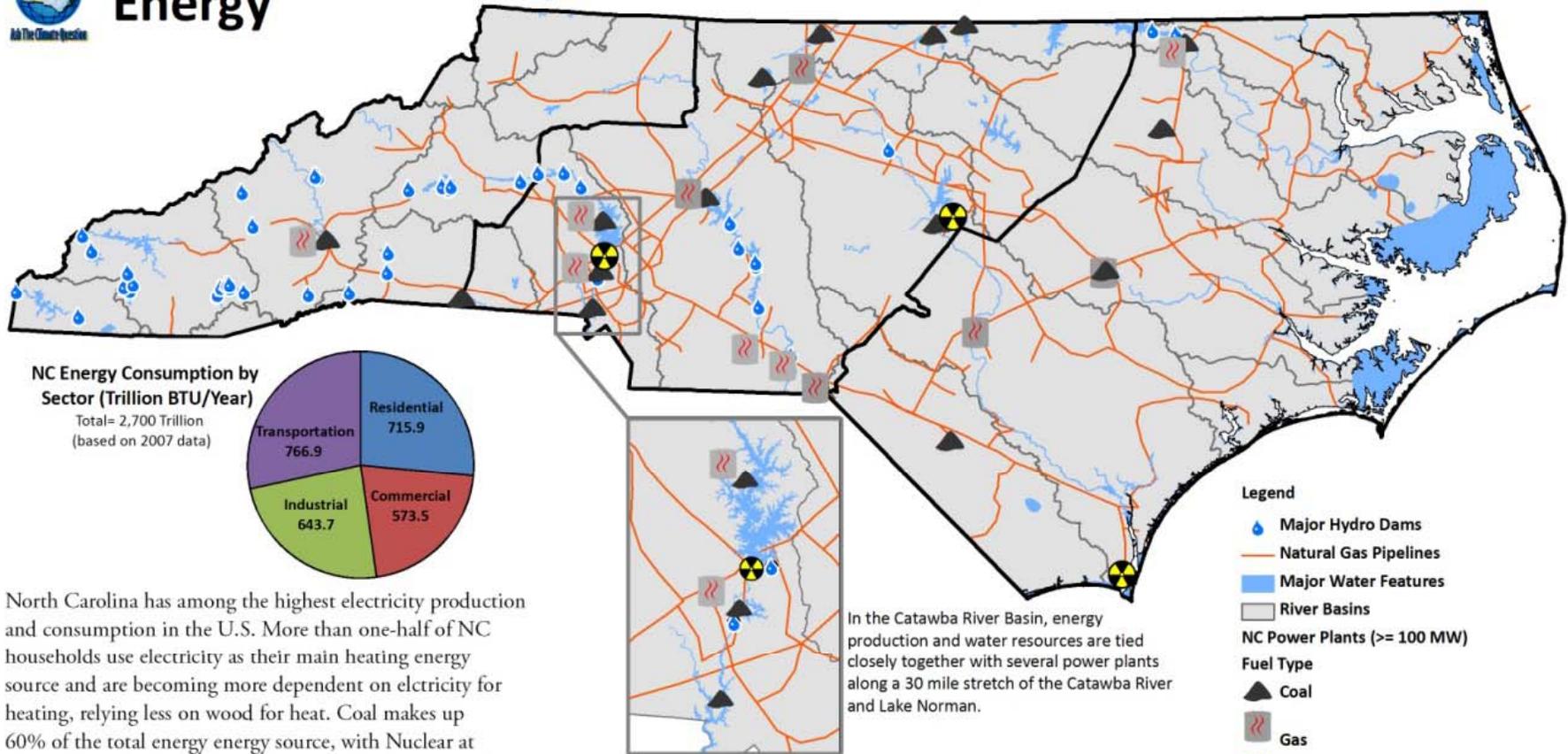


The graphs above show an index which indicates long-term impacts to water resources such as reservoirs and groundwater levels. On the graphs above, red indicates dry conditions whereas the green indicates wet conditions. Any value above 2 or below -2, indicates moderate wet/dry conditions, respectively, while any value above 4 or below -4 indicates extreme wet/dry. The graphs indicate historical wet and dry periods

Sources: State Climate Office of North Carolina;
Oregon State University, PRISM Group

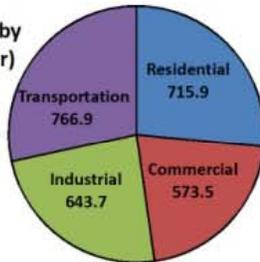


Energy



NC Energy Consumption by Sector (Trillion BTU/Year)

Total= 2,700 Trillion (based on 2007 data)



North Carolina has among the highest electricity production and consumption in the U.S. More than one-half of NC households use electricity as their main heating energy source and are becoming more dependent on electricity for heating, relying less on wood for heat. Coal makes up 60% of the total energy source, with Nuclear at 30% and Hydroelectric/Natural Gas making up most of the remaining 10%. Both industrial and residential energy demands are expected to increase into the near future. Residential energy demands will be driven by increasing population. Also, greater cooling requirements in summer will increase electricity use and higher peak demand. The energy sector is the largest consumer of water, and nuclear, coal, and natural gas power plants, in particular, require large amounts of water for cooling. Higher average temperatures with climate change will increase cooling water need from electrical generating stations. Energy production and delivery systems will also be exposed to sea-level rise and extreme weather events and some renewable energy sources such as hydropower are subject to changing patterns of precipitation.

Legend

- Major Hydro Dams
- Natural Gas Pipelines
- Major Water Features
- River Basins
- NC Power Plants (>= 100 MW)**
- Fuel Type**
- Coal
- Gas
- Nuclear

In the Catawba River Basin, energy production and water resources are tied closely together with several power plants along a 30 mile stretch of the Catawba River and Lake Norman.

Mountains

Changing precipitation patterns has significant implications for the hydroelectric energy plants in the Mountains. The Mountains also heavily rely on a steady energy supply for the transportation of goods to the region. Energy demands are greatest in the Mountains during the cold winter months

Piedmont

The central part of the state is experiencing increased energy demands due to population growth.

Coastal Plain

Several areas off the Coast of North Carolina have been identified as potentially well-suited for wind energy production.

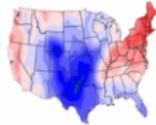
Sources: U.S. Energy Information Administration; U.S. Army Corps of Engineers; NCCGIA; NID



Climate Monitoring
National Oceanic and Atmospheric Administration
National Climatic Data Center



20 March 2010 Temperature
Departure from 1971-2000 Normal



National Climatic Data Center, NOAA



• [State of the Climate](#)

• [U.S. Products](#)

State of the Climate
National Overview
March 2010
National Oceanic and Atmospheric Administration
National Climatic Data Center

Use the form below to access monthly reports.

[« February 2010
National Overview Report](#)

Report:

Year: Month:

Maps and Graphics:

March	Most Recent 3 Months	Most Recent 6 Months
Most Recent 12 Months	Year-to-Date	US Percent Area Very Wet/Dry /Warm/Cold
Annual Summary for 2009		



Area Drought Information

Select State... >> Go

Select Region... >> Go

Maps & Tools

- [Map Viewer - updated!](#)
- [GIS Resources](#)
- [Geodata Portal](#)
- [Drought Monitor Graphics](#)
- [Data Visualizations](#)

Events & Announcements

- [NADM Workshop - April 20-23, 2010](#)
- [Scoping workshop ACF Basin - Lake Blackshear, GA - December 2009](#)
- [Map Viewer now includes US Drought Outlook - New!](#)
- [CRN Soil Data - New!](#)
- [Drought Monitor Forum - Austin 2009](#)
- [Drought Index Evaluation Workshop - Boulder, CO - August 2009](#)
- [ESA Millenium Conf - November 2009](#)

[View Archive](#) | [Portal Release Notes](#)

Drought In The News

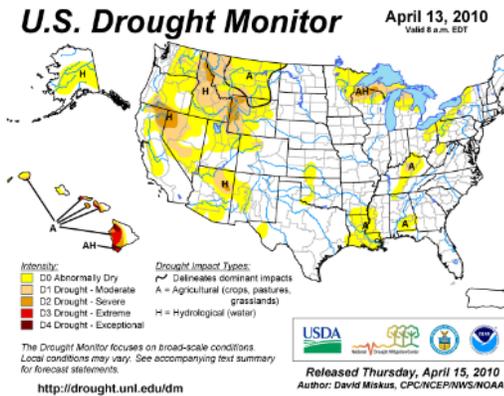
- [VIDEO: Historic drought threatens Kona coffee - Big Island Video News](#)
- [Governor declares drought in Klamath County - Sacramento Bee](#)
- [Sequoias tell tale of drought and fire 3,000 years ago - Sacramento Bee](#)
- [With low snowpacks, drought in the forecast for WA | Seattle Times Newspaper](#)
- [Big Island areas reach intense-drought classification - Hawaii News - Starbulletin.com](#)

Featured Products

[Where are Drought Conditions Now?](#)

[How is the Drought Affecting Me?](#)

[Will the Drought Continue?](#)



NIDIS Feature

Energy and Water Programs within the United States
 Department of Agriculture

Journal of Contemporary
Water Research & Education

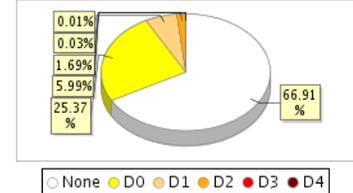
Issue 143
 December 2009

[view article >>](#)

Drought Conditions

% Area for U.S., including, AK, HI & PR (As of 4.13.2010)

Info Source: National Drought Mitigation Center



[Drought Classifications](#) | [View Time Series](#) - **updated!**

Drought Information Statements



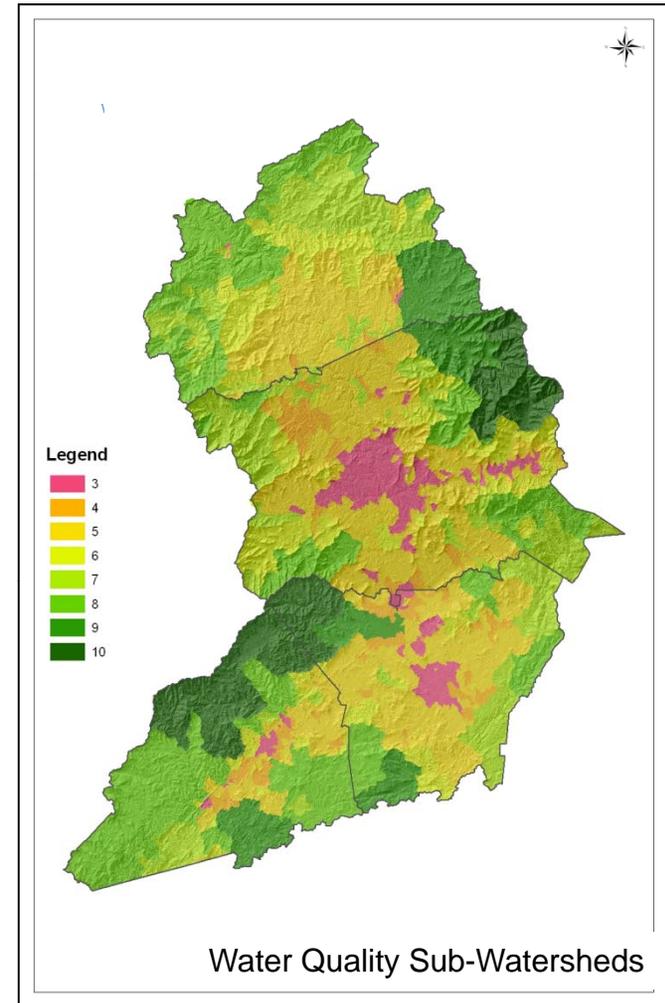
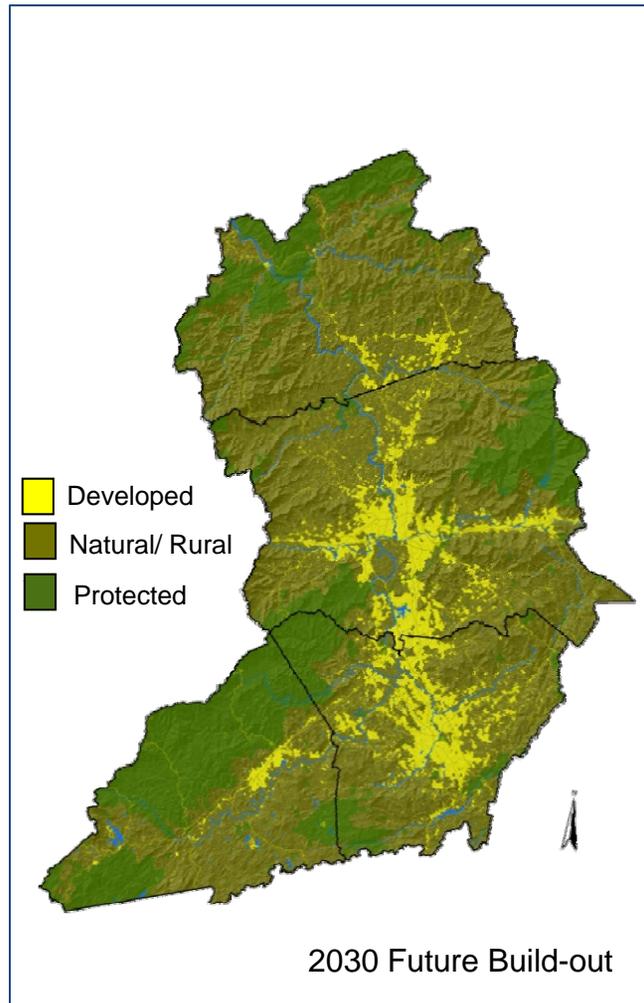
Click on a highlighted area to view the current NWS Drought Information Statement or [Click Here](#) to select from a list

[View larger map](#)

Featured Application

A New Drought Monitoring Tool:
US Climate Reference Network Soil Moisture Observations

Ecosystem Services



- You can't manage the water without managing the land
- Regional planning tool tied to Green Infrastructure
- Sub-watersheds in the upper end of the basin and with little impervious surface hold greater value

Serving Data

1. Building Literacy
2. Providing Information
- 3. Serving Data**
 - Data vs. models
 - “Pulling” vs. “Pushing” data
 - Portals
4. Services



Climate Monitoring

National Oceanic and Atmospheric Administration

National Climatic Data Center



Snow and Ice Data

- [U.S. Snow Monitoring](#)
- [U.S. Snow Climatology](#)
- [The Northeast Snowfall Impact Scale \(NESIS\)](#)
- [2004 SNOW/Data Users' Workshops](#)



Download U.S. Temperature, Precipitation, and Drought Data

- [Access Data](#)
 - [Data Descriptions](#)
 - [Divisional](#)
 - [Statewide/Regional/National](#)
 - [Palmer Drought Indices](#)
-

Welcome to the WNC Forest Sustainability Report Card Portal!

This portal is currently being overhauled!

- [Home](#)
- [Team Members](#)
- [Calendar](#)
- [Q&A Wizard](#)
- [Action Items](#)
- [Map Gallery](#)
- [Indicator Map Editor](#)
- [Flip Book Map Editor](#)
- [Document Library](#)
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Image Gallery

Select a map category to browse

Data Category Image

Climate

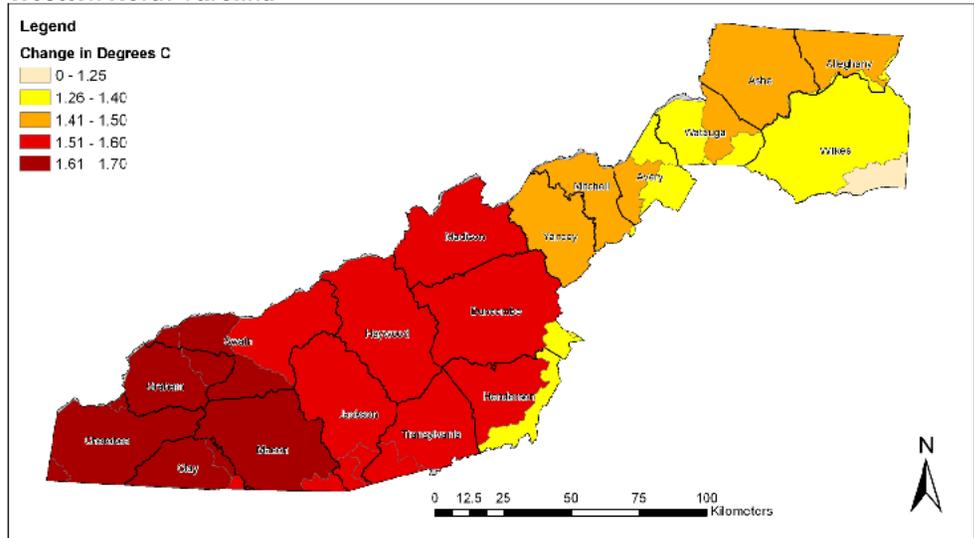
List View

- Annual and Monthly Precipitation
- Annual Max Temp 1970-2000
- Annual Min Temp 1970-2000
- Annual Precipitation
- Annual Total Predp 1970-2000
- Average Temperature Change 1990-2020 CGC1**
- Average Temperature Change 1990-2020 Had2
- Climate Projection
- Climate Projections, A1B Scenario
- Climate Projections, B1 Scenario
- Development vs Drought for Feb 12 2008
- Max Temp
- Mean Temp
- Min Temp
- Total Precip

Average Temperature Change 1990-2020 CGC1

Click the image to enlarge, then right-click the image to download.

Change in Average Annual Air Temperature, CGC1 Climate Scenario 1990 to 2020
Western North Carolina



Source:

Services

1. Building Literacy
2. Providing Information
3. Serving Data
- 4. Services**
 - **Decision Support Tools**
 - **Emergency Services**
 - **Early Warning Systems**
 - **Community Engagement**



drought.gov > CRN Soil Data

Climate Reference Network (CRN) Soil Moisture and Temperature

Moisture Data Temperature Data

- | | |
|--------------------------------|------------------------------------------|
| <input type="checkbox"/> 5cm | <input type="checkbox"/> 5cm |
| <input type="checkbox"/> 10cm | <input type="checkbox"/> 10cm |
| <input type="checkbox"/> 20cm | <input checked="" type="checkbox"/> 20cm |
| <input type="checkbox"/> 50cm | <input type="checkbox"/> 50cm |
| <input type="checkbox"/> 100cm | <input type="checkbox"/> 100cm |

To generate an interactive graph, select options on the left:

1. Select desired Variable(s).
2. Select a Station from the map.

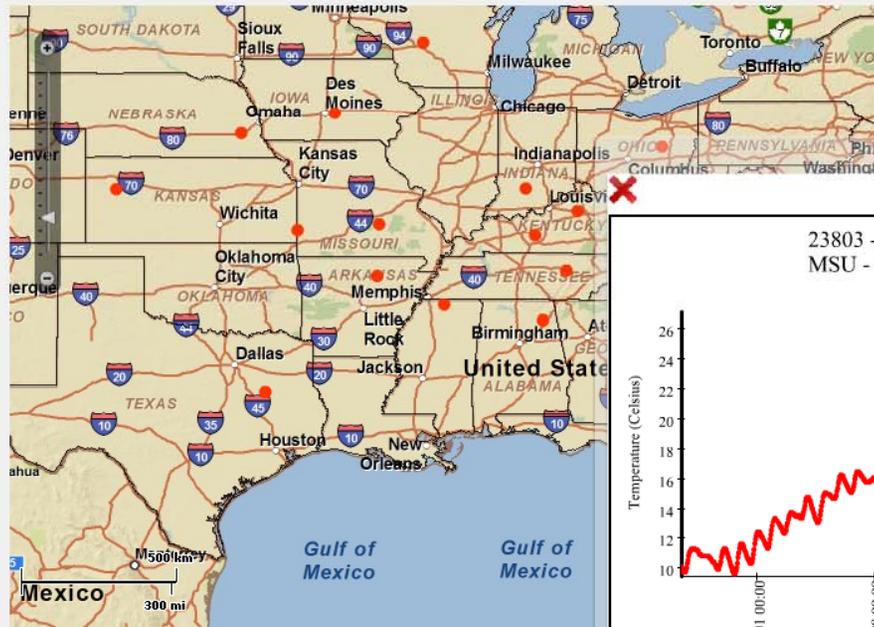
Once the graph is generated, you will be able to click and drag the axes to manipulate the view or look back in the period of record.

Another useful feature is the ability to resize the axes. To resize the axes, hold down the 'Shift' key, then click and drag on the desired axis.

The graph window can be moved by clicking the transparent area above the graph and dragging.

Multiple graphs can be viewed at one time by selecting additional stations.

For more CRN data click [here](#).



23803 - Holly Springs 4 N
MSU - North MS R & E Center

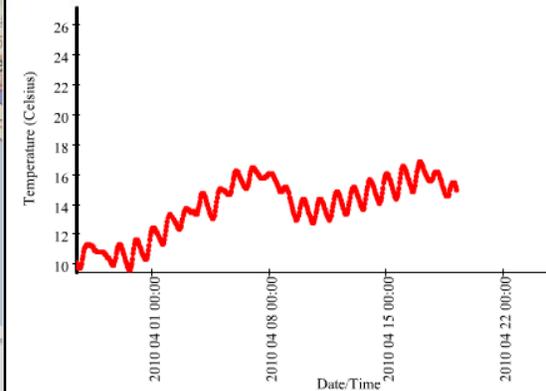
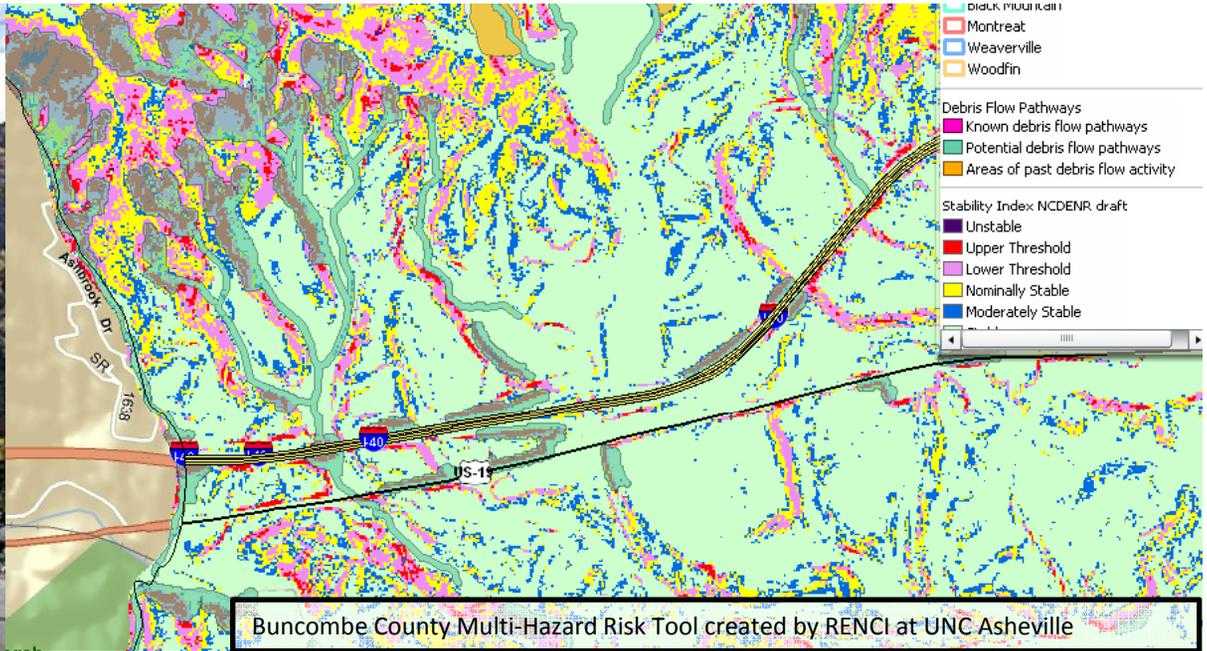


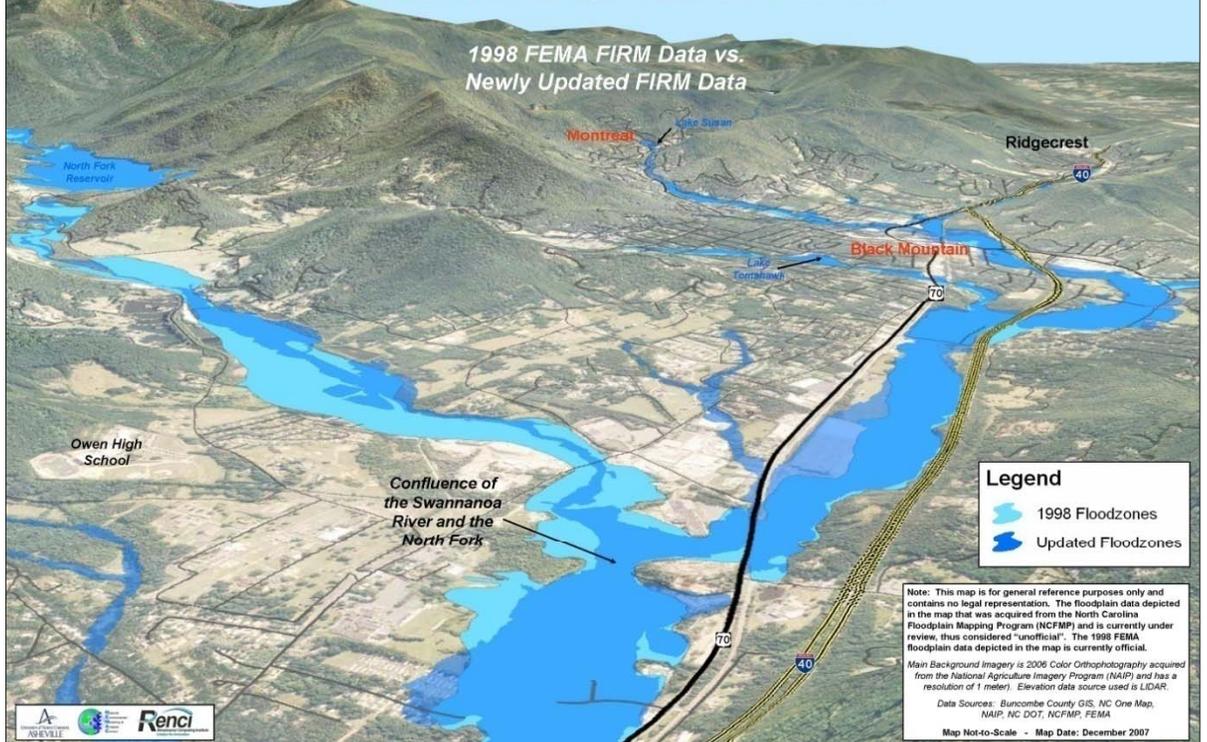


Photo courtesy of Asheville Citizen Times

Landslide on I-40 west of Asheville



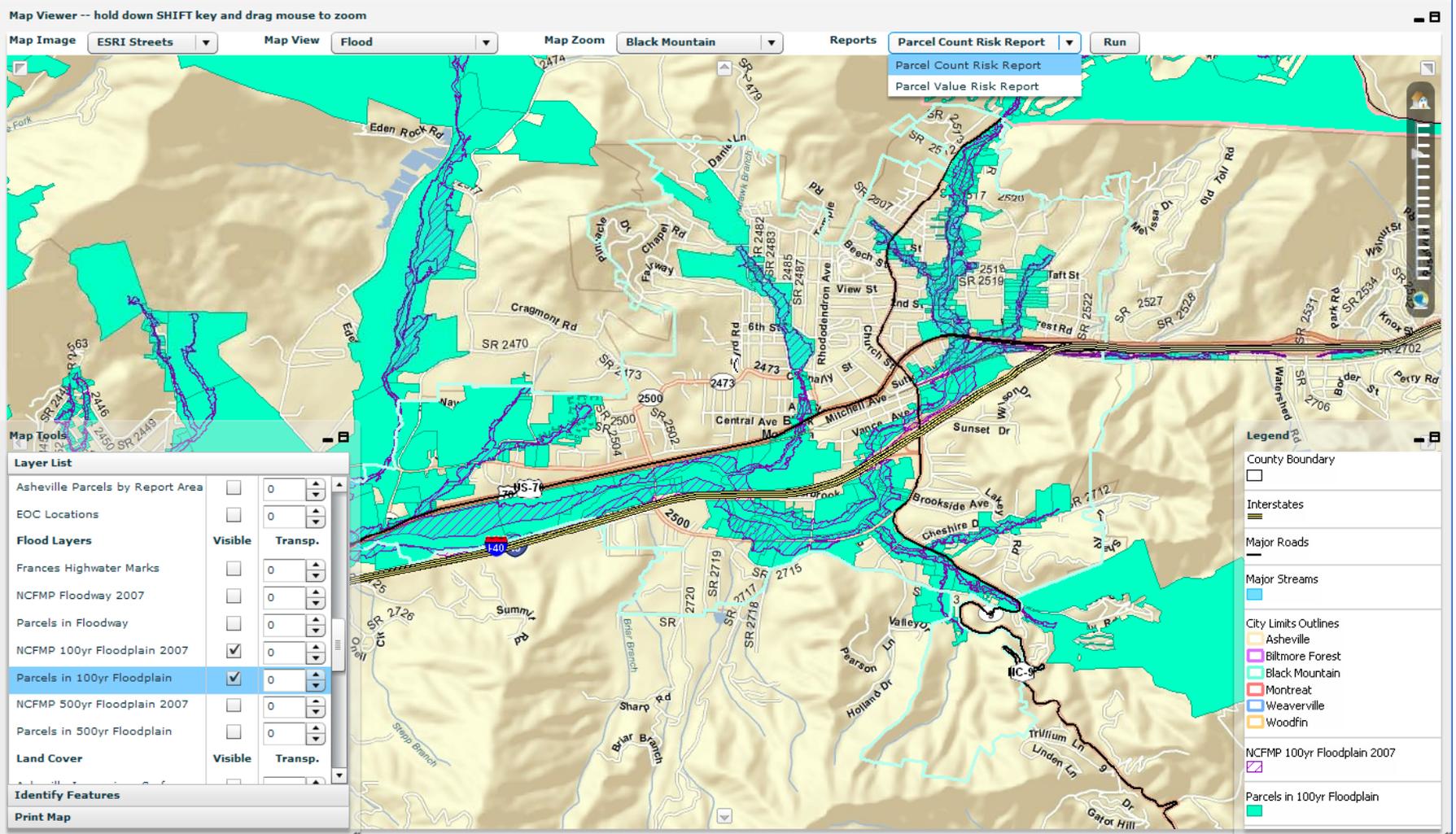
3D Perspective of The Upper Swannanoa Watershed



Multi-Hazard Tool integrates floods, landslides, wildfire, winter storm and other risks

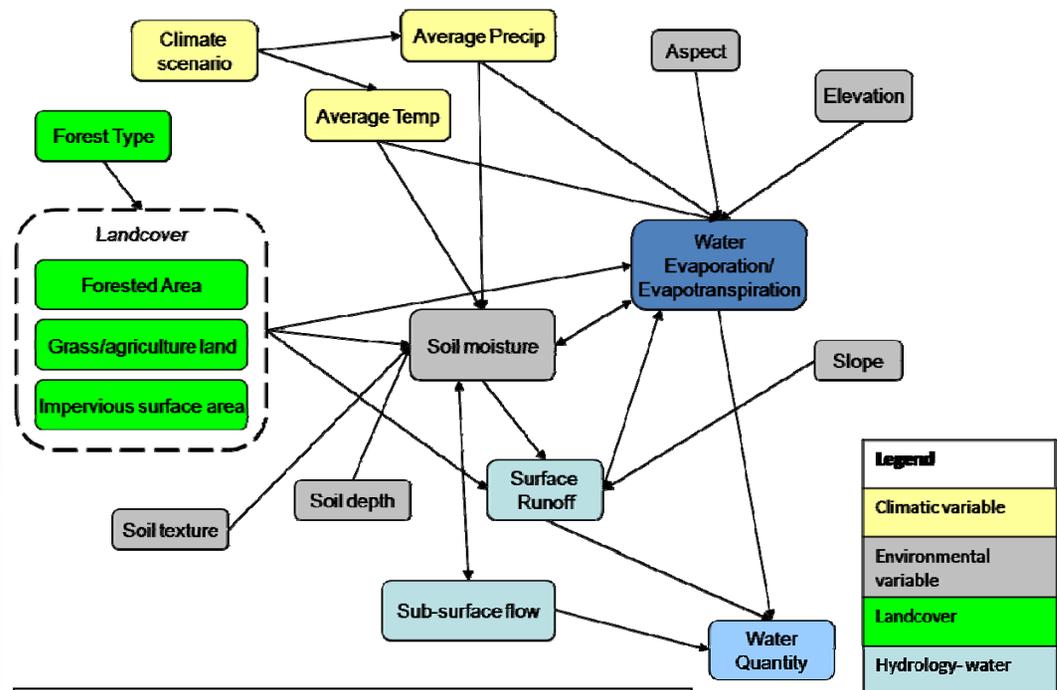
Buncombe County Multi-hazard Risk Tool

Tool tied to individual parcels – integration with City of Asheville and Buncombe County GIS Databases



Community Engagement and Planning Tools

- Combine data with different community value drivers
- Ability to work across sectors and understand needs



Eastern Forest Environmental Threat Center
CRAFT Decision Support Tool

Data + Values = Decision

*Focus on **VALUE***

- As part of a community, we rely on a set of **services** and we are willing to pay for those services – through taxes, cost of living, etc.
- Those services may be **stressed** by a variety of things – but we can usually plan based on trends, etc.
- Services that are **interrupted** are harder to deal with
- There are differences in **Natural Services** and **Infrastructure Services**, especially when we look at **vulnerable populations** (which could be human or ecosystem based)