

State of Wyoming Probable Maximum Precipitation (PMP) Study

★ Project Overview ★

Presented To:

Powder/Tongue River Basin Advisory Group Meeting

Buffalo, WY

April 21, 2015

Prepared By:

THE STATE



OF WYOMING

Water Development Office

A Couple Definitions



- Probable Maximum Precipitation (PMP)

- Theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given size storm at a particular geographic location at a certain time of the year.

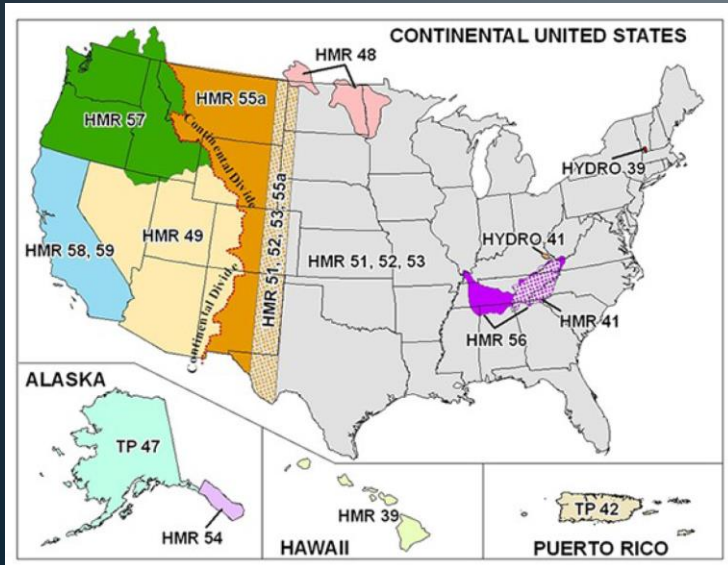


- Probable Maximum Flood (PMF)

- The flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area.

Wyoming Statewide Probable Maximum Precipitation Study

- Replaces the outdated National Weather Service Hydrometeorological Reports (HMRs) for Wyoming



Regions covered
by HMRs



HYDROMETEOROLOGICAL REPORT NO. 55A

(SUPERCEDES HYDROMETEOROLOGICAL REPORT NO. 53)

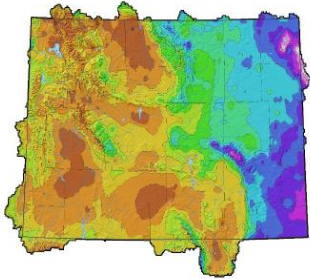
Probable Maximum Precipitation Estimates-United States
Between the Continental Divide and the 103rd Meridian

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U. S. DEPARTMENT OF ARMY
CORPS OF ENGINEERS
U. S. DEPARTMENT OF INTERIOR
BUREAU OF RECLAMATION

Silver Spring, Md.
June 1988



Probable Maximum Precipitation Study for Wyoming



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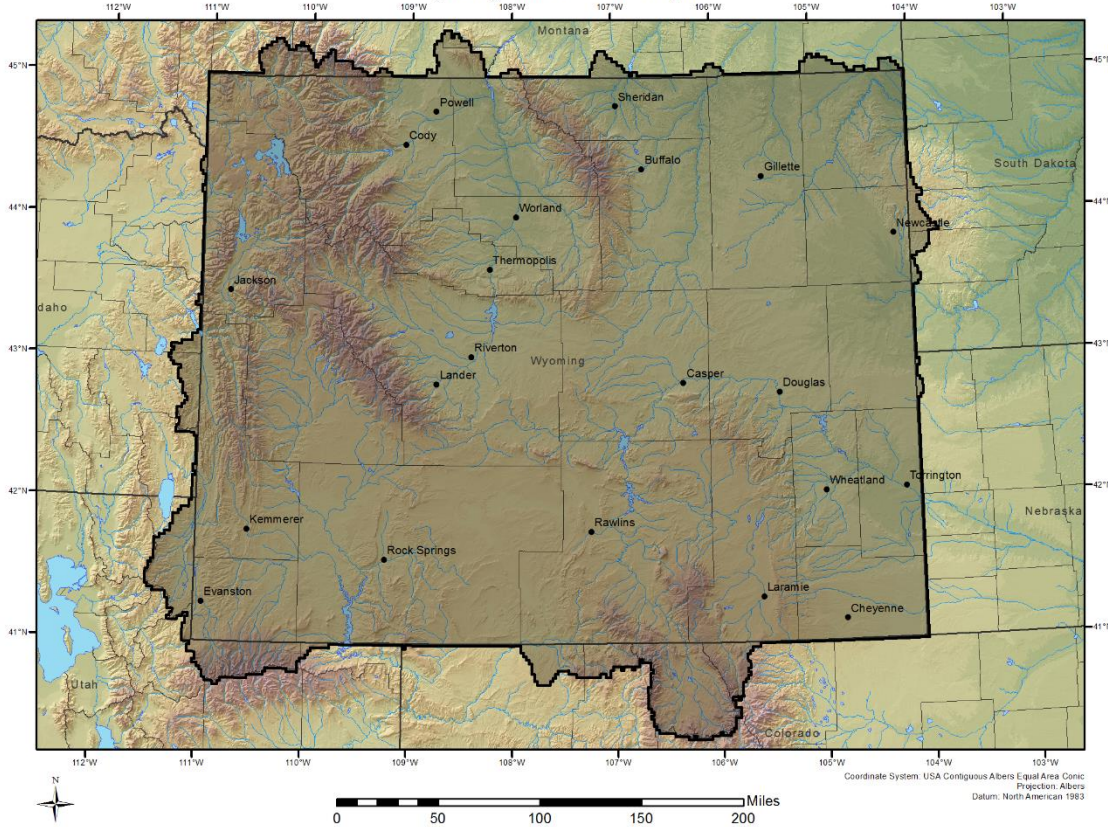
December 2014

WWDO Recently Completed PMP Study for Wyoming

<http://wwdc.state.wy.us/PMP/PMP.html>

Let's take a quick look at how PMP numbers are derived

Gridded PMP Analysis Domain
Wyoming Statewide PMP Analysis

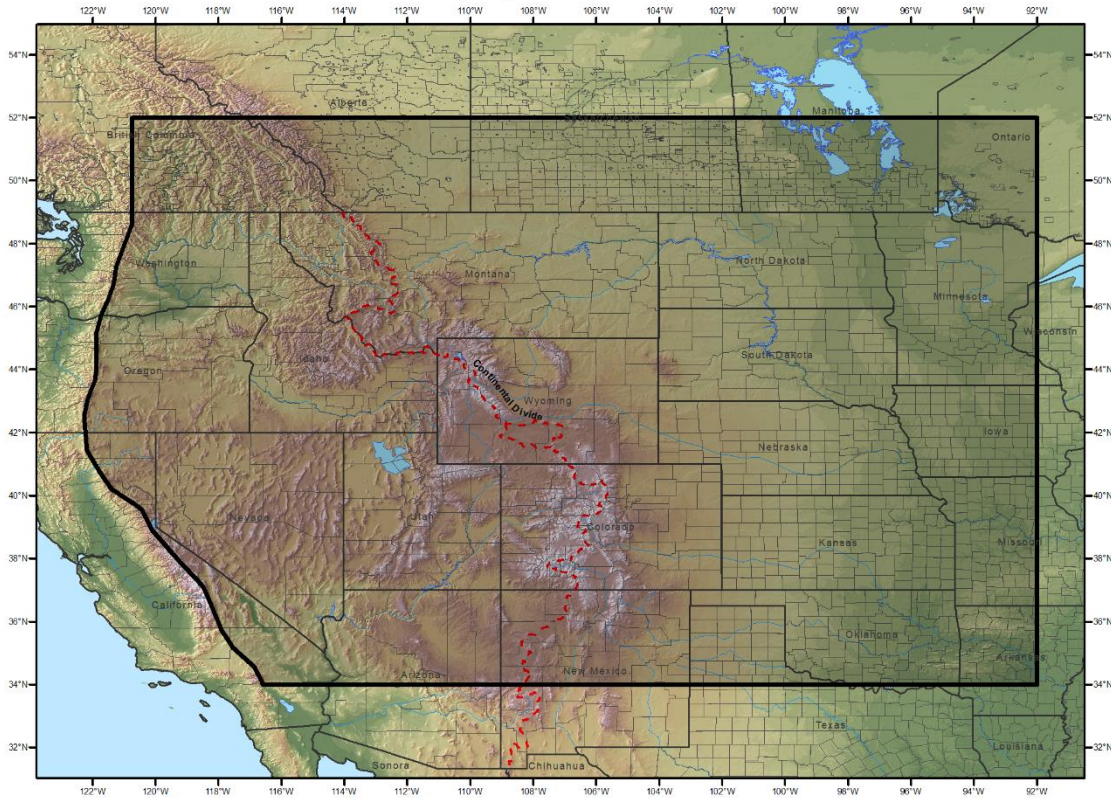


Step 1

Define the Analysis Domain

- Inclusive of River Basin Boundaries that Extend by State Line

Storm Search Domain
Wyoming Statewide PMP Study

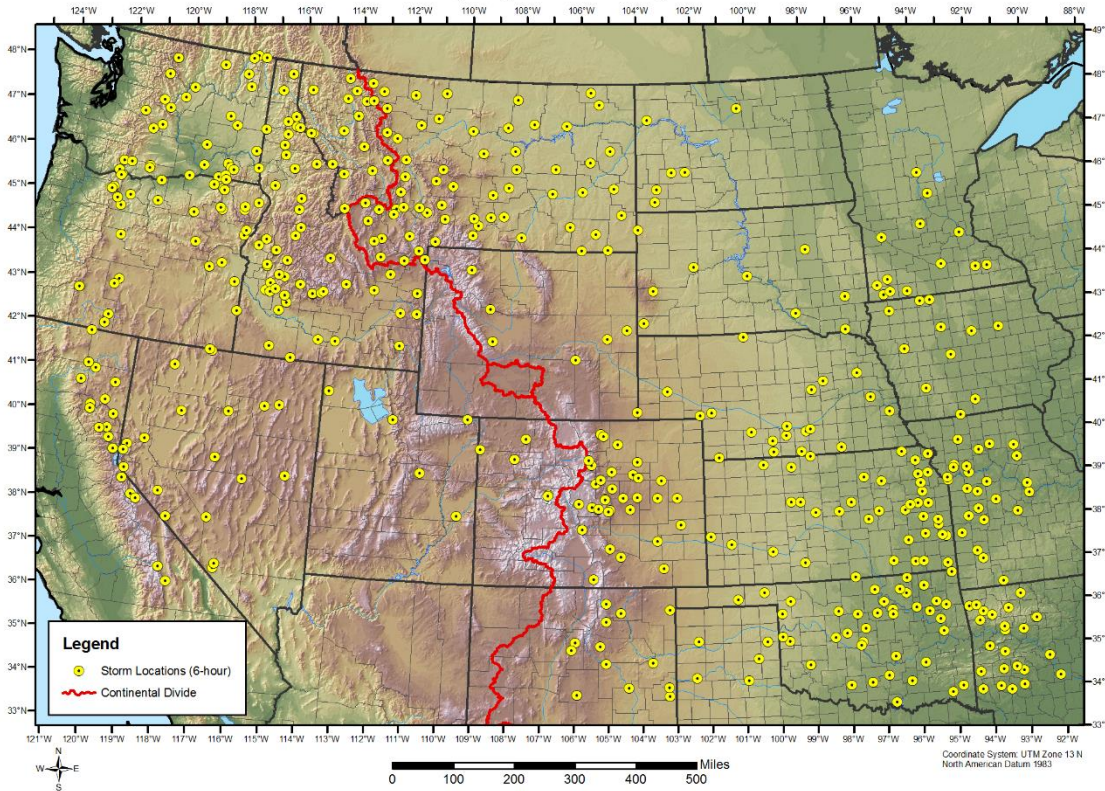


Step 2

Define the Storm Search Domain

- Inclusive of Areas Both East and West of the Continental Divide

6-hour Storm Locations Wyoming Statewide PMP Study

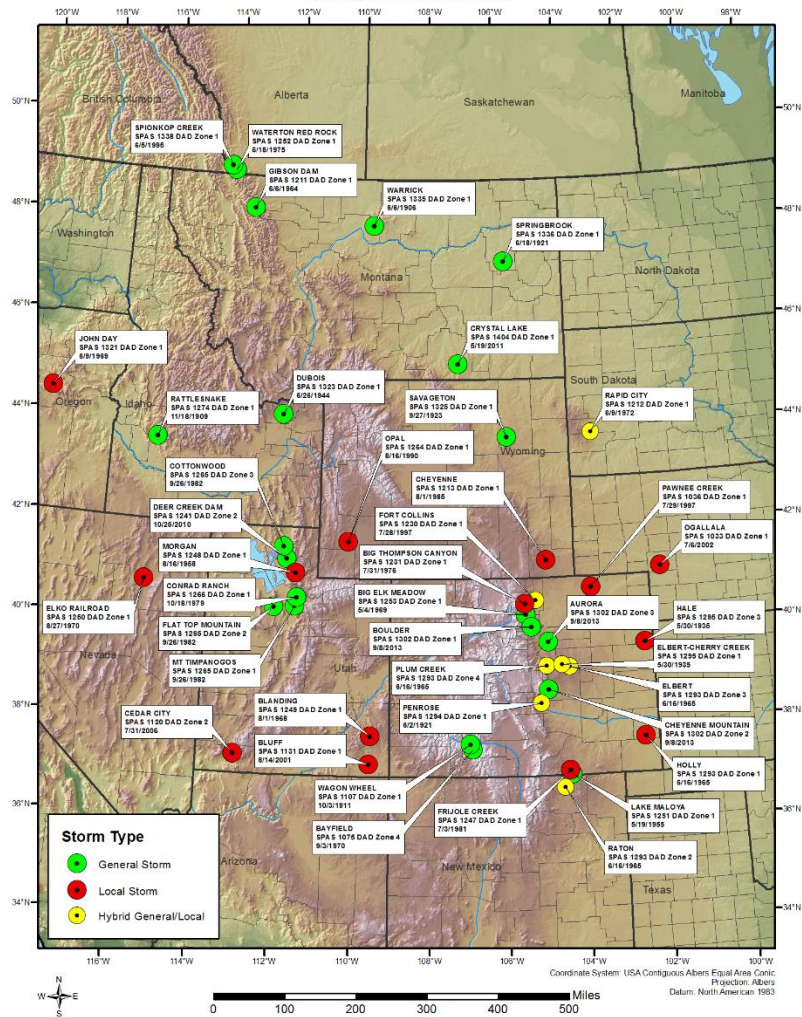


Step 3

Search for Storms

- National Climatic Data Center
- HMR Reports
- US Corps of Engineers Storm Studies
- US Bureau of Reclamation Storm Data
- Many Others....

Locations of Short List Storm Events
Wyoming Statewide PMP Study

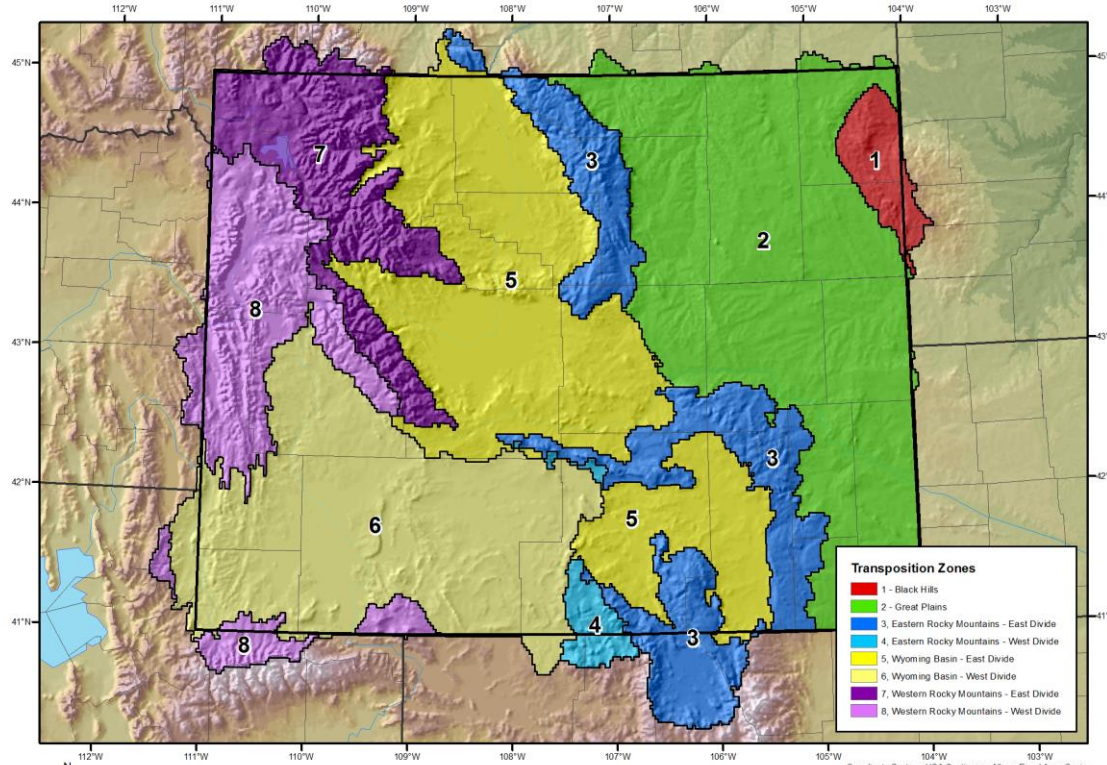


Step 4

Develop Storm Short List And Analyze Storms

- Determine Storms that can be “Transpositioned” to Wyoming
- SPAS (Storm Precipitation Analysis System)

Orographic Transposition Zones Wyoming Statewide PMP



Step 5

Develop Transposition Zones For Individual Storms

- Based on Topography and Other Physical Features

Wyoming Short-Listed Storms (40 Count)

Storm Name	State	Storm Type	Storm Location	Lat	Lon	Year	Month	Day	Maximum Point Rainfall	Precipitation Source
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GIBSON DAM	MT	General	West of Divide	48.354	-113.371	1964	6	6	19.16	SPAS 1211
LAKE MALOYA	NM	General	West of Divide	37.009	-104.341	1955	5	19	14.82	SPAS 1251
WATERTON RED ROCK	AB	General	West of Divide	49.088	-114.046	1975	6	18	14.46	SPAS 1252
BIG ELK MEADOW	CO	General	West of Divide	40.267	-105.417	1969	5	4	20.01	SPAS 1253
BOULDER	CO	General	West of Divide	40.150	-105.265	2013	9	8	22.81	SPAS 1302
CALGARY	AL	General	West of Divide	51.050	-114.100	2013	6	20	15	SPAS 1320
SAVAGETON	WY	General	West of Divide	43.846	-105.804	1923	9	27	17.56	SPAS 1325
WARRICK	MT	General	West of Divide							AS 1335
SPRINGBROOK	MT	General	West of Divide							AS 1336
PARKMAN	SK	General	West of Divide							AS 1337
SPIONKOP CREEK	AB	General	West of Divide							AS 1338
BAVFIELD	CO	General	West of Divide	37.304	-107.413	1970	9	3	5.95	SPAS 1075
WAGON WHEEL	CO	General	West of Divide	37.663	-106.938	1911	10	3	7.88	SPAS 1107
DEER CREEK DAM	UT	General	West of Divide	41.360	-111.910	2010	10	25	4.74	SPAS 1241
COTTONWOOD	UT	General	West of Divide	40.617	-111.783	1982	9	26	7.05	SPAS 1265
CONRAD RANCH	UT	General	West of Divide	40.585	-111.590	1979	10	18	5.78	SPAS 1266
RATTLESNAKE	ID	General	West of Divide	43.648	-115.744	1909	11	18	16.21	SPAS 1274
DUBOIS	ID	General	West of Divide	44.250	-112.193	1944	6	26	4.32	SPAS 1323

General Storms

West of Divide

- Sort Storms by Storm Type and Transposition Location

East of Divide

OGALLALA	NE	Local	West of Divide	41.125	-101.717	2002	7	6	14.92	SPAS 1033
PAWNEE CREEK	CO	Local	West of Divide	40.775	-103.625	1997	7	29	13.58	SPAS 1036
VANGUARD	SK	Local	West of Divide	49.922	-107.210	2000	7	3	15.29	SPAS 1177
RAPID CITY	SD	Local	West of Divide	44.196	-103.488	1972	6	9	15.8	SPAS 1212
CHEYENNE	WY	Local	West of Divide	41.354	-104.819	1985	8	1	7.15	SPAS 1213
FORT COLLINS	CO	Local	West of Divide	40.548	-105.133	1997	7	28	14.48	SPAS 1230
BIG THOMPSON CANYON	CO	Local	West of Divide	40.479	-105.429	1976	7	31	12.52	SPAS 1231
FRIJOLE CREEK	CO	Local	West of Divide	37.096	-104.379	1981	7	3	16.33	SPAS 1247
HOLLY	CO	Local	West of Divide	37.713	-102.404	1965	6	16	19.18	SPAS 1293
PLUM CREEK	CO	Local	West of Divide							AS 1293
PENROSE	CO	Local	West of Divide							AS 1294
ELBERT	CO	Local	West of Divide							AS 1295
HALE	CO	Local	West of Divide							AS 1295
GLEN ULLIN	ND	Local	West of Divide	47.304	-101.388	1966	6	24	12.87	SPAS 1324
BUFFALO GAP	SK	Local	West of Divide	49.115	-105.290	1961	5	30	10.5	SPAS 1334
CEDAR CITY	UT	Local	West of Divide	37.375	-113.075	2006	7	31	5.69	SPAS 1120
BLUFF	UT	Local	West of Divide	37.255	-109.575	2001	8	14	6.28	SPAS 1131
MORGAN	UT	Local	West of Divide	41.079	-111.654	1958	8	16	7.01	SPAS 1248
BLANDING	UT	Local	West of Divide	37.826	-109.543	1968	8	1	6.67	SPAS 1249
ELKO RAILROAD	NV	Local	West of Divide	40.776	-115.759	1970	8	27	4.68	SPAS 1250
OPAL	WY	Local	West of Divide	41.738	-110.246	1990	8	16	7.16	SPAS 1264
JOHN DAY	OR	Local	West of Divide	44.446	-118.879	1969	6	9	7.09	SPAS 1321

Local Storms

West of Divide

Each of the forty storms were analyzed using the Storm Precipitation Analysis System (SPAS), which produced Depth-Area-Duration (DAD) values, mass curves, and total storm isohyets, among other products.

East of Divide

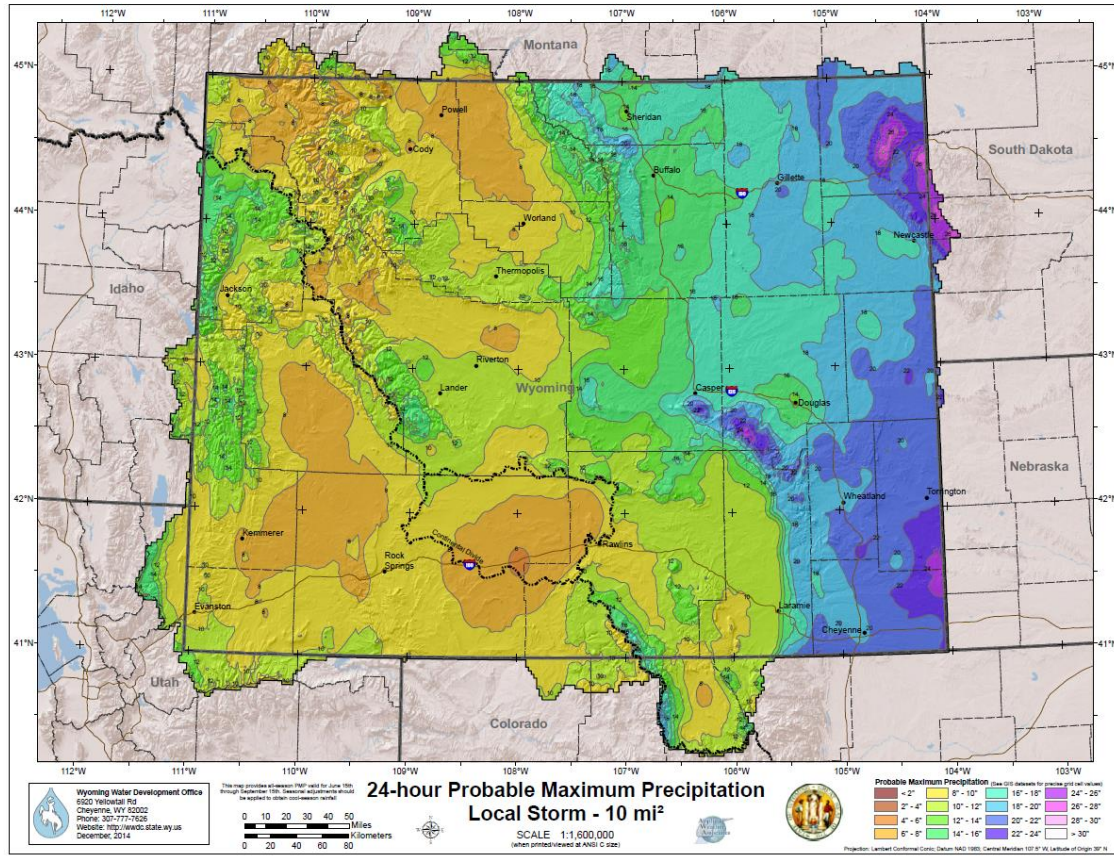
Step 6

Storm Maximization

- Determines How Much Rainfall Could Have Occurred in Original Storm
- Apply Adjustment Factors to Precipitation Values
- Produce Final Grid-Based PMP Maps

Adjustment Factors Include:

- IPMF – In Place Maximization Factor
- MTF – Moisture Transposition Factor
- OTF – Orographic Transposition Factor



Available PMP Mapping Includes the Following:

- **General Storms**

- 24 hour, 10 square mile
- 24 hour, 100 square mile
- 24 hour, 1,000 square mile
- 72 hour, 10 square mile
- 72 hour, 100 square mile
- 72 hour, 1,000 square mile

- **Local Storms**

- 1 hour, 1 square mile
- 1 hour, 10 square mile
- 1 hour, 100 square mile
- 6 hour, 1 square mile
- 6 hour, 10 square mile
- 6 hour, 100 square mile
- 24 hour, 1 square mile
- 24 hour, 10 square mile
- 24 hour, 100 square mile

Additional durations and area sizes are available within GIS deliverables

GIS PMP Raster Files

PMP Maps

Appendices

Final PMP Deliverables Include

GIS PMP Evaluation Tool

Provides PMP Numbers for Any User-Specified Basin

Final Report

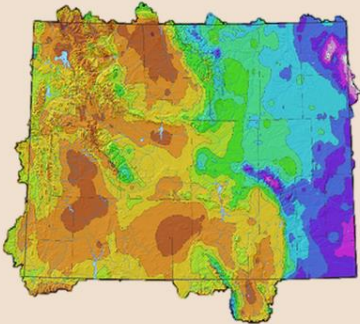
Digital Appendix

All PMP Products are Available Online


<http://wwdc.state.wy.us/PMP/PMP.html>

Citizen Government Business Visitor

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Wyoming Probable Maximum Precipitation Study
State of Wyoming



This study provides Probable Maximum Precipitation (PMP) values for any drainage basin within Wyoming, including regions adjacent to the State that provide runoff into drainage basins within Wyoming. The PMP values are valid for June 15 through September 15, which is the time of the year when the most intense rainfall could occur. A seasonality adjustment is provided to derive PMP values for dates outside of this time period. PMP values may be used in the computation of the Probable Maximum Flood (PMF). PMP values provided in this study supersede PMP values in the four Hydrometeorological Reports (HMRs) for locations in Wyoming, including HMR 49 (Hansen et al., 1977), HMR 51 (Schreiner and Riedel, 1978), HMR 55A (Hansen et al., 1988), and HMR 57 (Hansen et al., 1994).

Deliverables from the PMP Study Available for Download
Please check back frequently for new updates

Agency Information

- ◆ Mission Statement
- ◆ Directory
- ◆ Calendar
- ◆ Commission Agendas & Minutes
- ◆ Consultant Selection
- ◆ Items Open for Public Comment
- ◆ Newsletter
- ◆ Operating Criteria
- ◆ Project Application Information
- ◆ Send Us Your Comments

Planning Program

- ◆ Dam and Reservoir Planning
- ◆ Groundwater Grant Projects
- ◆ Instream Flow Filings
- ◆ Current Planning Projects
- ◆ River Basin Planning
- ◆ Weather Modification Study
- ◆ Probable Maximum Precipitation
- ◆ Water Research Projects

Construction Program

- ◆ Current Construction Projects
- ◆ Small Water Projects

Agency Publications

- ◆ Project Reports
- ◆ Irrigation & Water System Surveys
- ◆ Legislative Reports
- ◆ Water Mgmt & Conservation Dir
- ◆ History of Wyoming Water Law

WWDC Home Page

Water Plan Home Page

WRDS Home Page

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Please check back frequently for new updates

PMP Final Report & Appendices

- ◆ [Final Report](#) (29,981 kb)
- ◆ [Appendices A-E, G-N](#) (74,678 kb)
- ◆ [Appendix F](#) (85,669 kb)

Digital Appendices

- ◆ [Digital Appendices Overview](#) (227 kb)
- ◆ **PMP Maps**
 - [GIS Data](#) (25,016 kb)
 - [PDF Maps](#) (70,483 kb)
- ◆ **Seasonal Adjustment Factors**
 - [GIS Data](#) (3,154)
 - [PDF Maps](#) (70,628 kb)
- ◆ **Storm Spreadsheets** (*available upon request, contact WWDO*)
 - **Storm Summary Spreadsheets**
 - **Storm Adjustment Spreadsheets**
- ◆ **Monthly Dew Point Climatology**
 - [GIS Data](#) (*available upon request, contact WWDO*)
 - [Map Images](#) (54,825 kb)
- ◆ **Precipitation Frequency Climatology**
 - [GIS Data](#) (*available upon request, contact WWDO*)
 - [Map Images](#) (62,153 kb)
- ◆ **Depth Area Duration (DAD) Tables: Spreadsheets** (*available upon request, contact WWDO*)
- ◆ [Miscellaneous Map Images](#) (11,352 kb)

PMP Evaluation GIS Tool

- ◆ [PMP Evaluation GIS Tool](#) (91,455 kb)
- ◆ [PMP Evaluation GIS Tool Description & Usage](#) (362 kb)

Disclaimer:
All final deliverables for the Wyoming Probable Maximum Precipitation Study are being provided herein with the expressed understanding that the Wyoming Water Development Office and State of Wyoming are releasing these products at the user's own risk. It is the "Engineer of Record" and/or end users who are expected to take all steps necessary to ensure proper use and understanding of these products and that all information is being interpreted and applied properly.

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Wyoming PMP Study

Thanks for Your Attention!



Questions?

Wyoming Water Development Office

777-7626

<http://wwdc.state.wy.us>