Current Situation With Floodplains

- Many layers of complexity at Federal, State and local levels.
- Biggert-Waters Act to end loans from US Treasury to FEMA to cover flood losses.
- Homeowner Flood Insurance Affordability Act made modifications to B-W
- The new provisional maps for Tioga county are under review.
- We are working with the municipalities to update their Floodplain Ordinances.
What we do have & know

- The County has an All Hazard Mitigation Plan updated and adopted in 2011.
- This plan outlines some procedures and methods to mitigate flooding.
- We have the support and resources from FEMA to implement some floodplain projects – ie. Buyouts for repetitive loss structures (only 2 on record in the valley)
- We have detailed mapping capabilities for determining locations and elevations of structures and base flood elevations.
What we don’t know

- What the Federal & State Government will do about the Flood Insurance issue.
- When the next flood will occur and it’s extent.
- Best approach for mitigating flood impacts to protect business and residents in the Mansfield Valley.
## Recent Floods on the Tioga River

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/11/03</td>
<td>Countywide.</td>
<td>Flood – The Tioga River at Mansfield exceeded its flood stage of 9 feet, cresting at 9.24 feet.</td>
</tr>
<tr>
<td>3/2/04</td>
<td>Wellsboro Borough.</td>
<td>Flood.</td>
</tr>
<tr>
<td>3/17/04</td>
<td>Middlebury Township.</td>
<td>Flood.</td>
</tr>
<tr>
<td>7/14/04</td>
<td>Elkland.</td>
<td>Flash flood – Roads closed in Elkland and two homes had a partial basement collapse due to flooding.</td>
</tr>
<tr>
<td>7/27/04</td>
<td>Countywide.</td>
<td>Flood – The Tioga River at Mansfield exceeded its flood stage of 9 feet, cresting at 9.3 feet.</td>
</tr>
<tr>
<td>8/30/04</td>
<td>Countywide.</td>
<td>Flash flood – Flash flooding resulted in five road closures, basement flooding, and a vehicle rescue.</td>
</tr>
<tr>
<td>9/08/04</td>
<td>Multiple Counties.</td>
<td>Flood – The remnants of Hurricane Frances producing heavy rainfall and flooding in multiple Pennsylvania counties.</td>
</tr>
<tr>
<td>9/17/04</td>
<td>Multiple Counties.</td>
<td>Flood – The remnants of Hurricane Ivan moved across Pennsylvania weakening to a tropical depression and causing up to 8 inches of rain in a 12 hour period in some areas of the state. Flood damage estimates statewide were over $260 million. In Tioga County, the Tioga River at Mansfield exceeded its flood stage of 9 feet, cresting at 14.21 feet. The Tioga River at Tioga Junction exceeded its flood stage of 15 feet, cresting at 15.33 feet.</td>
</tr>
<tr>
<td>1/14/05</td>
<td>Countywide.</td>
<td>Flood – The Tioga River at Mansfield exceeded its flood stage of 9 feet, cresting at 9.09 feet.</td>
</tr>
<tr>
<td>4/02/05</td>
<td>Countywide.</td>
<td>Flood – The Tioga River at Mansfield exceeded its flood stage of 12 feet, cresting at 12.30 feet.</td>
</tr>
<tr>
<td><strong>6/27/06</strong></td>
<td>Multiple Counties.</td>
<td>Flash flood – Flash flooding resulted in a Declaration of Disaster Emergency for 46 Pennsylvania Counties. Twenty-one counties were given federal disaster designation status. In Tioga County, numerous roads and bridges were closed due to flood waters. One of the bridges was scoured and 2 others were damaged by debris.</td>
</tr>
<tr>
<td>7/21/06</td>
<td>Elkland.</td>
<td>Flash flood – Several roads were closed due to flooding in Elkland.</td>
</tr>
<tr>
<td>3/15/07</td>
<td>Countywide.</td>
<td>Flood – Heavy rains combined with rapid snowmelt led to flooding and road closures.</td>
</tr>
<tr>
<td>8/30/07</td>
<td>Countywide.</td>
<td>Flash flood – A stationary thunderstorm caused isolated flash flooding in Tioga County.</td>
</tr>
</tbody>
</table>

From: Tioga County All Hazard Mitigation Plan 2011
CURRENT FLOOD PLAIN

Richmond, Covington, & Putnam Township FIRM maps
Became effective the summer of 1980
Tioga County G.I.S. acquired this data from PASDA around 2002.

PASDA:
Pennsylvania Spatial Data Access
(public access geospatial information clearinghouse)
AN EXAMPLE OF ADDRESSED STRUCTURES EFFECTED BY THE PRELIMINARY D-FIRM FLOOD PLAIN

Red: Higher density of addressed structures.

Yellow: Medium density of addressed structures

Green: Low density of addressed structures
AN EXAMPLE OF ADDRESSED STRUCTURES EFFECTED BY THE PRELIMINARY D-FIRM FLOOD PLAIN

Red: Higher density of addressed structures.

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Green: Low density of addressed structures.
THE PRELIMINARY D-FIRM MAPS

Preliminary D-FIRM maps released to Municipalities in May 2010
(D-FIRM maps currently provisional until July 16, 2015)
EXAMPLE OF THE 2010 PRELIMINARY D-FRIM MAP GIVEN TO MUNICIPAL OFFICIALS

Higher detail of flooding areas
Better base map for easier use
SOME OF THE TOOLS FEMA USED TO DETERMINE THE FLOOD MAPS.

• LIDAR
• Existing Elevation Data & Hydrology studies
• USGS stream gage data.
• Aerial photography
LIDAR: WHAT IS IT AND HOW DID FEMA USE IT TO CREATE OUR PRELIMINARY D-FIRM MAPS?
LIDAR: is a laser pulse that determines the distance to an object or surface.
D-FIRM data was provided to the Tioga G.I.S. Department and Planning Department by FEMA at the FEMA preliminary roll out.
Using the LiDAR Point Cloud a 3D surface model was created.

GIS Hydrology & Flood Vector data overlaid on the 3D model

Red lines: Current flood plain
Blue lines: Current hydrology
WHY DOES FLOODPLAIN MANAGEMENT MATTER?
01516350 Tioga River near Mansfield, PA

<table>
<thead>
<tr>
<th>Date</th>
<th>Stage, feet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-09-09</td>
<td>12.52</td>
<td>Current Stage -0.13 feet on 2013-09-09 13:00:00 (provisional)</td>
</tr>
<tr>
<td>2013-01-27</td>
<td>20.13</td>
<td>Recent Maximum Stage (previous 365 days) 12.52 feet on 2013-01-27 (provisional)</td>
</tr>
<tr>
<td>1975-09-00</td>
<td>18.87</td>
<td>Highest Recorded Peak Stages at Current Datum</td>
</tr>
<tr>
<td>1994-08-18</td>
<td>16.57</td>
<td>National Weather Service Flood Stage 12 feet</td>
</tr>
<tr>
<td>1996-12-02</td>
<td>16.50</td>
<td></td>
</tr>
</tbody>
</table>

Graph showing water stages over time with peaks and current levels.
Characteristics of a Floodplain

Floodplain

Flood Fringe

Floodway

Base Flood Elevation (BFE)

Normal Channel

Fill

Source: NFIP Guidebook, FEMA
FLOODPLAIN ORDINANCES

- Remember the goal is to: Protect the health, safety, and welfare of your residents and businesses

- Generally
  - Floodways: no increase
  - 1 ½ ft above Base Flood Elevation
  - Not allowed to raise the BFE more than 1 Ft
  - Hazardous material restrictions
  - Manufactured Home restrictions – not allowed in FW or 50ft from top of bank
FLOODPLAINS AND FILL

100 YEAR FLOODPLAIN

- Flood Fringe
- Floodway
- Flood Fringe

- Encroachment
- Flood elevation for existing conditions
- Flood elevation after complete encroachment of flood fringe

Surcharge up to 1 foot

STREAM CHANNEL
FILLING A FLOODPLAIN

BEFORE DEVELOPMENT

AFTER DEVELOPMENT

Re-grading / Filling
WHY ARE FLOODS GETTING MORE EXPENSIVE?
NEW FLOOD INSURANCE RATES

NFIP Rating Examples:
The Impact of Loss of Subsidies

Rate comparisons

Non-Actuarial
$2,235/yr
1 foot above BFE
$519/yr
Building- $200,000 Contents- $80,000 (2012 Rates)

Actuarial
$5,623/yr
1 foot below BFE
$2,235/yr
10 feet below BFE
$25,000+/yr
WHY IS IT FLOODING MORE FREQUENTLY?

Figure 1: Degrees of Imperviousness and its Effects on Stormwater Runoff These four images show increasing amount of stormwater runoff as the area becomes developed with more impervious surfaces. Source: In Stream Corridor Restoration: Principles, Processes, and Practices (10/98) By the Federal Interagency Stream Restoration Working Group (FISRWG) (15 Federal agencies of the U.S.)
FLOOD PROOFING

A
- Existing floor joists
- Steel support beams
- Temporary steel lifting beam
- Openings out for beams
- New permanent openings for floodwaters

B
- The house is raised
- Jack raised on temporary cribbing

C
- The foundation walls are extended as the house is raised, and permanent openings for floodwaters are created
- Newly extended foundation wall

D
- Flood level
- Depending on final height of extended foundation, area under house may be used for parking, storage, or access
FLOOD PROOFING

Flood Vents

- Passive Wet

HVAC components raised to second floor or attic

Concrete floodwall around HVAC components below flood level

100-year flood level
WHAT ELSE CAN WE DO?
STREAM RESTORATION

Before

After
Previous land use changes and modifications to the stream channel resulted in an unstable channel on the WFWR (Left). Using a natural channel design, a 1,800 ft section of the river was restored to a stable condition (right).

Prior to restoration, streambanks were eroding as much as 13 ft/hr for an average flow year (left). After realigning the river channel, a series of ephemeral wetlands were created (right) where the highest erosion rates were observed.

In past decades, several levees were built along the river channel preventing the river from accessing its natural floodplain. This activity resulted in stream channel degradation and accelerated streambank erosion (left). Implementation of the restoration design included perforating the old levees to provide river access to the floodplain. Allen structures made from natural materials were built to deflect high velocity water to the center of the channel (right).
1 acre of wetlands can store about 1-1.5 million gallons of floodwater.
Next Steps:

- Understand there are no simple solutions to this issue.
- Continue to gather data and information
- Working at the County Level to expand our capabilities – GIS, Planning, and Emergency Services & Response.
- Encourage all to participate in the multi-municipal comprehensive plan that is ongoing.
- Participate in available training at state and federal level.
- Explore participating in the Community Rating System with FEMA.
QUESTIONS?