


Bureau of Waterways Engineering and Wetlands

Programs Overview

Citizens Advisory Council

August 20, 2019

Tom Wolf, Governor

Patrick McDonnell, Secretary

Office of Water Programs

- Chesapeake Bay Office
- **Bureau of Waterways Engineering & Wetlands**
- Bureau of Clean Water
- Office of Water Resources Planning
- Bureau of Safe Drinking Water

South Fork Dam – Johnstown PA

Johnstown, Pennsylvania
May 31, 1889

Failure of the South Fork Dam caused an estimated $17 million in damages.

Fatalities: 2,209



Division of Dam Safety

Pennsylvania Department of Environmental Protection

Bureau of Waterways Engineering & Wetlands

Division of Dam Safety

Austin Dam – Potter County

Austin Dam

Austin, Pennsylvania
September 30, 1911

Failure of the Austin Dam caused an estimated $10 million in damages.

Fatalities: 78

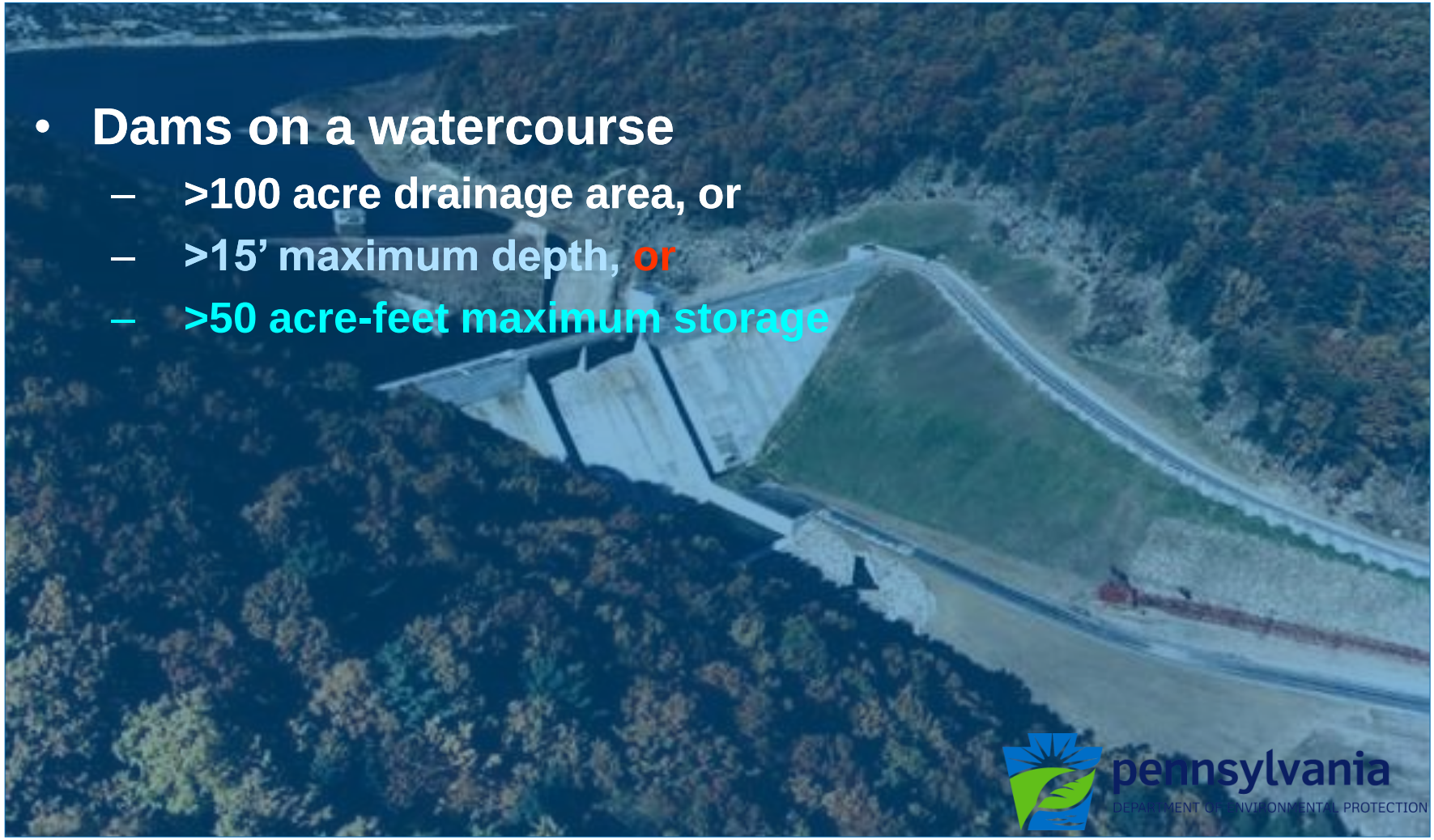
Regulation of Dams in Pennsylvania

- Jurisdiction
- Hazard Classification
- Emergency Action Plans
- Annual Inspections
- Permits and Authorizations

When Does DEP Have Jurisdiction?

- Dams on a watercourse
- Dams not on a watercourse

When Does DEP Have Jurisdiction?



- **Dams on a watercourse**
  - **>100 acre drainage area, or**
  - **>15’ maximum depth, or**
  - **>50 acre-feet maximum storage**

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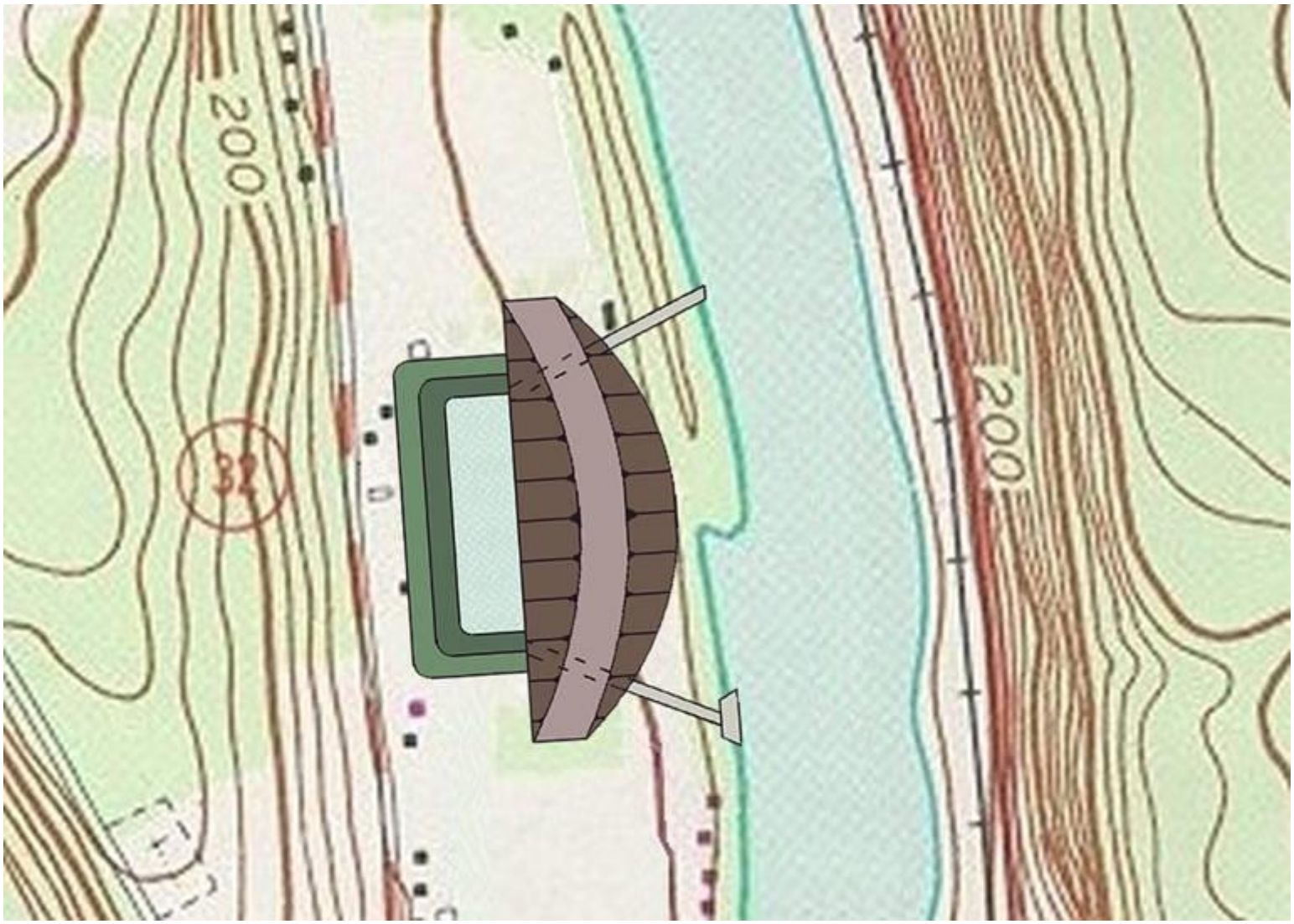
DEPARTMENT OF ENVIRONMENTAL PROTECTION

When Does DEP Have Jurisdiction?

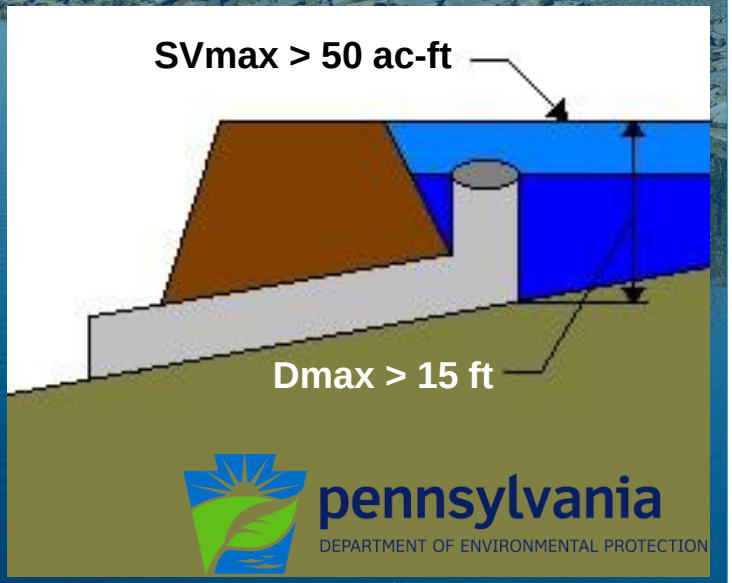
- **Dams on a watercourse**
- **Dams not on a watercourse**

Dams Not On A Water Course



When Does DEP Have Jurisdiction?

- Dams not on a watercourse
  - >15’ maximum depth, and
  - >50 acre-feet maximum storage



Dams Under Jurisdiction

Dams Currently Under the Jurisdiction of DEP Division of Dam Safety

3382 Dams

Hazard Classification of Dams

- Size and Potential for Damage
- Spillway Design Flood
- Level of Geotechnical Investigation
- Emergency Action Plans
- Annual Inspections

High Hazard Dams

What is a High Hazard Dam?

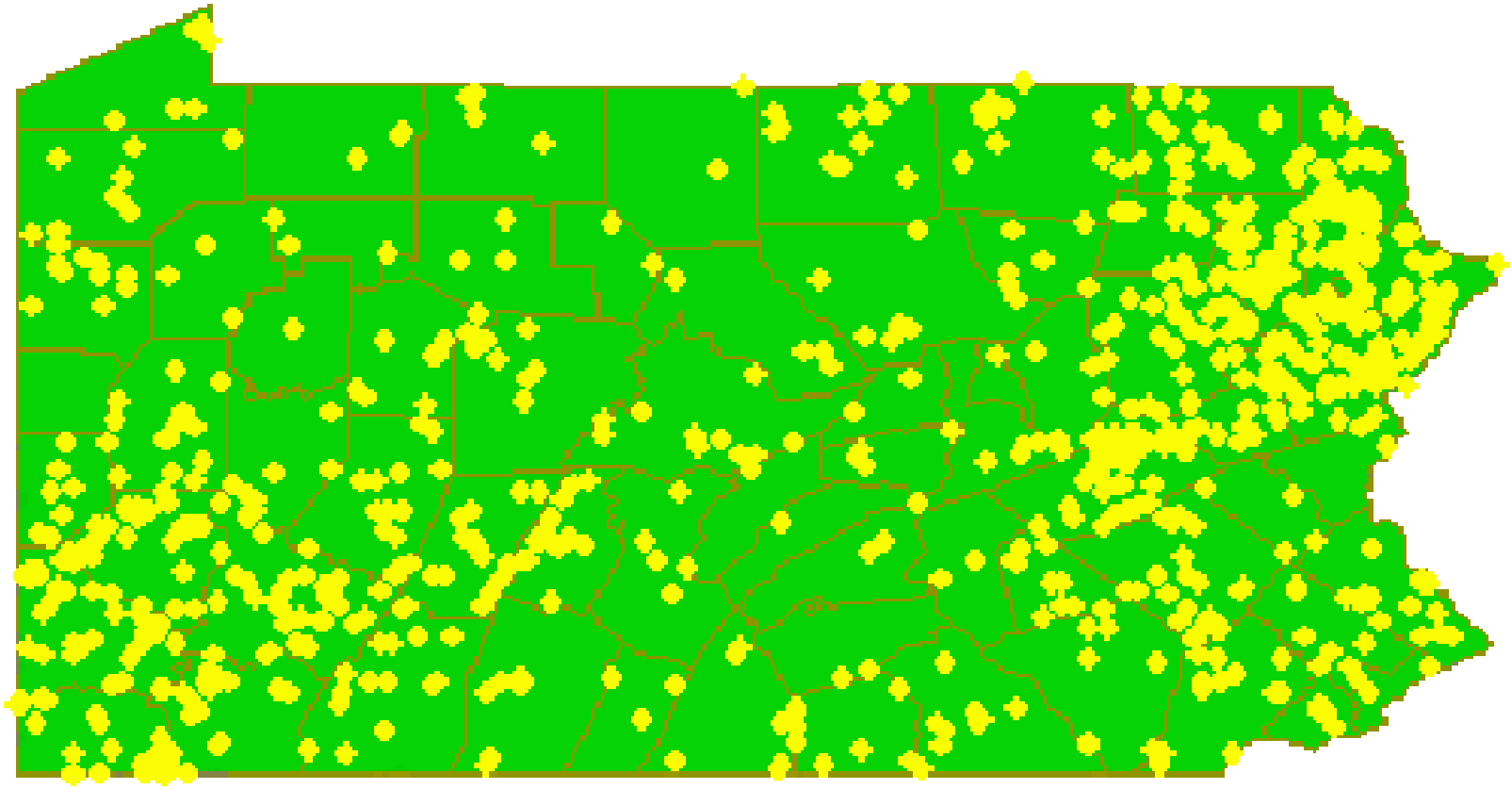
A dam so located as to endanger populated areas downstream by its failure.

Dams Under Jurisdiction

Hazard Classification of Dams Currently Under the Jurisdiction of DEP Division of Dam Safety

- 744 High Hazard Dams
- 291 Significant Hazard Dams
- 2347 Low Hazard Dams

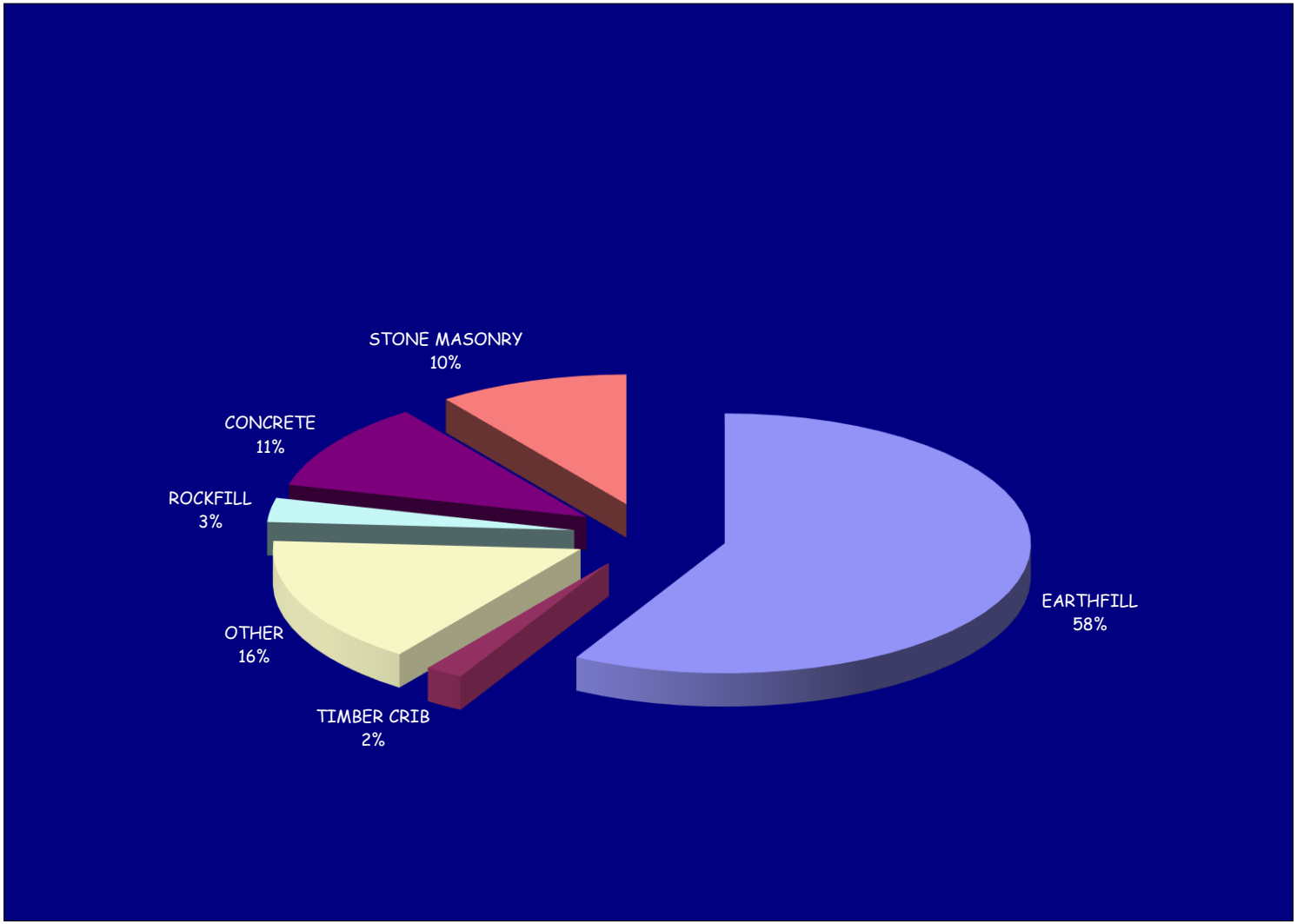
High Hazard Dams in Pennsylvania



Dam No. 1 ?

Dam No. 1 ?

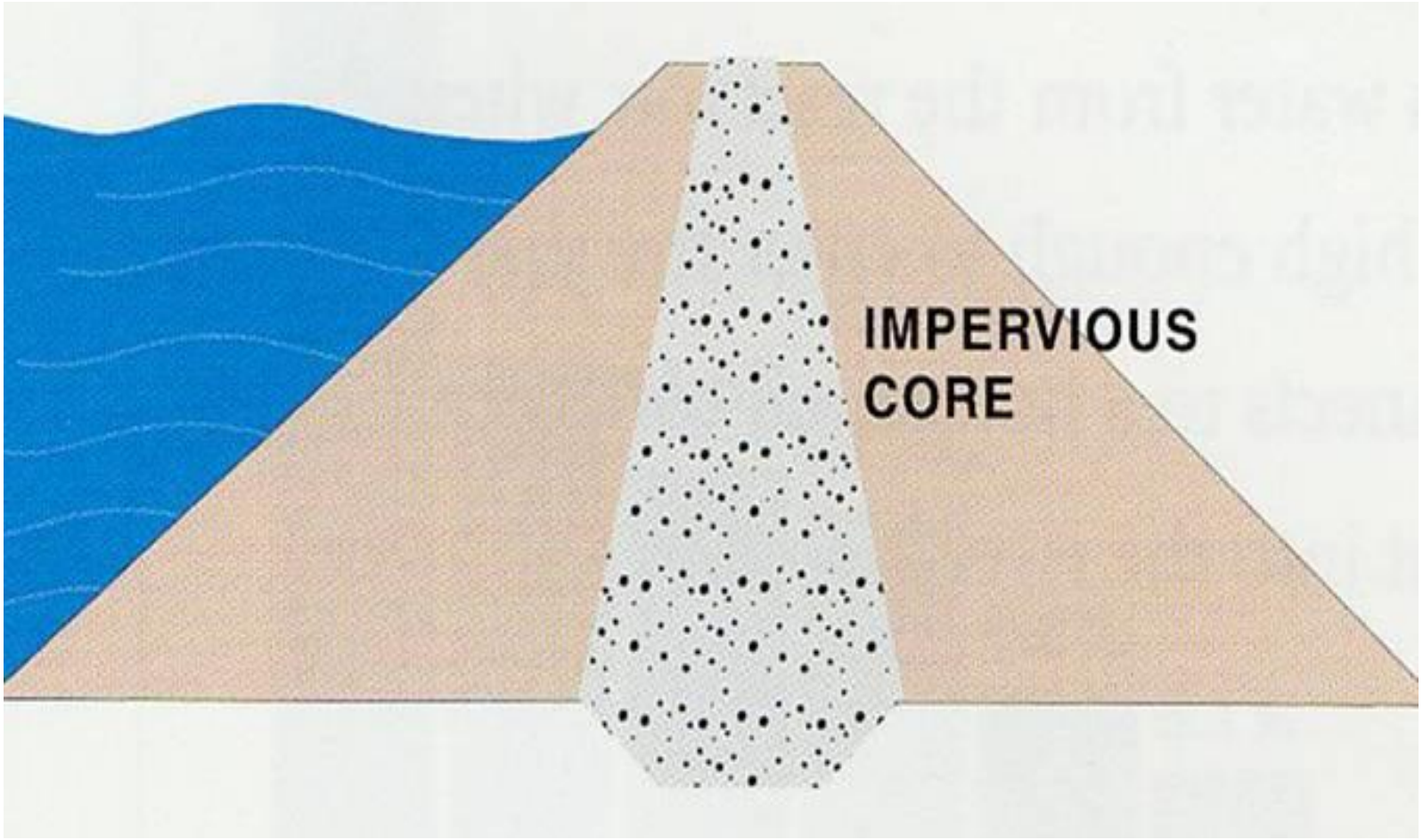
Types of Dams



Rock Fill Dams

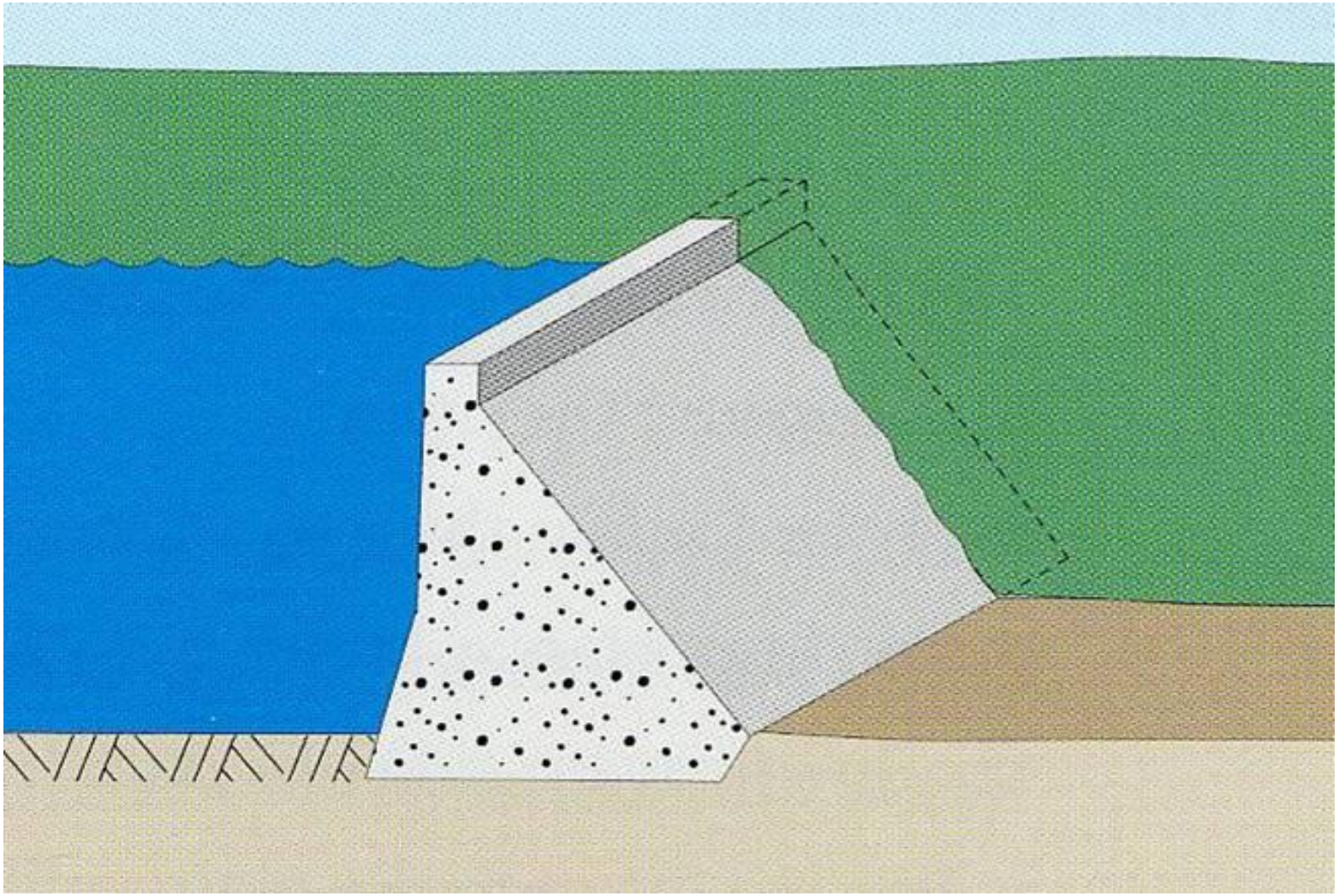
Laurel Creek Dam

Earthfill Embankment Dams



Earthfill Embankment Dams

Concrete Gravity Dams

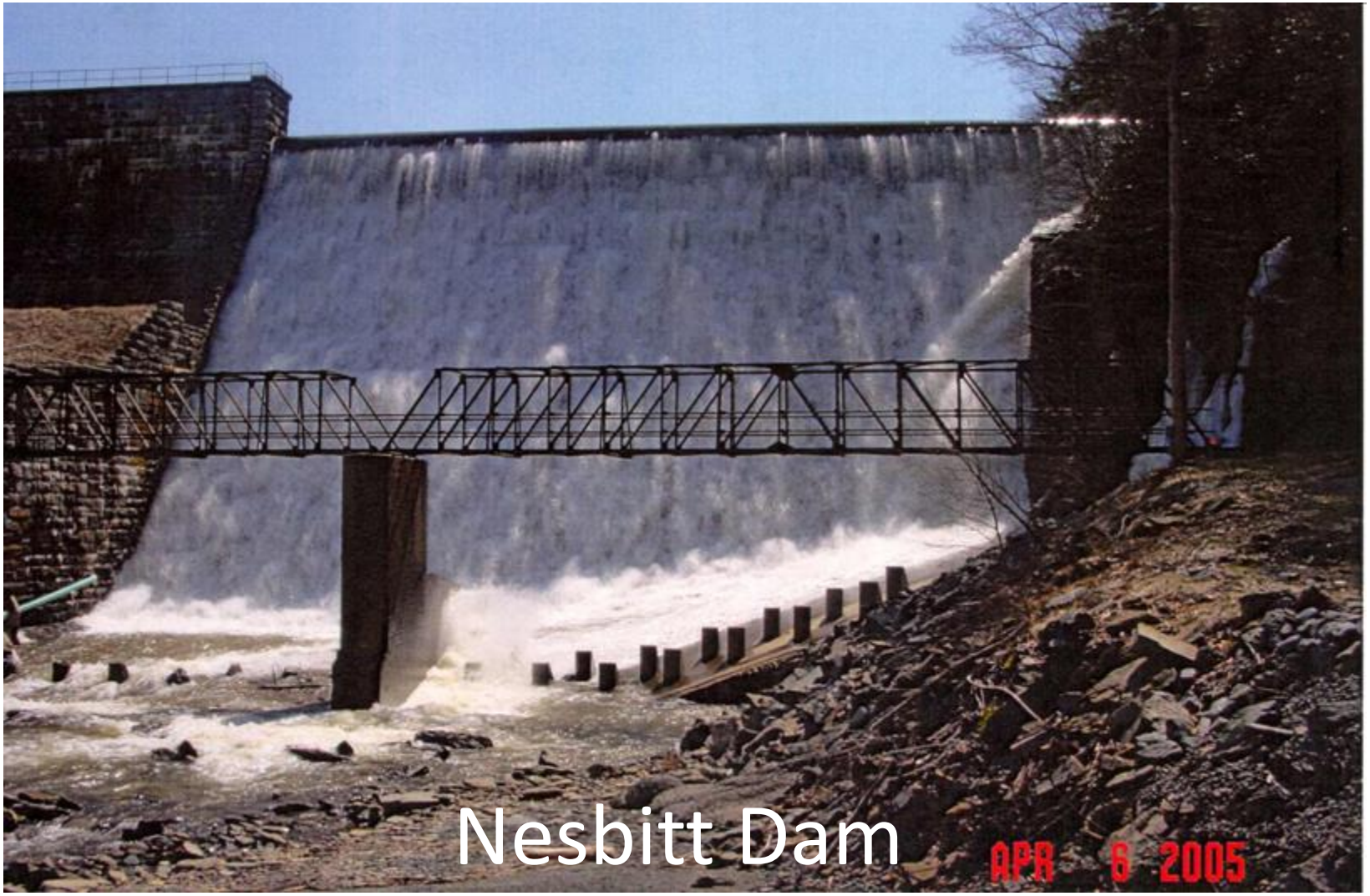


Christian Siegrist Dam

Ambursen Dams

Lake Mount Union Dam after Rehab

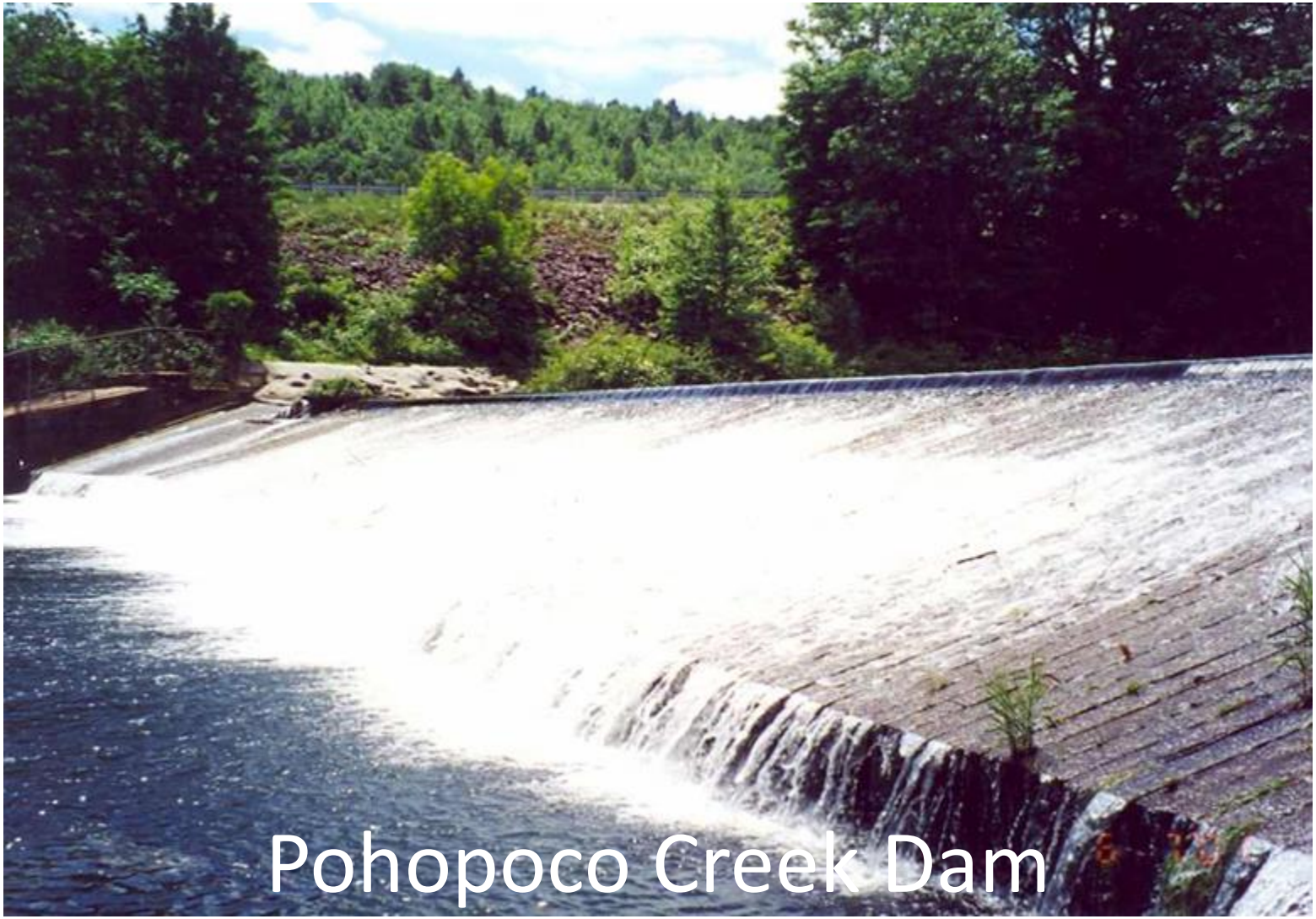
Stone Masonry Dams



Nesbitt Dam

Nesbit Dam

Timber Crib Dams

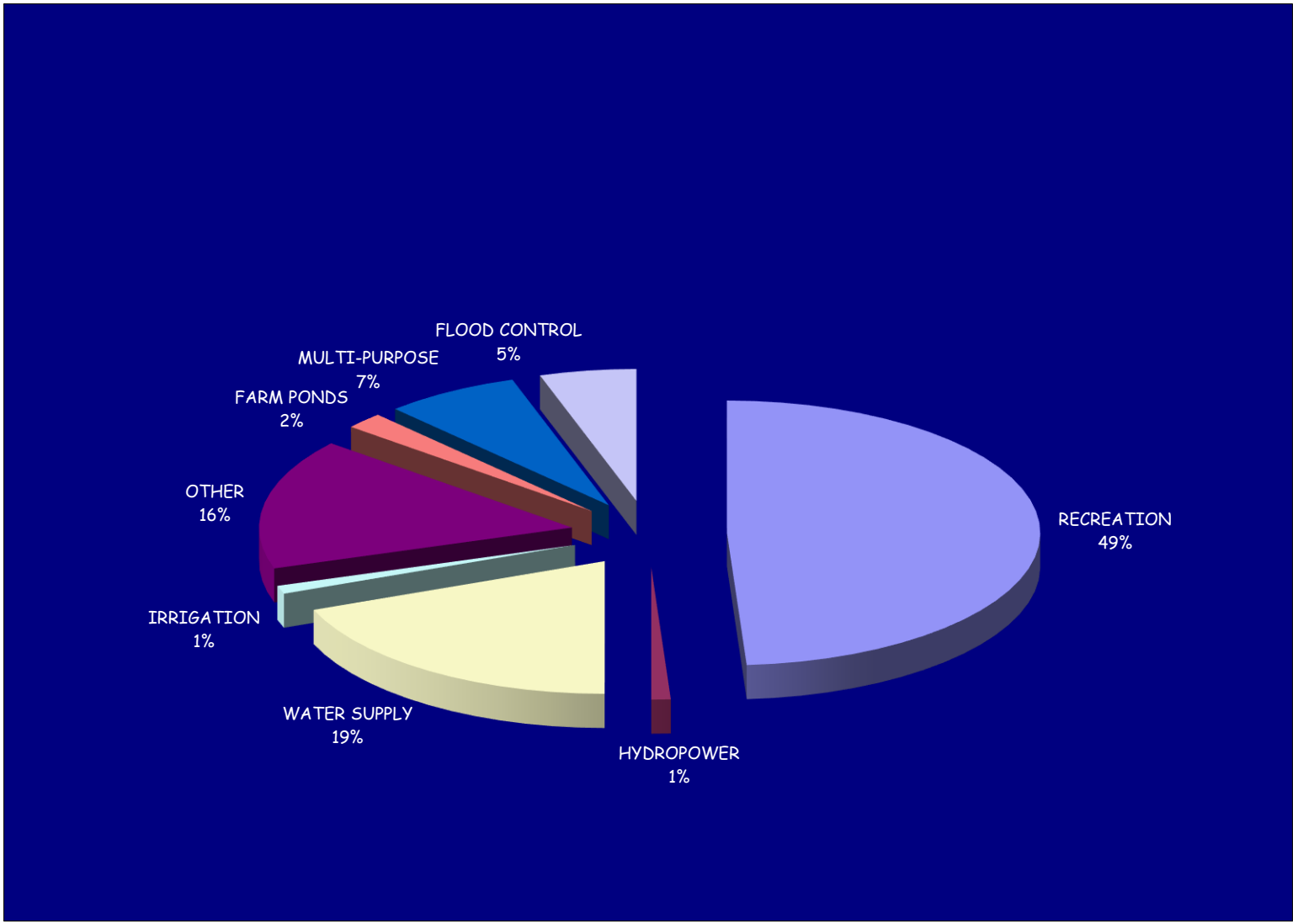


Dam No. 2 ?

Dam No. 2 ?

Dam No. 2 ?

Primary Dam Purpose



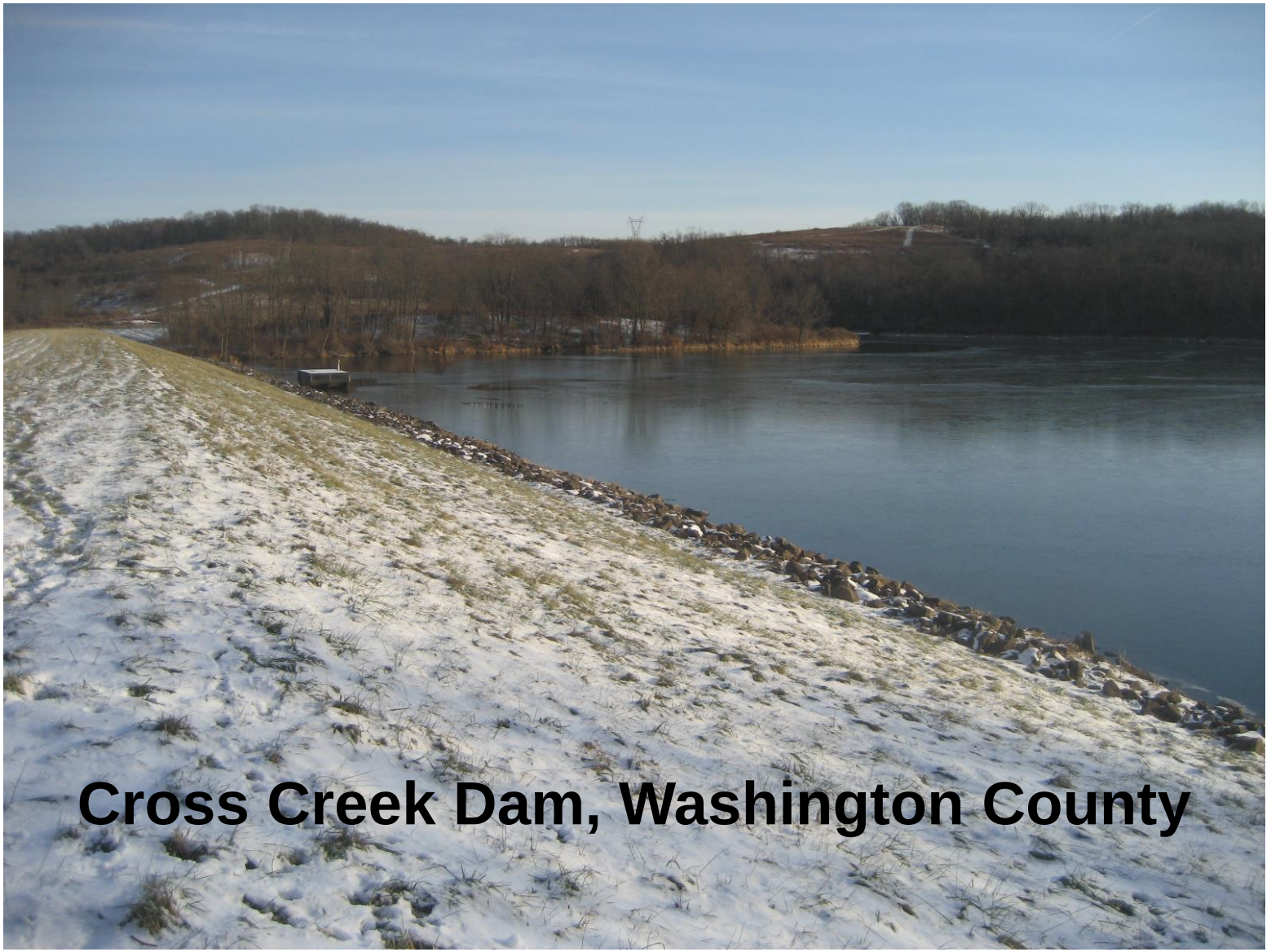
Recreation

Water Supply

Rock Run Dam

Flood Control

Flood Control



Flood Control

Goose Pond Dam, Monroe County

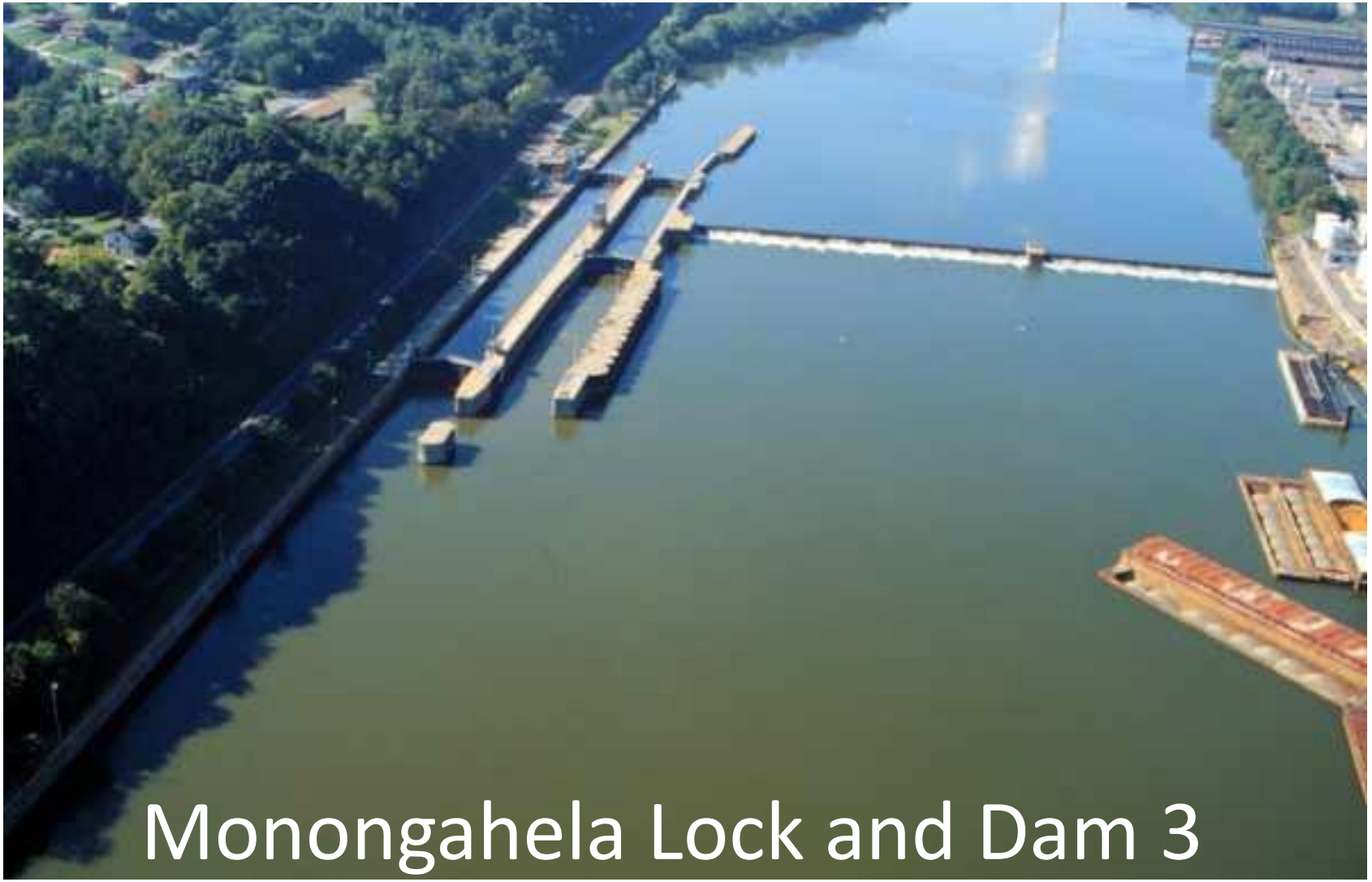
Flood Control

Flood Control

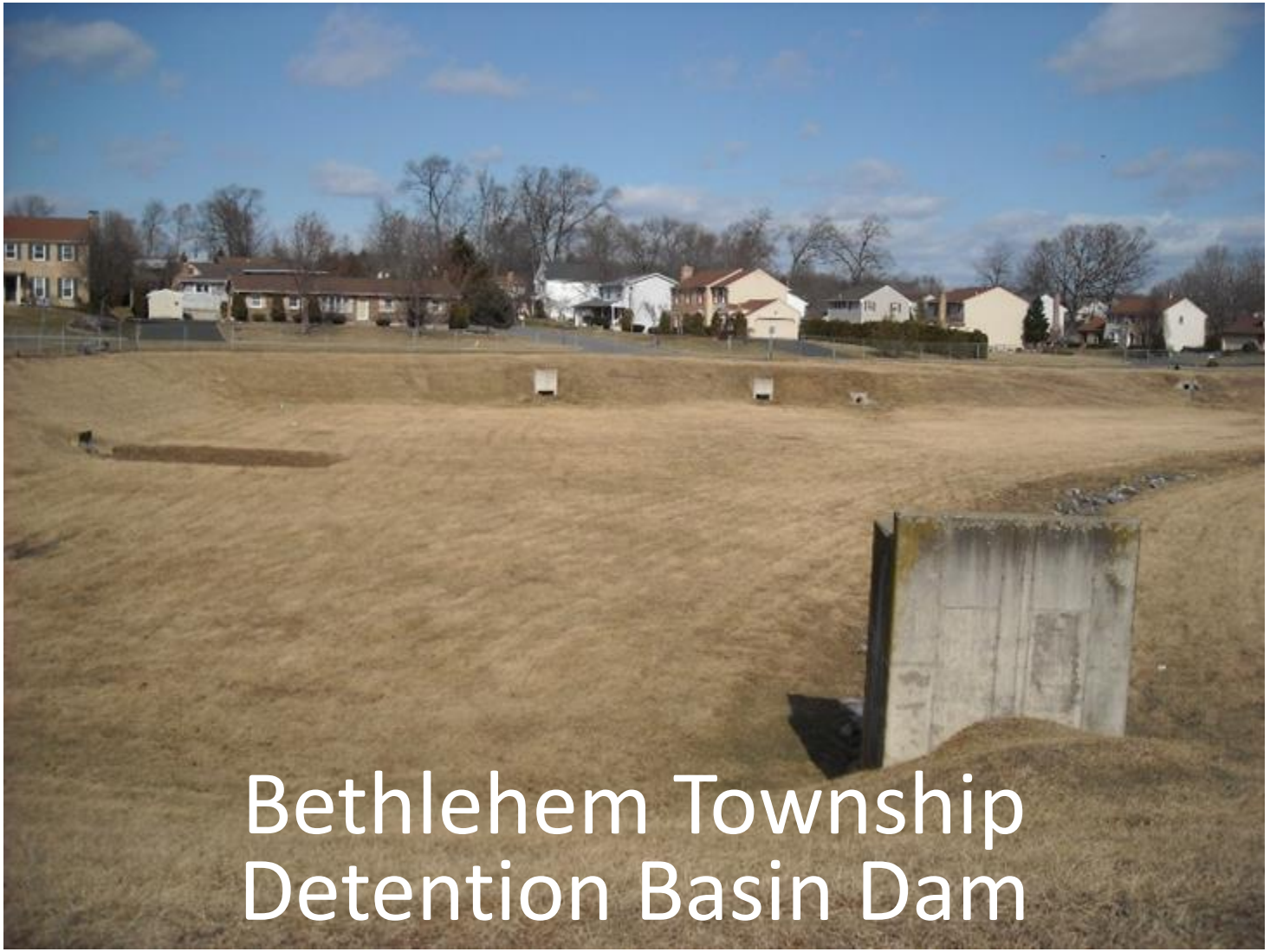
Hydroelectric

Safe Harbor Dam

Navigation



Stormwater Detention



Sediment Control

Antietam Settling Basin Dam

Mill Operation

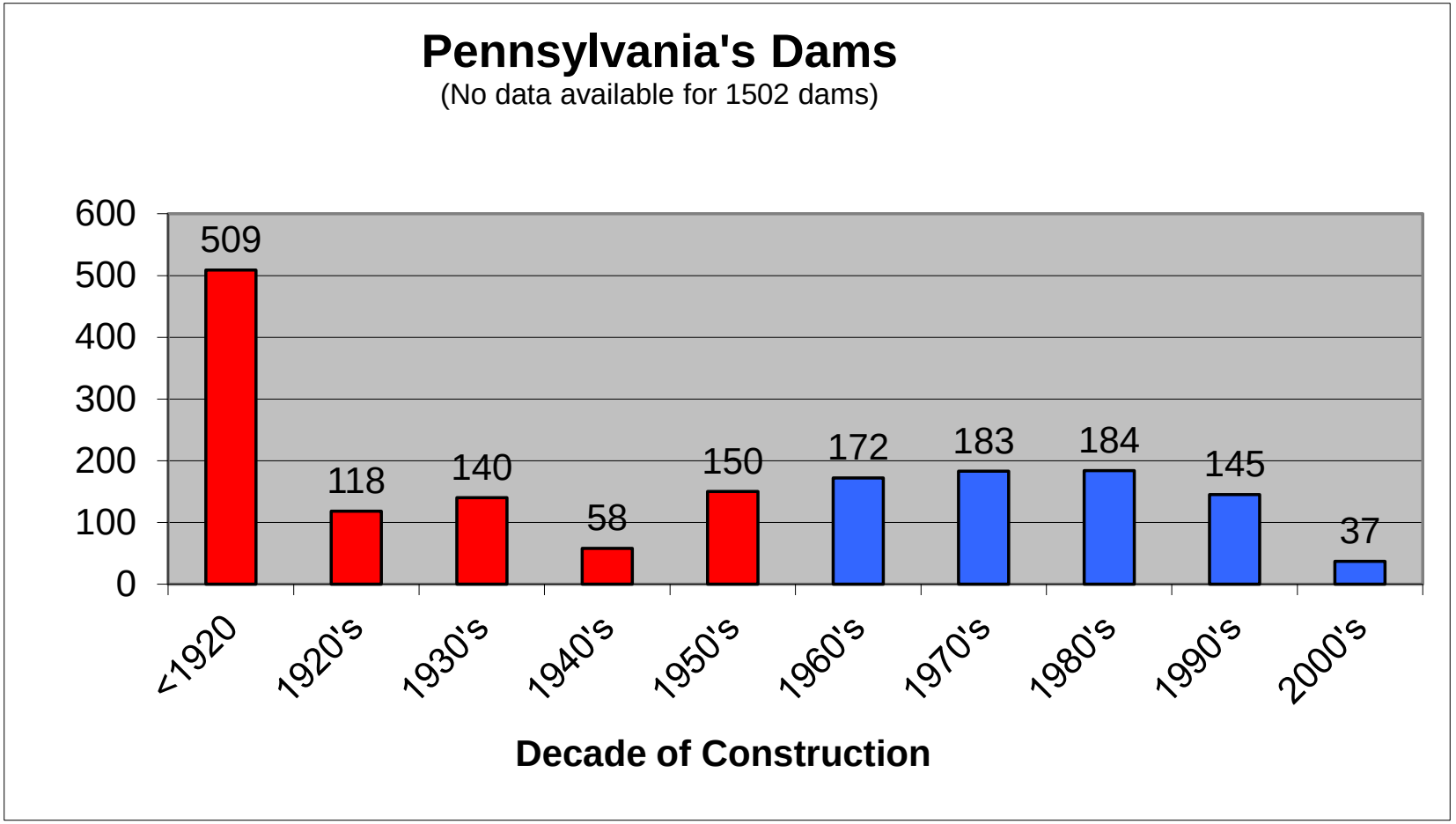
Dam No. 3 ?

Waste Storage

Little Blue Run Dam

Wastewater Treatment Lagoon

Age of Pennsylvania's Dams



Treesdale No. 1 Dam Before Rehab

Treesdale No. 1 Dam During Construction

Treesdale No. 1 Dam Completed

Sweet Arrow Lake Dam Before Rehab

Sweet Arrow Lake Dam Before Rehab

Sweet Arrow Lake Dam During Rehab

Sweet Arrow Lake Dam Rehabilitation

Before

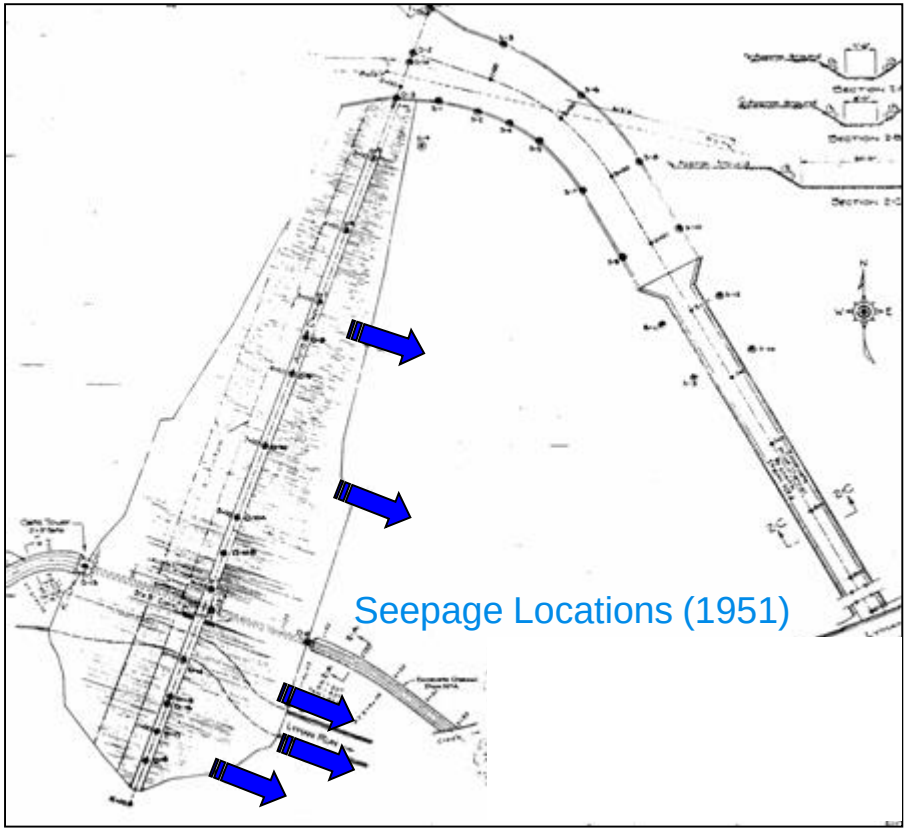
After

Sweet Arrow Lake Dam After Rehab

Historic Lyman Run Dam

Historical Performance

- Soon after first filling, five separate seepage outbreaks were reported, with cloudy pools noted.



Cloudy Seepage at Lyman Run Dam

Breaching of Lyman Run Dam

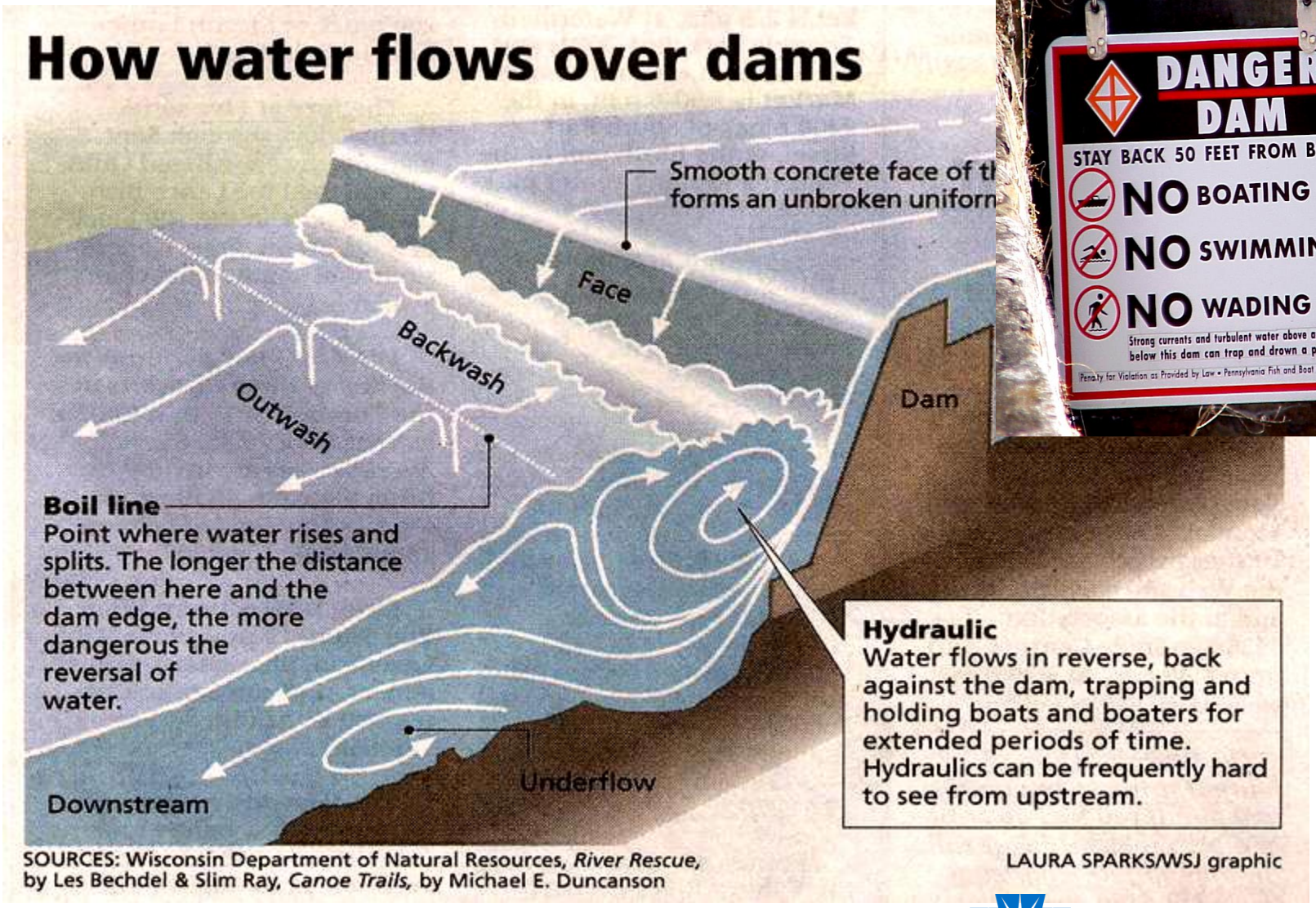
Lyman Run Dam Construction

Lyman Run Dam Near Completion

Lyman Run Dam After Completion

Dam No. 4 ?

Low-Head Run-Of-River Dams



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Probable Maximum Precipitation

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

Probable Maximum Flood

- 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
- Derived from the probable maximum precipitation (PMP) as determined on the basis of the most recent data available from the National Oceanographic and Atmospheric Administration (NOAA)

Probable Maximum Flood

- PMF and other factors dictate spillway design for high hazard dams
- Inadequate spillway capacity is the most common significant deficiency for dams in Pennsylvania

Inadequate Spillways Result in Overtopping

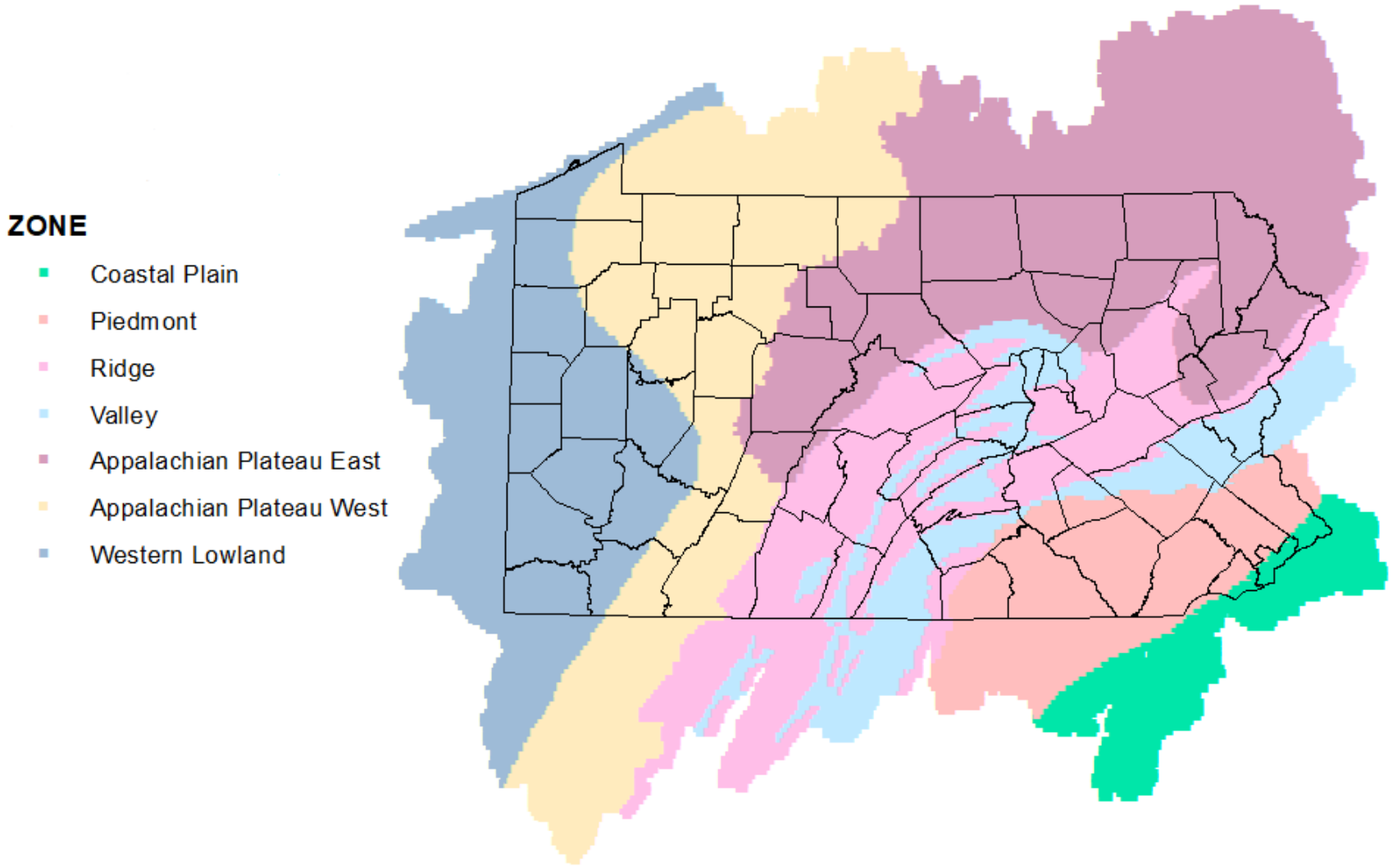
Site Specific PMP Process

- Began July 1, 2017
- Concluded March 31, 2019
- Rollout to dam owners and consultants planned for September, 2019

Site Specific PMP Methodology

- Use Actual Storm Data that is easily updatable
- Local, General, and Tropical Storms
- Geographic Zones of the State
- Actual storms are maximized and then transposed to specific basins
- Transposition factors are then applied to adjust the total rainfall for a specific basin
- Living tool that will be updated as new storms of significance occur

Pennsylvania Geographic Zones

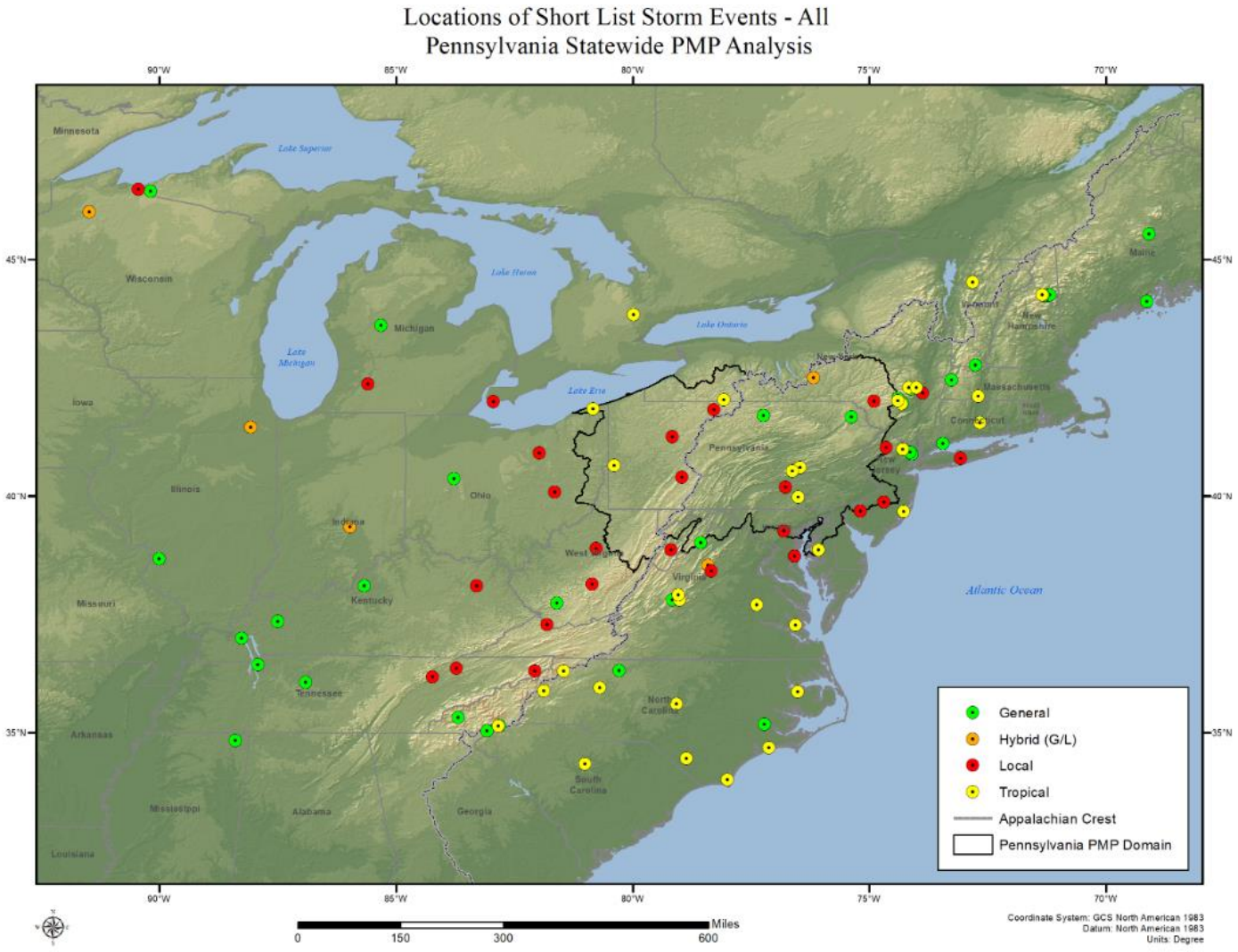


Smethport, Pennsylvania Storm

Smethport, Pennsylvania Storm

- World Record Rainfall – 28 inches in 3 hours, 30.8 inches in 4.5 hours
- July 1942
- Documentation of storm
- AWA and Aterra investigated storm
- Did not challenge rainfall amounts
- Focused on temporal distribution of storm

Pennsylvania Storm List





Two BWEW Divisions work closely together

Division of Project Development

Stream Improvements Program

Flood Protection Program

Division of Project Inspection

Construction Section

Completed Project Section

Stream Improvements Program

- Smaller projects to restore stream channels damaged by erosion during flood events.
- Require local or county government Sponsorship
- Cooperative agreements are used where DEP provide drawings and technical specifications and the Sponsor administers the construction contract.
- Typically 15 to 20 are constructed each year.
- Total annual expenditure typically ranges from $400,000 to $600,000.

Stream Improvements Program

- Commonwealth funded projects
- USDA NRCS EWP cost share

  National Resource Conservation Service (NRCS)

  Emergency Watershed Protection (EWP)

  75% federal and 25% non-federal cost share

Stream Improvements Program

- Must alleviate imminent threats to homes, businesses or industrial structures.
- Must be hydraulically beneficial and economically feasible.
- Repair and rehabilitation of facilities owned by others is not eligible.
- SIP does not fund or perform routine channel maintenance.

Flood Damage

Before

After

Before

After

Before

After

Before

Before

Before

After

Stream Improvements Program

- Commonwealth funded projects
- USDA NRCS EWP cost share

  National Resource Conservation Service (NRCS)

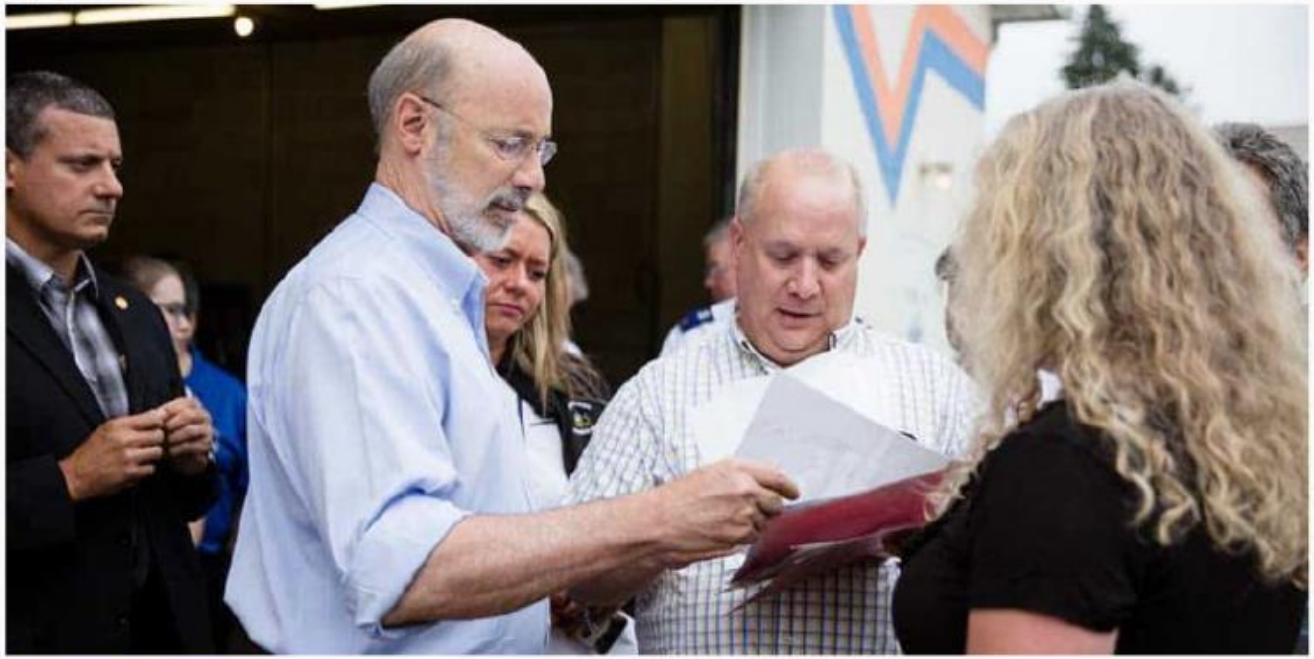
  Emergency Watershed Protection (EWP)

  75% federal and 25% non-federal cost share

USDA NRCS EWP

Governor Wolf Announces New Flood Recovery Aid Available to Local Governments

September 13, 2018



PRESS RELEASE, PSA, WEATHER SAFETY

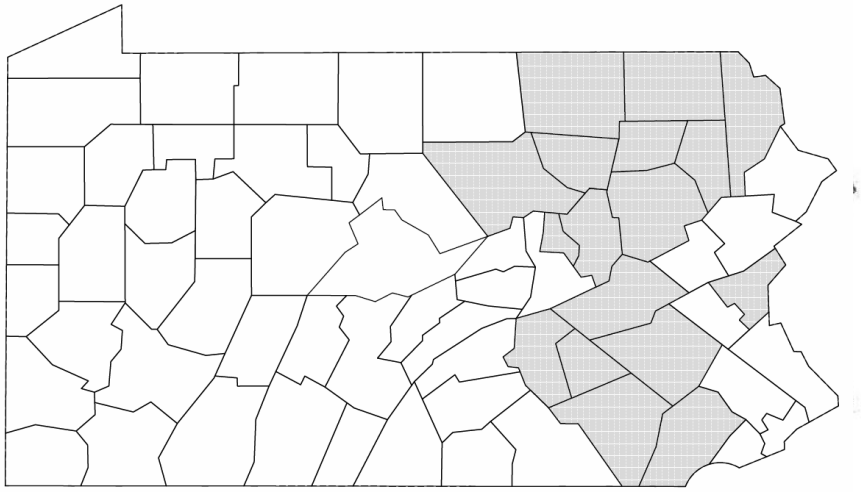
Harrisburg, PA – To assist flood recovery efforts in flood-stricken areas of northcentral and eastern Pennsylvania, today Governor Tom Wolf announced the availability of $6.25 million for streambank restoration and recovery efforts by local communities.

The governor directed the Pennsylvania Department of Environmental Protection (DEP) to provide the required cost-share for the projects so that eligible projects will be available at no cost to local governments. The funding will assist communities recovering from the recent floods and help them prepare for future storm events.

"Getting our communities back on their feet after these floods is one of my administration's top priorities, and these grants to local governments will

USDA NRCS EWP

That was the Sept 13, 2018 press release.



Summer 2018 Declaration

1. Berks County
2. Bradford Co.
3. Chester Co.
4. Columbia Co.
5. Dauphin Co.
6. Lackawanna Co.
7. Lancaster Co.
8. Lebanon Co.
9. Luzerne Co.
10. Lycoming Co.
11. Montour County
12. Northampton Co.
13. Schuylkill Co.
14. Sullivan County
15. Susquehanna Co.
16. Wayne County
17. Wyoming Co.

USDA NRCS EWP

- These are very similar in scope to standard SIP projects.
- Current estimates

  $3.9 Million Federal cost share (75%)

  + $1.3 Million non-Federal share (25%)

  $5.2 Million Total
- There were 117 potential projects initially identified by NRCS, in coordination with the County Conservation Districts.

- Division of Project Development
  - Stream Improvements Program
  - Flood Protection Program
- Division of Project Inspection
  - Construction Section
  - Completed Project Section

Flood Protection Program

- These are larger projects where flooding has caused damages to a significant number of homes or businesses in a community.
- Projects typically are designed to provide protection up to the 1% annual chance flood (sometimes called the 100-year flood).
- Feasibility Studies are required to determine that the benefits outweigh the cost of the selected alternative (aka b/c ratio $\geq$ 1.0).

Flood Protection Program

- The municipality is the project Sponsor and circulates damage assessments forms.
- Feasibility Studies prove b/c $\geq$1.0.
- Right-of-way drawings and a Sponsor Agreement is generated with an estimated annual cost of operation and maintenance.
- As Sponsor, the municipality needs to sign the agreement and set up an O&M escrow account.

- Division of Project Development
  - Stream Improvements Program
  - Flood Protection Program
- Division of Project Inspection
  - Construction Section
  - Completed Project Section

Flood Protection Program

- During design, the Construction Section is consulted using peer reviews where “constructability” comments are addressed.
- During construction, the Construction Section provides the day-to-day inspection services and the Design Staff attend biweekly construction conferences.
- Both groups work on material submission approvals, change orders and request for information by the contractor.

- Division of Project Development
  - Stream Improvements Program
  - Flood Protection Program
- Division of Project Inspection
  - Construction Section
  - Completed Project Section

Flood Protection Program

- After construction, the Completed Project Section takes the lead and coordinates with the US Army Corps of Engineers (USACOE) for annual maintenance inspections.
- If the Sponsor keeps the projects maintained, the USACOE Public Law 84-99 program can provide funds to repair the project after a disaster declaration.
- DEP has historically provided the 20% non-federal cost share for PL 84-99.

Flood Protection Program

- The Completed Project Section also assists the Sponsor in determining if O&M repairs will require additional permits.
- If third-party requests permission to cross the project easement, the Completed Project Section will review and comment.
- If construction activities are needed for either O&M repairs or third-party activities, the Construction Section can again provide daily inspection oversight.

Flood Protection Program

- The following slides show a number of typical project features.
- Projects are usually some combination of levee, channel, culvert or floodwall.
- Access ramps over the levees allow maintenance vehicles to perform repairs and remove debris and deposition after floods.
- Chain-link fence and guiderails are provided to protect against fall hazards.

Levee

Levee

Levee

Channel

Channel

Channel

Culvert

Culvert

Culvert

Floodwall

Floodwall

Floodwall

Streamside View

Floodwall

Flood Protection Program

- Additional photos are included for other typical features.
- Drainage structures with flap gates and sluice gates prevent backwater flooding into the municipal stormwater system.
- Closure structures are sometimes required at bridges and road and railroad crossings.
- Access ladders and debris racks make the project easier to maintain.

Drainage Structure

Drainage Structure

Drainage Structure

Closure Structure

Closure Structure

Closure Structure

Closure Structure

Access Ladders

Debris Rack



Division of Wetlands Encroachment and Training

Pennsylvania Department of Environmental Protection

Bureau of Waterways Engineering & Wetlands

Division of Wetlands, Encroachment and Training

Overview

- Oversees Statewide Water Obstructions and Encroachments Regulatory Program under Chapters 105 and 106
  - Direct and Oversee Regulatory Permitting of Water Obstructions and Encroachments in Regulated Waters of this Commonwealth
  - Develop and coordinate guidance and program assistance to Regional Offices, Oil And Gas Programs, Mining, and Delegated Conservation Districts for administering the Chapter 105 program

Overview

- Leadership and approval Stream and Wetland Restoration
- Compensatory Mitigation and Mitigation Banking
- Submerged Land License Agreements
- Perform environmental reviews of Dam Safety and Flood Protection permits and projects and dam removals

Overview

- 25 Pa. Code Chapter 105 regulates:
  - Water Obstructions and Encroachments in, along, or across streams, wetlands, floodways, bodies of water
- Permits are required to "…construct, operate, maintain, modify, enlarge or abandon a dam, water obstruction or encroachment…"

Examples of Structures and Activities

- Bridges and Culverts
- Intake and Outfall Structures
- Stream Bank Stabilization
- Wetland Fills
- Agricultural Crossings
- Docks
- Utility Line Crossings
- Retaining Walls
- Stream Relocations
- Stream and Wetland Restoration
- Stream Enclosures

Watercourse

- Watercourse – a channel or conveyance of surface water having defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Watercourse

Body of Water

- Body of water – a *natural or artificial* lake, pond, reservoir, swamp, marsh or *wetland*.

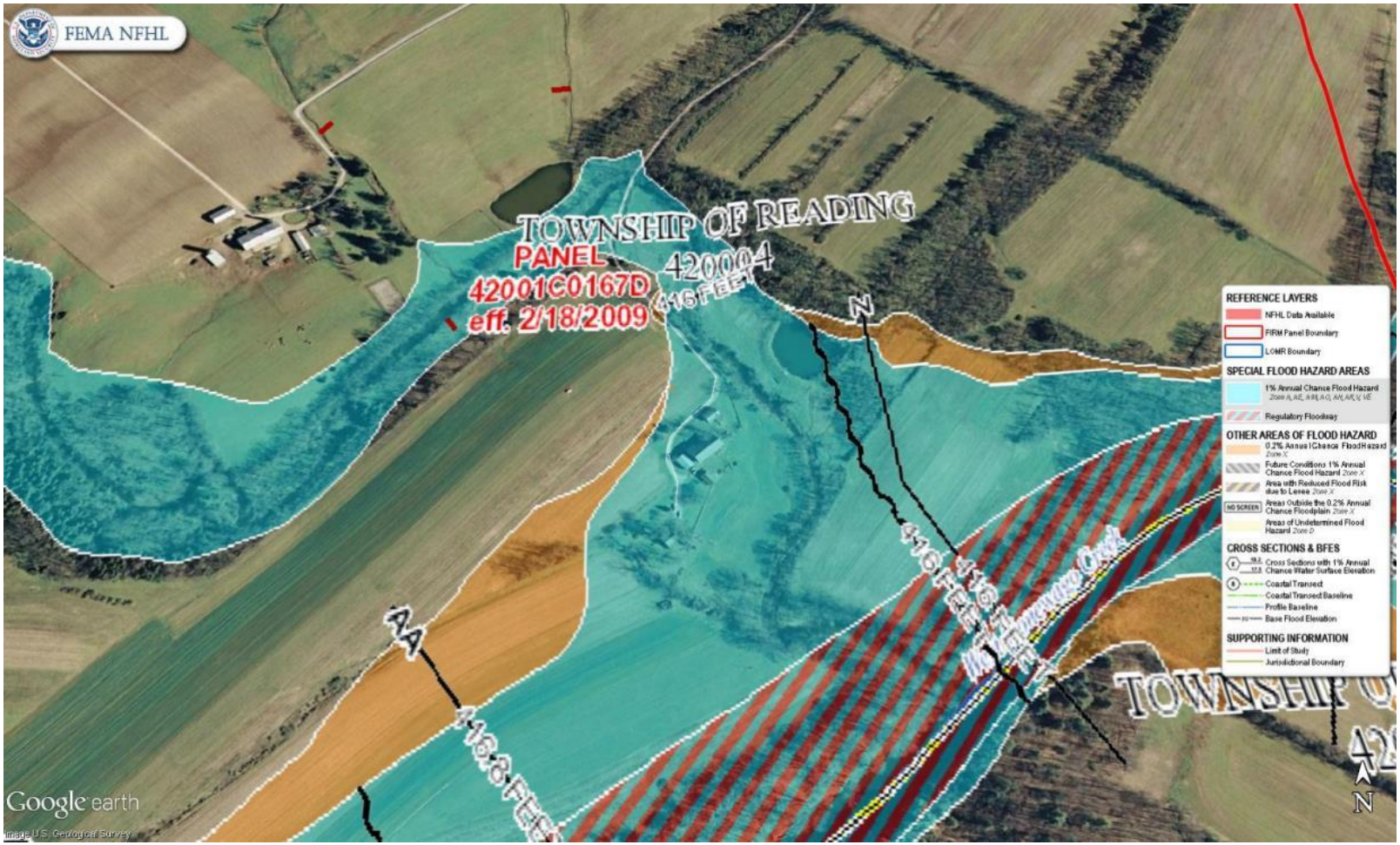
Body of Water

Approximately what percent of wetlands have been lost?

Floodway

- Floodway – The channel of the watercourse and portions of the adjoining floodplains which are reasonably required to carry and discharge the 100-year frequency flood.
- Floodway is mapped by FEMA, or assumed to be 50 feet from the top of stream bank, absent evidence to the contrary

Floodway


FEMA NFHL
TOWNSHIP OF READING
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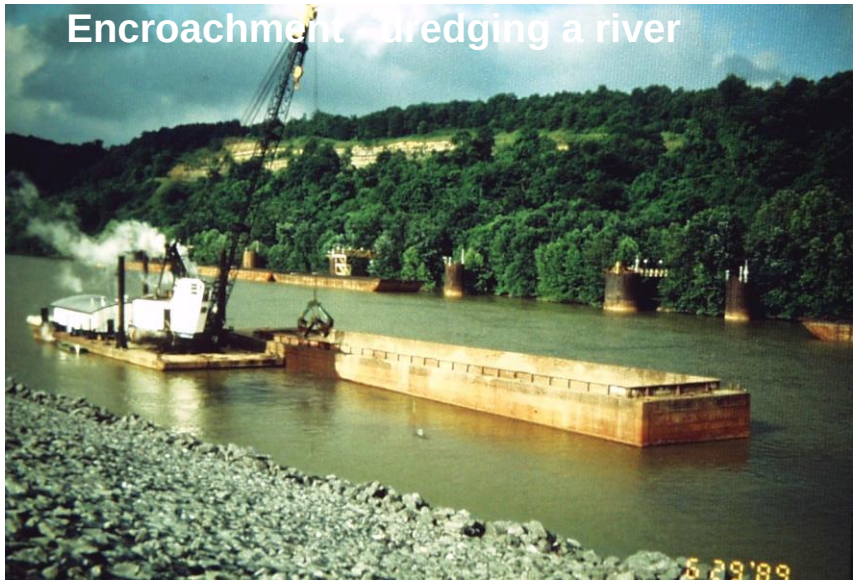
REFERENCE LAYERS
NFHL Data Available
FIRM Panel Boundary
LOMR Boundary
SPECIAL FLOOD HAZARD AREAS
1% Annual Chance Flood Hazard
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee Zone X
NO SCREEN
Areas Outside the 0.2% Annual Chance Floodplain Zone X
Areas of Undetermined Flood Hazard Zone D
CROSS SECTIONS & BFES
Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Base Flood Elevation
SUPPORTING INFORMATION
Limit of Study
Jurisdictional Boundary
PA
416 FEET
Google earth
Image U.S. Geological Survey

Encroachment

- Encroachment – a *structure or activity* which changes, expands or diminishes *the course, current or cross section* of a watercourse, floodway or body of water.



Water Obstruction

- Water Obstruction – A dike, bridge, culvert, wall, wingwall, fill, pier, wharf, embankment, abutment or other structure *located in, along or across or projecting into* a watercourse, floodway or body of water.

Water Obstruction

How many miles of streams are in Pennsylvania?

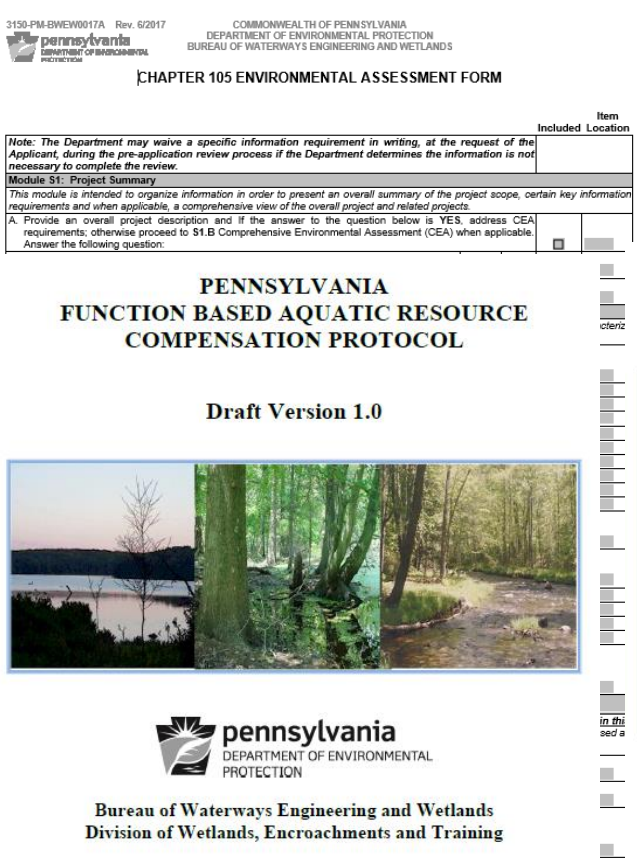
How many miles of roads are in Pennsylvania?

Permitting

- Permitting functions includes writing/revising General Permits and Individual Permits
- Work with Army Corps to coordinate, develop, implement PA State Programmatic General Permit federal authorization
- New Delegation Agreement with Bradford County Conservation District for Emergency Stream Restoration
- Fall of 2018 launched Chapter 105 General Permit e-Permitting

Permitting

- Develop Technical Guidance and Forms



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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERWAYS ENGINEERING AND WETLANDS

CHAPTER 105 ENVIRONMENTAL ASSESSMENT FORM

	Included	Item Location
Note: The Department may waive a specific information requirement in writing, at the request of the Applicant, during the pre-application review process if the Department determines the information is not necessary to complete the review.		
Module S1: Project Summary		
This module is intended to organize information in order to present an overall summary of the project scope, certain key information requirements and when applicable, a comprehensive view of the overall project and related projects.		
A. Provide an overall project description and if the answer to the question below is YES, address CEA requirements; otherwise proceed to S1.B Comprehensive Environmental Assessment (CEA) when applicable. Answer the following question:	☐	

PENNSYLVANIA
FUNCTION BASED AQUATIC RESOURCE
COMPENSATION PROTOCOL

Draft Version 1.0

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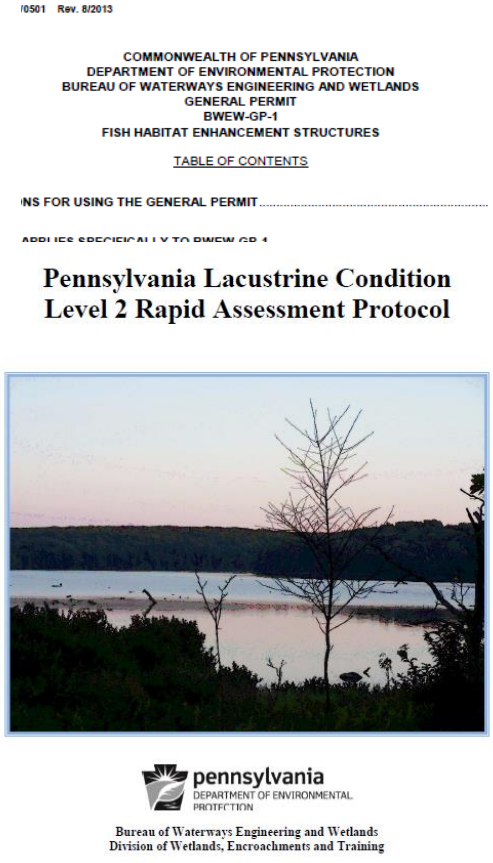
Bureau of Waterways Engineering and Wetlands
Division of Wetlands, Encroachments and Training



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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERWAYS ENGINEERING AND WETLANDS
GENERAL PERMIT
BWEW-GP-1
FISH HABITAT ENHANCEMENT STRUCTURES

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NS FOR USING THE GENERAL PERMIT .....

Pennsylvania Lacustrine Condition
Level 2 Rapid Assessment Protocol

pennsylvania
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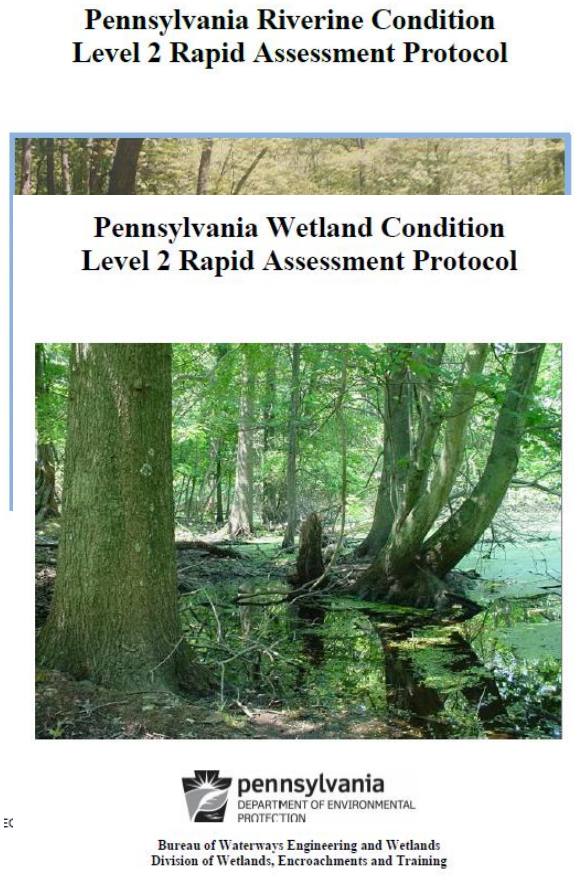
Division of Wetlands, Encroachments and Training



Pennsylvania Riverine Condition
Level 2 Rapid Assessment Protocol

Pennsylvania Wetland Condition
Level 2 Rapid Assessment Protocol

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Waterways Engineering and Wetlands
Division of Wetlands, Encroachments and Training

Permitting

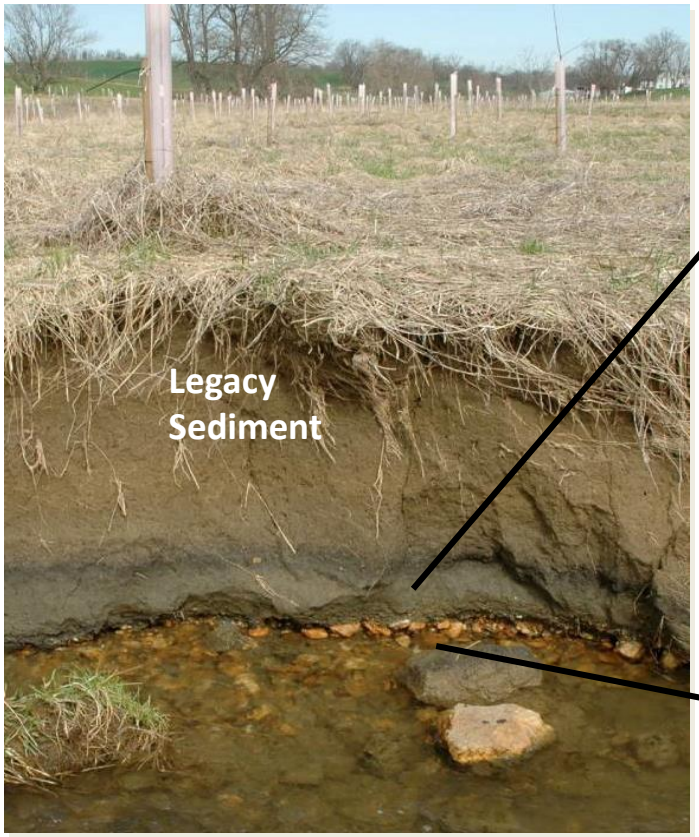
- Permits can require compensatory mitigation
  - Permittee Responsible
  - In-lieu-fee
  - Mitigation Banking

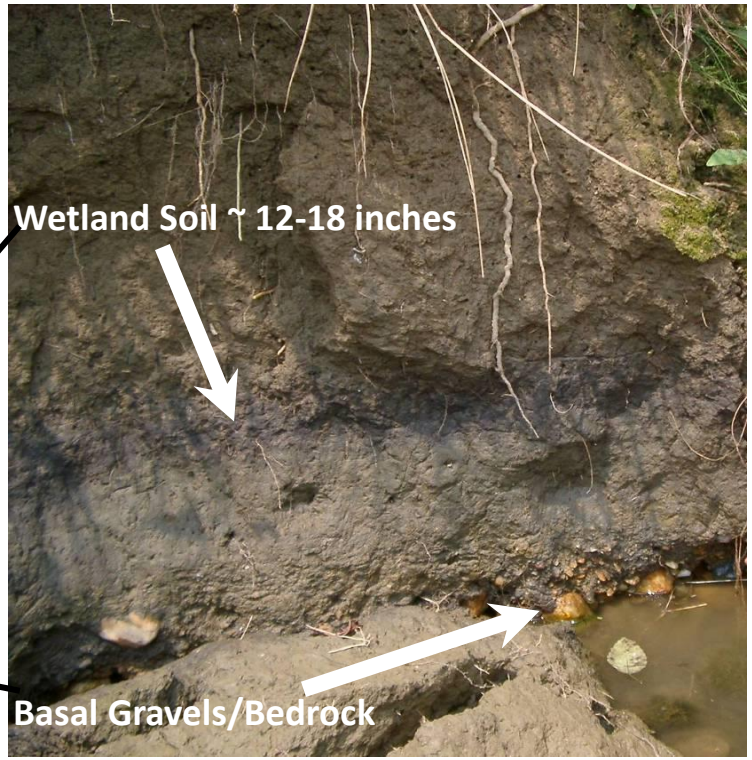
Legacy Sediments

- A ubiquitous impairment that only recently has been recognized and has begun to be addressed
- Permitting of restoration projects has been streamlined using Chapter 105
- Remediation benefits include wetland restoration, stream restoration, stormwater reduction, sediment and nutrient reduction, and T&E species restoration
- Extensive monitoring has demonstrated remediation cost-effectiveness

Legacy Sediments

Big Spring Run - Type Section





Photos Courtesy Franklin & Marshall College

Legacy Sediments

Big Spring Run

Typical Existing Conditions
9/13/2011

Restoration
07/27/2012

Natural Valley Morphology
Biological and Bio-geochemical

Photos Courtesy Franklin & Marshall College

Legacy Sediments

“Big Spring Run SRBC Water Tour 2017” excerpts

https://www.youtube.com/watch?v=nnxhs3aTTJs

Courtesy Susquehanna River Basin Commission, 2017

Legacy Sediments

August 2014 – ~ 3 years after construction

Mitigation Banking

- Private Entrepreneurial Banking
  - Provides compensation for aquatic resource impacts for both state and federal permitting (Ch. 105 and Section 404)
  - Utilize the USACE Interagency Review Team to coordinate proposals
- PA DEP In Lieu Fee Program
  - Currently under development
  - Must comply with the USACE 2008 Mitigation Rule

Banking Status

Private Entrepreneurial Mitigation Banking Status

Company	Bank Operation Permit Approval Status	Bank Site Construction Permit	County	Status	Stream Credit (linear feet)	Wetland Credits (acres)
Evergreen Environmental	95%	Hop Bottom Creek	Susquehanna	Pending	0	14.93
Land Reclamation Group	95%	Tunnel Road	Somerset	Pending	2,719	5.49
		Shrader Hollow	Westmoreland	Preapplication	-	-
		Furnace Run	Westmoreland	Preapplication	-	-
		Tamaqua	Schuylkill	Preapplication	-	-
Resource Environmental Solution (RES)	100%	USRMB 1	Potter	Constructed	1,935	1.95
		USRMB2	Potter/Tioga	Constructed	7,858	8.12
		Robinson Fork Phase 1	Washington	Constructed	95,227	48.88
		Enlow Fork Creek	Washington	Constructed	4,150	2.62
		Conneautee Creek	Crawford	Pending	11,234	26.84
		Codorus Creek	York	Under Construction	9,953	7.78
		Robinson Fork Phase 2	Washington	Pending	21,601	9.99
		Quaker	Berks	Pending	17,121	17.75
		Laurel Hill	Somerset	Pending	22,741	25.19
		Starruca	Wayne	Preapplicaiton	-	-
		Ryerson Station Park	Greene	Preapplicaiton	-	-

Banking Restoration Examples

2017

2019

Banking Restoration Examples

2017

2018


Questions or Comments?

Roger P. Adams, P.E.
Bureau Director