

NOAA National Weather Service Climate Services

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**MEETING OF
ADVISORY COMMITTEE ON WATER INFORMATION'S (ACWI'S)
SUBCOMMITTEE ON HYDROLOGY (SOH)**
January 29, 2009



Outline

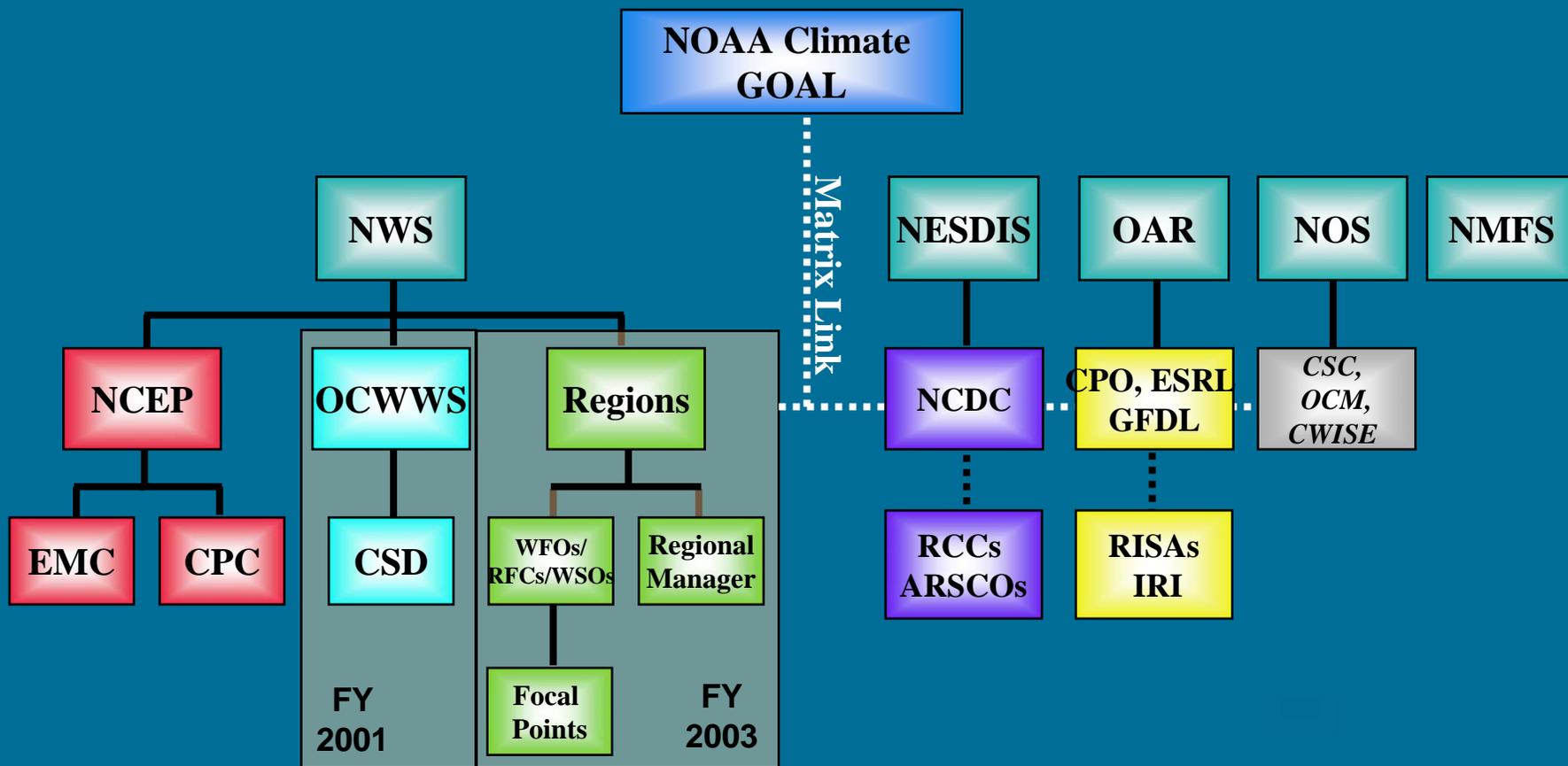
- Overview of NOAA NWS Climate Services
- NOAA Data Collection Efforts
- User Access to Data
- Latest Research Activities
- National Climate Services

NOAA & Climate: The Present

- NOAA is a leading provider of reliable weather, water, and climate information to the Nation and the globe
- NOAA's products are the result of a vigorous research program and a growing operational capability



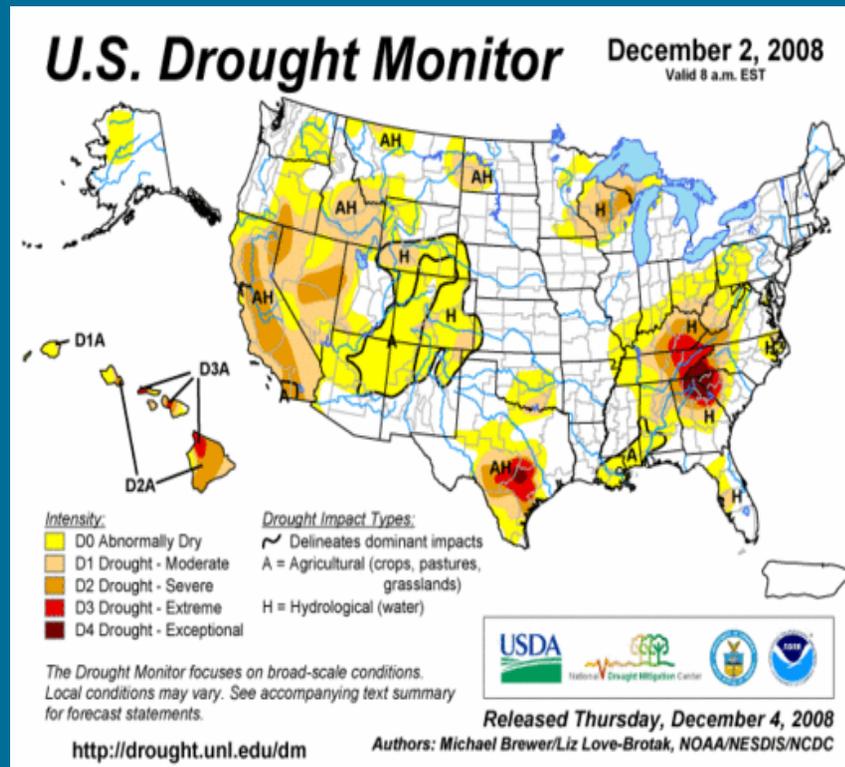
Overview of NOAA NWS Climate Services



Overview of NOAA NWS Climate Services

Examples of NWS Climate Services Partners:

- NOAA (NESDIS/NCDC, OAR, NOS)
- National Drought Mitigation Center
- Regional Integrated Sciences and Assessments (RISAs)
- Regional Climate Centers (RCCs)
- State Climatologists (AASC)
- UCAR
- Academia
- Other Government Agencies



Drought Monitor is an example of partnership: local staff provides data and local assessments, NCDC makes analysis, NDMC monitor impact, CPC produces the Drought Monitor and Outlook.

Overview of NOAA NWS Climate Services

- **NWS**: provides weather, hydrologic, and climate forecasts and warnings for the United States ... for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure....
- **CSD**: Ensure NWS is equipped to develop and deliver an end-to-end suite of climate variability and change products through strategic planning, user engagement, data stewardship, policy development, integration of research and assessments, partnerships, outreach, and training.
- **CPC**: Deliver climate prediction, monitoring, and assessment products for timescales from weeks to years to the Nation and the global community for the protection of life and property and the enhancement of the economy.

Overview of NOAA NWS Climate Services

- National: Climate Services Division and Climate Prediction Center
- Regional: Climate Services Program Managers (CSPMs)
- Local: ~250 Climate Services Focal Points (CSFPs) at WFOs and RFCs
- Climate expertise at all levels
- Standardized climate web pages
- Established relationships and partnerships
- Trust, credibility, and recognition in services



NWS Climate Services Programs and Initiatives

- **Examples of National Climate Programs and Initiatives**
 - Monitoring climate variability
 - Climate assessments and diagnostic discussions
 - Climate forecasts
 - Climate Test Bed
- **Examples of Regional and Local Climate Programs and Initiatives**
 - Bridging climate user needs and product requirements
 - Climate observing system and data records
 - Local climate data and forecast products
 - Local climate outreach
 - Training climate services staff

NOAA Data Collection Efforts

- **Foundation for all climate services**
- Nearly 18,000 sites (COOP, ASOS)
- NWS local offices monitor, observe, collect, analyze, quality control, and transmit data for the climate record

- NWS data allows for:

- o Modeling
- o Archiving
- o Research
- o Products
- o Analyses
- o Assessments

Sectors for Climate Data Uses



NOAA Data Collection Efforts

Data Stewardship – to ensure timely, reliable, high quality data to support the continuity of the climate record

- Online Data Tools:
 - **xmACIS** – powerful, internal, limited access data mining tool integrating NOAA software and data bases. **NOWData** is the public version
 - **ThreadEx** - Standardized method for threading data sets
- Data Quality Assurance/Quality Control (QA/QC) Tools (limited access)
 - **Health of the Network** – identify local data errors
 - **Datzilla** – data problem reporting and tracking
- Paperless surface weather observation data entry
 - **WxCoder** (PC-web based) and **IVROCS** (telephone based)
- Standardized, coordinated data quality control across NOAA and its Climate Services partners



User Access to Data

Public interactive access to “past weather”:

NOWData: NOAA Online Weather Data

- 3900 sites (ASOS, COOP)
- 9 summary products, 9 variables, 3 time periods
- Powered by the Applied Climate Information System (xmACIS) in partnership with the Regional Climate Centers and NCDC

The screenshot shows a web browser window displaying the National Weather Service Climate page for Western and Central Wyoming. The page features a navigation menu with options like Home, News, Organization, and a search bar. Below the navigation, there are tabs for Observed Weather, Climate Locations, Climate Prediction, Climate Resources, Local Data/Records, and NOWData. The NOWData section is active, showing a form for selecting a location (Afton, WY), a variable (Min Temperature), and a month (February). The page also includes a sidebar with various weather-related links and a footer with logos for NOAA and ACIS.

<http://www.weather.gov/climate/index.php?wfo=pdt>

User Access to Data

Public interactive access to
“past weather”

Other online data products:

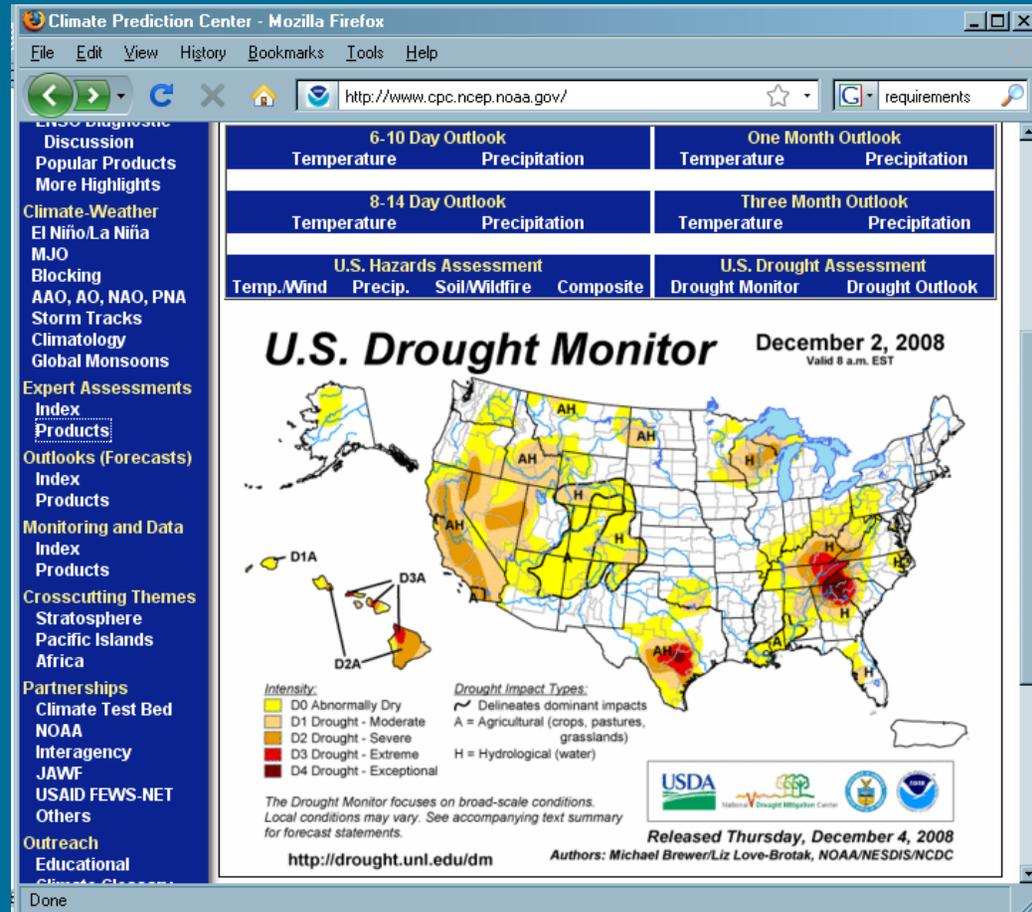
- Last 3 month daily data
- Last 5 year monthly/daily
- This year record events
- Last year monthly site, regional and state summaries

The screenshot shows a web browser window displaying the National Weather Service Climate page for Denver-Boulder, CO. The page features a navigation menu with links for Home, News, Organization, and Search. A search bar is present with the text 'NWS All NOAA Go'. The main content area is titled 'Observed Weather Reports' and includes a 'Local forecast by "City, St"' section with a search box. Below this, there are tabs for 'Observed Weather', 'Climate Locations', 'Climate Prediction', 'Climate Resources', 'Local Data/Records', 'Astronomical', and 'NOWData'. The 'Observed Weather Reports' section has four columns: '1. Product' with radio buttons for 'Daily Climate Report (CLI)', 'Preliminary Monthly Climate Data (CF6)', 'Record Event Report (RER)', 'Monthly Weather Summary (CLM)', 'Regional Summary (RTP)', and 'State Summary (Temp/Precip)'; '2. Location' with a dropdown menu set to 'Denver'; '3. Timeframe' with radio buttons for 'Most Recent' and 'Archived Data', and a date selector showing 'December 8th, 2008'; and '4. View' with a 'Go' button. A 'Product Description' section is also visible, providing details about the 'DAILY CLIMATE REPORT'.

<http://www.weather.gov/climate/index.php?wfo=pdt>

User Access to Data

- Extended Range Outlooks: (6-10 and 8-14)
- Long Range Outlooks (Monthly and 3-Months)
- Assessments: Hazards, Drought, MJO, Global Ocean
- Special Outlooks: Hurricane, Winter, African Rainfall
- Bulletins: Climate Variability, Stratospheric Ozone, Weekly Weather and Crop



<http://www.cpc.ncep.noaa.gov/>

Product Suite and Services: National Examples

Climate Prediction Center - seasonal Outlook - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.cpc.noaa.gov/products/predictions/long_ra

mid-month at 8:30am Eastern Time. Please consult the schedule of 30 & 90-day outlooks for exact release dates.

Text-Format Discussions

[Monthly](#)
[Long Lead](#)
[30-& 90-Day Hawaiian](#)

More Outlooks

[0.5mn DJF 2008 - 09](#)
[1.5mn JFM 2009](#)
[2.5mn FMA 2009](#)
[3.5mn MAM 2009](#)
[4.5mn AMJ 2009](#)
[5.5mn MJJ 2009](#)
[6.5mn JJA 2009](#)
[7.5mn JAS 2009](#)
[8.5mn ASO 2009](#)
[9.5mn SON 2009](#)
[10.5mn OND 2009](#)
[11.5mn NDJ 2009 - 10](#)
[12.5mn DJF 2009 - 10](#)
[0.5mn Dec 2008](#)

[Climatological Values \(1971-2000\) for DJF](#)

[Time Series of Skill for all 0.5mn lead forecasts](#)

Tools Used (see Discussion for explanation)

[Tools Discussion](#)
(updated as new tools are implemented)

[Canonical Correlation Analysis](#)
[Ensemble Canonical Correlation Analysis](#)
[Optimal Climate Normals](#)
[Coupled Ocean-Atmosphere Model](#)
[Soil-Moisture Tools](#)
[Probability of Exceedence](#)

THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID DJF 2008
MADE 20 NOV 2008

THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID DJF 2008
MADE 20 NOV 2008

Click on individual map to view larger format

Temperature and Precipitation Forecasts

- 3-Month Outlooks released monthly with 0.5 month lead for 13 3-month periods (categories: Above, Below, Near Normal and Equal Chances)
- 6-10 / 8-14 Day Outlooks released daily with 6/8 day leads (categories: Above, Below and Normal)

<http://www.cpc.ncep.noaa.gov/>

Product Suite and Services: Local

The screenshot displays the National Weather Service Forecast Office website for Marquette, MI. The page is titled "Three-Month Temperature Outlook (Issued: October 2008)". It features a navigation menu with options like "National Outlook", "Local Outlook", "Background Information", and "Questions and Feedback". The main content area includes a "Local Outlook" section with a "Help" button, a "Probability of Exceedance Calendar", a "Temperature Range" graph, a "Text Discussion", and a "Three Category Outlook" pie chart. Below these are "PoE Table", "Probability of Exceedance", "Probability of Non-Exceedance", and "PoNE Table" sections, each with a "Help" button. The left sidebar contains various navigation links such as "Current Hazards", "Current Conditions", "Forecasts", "Rivers / Hydrology", "Climate", and "Weather Safety".

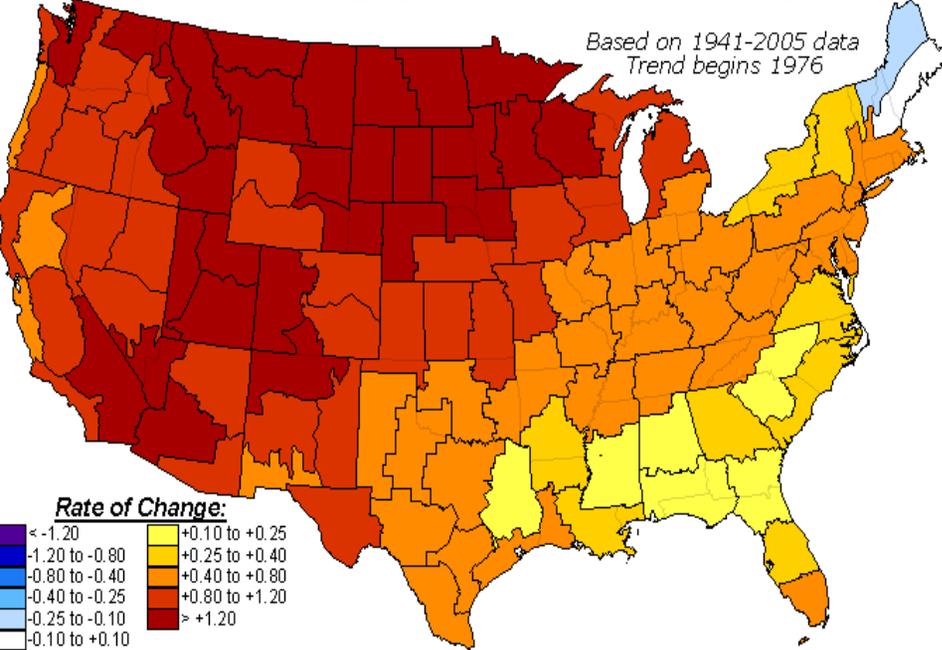
Local 3 Month Temperature Outlooks:

- Local information
- Multiple user centric formats
- Dynamic text interpretation
- Benefits and limitations
- Long term forecast evaluation
- Trained staff support

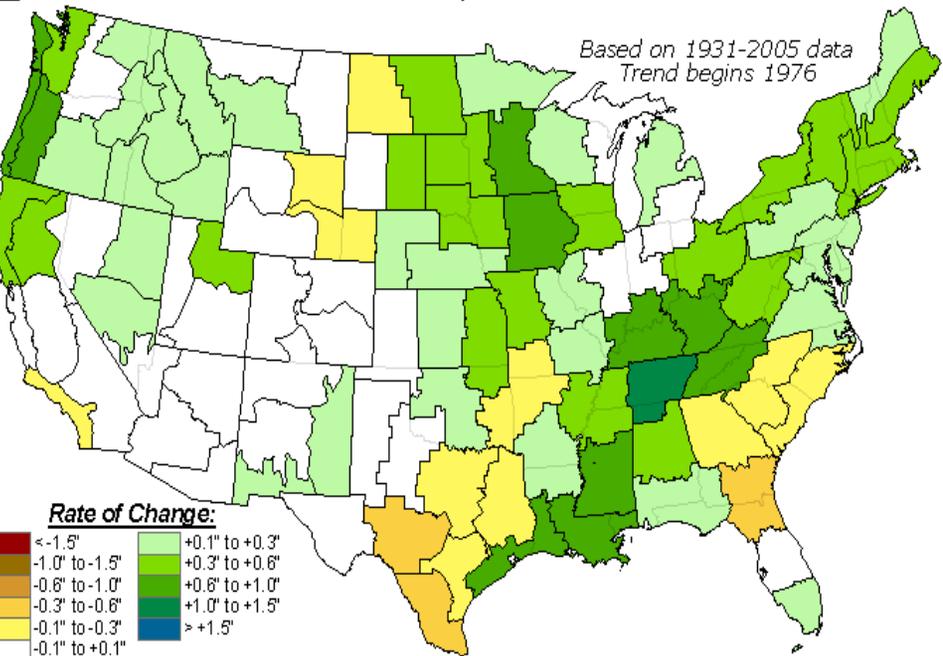
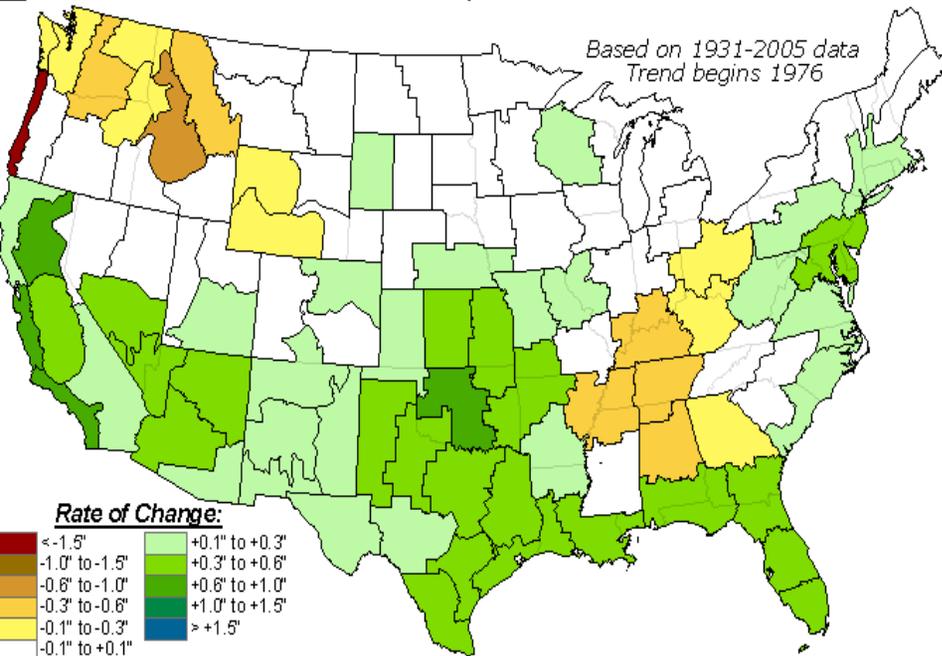
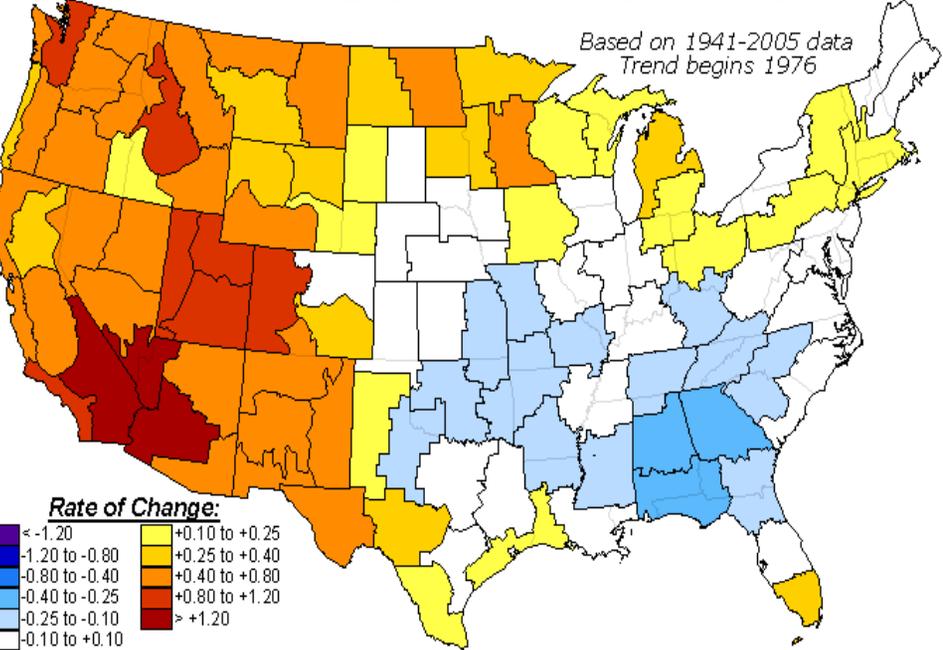
<http://www.weather.gov/climate/l3mto.php>



Rate of Long-Term Trend Temperature Change (top; °F per decade) & Precipitation Change (bottom; inches per decade) – JFM



Rate of Long-Term Trend Temperature Change (top; °F per decade) & Precipitation Change (bottom; inches per decade) – AMJ



Latest Research: Motivation

- Products misinterpretation, lack of verification information, confusing and inconsistent language (Hartmann, 2002)
- Skill is variable for different seasons, areas and forecast periods
- Growing demand for Climate Change information
- Impacts and applicability of climate products

Latest Research: User Requirements

CSD activities bridging NWS user needs and product requirements

- Claes Fornell International (CFI) Group Surveys (2004, 2009)
- Annual Climate Prediction Application Science Workshop (CPASW): March 24-27, 2009, Norman OK
- Feedback option for local climate forecast products
- Annual NWS local offices reporting of local climate users needs
- Regional Integrated Sciences and Assessments (RISAs) findings and reports
- American Association of State Climatologists (AASC) annual meetings

Latest Research: User Requirements

NWS Climate Services WFO Support - Mozilla Firefox

File Edit View History Bookmarks Tools Help

https://ocwww.weather.gov/intranet/climate/print.php

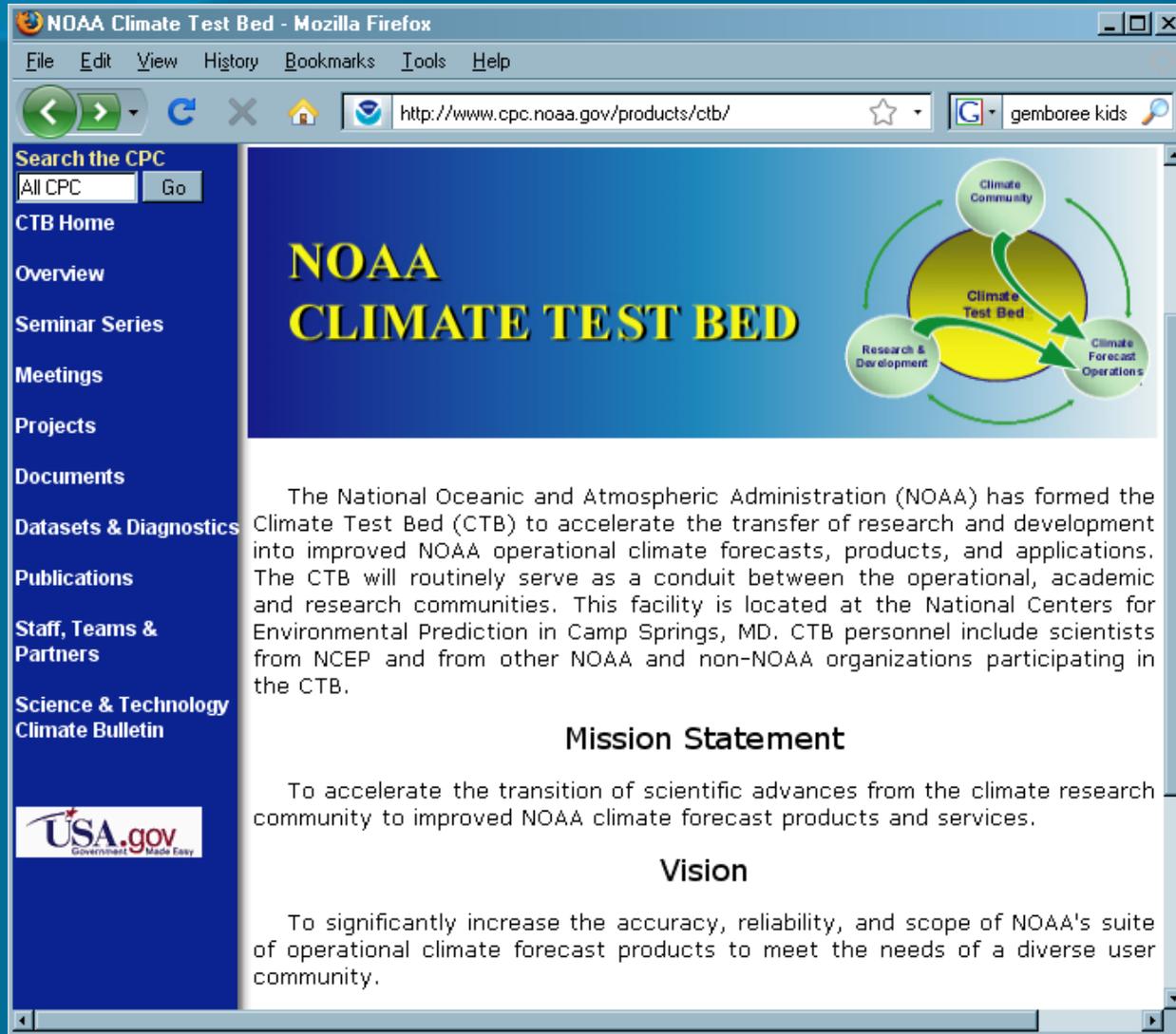
NWS Climate Services WFO Support

| Location | State | Climate Focus Area |
|----------------|-------|---|
| Aberdeen | SD | Outlooks,daily climate data,historical data,and ENSO information,etc. |
| Gaylord | MI | Climate Data: daily/monthly/seasonal/annual data,degree days,etc. |
| LaCrosse | WI | Climate Data,information,Climate change,ENSO |
| Bismarck | ND | Data: temperature,precipitation,extreme event,long term records |
| Farmington | MN | Data: Aviation weather,thunderstorms,wind directions/speeds/gustiness,snowfall,and severe weather,climatology of icing,turbulence,and jet stream winds |
| Cheyenne | WY | COOP data and forms Monthly Precipitation reports Data |
| Dodge City | KS | NA |
| Denver/Boulder | CO | El Nino,MJO,drought,climate data |
| Duluth | MN | Data: rainfall,temperature,relative humidity,winds Cold weather snow,thunderstorm,hot weather,drought Climate Change |
| Johnston | IA | Coop and ASOS data : Wind,Temperature,Heat indices,Precipitation,Rainfall, Snowfall Record information,Daily climate data,Interesting facts about climate,etc... Forensic data |
| White Lake | MI | Primarily data,and monthly & seasonal outlooks |
| Davenport | IA | max/min temp and precipitation (rain/snow/depth); accumulations to date and comparisons to normal and records, CPC outlooks, general info, climatological summaries of significant weather by emergency managers (e.g.,# of tornado days,# of days with freezing rain,etc.) |
| Pleasant Hill | MO | Historical climate information Seasonal outlook information |
| Grand Forks | ND | Data: snowfall,precipitation,degree day,wind and temperature data |
| Sioux Falls | SD | Observed data Extremes/records/rank of observed vs. historical record/departures from normal Long range outlooks (temp/precipitation) ENSO information/correlations with possible expected future weather |
| Hastings | NE | Winter weather records Forensic Weather Data 30 year climate normals and freeze information Sunshine data for economic development purposes tornado data/climatology/history Wind rose data for Grand Island average annual precipitation and compared to rainfall |

Done ocwww.weather.gov



Latest Research: Climate Test Bed



The screenshot shows a Mozilla Firefox browser window displaying the NOAA Climate Test Bed website. The address bar shows the URL <http://www.cpc.noaa.gov/products/ctb/>. The page features a dark blue sidebar with navigation links: Search the CPC, CTB Home, Overview, Seminar Series, Meetings, Projects, Documents, Datasets & Diagnostics, Publications, Staff, Teams & Partners, and Science & Technology Climate Bulletin. The main content area has a header with the text "NOAA CLIMATE TEST BED" and a circular diagram showing the interaction between the Climate Community, Research & Development, and Climate Forecast Operations. Below the header, a paragraph explains the mission of the Climate Test Bed (CTB) to accelerate the transfer of research and development into improved NOAA operational climate forecasts, products, and applications. The page also includes sections for the Mission Statement and Vision.

Search the CPC
All CPC

CTB Home
Overview
Seminar Series
Meetings
Projects
Documents
Datasets & Diagnostics
Publications
Staff, Teams & Partners
Science & Technology
Climate Bulletin

NOAA CLIMATE TEST BED

Climate Community
Research & Development
Climate Forecast Operations

The National Oceanic and Atmospheric Administration (NOAA) has formed the Climate Test Bed (CTB) to accelerate the transfer of research and development into improved NOAA operational climate forecasts, products, and applications. The CTB will routinely serve as a conduit between the operational, academic and research communities. This facility is located at the National Centers for Environmental Prediction in Camp Springs, MD. CTB personnel include scientists from NCEP and from other NOAA and non-NOAA organizations participating in the CTB.

Mission Statement

To accelerate the transition of scientific advances from the climate research community to improved NOAA climate forecast products and services.

Vision

To significantly increase the accuracy, reliability, and scope of NOAA's suite of operational climate forecast products to meet the needs of a diverse user community.

USA.gov
Government Made Easy

Climate and Society

- Socio-economic impacts of climate are well documented
- Total market damages to the U.S. due to climate change estimated at \$80B - \$181B annually (NCDC)
- \$20.4B loss of property due to sea level rise (NCDC)
- Climate linked to high-impact weather events (i.e., flooding, drought, wildfires, severe weather, hurricanes)
- Decision support services are critically important to users for climate change and variability information
- Water resource decisions
- Infrastructure planning
- Wind energy
- Adaptation and mitigation strategies
- Insurance industry / insurance rates

US House Has Recognized National Needs

- Dingell-Boucher Bill (discussion draft)
- **SEC. 605. CLIMATE CHANGE ADAPTATION SERVICES**
- “ (a) NATIONAL CLIMATE SERVICE.—The Secretary of Commerce, acting through the Administrator of NOAA, shall establish within NOAA a National Climate Service to serve as a clearinghouse to provide State, local, and tribal government decision makers with access to regionally and nationally relevant information, data, forecasts, and services relating to climate change impacts and adaptation.”

F:\BEC\CLIM09_001.XML

[DISCUSSION DRAFT]
OCTOBER 7, 2008

110TH CONGRESS
2nd Session: **H. R.** _____
To [to be supplied]

IN THE HOUSE OF REPRESENTATIVES

Mr. BOUCHER (for himself and Mr. DINGELL) introduced the following bill,
which was referred to the Committee on _____

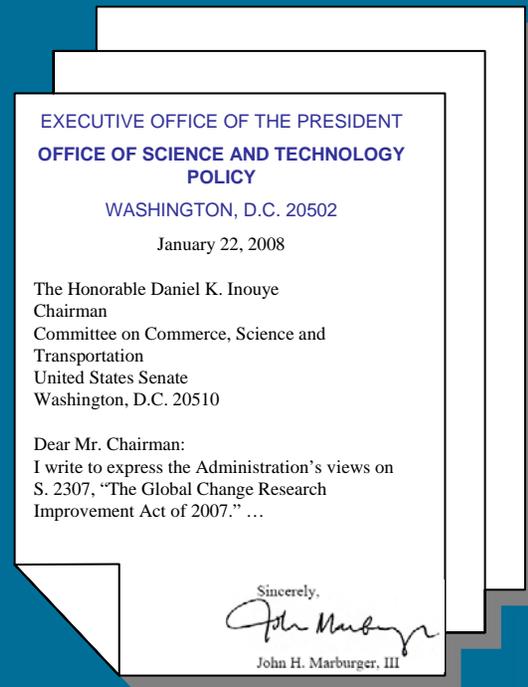
A BILL
To [to be supplied]

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*
3 **SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**
4 (a) **SHORT TITLE.**—This Act may be cited as the
5 “ _____ Act of 2008”.
6 (b) **TABLE OF CONTENTS.**—The table of contents for
7 this Act is as follows:
Sec. 1. Short title; table of contents.
Sec. 2. Definitions.
TITLE I—CAP AND TRADE PROGRAM
Sec. 101. Amendment of Clean Air Act.

F:\10100708\100708_002.xml (41513031)
October 7, 2008 (8:50 a.m.)

US Senate Has Recognized National Needs

- **Pending Legislation**
 - S. 2307 – Global Change Research Improvement Act of 2007
 - Establishes a National Climate Service within NOAA that *“shall produce and deliver authoritative, timely and usable information about climate change, climate variability, trends, and impacts on local, State, regional, national, and global scales.”*
- **NOAA’s Role is Essential**
 - Administration’s views on S. 2307
 - *“Most of the infrastructure and institutional capabilities required to fulfill the work of a National Climate Service currently exist, primarily within NOAA.”*



National Climate Service

4 Options

A Coordinating Committee, through the NOAA Science Advisory Board, has been established to integrate the analyses of four Tiger Teams tasked to identify the pros and cons of four specific models:

- **Federation:** Partners in which members retain capabilities but are coordinated by leadership
- **NCS with NOAA Lead:** NCS with NOAA as the lead agency with specifically-defined partners
- **Federally-sponsored Non-profit:** Non-profit with a legal relationship with a department or agency of the federal government
- **National Weather and Climate Service:** Expand NWS into a National Weather and Climate Service

<http://www.sab.noaa.gov/Reports/>