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La Crosse, Wisconsin

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Inside this Issue:

2013 Shareholder's Report

National Weather Service, La Crosse, WI

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Decision Support for Weather: Making a Difference

Decision Support Services (DSS) for weather. What does that mean to you? If you have not thought about DSS before, it may not seem too important.

But consider the following simple example. A mother hears through the media that the school district has called for a 2-hour delay because of foggy conditions. The fog is expected to improve around 9 a.m. Of course, the school district got that information from the National Weather Service (NWS) and took action for the protection of the children. This is an example of DSS. The school district uses NWS information to make informed decisions for the protection of the citizenry.

On May 6th of this past year, the La Crosse Fitness Fest marathon was canceled in the early morning because of strong thunderstorms that were impacting the area. Race officials were in contact with our office to identify the timing of the storms and the associated risk of lightning. While the NWS does not tell our partners what they should do, providing them the best possible weather information can make the difference in ensuring the safest possible event for participants.

In this case, NWS forecasters informed race officials that ongoing morning storms would end, but additional storms could be expected later in the morning, creating a window of a few hours for their races to be run.

Fitness Festival organizers praised the NWS for the excellent guidance to help them make an informed decision. With the safety of thousands of runners dependent on their decision, it was critical to have the best information available to make the best decision.

We want to work with communities and businesses alike to identify the weather information they need and learn how we can help maximize weather safety and minimize loss of life from weather events.

Runners coming over the Cass Street Bridge to start the 2010 La Crosse marathon. Photo courtesy of the La Crosse Tribune.

Now, more than ever, we are working to find ways to improve the value of the information we provide for the many weather-sensitive sectors of our society, including the general public.

I welcome your comments regarding how we can provide better weather information for you - whenever, wherever and however you need it!

Glenn R. Lussky
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Blazing New Ground with DSS

The NWS is committed to helping our partner groups make critical decisions involving the impact of hazardous weather. During this past year, the NWS La Crosse implemented a number of advancements to enhance this type of "Decision Support" for our partners.

Research was conducted with partner groups like highway and street departments, medical facilities, and utility companies to better understand their needs and critical decision making thresholds. This helps our local meteorologists understand the impact of various weather elements on select groups and allows for the development of tools that might help in our decision support process. For example, a series of decision support web pages were developed for select groups that include specific graphics, maps, and other important weather information. These web sites are tailored to the needs of each group

Fire Weather services is an area in which the NWS has long provided Decision Support.

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Improvements to the 4-7 Day Forecast

In the past, NWS forecast offices would use their forecasting experience to determine the most likely outcome for the 4 through 7 day (extended) forecast. Forecasters would look through various computer models and determine which one(s) seemed most reasonable, place them into the forecast and adjust them for known local effects (e.g. valleys in our area).

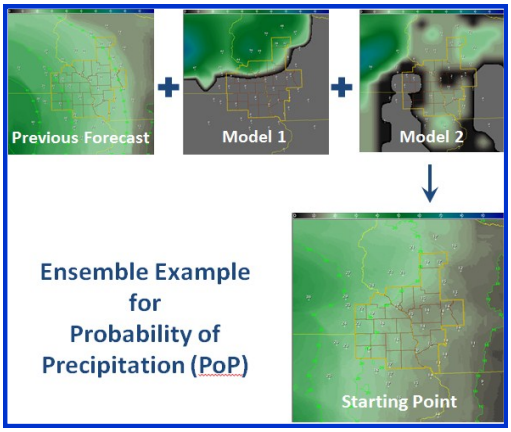
"utilizing an ensemble approach simplified the extended forecast process and produced a much more seamless forecast from office to office."

However, many problems existed with this process:

- verification over the long run (i.e., 30 days) was no better than numerical guidance provided by the independent models,
- completing the analysis and forecast process was time intensive (typically, between 2 and 4 hours),
- time constraints would not always allow the latest model guidance to be incorporated into the extended forecast, and
- ensuring the forecast matched meteorologically from office to office was difficult and time consuming.

To solve these problems, research performed by an NWS Central Region team (including NWS La Crosse Lead Forecaster Andy Just) determined that a group of all the available computer models (termed an "ensemble") would often perform better than guidance from an individual model. Based on this research, offices across the central U.S. have utilized this ensemble approach to produce a starting point for the extended forecast since October 2011. Forecasters then coordinate with their neighboring forecast offices regarding adjustments from that ensemble starting point.

The ensemble process is often referenced in the NWS La Crosse Area Forecast Discussions, utilizing words such as model consensus, AllBlend, or ConsAll. These are interchangeable references which represent the ensemble forecast.



We have found that, in addition to producing better forecasts, utilizing an ensemble approach simplified the extended forecast process, allowed forecasters to incorporate the latest computer model guidance, and produced a much more seamless forecast from office to office. In addition, with less time needed to produce an extended forecast, our meteorologists were able to devote more time to enhanced Decision Support Services, especially for weather events in the 0 to 36-hour forecast period. We believe that's a win-win solution on both accounts!

Enhancing Information Available in the Short Term Forecast

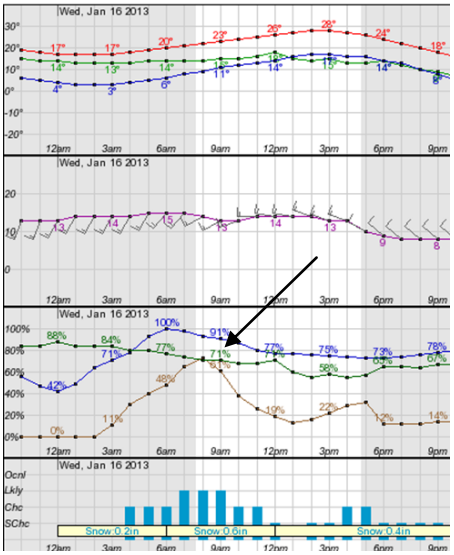
Following the vision of the NWS to improve and enhance Decision Support Services, Central Region forecast offices will officially start providing Enhanced Short Term Forecast (ESTF) services beginning April 1, 2013.

These ESTF services are a combination of a philosophical and methodological approach which:

- ensures the forecast matches reality as much as possible,
- provides hourly detail for all forecast parameters (e.g. temperature, sky, precipitation chances) for the first 12 hours of the forecast, with 3 or 6 hourly detail for the next 12 to 24 hours of the forecast,
- turns the first 36 hours of the forecast into a "streaming" forecast, (i.e. is constantly relevant, accurate and reflecting the latest meteorological thinking),
- provides more detail and definition to the forecast, and
- includes a standardization of Area Forecast Discussion appearance across forecast offices so the users can quickly access the information of interest.

With greater detail provided in the first 36 hours of the forecast, forecast users can better assess how the weather will impact their day. For example, a forecast which, in the past, might have read "a 40% chance of showers and thunderstorms this afternoon," now may read, "a 40% chance of showers and thunderstorms, mainly after 5 pm."

With this change, hourly weather graphs and forecasts available on the NWS point-and-click web pages will become even more useful. An example of an ESTF hourly weather graph forecast for Medford, WI made at 9 pm Tuesday January 15th is shown in the figure to the right. If you were wondering when snow was most likely to occur, the precipitation potential (brown) shows around 8 am Wednesday, with chances falling off quickly thereafter.



A graphical hourly forecast of gridded weather information, available via the NWS web page. Arrow points to the time with the highest probability of precipitation (brown curve).

Low Flows: A Different Type of Hydrologic Event

Typically, we allocate space in the Shareholder's Report to review recent flooding events, or note how the NWS works to help residents prepare for high water or flooding. But with last summer's drought continuing into the winter months, we have not had much cause to be concerned about too much water. In fact, it is the *lack* of water that has, of late, caused the most problems.

The months-long drought has led to very low water levels along most creeks and rivers in the NWS La Crosse Service Area since last spring. Heading into the winter season, many rivers were near historical lows for flow (the volume of water moving through the stream). Many were in the top 10 for the lowest water levels since records have been kept.

While those who are typically concerned with high water and flooding may find this trend a good thing, it also poses some problems. Low water levels have led to some water quality concerns, as agricultural runoff and other pollutants are allowed to become more concentrated. Shallow water also warms up more in the summer sunshine, and higher water temperature is hard on aquatic life, especially fish. Last summer there were many reports of extensive fish kills around the area, especially in shallow or backwater areas. As swamps and other low spots dried up, there was less supportive habitat for other small animals as well. Warm water also led to an explosion of algae and other nuisance weeds.

Low water in the rivers impacts humans as well. Recreational interests were curtailed for

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In August 2012, barges stacked up on the Mississippi River due to the need for dredging to re-open the river to navigation.

StormReady Continues Expansion Across the Area

'StormReady' is a voluntary program that provides guidance to and recognizes those communities or groups that take pro-active approaches to local hazardous weather. It has criteria that includes communication, weather monitoring, warning dissemination, and community preparedness activities. Communities can become 'Storm Ready' and businesses or groups can become 'StormReady Supporters'.

In 2012, we saw the renewal of the StormReady status for communities like Edgewood, IA, and Dover, Eyota, and Spring Valley in southeast MN. We also added our 2nd StormReady Supporter when KAAL Television (Austin, MN) was recognized during the fall. Fort McCoy (Monroe Co., WI) is moving through the process of being recognized and will likely be our newest StormReady community in 2013.

StormReady
NATIONAL WEATHER SERVICE

For additional information on the local StormReady program, see our web site at: *www.weather.gov/lacrosse/?n=stormready*

Blazing New Ground with DSS (continued from page 1)

Decision Support can play a key role in emergency actions such as citizen evacuations.

and can serve as a "one-stop" monitoring page to assist in critical weather-related decision making.

These support web sites can be viewed at: *www.weather.gov/lacrosse/?n=decisionSupport*

Additional new capabilities include the development and use of event specific web pages to help organizers of large outdoor events or festivals. These web sites were designed to handle specific locations on select dates so those making critical weather-related decisions have a tool that will help them with this process. This proved useful for activities like fitness festivals, outdoor concerts, and county fairs, keeping event organizers updated on incoming thunderstorm activity, lightning, and dangerous heat.

Besides refining what we've developed over the past couple of years, we plan to expand our partner research in 2013 and continue to advance our Decision Support Services.

Public safety at large scale public venues is a critical part of NWS Decision Support Services.

The Application of Dual Pol Radar in NWS Operations

Dual-Polarization (DP) Radar, installed at the NWS La Crosse in spring 2012, enables forecasters to remotely detect the type of precipitation occurring with weather systems. This article will review some examples of local DP radar imagery which helped us provide greater forecast detail during the past year.

On August 16th 2012, a thunderstorm moved just north of the town of Holmen, Wisconsin (north of La Crosse). Traditional radar reflectivity (Fig. 1a, extreme zoom-in) shows high values indicative of heavy rain, hail, and possibly large hail (pinks/purples). However, using a DP product named Differential Reflectivity (ZDR), the area of large hail becomes more apparent. ZDR measures how horizontal the radar target is compared to it's vertical extent. Large rain drops fall more like hamburgers than round drops, and therefore have larger horizontal extent than vertical, and larger ZDR values (e.g., 2-4 dBZ). Large hail "tumbles" as it falls and is seen as more spherical to the radar and produces ZDR values near 0 dBZ. In Figure 1b, the ZDR indicates large hail falling north of Holmen (blues/grays), while areas around the large hail consist of higher ZDR values representing large rain drops (reds/purples in Fig 1b). Golfball-sized hail was reported with this severe thunderstorm within the white outlined area (which is only 1 mile wide!) as it moved southeast. The "R" in Figs 1a and 1b represents a location with high reflectivity, but no hail.

"these additional DP products bring improvements over the legacy radar…even so, we will still rely heavily on our media, spotters, and law enforcement for ground truth information"

Winter season has brought much excitement in the radar world as forecasters are now able to better determine different wintertime precipitation types remotely. Using the DP Correlation Coefficient (CC) field, the meteorologist can determine how uniform the targets are across the area. If a uniform precipitation type is falling (such as all snow), the CC values will be near 1, while a mix of types (e.g., sleet and freezing rain along with snow) will yield lower CC values, indicative of non-uniformity. On January 27, 2013, a nasty mix of freezing rain, sleet and snow moved into the area from the south. Fairly high radar reflectivity was observed in Wisconsin, affecting both the I-90 and I-94 corridors (Fig. 2a).

The CC product at the same time (Fig. 2b) clearly showed a transition from yellows to reds in the vicinity of I-94. This transition is the precipitation type dividing line between all snow to the northeast (reds) and a mix of freezing rain, sleet, and snow southwest of I-94. NWS forecasters saw that the high reflectivity band along I-94 was moving northeast as all snow, and notified central Wisconsin law enforcement that 2-3 inches of snow in one hour was possible from this band. This type of confidence, detail, and service was enabled by the DP radar.

On January 18, 2013, a weather system moved through the region causing light snow along the Mississippi River (Fig. 3a). However, further west, steady freezing drizzle was occurring under "light" reflectivity echoes in Rochester, Minnesota (indicated by the white asterisk in Figs 3a and 3b). In the CC product (Fig. 3b), freezing drizzle appears as "hot pink" with CC values of 1. Comparing this freezing drizzle area to the CC values in the snow area further east (reds), meteorologists are able to address and inform customers on the weather hazards presented with each type of precipitation.

It is clear that these additional DP products bring improvements over the legacy radar. When DP products are compared to legacy reflectivity data, much more information can be obtained about where hazardous weather is occurring in real-time. Even so, we will still rely heavily on the our media, spotters, and law enforcement for ground truth information!

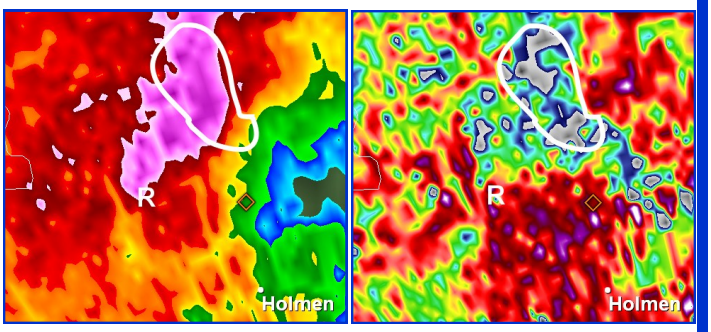


Fig 1. (a) Radar reflectivity (left) and (b) differential reflectivity (right). "R" = rain.

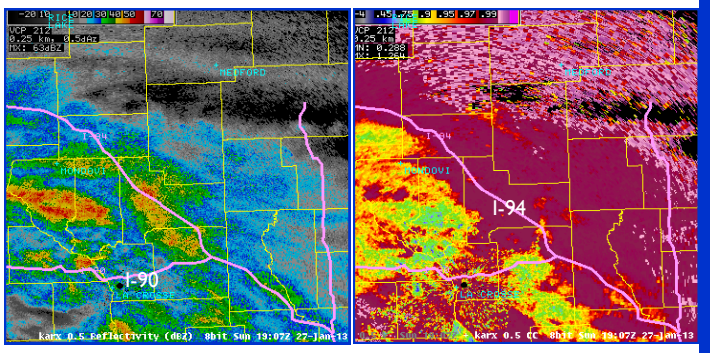


Fig 2. (a) Radar reflectivity (left) and (b) correlation coefficient (right). I-94 and I-90 are shown in pink, and labeled in white.

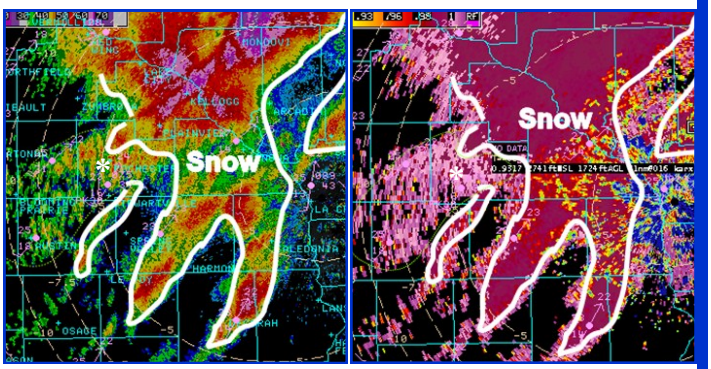


Fig 3. (a) Radar reflectivity (left) and (b) correlation coefficient (right). White asterisk (*) denotes location of Rochester, MN.

Low Flows: A Different Type of Hydrologic Event (continued)

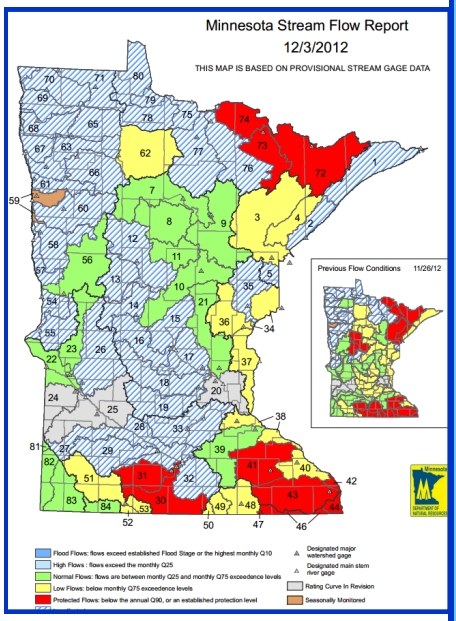
some areas, as low water led to navigation problems, with damage to boats and motors as they ran into submerged objects. Some cities and industries that rely on water for cooling or other processes were limited in the amount of water available for use. And low river levels caused concern among some municipalities that rely on the river for their water supply.

"it is the lack of water that has, of late, caused the most problems."

Commercial navigation by the barge industry has not been impacted too much yet in our immediate area on the Mississippi River (from Dam 3 through Dam 10). However, farther downstream, water levels dropped so low that barge traffic had to be temporarily discontinued. From St. Louis through Cairo, IL, December water levels had fallen so low that if the river had fallen another half-foot, *all* boat traffic would have been halted. Rocks and sandbars were exposed, and water depth simply was not sufficient for traffic to pass safely in some areas.

The NWS has been preparing probabilistic forecasts for low water levels for several years now and, with the current low water situation, these forecasts have garnered considerable attention during the past few months. We have been working closely with the U.S. Army Corps of Engineers and other local authorities to provide the best information possible regarding how much rain will be falling upstream, as well as how much the river will rise or fall. Our hydrologic partners have used these forecasts to determine the most cost-effective ways to ensure safe, ongoing navigation on the river system through they dredging operations and other water management decisions.

While this low-water issue has not yet impacted navigation significantly in our local area, it is certainly possible if the drought worsens. Either way, your National Weather Service will stay on top of the situation, and will be sure to provide informational support to those who need it.



River flows in Minnesota as of December 2012. Red areas denote flows in the bottom 10% of the historical record.

Awards, Recognition and Personnel Changes

2012 marked another year where NWS La Crosse staff members provided significant service to the broad agency mission through special program activities. A number of local office staff members received recognition for these agency-level contributions this past year. These contributions are listed below.

Lead Forecaster Andy Just.

Over a number of years, Andy developed a methodology whereby NWS forecasters could use a gridded forecast database to forecast precipitation type (e.g., snow, sleet, freezing rain, etc.) during winter events. This process greatly simplified the precipitation type forecast process and ensured the forecast precipitation elements were consistent with other forecast elements, such as temperature. Andy was recognized for adding functionality to that process during the past year. This methodology has gradually been implemented at many NWS offices over the past two years, and has a clear impact which improves wintertime forecasts.

Information Technology Officer Matt Davis.

Matt has developed some essential operational tools which allow rapid data access and parsing and enable NWS forecasters to provide useful or critical data to the public in a quick and efficient manner. These tools are a part of an overarching data management program for which Matt has provided national leadership over the past few years.

"Andy, Matt and Jeff were among nine of the local staff members who were awarded local NWS Isaac Cline Awards."

Forecaster Jeff Boyne.

Jeff has been a clear national leader for a number of years in the NWS drought program. In fact, Jeff designed the format of the drought information web pages that all NWS offices follow (see, for example, *http://weather.gov/lacrosse/?n=drought*). During the drought that increased over the local area this past summer, Jeff coordinated regularly with area agricultural experts, reviewed data, provided Decision Support, and ensured timely status information was available as the event unfolded.

Andy, Matt, and Jeff were among nine of the local staff members who were awarded local NWS Isaac Cline Awards for their performance and leadership in a variety of areas. The others included Lead Forecasters Tim Halbach and Todd Rieck, Hydro Met Techs Tom Stangeland and Brad Adams, Electronic Technician Nate Nelson, and Administrative Support Assistant Jamie Gibbons.

We have had but one staffing change during this past year. Brad Adams, who has supported our operations and our Cooperative Observer Program for the past 10 years, was recently selected for a similar position in Sioux Falls, SD. We wish Brad well in his new responsibilities.

National Weather Service
La Crosse, WI

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http://weather.gov/lacrosse

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Our Mission

NWS Mission Statement

"Provide weather, hydrologic and climate forecasts and warnings… for the *protection of life and property* and enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by others in the global community."

NWS La Crosse Mission Statement

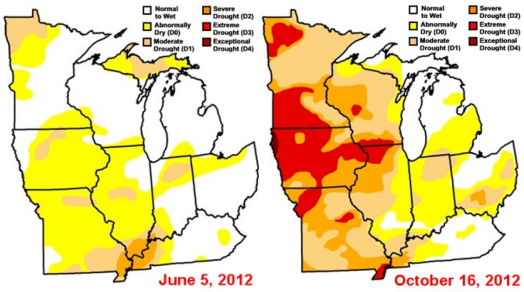
"Dedicated to continuous improvement in the provision of high quality weather-related warning, forecast and educational information for the safety and overall benefit of the citizens we serve."

The Drought of 2012

Summer 2012 provided considerable interest in the weather, with extensive hot and dry conditions across the U.S. Great Plains states, extending into the WFO La Crosse service area. While the drought became fully developed during 2012, it actually started to materialize during the late summer and autumn of 2011. From August through November 2011, precipitation ranged from 2 to 9 inches below normal across the area. Rochester, MN had their 4th driest August through November period, receiving only 35% of their normal seasonal precipitation (8.02 inches below normal). Overall, this resulted in a moderate to severe drought developing across southern Minnesota, and northwest and north-central Iowa.

"the drought of 2012 ranks as the 15th worst drought in the La Crosse service area… nationally, this drought ranks 8th"

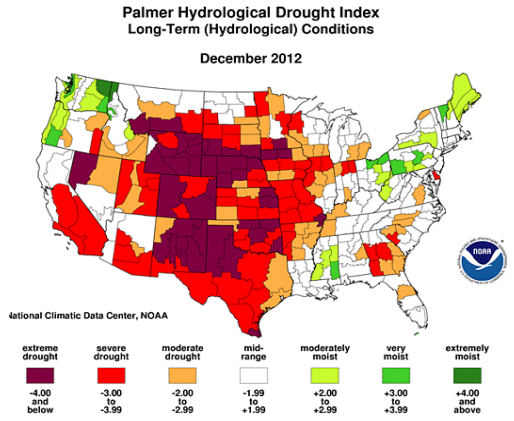
During the winter and spring of 2012, precipitation was near to slightly-above normal. This caused little change in the drought situation. However, during June and July of 2012, the drought expanded and intensified rapidly over the Plains states and eastward into the Great Lakes states, due to a combination of above-normal temperatures and below-normal precipitation.



Drought conditions expanded and intensified from early June 2012 (left) to mid-October 2012 (right). Yellow shading indicates abnormally dry areas; red shading designates areas of extreme drought.

Locally, this drought developed rapidly in June and July. Temperatures during this time period averaged 4 to 5 degrees above normal and precipitation deficits ranged from 3 to 8 inches across northeast Iowa and southern Wisconsin. From July to October, 3- to 9-inch precipitation deficits expanded into northern Wisconsin as well, causing drought to spread northward through mid-October.

The drought of 2012 ranks as the 15th worst drought in the La Crosse service area using the Palmer Drought Severity Index. It was the most severe since the summer of 1989 drought, which is the worst local drought on record. Other local droughts rounding out the top five include: 1934, 1977, 1964, and 1911.

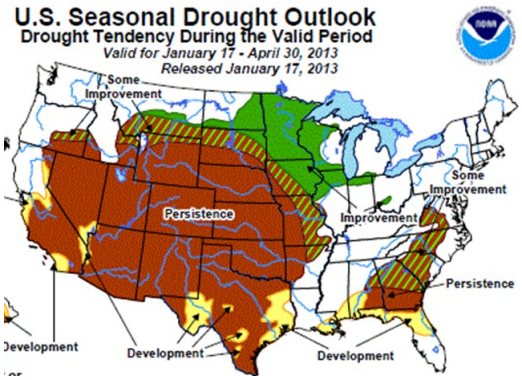


The Palmer Drought Index, as of December 2012. Moderate drought conditions remain in the La Crosse hydrologic area.

Nationally, this drought ranks 8th in terms of severity. The last time the U.S. had a drought this severe was in 1956 (6th worst all time). Three of the most severe U.S. droughts occurred during the 1930s (1931, 1934 and 1936).

What does the current drought situation mean regarding this coming agricultural season? Certainly, a continuation of dry conditions during the spring and summer could re-intensify the drought conditions across the area. As a potentially positive sign, the Climate Prediction Center is forecasting near- to above-normal precipitation in our area for the March through May time period. This is consistent with the long range climate models, which have been suggesting above normal precipitation in our area during that period. As a result, the U.S. Seasonal Drought Outlook (below, issued on January 17, 2013) calls for improvement in the drought conditions for the La Crosse hydrologic service area. While this is good news, spring and summer precipitation can be localized, so some areas may not receive rainfall which meets their agricultural needs.

The NWS La Crosse office will be monitoring these conditions as the season unfolds, and will provide weekly updates on the latest drought status during the growing season.



U.S. Drought Outlook, as of January 17, 2013.