

THE GOVERNOR'S REPORT

On the Potential for Drought and Flooding In Montana May 2015

The Honorable Governor Steve Bullock

Prepared by

**The Montana
Governor's Drought and Water Supply Advisory Committee**

www.Climate.mt.gov

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Executive Summary

The *Governor's Report on the Potential for Drought and Flooding in Montana 2015* provides projections of what can be expected from May through July for surface water supplies in terms of reservoir storage, streamflow, soil moisture, agricultural production, and climatic conditions. Valley elevation precipitation, temperatures, the El Nino update, soil moisture, and drought potential, as well as other information the Weather Service presented to the Committee May 21, 2015 can be found under 2015 Meeting Dates: <http://drought.mt.gov/Committee/Meetings.aspx>

Drought Potential

At this time, the potential for impacts from drought to surface water uses dependent on spring snowmelt runoff from mountain snowpack (high elevation precipitation) through July is **moderate** to **high east and west** of the Continental Divide. The potential for impacts from drought to dryland farming and livestock production is **moderate** to **high east and west** of the Continental Divide through July.

Flood Potential

The potential for flooding in coming weeks at this time is **low to moderate** on both sides of the Continental Divide of the state. See: <http://waterwatch.usgs.gov/?m=flood&r=mt&w=real.map>
<http://water.weather.gov/ahps2/hydrograph.php?wfo=tx&gage=MLRM8>

Mountain Snowpack and temperatures

Several periods of unusually high daily temperatures over the course of March accelerated melting of low- and mid-elevation mountain snowpack. According to the Natural Resources Conservation Service (NRCS) *April 1st 2015 Montana Water Supply Basin Outlook Report*, "47 measurement locations in the state set new record low snow water equivalent values for April 1st, many of these locations are low-elevation sites. Low to mid elevations have experienced significant melt during the month, while higher elevations have continued to hold on to the abundant snow they received earlier in the year. Basin declines have caused streamflow prospects to drop this spring and summer during the April-July time period."

Precipitation

According to the NRCS May 1, 2015 *Montana Water Supply Basin Outlook Report*, "The coming months will be critical for the west-side basins as snowpack is extremely below average in some locations. The months of April, May and June are historically favored for precipitation east of the Divide, but the basins did not receive normal precipitation this month. East of the Divide basins received 75 percent of their normal monthly precipitation during the month, but some of the northern basins (St. Mary-Milk, Sun-Teton-Marias) more closely resembled the west-side receiving well below average precipitation. The southwest corner of the state in the Beaverhead, Ruby and Madison River basins experienced another month of well below normal precipitation. Up-to-date Precipitation totals from the National Weather Service can be found here: <http://www.wrh.noaa.gov/tx/dx.php?wfo=tx&type=&loc=products&fx=PCPNTOTALS>

Antecedent Conditions

Water Year 2014, (October 1, 2013 to September 30, 2014) was an above average water year ending with high soil moisture, reservoir storage, streamflow, and precipitation. August 2014 recorded the highest monthly August precipitation statewide for Montana since record keeping started in 1895. According to the National Climate Data Center (NCDC) Water Year 2013–2014 statewide precipitation for Montana was ranked 24th of 119 years, “*Montana had its wettest August on record with 3.62 inches of precipitation, 2.31 inches above average. This bested the previous record set in 1968 by 0.64 inch.*”

NOAA Significant Events for August and summer 2014:

<http://www1.ncdc.noaa.gov/pub/data/cmb/images/us/2014/aug/monthlysigeventmap-082014.gif>

The presentations before the Committee on October 16, 2014:

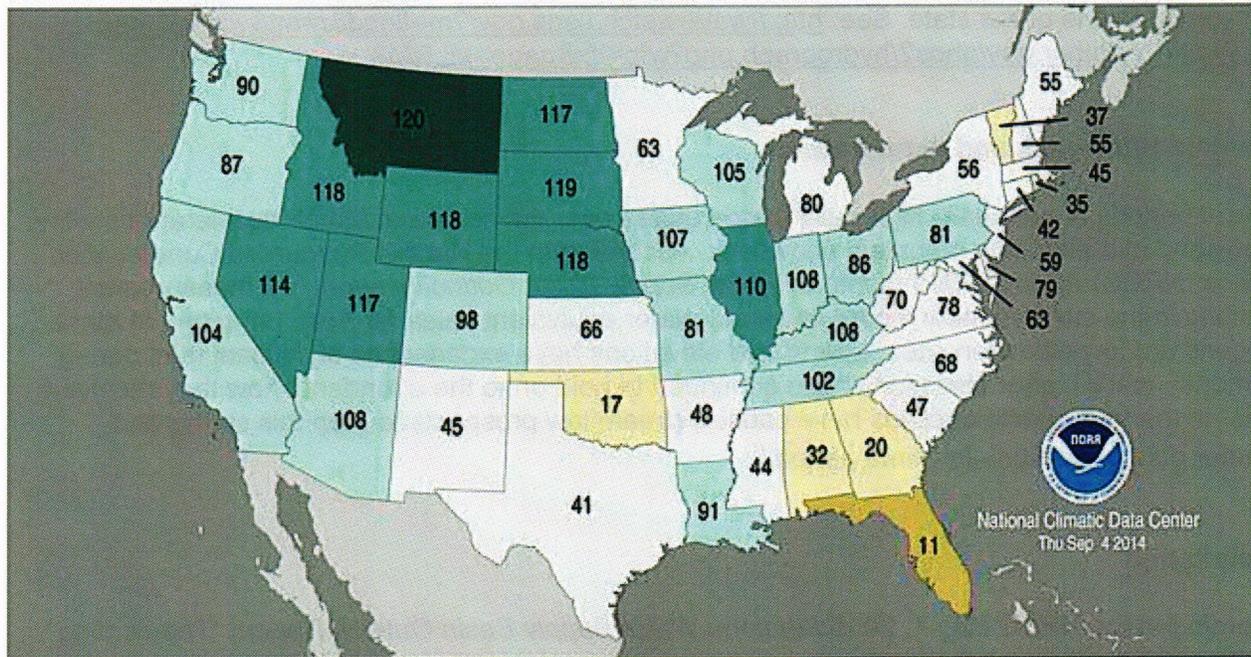
<http://drought.mt.gov/Committee/Meetings/2014.aspx>

In Montana, nearly half the average annual precipitation of many locations fell in just a few days in August: <http://www.ncdc.noaa.gov/sotc/national/2014/8>

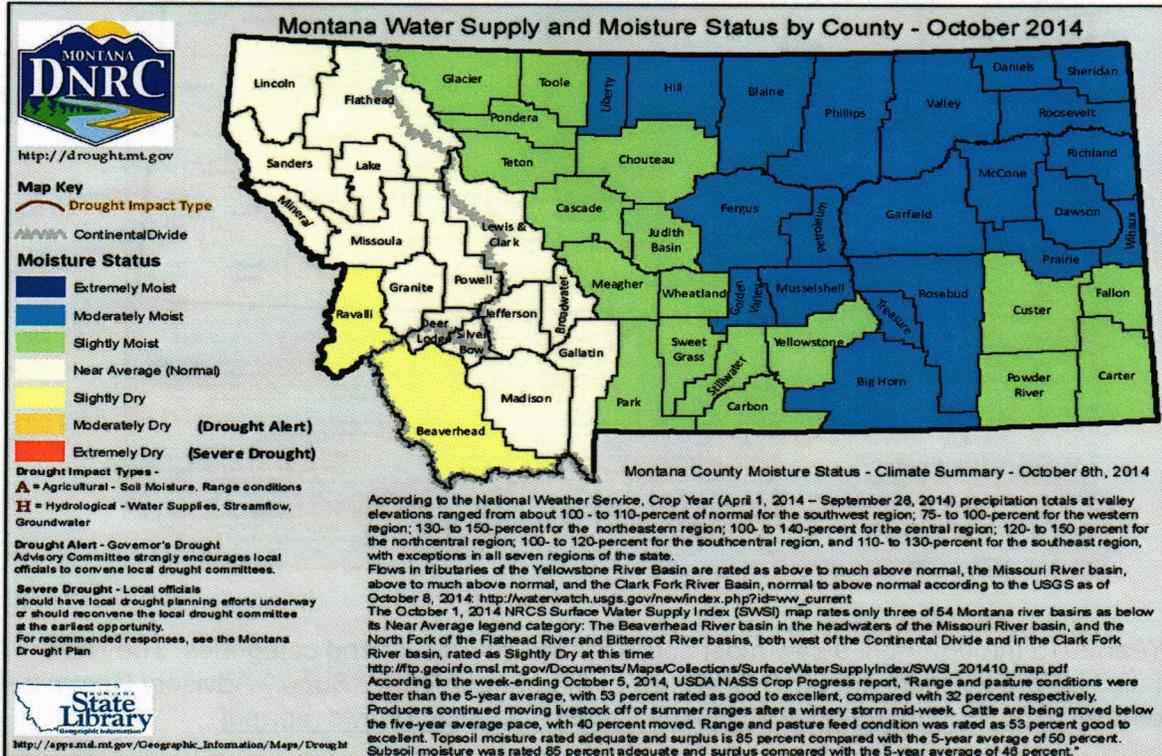
Statewide Precipitation Ranks

August 2014

Period: 1895–2014



Water Year 2014 concluded with only two counties below the *Near Average* category on the October 8th, 2014 Montana Water Supply and Moisture Status by County map. Such carryover conditions from Water Year 2014 could serve to buffer forecasted water supply shortfalls during late spring and early summer 2015 including groundwater, streamflow, and reservoir storage.



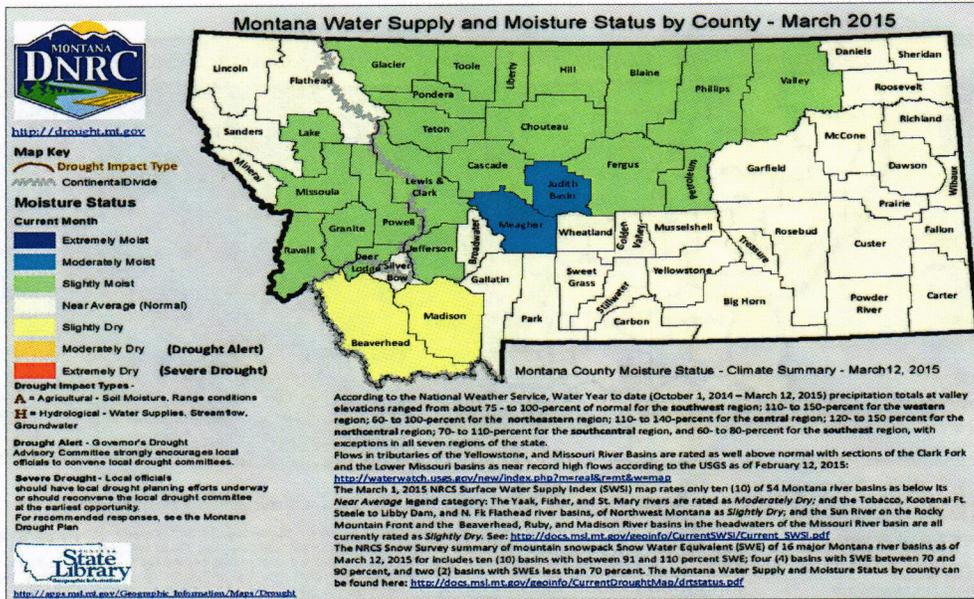
Water Year 2014 Power Point presentations before the Governor's Drought and Water Supply Advisory Committee: <http://drought.mt.gov/Committee/Meetings/2014.aspx>

WATER SUPPLY AND MOISTURE CONDITIONS

Montana Water Supply and Moisture Status by County

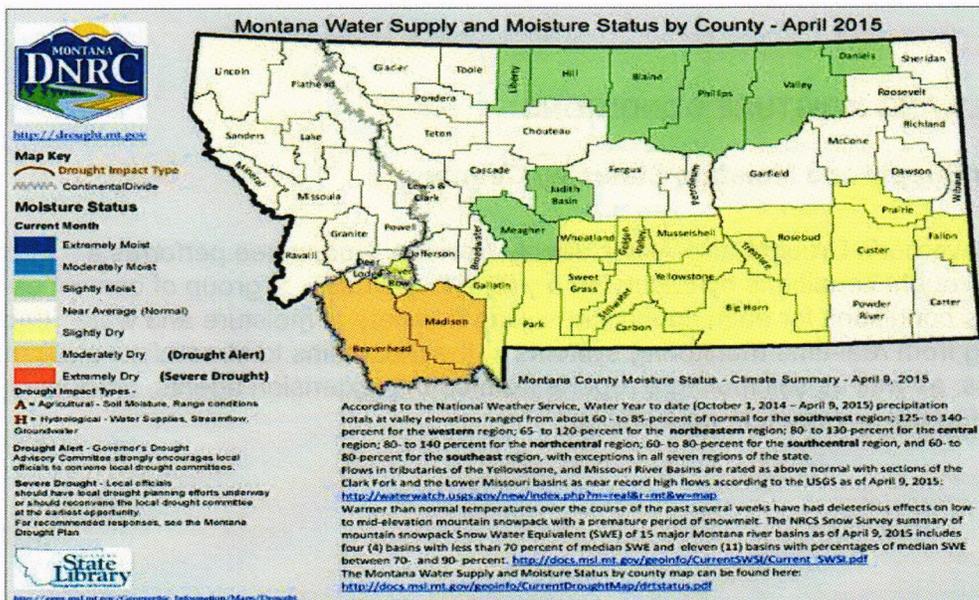
The Montana Governor's Drought and Water Supply Advisory Committee performs a monthly assessment of drought conditions by county on a year-around basis. A group of committee scientists assess conditions for each county consulting a variety of moisture and water supply data products ranging from real-time monitoring systems in the mountains to streamflow and reservoir gauging systems, as well as soil moisture reports from county extension agents, producers, and other state and federal government field offices.

By March 12, 2015 only two counties, Judith Basin and Meagher, remained in the Moderately Moist status, down from 21 counties on the 8th of October 2014. For the most part, the state was rated as *Near Average* with the exception of Beaverhead and Madison counties in the Missouri Headwaters.

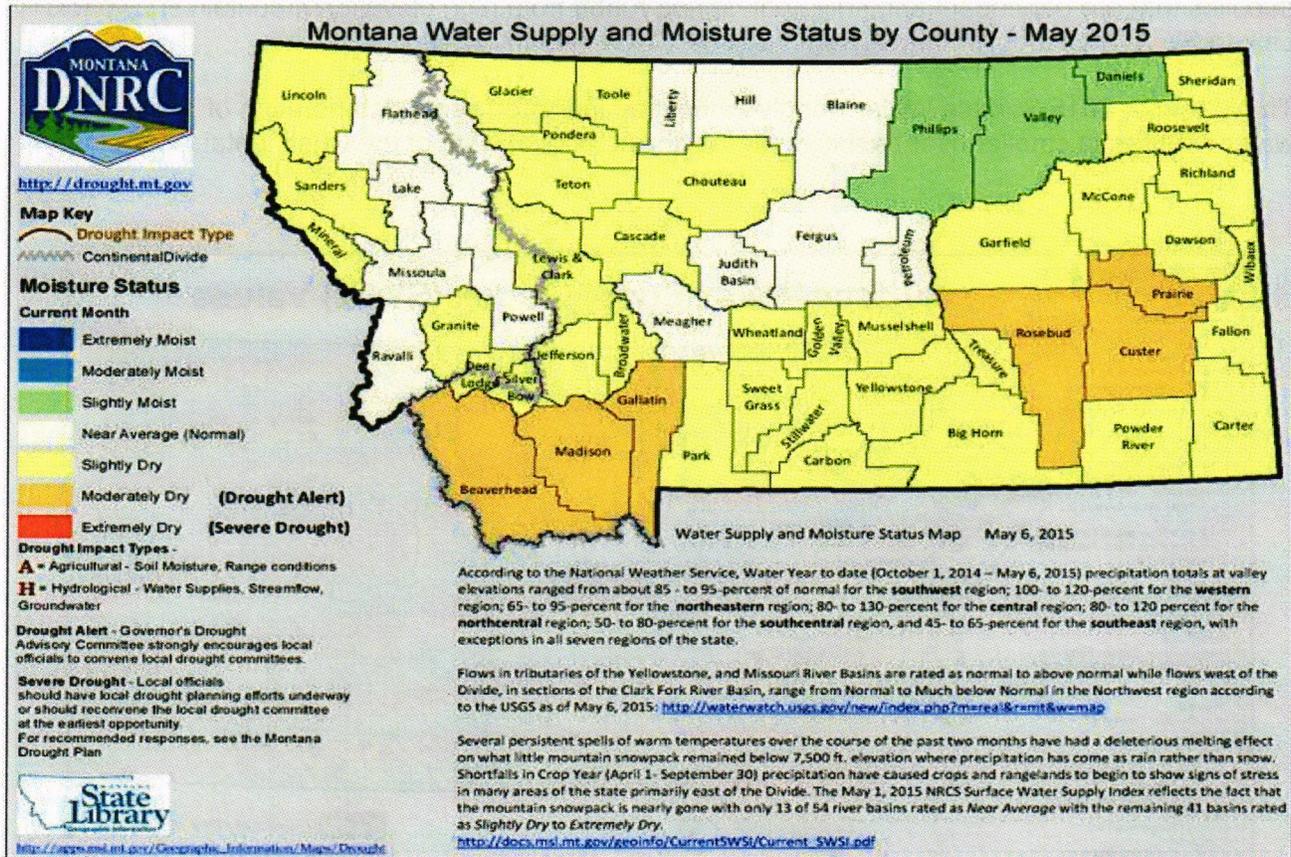


Water Year 2015 through April 9 saw most counties fall two map legend categories. The NWS presentation before the April 16, 2015 Governor’s Drought and Water Supply Advisory Committee is linked here: http://drought.mt.gov/Committee/Presentations/2015/nws_apr.pdf

By April 9th much of Southwest and South-Central Montana were below average for moisture.



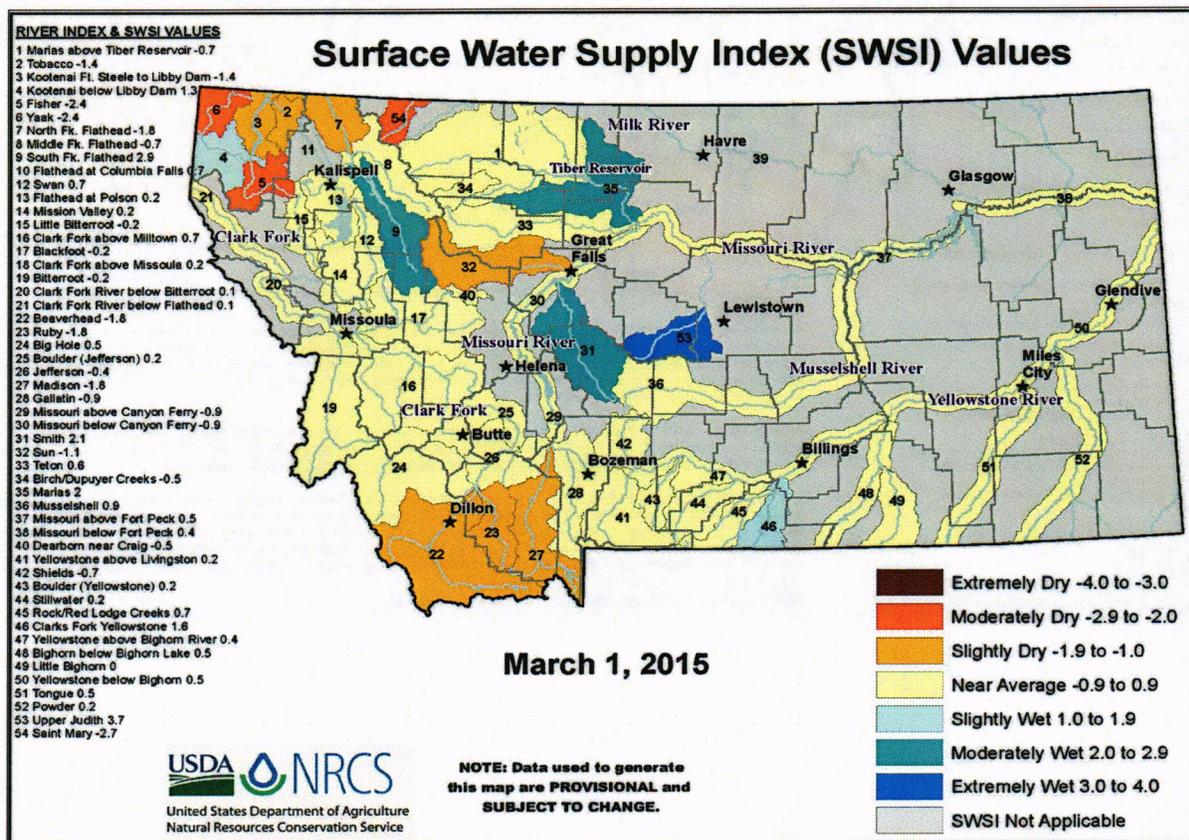
By May 6th moisture conditions had declined further in the east-central region, the southeastern region, the Rocky Mountain Front counties, the headwaters of the Missouri, and along the Montana border with Idaho's Panhandle.



Surface Water Supply Index (SWSI)

The NRCS generates the Surface Water Supply Index as a projection of surface water availability for 54 Montana river basins based on mountain snowpack, mountain precipitation, streamflow, soil moisture, and reservoir storage. The SWSI is best applied to valley areas with surface water supplies that are dependent primarily upon spring runoff from high elevation mountain snowpack. Link to SWSI map archive: <http://nris.mt.gov/NRCS/swsi/Monthly.asp>

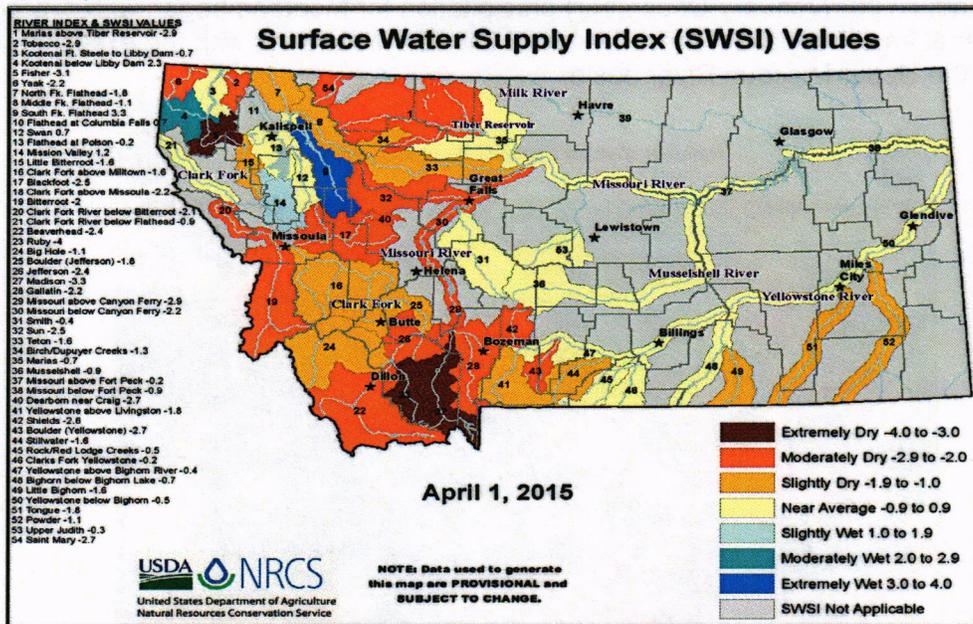
The March 1, 2015 Surface Water Supply Index map indicated some deterioration of projected water supplies in smaller river basins of the Northwest region west of the Continental Divide.



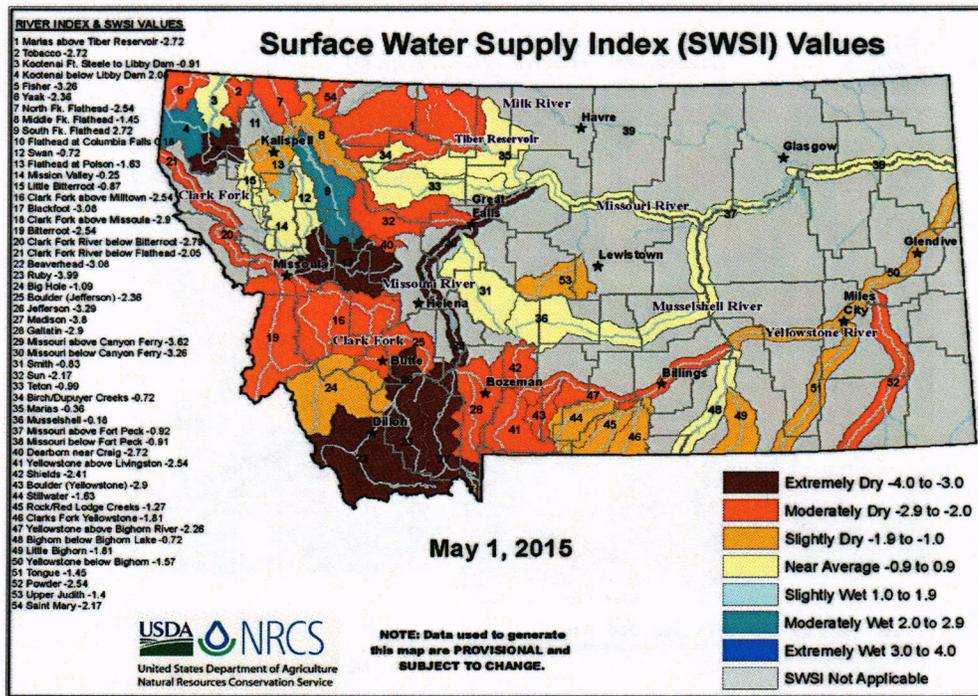
See: http://docs.msl.mt.gov/geoinfo/CurrentSWSI/Current_SWSI.pdf

The April 1st 2015 NRCS Water Supply Outlook Report noted that, “Well above average temperatures during the month of March, and well below normal snowfall has caused all basins to decline below normal for April 1st, 2015. Low to mid-elevations experienced significant melt during the month, while higher elevations have continued to hold on to the abundant snow received earlier in the year. Basin declines have caused streamflow prospects to drop for this spring and summer during the April through July time period.”

The April 1, 2015 SWSI map reflected the warm periods of March that melted mountain snowpack below 6,000 ft. elevation.



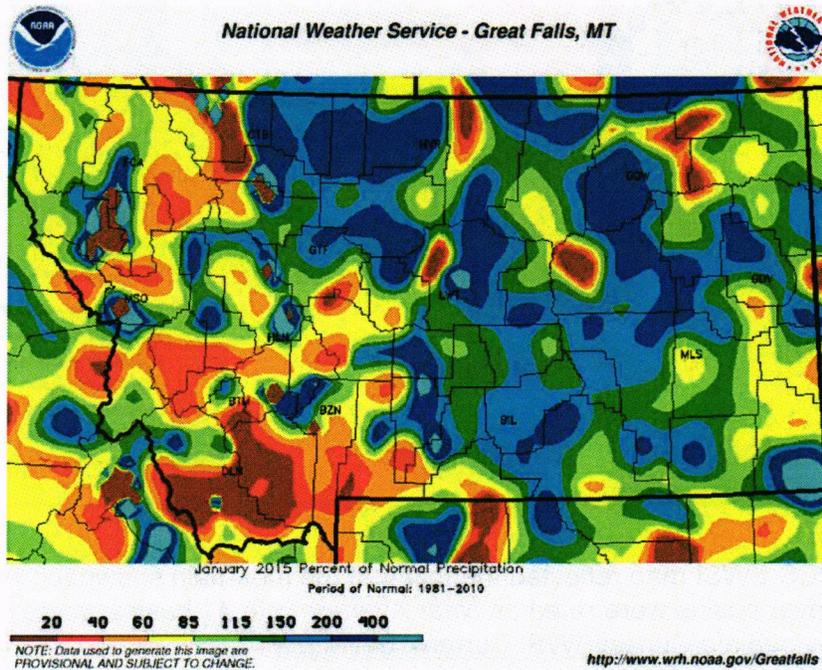
The May 1, 2015 NRCS SWSI map reflected the fact that the mountain snowpack was nearly gone. Only 13 of 54 river basins were rated as *Near Average* with 41 basins worse. See: http://docs.msl.mt.gov/geoinfo/CurrentSWSI/Current_SWSI.pdf



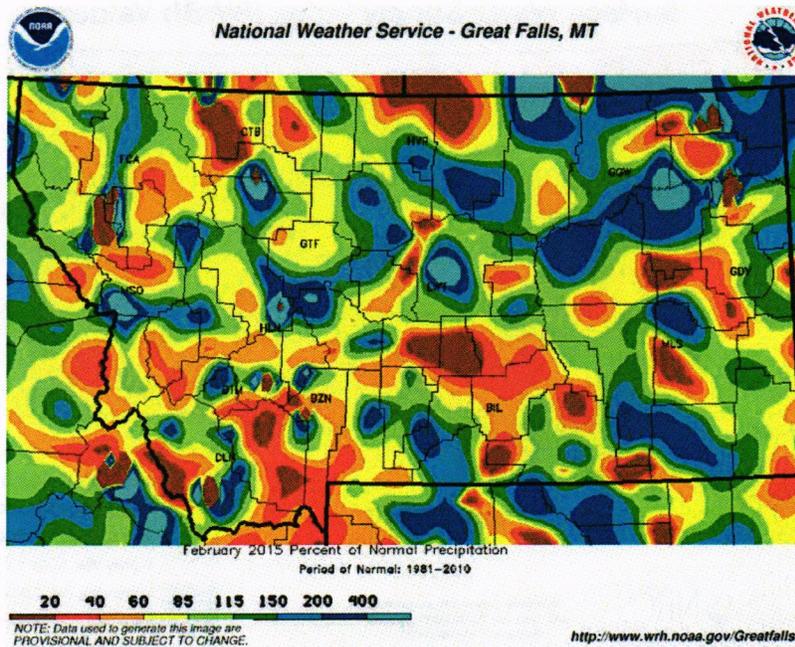
Precipitation

(Courtesy of the National Weather Service, Great Falls, Montana Office)

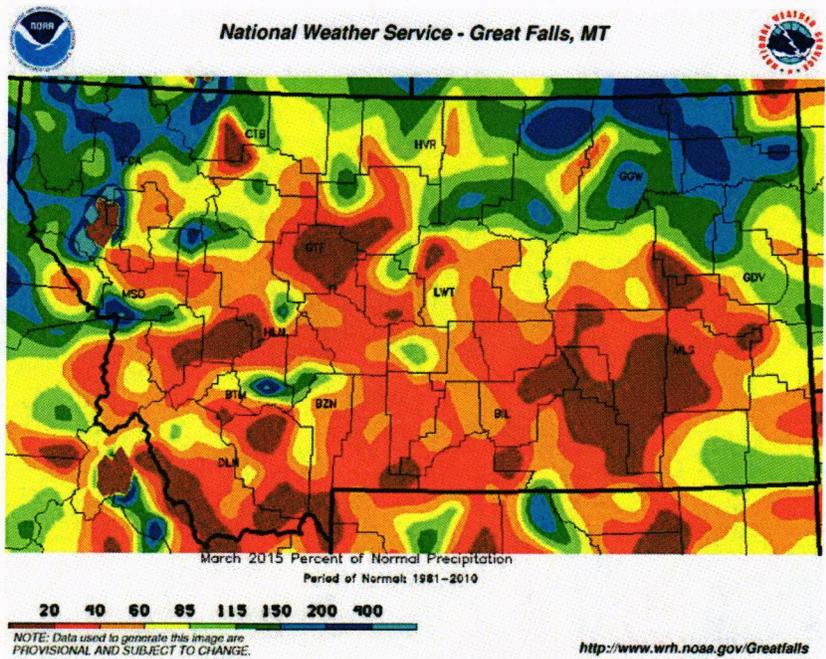
The 2015 Calendar Year (January-December) precipitation for Montana began with average to well above normal amounts east of the Continental Divide for January, with the exception of the headwaters of the Upper Missouri River basin.



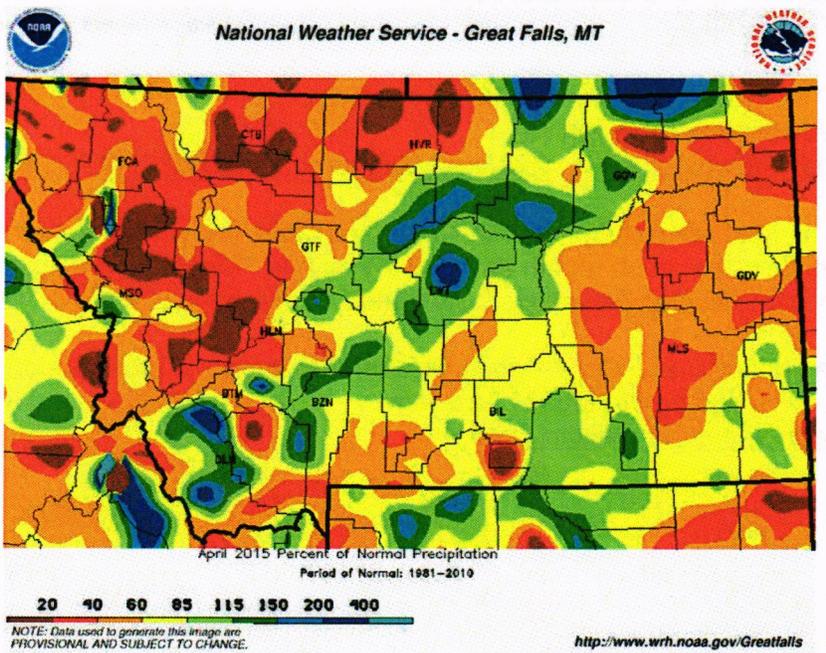
February precipitation was above average in the central and north-central regions.



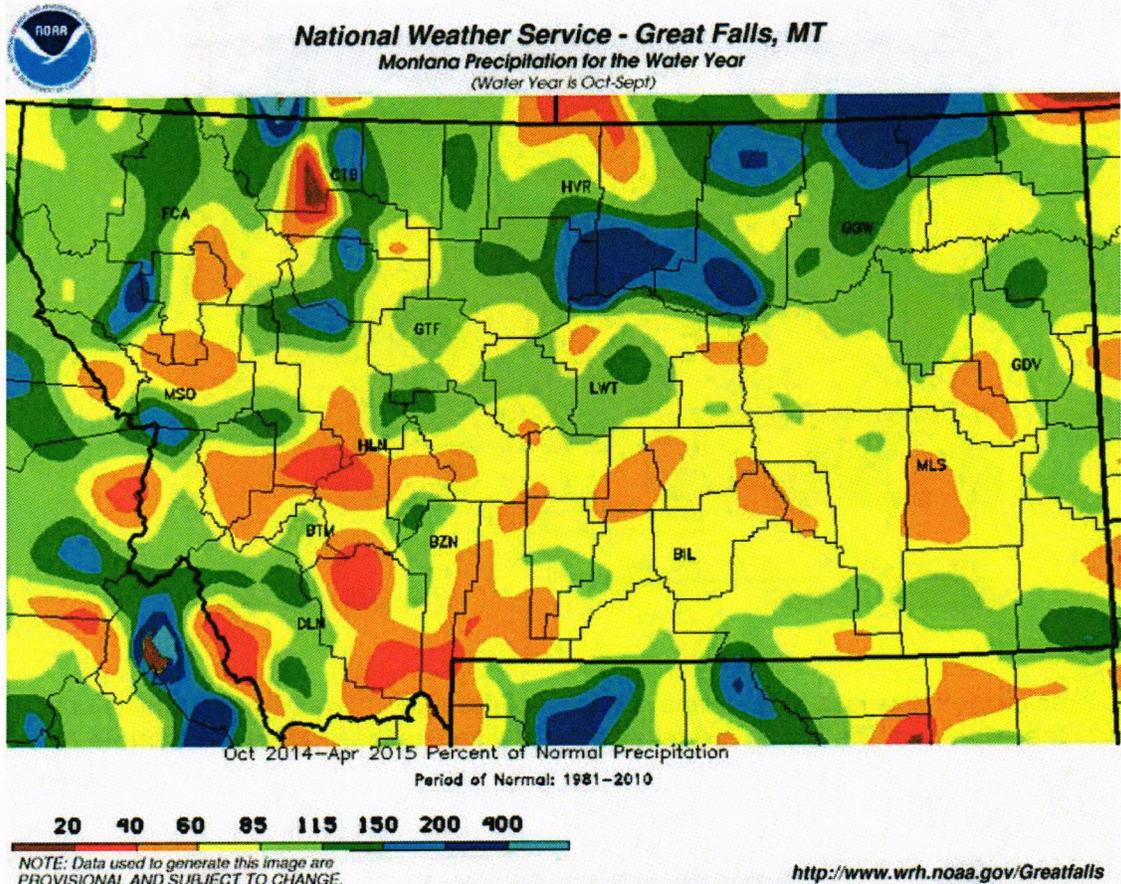
March 2015 precipitation deviated markedly from the Montana Climate Atlas: "In March a notable percentage increase in precipitation takes place east of the Continental Divide in southern and southwestern locations." (Caprio & Nielsen, 1992)



April 2015 precipitation was less than normal for most of the state. "The high mountains of the south and in the north near the Divide still receive more than 6 inches." Montana Climate Atlas (Caprio)



Water Year precipitation to date, October 1, 2014 through April 30, 2015, benefitted the northern regions on both sides of the Continental Divide with a few exceptions, while the southern one-half of the state was below to well below average.



Current statewide precipitation totals (NWS):

<http://www.wrh.noaa.gov/tfx/dx.php?wfo=tfx&type=&loc=products&fx=PCPNTOTALS>

With the state's two highest precipitation months, May and June, just ahead we can expect about 2.5 inches of precipitation from each month at valley elevations. "Mountain precipitation continues to provide moist conditions at high elevations." Montana Climate Atlas (Caprio & Nielsen 1992)

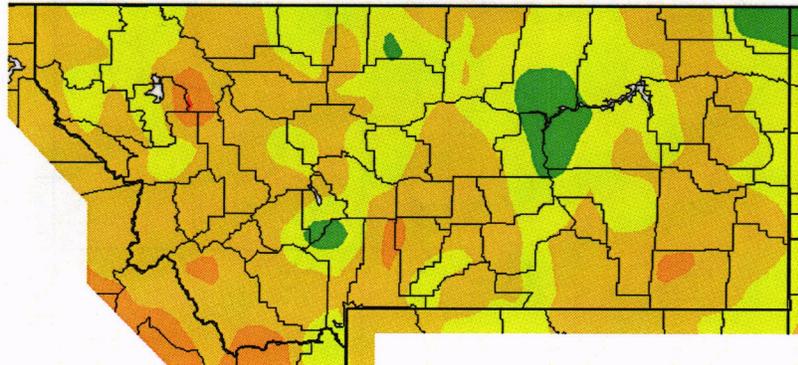
NOAA's Western Regional Climate Center generates temperature and precipitation maps daily showing departures from, and percentages of average.

http://www.wrcc.dri.edu/anom/mon_anom.html

Temperature (Courtesy of NOAA's Western Regional Climate Center)

Water Year 2015 to date has seen below to near average temperatures statewide.

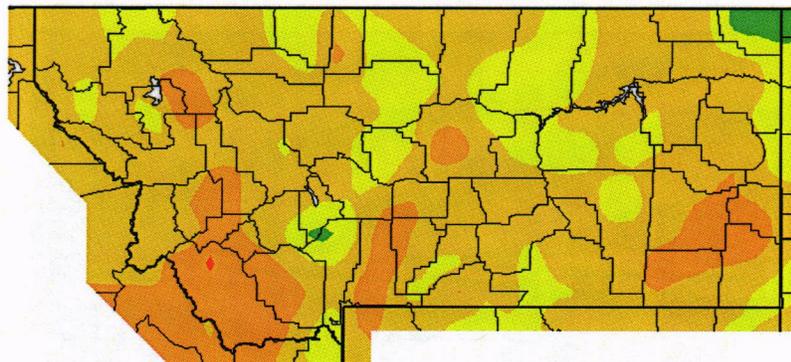
Av. Max. Temperature dep from Ave (deg F)
10/1/2014 – 5/18/2015



Generated 5/19/2015 at WRCC using provisional data.
NOAA Regional Climate Centers

Six-month departure from average temperatures for Montana illustrates the daily high temperatures across the state over the past 6-months.

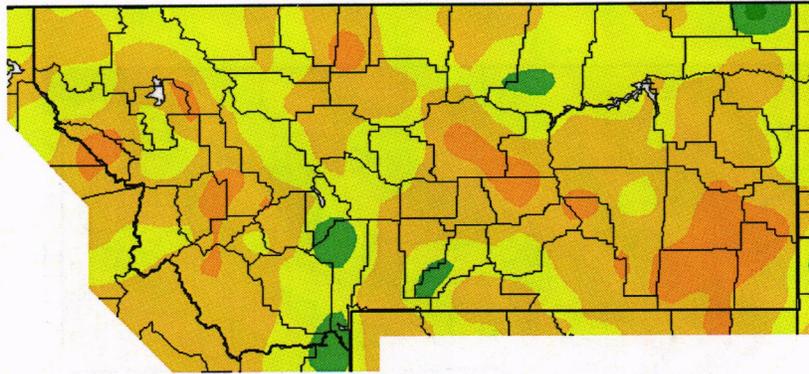
Av. Max. Temperature dep from Ave (deg F)
11/19/2014 – 5/18/2015



Generated 5/19/2015 at WRCC using provisional data.
NOAA Regional Climate Centers

Sixty-day departure from average daily high temperatures for Montana illustrates the continued above average daily temperatures across the eastern two-thirds of the state and its southern tier.

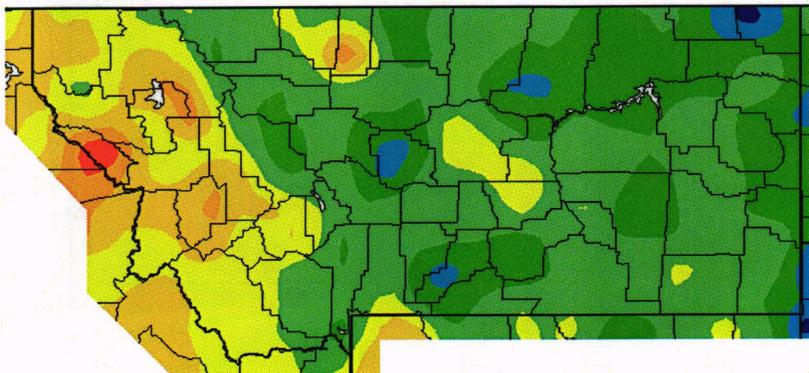
Av. Max. Temperature dep from Ave (deg F)
3/20/2015 - 5/18/2015



Generated 5/19/2015 at WRCC using provisional data.
NOAA Regional Climate Centers

Thirty-day high temperature departure from average reveals some of the moderation seen over the course of the past one-month in the eastern one-half of Montana. Cooler, yet windy conditions helped prevent what could have been a higher loss of soil moisture had the previous warming trend continued unabated.

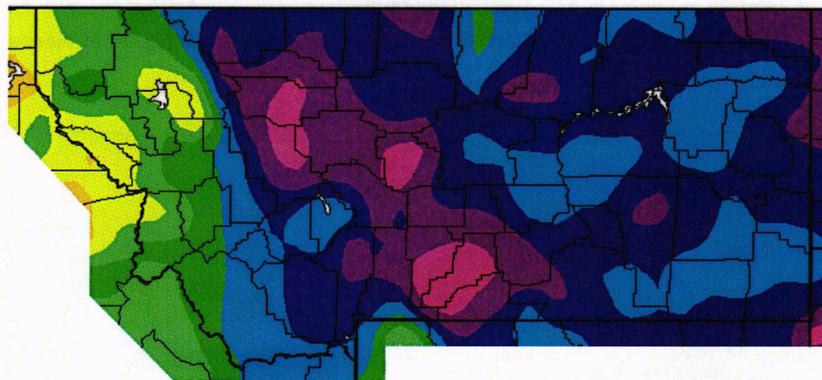
Av. Max. Temperature dep from Ave (deg F)
4/19/2015 - 5/18/2015



Generated 5/19/2015 at WRCC using provisional data.
NOAA Regional Climate Centers

Two week temperatures departure from average illustrate the significant shift from recent anomalously warm temperatures to below and well below average temperatures east of the Continental Divide. Temperatures west of the Divide reflect a more temperate climate.

Av. Max. Temperature dep from Ave (deg F)
5/5/2015 – 5/18/2015



Generated 5/19/2015 at WRCC using provisional data.
NOAA Regional Climate Centers

Mountain Precipitation

According to the NRCS, nearly 80 percent of annual streamflow in Montana originates as snowfall that accumulates high in the mountains during fall, winter, and spring. Aquifers, lakes, streams, and reservoirs are largely dependent on runoff from mountain snowpack. As the snowpack accumulates, hydrologists are able to forecast the runoff that occurs when it melts, and in turn, the streamflow expected in the months that follow. NRCS data for the current period of record, 1981-2010 indicate that the peak of snow water equivalent (SWE) of the snowpack occurs around April 15 each year. See: <http://www.mt.nrcs.usda.gov/snow/data/>

Snowpack

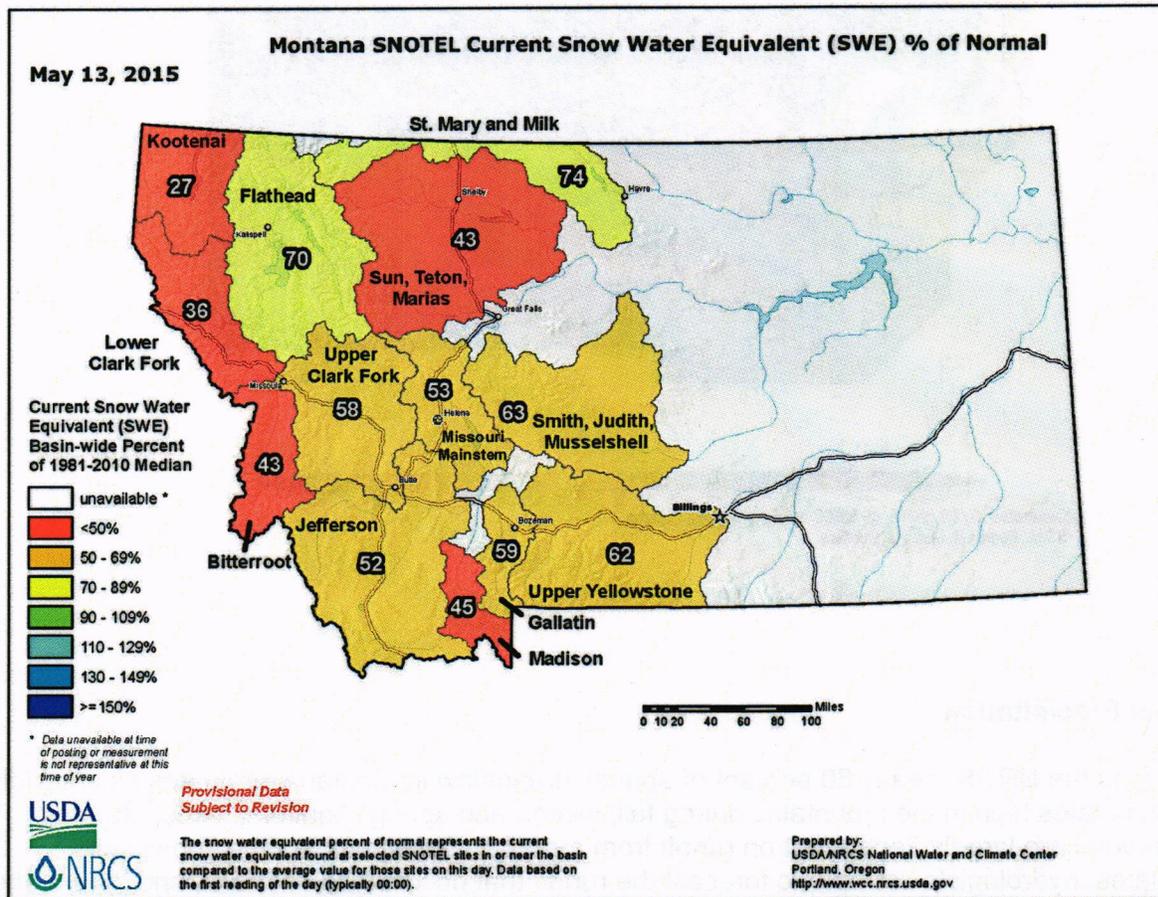
Several periods of unusually high daily temperatures over the course of March accelerated melting of low- and mid-elevation mountain snowpack. According to the Natural Resources Conservation Service (NRCS) *April 1st Montana Water Supply Basin Outlook Report*, “47 NRCS Snow gauges at mountainous locations across the state set new record low snow water equivalent values by April 1st. Low to mid-elevations experienced significant melt during the month, while higher elevations continued to hold on to the abundant snow they received earlier in the year. By May 1st, there were 36 additional sites that had set new record lows for snow water equivalent values for that date. Basin declines have caused streamflow prospects to drop this spring and summer during the April-July time period.”

Snow Survey Products

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/mt/snow/products/>

Daily SNOTEL & Daily Maps

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/snow/products/data/?cid=nrcs144p2_057794



<http://www.wcc.nrcs.usda.gov/reports/SelectUpdateReport.html>

NRCS provides an interactive SNOTEL Update Report:

<http://www.wcc.nrcs.usda.gov/reports/SelectUpdateReport.html>

For the April 16 NRCS Snow Survey and Water Supply Report before the Governor's Drought and Water Supply Advisory Committee See: <http://drought.mt.gov/Committee/Meetings.aspx> Please page down to April 16 meeting – USDA NRCS Snow Survey

The following table summarizes water year mountain precipitation from the NRCS Snotel automated network as of May 13, 2015 for the major river basins of the state. The peak of water content of the snowpack occurs historically around April 15. This Water Year however, snowpack below 6,000 ft. elevation melted in unseasonably warm temperatures during March.

Snow Water Equivalent (SWE) figures indicate the water content of the snowpack at a particular site on that date as a percent of median. Water-year-to-date or "Total Precipitation" figures show what precipitation has occurred as a percentage of average for the period of record (1981-2010) since October 1, 2014 at Snotel sites whether or not it has melted or remains (as snow) at the site.

**Table 1.
Remaining Water Content of Mountain Snowpack in Montana
and Water Year-to-Date Precipitation ⁽¹⁾**

Period of Record 1981-2010

Based on Mountain Data from NRCS SNOTEL Sites
As of Thursday, May 13, 2015

Basin	Water Year Snow Water Equivalents (% of median)	Water Year-to-Date Precipitation (% of average)
Kootenai River	27	95
Flathead River	70	99
Upper Clark Fork River	58	89
Bitterroot River	43	98
Lower Clark Fork River	36	93
Jefferson River	52	81
Madison River	45	74
Gallatin River	59	91
Missouri River Headwaters	49	80
Headwaters Missouri Main Stem	45	90
Smith, Judith, & Musselshell	63	91
Sun, Teton, & Marias Rivers	43	94
Missouri Lower	53	93
St. Mary & Milk Rivers	74	104
Upper Yellowstone	62	88
Big Horn (Wyoming)	54	84
Tongue River (Wyoming)	69	79
Powder (Wyoming)	50	80
Lower Yellowstone	59	83

Reservoir Storage

Reservoir storage statewide currently is very good, in part due to good carryover storage from Water Year 2014. The U.S. Bureau of Reclamation reports that as of May 20, 2015 its projects for the most part contain from 80- to 140-percent of average contents.

20-May-15 2:07 PM

BUREAU OF RECLAMATION
MONTANA AREA OFFICE
RESERVOIR OPERATIONS REPORT
19-May-2015

RESERVOIR NAME	NORMAL FULL POOL	TOTAL CAPACITY	AVERAGE CAPACITY	RESERVOIR CONDITIONS						WATER SUPPLY OUTLOOK							
				ELEVATION (FEET)		CAPACITY (ACRE-FEET)		2015		MTN. SNOW WATER CONTENT (INCHES)			APRIL-JULY RUNOFF FEBRUARY 1st FORECAST				
				2014	2015	2014	2015	% FULL	% OF AVG	% OF Last Yr	2014	2015	AVG	% OF AVG	(KAF)	AVG	% OF AVG
CLARK CANYON	5546.10	174,368	129,200	5531.50	5534.11	106,465	117,269	67	91	110	9.56	4.21	9.09	46	56	78	72
CANYON FERRY	3797.00	1,891,888	1,483,074	3779.20	3788.94	1,336,358	1,629,862	86	110	122	16.22	6.23	11.83	53	1,662	1,699	98
GIBSON	4724.00	98,687	75,633	4664.81	4716.88	35,627	89,387	91	118	251	16.84	4.06	9.42	43	359	409	88
PISHKUN	4370.00	46,694	998,877	4370.31	4369.79	47,168	46,375	99	5	98	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
WILLOW CREEK	4142.00	31,848	27,508	4140.65	4141.38	29,894	30,945	97	112	104	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
LAKE ELWELL	2993.00	925,649	763,089	2984.87	2990.60	789,873	882,596	95	116	112	19.65	4.95	11.08	45	346	373	93
SHERBURNE	4788.00	66,147	25,117	4768.73	4779.80	37,147	52,709	80	210	142	26.70	14.70	20.10	73	89	101	88
FRESNO	2575.00	91,746	66,615	2574.21	2572.75	87,749	80,772	88	121	92	0.00	0.00	0.10	0	77	82	94
NELSON	2221.60	78,951	62,436	2221.22	2221.37	77,317	77,959	99	125	101	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
BIGHORN LAKE	3640.00	1,020,573	764,099	3602.72	3623.86	724,145	858,879	84	112	119	13.90	5.19	9.47	55	1,016	1,082	94

RESERVOIR NAME	INFLOW (cfs)		Change From a Year Ago		FEET TO FILL	RIVER DISCHARGE
	CURRENT	% of AVG	ELEVATION (FEET)	CAPACITY (ACRE-FEET)		
CLARK CANYON	205	99	2.61	10,804	11.99	184
CANYON FERRY	7,690	94	9.74	293,504	8.06	3,154
GIBSON	1,219	39	52.07	53,760	7.12	346
PISHKUN	642	N.A.	-0.52	-793	0.21	611
WILLOW CREEK	7	N.A.	0.73	1,051	0.62	0
LAKE ELWELL	1,224	58	5.73	92,723	2.40	607
SHERBURNE	198	32	11.07	15,562	8.20	331
FRESNO	429	63	-1.46	-6,977	2.25	569
NELSON	251	N.A.	0.15	642	0.23	230
BIGHORN LAKE	4,207	94	21.14	134,734	16.14	2,203

DNRC's State Water Projects April 16, 2015 reservoir contents report before the Governor's Drought and Water Supply Advisory Committee is here:

http://drought.mt.gov/Committee/Presentations/2015/dnrc_apr.pdf

As of May 13, 2015 17 State of Montana owned water storage projects had contents ranging from about 95- to over 200-percent of average with a few exceptions.

Streamflow

Current Conditions for Montana: Streamflow – 221 gaging sites (real-time)

<http://waterdata.usgs.gov/mt/nwis/current/?type=flow>

USGS Water Watch shows real-time streamflow and statistics by waving the mouse over a station.

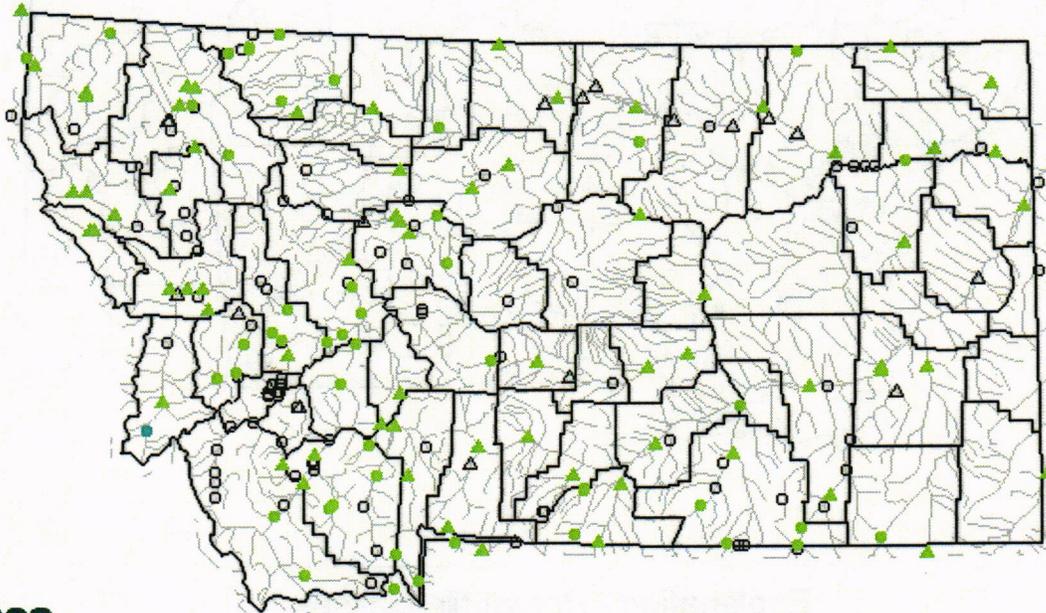
<http://waterwatch.usgs.gov/?m=real&r=mt>

The U.S. Geological Survey Water Watch interactive current streamflow conditions can be accessed here: <http://waterwatch.usgs.gov/new/?m=flood&r=mt&w=real.map>

Flood Potential

National Weather Service - Advanced Hydrologic Prediction System for flooding information:
<http://water.weather.gov/ahps/>

Wednesday, May 20, 2015 13:01ET



Map of Flood and high Flow Condition (Montana)

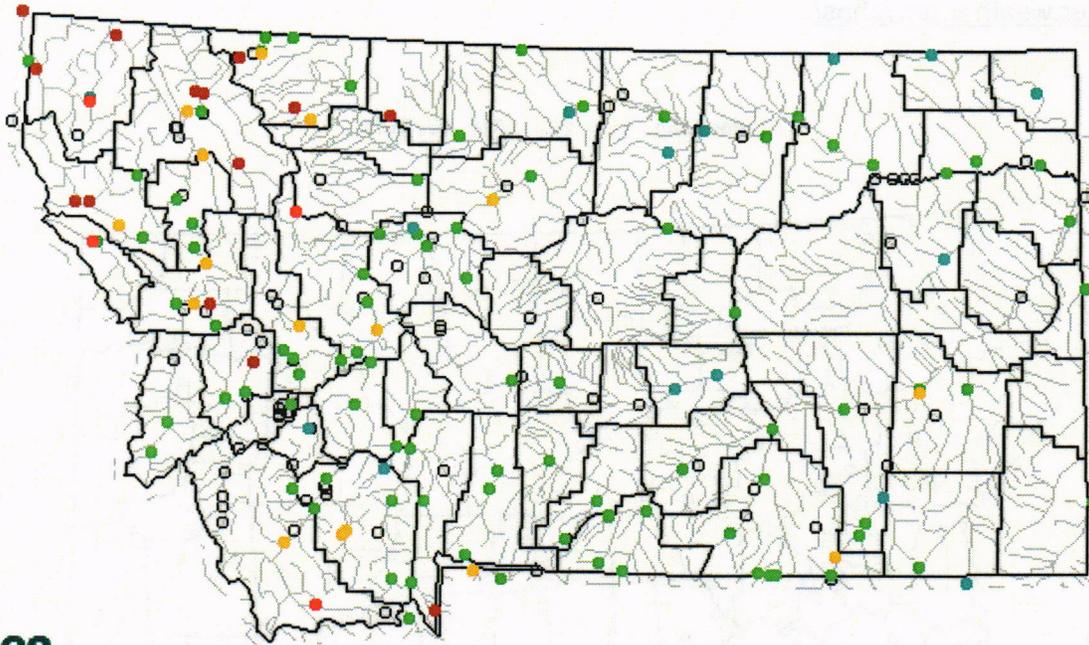
Explanation - Percentile classes				
<95	95-98	>= 99	River above flood stage	Not ranked
Streamgage with flood stage Streamgage without flood stage				

http://waterwatch.usgs.gov/?m=flood&r=mt&w=real_map

Map of real-time streamflow compared to historical streamflow for the day of the year (Montana)

<http://waterwatch.usgs.gov/index.php?m=real&r=mt&w=map>

Hednesday, May 20, 2015 13:00ET



Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Streamflow Forecasts May 21 Committee meeting presentation of USDA Snow Survey:
<http://drought.mt.gov/Committee/Meetings.aspx>

http://www.wcc.nrcs.usda.gov/ftpref/support/water/westwide/forecast_table/wy2015/fcst1504.html#MISSOURI%20HEADWATERS

May 21 Committee meeting presentation of U.S. Geological Survey:
<http://drought.mt.gov/Committee/Meetings.aspx>

The NRCS Peak Streamflow Dates Forecast Table is here:
See: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/snow/?cid=nrcs144p2_057801

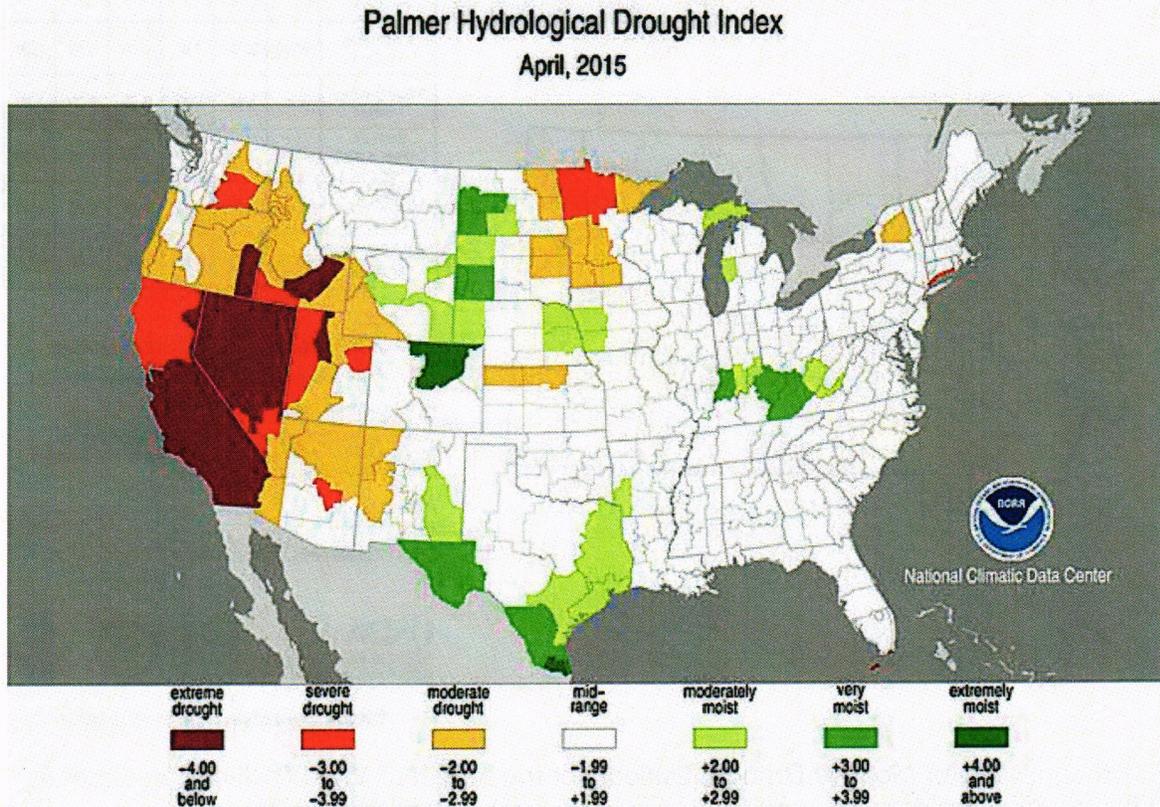
USGS Water Watch: <http://waterwatch.usgs.gov/?m=real&r=mt>

USGS Flood Watch: <http://wy-mt.water.usgs.gov/floodwatch/index.html>

Indices of Drought

Palmer Drought Hydrological Index (PDHI)

The PHDI is an index generated by NOAA and used as an assessment of hydrological conditions:
<http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/phdiimage.html>



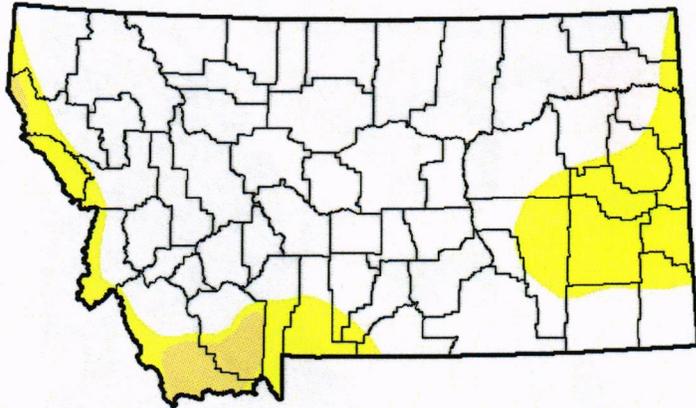
U.S. Drought Monitor

The Drought Monitor map is a widely used cooperative weekly assessment product that describes the degree, type, and extent of conditions across the nation. See: <http://droughtmonitor.unl.edu/>

As of May 12, 2015, the U.S. Drought Monitor Map indicated that the southern one halves of Beaverhead and Madison counties, in the headwaters of the Missouri River basin, were classified as *D-1 Moderate Drought*. This was in large part due to low carryover storage levels in Clark Canyon and Lima reservoirs dating from 2012 and earlier. South Central Montana and the state's southeast corner are also rated as *D-O Abnormally Dry*. West of the Continental Divide, one small area in Sanders County along the Idaho border was rated *Abnormally Dry* or *D-0*. See: <http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx>

U.S. Drought Monitor Montana

May 19, 2015
(Released Thursday, May 21, 2015)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	78.75	21.25	2.97	0.00	0.00	0.00
Last Week 5/12/2015	67.08	32.92	2.90	0.00	0.00	0.00
3 Months Ago 2/17/2015	96.52	3.48	0.00	0.00	0.00	0.00
Start of Calendar Year 12/02/014	98.84	1.16	0.00	0.00	0.00	0.00
Start of Water Year 9/06/2014	91.25	8.75	1.25	0.00	0.00	0.00
One Year Ago 5/20/2014	98.75	1.25	0.00	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brad Rippey
U.S. Department of Agriculture

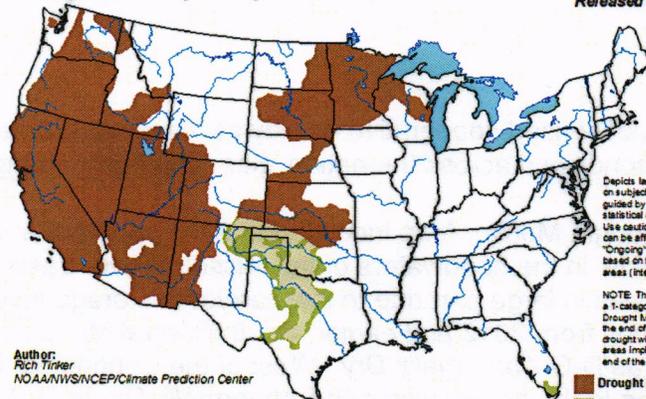


<http://droughtmonitor.unl.edu/>

The U.S. Drought Monitor Monthly Drought Outlook for the month of May 2015 indicates that at this time the potential for drought conditions is unlikely for the state through May.

U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

Valid for May 2015
Released April 30, 2015

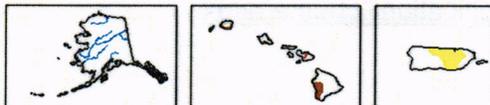


Author:
Rich Tinker
NOAA/NWS/NCEP/Climate Prediction Center

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short-lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensity of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

- Drought persists/intensifies
- Drought remains but improves
- Drought removal likely
- Drought development likely

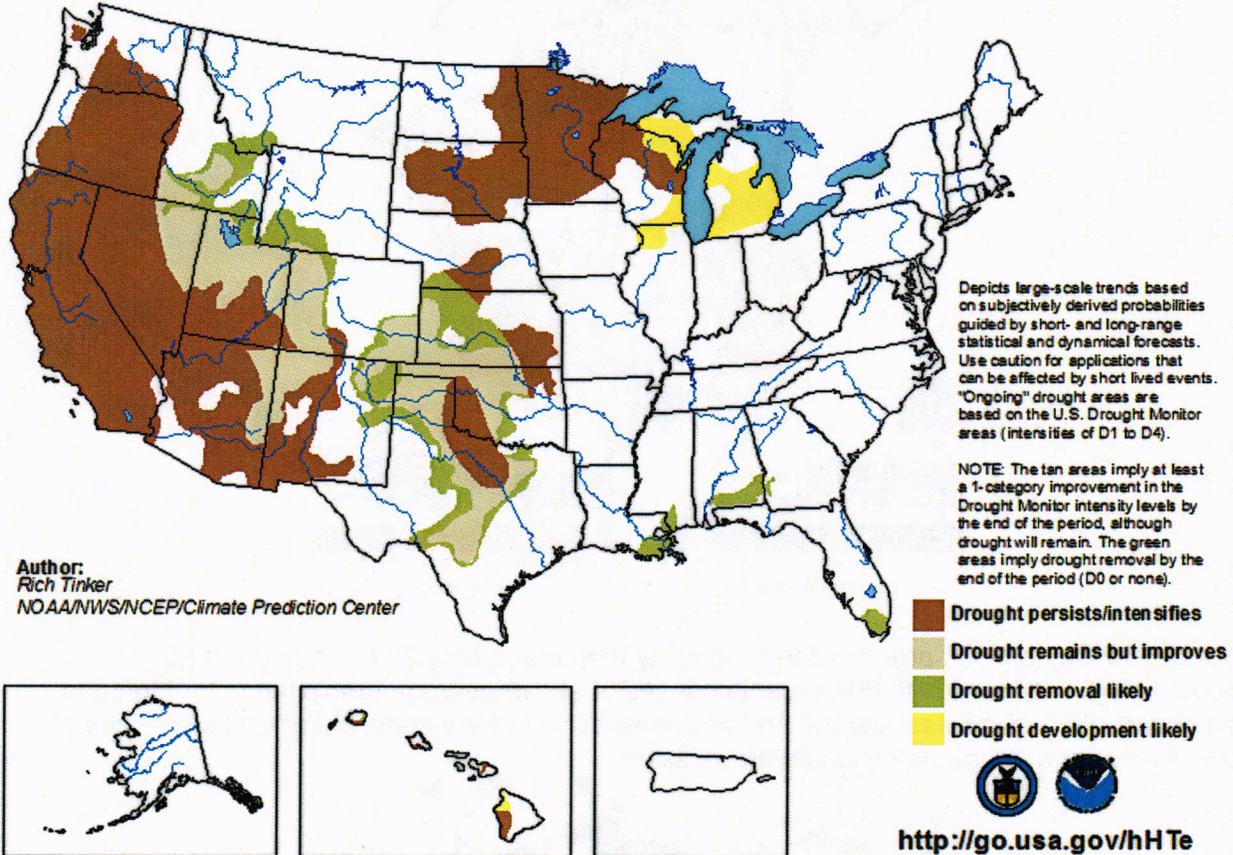


<http://go.usa.gov/h6jh>

The U.S. Seasonal Drought Outlook for the period April 16 through July 31, 2015 calls for the absence of drought statewide with the exception of the southwest corner, east of the Divide, which is designated, "Drought removal likely."

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for April 16 - July 31, 2015
Released April 16, 2015



U.S. Geological Survey

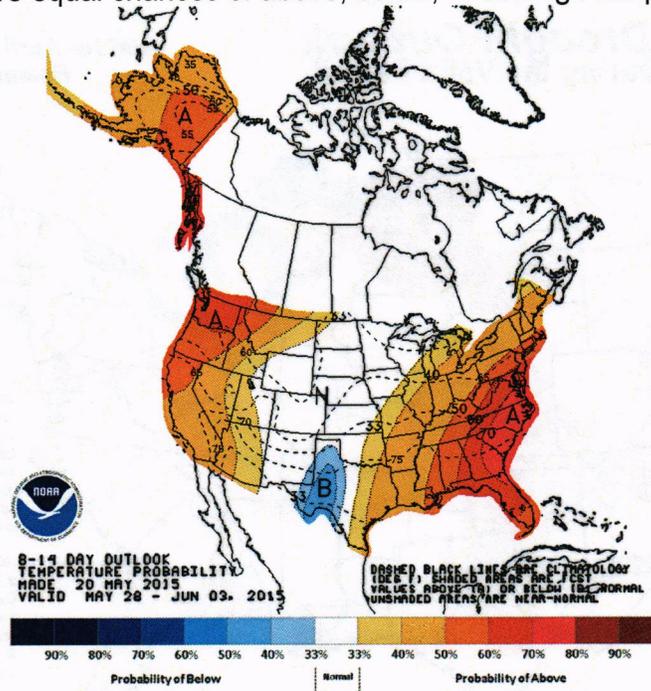
Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. : <http://waterwatch.usgs.gov/index.php?id=wwdrought2>

National Integrated Drought Information System (NIDIS) Map and Data Viewer:
<http://gis.ncdc.noaa.gov/map/drought/US.html#app=cdo>

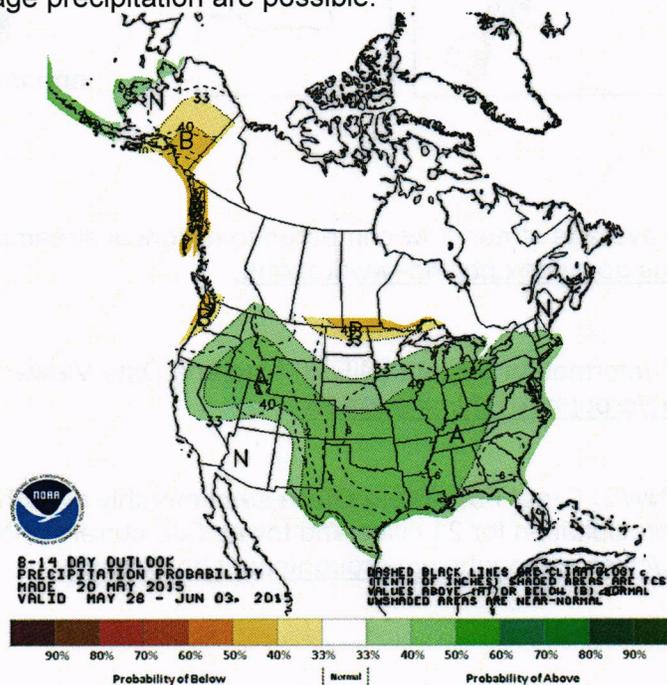
National Weather Service (NWS) Great Falls State Office semi-monthly drought report
 Summarizing weather and precipitation for 21 cities and towns See current and archive:
<http://www.wrh.noaa.gov/tfx/climate/droughtsum/droughtsum.php?wfo=tx>

Climate Forecasts

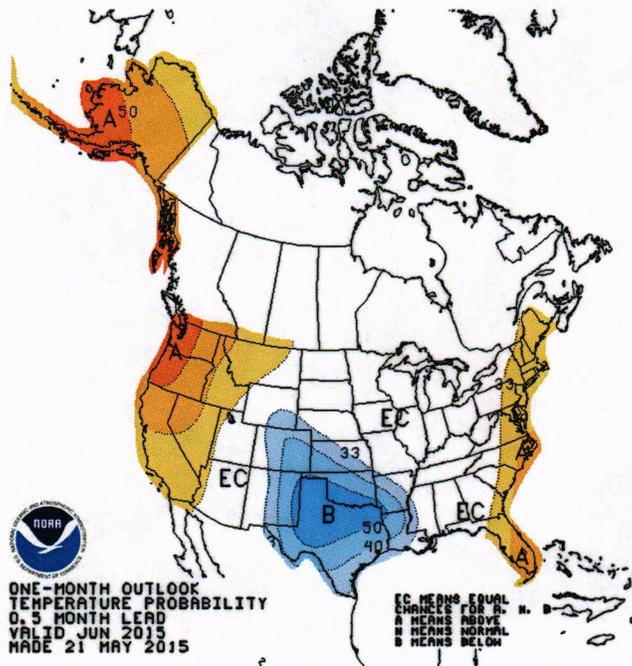
NOAA's 8-14 Day outlook temperature probability made May 20 calls for a 33- to 60-percent warmer than average period for May 28 to June 3 for Montana with the exception of the southeast corner of the state where equal chances of above, below, or average temperatures are possible.



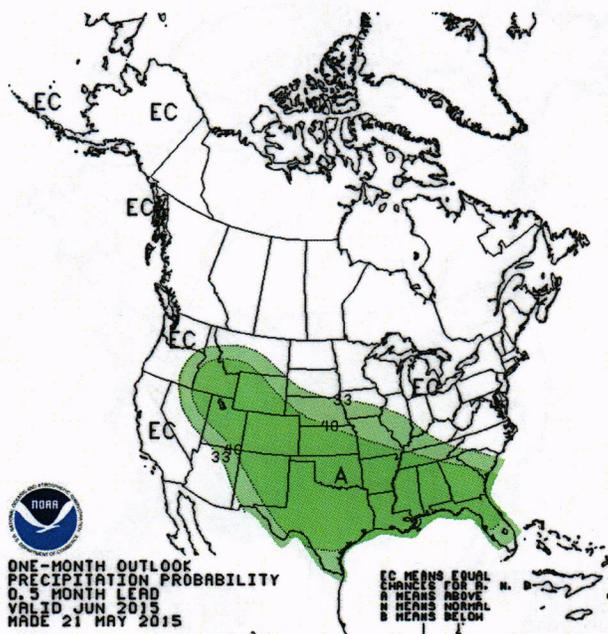
NOAA's 8-14 Day outlook precipitation probability map made May 20 for the period May 28 through June 3 calls for 33- to 60-percent chances of above average precipitation for Montana with the exception of the east-central and northeast corner of the state where equal chances of above, below, or average precipitation are possible.



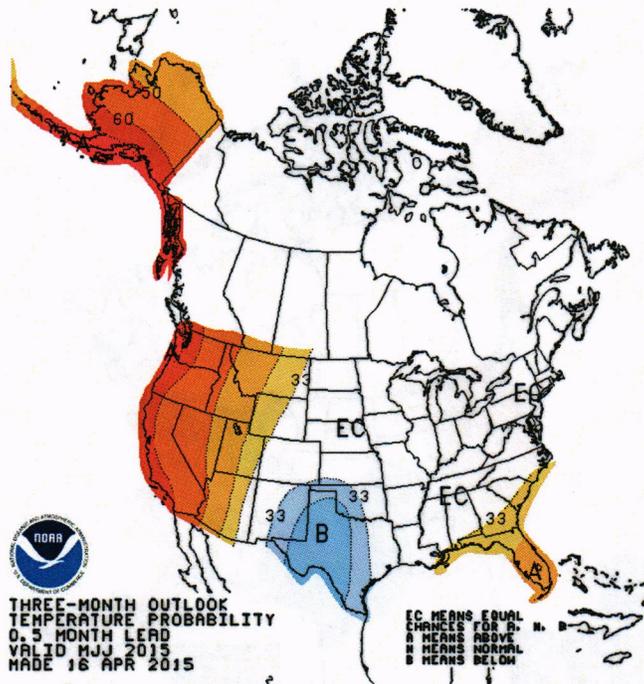
NOAA's one-month outlook temperature probability made May 21 for the month of June 2015 calls for a 50- to 60- percent chance that temperatures will be above average for Western Montana, the Rocky Mountain Front, and near the border with Canada. There are equal chances of above, normal, or below average temperatures for the eastern one-third of Montana.



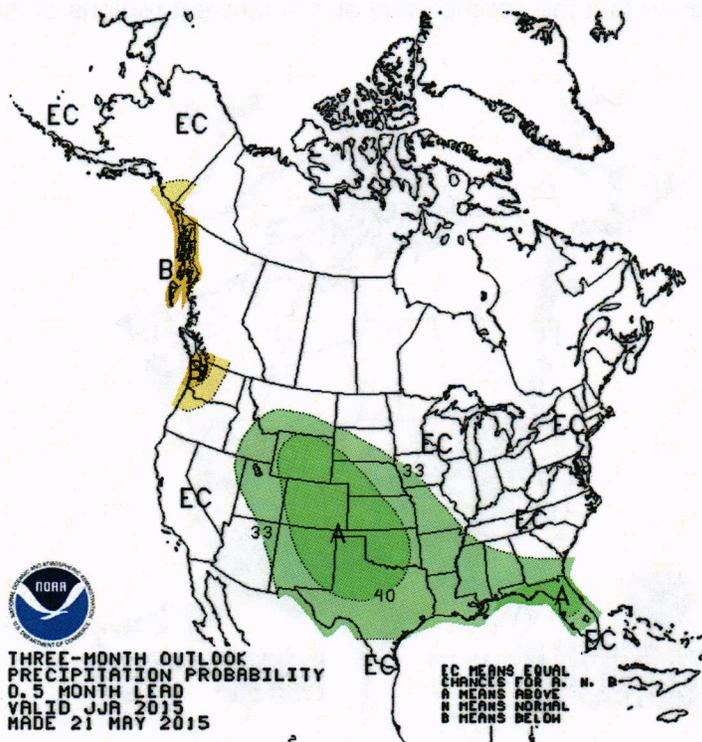
NOAA's one-month outlook precipitation probability made May 21 for the month of June 2015 calls for a 33- to 60 percent chance that the southcentral and southwest regions of the state will see rainfall.



The CPC May 21 Three-month Temperature Outlook for June- July-August calls for a 33- to 40-percent probability of warmer temperatures for most of the state running north to south from the border with Canada to the north borders Wyoming and Idaho



The CPC May 21 Three-month precipitation outlook valid for June, July, and August calls for a 33- to 40-percent probability of wetter than normal conditions for the southern one-half of the state.



Crop Weather and Progress Report (NASS)

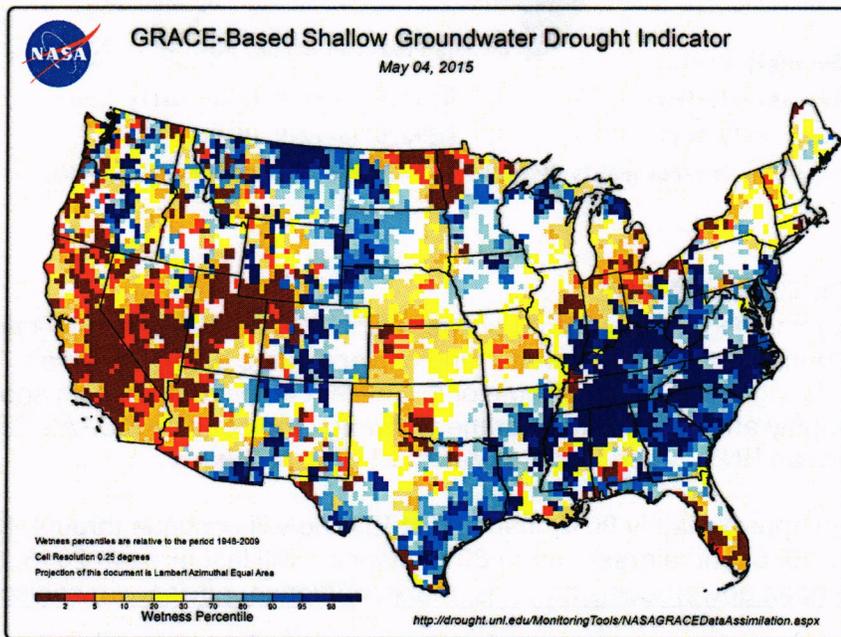
According to the May 10, 2015 USDA Agricultural Statistics Service Montana Crop Progress and Condition Report, Montana had another mostly dry and warm week which allowed for 6.4 days suitable for fieldwork but some areas did receive some substantial precipitation from a mid-week storm. Overall, soil moisture levels declined from last week and reporters across the State are noting that crops and grasses are starting to show signs of stress due to lack of moisture. Winter wheat condition has declined from weather damage and diseases such as powdery mildew and wheat streak mosaic virus. Potato producers began seeding ahead of last year but behind the 5-year average with 12 percent seeded.

Durum wheat is 67 percent planted and 16 percent emerged, barley is 92 percent planted and 66 percent emerged, spring wheat is 86 percent planted and 57 percent emerged and sugar beets are 89 percent planted and 48 percent emerged. Cattle are 38 percent moved to summer ranges and 38 percent receiving supplemental feed, cows calved are 94 percent. Sheep are 50 percent moved to summer ranges and 39 percent receiving supplemental feed.

Soil Moisture

According to the May 10, 2015 USDA Agricultural Statistics Service Montana Crop Progress Report topsoil moisture was rated 53 percent adequate to surplus compared with last year at this time when it was 86 percent. The five-year average is 82 percent. Subsoil moisture was rated 68 percent adequate to surplus compared with 86 percent last year on this date and the five-year average of 77 percent.

Scientists at NASA's Goddard Space Flight Center generate groundwater and soil moisture drought indicators each week. They are based on terrestrial water storage observations derived from GRACE satellite data and integrated with other observations, using a sophisticated numerical model of land surface water and energy processes.

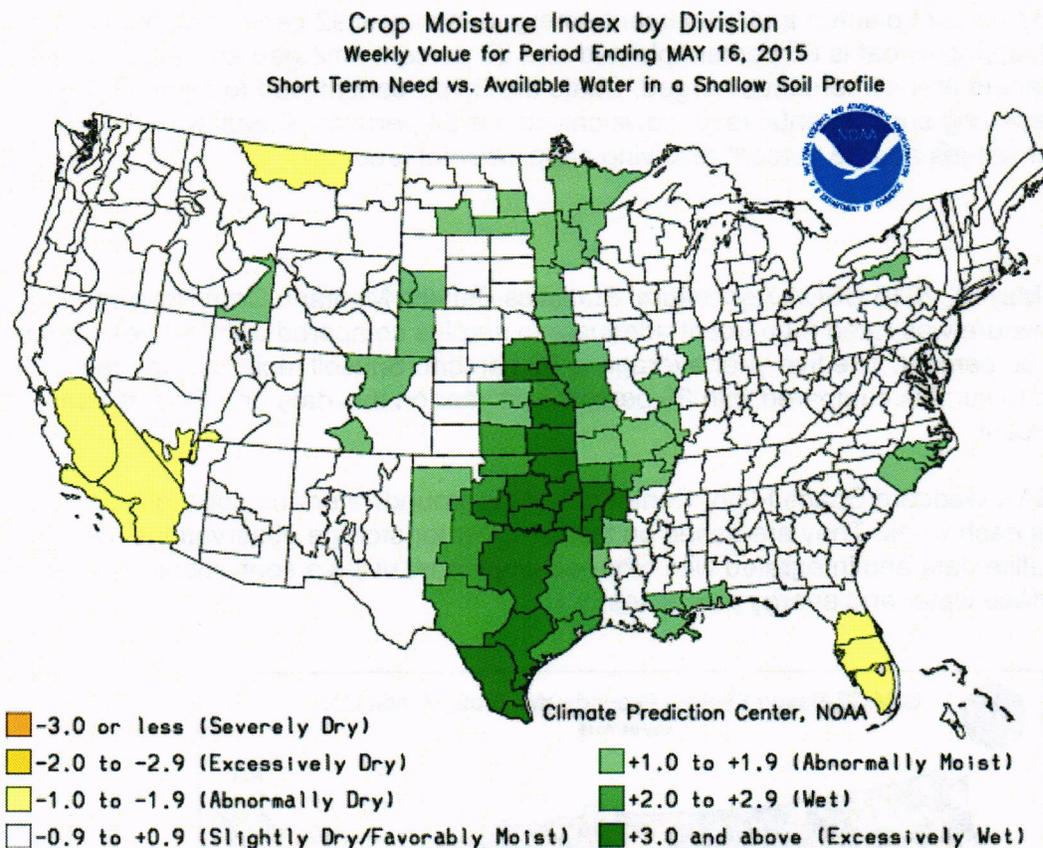


Crop Moisture Index

Derived from the Palmer Index, the [Crop Moisture Index](#) reflects moisture supply in the short-term across major crop-producing regions. It identifies potential agricultural droughts. It is not intended to assess long-term droughts. The Vegetation Drought Response Index: <http://vegdril.unl.edu/>

Soil Moisture Percentiles

<http://www.drought.gov/drought/content/products-current-drought-and-monitoring-drought-indicators/soil-moisture>

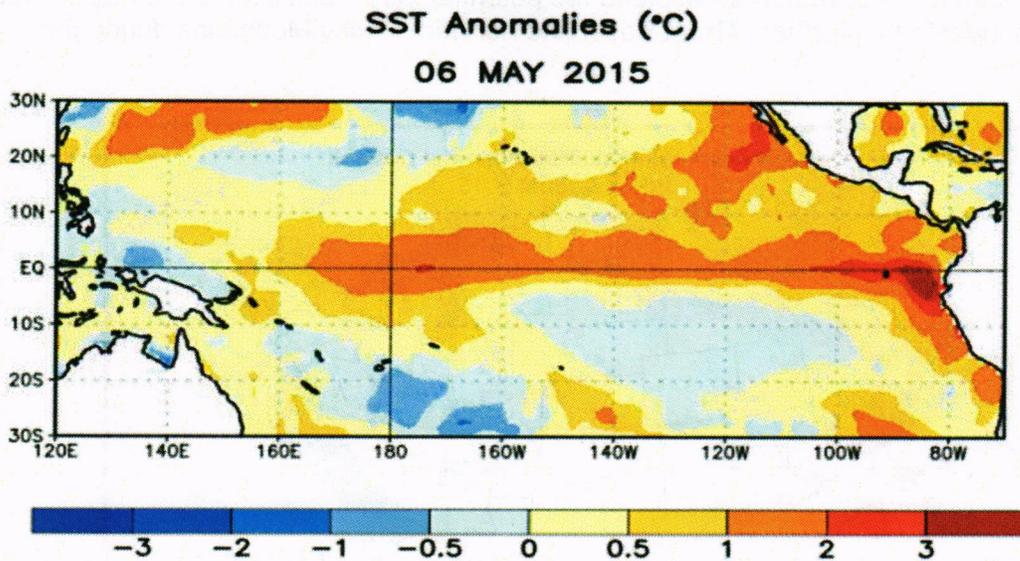


Climatology

El Niño / Southern Oscillation (ENSO)

The positive (El Niño) and negative (La Niña) phases of ENSO affect Montana by bringing drier and warmer winters during El Niño's and wetter and cooler winters during La Niña's. The impacts each phase creates during winter, such as high or low water content of mountain snowpack, have influence on water supply and soil moisture for the following crop season. NOAA's CPC May 14, 2015 forecast calls for an ENSO Alert System Status: **El Niño Advisory**.

Synopsis: There is an approximately 90% chance that El Niño will continue through Northern Hemisphere summer 2015, and a greater than 80% chance it will last through 2015. See: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.pdf



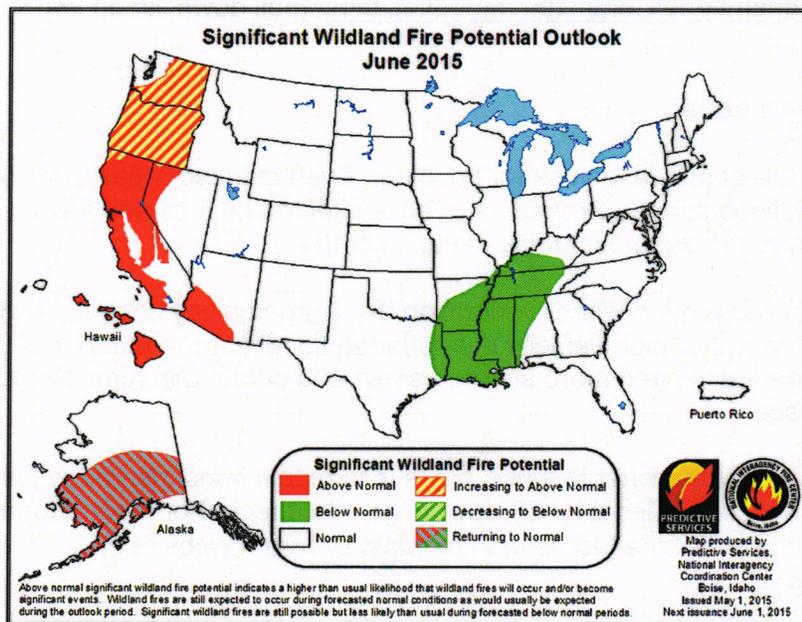
Above: The May 14 Enso update Figure 1. Shows anomalously warm sea surface temperatures (SST's) of the equatorial Niño 3.4 region located between (5°N-5°S, 120°W- 170°W) pooling in part due to weak equatorial low level easterly winds. The pooling in the Niño 3.4 region is a signature of a developing El Niño event.

The ENSO Blog here: <http://www.climate.gov/news-features/blogs/enso/details-april-enso-forecast>

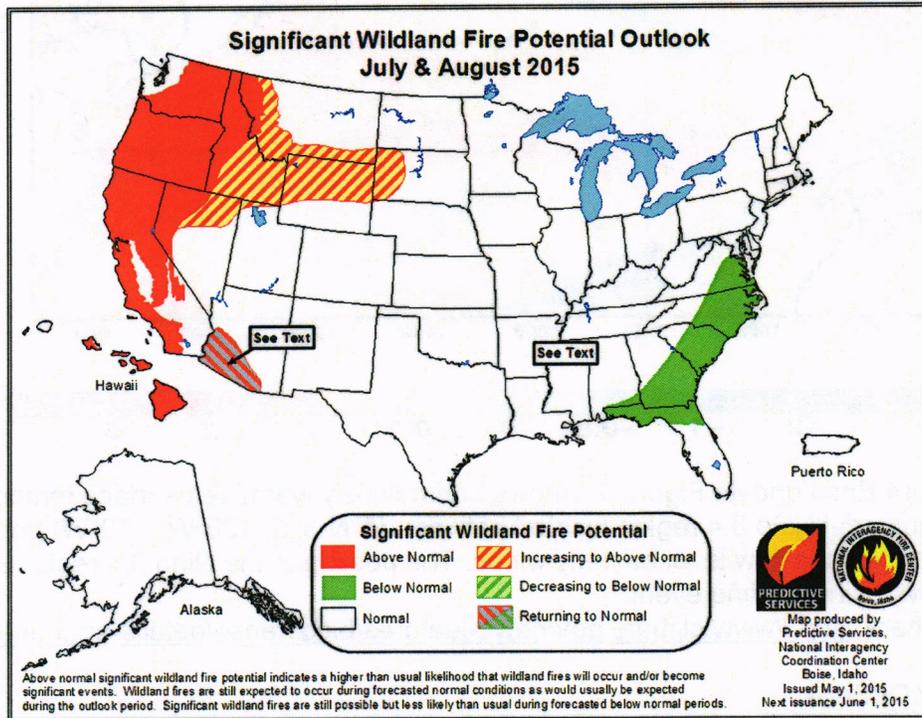
Wildfire Season Outlook

http://gacc.nifc.gov/nrcc/predictive/fuels_fire-danger/fuels_fire-danger.htm

As of May 1, 2015 officials of the Northern Rockies (Wildfire) Coordination Center (NRCC), in Missoula issued the Significant Wildland Fire Potential Outlook for the period of May, June, and July: http://www.nifc.gov/nicc/predictive/outlooks/monthly_seasonal_outlook.pdf



July through August - Above normal wildland fire potential will persist across the Pacific Coast states and expand into the northern Great Basin and northern Rocky Mountains during the summer months.



Wildfire Season

Northern Rockies Coordination Center (NRCC)

See: May 21, 2015 NRCC presentation before the Governor’s Drought and Water Supply Advisory Committee <http://drought.mt.gov/Committee/Meetings.aspx> (pull down list on left).

Post Wildfire Considerations

Wildfire burned areas are at increased risk for flooding. Even in those areas that are not considered in high-risk flood zones. Properties directly affected by fires and those located below or downstream of burn areas are most at risk of flash floods.

After a wildfire, the charred ground where vegetation has burned away cannot easily absorb rainwater, increasing the risk of high-velocity debris-laden flooding for a number of years. In addition, flooding after a fire is often more severe as ash and debris can form a mudflow and cause significant damage.

The best protection for a home owner in these areas is to obtain flood insurance prior to a weather event. New flood insurance policies take 30-days to go into effect. For more information on floods and flood insurance please visit the Montana Floodplain Program website at: www.mtfloodplain.mt.gov .

CONCLUSION

At this time, the Montana Governor's Drought and Water Supply Advisory Committee rates the potential for drought conditions through the month of July 2015 as **moderate to high** for surface water dependent uses east and west of the Continental Divide. East of the Divide there is a **moderate to high** chance that dryland farming will be impacted if average precipitation is not received at valley and plains elevations over the course of May, June, and July. There is a **low to moderate** chance that the state will experience flooding this spring due to high levels of soil moisture remaining from late summer 2014 record-breaking precipitation. See: http://kestrelaerial.com/#/projects/musselshell-flood-8-26-2014/MSRFlood_1059

RESPONSES TO WATER SUPPLY AND MOISTURE CONDITIONS

Execution of the response function of this plan corresponds with two primary levels of below average moisture conditions, *Drought Alert* and *Severe Drought*. See: <http://drought.mt.gov/default.aspx>

Drought Alert

The Montana Water Supply and Moisture Status Map by County legend as indicated when a *Drought Alert* will be in effect The Montana Drought Response Plan states: **If after April 15**, monitoring and assessment indicate that a county is entering initial levels of drought it will be under *Drought Alert* status. During a Drought Alert, the state will take the following actions according to the Drought Response Plan:

- 1) The DAC will request that the governor advise counties with an alert status to convene local drought advisory committees (LDACs) and communicate with the DAC regarding local conditions. This request is made by letter to county commissions and by press release.
- 2) The DAC will request state agencies to activate their plan annexes and prepare drought impact assessments. State agencies will present response strategies to the DAC in written form for the worst case scenario of worsening conditions.
- 3) DNRC prepares news releases, to be issued by the governor's office, summarizing conditions and explaining reasons for activation of LDACs.
- 4) The state library will issue water supply and/or moisture condition maps to the media for publication and broadcast.
- 5) The DAC staff will distribute information to LDACs, and county commissioners including materials to guide local drought management operations, and inform localities of available state and federal assistance.
- 6) The DAC considers increasing the frequency of meetings in response to the nature and rate of changes in drought conditions.
- 7) DNRC coordinates the preparation of assessment reports.
- 8) The DAC advises state and federal agencies to review reservoir operation plans and considers implementation appropriate drought contingency plans.

Severe Drought

A county will be assigned a *Severe Drought* status when drought indices and the Montana Water Supply and Moisture Status Map by County indicate steadily worsening conditions; and assessment confirms that the trend and the map legend indicates that the *Extremely Dry* category is reached, and precipitation forecasts indicate no improvement in the near future

A county will be assigned the Severe drought status, if **after May 15**, a river basin(s) of that county(s) have SWSI figures of -4.0 and poor moisture conditions, and the Montana Water Supply and Moisture Status Map ranks the subject county as *Extremely Dry* on the Montana Water Supply and Moisture Status Map, and the projected precipitation or water shortage is likely to create undue hardships for water uses and users.

State Response

- 1) The DAC requests that the governor officially declare counties with DAC Severe Drought status a drought disaster.
- 2) The DAC will request that state agencies implement appropriate mitigation responses, based on current impact assessments in accordance with agency annexes to this plan.
- 3) DNRC will issue news releases through the governor's office explaining current drought conditions and recommended actions.
- 4) DES will contact local disaster services in counties with a Severe Drought status regarding federal disaster designation process.
- 5) DAC will increase the frequency of meetings with emphasis on assessment and response activities. The DAC will continue to monitor conditions, especially for significant changes.
- 6) On behalf of the governor, DES will facilitate the federal natural disaster determination process with state USDA officials and report progress to governor and DAC.
- 7) DEQ Water Quality Division will contact communities with a history of municipal water supply problems or discharge permit noncompliance to determine the extent of water quantity and quality and report these findings to DAC.

Internet Site

The Montana State Library's Natural Resources Information System (NRIS) continues to provide generous support to the Governor's Drought and Water Supply Advisory Committee by maintaining important parts of its Internet site, including current links to the NRCS Surface Water Supply Index, the Montana Water Supply and Moisture Status Map and archives, and the U.S. Drought Monitor and its related products See: <http://drought.mt.gov>

Governor's Drought and Water Supply Advisory Committee Meetings - 2015

The Committee will meet monthly May through October for the remainder of 2015.

See: <http://drought.mt.gov/Committee/Meetings.aspx>

All Power Point presentations from past meetings of the Committee can be found here as well.

MAP FIGURES

Montana Water Supply and Moisture Status by County - May 2015
<http://drought.mt.gov/default.aspx>

NRCS Montana Surface Water Supply Index May 1, 2015
<http://nris.mt.gov/Nrcs/swsi/ShowMap.asp?month=Current>

Current Hydrologic Conditions
<http://drought.mt.gov/Links/CurrentConditions.aspx>

CPC Forecasts
<http://www.cpc.ncep.noaa.gov/products/forecasts/>

National Climatic Data Center
<http://www.ncdc.noaa.gov/>

U.S. Drought Monitor Map (Current)
<http://droughtmonitor.unl.edu/>

Water Watch, USGS Flood and high flow condition
<http://waterwatch.usgs.gov/new/?m=flood&r=mt&w=real,map>

National Weather Service (NWS) Great Falls State Office semi-monthly drought report
Summarizing weather and precipitation for 21 cities and towns See current and archive:
<http://www.wrh.noaa.gov/tfx/climate/droughtsum/droughtsum.php?wfo=tfx>

U.S. Seasonal Drought Outlook Map (CPC) April 16, 2015
http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.html

Palmer Hydrological Drought Index – through April 2015
<http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/>

End