USACE Extreme Storm Team

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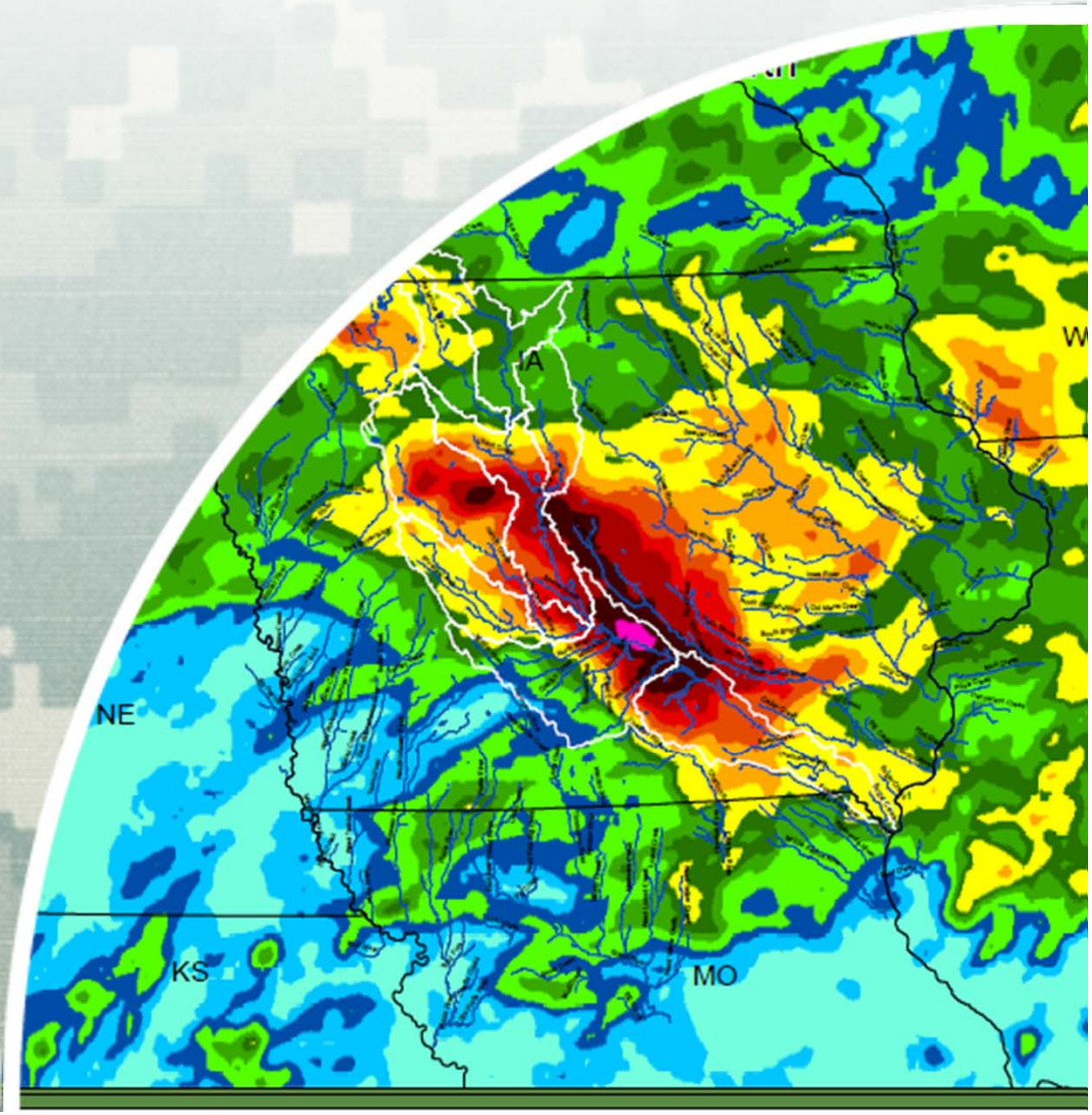
Chief, Hydrology Section

Omaha District, USACE

19 April 2012



US Army Corps of Engineers

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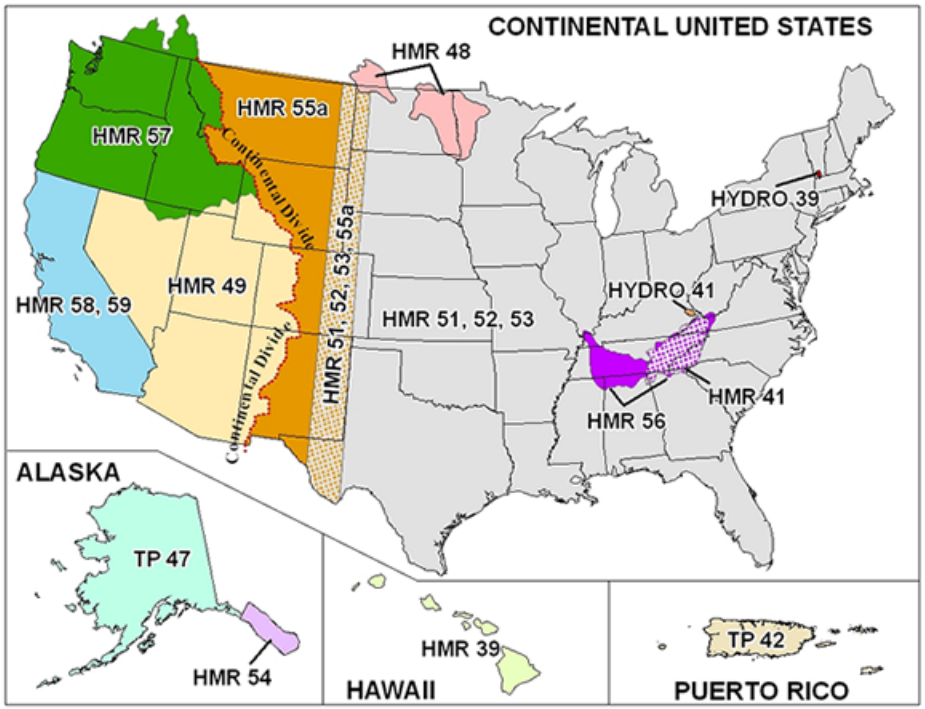
History

- 1991 – ER1110-8-2 “Use HMR’s or request site-specific studies through NWS Hydro-met”
- 2004 – NWS declines to continue PMP services
- 2008 – Interagency Federal Work Group established
- 2010 – USACE Extreme Storm Team established

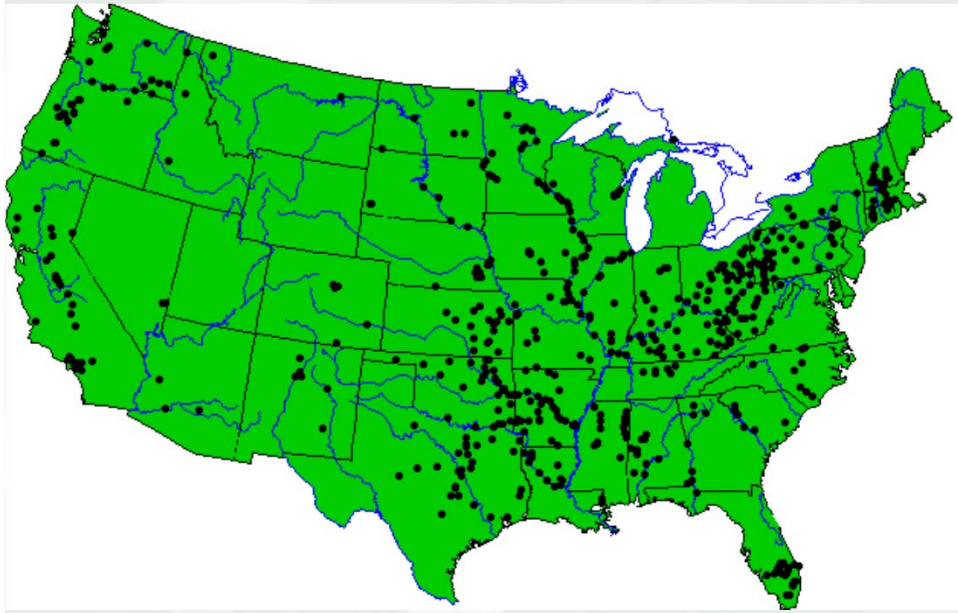
USACE Extreme Storm Data Needs

- Site-Specific Probable Maximum Precipitation Studies
- Hydrometeorological Reports (HMR's) updates
- Data Archiving & Analysis of Extreme Storm Events
- Update Standard Project Storm Criteria

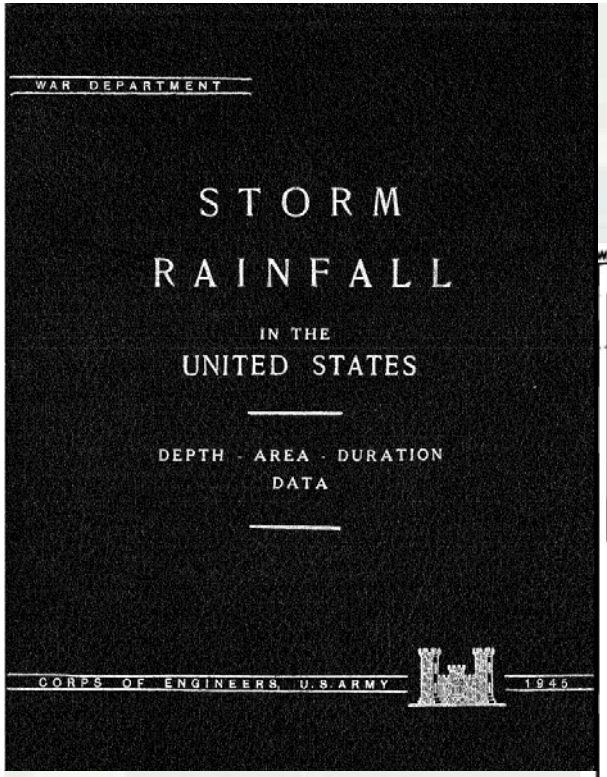
HMR Regional Coverage

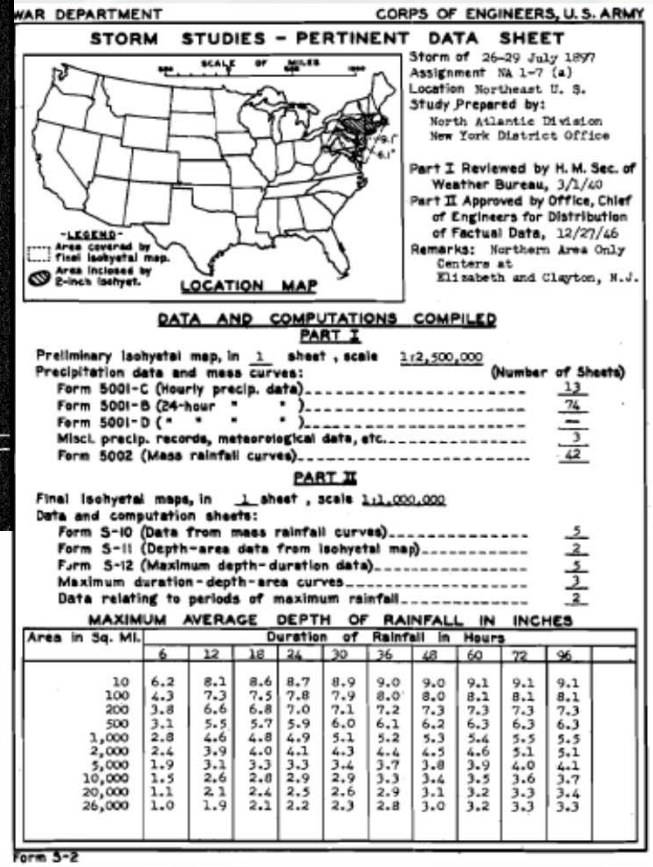


Location of USACE Dams



http://www.weather.gov/oh/hdsc/studies/images/20080513_PMP_Map_r.png





WAR DEPARTMENT — CORPS OF ENGINEERS, U. S. ARMY

STORM STUDIES – PERTINENT DATA SHEET

Storm of 26-29 July 1897
Assignment NA 1-7 (a)
Location Northeast U. S.
Study Prepared by:
North Atlantic Division
New York District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 3/1/40
Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 12/27/46
Remarks: Northern Area Only
Centers at
Elizabeth and Clayton, N.J.

DATA AND COMPUTATIONS COMPILED

PART I

Preliminary isohyetal map, in 1 sheet, scale 1:2,500,000

Precipitation data and mass curves:	(Number of Sheets)
Form 5001-C (Hourly precip. data)	13
Form 5001-B (24-hour " ")	74
Form 5001-D (" " ")	—
Misc. precip. records, meteorological data, etc.	3
Form 5002 (Mass rainfall curves)	42

PART II

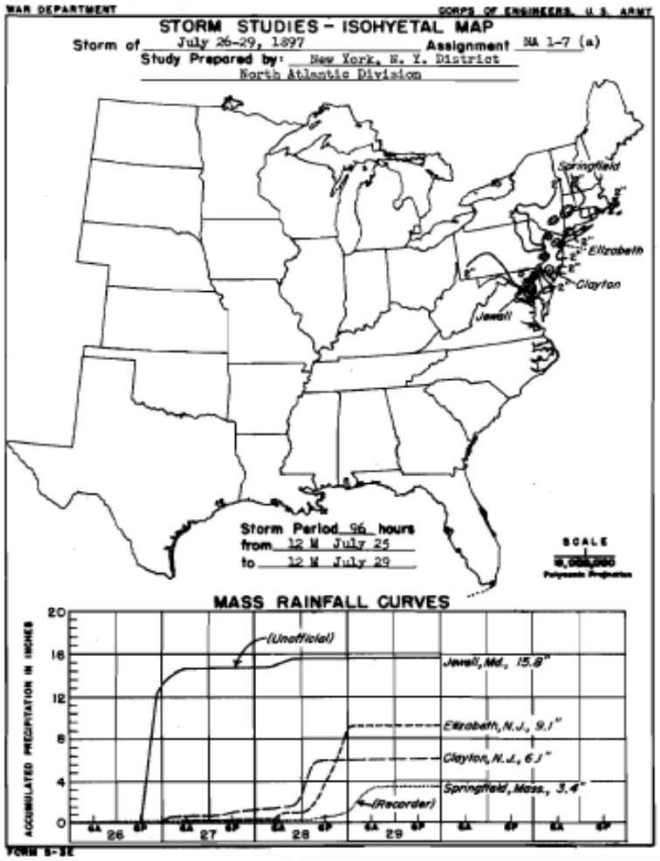
Final isohyetal maps, in 1 sheet, scale 1:1,000,000

Data and computation sheets:	
Form S-10 (Data from mass rainfall curves)	5
Form S-11 (Depth-area data from isohyetal map)	2
Form S-12 (Maximum depth-duration data)	5
Maximum duration-depth-area curves	3
Data relating to periods of maximum rainfall	2

MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

Area in Sq. Mi.	Duration of Rainfall in Hours									
	6	12	18	24	30	36	48	60	72	96
10	6.2	8.1	8.6	8.7	8.9	9.0	9.0	9.1	9.1	9.1
100	4.3	7.3	7.5	7.8	7.9	8.0	8.0	8.1	8.1	8.1
200	3.8	6.6	6.8	7.0	7.1	7.2	7.3	7.3	7.3	7.3
500	3.1	5.5	5.7	5.9	6.0	6.1	6.2	6.3	6.3	6.3
1,000	2.8	4.6	4.8	4.9	5.1	5.2	5.3	5.4	5.5	5.5
2,000	2.4	3.9	4.0	4.1	4.3	4.4	4.5	4.6	5.1	5.1
5,000	1.9	3.1	3.3	3.3	3.4	3.7	3.8	3.9	4.0	4.1
10,000	1.5	2.6	2.8	2.9	2.9	3.3	3.4	3.5	3.6	3.7
20,000	1.1	2.1	2.4	2.5	2.6	2.9	3.1	3.2	3.3	3.4
26,000	1.0	1.9	2.1	2.2	2.3	2.8	3.0	3.2	3.3	3.3

Form S-2



WAR DEPARTMENT — CORPS OF ENGINEERS, U. S. ARMY

STORM STUDIES – ISOHYETAL MAP

Storm of July 26-29, 1897 Assignment NA 1-7 (a)
Study Prepared by: New York, N. Y. District
North Atlantic Division

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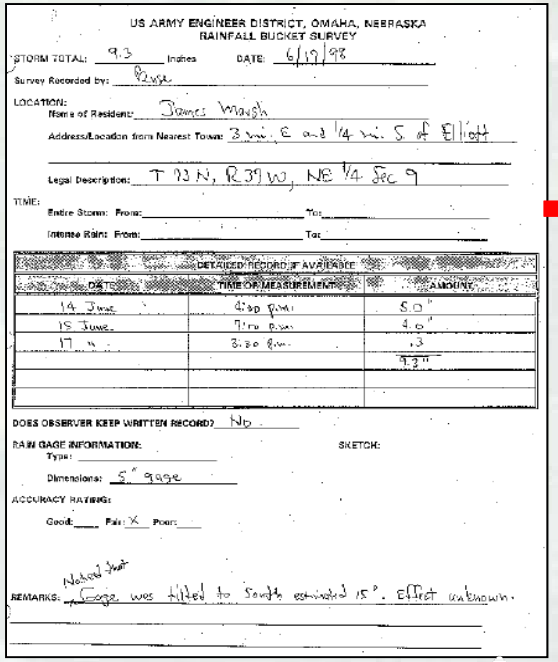
Data Archiving and Analysis System



US ARMY ENGINEER DISTRICT, OMAHA, NEBRASKA
RAINFALL BUCKET SURVEY

STORM TOTAL: 9.3 Inches DATE: 6/19/98

Survey Recorded by: Rose

LOCATION:
Name of Resident: James Marsh
Address/Location from Nearest Town: 3 mi. E and 1/4 mi. S of Elliott
Legal Description: T 73 N, R 39 W, NE 1/4 Sec 9

TIME:
Entire Storm: From: To:
Intense Rain: From: To:

DETAILED RECORD IF AVAILABLE

DATE	TIME OF MEASUREMENT	AMOUNT
14 June	4:30 p.m.	5.0"
15 June	7:00 p.m.	4.0"
17 "	3:30 p.m.	.3
		9.3"

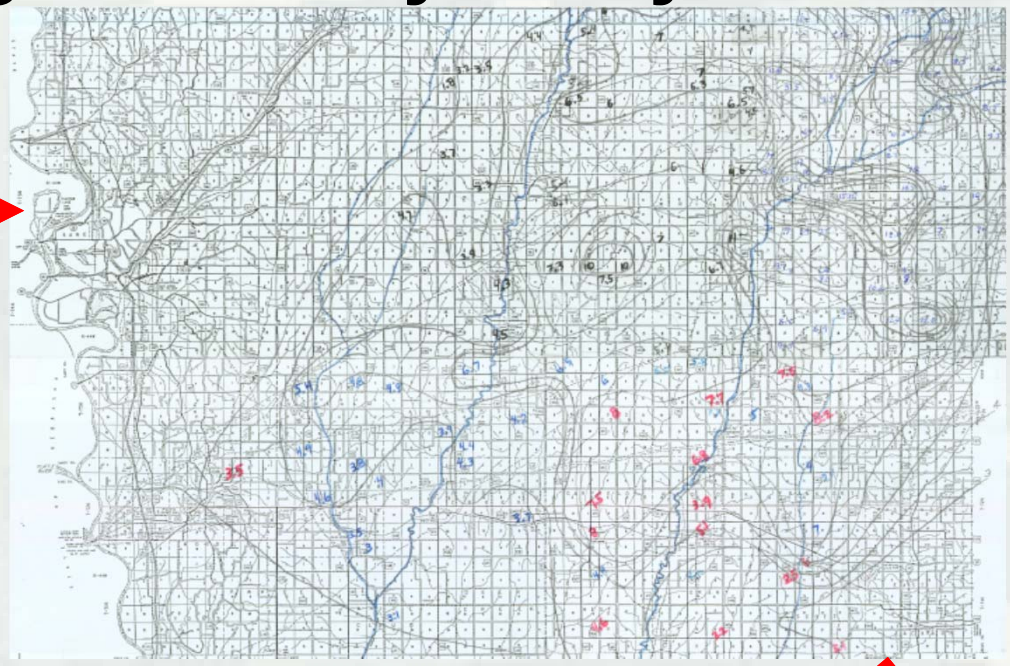
DOES OBSERVER KEEP WRITTEN RECORD? No

RAIN GAGE INFORMATION: SKETCH:
Type:
Dimensions: 5" gage

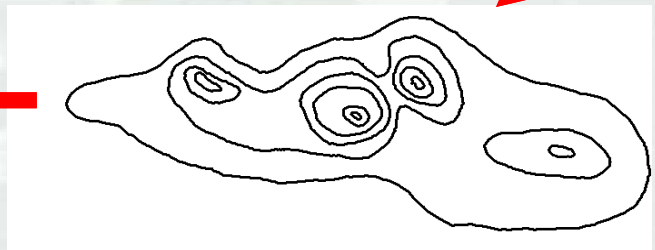
ACCURACY RATING:
Good: Fair: X Poor:

REMARKS: Noticed that Gage was tilted to South estimated 15°. Effect unknown.

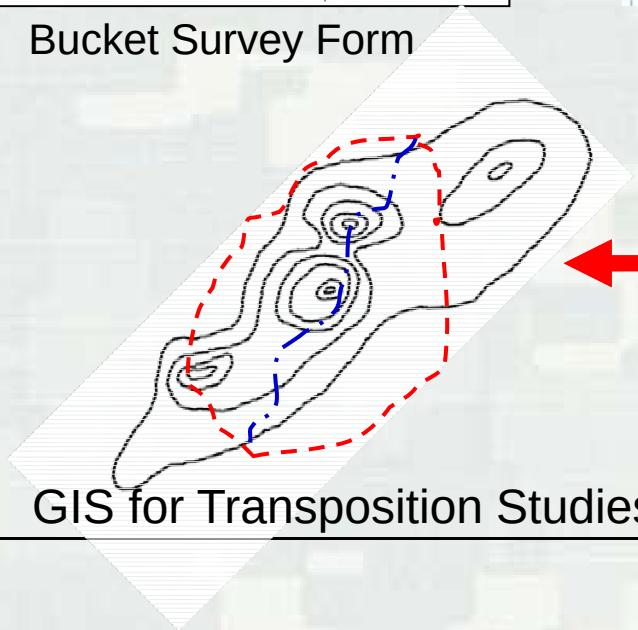
Bucket Survey Form



Original Isohyetal Map

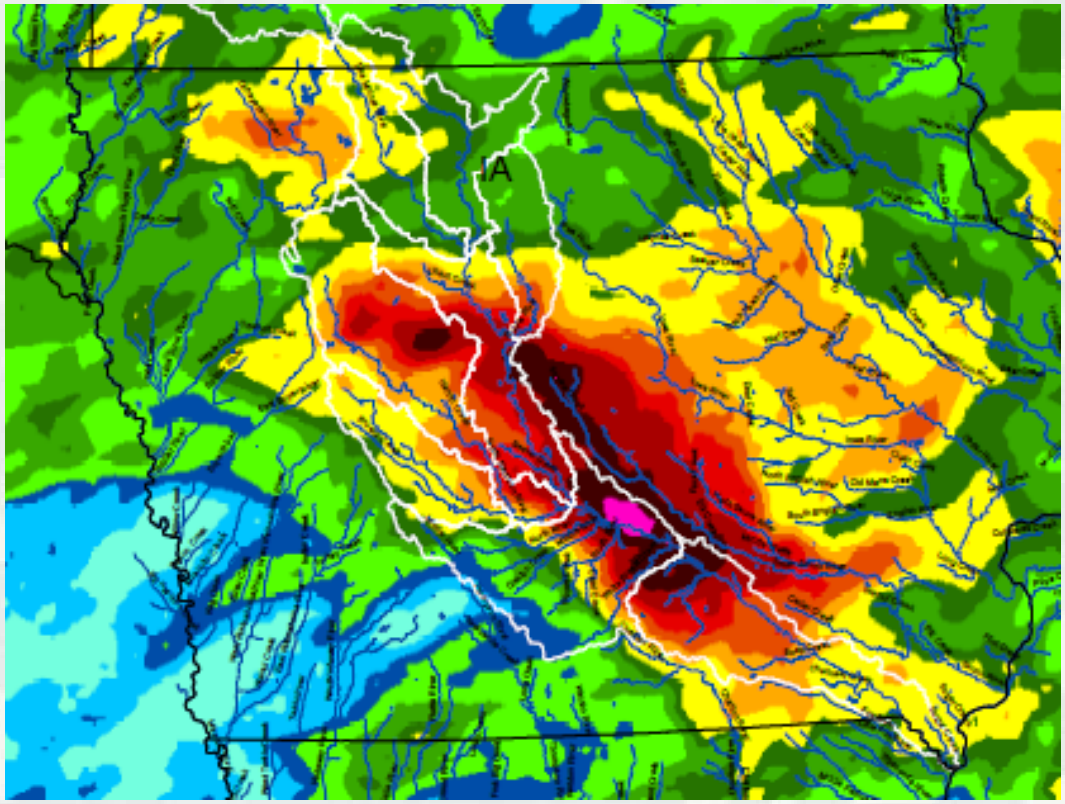


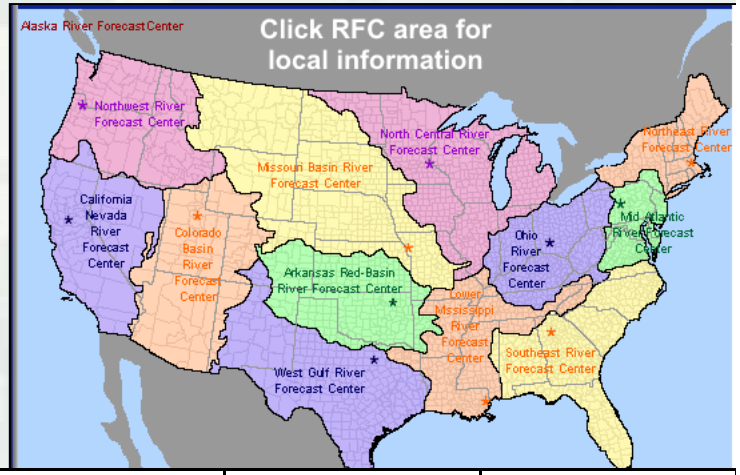
Digitized Isohyetal Map



GIS for Transposition Studies

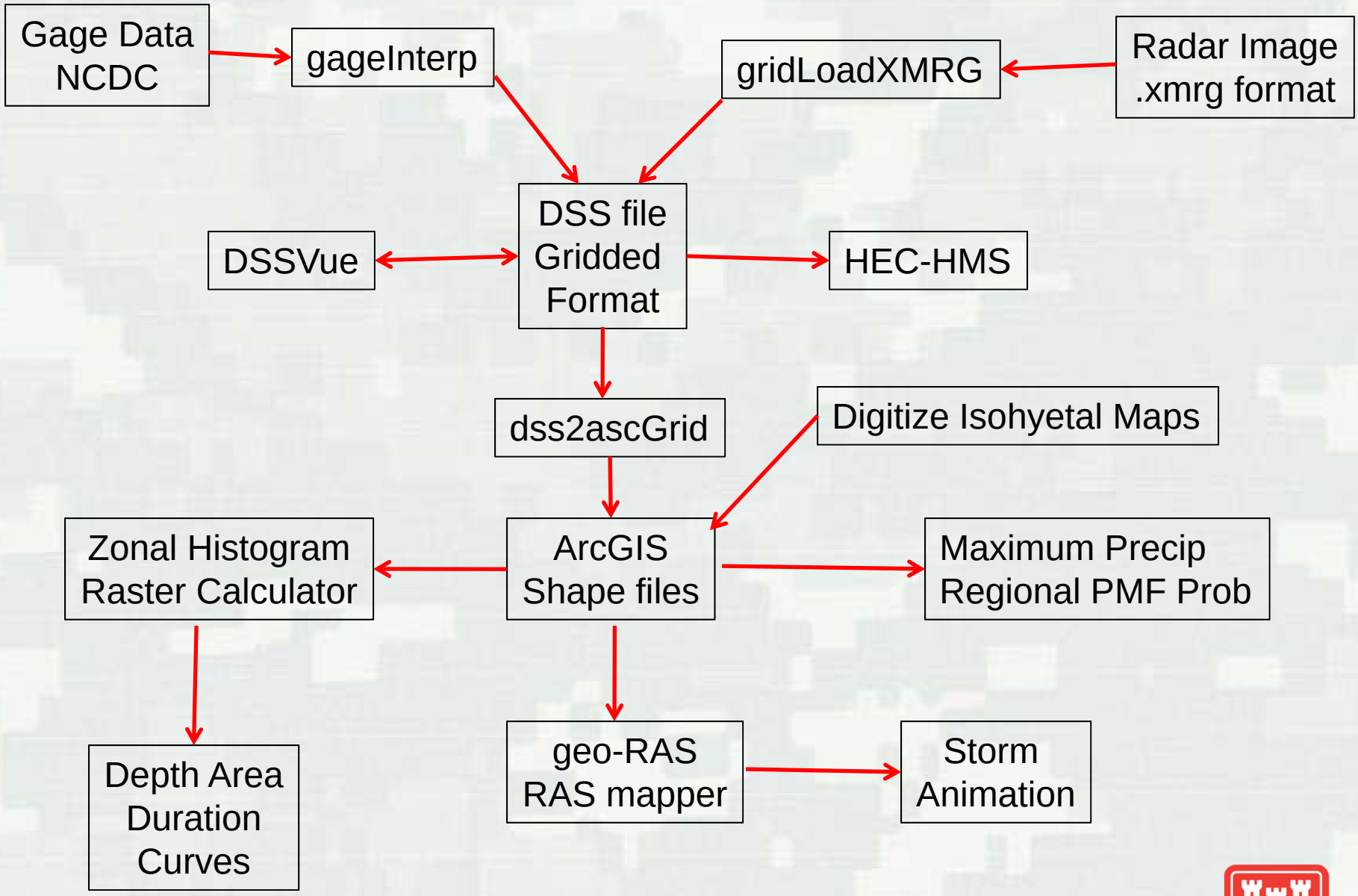
Radar Estimates of Precipitation





	Stage III	MPE
ABRFC	May 1993-Dec 2004	Jun 2003-Sep 2005
APRFC		Jul 2002-Sep 2005
CBRFC	Sep 1996-Mar 2002	Feb 2002-Sep 2005
CNRFC	Sep 1996-Jan 2005	May 2003-Sep 2005
LMRFC	Apr 1996-Aug 2003	Aug 2003-Sep 2005
MARFC	Oct 1995-Dec 2001	Oct 1999-Sep 2005
MBRFC	Nov 1994-Jun 2003	Jan 2003-Sep 2005
NCRFC	Dec 1994-Apr 2002	Feb 2002-Sep 2005
NERFC	Feb 1996-Aug 2002	Aug 2002-Sep 2005
NWRFC	Jan 1996-Nov 2002	Nov 2002-Sep 2005
OHRFC	Dec 1995-Jun 2003	Dec 2001-Sep 2005
SERFC	Dec 1995-Sep 2002	Jan 2002-Sep 2005

Radar Data can be downloaded from the NWS
http://dipper.nws.noaa.gov/hdsb/data/nexrad/nexrad.html


Gage Data NCDC
gageInterp
gridLoadXMRG
Radar Image .xmrg format
DSS file Gridded Format
DSSVue
HEC-HMS
dss2ascGrid
Digitize Isohyetal Maps
Zonal Histogram Raster Calculator
ArcGIS Shape files
Maximum Precip Regional PMF Prob
Depth Area Duration Curves
geo-RAS RAS mapper
Storm Animation

Extreme Storm Database

			Highest recorded rainfall		Total Storm			
Storm ID	Basic assignment number (if given)	Date of storm	Approximate location of storm center	Total rainfall (in)	Storm duration (hr)	Storm area (mi^2)	Max average depth of rainfall (in)	24-hr, 100 mi^2 rainfall (in)
1	MR 1-1	16-20 Dec 1895	Phillipsburg, MO	12.20	96	110000	5.6	7.2
2	MR 1-3A	6-7 Jul 1898	Blanchard, IA	12.50	30	7200	4.2	10.9
3	MR 1-3B	7-8 Jul 1898	Edgehill, MO	8.30	30	20000	3.2	7.8
4	MR 1-5	14-17 Jul 1900	Primghar, IA	13.60	78	100000	3.9	11.8
5	MR 1-6	4-8 Sep 1901	Ness City, KS	9.10	114	63000	3.5	8.3
6	MR 1-8	20-24 Sep 1902	Wakeeney, KS	8.10	108	81600	4.0	6.2

Area within 2-in isohyetal (mi^2)	Area within 4-in isohyetal (mi^2)	Latitude	Longitude	Storm Dew point	Max Dewpoint	In-place moisture adjustment	Wind Vector	Elevation

Links to Depth-Area-Duration Curves, Isohyetal Map, Scanned Images of Original Data, GIS Shapefiles, DSS files

Data Sources

- US Storm Rainfall (1882-1973)
- Bucket Surveys (COE, USBR, NWS)
- NOAA COOP Observations (1753-2011)
- NWS Radar Estimates (1993-2011)
- CoCoRaHS (1998-2011)
- Local & Regional Precip Networks
  (NERain, SD-AWDN, NDAWN, DOT, ALERT, etc)

Current Projects

- Update Extreme Storm Catalog
- Digitize Historic Storm Isohyetal Maps
- Convert Radar Imagery
- Compute Depth Area Duration
- Chena Basin Site Specific PMP Study
- Incorporate HMR52 into HEC-HMS
- Afghanistan PMP/PMF Criteria

Future Projects

- Update SPS Criteria
- Other Site-Specific PMP studies
- Review of District PMP studies
- Review of AE prepared PMP studies
- Combine Database with USBR and others
- Set up Web Site to Disseminate Data

Questions/Comments?