Response Planning for Drought and Flood Events

Photo courtesy of USDA-NRCS

West Virginia Water Resources Training Workshops

Presented by the Interstate Commission on the Potomac River Basin

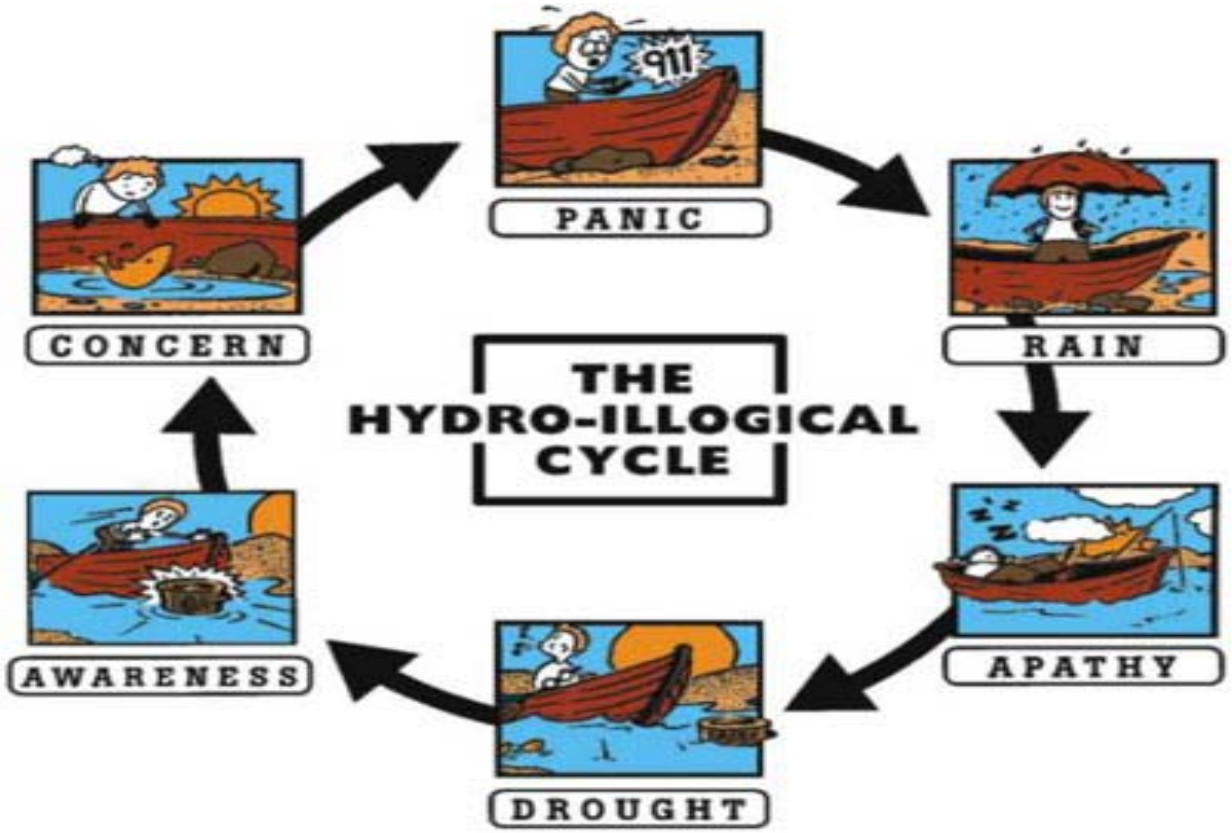
Sponsored by the West Virginia Department of Environmental Protection

With funding from the American Reinvestment & Recovery Act

Overview

- Introduction to floods and droughts in West Virginia
- Droughts
  - Definition
  - Drought management plans
  - Problems with drought management plans
  - Drought related resources
- Floods
  - WV flood resources
  - Identifying flood-prone areas
  - FEMA floodplain mapping
  - Flooding related resources

The Hydro-Illogical Cycle



Credit: National Drought Mitigation Center
From I.R. Tannehill, *Drought: Its Causes and Effects*, Princeton University Press, Princeton, New Jersey, 1947

Introduction

- West Virginia background
  - Floods more of a problem that droughts in general
  - But droughts can limit surface water supply and hurt agricultural communities

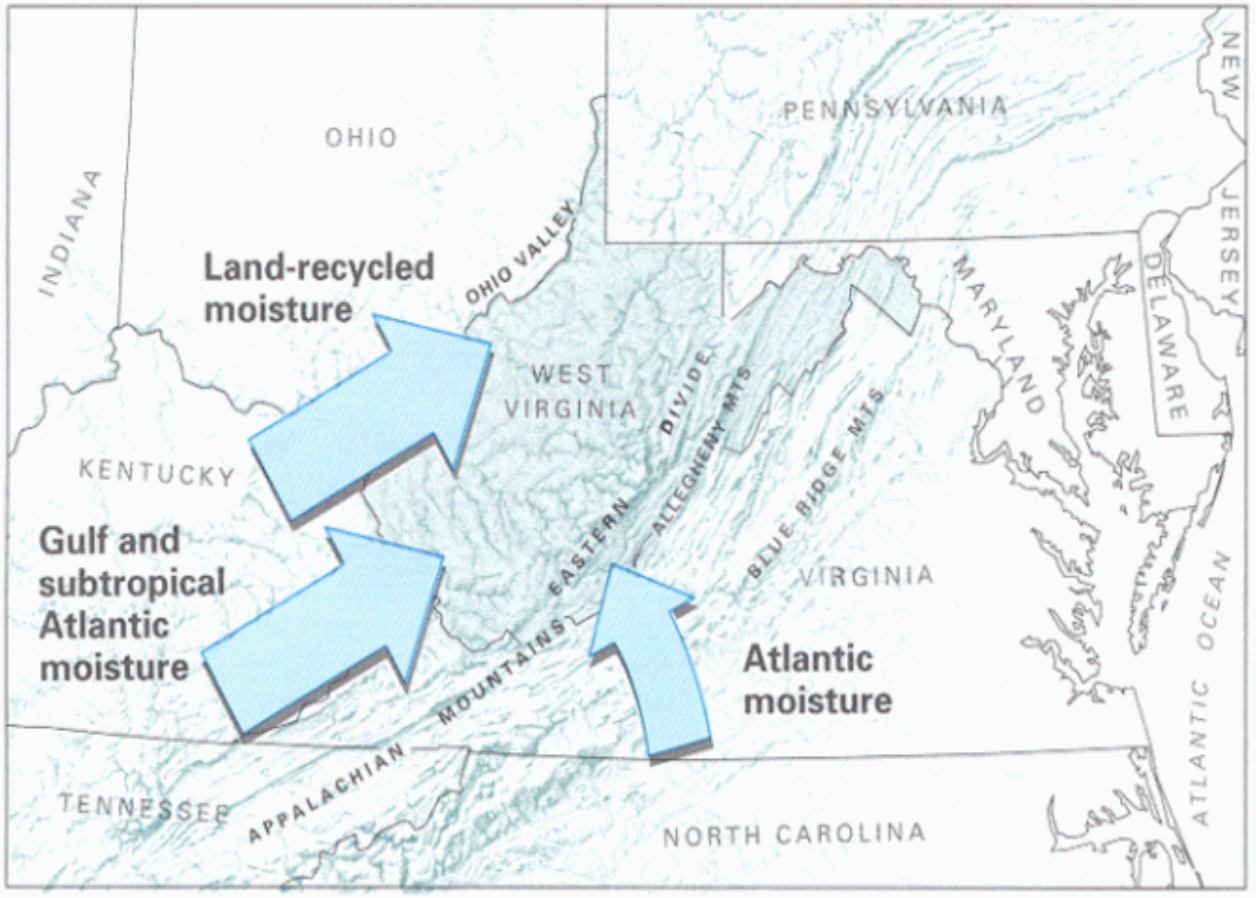


Figure 1. Principal sources and patterns of delivery of moisture into West Virginia. Size of arrow implies relative contribution of moisture from source shown. (Sources: Moisture delivery data from Douglas R. Clark and Andrea Lage, Wisconsin Geological and Natural History Survey.)

Introduction

Flood or drought	Date	Area affected (fig. 2)	Recurrence interval (years)
Flood	1877-88	Potomac and Monongahela River basins.	>50
Flood	1912	Big Sandy Creek and Tygart Valley River.	25 to >50
Flood	1918	Greenbrier and Cheat Rivers	>50
Drought	1929-32	Statewide	>25
Flood	1932	Gauley, Greenbrier, and Tygart Valley Rivers.	>50
Flood	Mar. 9-22, 1936	Potomac River basin and Cheat River.	25 to >100
Drought	1940-42	Regional drought	>25
Flood	1949	Potomac River basin	>50
Flood	June 25, 1950	West Fork River, Middle Island Creek, and Little Kanawha River.	25 to >50
Drought	1952-54	Statewide	10 to >25
Flood	Mar. 6-19, 1963	Tug Fork, Guyandotte, Big Sandy, Little Kanawha, Cheat, and Greenbrier River basins.	25 to 100
Drought	1963-70	Statewide	>25
Flood	Mar. 7, 1967	Kanawha and Monongahela River basins.	25 to >50
Flood	Feb. 26, 1972	Buffalo Creek	Unknown
Flood	Apr. 4-5, 1977	Tug Fork and Guyandotte River.	25 to >100
Flood	1980	Lost and Little Grave Creeks	>100
Flood	1984	Tug Fork and Guyandotte River.	25 to >50
Flood	Nov. 4-5, 1985	North-central and eastern areas of State.	25 to >100
Drought	1987-88	Statewide	Unknown

Drought

- Definition: “periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or streamflow” (US CoE, 2005)
- Types of drought (WVDEP, 2006)
  - Meteorological drought
  - Hydrological drought
  - Agricultural drought
  - Socioeconomic drought

Developing drought management plans

- Steps in preparation
  - Obtaining public input and involvement
  - Defining goals and objectives
  - Assessing water supply and demand conditions
  - Defining drought indicators
  - Identifying and assessing drought mitigation measures
  - Developing a drought index and management strategy

(AWRA, 2002)

Assessing supply and demand

- Identify water supply sources
- Research previous drought conditions
- Determine safe yield of sources
- Assess community water demand
  - Average and peak; Historic; User class; indoor vs outdoor; large users, projected demand, environmental demands
- Identify local conditions (laws, water conservation, etc.)
- Compare demand with availability
- Forecast potential deficit conditions

(AWRA, 2002)

Defining drought indicators

- Palmer index
  - Based on soil moisture supply and demand
- Reservoir storage
- Streamflow conditions
- Groundwater levels
- Precipitation

(AWRA, 2002)

Drought mitigation measures

- Public information and education
- Nonessential use restrictions
- Local regulations and ordinances
- Rationing schemes
- Large water user contingency plans
- Pricing

(AWRA, 2002)

Implementing drought management plans

- Formal adoption of the plan
- Implement the plan through an aggressive public information and education program
- Develop administrative procedures to ensure uniform enforcement
- Need for Variances

(AWRA, 2002)

Problems with traditional drought plans

- "May not recognize newer uses of water
- Usually designed for the drought of record, without consideration of the rarity of that drought
- Often are not understood or endorsed by those who will suffer the impacts of the drought
- May not sufficiently address equity issues or economic differences in the use of water
- Are often triggered by indicators not related in a known way to impacts
- Documents rather than ways of behaving"

(USACoE, 1995)

USGS science for a changing world

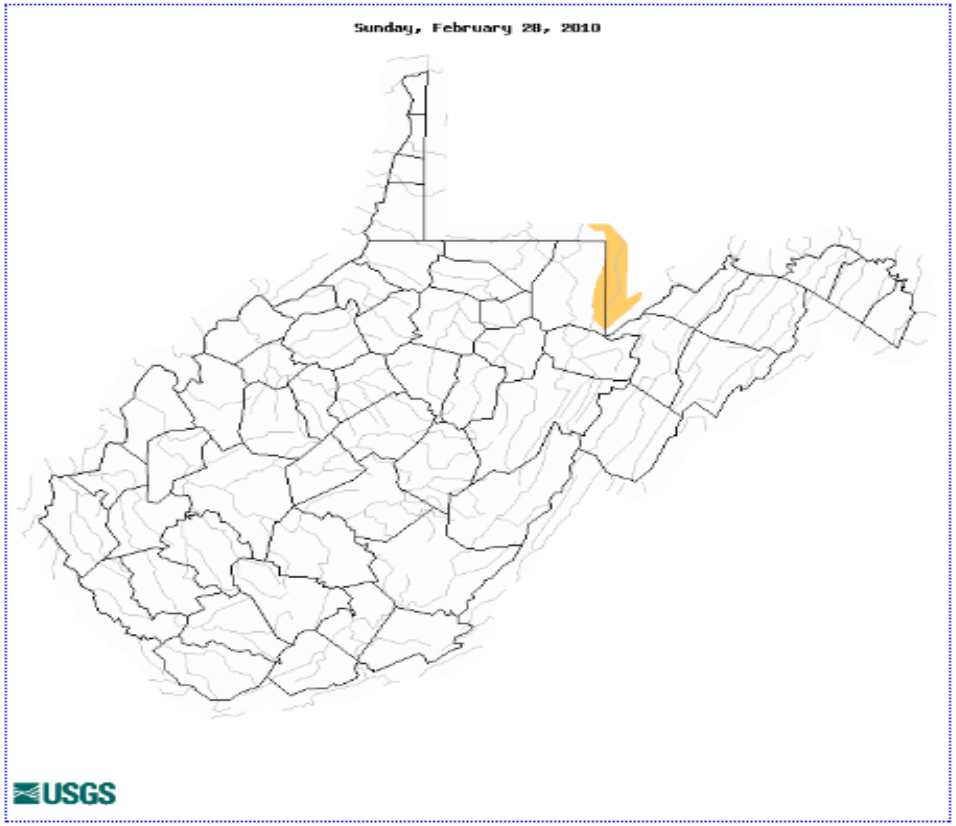
WaterWatch -- *Current Water Resources Conditions*

Current Maps/Graphs: | Flood Watch: | Drought Watch: State Drought Information | Recent/Historical Maps/Graphs:

State information | West Virginia

Drought Watch -- *USGS State Information on Drought*

Map of below normal 7-day average streamflow compared to historical streamflow for the day of year (West Virginia)



Click map to obtain more detailed drought information for the state

Explanation - Percentile classes				
Low	<=5	6-9	10-24	Insufficient data for a hydrologic region
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal	

Climate of Sep 2009

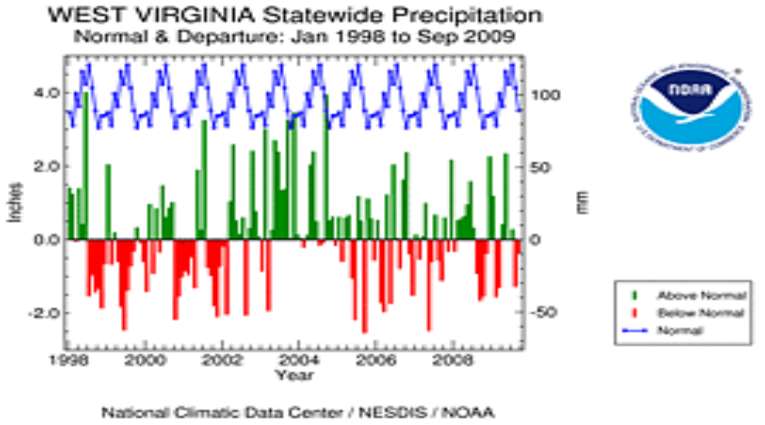
WEST VIRGINIA

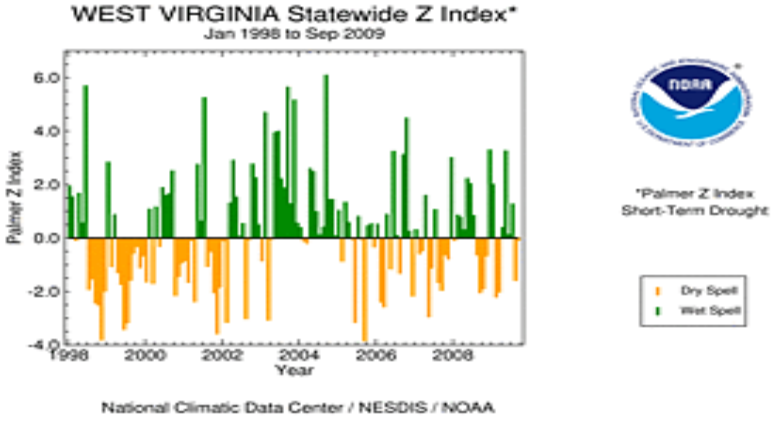
Moisture & Drought Status

National Climatic Data Center, 5 October 2009

Statewide Precipitation Ranks for WEST VIRGINIA
2008-2009

Period	Amount	Rank
Sep 2009 1-month period	3.14"	61st driest 55th wettest
Aug-Sep 2009 2-month period	6.00"	32nd driest 84th wettest
Jul-Sep 2009 3-month period	11.03"	40th driest 76th wettest
Jun-Sep 2009 4-month period	15.27"	42nd driest 74th wettest
May-Sep 2009 5-month period	22.18"	82nd driest 34th wettest
Apr-Sep 2009 6-month period	26.23"	81st driest 35th wettest
Mar-Sep 2009 7-month period	28.90"	72nd driest 44th wettest
Feb-Sep 2009 8-month period	30.46"	49th driest 67th wettest
Jan-Sep 2009 9-month period	35.11"	62nd driest 54th wettest
Dec-Sep 2008-09 10-month period	40.75"	88th driest 27th wettest
Nov-Sep 2008-09 11-month period	43.74"	81st driest 34th wettest
Oct-Sep 2008-09 12-month period	45.25"	67th driest 48th wettest





http://www.ncdc.noaa.gov/oa/climate/research/2009/sep/st046dv00pcp200909.html

National Integrated Drought Information System

U.S. Drought Portal

www.drought.gov

HOME | WHAT IS NIDIS? | CURRENT DROUGHT | FORECASTING | IMPACTS | PLANNING | EDUCATION | RESEARCH | RECOVERY

Area Drought Information

Select State... Go

Select Region... Go

Maps & Tools

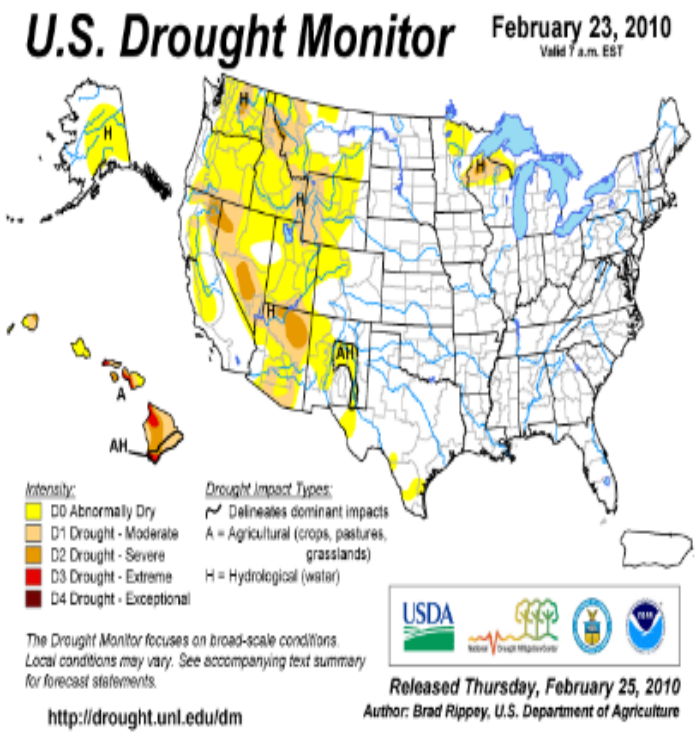
- Map Viewer - **updated!**
- GIS Resources
- Geodata Portal
- Drought Monitor Graphics
- Data Visualizations

Events & Announcements

- NADM Workshop - April 19-23, 2010
- Scoping workshop ACF Basin - Lake Blackshear, GA - December 2009
- Map Viewer now includes US Drought Outlook - New!
- CRN Soil Data - New!
- Drought Monitor Forum - Austin 2009

Featured Products

Where are Drought Conditions Now? | How is the Drought Affecting Me? | Will the Drought Continue?



http://www.drought.gov/portal/server.pt/community/drought_gov/202

Floods

- WV Water Resources Protection Act includes identifying and mapping
  - Historically flood-prone areas of the state
  - Anthropogenic factors exacerbating flood conditions
  - Areas in which high flows negatively affect beneficial uses

(WVDEP, 2006)

Floods

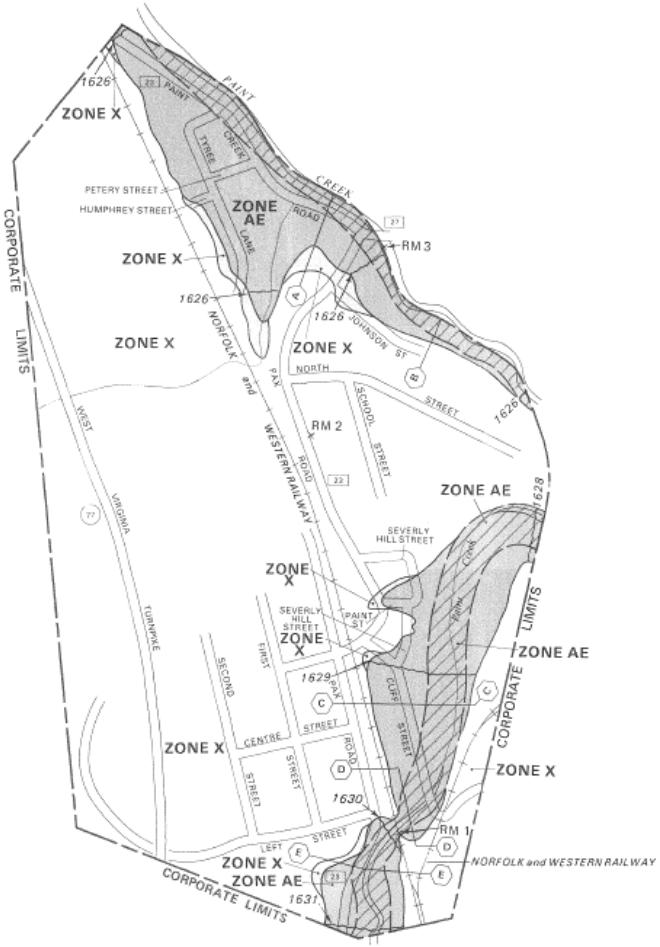
- Key WV flood resources
  - The Flood Advisory Technical Taskforce Report
  - WV Statewide Flood Protection Plan
    - http://www.wvca.us/flood/
  - State All-Hazards Plan
  - FIRM Maps
  - IFLOWS Warning System

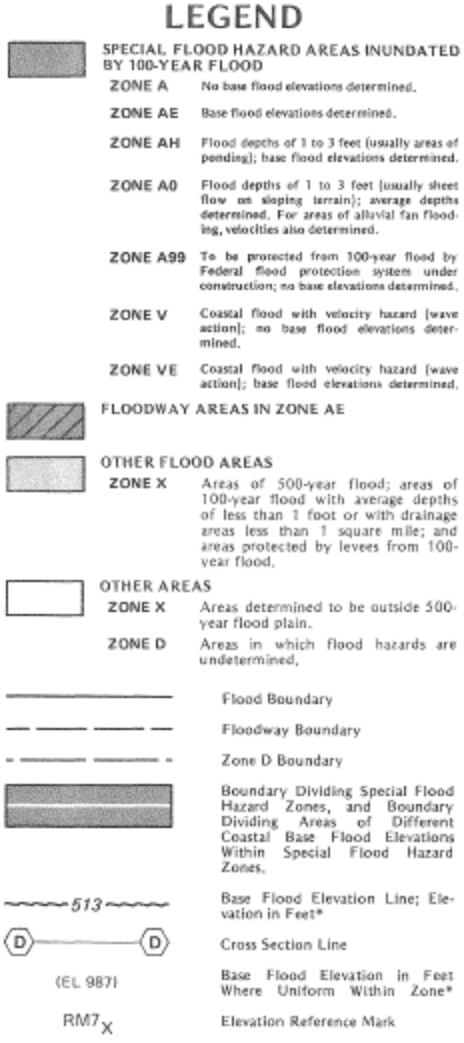
(WVDEP, 2006)

Floods

- 4 approaches to identifying flood prone areas (WVDEP, 2006):
  - Obtaining existing flood monitoring data (ex agencies that collect this type of data – NCDC and dept of homeland security)
  - Obtaining indirect flood monitoring data (ex. Evaluate cost of flood damage)
  - Streamflow analysis (limited applicability on ungaged streams/rivers)
  - Simulate land & river characteristics likely to contribute to flooding

FEMA Floodplain Mapping





http://msc.fema.gov/webapp/wcs/stores/servlet/CategoryDisplay?catalogId=10001&storeId=10001&categoryId=12001&langId=-1&userType=G&type=1
http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/ffr_overview.jsp

WV Flood Hazard Determination Tool - Mozilla Firefox

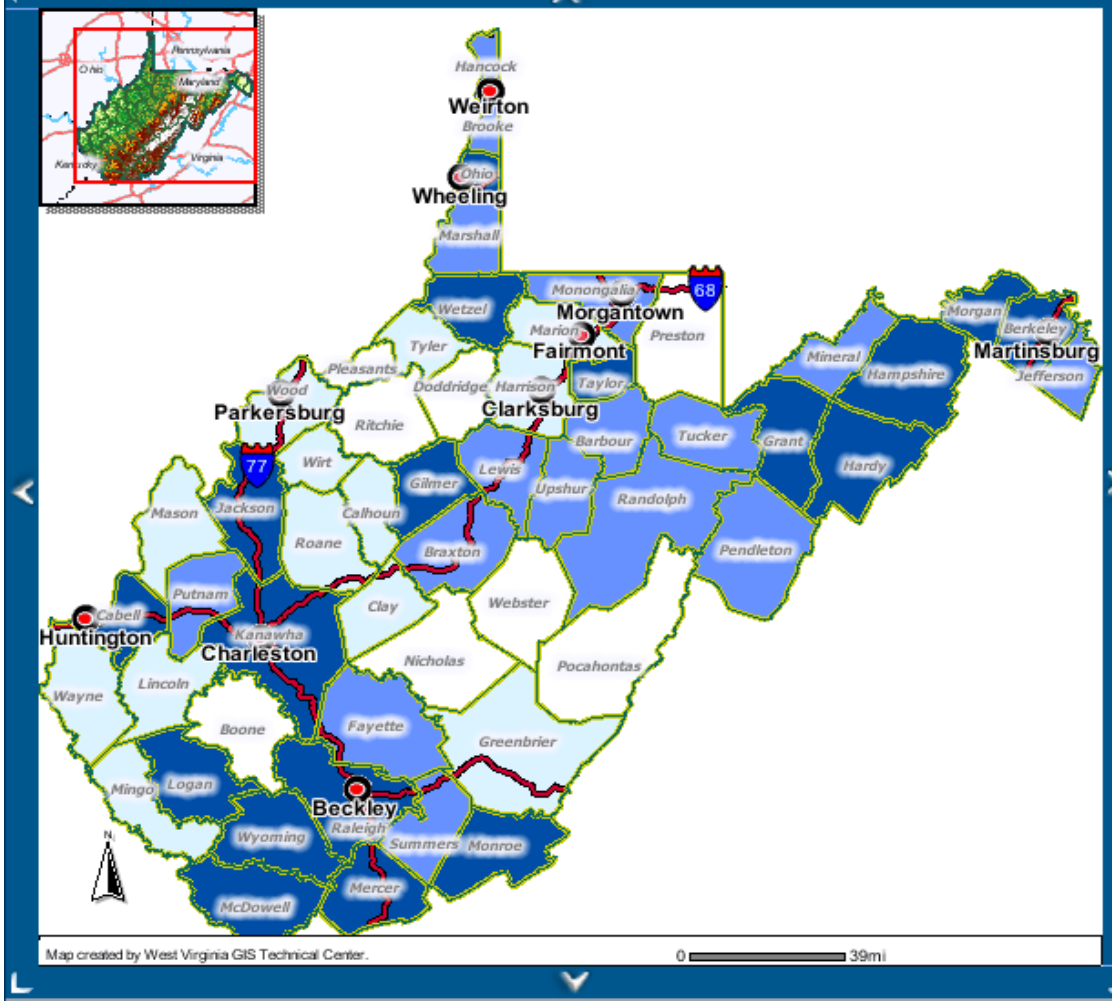
http://www.mapwv.gov/FloodTool/viewer.htm

WV Flood Hazard Determination Tool

an online mapping resource

MAP WV

Address Locator | Layers | Help | About



FLOOD HAZARD TOOL: Click on an identified location using the Flood Hazard Determination Tool to make an initial assessment of flood hazards.

DATA AVAILABILITY: Various formats of flood hazard data are available for 46 West Virginia counties (see FEMA data status graphic).

FEMA Data Status Disclaimer

- *DFIRM*
- *Provisional DFIRM*
- *Q3*
- *No Data*

FLOOD HAZARD LAYERS Disclaimer

- Flood Hazard Area
- Floodway Area
- FEMA Index
- No Data Counties

REFERENCE LAYERS Disclaimer

BACKGROUND LAYERS

Invisible at current scale.

-Zoom to Cities- -Zoom to County-

Scale 1:2762848 **Lon, Lat:** W 77°49'22", N 39°16'37" **UTM:** 774071.84, 4352329.61 WV Floodplain Contacts | Local Floodplain Managers | FEMA Map Viewer | FEMA Map Store

USGS
science for a changing world

WaterWatch -- *Current Water Resources Conditions*

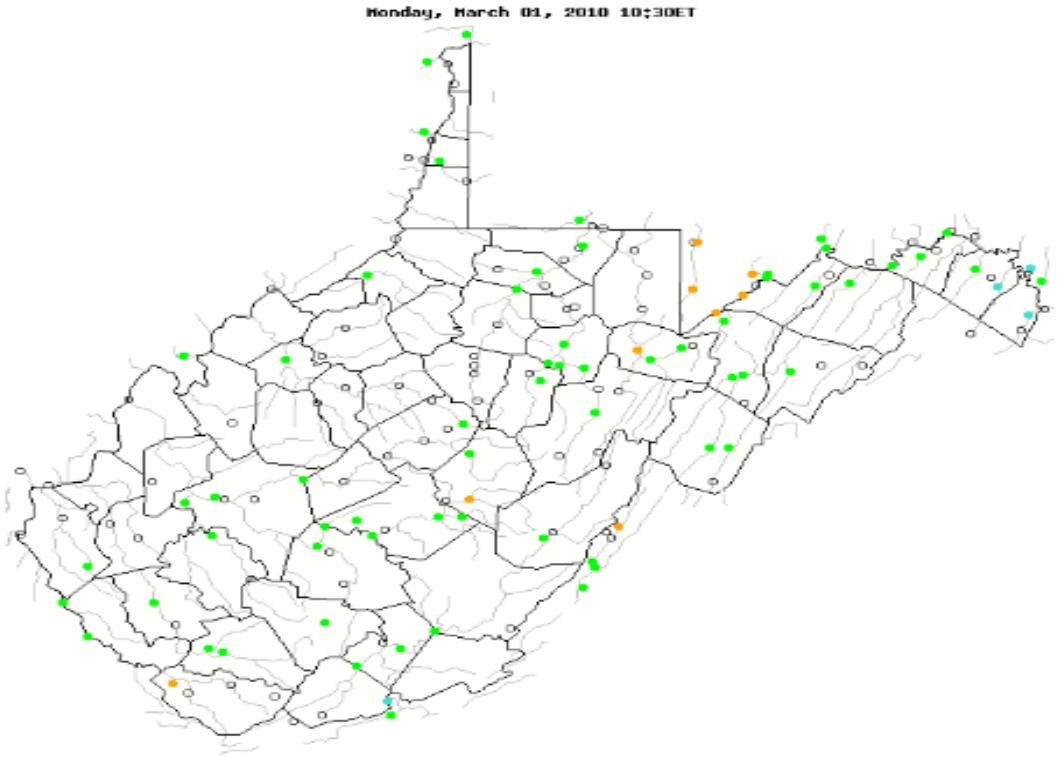
Current Maps/Graphs: Current Streamflow | Flood Watch: | Drought Watch:

Map | West Virginia | Water-Resources Regions

WaterWatch -- *Current water resources conditions*

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

Google Maps version of this map



USGS

Choose a data retrieval option and select a location on the map

List of all stations | Single station | Nearest stations | Peak flow

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

http://waterwatch.usgs.gov/?m=real&r=wv&w=map

References

- AWRA. 2002. Drought management handbook. Denver, CO. 121p.
- USACoE. 1995. National study of water management during drought: the report to the U.S. Congress. IWR Report 94-NDS-12.
- WVDEP. 2006. Water resources protection act water use survey final report. West Virginia Department of Environmental Protection. Submitted to the Joint Committee on Government and Finance, West Virginia Legislature.