

# Northern Exposure

## National Weather Service Grand Forks, ND

# Fall 2010

## New Services

by Tom Grafenauer  
and Geoff Grochocinski



There are new services available that may interest you. They can be accessed by clicking on “Local Links” (<http://www.crh.noaa.gov/fgf/?n=localpage>) on the Grand Forks Weather Forecast Office’s main webpage ([www.weather.gov/fgf](http://www.weather.gov/fgf)).

### Recreational Lake Wind/Wave Forecasts:

Recreation forecasts are now available for the 3 major bodies of water in our forecast area, including Devils Lake, Upper and Lower Red Lakes, and Lake of the Woods during open water months. These forecasts can be found by clicking on “Lake Wind/Wave Forecasts” ([http://www.crh.noaa.gov/fgf/hydro/lake\\_fcst.php](http://www.crh.noaa.gov/fgf/hydro/lake_fcst.php)) in the “Local Links” section. The forecasts include wind speed and direction and wave heights for the next 36 hours in

both text and graphical formats. Wave heights are calculated using the Great Lakes Environmental Research Laboratory Donelan Wave Model (GDM). Basically, the GDM uses the momentum balance equation on a two dimensional surface to predict wave height. The model analyzes the wind speed and direction and the fetch, or the distance air will travel across a water body. The lake surface water temperature and air temperature are also utilized to calculate surface layer stability, which has an effect on wind speed. The lake surface water temperature also influences water density. Modeled water temperature and the Grand Forks office’s forecast of temperature and wind are used in the model to produce the forecasts.

### Information of Interest to Area Growers:

Crop water use (or evapotranspiration) forecasts are now available during the growing season. These forecasts can be found by clicking on “Information of Interest to Area Growers” ([http://www.crh.noaa.gov/fgf/climate/farm\\_info.php](http://www.crh.noaa.gov/fgf/climate/farm_info.php)) in the “Local Links” section. The Evapotranspiration forecasts show estimate how much water a crop near full cover is expected to use each day for the next 7 days, along with a weekly total. The crop water use values are representative of tall canopies (0.5 meters) similar to full-cover alfalfa, and calculated using the Penman-Monteith Reference Evapotranspiration Equation, which was adopted by the Environmental Water Resources Institute-

## IN THIS ISSUE

New Services	1-7
An Update on the Upcoming Solar Sunspot Maximum	8-9
New Senior Forecaster	9-10
Cold Season Outlook	10-11
1910 Baudette Fire	12

American Society of Civil Engineers (ASCE-EWRI, 2005). The Grand Forks office's forecast of temperature, relative humidity, wind, and cloud cover are used in the equation. The page also includes some climate information and local soil temperatures.

**Grand Forks Flood Briefing Page:**

A one-stop shop for flood information within our

forecast area is now available. The "Grand Forks Flood Briefing Page" (<http://www.crh.noaa.gov/fgf/briefing/floodbriefing.php>) can be found within the "Local Links" section. This flood page includes the latest river forecasts, a graphical overview of river flooding in the forecast area, soil frost depths, and much more. The Flood Page should be a useful tool prior and during the annual spring melt.

National Weather Service Weather Forecast Office  
Grand Forks, ND

Home Site Map News Organization Search for: [ ] NWS All NOAA Go

Local forecast by "City, St" or Zip Code  
City, St Go

KML RSS Feeds  
Current Hazards  
Watches/Warnings  
Outlooks  
Submit Report  
Current Conditions  
Observations  
Radar  
Satellite  
Observed Precip  
Forecasts  
Forecast Discussion  
Local Area  
Activity Planner  
Aviation Weather  
Fire Weather  
Marine Weather  
Severe Weather  
Winter Weather  
Hurricane Center  
Hydrology  
Rivers & Lakes  
Climate  
Local  
National  
Drought  
More...  
Weather Safety  
Preparedness  
Weather Radio  
StormReady  
SkyWarn  
Additional Info  
Education Resources  
Coop Observer  
Top News Archives  
**Our Office**  
**Local Links**  
Contact Info  
Feedback

Top News of the Day  
La Nina Continues to develop  
This Day in Weather History  
Archived News Stories

Watches & Warnings Observations Forecast Graphics Rivers & Lakes Climate Fire Weather

Click on the map below for the latest forecast.

Read watches, warnings & advisories  
Zoom Out  
Flood Warning  
Hazardous Weather Outlook

Last map update: Wed, Sep. 29, 2010 at 2:30:24 pm CDT

Latest Conditions in Grand Forks, ND Choose Your Front Page City

Sep 29 1:53 pm 71°F (22°C)  
Partly Cloudy and Breezy

Select A City: [ ]

Weather Story Radar Satellite Weather Map

Current Weather Observations...

Location	Time	Weather	Vsby.	Temp.	Dewpt.	Hum.	Wind	Heat Index	Pres.
----------	------	---------	-------	-------	--------	------	------	------------	-------

These new services can be found within "Local Links" on the main webpage of the Grand Forks Weather Forecast Office.



# Grand Forks, ND

Home Site Map News Organization Search for:  NWS All NOAA

## Lake Forecast Information

Images Updated: 10:30 AM Wed September 29, 2010

### Lake Wind/Wave Forecasts

```

000
SXUS43 KFGF 291531
RECPGF

MNZ001>009-013>017-022>024-027>032-040-
NDZ006>008-014>016-024-026>030-038-039-049-052>054-292300-
RECREATIONAL FORECAST
NATIONAL WEATHER SERVICE GRAND FORKS ND
1030 AM CDT WED SEP 29 2010

```

HERE ARE THE RECREATION AREA FORECASTS...

FOR DEVILS LAKE...

```

.REST OF TODAY...BREEZY. NORTHWEST WINDS 20 TO 25 KNOTS. WAVES
2 TO 4 FEET. SUNNY. HIGHS IN THE UPPER 60S.
.TONIGHT...NORTHWEST WINDS 15 TO 20 KNOTS...DECREASING TO 10 TO
15 KNOTS IN THE LATE EVENING AND OVERNIGHT. WAVES 2 TO 4 FEET...
SUBSIDING TO 1 TO 2 FEET AFTER MIDNIGHT. MOSTLY CLEAR. LOWS IN
THE LOWER 40S.
.THURSDAY...NORTHWEST WINDS 5 TO 10 KNOTS. WAVES AROUND 1 FOOT.
SUNNY. HIGHS IN THE MID 60S.

```

FOR THE UPPER AND LOWER RED LAKES...

```

.REST OF TODAY...NORTHWEST WINDS 15 TO 20 KNOTS. WAVES 1 TO
2 FEET...BUILDING TO 1 TO 3 FEET IN THE AFTERNOON. CHANCE OF
SHOWERS IN THE LATE MORNING AND EARLY AFTERNOON. MOSTLY SUNNY.
HIGHS IN THE UPPER 60S.
.TONIGHT...NORTHWEST WINDS 10 TO 15 KNOTS...DECREASING TO 5 TO
10 KNOTS IN THE LATE EVENING AND OVERNIGHT. WAVES 1 TO 3 FEET...
SUBSIDING TO 1 TO 2 FEET AFTER MIDNIGHT. PARTLY CLOUDY. LOWS IN
THE LOWER 40S.
.THURSDAY...NORTHWEST WINDS 5 TO 10 KNOTS...INCREASING TO 10 TO
15 KNOTS LATE IN THE MORNING...THEM...INCREASING TO 15 TO
20 KNOTS EARLY IN THE AFTERNOON...DECREASING TO 10 TO 15 KNOTS
LATE IN THE AFTERNOON. WAVES 1 TO 2 FEET...BUILDING TO 1 TO
3 FEET IN THE AFTERNOON. SUNNY. HIGHS IN THE UPPER 60S.

```

FOR LAKE OF THE WOODS...

```

.REST OF TODAY...BREEZY. NORTHWEST WINDS 15 TO 20 KNOTS...
BECOMING 15 TO 25 KNOTS IN THE AFTERNOON. WAVES 1 TO 2 FEET...
BUILDING TO 1 TO 3 FEET IN THE AFTERNOON. MOSTLY SUNNY. HIGHS IN
THE LOWER TO MID 60S.
.TONIGHT...NORTHWEST WINDS 10 TO 20 KNOTS...BECOMING 10 TO
15 KNOTS IN THE LATE EVENING AND EARLY MORNING...THEM...BECOMING
10 TO 20 KNOTS EARLY IN THE MORNING. WAVES 1 TO 3 FEET. MOSTLY
CLOUDY. LOWS IN THE LOWER 40S.
.THURSDAY...NORTHWEST WINDS 10 TO 15 KNOTS...BECOMING 10 TO
20 KNOTS. WAVES 2 TO 4 FEET. MOSTLY SUNNY. HIGHS IN THE MID TO
UPPER 60S.

```

\$\$

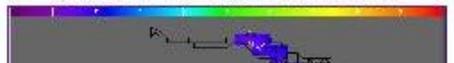
**Devils Lake**



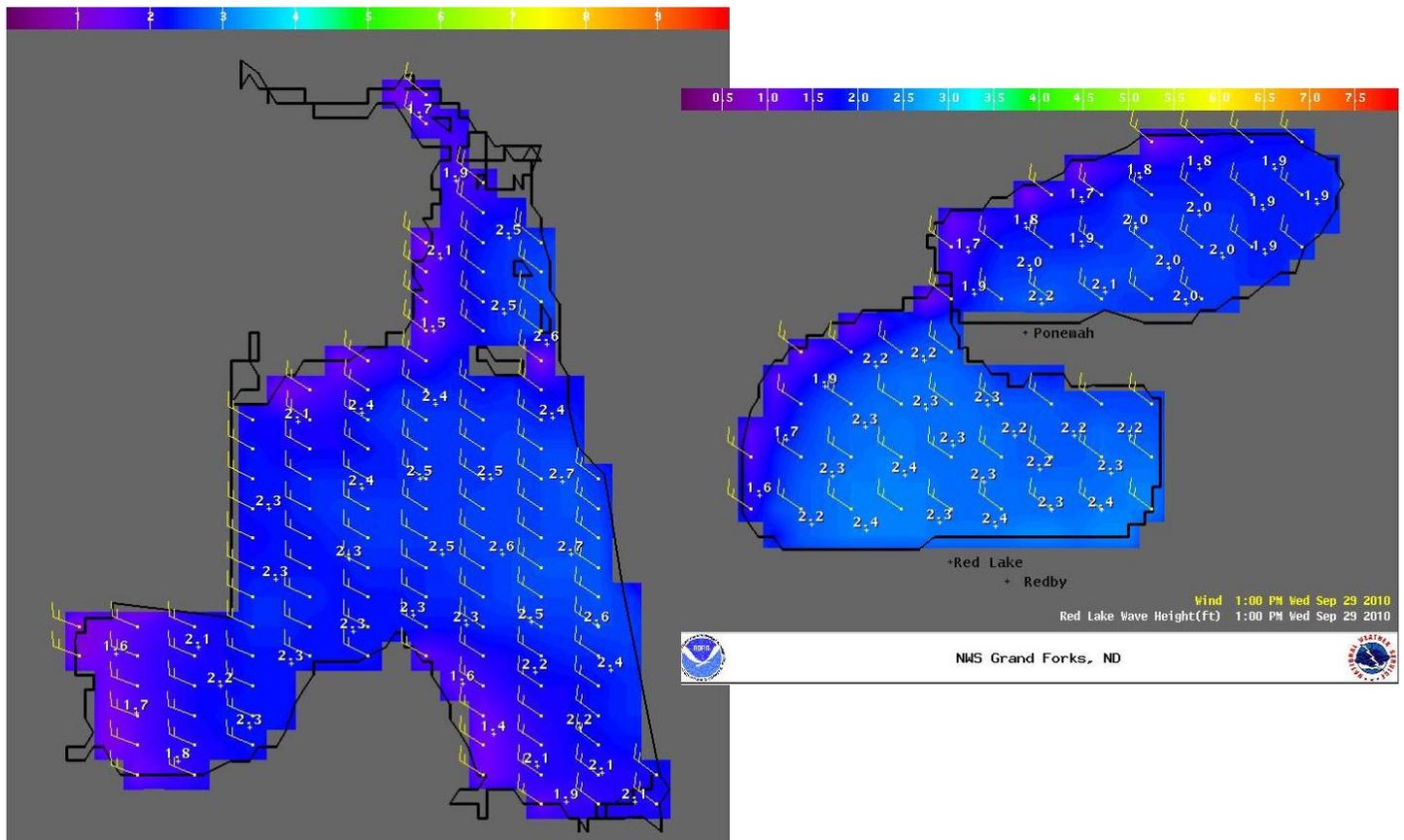
**Red Lake**



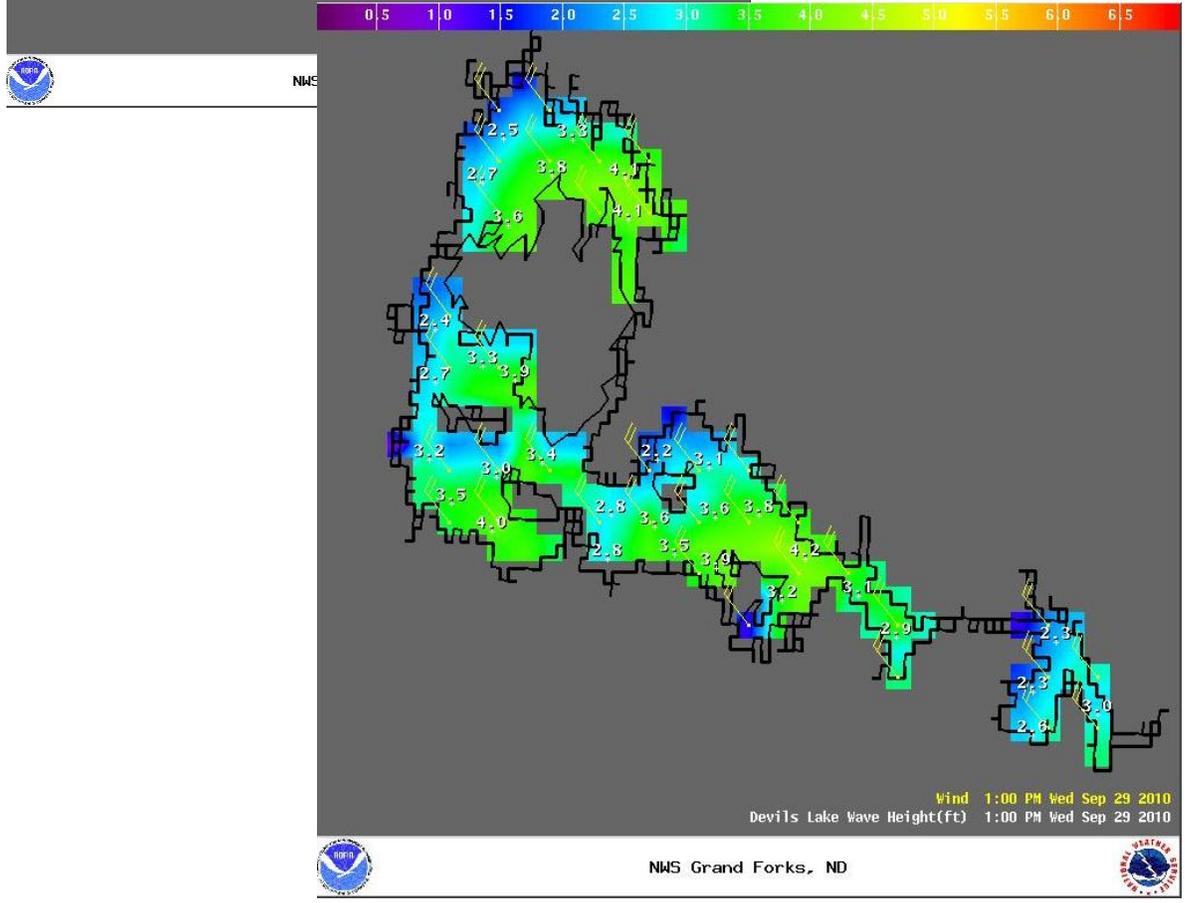
**Lake of the Woods**



The Recreational Lake and Wind/Wave Forecast webpage.



NWS Grand Forks, ND



NWS Grand Forks, ND



Wind/Wave forecasts for Lake of the Woods, the Red Lakes, and Devils/Stump Lakes.



# Grand Forks, ND

Home Site Map News Organization Search for:  NWS All NOAA Go

## Information of Interest to Area Growers

GDD Updated: 901 AM CDT WED SEP 29 2010

ET Images Updated: 12:15 PM Wed September 29, 2010

North Dakota	GDD	Total	Departure	Minnesota	GDD	Total
Fargo	8	2396	76	Thief River Falls	10	1935
Grand Forks	6	2138	-177	Baudette	8	1812
Devils Lake	16	2081	N/A	Bemidji	11	2093
				Detroit Lakes	11	2989

*Note: The Growing Degree Days above are calculated from April 1 through yesterday. These data are preliminary based on automated temperature systems and are provided as guidance only.*

SHUS53 KEGF 291258  
AGOEKF

EASTERN NORTH DAKOTA SOIL TEMPERATURES  
NATIONAL WEATHER SERVICE GRAND FORKS ND  
758 AM CDT WED SEP 29 2010

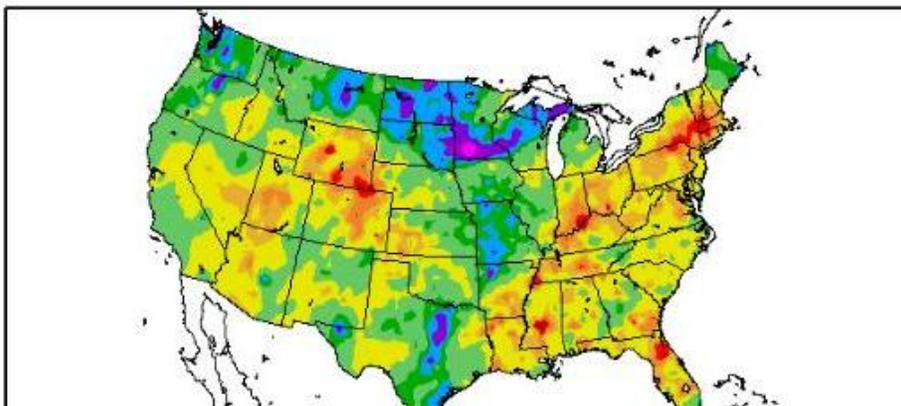
SOIL TEMPERATURE READINGS TAKEN UNDER SOD.  
DATA FROM NDAWN WEATHER SYSTEMS.  
MM INDICATES MISSING DATA

STATION	2IN	4IN	8IN	20IN	40IN	60IN
NDSU FARGO	56	57	58	58	58	57
NDSU LANGDON EXP STN	57	55	54	54	53	53
GRAND FORKS	55	55	56	56	55	54

These soil temperature data are from the [North Dakota Agricultural Network](#) and are provided as is. Courtesy of [NDSU Soils Science Department](#).

## High Plains Regional Climate Center - Lincoln Nebraska

30 Day SPI  
8/30/2010 - 9/28/2010



The Information of Interest to Area Growers webpage.



# Grand Forks, ND

Home Site Map News Organization Search for:  NWS All NOAA Go

## Grand Forks Flood Briefing Page

### Latest Flood Point Forecast/Warning

\* Note: Refresh browser to see latest times.

#### Red River Mainstem

Forecast Point	Last Issued
<a href="#">Wahpeton</a>	None Issued recently
<a href="#">Fargo</a>	None Issued recently
<a href="#">Halstad</a>	None Issued recently
<a href="#">Grand Forks</a>	10: 27AM Sep 29
<a href="#">Oslo</a>	10: 27AM Sep 29
<a href="#">Drayton</a>	None Issued recently
<a href="#">Pembina</a>	None Issued recently

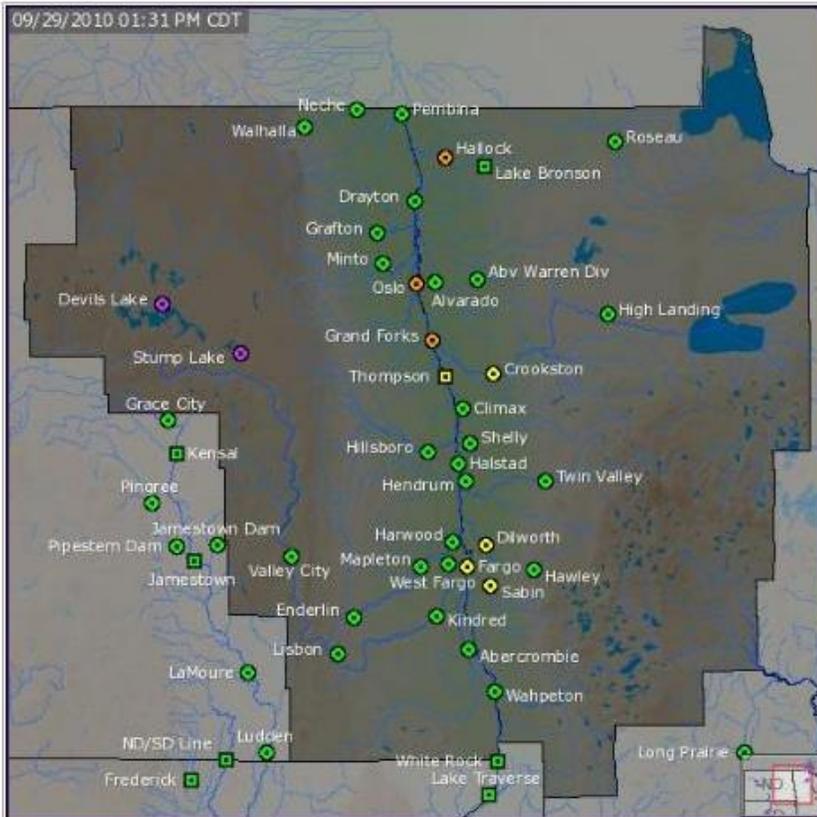
#### MN Tributaries

Forecast Point	Last Issued
<a href="#">Sabin</a>	None Issued recently
<a href="#">Hawley</a>	None Issued recently
<a href="#">Dilworth</a>	None Issued recently
<a href="#">Twin Valley</a>	None Issued recently
<a href="#">Hendrum</a>	None Issued recently
<a href="#">Shelly</a>	None Issued recently
<a href="#">Climax</a>	None Issued recently
<a href="#">High Landing</a>	None Issued recently
<a href="#">Crookston</a>	8: 54PM Sep 27
<a href="#">Above Warren</a>	None Issued recently
<a href="#">Alvarado</a>	None Issued recently
<a href="#">Hallock</a>	10: 12AM Sep 29
<a href="#">Roseau</a>	None Issued recently

#### ND Tributaries

Forecast Point	Last Issued
<a href="#">Abercrombie</a>	None Issued recently
<a href="#">Valley City</a>	None Issued recently
<a href="#">Lisbon</a>	None Issued recently
<a href="#">Kindred</a>	None Issued recently
<a href="#">West Fargo</a>	None Issued recently
<a href="#">Harwood</a>	None Issued recently
<a href="#">Enderlin</a>	None Issued recently
<a href="#">Mapleton</a>	None Issued recently
<a href="#">Hillsboro</a>	None Issued recently
<a href="#">Minto</a>	None Issued recently
<a href="#">Grafton</a>	None Issued recently
<a href="#">Walhalla</a>	None Issued recently
<a href="#">Neché</a>	None Issued recently

### High-Water Notices (River Statements)



[Area Probabilistic River Forecasts](#)  
[Current River Conditions](#)

#### Resources

[Buying Flood Insurance: Now is the Time](#)

[Flood Preparation \(NDSU\)](#)

[Flood Preparation \(MN DNR\)](#)

[FloodSmart.gov](#)

[GIS Data from the NWS](#)

[Ice Jams](#)

[Red River Anatomy](#)

[River Forecast Center Spring Outlook](#)

[River Forecast Center Quick Brief](#)

[RSS Feeds for Alerts and Forecasts](#)

#### Office Pages

[River Forecast Center](#)

[Duluth, MN](#)

[Grand Forks, ND](#)

[Bismarck, ND](#)

[Aberdeen, SD](#)

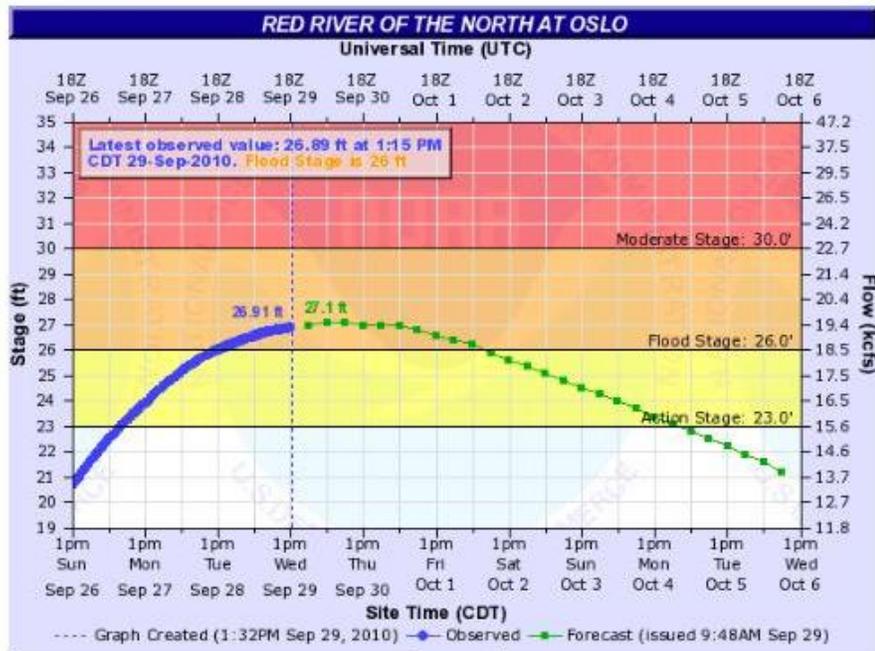
[Twin Cities, MN](#)

[Snow Survey \(NDHRSC\)](#)

The Grand Forks Flood Briefing webpage.



# Grand Forks, ND



OSLM5(plotting HGIRG) "Gage 0" Datum: 772.65' Observations courtesy of US Geological Survey  
 Note: Graph may lag text forecast and will be updated within the hour

## Latest Forecast for Oslo

Issued: 1027 AM CDT WED SEP 29 2010

- THE FLOOD WARNING CONTINUES FOR THE RED RIVER AT OSLO.
- \* AT 10:15 AM WEDNESDAY THE STAGE WAS 26.8 FEET.
  - \* MINOR FLOODING IS OCCURRING AND FOR THE NEXT 7 DAYS...MINOR FLOODING IS FORECAST.
  - \* MINOR FLOOD STAGE IS 26.0 FEET.
  - \* FORECAST...THE RIVER WILL CONTINUE RISING TO NEAR 27.1 FEET BY AFTER MIDNIGHT TOMORROW.
  - \* IMPACT STATEMENT(S) - AT 26.0 FEET, FLOOD WARNING STAGE...MINOR. COUNTY ROAD 2 SOUTH OF OSLO IS CLOSED IN SECTIONS 2 AND 11 OF PULASKI TOWNSHIP.

55

DAILY 7 AM CDT/6 AM CST FORECAST STAGE IN FEET:

DATE (MONTH/DAY)	THU 09/30	FRI 10/01	SAT 10/02	SUN 10/03	MON 10/04	TUE 10/05	WED 10/06
RED RIVER OSLO	27.1	26.8	25.9	24.8	23.7	22.5	21.2

## Hydro Briefing

Issued: 830 PM CDT TUE SEP 28 2010 RIVER POINT FLOOD WARNINGS REMAIN IN EFFECT ON THE RED FROM GRAND FORKS TO OSLO AND ON THE TWO RIVERS RIVER AT HALLOCK. CRESTS BEING APPROACHED AT BOTH GRAND FORKS AND OSLO THIS EVENING.

- [Click here for full Flood Statement Product](#)
- [Click here for Probabilistic Outlook](#)
- [Click here for Watches, Warnings, and Weather Forecasts](#)

An example river forecast from the Flood Briefing webpage, with information below the graphic.

# **An Update on the Upcoming Solar Sunspot Maximum**

**by Brad Bramer**

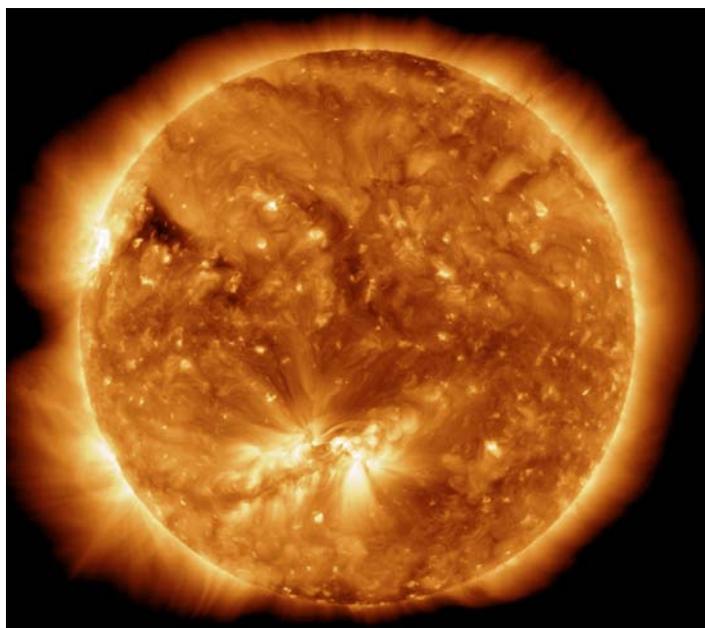
Although it may not feel like it outside, the sun is entering a more active phase in its sunspot cycle. This will mean an increasing amount of energetic particles reaching the earth's upper atmosphere over the next few years. The sun is a very dynamic star with a number of cycles which dominate its activity. Once every 22 years or so, the sun reverses its magnetic field. Thus, the sun's North Pole becomes the South Pole and vice versa. Sunspots on the solar surface also have a magnetic field which reverses when the poles do. This cycle of approximately every 22 years is known as the double sunspot cycle. This is because sunspots increase and decrease during a cycle which lasts approximately 11 years. Thus, sunspots go through two complete cycles of activity before the sun flips its magnetic field.

The number of sunspots appearing on the sun's surface has been recorded by man for centuries. At the present time, the sun is entering what is known as Solar Cycle 24. This cycle of approximately 11 years in length began in December 2008 when the sun reached its minimum in sunspot activity. There was a prolonged period of several months in late 2008 into 2009 where no sunspots were observed. This was very unusual and was not expected by solar scientists. As a result, the start of Solar Cycle 24 was slower and longer than expected. It also reduced the forecast maximum number of sunspots expected which should peak around 90 in May 2013. This is almost half the number which occurred in Solar Cycle 23 which peaked with a sunspot number of about 170 in the

early summer of 2000.

An active period on the sun (when you have many sunspots) also results in other solar features which can have observable effects in the earth's upper atmosphere. A coronal mass ejection (CME) from the sun can send a large shower of energetic particles toward the earth's magnetic field. This results in a concentration of these particles in a ring around the earth's magnetic north and south poles. In the upper atmosphere (between approximately 60 to 600 miles above the earth's surface), these particles interact with nitrogen and oxygen molecules to produce what we know as the aurora borealis. The aurora is a vivid display of fluctuating green and sometimes red lights across the night sky which typically last for several hours. In addition, a severe CME may also disrupt short-wave radio signals and electrical power transmission.

The graph (Fig. 1) from NOAA's Space Weather Prediction Center (SWPC) shows the actual number of sunspots (black line with circles) over the past 11 years and the projected number (red line)



A recent image of the Sun from October 14, 2010.

of sunspots expected in future years.

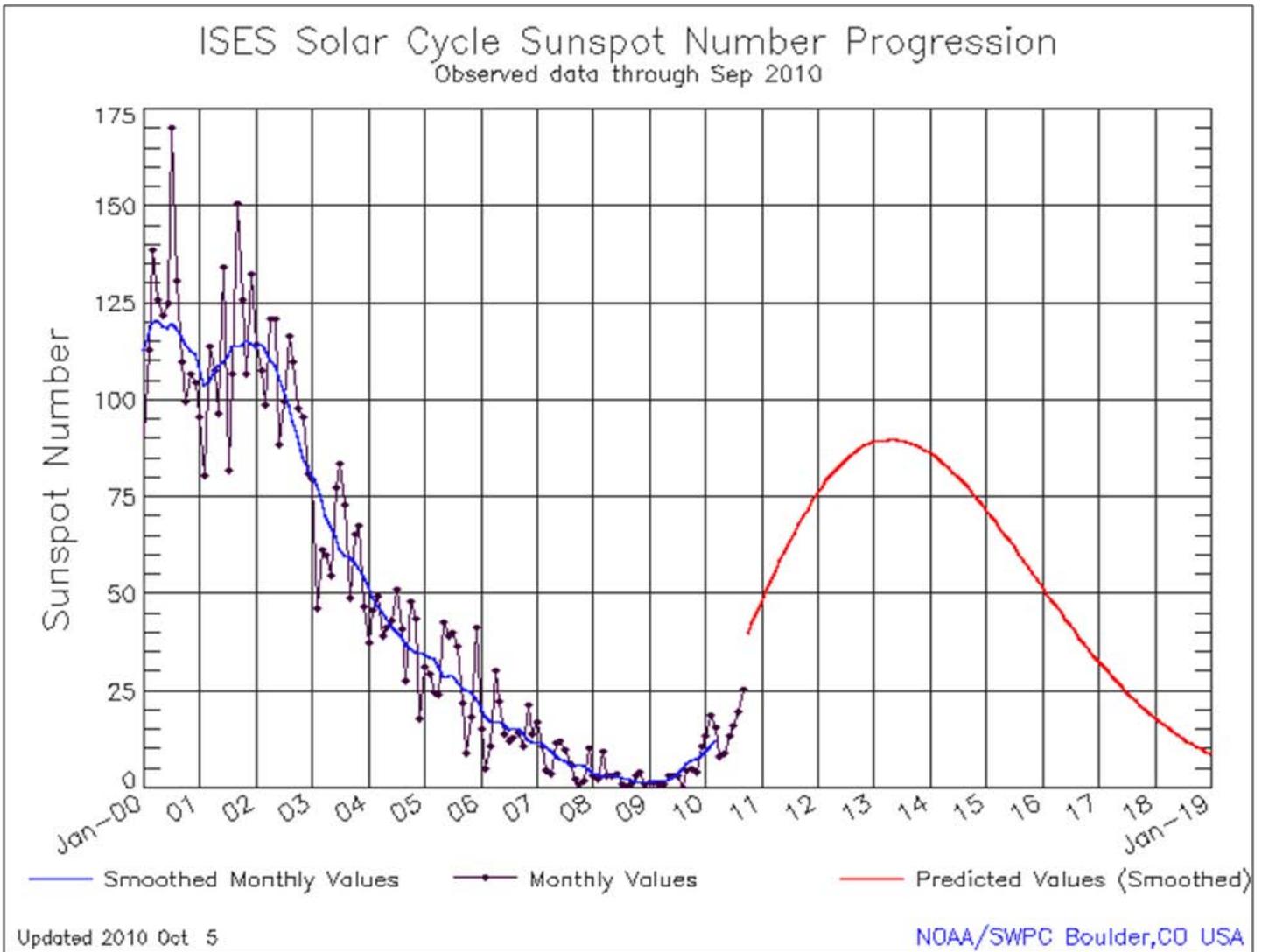


Fig 1: A graph depicting observed sunspots over the last decade and the most recent sunspot forecast from NOAA's Space Weather Prediction Center..

## ***New Senior Forecaster: Jennifer Ritterling***

Like many meteorologists, Jennifer can date her fascination with weather from childhood. In kindergarten, the first book she got from school book orders was one called "Tornadoes: Killer Storms", much to the dismay of her mother. Growing up in rural Nebraska allowed for many opportunities to experience weather's fury firsthand.

Jennifer attended the University of Nebraska-Lincoln and graduated in 1997 with a Bachelor of

Science in Meteorology/Climatology. After some time in graduate school at the University of Oklahoma, she discovered that a career as a forecaster was more suited to her temperament than one in research. Thus, she got a job with WeatherBank Inc in Edmond, OK, a private forecasting company that provided services to utilities and railroads.

After almost two years at WeatherBank, an opportunity to work for the National Weather Ser-

Service was available. Having enjoyed temporary student employment at the Hastings, NE office between junior and senior years as an undergrad, she gladly took a journeyman forecaster job in Dodge City, KS in October 2002. There she got a large amount of experience working with severe weather, including the day Greensburg, KS was devastated by an EF5 tornado. However, as there is actually no water in the Arkansas River at Dodge City, there was not much flooding to work with. So when a job opened in Grand Forks, she

took the opportunity to gain more experience with hydrology and winter weather.

In her spare time, Jennifer enjoys bicycling, and has been happily riding on the Grand Forks Greenway since she arrived this past June. She also likes to read, hike, and watch movies. The last month she has spent much of her free time getting settled into her newly purchased house, along with her two cats (one of which is named after a cloud).

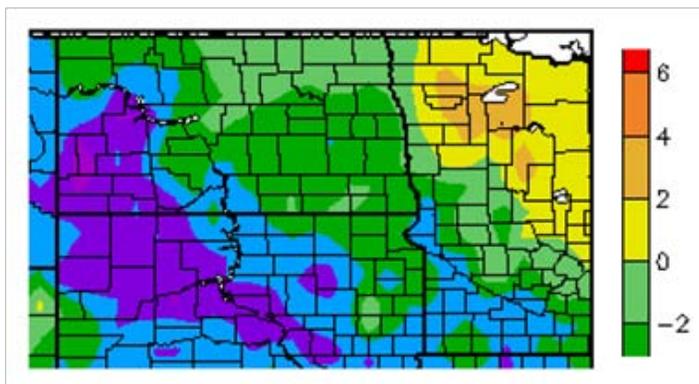
## **Cold Season Local Climate Outlook November 2010 - February 2011**

**by Mark Ewens**

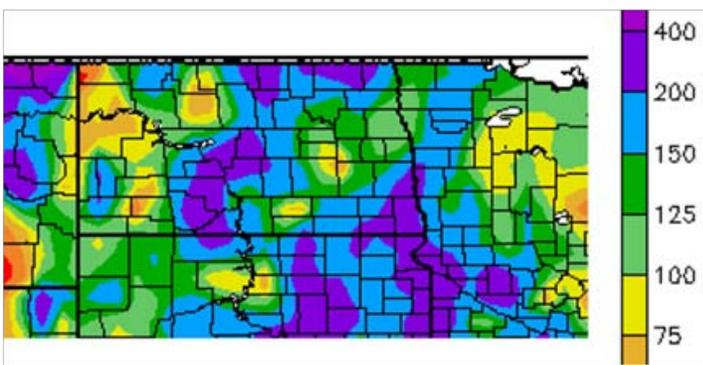
**Discussion:** A La Nina developed rapidly during the summer of 2010. This La Nina was preceded by a moderate El Nino during the 2009/2010 winter season. Due to the presence of a colder than average waters in the northern and eastern Pacific, the El Nino impacts across the U.S. were atypical. An unusually strong southern jet was periodically diverted north, bringing several very unusual El Nino snow storms to the tri states region. In the Red River and Devils Lake basins, precipitation was near to or above normal, with normal to below normal precipitation in portions of the north-central Minnesota Lakes region (Fig. 1). Temperatures were very close to average; a little below normal on the North Dakota side of the Red River and a little above to the east (Fig. 2).

This winter presents an unusual set of challenges as well. Despite the existence of a moderate La Nina, this year's La Nina has developed farther to the west than normal, in the central Pacific. Additionally, there is an increasing area of colder than normal water in the north and eastern Pacific (negative phase of the Pacific Decadal Oscillation -

PDO).



**Fig. 1: Average temperature departure from normal  
Dec 2009-Feb 2010**



**Fig. 2: Percent precipitation departure from normal  
Dec 2009-Feb 2010**

The climate outlook for November 2010 through March 2011 calls for, on balance, below normal temperatures (Fig. 3) and normal to a little above normal precipitation (Fig. 4). This outlook is based on the average weather that occurs during La Nina winter seasons. However, as with last winter,

the presence of the negative PDO complicates the outlook. As we get closer to the start of the winter season, the overall atmospheric pattern will become better established and a clearer picture will emerge.

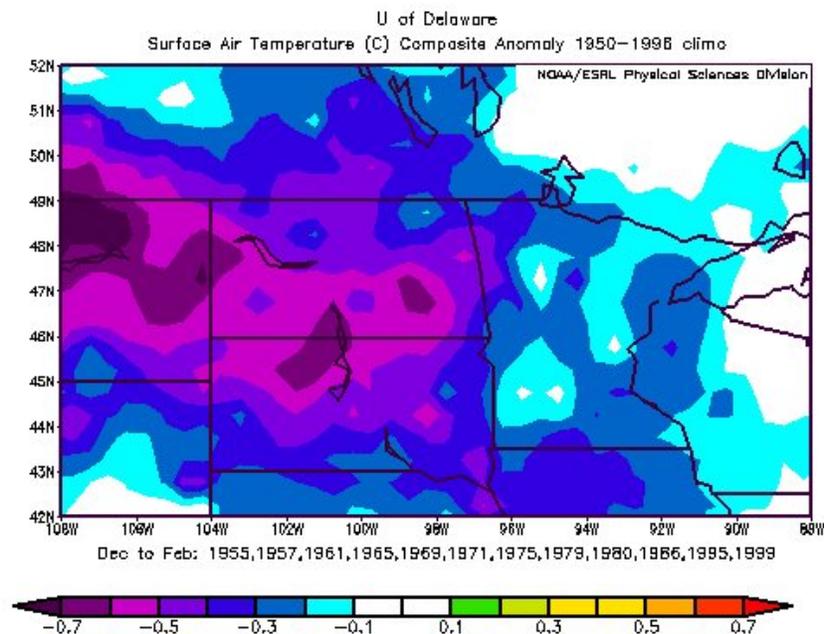


Fig. 3: The outlook for temperature departure from normal for the period Dec 2010-Feb 2011.

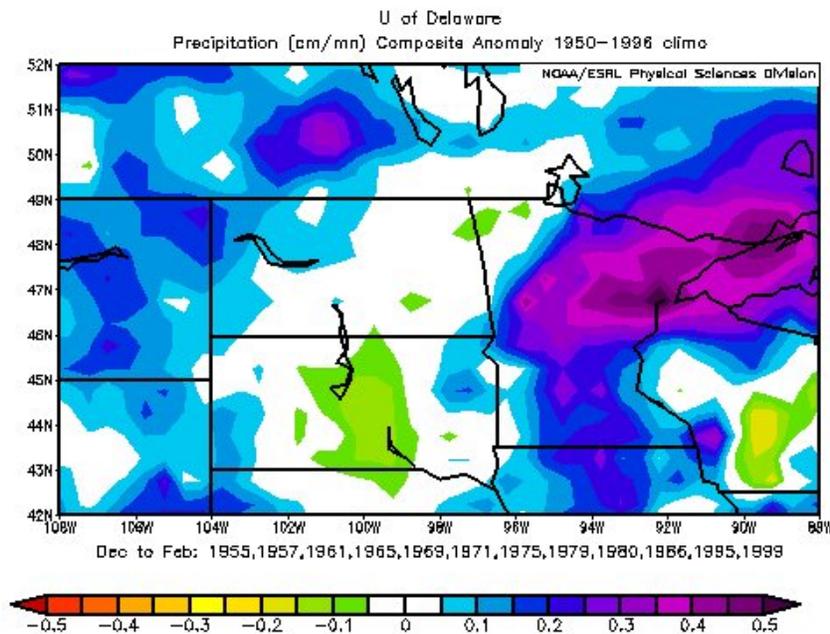


Fig. 4: The outlook for precipitation departure from normal for the period Dec 2010-Feb 2011.

# 100th Anniversary of the Baudette Fire

by Geoff Grochocinski

This year is the 100<sup>th</sup> anniversary of the Baudette Fire of 1910. It is Minnesota's 3<sup>rd</sup> deadliest fire behind the 1918 Cloquet Fire and the 1918 Great Hinkley Fire. The region near Lake of the Woods had been in a drought for months leading up to October of 1910. Fires started and were fed by slash created by the logging industry. The villages of Pitt, Cedar Spur, Graceton, and Spooner were ruined by the engulfing fires. The fires finally reached Baudette, MN on October 7 and destroyed much of the town, except for the section

dating back to the beginnings of settlement. A total of 42 people lost their lives due to the region's fires. The fire burned about 360,000 acres in Lake of the Woods County. It helped Forestry Commissioner Christopher C. Andrews convince others in the need for active forestry management to prevent massive forest fires. Next time you are near the Baudette - Rainy River International Bridge, look for the Minnesota Historical Society's marker describing the fire.



The Minnesota Historical Society's marker describing the Great Fire of 1910.



**WE NEED YOUR  
WEATHER  
STORIES AND  
PICTURES!**

**Want a chance at sharing  
your weather story or picture  
in future newsletters?**

If you are interested, then please send your weather story/picture(s) to Geoffrey Grochocinski at the Grand Forks, ND National Weather Service by email or mail:

[Geoffrey.Grochocinski@noaa.gov](mailto:Geoffrey.Grochocinski@noaa.gov)

or

**National Weather Service  
4797 Technology Circle  
Grand Forks, ND 58203**

- **Greater preference will be given to story/photo(s) originating within our county warning area of eastern ND and the northwestern quarter of MN.**
- **Please be as detailed as possible (provide a title, the name of the author/photographer, where, when, and so forth).**
- **If your story or photo does not fit the theme of the next newsletter (Spring, for instance), do not despair! It will be saved for the next appropriately themed Northern Exposure.**

# *The Grand Forks NWS Staff*

**MIC (Meteorologist in Charge)**  
**SOO (Science Operations Officer)**  
**WCM (Warning Coordinator Meteorologist)**  
**ESA (Electronic Systems Analyst)**  
**DAPM (Data Acquisition Program Manager)**

**SH (Service Hydrologist)**  
**ITO (Information Technology Officer)**  
**ASA (Administrative Support Assistant)**

**Lead Forecaster**  
**Lead Forecaster**  
**Lead Forecaster**  
**Lead Forecaster**  
**Lead Forecaster**

**Forecaster**  
**Forecaster**  
**Forecaster**  
**Forecaster**

**Intern Meteorologist**  
**Intern Meteorologist**  
**Intern Meteorologist**

**Hydrometeorological Technician**

**Electronic Technician**  
**Electronic Technician**

**SCEP**  
**SCEP**

**Mark Frazier**  
**Bradley Bramer**  
**Greg Gust**  
**Michael Lukasz**  
**Mark Ewens**

**Michael Lukes**  
**Richard Hozak**  
**Jeannette Ringuette**

**Jennifer Ritterling**  
**Dan Riddle**  
**Al Voelker**  
**David Kellenbenz**  
**Tommy Grafenauer**

**Vince Godon**  
**John Hoppes**  
**Peter Rogers**  
**Peter Speicher**

**Geoffrey Grochocinski**  
**Bradley Hopkins**  
**Jim Kaiser**

**William Barrett**

**Ed Schulz**  
**David Masterson**

**Ed Townsend**  
**Scott Rowe**

**Feel free to make suggestions to Editor Geoffrey Grochocinski**  
**[Geoffrey.Grochocinski@noaa.gov](mailto:Geoffrey.Grochocinski@noaa.gov)**



**National Weather Service**  
**4797 Technology Circle**  
**Grand Forks, ND 58203**  
**(701) 772-0720**

**<http://www.crh.noaa.gov/fgf/>**

