

Brandywine Flood Study

Flood Mitigation in the Delaware River Watershed
April 1, 2025



**BRANDYWINE
CONSERVANCY**

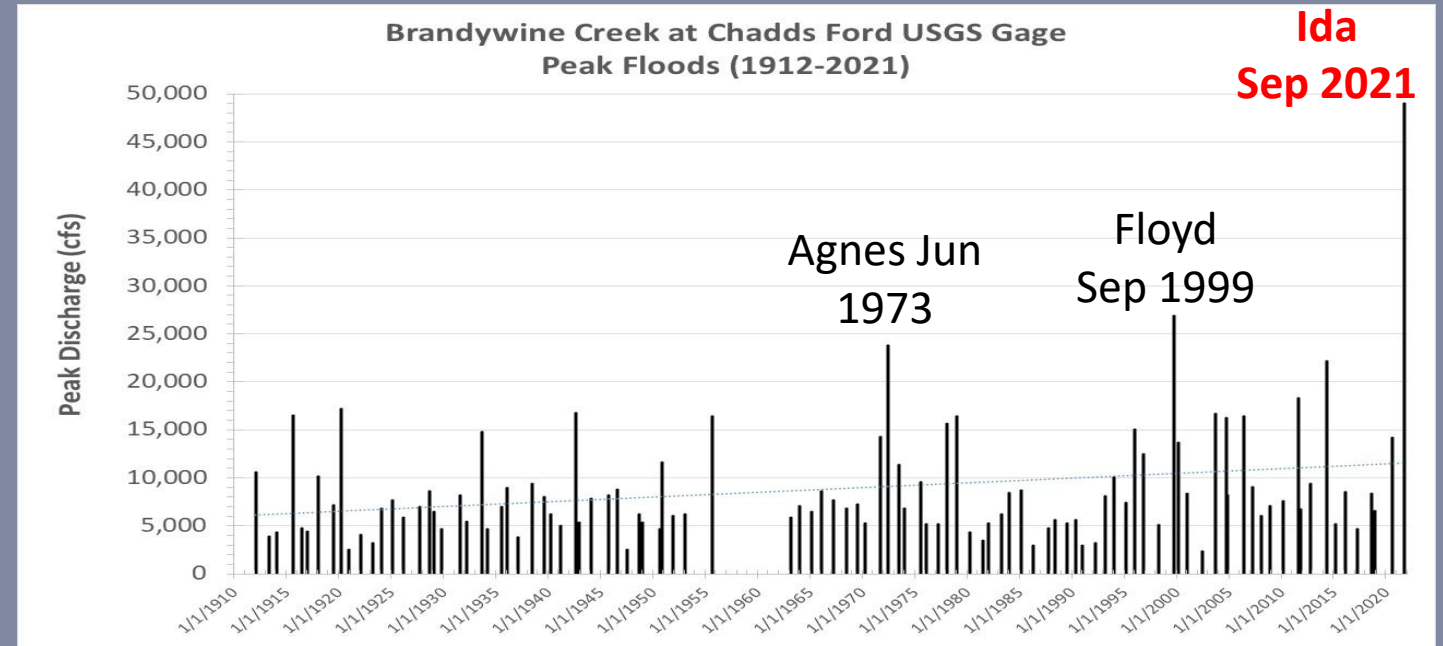


HURRICANE IDA: A CALL TO ACTION

September 1-2, 2021

Chadds Ford, PA at USGS gage

- Forecasts & models predicted 14.5'
- Prior record 17.2' in 1999
- Flood level reached 21.04'



Downingtown; photo credit: Skyforce Philadelphia NBC10



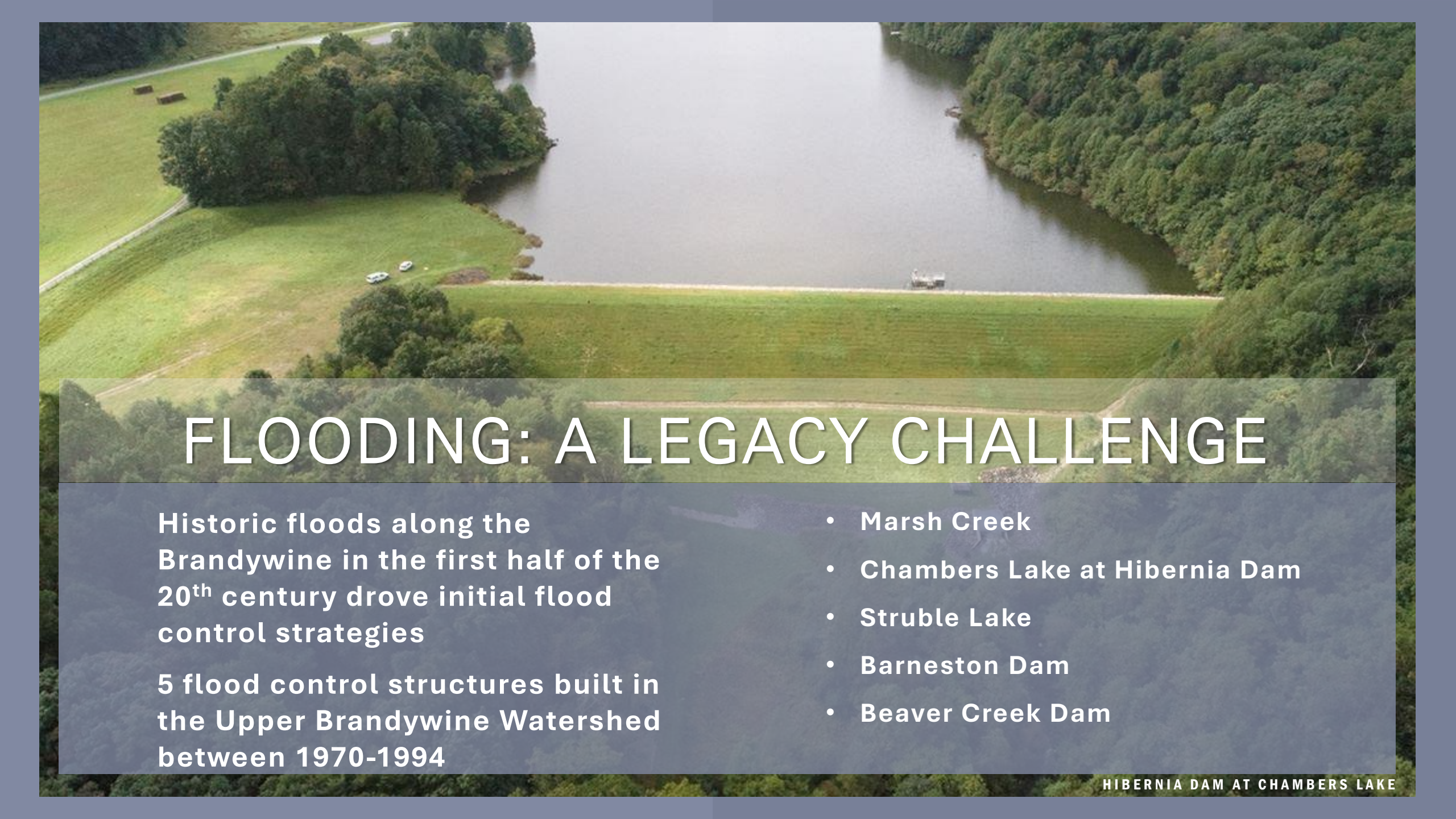
Coatesville; photo credit: Ximena Conde/WHYY



Chadds Ford; photo credit: Tim Furlong NBC10



Wilmington; photo credit: William K. Clark



FLOODING: A LEGACY CHALLENGE

Historic floods along the Brandywine in the first half of the 20th century drove initial flood control strategies

5 flood control structures built in the Upper Brandywine Watershed between 1970-1994

- Marsh Creek
- Chambers Lake at Hibernia Dam
- Struble Lake
- Barneston Dam
- Beaver Creek Dam

BRANDYWINE FLOOD STUDY

Goals:

- Flood reduction in the Brandywine watershed
- Implementable projects and approaches
- Transferrable methods and strategies
- Coordination with interrelated regional efforts

Funders:



Chester County
Pennsylvania



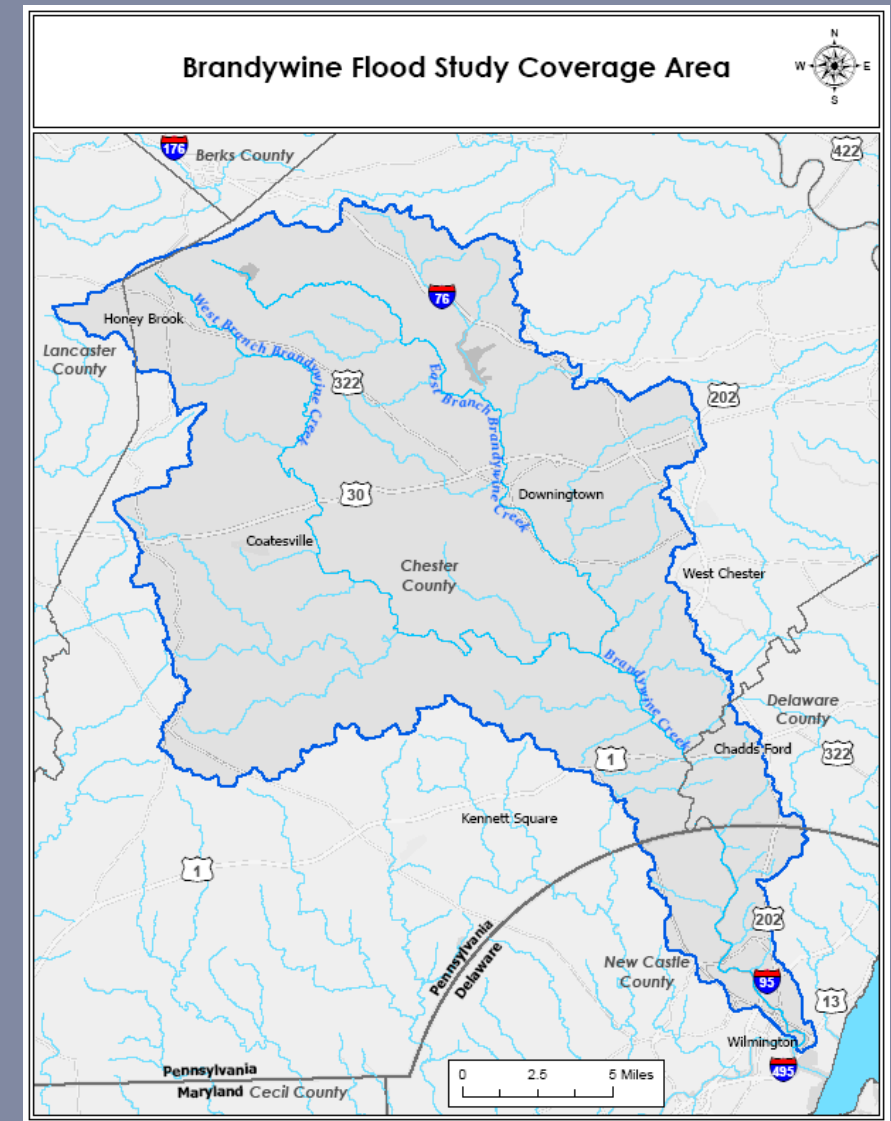
DELAWARE
COUNTY
PENNSYLVANIA



FEMA



Pennsylvania
Emergency Management Agency



FLOOD STUDY PARTNERS



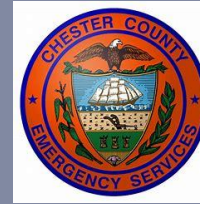
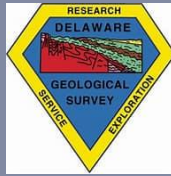
BRANDYWINE
CONSERVANCY



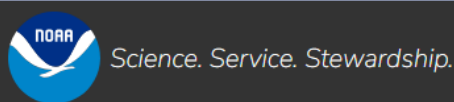
CCWRA SUBCONSULTANTS:



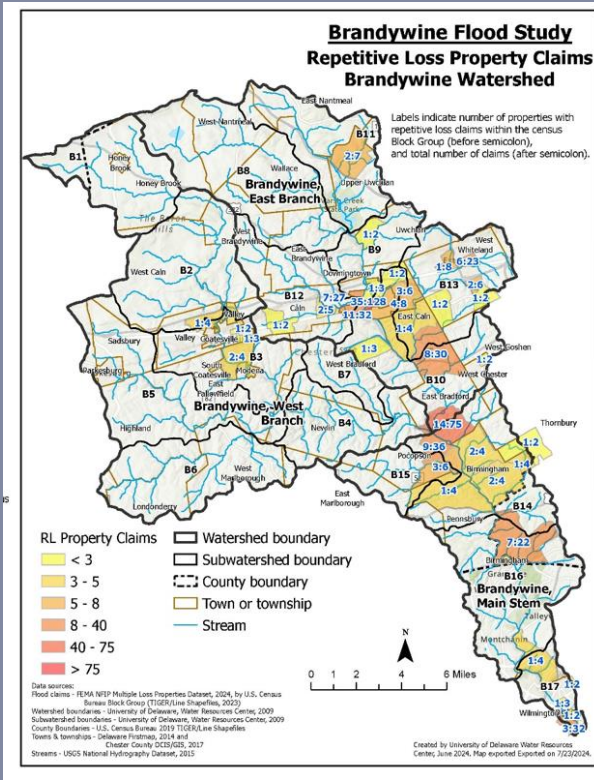
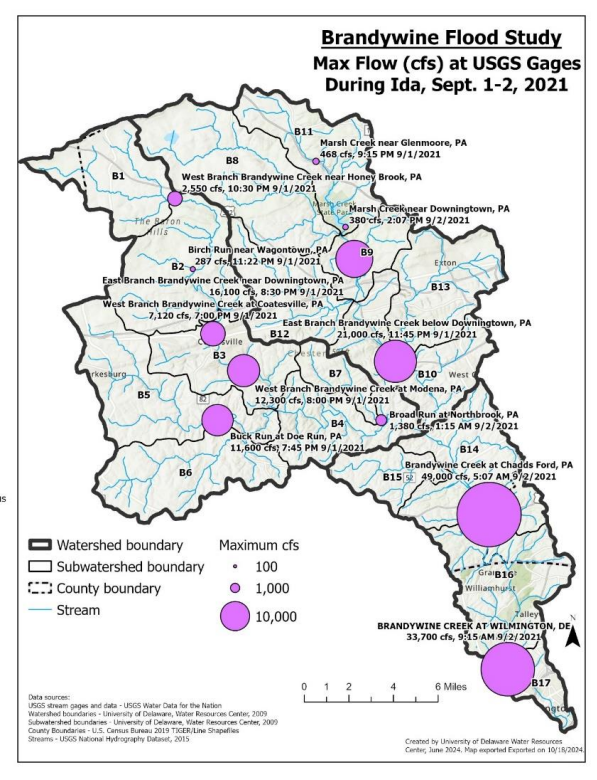
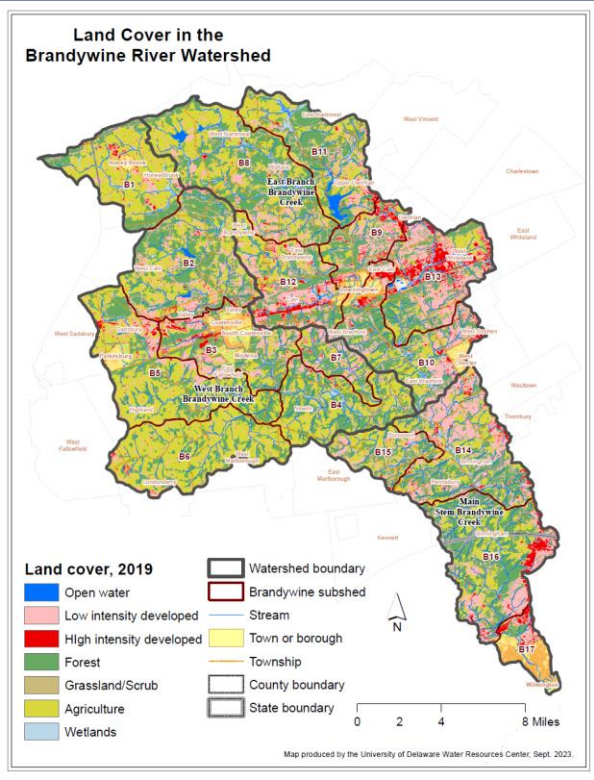
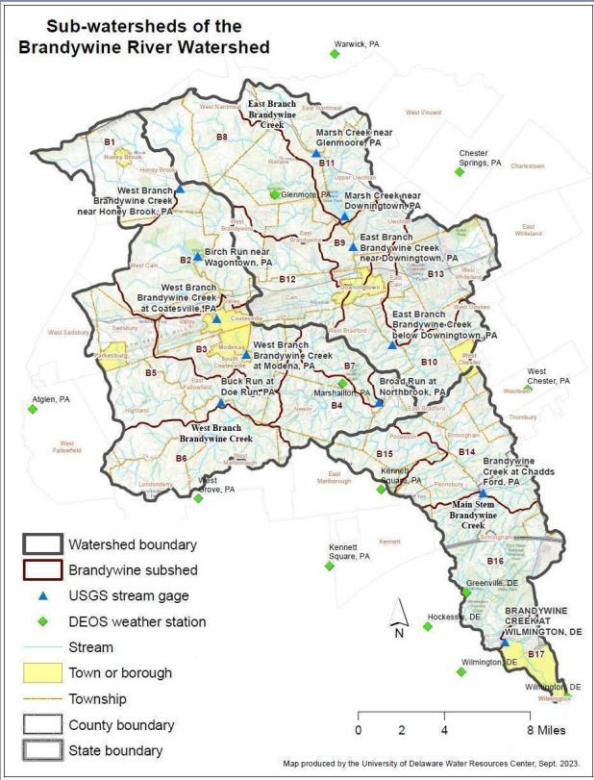
FLOOD ADVISORY COMMITTEE



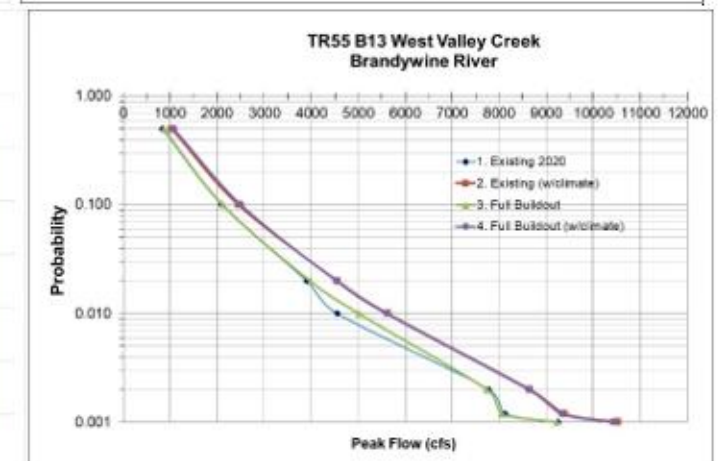
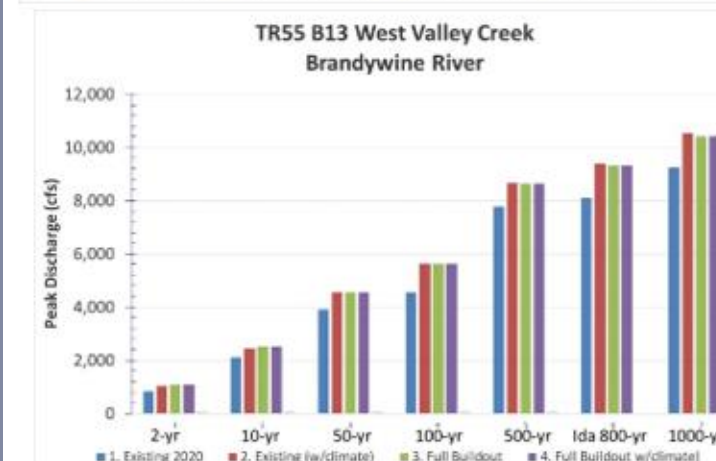
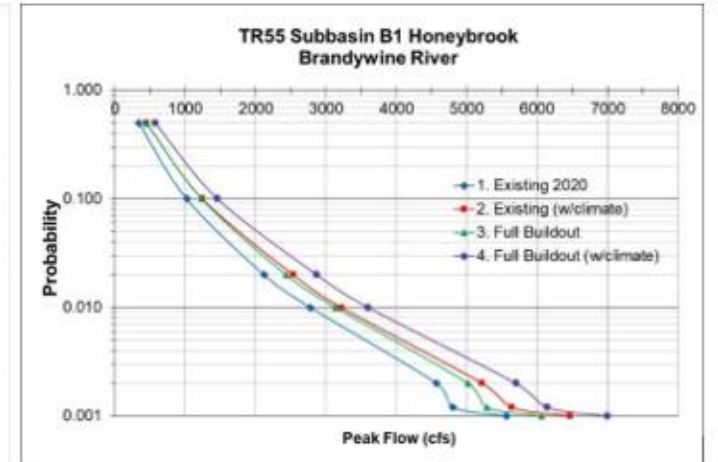
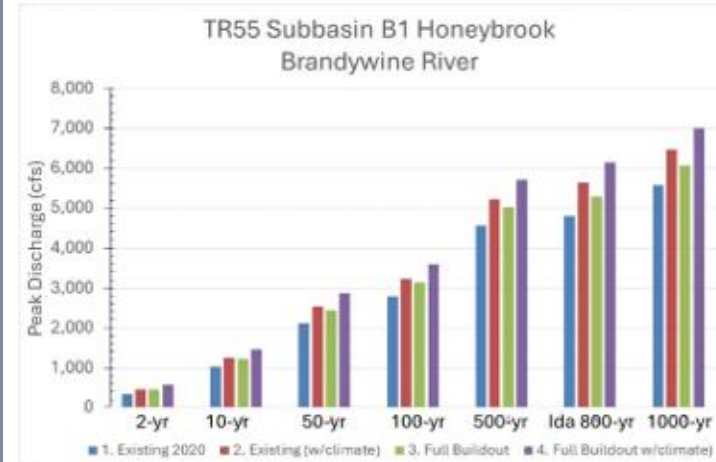
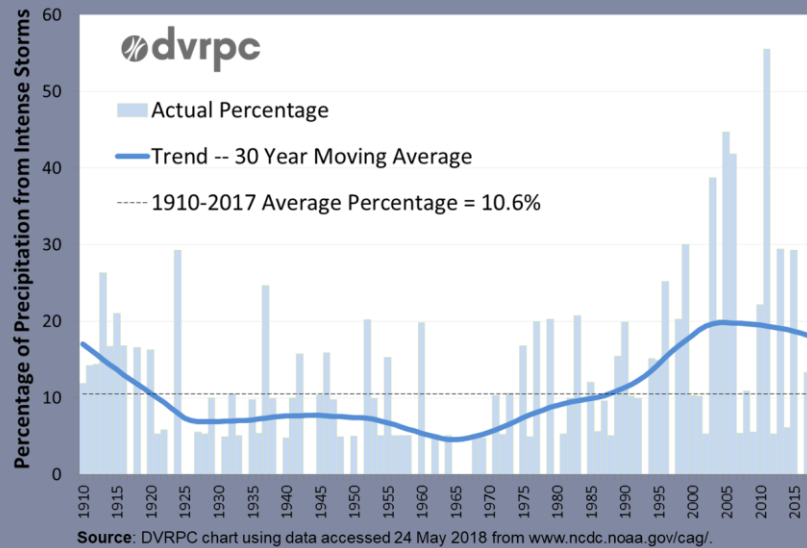
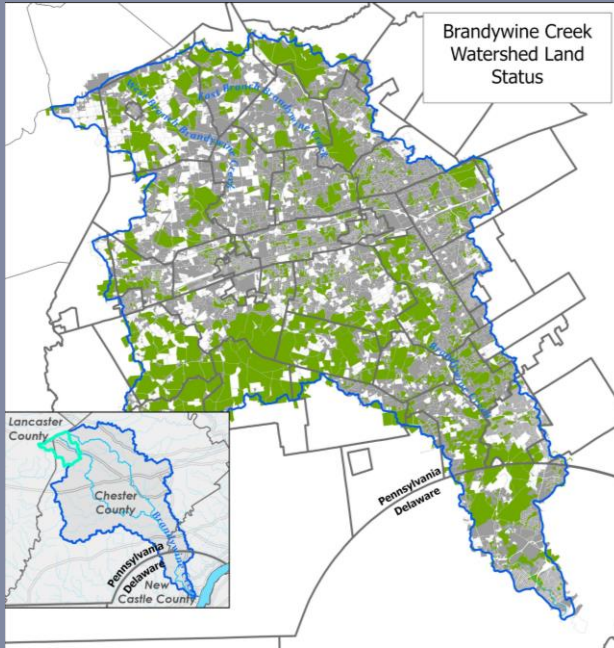
US Army
Corps of
Engineers



MODELING EXISTING CONDITIONS

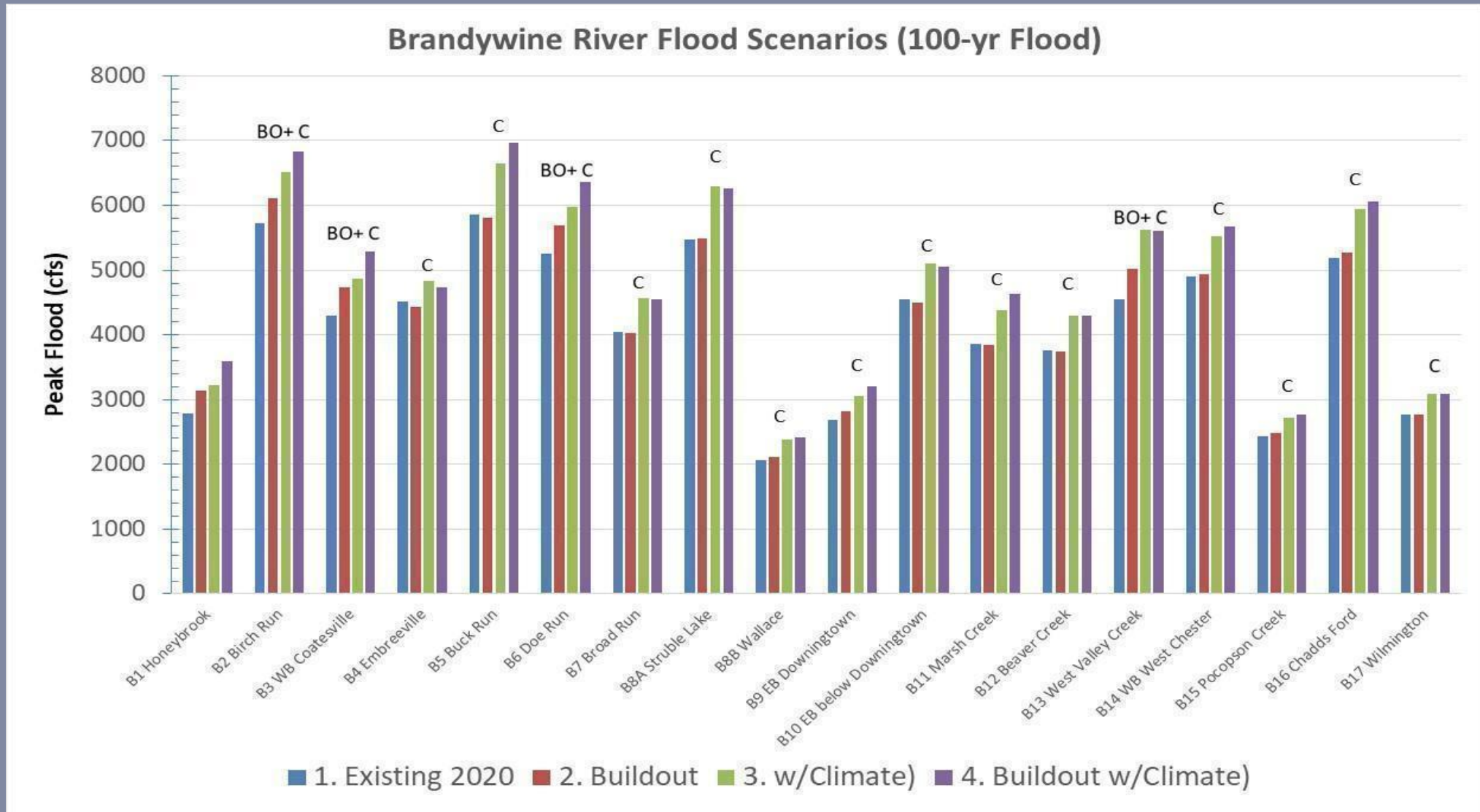


MODELLING FUTURE CONDITIONS



Factoring in buildout scenarios & storm event analysis projections

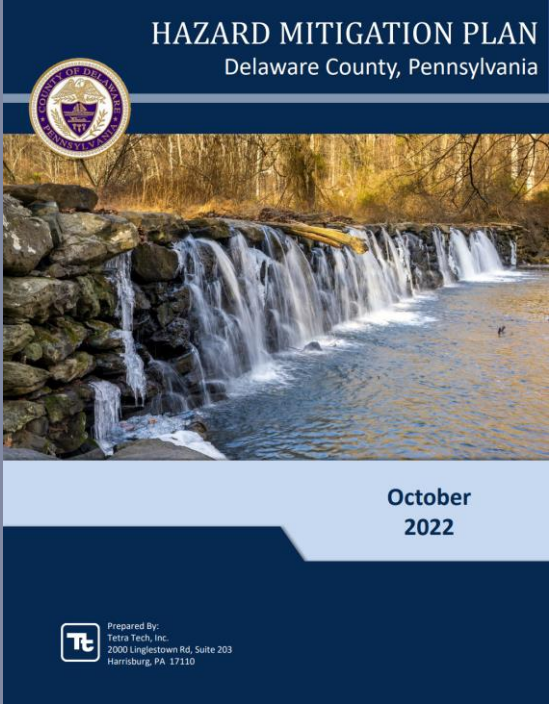
MODELLING FUTURE CONDITIONS



MUNICIPAL ENGAGEMENT

- Municipal Flood Concern Mapping
- County Hazard Mitigation Plan Review
- MS4 Review

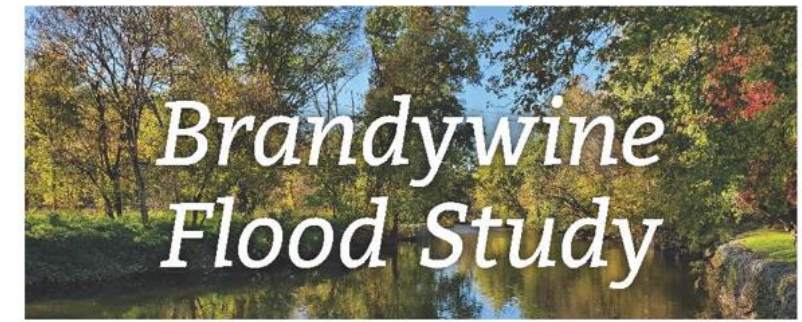
HAZARD MITIGATION PLAN – WEST BRADFORD TOWNSHIP												
Initiative	Mitigation Initiative	Applicable to new and/or existing structures	Hazard(s) Mitigated	Grain unit	Lead Agency	Support Agencies	Estimated How Often	Estimated Cost	Source of Funding	Timeline	Priority	Mitigation Category
West Bradford Township												
WestBradfordT-1	Acquire and install back-up sewerage at Wastewater Treatment Plant	Existing	Utility Interruption	2	Twp./DPW		High	High	FEMA HMGP, BRCC, Operating Budget	Short	Medium	SP
WestBradfordT-2	Improve drainage on Broad Run Road between Beacon Hill	Existing	Flood, Flood, and Ice Jam, Dam Failure	1	Twp.		Medi um	Medi um	FEMA HMGP, BRCC, FEMA PA DCD EDCP, Operating Budget	Short	Low	SP
WestBradfordT-3	Install 4 gates to be closed during flood incidents and signage at Downingtown Pike between Henshaw Hill Rd and Sharp Larch Rd	Existing	Flood, Flood, and Ice Jam, Dam Failure	1.2	Twp.		High	High	FEMA HMGP, BRCC, Operating Budget	Short	High	SP
WestBradfordT-4	Protect the Broad Run Sewage Treatment Plant from dam failure and to the 0.2% annual chance flood level	Existing	Flood, Flood, and Ice Jam, Dam Failure	1.2	EMC, FPA		High	High	FEMA HMGP, BRCC, FEMA PA DCD EDCP, Operating Budget, Sever Grant, Sever Fee	Short	Medium	SP
WestBradfordT-5	Work with the management of Tetra+ Construction Specialist to protect the building from dam failure. Work with the property owners of the following facilities to determine what flood protection measures can be taken to protect them to the 0.2% annual chance flood level and from the vulnerability to flooding: Northbrook Homecare District, Pennsylvania Railroad, Morrisville Linn, Vintner	Existing	Dam Failure	1.2	EMC, FPA	Re-mot Construction management	High	High	Operating Budget	Short	Medium	SP
WestBradfordT-6	Work with the property owners of the following facilities to determine what flood protection measures can be taken to protect them to the 0.2% annual chance flood level and from the vulnerability to flooding: Northbrook Homecare District, Pennsylvania Railroad, Morrisville Linn, Vintner	Existing	Flood, Flood, and Ice Jam, Dam Failure	1.2	EMC, FPA	PHMC	High	High	Operating Budget	Short	Medium	SP



PUBLIC ENGAGEMENT

- Over 35 public meetings, listening sessions, & forums
- Over 1,500 public interactions
- Online public survey & interactive flood mapper
- Media/communications toolkit

www.brandywine.org/conservancy/brandywine-flood-study



Wilmington Public Meeting

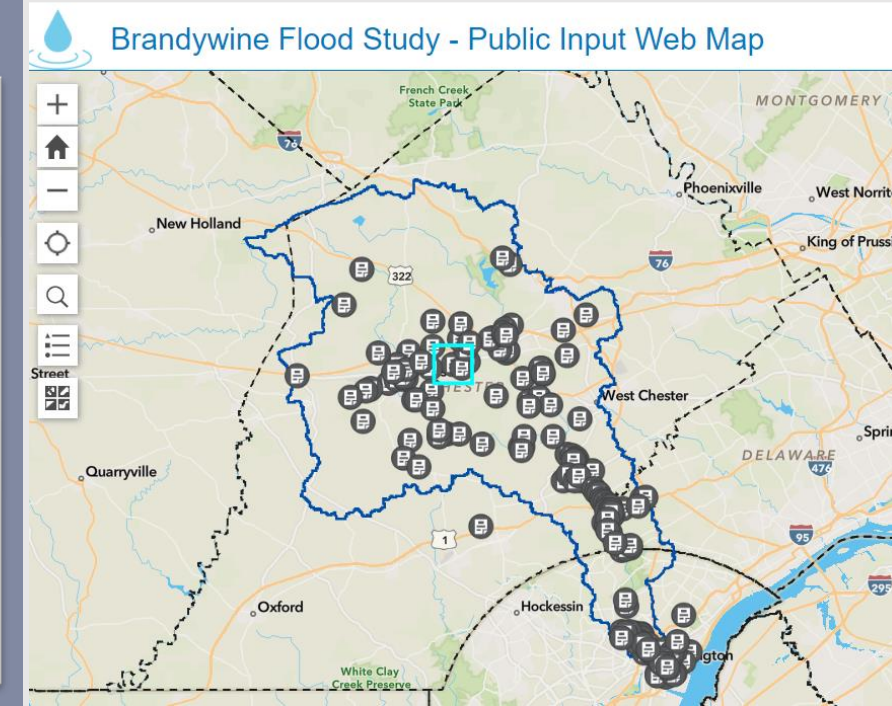
Thursday, May 9, 2024

6:30-8:30 p.m.

UrbanPromise Rick's Rock Servant Leadership Center

1000 E. 28th Street
Wilmington DE 19802

Make your voice heard!



Only **28%** report
having flood
insurance coverage

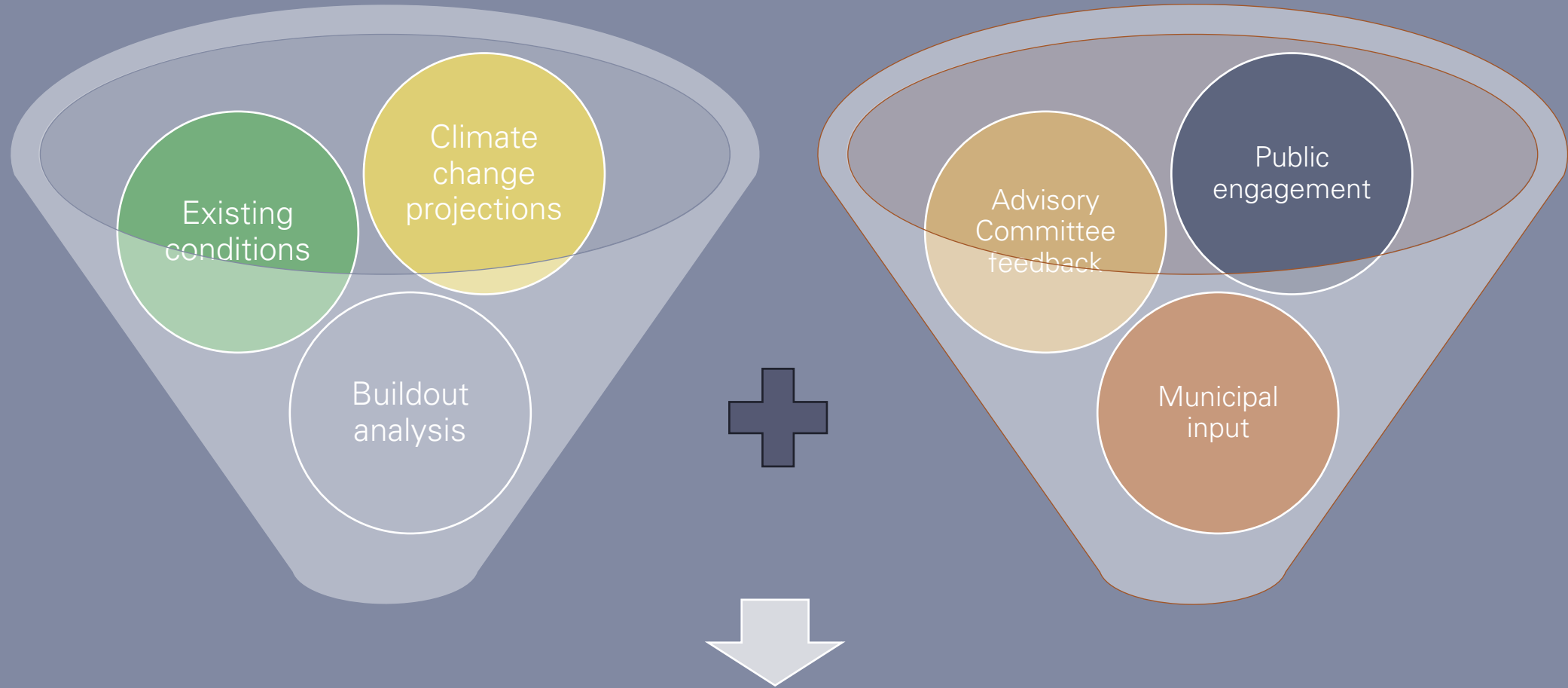
79% have had
flooding greatly affect
their ability to travel
for work, recreation,
and essential services

51% have
experienced property
damage due to
flooding

26% have experienced flood damage to
their homes and **37%** experienced
damage to other private property

More than 66% have
experienced some
degree of financial
losses due to flooding

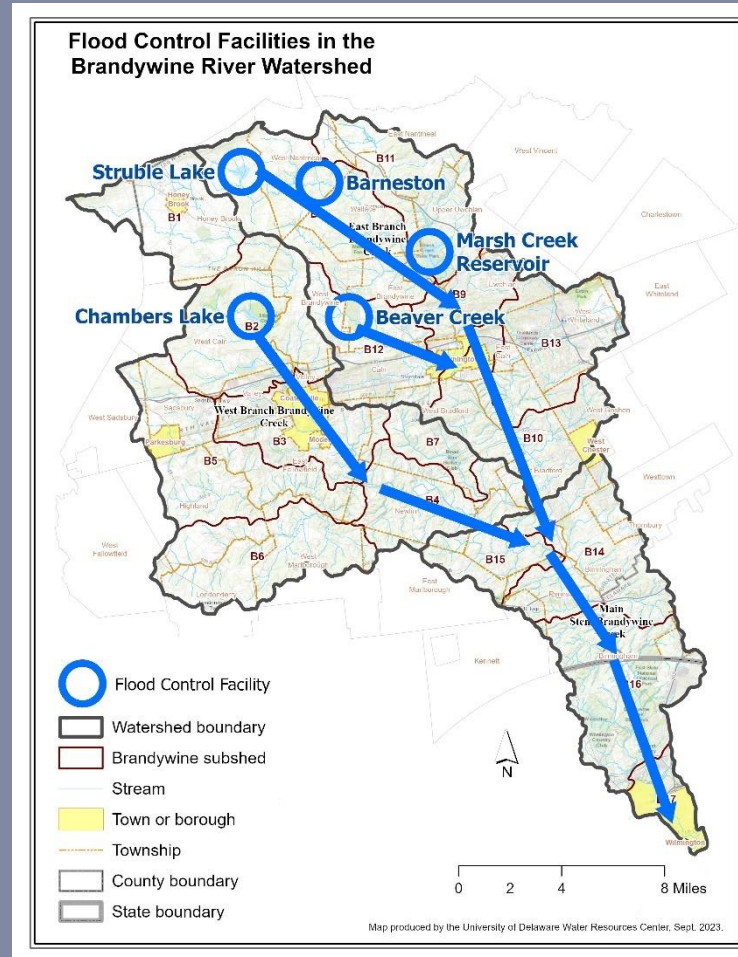
95% are worried about increased frequency
and/or intensity of future flooding



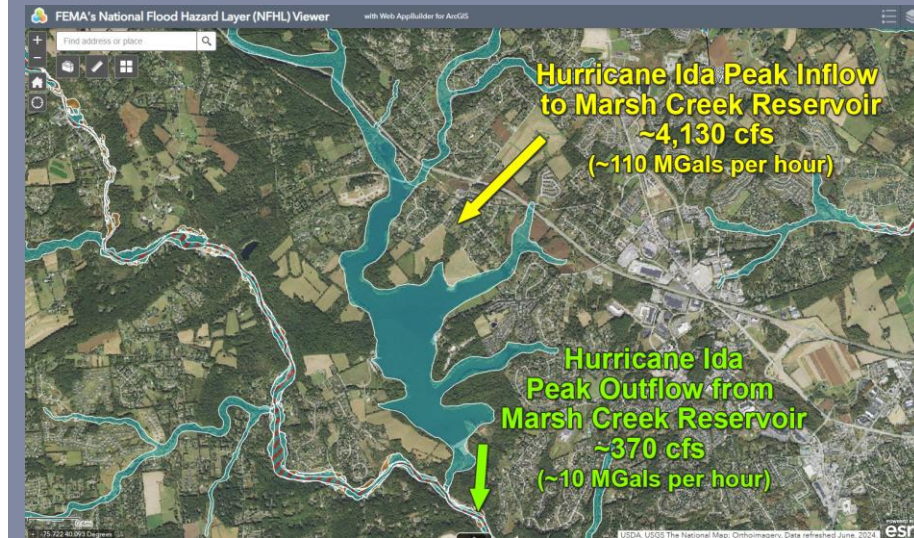
Structural & Non-Structural
Recommendations

EVALUATION OF EXISTING FLOOD CONTROL FACILITIES

1. Struble Dam – Flood Control, Fishing
2. Barneston Dam - Flood Control
3. Marsh Creek Dam - Water Supply, Flood Control, Recreation, Flow Augmentation
4. Beaver Creek Dam - Flood Control
5. Chambers Lake/Hibernia Dam on Birch Run - Water Supply, Flood Control, Recreation



Marsh Creek Dam



MODIFICATIONS TO EXISTING FLOOD CONTROL FACILITIES AND RESERVOIRS

Beaver Creek Dam – Change of Operation to Provide Additional Flood Storage



Beaver Creek Dam in East Brandywine Township before (with a 7.2 million gallon pool) and after (operating as dry dam with no permanent pool) the rehabilitation project, completed in 2022.

MODIFICATIONS TO EXISTING FLOOD CONTROL FACILITIES AND RESERVOIRS

Proposed Barneston Dam Rehabilitation

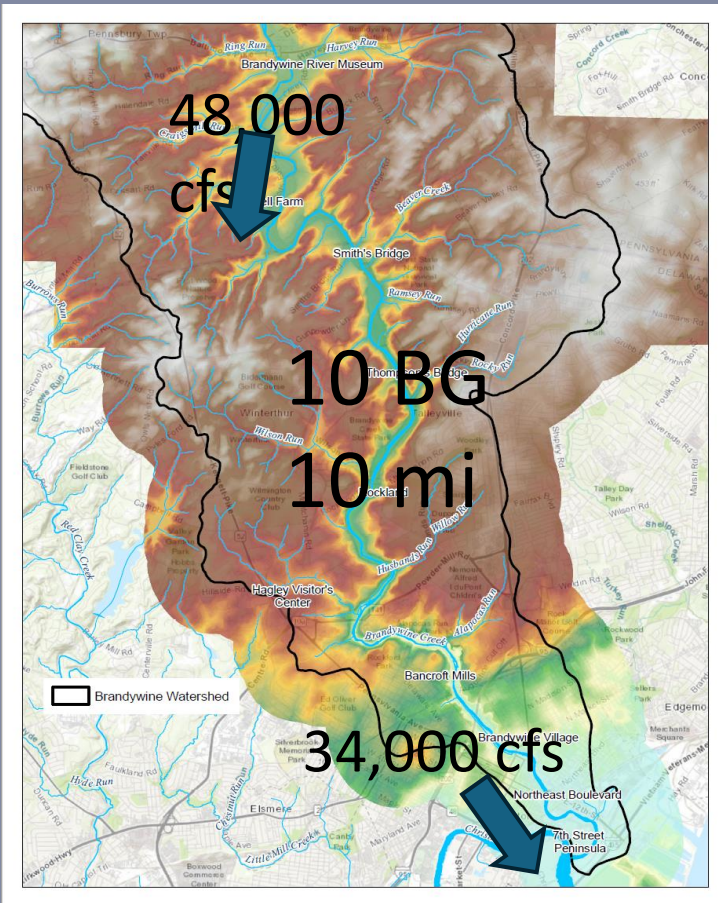
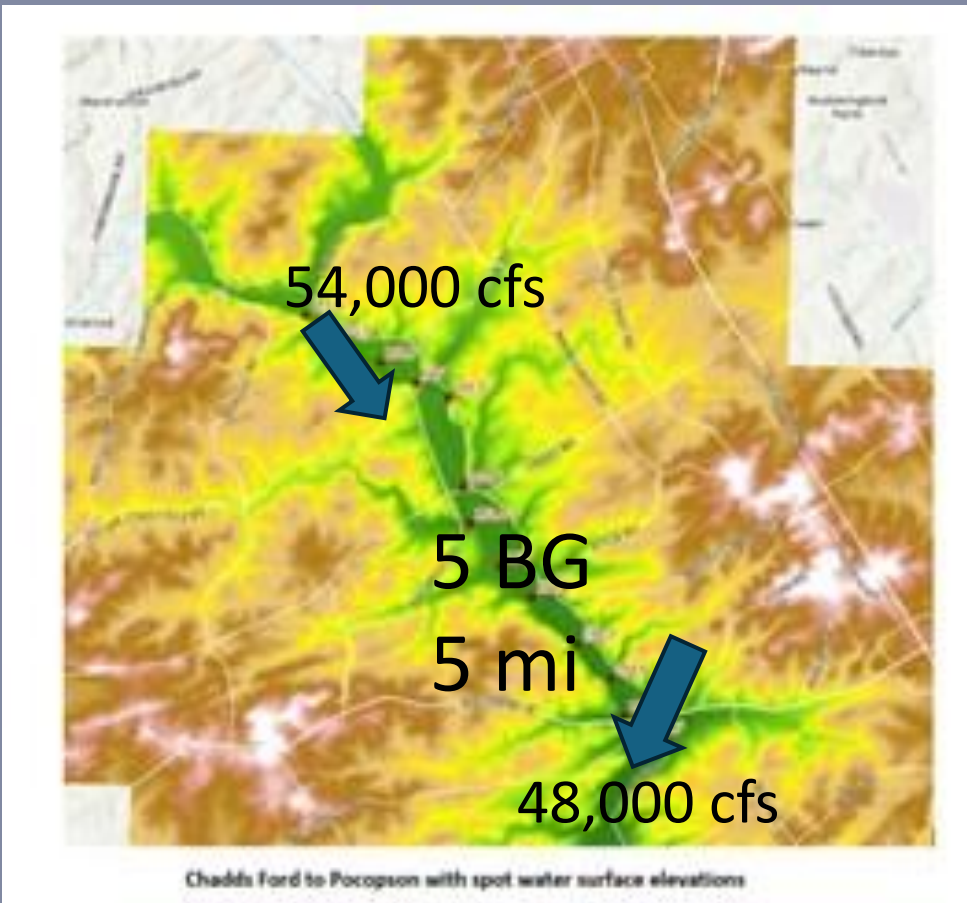
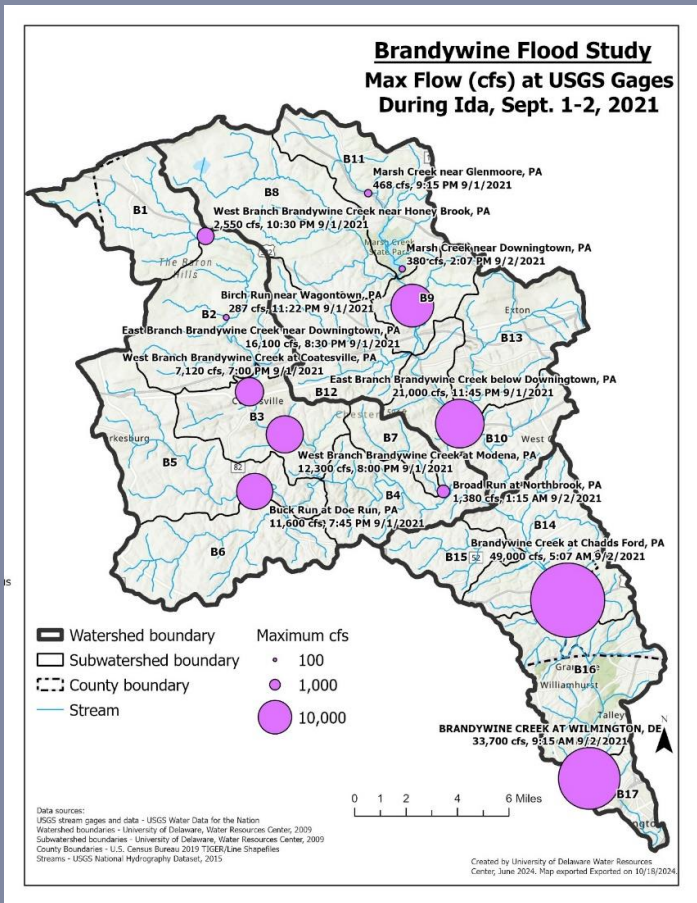


Barneston Dam in Wallace Township, East Branch Brandywine Creek

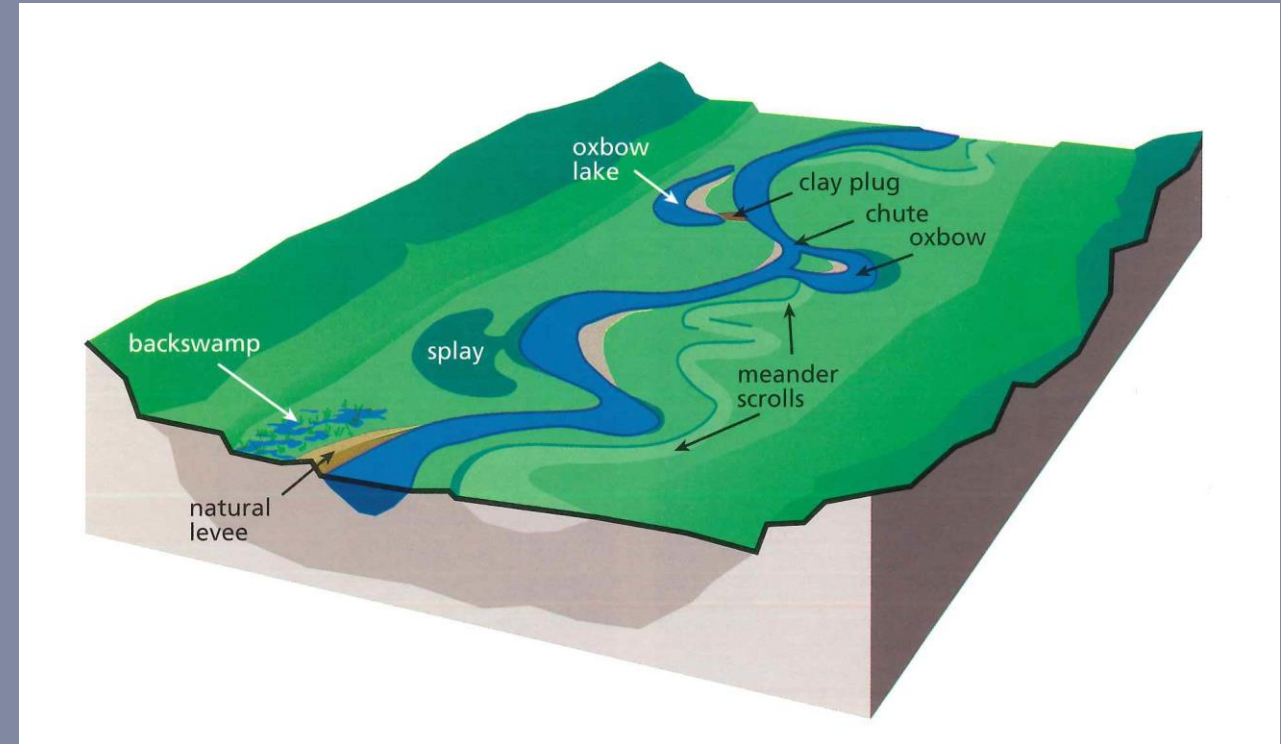
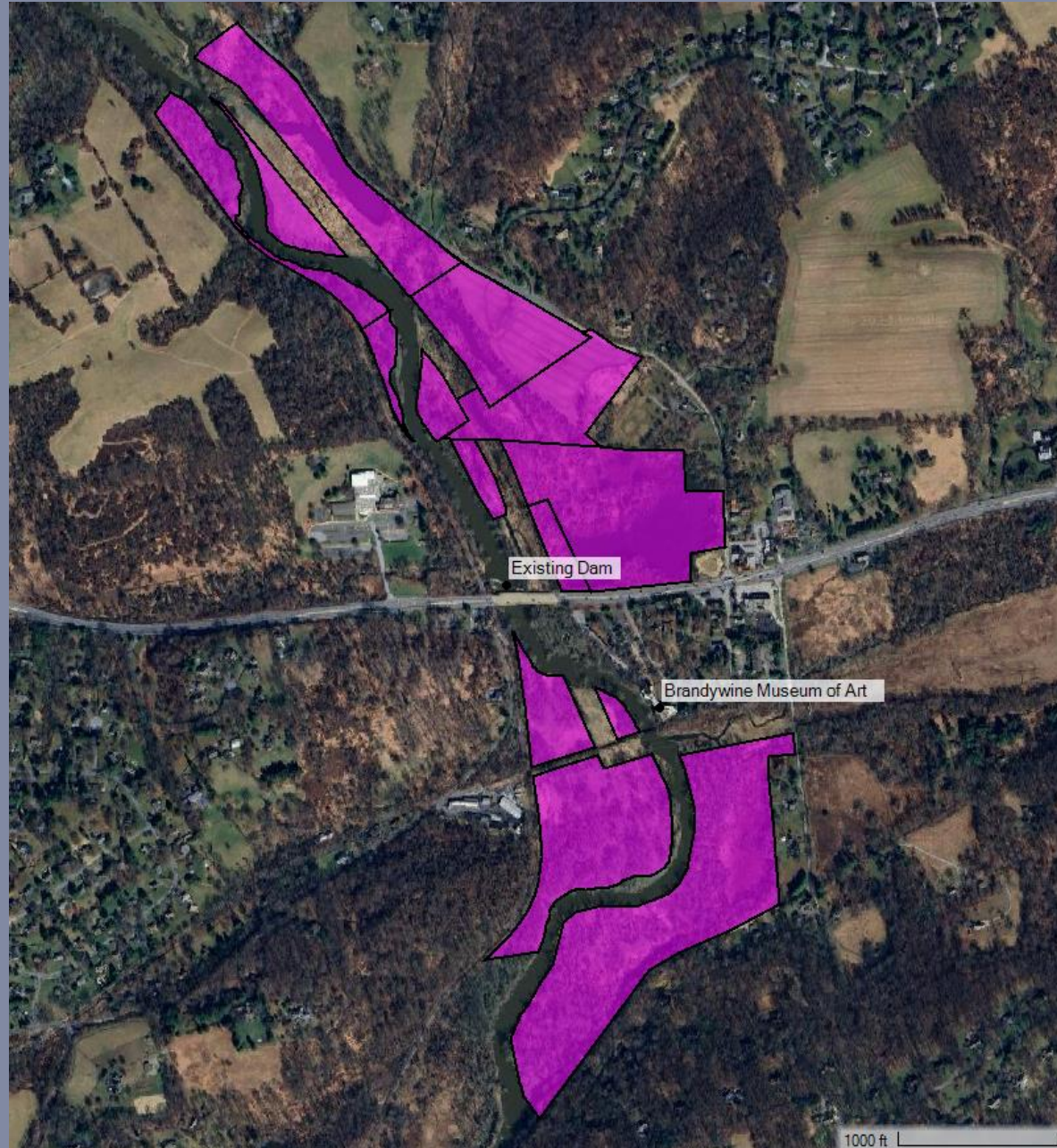


*A labyrinth weir constructed at Lake Williams Dam in York, PA
(photo courtesy of Gannett Fleming)*

FLOODPLAIN RESTORATION



FLOODPLAIN RESTORATION



BRIDGES, CULVERTS, AND DAMS – STREAM CROSSINGS

Reach	Bridges/ Culverts	Raises Flood Level	% Undersized
Main Stem Brandywine Del.	25	4	16%
Main Stem Brandywine Pa.	8	4	50%
East Branch Brandywine	37	7	19%
West Branch Brandywine	37	20	54%
Beaver Creek	16	4	25%
Brandywine Tributaries	168	87	52%
Total	291	126	43%



STORMWATER BASIN RETROFITS

- Analyzed 1,232 stormwater basins
- Estimated capacity of 5.4 million cubic feet, or about 40 million gallons
 - roughly 1% of the capacity of the 5 major flood control facilities
- Potential localized flood reduction benefits



MUNICIPAL INVENTORY & ASSESSMENTS

Chadds Ford Township, Delaware County | Brandywine Flood Inventory and Assessment 2025



Chadds Ford Township, Delaware County

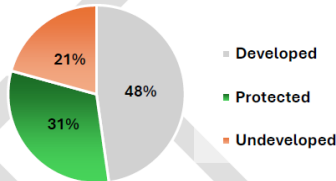
Brandywine Flood Inventory and Assessment 2025

Chadds Ford Township Summary

- 94% of the Township is within the Brandywine Watershed
- Township features the Brandywine Creek to the West (~4 miles) with the following tributaries: Harvey's Run, Brinton Run, Wilson Run, Beaver Creek
- Predominately suburban rural
- FEMA floodplain acres: 409 acres
- Population: 3,972 (2020 Census)
3,170 (2000 Census)

Open Space Inventory

- Dedicated municipal funding: Yes
- Approximately 31% (1,679 ac.) of the Brandywine Watershed is protected in the Township



Build Out Analysis (for portions of the municipality in the Brandywine Watershed)

Full Buildout			Preservation Opportunities		
	Quantity	% of Total		Quantity	% of Total
Potential impervious coverage	84 ac.	17.2%	Woodland preservation opportunity	498 ac.	16%
Potential woodland loss	250 ac.	8%	Floodplain preservation opportunity	54 ac.	13%
Potential loss of agricultural lands	407 ac.	0.07%	Riparian buffer preservation opportunity	56 ac.	19%
Population in floodplain	75	1.8%	Total preservation opportunity	1107 ac.	21%
Population Projection	3,910 by 2050 (DVRPC)	1.5% decrease	Structures in floodplain (over 400 sq. ft.)	40 (1,302 total)	3.1%

Flood Improvement Structural Recommendations

- Floodplain restoration
- Flood mitigation dry ponds
- Implement stormwater reduction measures
- Evaluate bridges, culverts and dams based on Chapter 6 recommendations and future flood models
 - Study identified that the following infrastructure contributes to flooding:
 - RM 22413, Main Stem
 - RM 23660, Main Stem
 - RM 23743, Main Stem

Flood Improvement Non-Structural Recommendations

- Emergency preparedness planning
- Public alerts and readiness
- Enforcing and enhancing floodplain regulations
- Structural elevations, floodproofing, property buyouts
- Public education and engagement
- Fee simple acquisitions
- Conservation easements
 - Review existing conservation easement language
- River corridor easements
- Develop municipal open space funds

February 2025

Chadds Ford Township, Delaware County | Brandywine Flood Inventory and Assessment 2025



Municipal Map Summary

- Majority of concerns are located along the Main Stem of Brandywine Creek
- 17 reported flooding locations
- 1 reports of debris jams
- 1 reports classified as other, ex: hazardous debris
- 1 bridges/culverts in Township undersized

Additional Municipal Recommendations

- Continue to preserve open space and agricultural lands
- Preserve and enhance ecological functions of riparian areas
- Limit development of steep slopes, consider adopting additional slope protection ordinances
- Implement municipal level projects for localized solutions
- Address flood concerns per the recommendations of subbasin B14 and B16, see Brandywine Flood Study Report
- Review, update, and implement projects for MS4 and the municipal projects identified in County Hazard Mitigation Plan
- Consider participation in the FEMA CRS program to reduce local flood insurance premium costs and encourage residential participation in the NFIP

February 2025

NON-STRUCTURAL RECOMMENDATIONS

- Public Alerts and Readiness
- Flood Insurance
- Enforcing and Enhancing Local Floodplain Regulations
- Public Education and Engagement
- Strengthening Steep Slope Protection Ordinances

Only **28%** report
having flood
insurance
coverage

STRUCTURAL ELEVATIONS, FLOODPROOFING, AND PROPERTY BUYOUTS

Municipality	County	State	Total Acres	# of Parcels	# of Structures (> 400 sq. ft)
Birmingham Township	Chester	PA	646.2	215	43
Pennsbury Township	Chester	PA	499.8	153	24
Chadds Ford Township	Delaware	PA	436.0	134	40
TOTAL			16442.1	6632	1707

NON-STRUCTURAL RECOMMENDATIONS

Open Space Preservation:

- Fee Simple Acquisition
- Conservation Easements
- River Corridor Easements
- Develop Municipal Open Space Funds

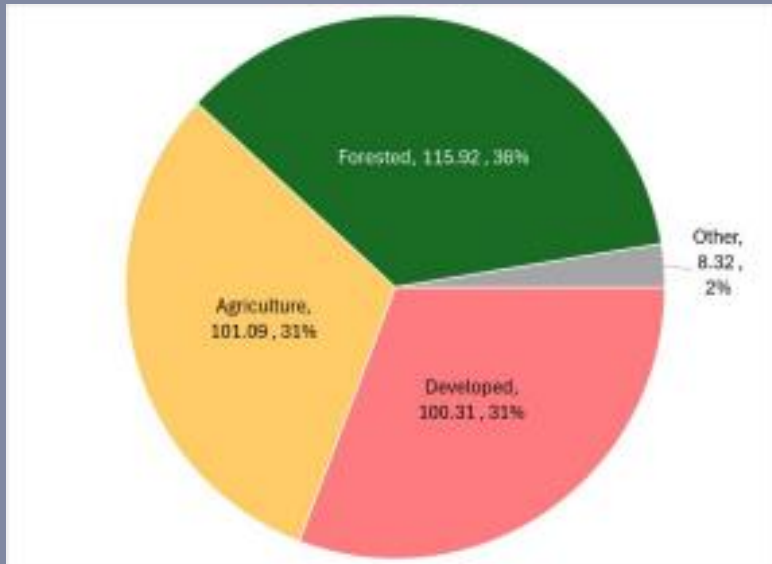
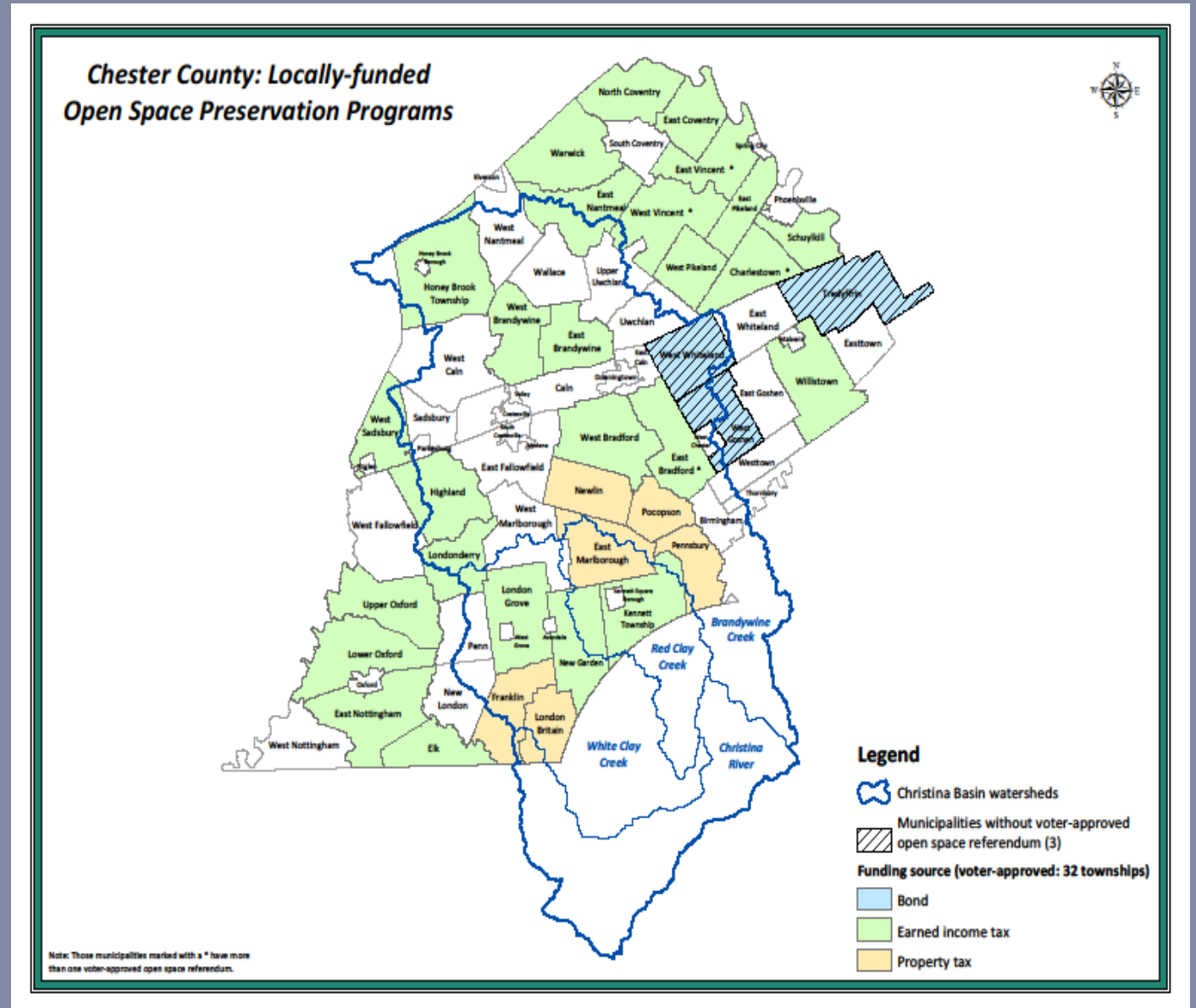


Figure 1.10. Land cover in the Brandywine Watershed, 2021



POTENTIAL IMPLEMENTATION PARTNERS AND ROLES

Chester County Water Resources Authority



County Departments of Emergency Services /
Emergency Management

Municipalities

PennDOT / DelDOT

Conservation Organizations

Community Groups

Individuals



NEXT STEPS

- Draft Reports available online
- Public engagement
- 45-day public comment period
- Final report released April
- Final report additional materials:
 - Executive Summary
 - Public Resources



Brandywine Flood Study



BRANDYWINE
CONSERVANCY



Chester County Water Resources Authority
CHESTER COUNTY ~ PENNSYLVANIA



UNIVERSITY OF
DELAWARE

Upcoming Public Meetings for the Brandywine Flood Study

Please join us for one of the upcoming public meetings to discuss the draft report of the Brandywine Flood Study. Each meeting will include a brief presentation followed by an open house discussion on the draft report findings and recommendations.

February 20, 2025, 6:00-7:30 p.m.:

Police Athletic League, 3707 N Market St, Wilmington, DE — [Click here to register](#)

February 24, 2025, 6:00-7:30 p.m.:

Delaware Center for Horticulture, 1810 N Dupont St, Wilmington, DE — [Click here to register](#)

February 25, 2025, 6:00-7:30 p.m.:

Coatesville City Hall, 1 City Hall Place, Coatesville, PA — [Click here to register](#)

February 26, 2025, 6:00-7:30 p.m.:

Borough Hall, Annex Meeting Rm, 6 W Lancaster Av, Downingtown, PA — [Click here to register](#)

March 4, 2025, 6:00-7:30 p.m.:

Brandywine Museum of Art, 1 Hoffman's Mill Rd, Chadds Ford, PA — [Click here to register](#)

IMPLEMENTATION

- Once the Flood Study Report is released, work doesn't stop
- Long-standing bi-state and cross-county partnerships
- Project prioritization and project leads identification is underway
- Support and assist implementing the other flood studies



*Rehabilitation of Beaver Creek Dam in
East Branch Brandywine Creek Watershed, 2021*

Brandywine Flood Study

THANK YOU



**BRANDYWINE
CONSERVANCY**

