


# Agricultural TMDLs and the Evolution of the Fishing Creek Alternative Restoration Plan

2020

Tom Wolf, Governor

Patrick McDonnell, Secretary

# Agricultural Pollution is Widespread

# Agricultural TMDLs

Total Maximum Daily Loads (TMDLs):

- Address polluted stream segments on 303(d) List of Impaired Waters as directed under the Clean Water Act
- Identify pollution sources and their level of pollution in a watershed
- Model and develop maximum numeric pollution load limits/pollution reduction goals to restore ecological health using the Reference Watershed Approach

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# Reference Watershed Approach

Reference Watershed Approach used for non-point source (NPS) pollution, such as agriculture:

- reference watershed must be attaining its designated use; not polluted
- similar in size and characteristics to the impaired watershed
- implementing best management practices (BMPs) to reduce pollution from similar source sectors not being managed properly in the impaired watershed
- Both watersheds are modeled and the loading rate of the reference is applied to the area of the impaired to produce the TMDL/load reduction goal; then…

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# Total Maximum Daily Load (TMDL)

TMDL = MOS + WLA + LA

The above formula applies generally to TMDLs.
The following is agricultural TMDL specific:

- MOS = Margin Of Safety = 10% of the TMDL is reduced for conservative safety = TMDL * 0.1
- WLA = Waste Load Allocation = the existing permitted point source loads plus a bulk reserve of 1% of the TMDL for new permits and permit expansion is subtracted = sum of permit loads + (TMDL * 0.01)
- LA = Load Allocation = the remaining portion of the TMDL that is divided between targeted non-point source sectors = TMDL – MOS – WLA = LA

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# Load Allocation (LA)

TMDL - MOS - WLA = LA

LA = LNR + ALA

(non-point source agricultural pollution example)

- LNR = loads not reduced = sum of source sectors not targeted for reduction, such as: forest, wetlands, open land subtracted from the LA without reduction

- ALA = adjusted load allocation = remaining LA divided between source sectors targeted for reduction, such as: croplands, pastures and streambanks

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# Pollution Load Reductions

## Equal Marginal Percent Reduction Method (EMPR)

- The ALA is further parsed out numerically to the targeted source sectors being reduced
- First, if a source exceeds the ALA, it is reduced to the ALA
- Then all sources receive an equal percent reduction to meet the ALA
- This is where the numeric load reduction goals of the TMDL are assigned to the targeted source sectors of croplands, pastures and streambanks for pollutants such as sediment and nutrients
- Future load reductions can be measured by applying numeric BMP efficiency standards to proposed BMP units and applying these reductions to the load reduction goals of the TMDL
- Note: TMDLs set a maximum pollution load limit for a waterbody
- ***Implementation*** of the TMDL is a separate function as is the tracking of future load reductions/TMDL attainment

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# New Vision: ARPs (TMDLs + Implementation)

Alternative Restoration Plans (ARPs)

- Mirror TMDLs by:
  - addressing stream impairments
  - identifying pollution types and sources
  - developing maximum numeric pollution load limits
- ARPs add Implementation to TMDLs by:
  - teaming up with local partners on BMP implementation
  - providing ongoing BMP modeling to local partners quantifying their numeric pollution load reductions
  - providing enhanced ecological monitoring to track environmental responses to BMP implementation and pollution reduction
  - assisting in the grant process
  - conducting Adaptive Management through time to attain pollution reduction goals and watershed restoration
  - ***TMDLs + Implementation = ARPs***

  (of note: ARP development and implementation require significantly more effort than TMDL development)

# ARPs

- Multiple uses but work well for NPS pollution
  - Target HUC12 or smaller
  - Fishing Creek is 11 square miles, just shy of its HUC12
- Phased restoration
  - Phase 1 - Regulatory Compliance
    - financial incentives for agricultural conservation plan development
    - compliance visits ensure implementation of plans
  - Phase 2 - Habitat Improvement and Protection
    - stream, wetland and forest habitat restoration/preservation
- Adaptive Management
  - monitor:  chemistry, ecology and habitat
  - remodel BMPs as implementation evolves
  - Active support and protection of the natural system to give it a fighting chance to heal and thrive

# Fishing Creek ARP

- Streambank Fencing = Higher Milk Profits
- Partners, including Plain Sect Farmers and Donegal Trout Unlimited (DTU), implementing BMPs
- NFWF, GG and 319 grants
  - streambank fencing and microbiological somatic cell count monitoring to indicate trends in cow herd health
  - conservation plan development and implementation
  - stream, forest, wetland (HABITAT) restoration/preservation/protection
    - 22 of 26 stream miles are polluted by siltation from agriculture
- Adaptive management
- Protecting a PA threatened species:
  - Chesapeake logperch, *Percina bimaculata*

# Fishing Creek Pollution Sources

| Existing Sediment Loading Values for Fishing Creek | | | |
|---|---|---|---|
| Source | Area, acres | Sediment, lbs/yr | Loading Rate, lbs/ac/yr |
| HAY/PASTURE | (25%) 1,825 | (4%) 54,807 | 140 |
| CROPLAND | (42%) 3,015 | (85%) 5,263,838 | 1,746 |
| FOREST | (25%) 1,810 | (0.09%) 5,715 | 3 |
| WETLAND | 67 | 161 | 2 |
| OPEN LAND | 435 | 64 | 0 |
| LOW DENSITY MIXED | 62 | 4,407 | 71 |
| MEDIUM DENSITY MIXED | 15 | 661 | 45 |
| HIGH DENSITY MIXED | 2 | 59 | 24 |
| STREAMBANKS | | (10%) 632,962 | |
| TOTAL | 7,230 | 6,162,674 | 852 |

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# Fishing Creek ARP

## Reference Watershed Approach reduction goal:

Note: Existing load in Fishing Creek was 6,162,674 lbs/yr

| Pollutant | Loading Rate in Reference, lbs/ac/yr | Total Area in Impaired Watershed, ac | AL, lbs/yr | AL, lbs/day |
|---|---|---|---|---|
| Sediment | 449 | 7,230 | 3,249,202 | 8,902 |

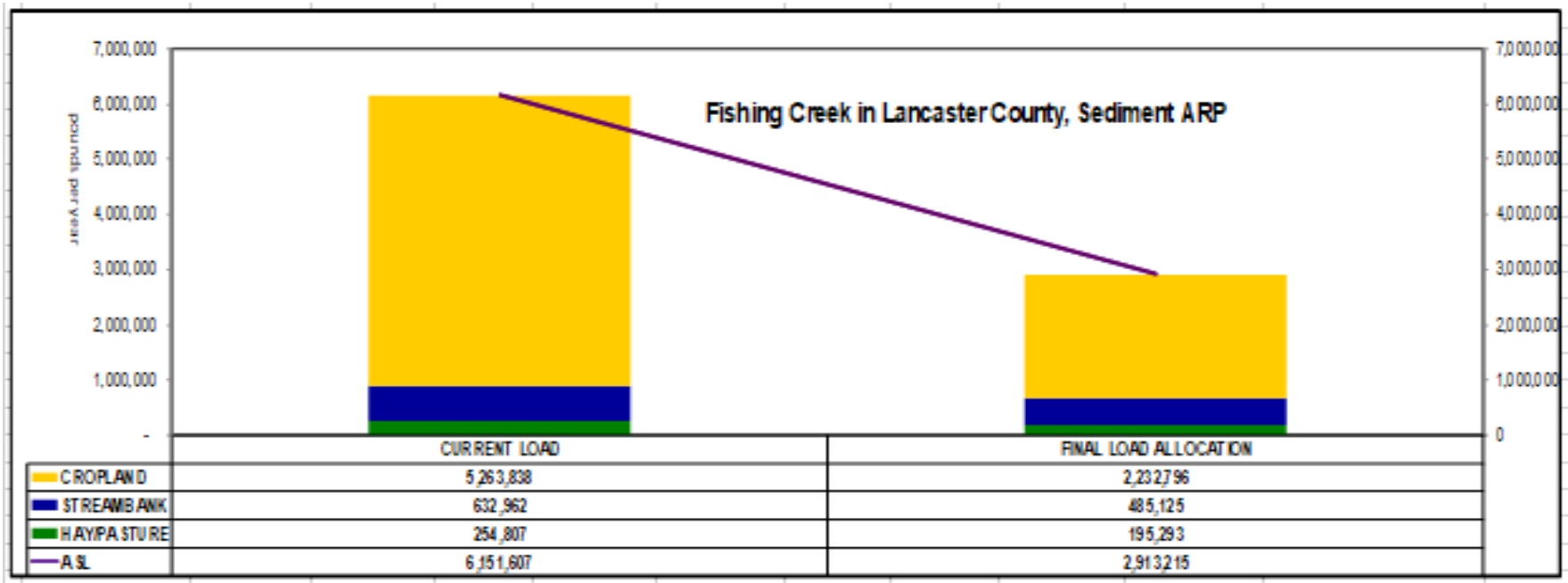
## ARP components are slightly different than those of regular TMDLs

| Component | Sediment, lbs/yr | Sediment, lbs/day |
|---|---|---|
| AL (Allowable Load) | 3,249,202 | 8,902 |
| UF (Uncertainty Factor) | 324,920 | 890 |
| SL (Source Load) = (LNR+ASL) | 2,924,282 | 8,012 |
| LNR (Loads Not Reduced) | 11,067 | 30 |
| ASL (Adjusted Source Load: here is the load reduction) | 2,913,215 | 7,981 |

# EMPR/Pollution Reduction Goals

Parsing out the load reduction: (ASL/ALA = 2,913,215)

| | | Allowable Loading Rate | Allowable Load | Current Loading Rate | Current Load | |
|---|---|---|---|---|---|---|
| Source | Acres | lbs/acre/yr | lbs./yr | lbs/acre/yr | lbs/yr | Reduction |
| Cropland | 3,015 | 741 | 2,232,796 | 1,746 | 5,263,838 | 58% |
| Hay/Pasture | 1,825 | 107 | 195,293 | 140 | 254,807 | 23% |
| Streambanks | | | 485,125 | | 632,962 | 23% |



# Fishing Creek Pollution Solution

| Phased Annual Sediment Load Reductions | | | | |
|---|---|---|---|---|
| | Current Load | Phase 1 Reduction | Allowable Load | Phase 2 Reduction |
| | lbs/yr | lbs/yr | lbs/yr | lbs/yr |
| Fishing Creek Watershed | 6,162,674 | 5,145,729 | 3,249,202 | 3,009,223 |
| Load Reduction | | 1,016,945 | 2,913,472 | 3,153,451 |
| Percent Reduction | | 17% | 47% | 51% |

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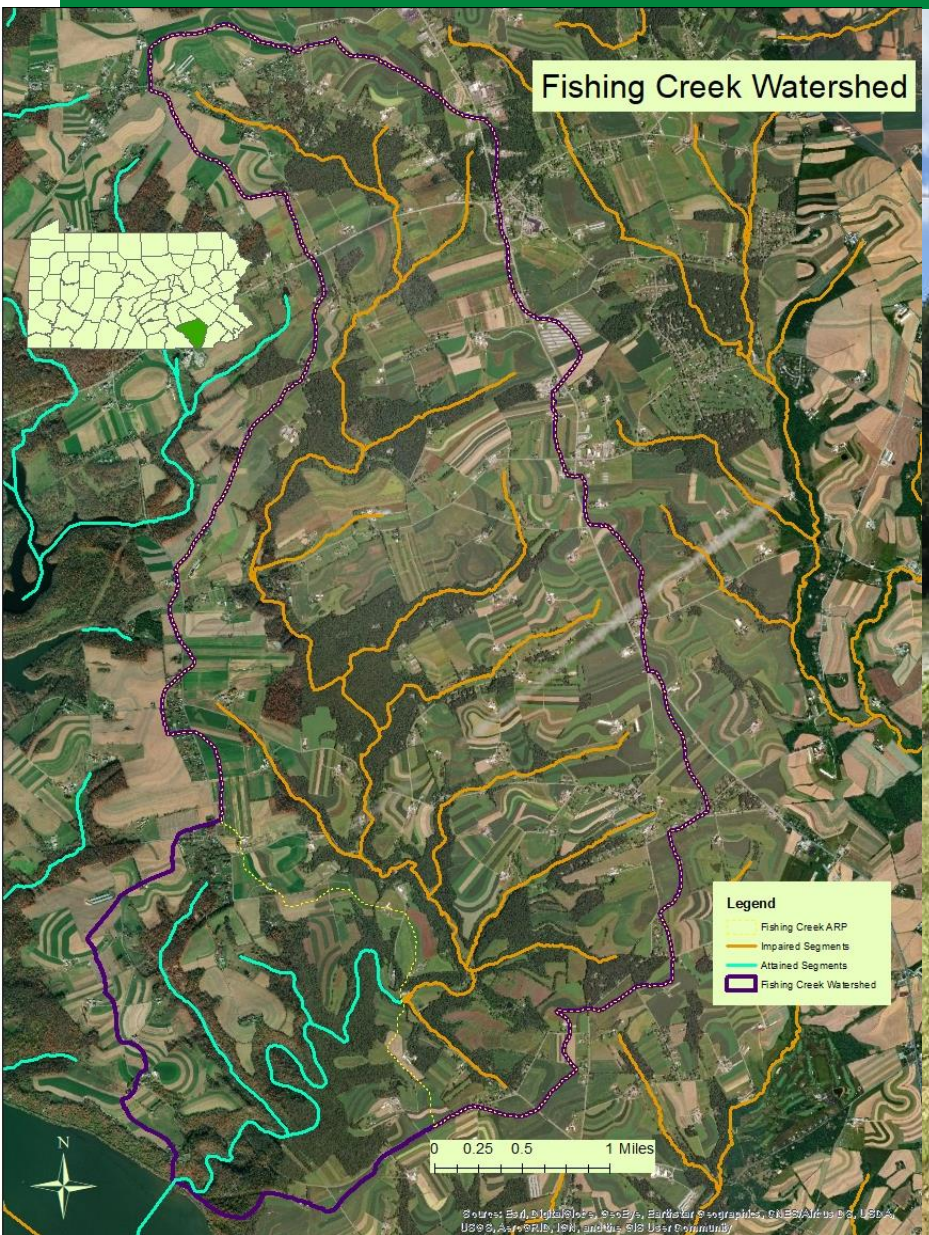
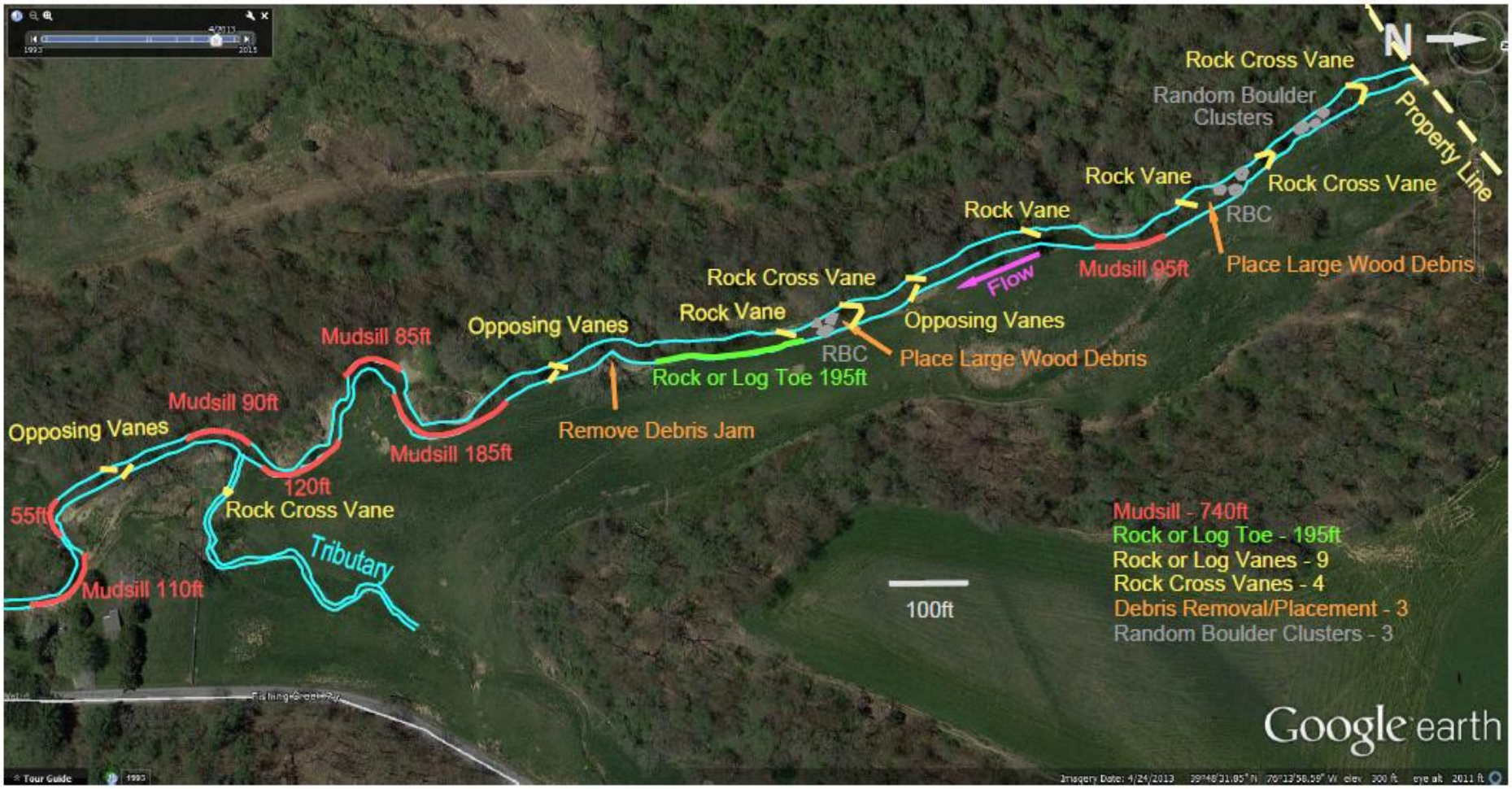
# Fishing Creek Watershed/Partners




# Natural Stream Restoration Design




Partners for Fish & Wildlife

Donegal Chapter of Trout Unlimited

**Fishing Creek Habitat Restoration Project Upstream**

**Drumore Township, Lancaster County, PA**

Drawn by: C.Keller, A. Smith

# Stream Restoration Implementation

**Before** **After**

Links:

Drone video of work: https://youtu.be/YbE90H62KJM

DTU video: https://vimeo.com/374217402

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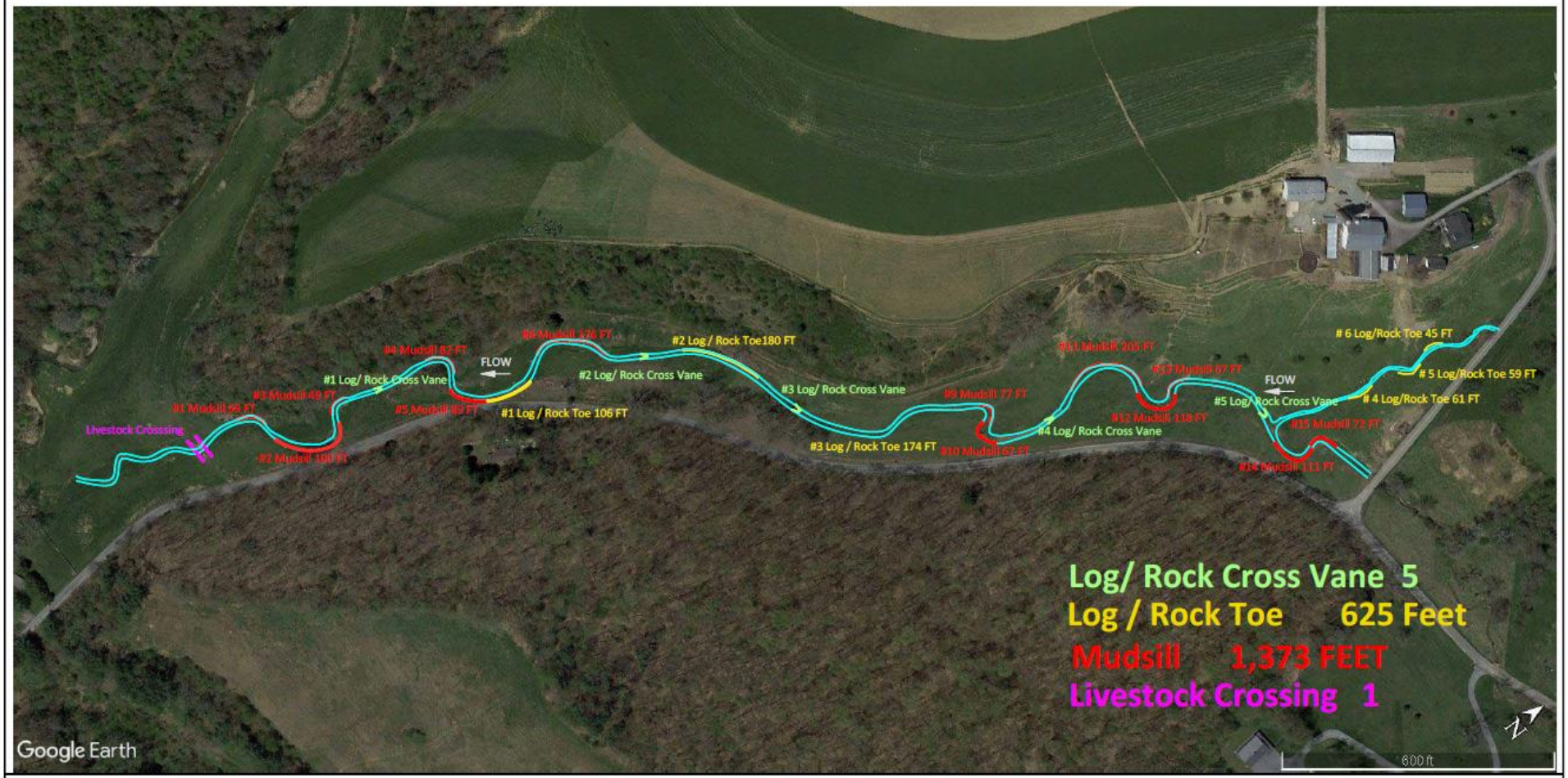


Fishing Creek Tributary At Bieler Farms

Drumore Township, Lancaster County, PA

U.S. Fish and Wildlife Service Partners for Fish & Wildlife

Donegal Chapter of Trout Unlimited

Lancaster County Conservation District

Drawn by: G. Port and K. Miller

# Stream Restoration Implementation

Before

After

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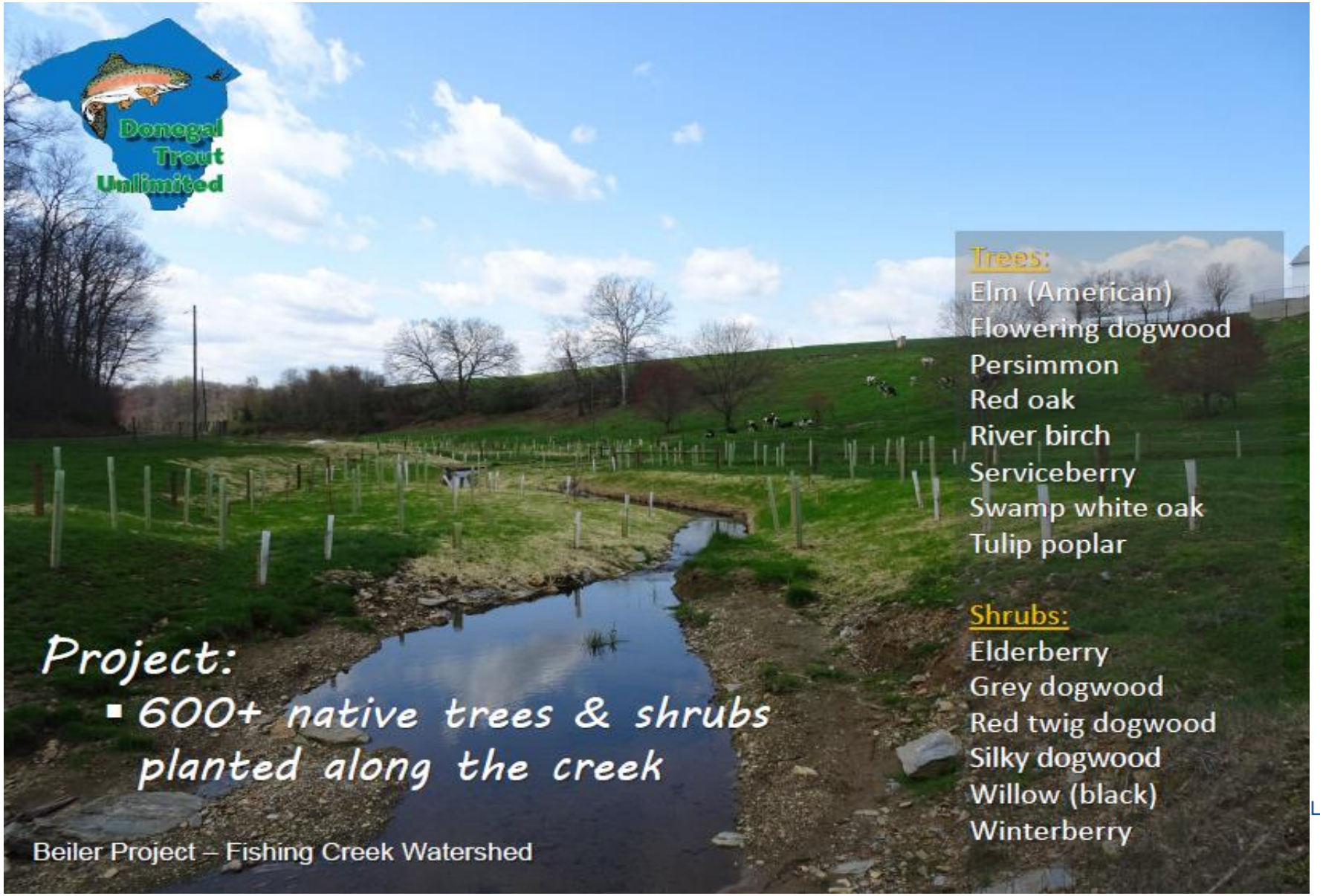
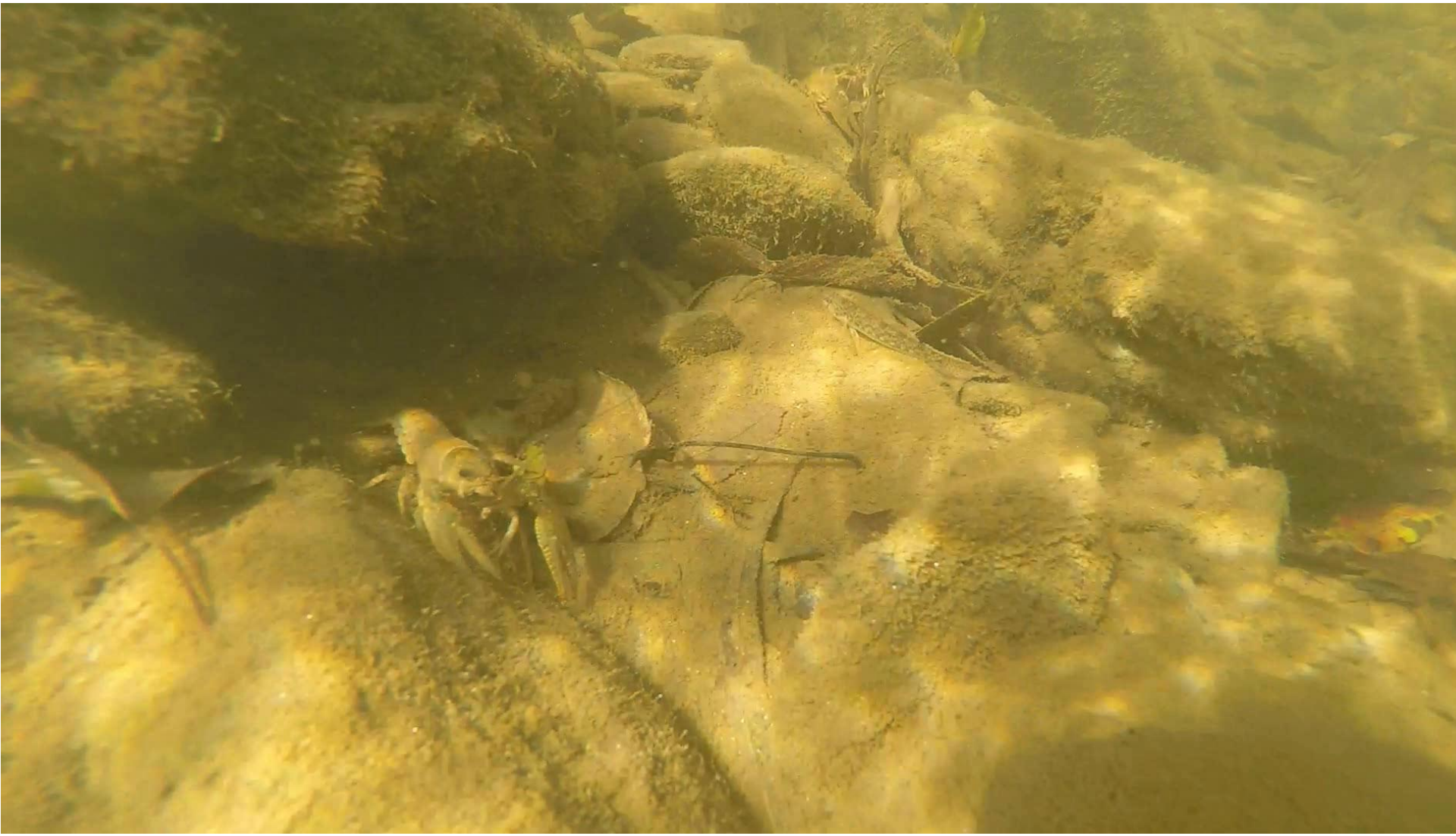
# Volunteers !!!

# Native Trees and Shrubs





# Summary

- Local leaders and grant funding are essential to BMP implementation and ecosystem revitalization
- DEP provides technical expertise in modeling and ecological monitoring, and assistance throughout the grant process
- Adaptive management ensures the ARP can guide restoration and provide habitat protection through time
- Enhanced stream, forest, riparian corridor and wetland restoration/preservation gives nature the ability to heal critical habitat and repopulate species struggling to survive
- Post-BMP trends in herd health and ecological responses in the Fishing Creek Watershed will be communicated to protect high quality ecological functionality and promote vibrant and necessary agriculture throughout the region

# Any Questions or Comments?

Chesapeake Logperch (*Percina bimaculata*).
Credit: Rob Criswell.

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Underwater Videos Credit:
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Special Thanks to the Donegal Chapter of Trout Unlimited.
**Thank you DTU!**