

USGS Water Data

Collection, Application and Delivery

Flood Warning User Forum Delaware River Basin

Narrowsburg, New York
September 28, 2010

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*Providing reliable, impartial, and timely data to
assess the quantity and quality of our nation's water
resources*

History of Streamgaging???

- The first systematic stream gages in New York were daily record in 1835 on Eaton and Madison Brooks in Madison County by private interests.*
- The earliest known streamflow measurement in New York was made in 1851 on Long Island by a private group.*
- Director John Wesley Powell establishes first gaging station in 1887. (Rio Grand River, NM)
- The oldest USGS gage in the Delaware River basin of New York is Delaware River at Port Jervis, 1903



*Research by A.J. Finch and R.C. Heath

Why does USGS measure streamflow?

- To provide Nat'l Weather Service with data for flood forecasting and for flood warning
- To compute flood frequencies for designing bridges, dams, flood control structures, flood plain designation, and flood insurance studies
- For issuing discharge permits to point sources & withdrawal permits to purveyors
- Water supply planning & drought management
- Compute loadings to develop water quality standards and TMDL's
- Study trends
- Boaters and fishermen use data to plan activities



How is streamflow computed?

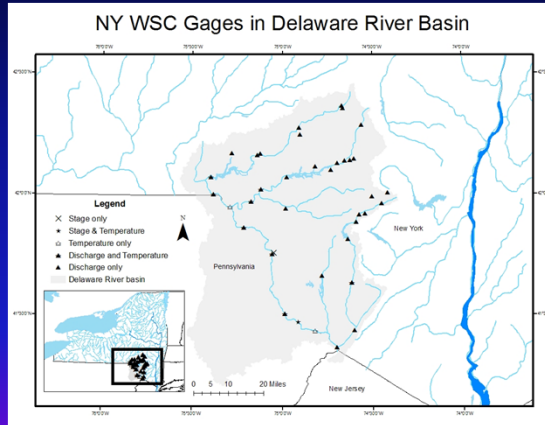
- Measure water depth in gage pool (Stage)
- Measure streamflow at various water levels
- Develop stage – discharge relationship (Rating)
- Record and transmit stage data to office and apply rating to compute discharge



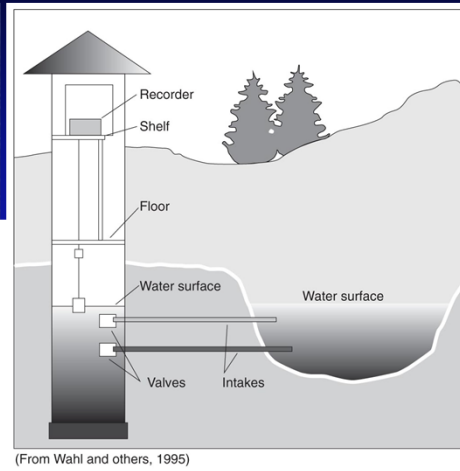
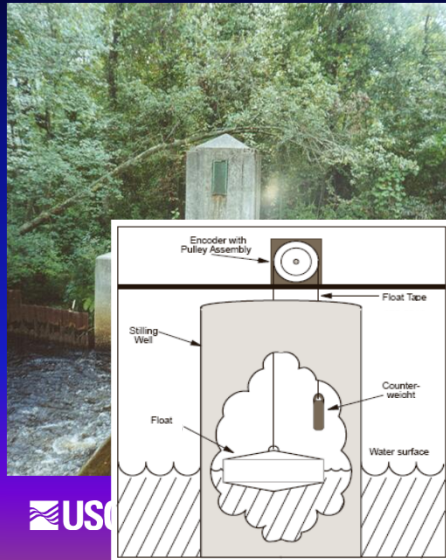
Streamgages in Delaware River Basin, New York

- 26 Discharge streamgages
- 8 Discharge and Water Temp.
- 2 Water Temp only
- 1 Stage only
- 1 Stage and Water Temp.

Total of 38 USGS gages



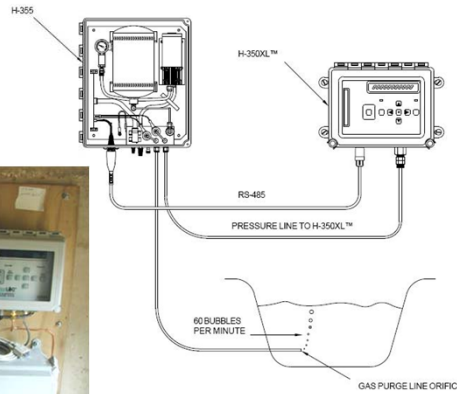
Gaging Station Design



New Gaging Station Design

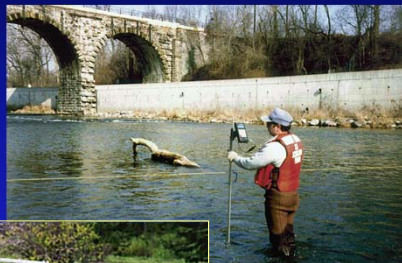


Typical Application Drawing



Streamflow Data Collection

Transitioning from mechanical means



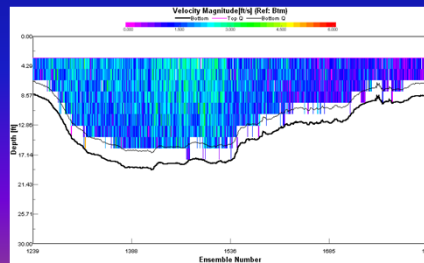
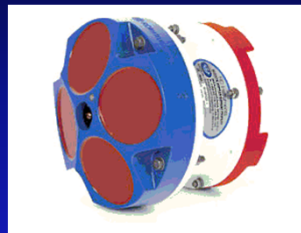
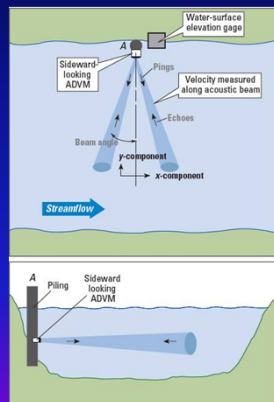
Streamflow Data Collection

To acoustic means



Streamflow Data Collection

Using acoustic technology



Satellite Telemetry

- Geostationary Operational Environmental Satellite (GOES)

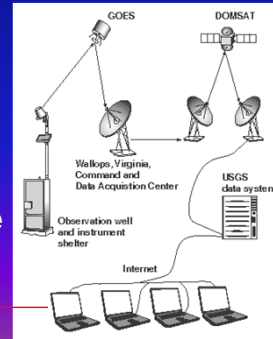
- Operated by NOAA (National Oceanic and Atmospheric Administration)
- Reliable
- Automatic switchover during primary failure

- Timed transmissions every hour

- Random transmissions when thresholds are exceeded

- Stream reaches exceeds flood stage

- Data transmitted to computer base stations and USGS archival database



Your computer

ny.water.usgs.gov

Water Data Report 2007

050200 WEST BRANCH DELAWARE RIVER AT WALTON, NY

Upper Delaware Basin
Upper Delaware Division

LOCATION: Lat 42°04'34" Long 79°07'07" referenced to North American Datum of 1983. Outcreek County, NY. Hydrologic Unit CODE: 01010101. On left bank at head end of segment of bridge, and 100 ft downstream from flow brink.

DRAINAGE AREA: 222 sq mi

SURFACE WATER RECORDS

PERIOD OF RECORD: October 1964 to current year

REVISED RECORDS: None for this station

NOTE: Water stage recorded and not stage gage. Station of gage is 1.06 ft above NOD of 1929.

REMARKS: Records good except those for estimated daily discharge, which are poor. Satellite and telephone gage height telemeter at station.

EXTREMES FOR PERIOD OF RECORD: Maximum discharge, 13,800 cfs, June 26, 2001, gage height, 16.6 ft, section gage height was 17.66 ft, from crest stage gage, minimum discharge, 0.0 cfs, Sept. 25, 1964, minimum gage height, 1.6 ft, Nov. 23, 1964.

EXTREMES FOR CURRENT YEAR: Peak discharge greater than base discharge of 4,000 cfs on 01/04/07.

Date	Discharge (cfs)	Gage height (ft)
Oct 22, 2007	2,310	6.02
Nov 07, 2007	6,700	9.02
Mar 05, 2008	11,200	11.51

Minimum discharge, 0 cfs, Sept. 4, gage height, 2.06 ft.

Water Data Report 2007

050200 WEST BRANCH DELAWARE RIVER AT WALTON, NY--Continued

DISCHARGE, CUBIC FEET PER SECOND

WATER YEAR OCTOBER ONE TO SEPTEMBER 30

DAILY MEAN VALUES

By month

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	1,040	1,510	757	472	4761	4135	1,550	760	164	105	125	79
2	1,170	1,490	1,260	780	4161	4317	1,480	822	201	97	112	74
3	920	1,340	809	630	4306	4499	1,270	704	228	91	114	70
4	840	1,030	808	567	4248	4448	1,200	665	319	97	110	67
5	822	891	738	599	4227	4387	1,440	547	320	134	95	63
6	1060	795	682	5260	4250	4111	1,180	487	252	156	87	60
7	662	718	677	1,540	4260	4329	1,020	433	190	135	85	58
8	517	641	617	2,020	4232	4155	914	417	170	124	118	58
9	486	1,560	553	1,840	4221	4338	808	387	155	123	121	135
10	441	1,690	511	1,520	4204	4338	727	423	170	177	164	124
11	405	948	407	1,280	4197	482	656	889	129	144	162	162
12	402	935	489	1,140	4187	486	812	596	123	150	278	1,210
13	397	976	496	1,270	4177	567	1,070	454	119	151	200	1,546
14	351	869	503	1,320	4210	1,040	839	403	112	130	171	389
15	339	812	490	1,240	4179	6,500	1,170	373	108	180	150	745
16	294	1,510	436	1,780	4252	4,550	3,980	389	100	97	155	618
17	303	3,940	407	1,070	4238	2,730	4,180	433	129	93	253	400
18	399	2,280	417	1,690	4227	1,980	3,840	363	168	96	188	341
19	354	1,800	366	1,480	4206	1,500	3,810	339	196	116	163	313
20	1,190	1,500	346	1,240	4189	1,280	3,620	436	372	313	143	293
21	1,770	1,240	337	973	4177	1,030	2,430	480	216	242	158	261
22	1,260	1,600	326	913	4170	1,130	2,290	421	268	159	116	232
23	1,090	1,200	500	817	4164	3,530	1,920	283	165	145	148	212
24	942	1,260	503	729	4159	2,690	1,730	260	140	140	205	189
25	898	995	425	642	4152	3,910	1,500	237	126	174	141	172
26	839	917	647	4417	4149	3,250	1,620	219	116	139	123	163
27	713	848	745	4798	4142	4,130	1,220	208	116	144	112	162
28	2,790	786	424	4794	4142	4,090	1,140	218	147	228	103	930
29	3,960	721	624	4790	---	1,600	211	140	140	229	95	937
30	2,480	670	603	4761	---	2,310	909	181	116	164	89	363
31	1,880	---	575	4794	---	1,850	---	166	---	---	---	---
Total	30,527	36,670	17,828	34,003	5,947	56,472	52,115	12,971	5,625	4,568	4,979	9,990
Mean	968	1,183	575	1,090	1,921	1,752	1,717	438	188	147	161	313
Max	2,015	1,605	2,002	1,880	2,052	2,935	2,953	1,564	2,241	389	942	1,312
Min	1,070	1,070	1,070	1,090	1,091	1,070	1,090	1,090	1,090	1,090	1,070	1,070
Std	15.4	17.3	139	94.6	147	371	452	190	70.6	38.9	24.2	15.8
CV	1.60	1.46	24.2	8.6	7.6	21.2	26.3	43.4	37.6	26.9	15.0	5.0

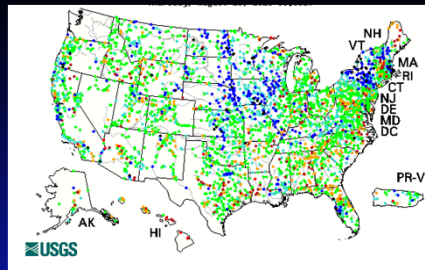
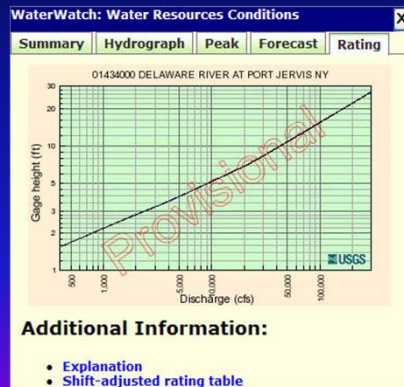
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 2006, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	366	643	729	609	667	1,175	1,241	669	396	313	362	218
Max	2,015	1,605	2,002	1,880	2,052	2,935	2,953	1,564	2,241	389	942	1,312
Min	1,070	1,070	1,070	1,090	1,091	1,070	1,090	1,090	1,090	1,090	1,070	1,070
Std	15.4	17.3	139	94.6	147	371	452	190	70.6	38.9	24.2	15.8
CV	1.60	1.46	24.2	8.6	7.6	21.2	26.3	43.4	37.6	26.9	15.0	5.0

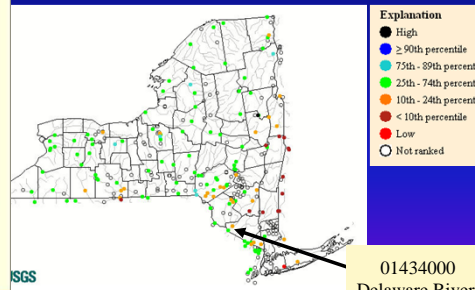
- Office information
- Locations
- Employees directory

Create press

Water Watch Real-time Surface Water Data



<http://water.usgs.gov/waterwatch>



Ratings Depot

- Expanded Base ratings, and latest shift-adjusted rating retrieved from all stage-discharge sites at 8 PM local time
- Available on web by site:
http://nwis.waterdata.usgs.gov/nwisweb/data/exsa_rat/01434000.rdb
- Tab delimited (rdb) format
- Detailed information on current variable stage shifts included



//WARNING
 # //FILE TYPE="NWSIS RATING"
 # //DATABASE NUMBER=1 DESCRIPTION=" Standard data base for New York"
 # //STATION AGENCY="USGS" NUMBER="01494000" TIME_2 # //UNITED STATES GEOLOGICAL SURVEY http://water.usgs.gov/
 # //STATION NAME="DELAWARE RIVER AT PORT JERVIS NY" # //NATIONAL WATER INFORMATION SYSTEM http://water.usgs.gov/data.html
 # //DD NUMBER=" 5" LABEL="Discharge (realtime 98vy) (cfs) # //DATA ARE PROVISIONAL AND SUBJECT TO CHANGE UNTIL PUBLISHED BY USGS
 # //PARAMETER CODE="00060"
 # //RATING SHIFTED="20100706200000 EST"
 # //RATING ID="59.1" TYPE="STGQ" NAME="stage-discharge" AG # //WARNING
 # //RATING REVISION=" Based on Reg. 57.0 and shift, added # //WARNING The stage-discharge rating provided in this file should be
 # //RATING EXPANION="logarithmic" # //WARNING considered provisional and subject to change. Stage-discharge
 # //RATING BREAKPOINT="2.40 BREAKPOINT="7.00
 # //RATING OFF
 # //RATING ON
 # //RATING DE
 # //RATING DA
 # //RATING DA
 # //RATING DA
 # //RATING DA
 # //SHIFT_FRE
 # //SHIFT_FRE
 # //SHIFT_FRE
 # //SHIFT_NEX
 # //SHIFT_NEX
 # //SHIFT_NEX
 INDEP SHIFT
 1.6N 1.6N
 1.57 -0.07
 1.58 -0.07 421
 1.59 -0.07 424
 1.60 -0.07 431
 1.61 -0.07 439
 1.62 -0.07 446
 1.63 -0.07 454
 1.64 -0.07 462
 1.65 -0.07 469
 1.66 -0.07 476
 1.67 -0.07 484
 1.68 -0.07 492
 1.69 -0.07 500
 1.70 -0.07 508
 1.71 -0.07 516
 1.72 -0.07 524
 1.73 -0.07 532
 1.74 -0.07 541
 1.75 -0.07 549

01434000 DELAWARE RIVER AT PORT JERVIS NY
 Stage height (ft) vs Discharge (cfs) graph showing a logarithmic relationship. The graph is labeled "PROVISIONAL" and includes the USGS logo.

//RATING OFFSEAL="J.00000000-01 US
 # //RATING_INDEP ROUNDING="22234567
 # //RATING_DEF ROUNDING="222233333
 # //RATING_DATETIME BEGIN="200810010
 # //RATING_DATETIME COMMENT=" Scr.
 INDEP DEF STOR
 1.6N
 0.1500000E+01 0.4100000E+03
 0.1000000E+01 0.1385000E+01
 0.4120000E+01 0.5630000E+04
 0.7000000E+01 0.2081000E+05
 0.7620000E+01 0.2500000E+05
 0.2500000E+02 0.2540000E+06
 0.2700000E+02 0.2945000E+06

Shift adjusted rating
Base rating

USGS

StreamMail

- Request, by email, the most recent USGS river stage and streamflow data for streams in the United States.
- To use the system, send an email to "streammail@usgs.gov" and in the "Subject" line, put in a **USGS station (site) number**.
- An email will be sent back to you with the most recent stream stage and flow.

USGS

Example of StreaMail Response

- U.S. Geological Survey (USGS) StreaMail:
The latest river stage and streamflow values you requested from StreaMail. Site: 01434000
Station name: Delaware River at Port Jervis, NY
Date: 09/23/2010
Time: 08:45:00
Stage: 2.67 feet
Streamflow: 1710 cubic feet per second (cfs)
- Link to charts for 01434000:
Stage:
http://waterwatch.usgs.gov/wwapps/zchart.php?i=nwis2&vt=uv&cd=00065&site_no=01434000
Streamflow:
http://waterwatch.usgs.gov/wwapps/zchart.php?i=nwis2&vt=uv&cd=00060&site_no=01463500
- The U.S. Geological Survey's (USGS) StreaMail system allows you to request, by email, the most recent USGS river **stage** and **streamflow** data for streams in the United States. To use the system, send an email to "streammail@usgs.gov" and in the "Subject" line, put in a USGS station (site) number. An email will be sent back to you with the most recent stream stage and flow.
- If you need help, contact Howard Perlman (hperlman@usgs.gov)



Water Alert

- Threshold notification system
- User selects station & desired notification settings; i.e. **data type**, **threshold condition**, and **frequency**
- Interactive map with search options
- Subscription form and Confirmation
- Text message or email sent to subscriber
- <http://water.usgs.gov/wateralert/>



Water Alert's Email Response when threshold reached

- Streamflow of 1710 cfs is below subscriber threshold of 1750 at 2010-09-23 08:15:00 EDT
01434000 00060 Delaware River at Port Jervis, NY
Notification interval, no more often than: Daily
 - For Realtime Data at this station:
http://waterdata.usgs.gov/nwis/uv/?site_no=01463500
 - To Delete this Specific Alert
reply with Subject: SIGNOFF hni-CrY2s
 - To Pause this Specific Alert for 5 days
reply with Subject: PAUSE hni-CrY2s 5
 - To List Settings
reply with Subject: LIST hni-CrY2s
 - To List Settings for all Notifications of the Same Address
reply with Subject: LIST ALL hni-CrY2s
 - For Help
reply with Subject: HELP hni-CrY2s
 - To Sign up for New Notifications
<http://water.usgs.gov/wateralert>
- To Modify a threshold, set a "new" notification with the same email address, site number and parameter



Send Questions to: GS-W_RT-HNS_Feedback@usgs.gov

Reply to Request for settings Email Subject: LIST hni-CrY2s

Your USGS WaterAlert request has been processed.

Site Number: 01434000
Station Name: Delaware River at Port Jervis, NY
Parameter Code: 00065
Parameter Name: Gage height
Agency Code: USGS
Notify when value exceeds subscriber threshold of 20.00 ft
Notification interval, no more often than: Daily
Address: tsuro@usgs.gov
Message type (e=email, t=text msg): e
Notification id: hni-Q6Lhb
For Help: <http://water.usgs.gov/hns?hni-Q6Lhb:01434000>



National Water Information System (NWIS WEB)

- Much of the hydrologic data collected by the USGS is available through the NWIS Web interface
- Surface water - Water flow and levels in streams, lakes, and springs ,
- Ground water - Water levels in wells
- Water quality data - Chemical and physical data for streams, lakes, springs, and wells
- <http://waterdata.usgs.gov>



Instantaneous Data Archive

- Time-series discharge data now available online at the Instantaneous Data Archive (IDA)
 - <http://ida.water.usgs.gov/>
- Enter station # or get a list of gages by state



Preparing for the future...

Flood hardening streamgages

Extending Ratings

Increased data transmit interval

Documented high-water-marks

Flood inundation mapping



Flood Hardened Gages

01427510 Delaware River at Callicoon, NY



Flood Hardened Gages

01428500 Delaware River abv. Lackawaxen River near Barryville, NY

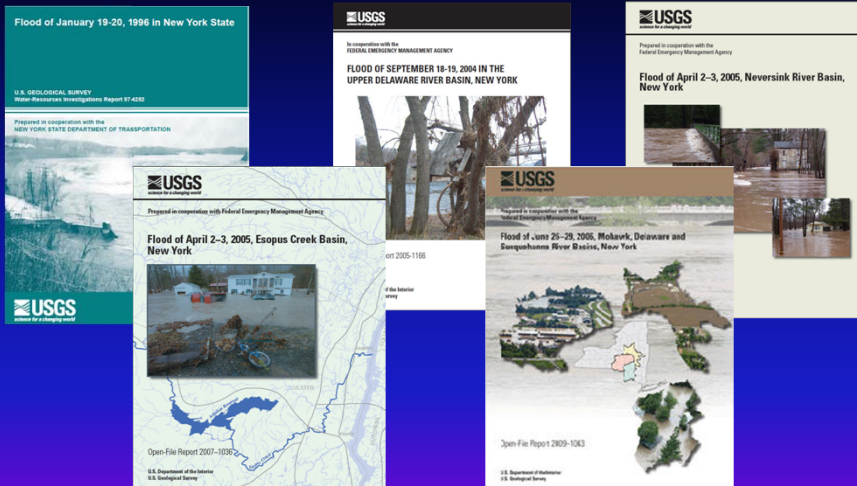


Major Flooding in New York

- USGS documented high-water-marks (HWMs) at hundreds of study sites.
- HWMs are used to evaluate current flood insurance studies and calibrate future studies.
- HWMs are used to verify areas of suspected inundation.
- HWMs are used to calculate peak discharges at ungaged sites to improve infrastructure design and FEMA FIS.
- Reports available online as a reference for designers, planners and the local community.



Recent USGS Flood Reports in NY



<http://ny.water.usgs.gov/publications/>

Floods are the most costly natural disaster, in terms of lives lost and property damaged

Since 1903 almost 9,000 flood-related deaths in the U.S.
Average about 100 deaths a year

From: NWS Flood Estimates http://www.nws.noaa.gov/oh/hic/flood_stats/recent_individual_deaths.shtml



Advanced warning saves lives and reduces property damage

New York received \$227 Million for June 2006 flood damages

10 percent is \$22.7 Million



Day, H.J. (1970). "Flood warning benefit evaluation-Susquehanna River Basin (urban residences)." ESSA technical memorandum WBTM Hydro-10. National Weather Service. Silver Spring, MD.

In A Perfect World...

- In a perfect world the public would use flood-warning information to take appropriate actions to prevent loss of life and property.
- The fact is people often do not respond to warnings and weather information.
- Inundation maps have been shown to effect public response –

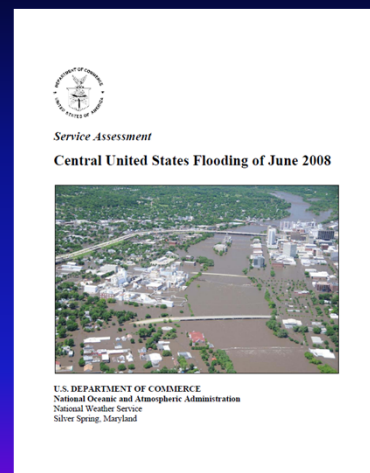
“The forecast map showed our house under water”

“I could see I would need to close Main Street near the river.”

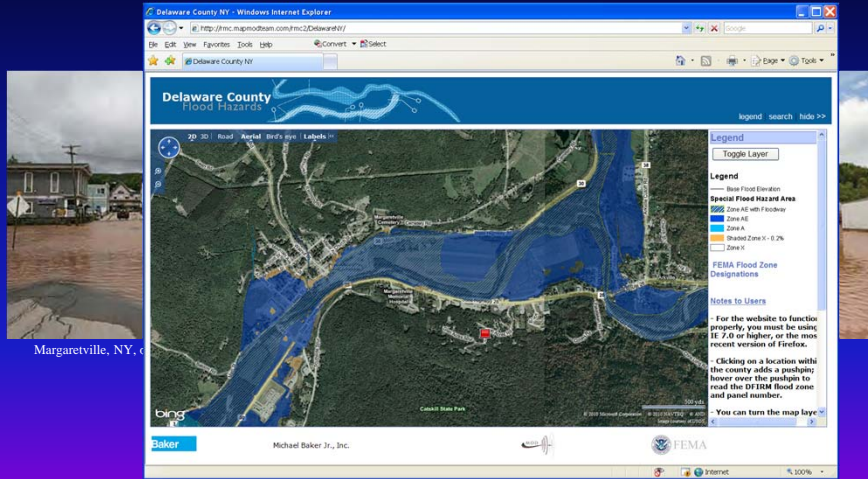


Central U.S. Flooding Assessment Team

- Team comprised of NWS, USACE, & USGS.
- Report contains a number of recommendations to improve customer service & interagency cooperation.

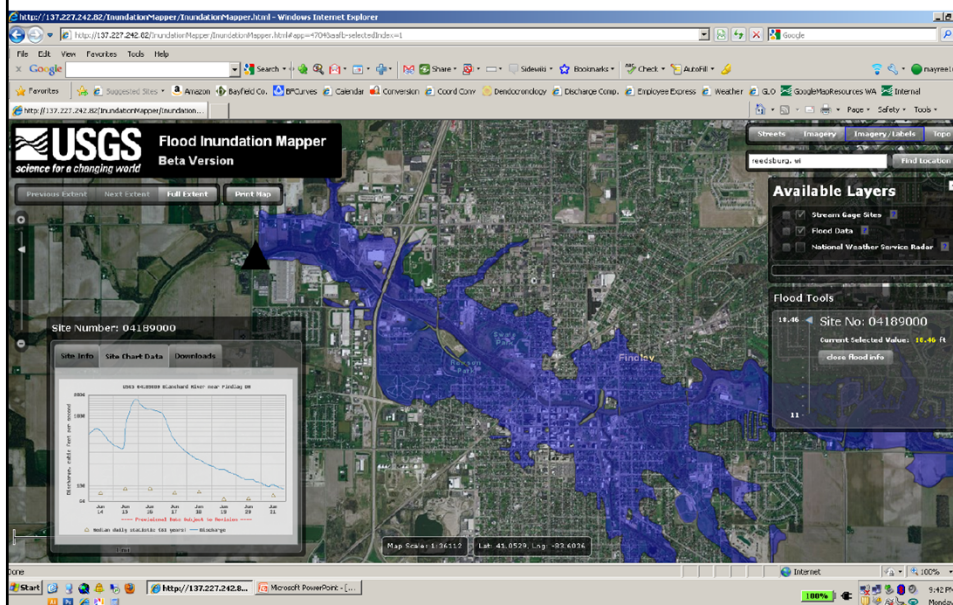


Propose pilot study of East Branch Delaware River at Margaretville, NY



USGS

WiM Flood Inundation Map Library Demo



Short term would include:

- Ability to print paper copies of maps at selected water stages;
- Interactive web-based map viewer with ability to pinpoint depth of water at your house, access road, hospital, etc.;
- Link to AHPS site to show forecast;
- Link from AHPS to show maps; and
- Report describing methods & results.



USGS Water Data

Collection, Application and Delivery

USGS is the Nations Science Agency

Remember... want **water** data ? Think **USGS**... put it together and get

water.usgs.gov

in New York → ny.water.usgs.gov



Contact Information

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