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Watershed Scale Reclamation and Treatment Planning with Changing Reclamation Funding Sources

Natalie Kruse Daniels, Jen Bowman, Guy Riefer
Ohio University

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Rush Creek Watershed - Ohio

Extensive Coal Mining Legacy

Pre Law and Post Law

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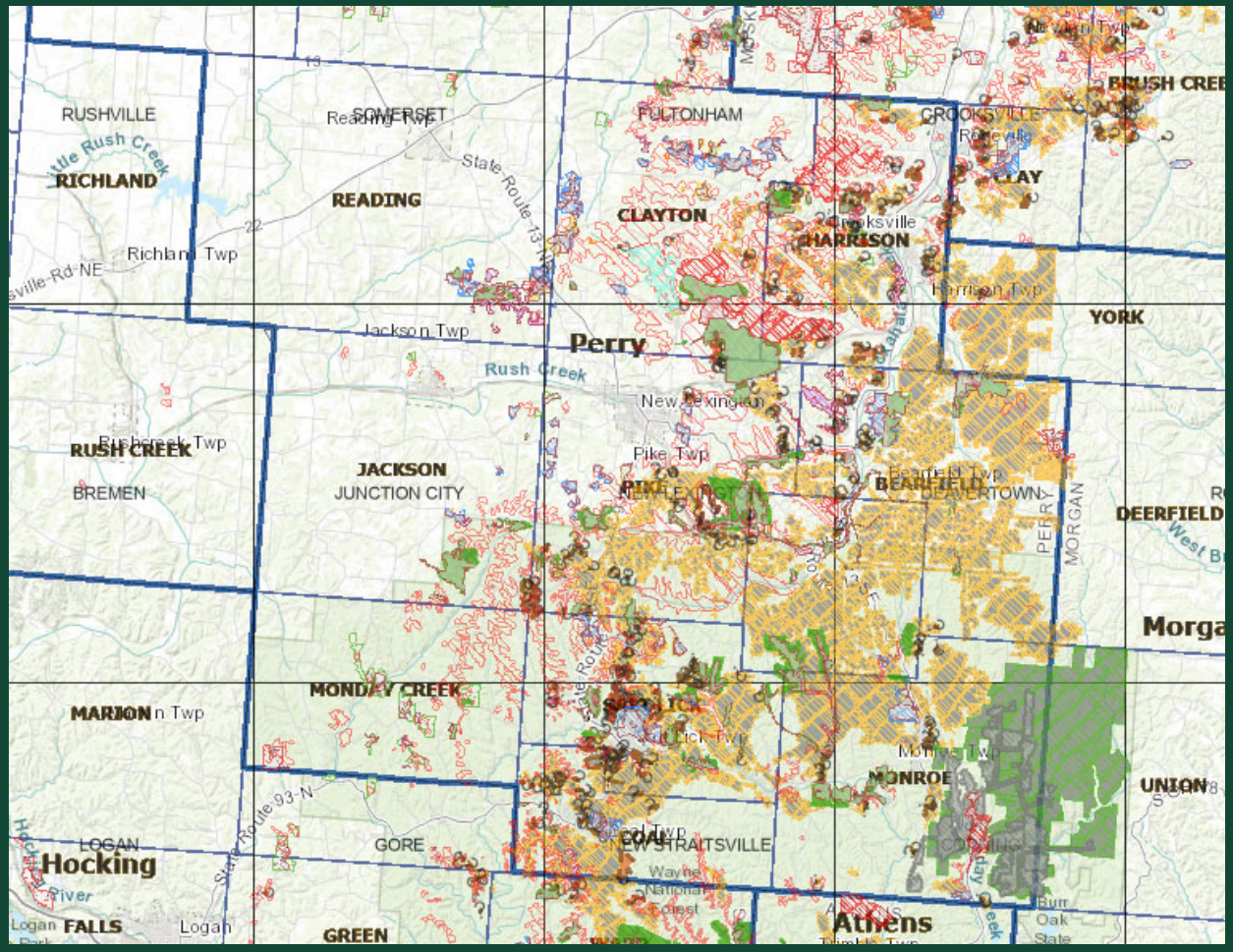
Mines in Perry County, Ohio



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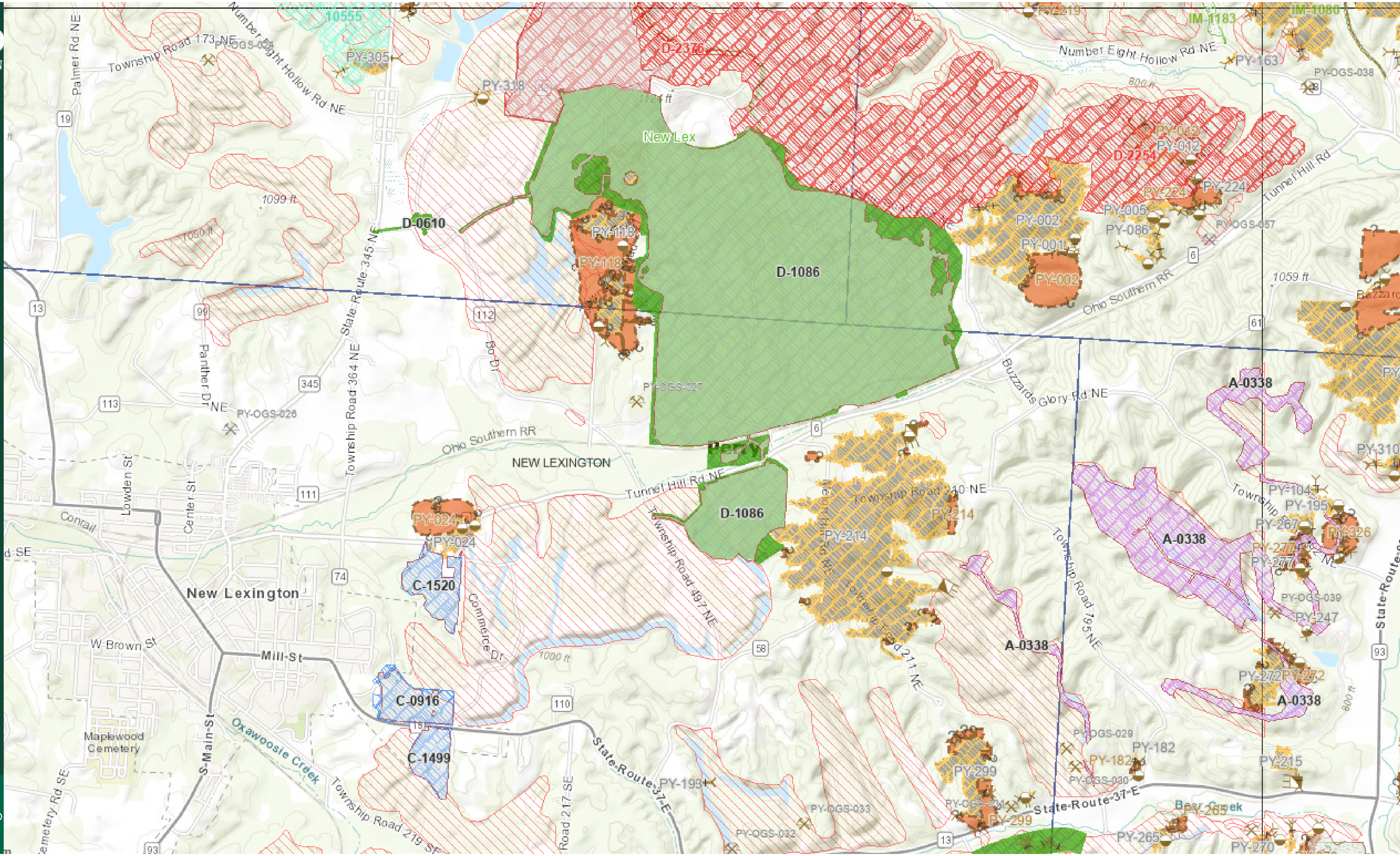
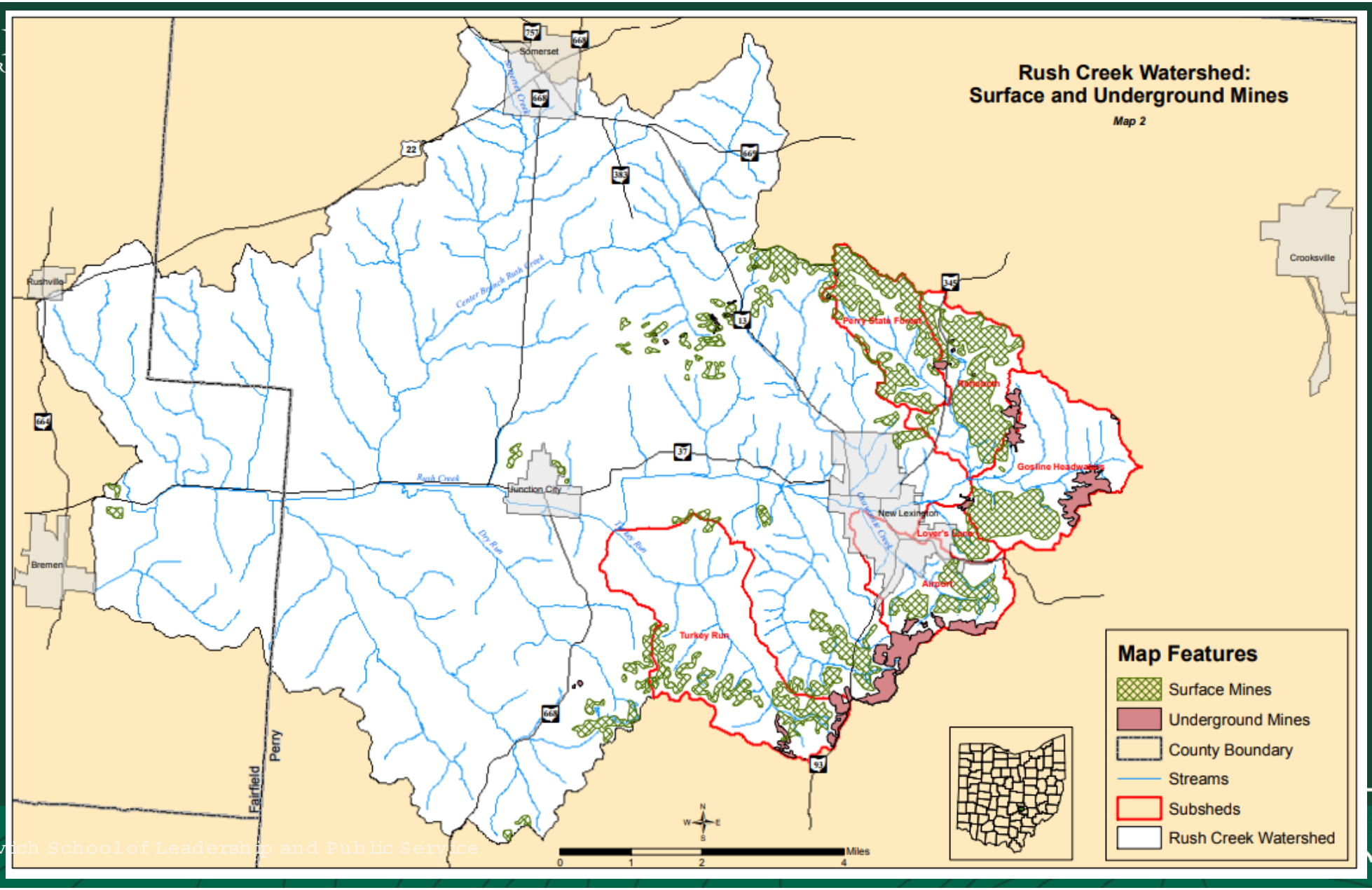


New Lexington
NEW LEXINGTON
New Lex
D-1086
D-0610
D-2376
D-2254
A-0338
C-1520
C-0916
C-1499
PY-118
PY-024
PY-214
PY-002
PY-001
PY-005
PY-086
PY-012
PY-224
PY-299
PY-182
PY-193
PY-215
PY-265
PY-270
PY-272
PY-247
PY-267
PY-277
PY-104
PY-195
PY-326
PY-310
PY-305
PY-318
PY-219
PY-163
PY-OGS-024
PY-OGS-026
PY-OGS-027
PY-OGS-038
PY-OGS-057
PY-OGS-039
PY-OGS-029
PY-OGS-030
PY-OGS-032
PY-OGS-033
IM-1183
IM-1080
10555
Perry
Township Road 173 NE
Number Eight Hollow Rd NE
Palmer Rd NE
Panther Dr
State Route 345 NE
Township Road 364 NE
Ohio Southern RR
Tunnel Hill Rd NE
Tunnel Hill Rd
Buzzards Glory Rd NE
Township Road 240 NE
Township Road 497 NE
Township Road 195 NE
Township Road 211 NE
Township Road 219 SE
State Route 37 E
State-Route-93
Commerce Dr
Bo Dr
Mill St
W Brown St
S Main St
Lowden St
Center St
Conrail
Oxawoosie Creek
Bear Creek
Maplewood Cemetery
Cemetery Rd SE
Road 217 SE
1099 ft
1050 ft
1124 ft
1059 ft
1000 ft
800 ft


Rush Creek Watershed:
Surface and Underground Mines
Map 2
Somerset
Rushville
Bremen
Junction City
New Lexington
Crooksville
Perry
Fairfield
Center Branch Rush Creek
Rush Creek
Dry Run
Turkey Run
Perry State Forest
Goshline Headwaters
Airport
Lower's Dock
Map Features
Surface Mines
Underground Mines
County Boundary
Streams
Subsheds
Rush Creek Watershed
N
W
E
S
0
1
2
4
Miles

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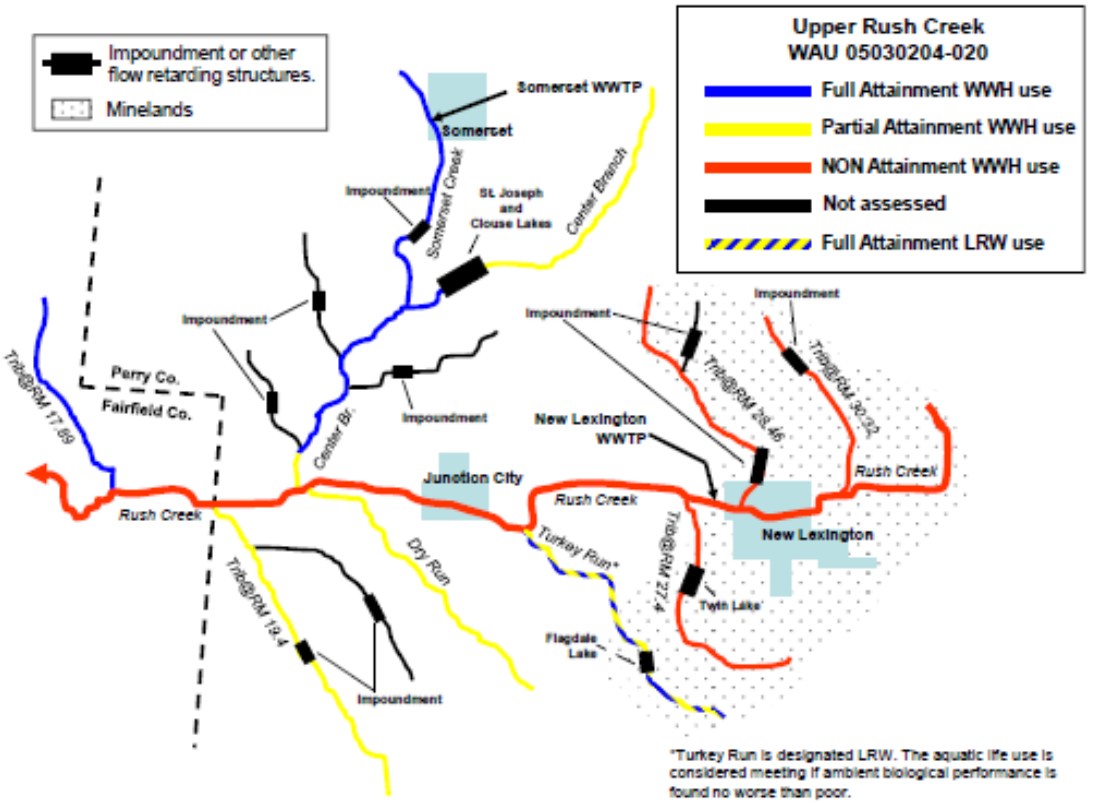
Rush Creek Data

From AMDAT (Bowman 2009) and update (Voinovich School 2021)

Figure 1. Biological attainment condition of Rush Creek from 2004 OEPA TMDL study



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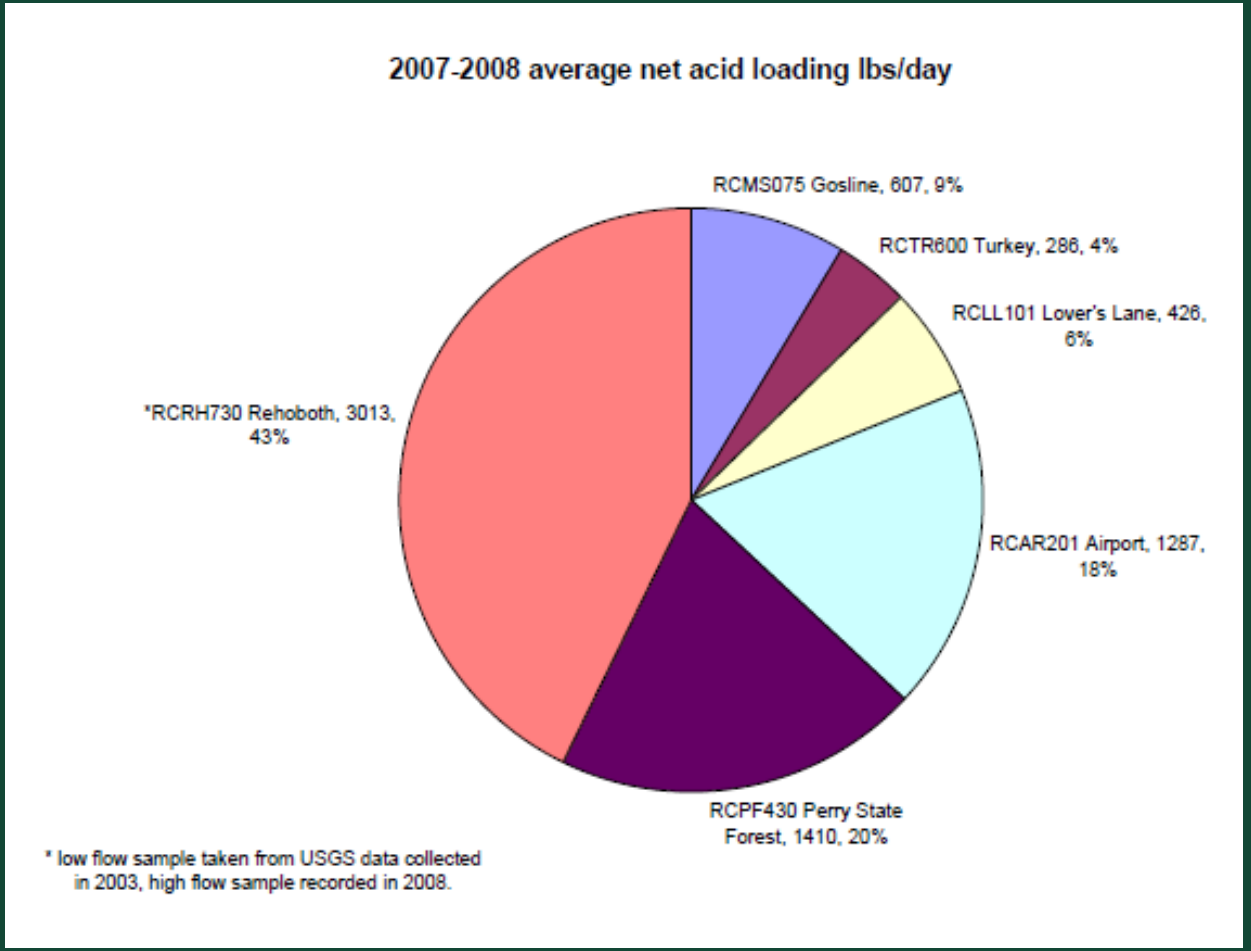
2007-2008 Acid Loadings



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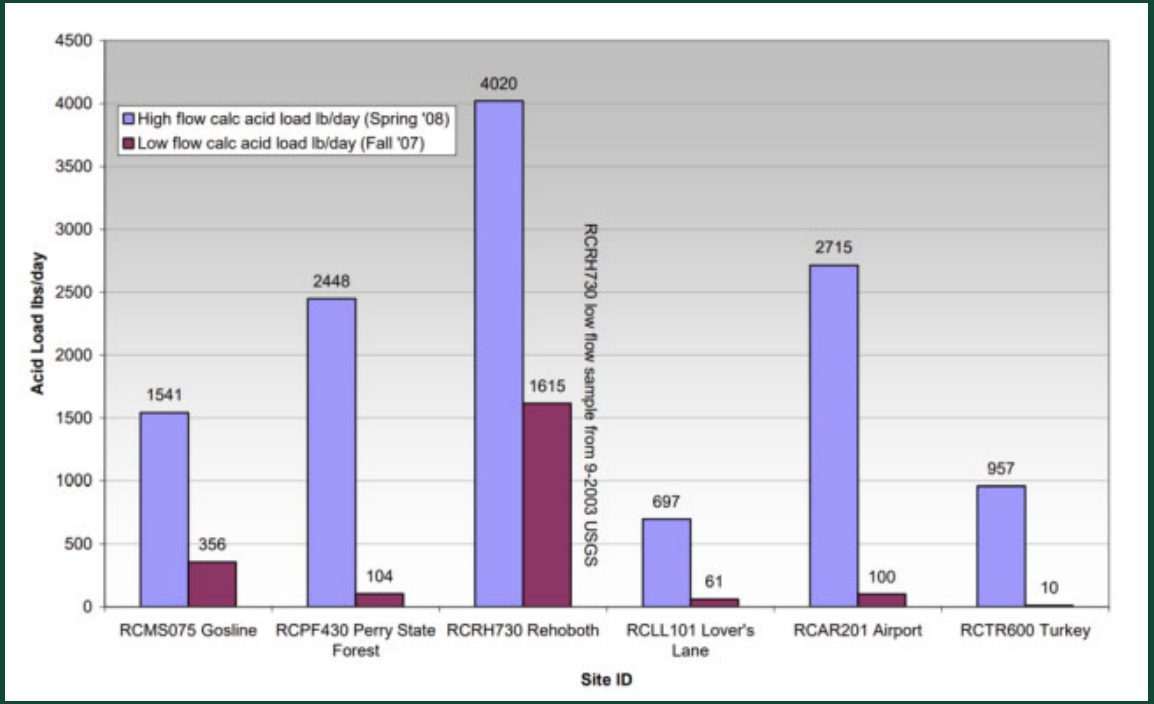
Acidity Loading from Tributaries



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Timeline of Planning & Funding

AMDAT Develbpment- Complete in 2009	• No Action Planned – too great a cost
Community Member Interest and Investment	• Updated Upper Rush Creek Planning
Brownfields Phase II Grant	• Additional Sampling and Conceptual Treatment/Reclamation Design
BIL	• Land Reclamation & AMD Treatment Planning
H2Ohio – State Water Quality Improvement Program	• Short turnaround time dollars – must show a measurable and visible improvement

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Current Efforts

- Brownfields Grant Ends Q3 2024 – includes treatment/reclamation planning
- BIL Funds – Perry State Forest focus, then downstream Rehobeth
- H2Ohio Funds with a rapid turnaround – design bids open end of 24/early 25
  - Gosline

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Rehobeth Treatment Planning

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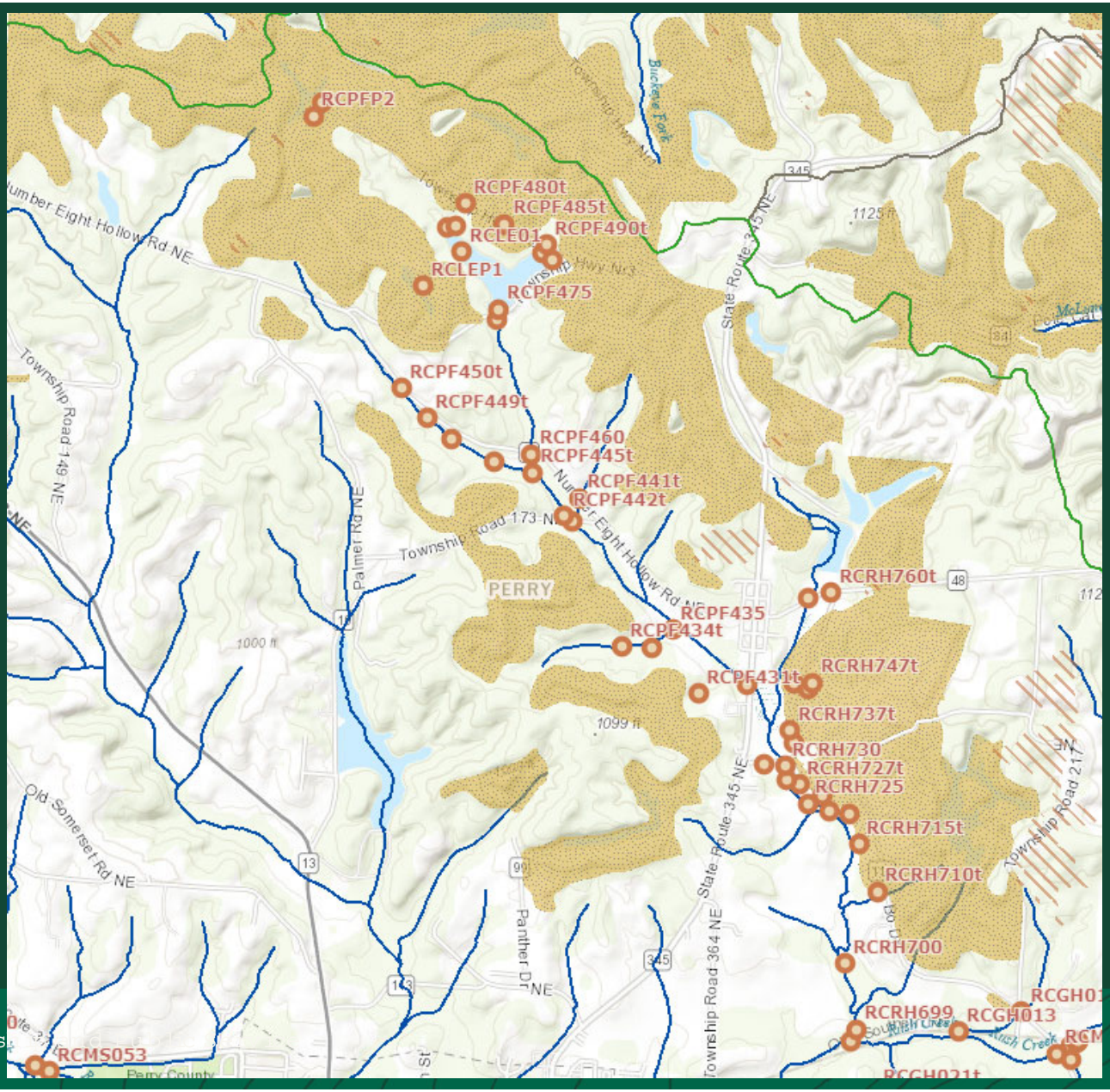

Voinovich School of Leaders

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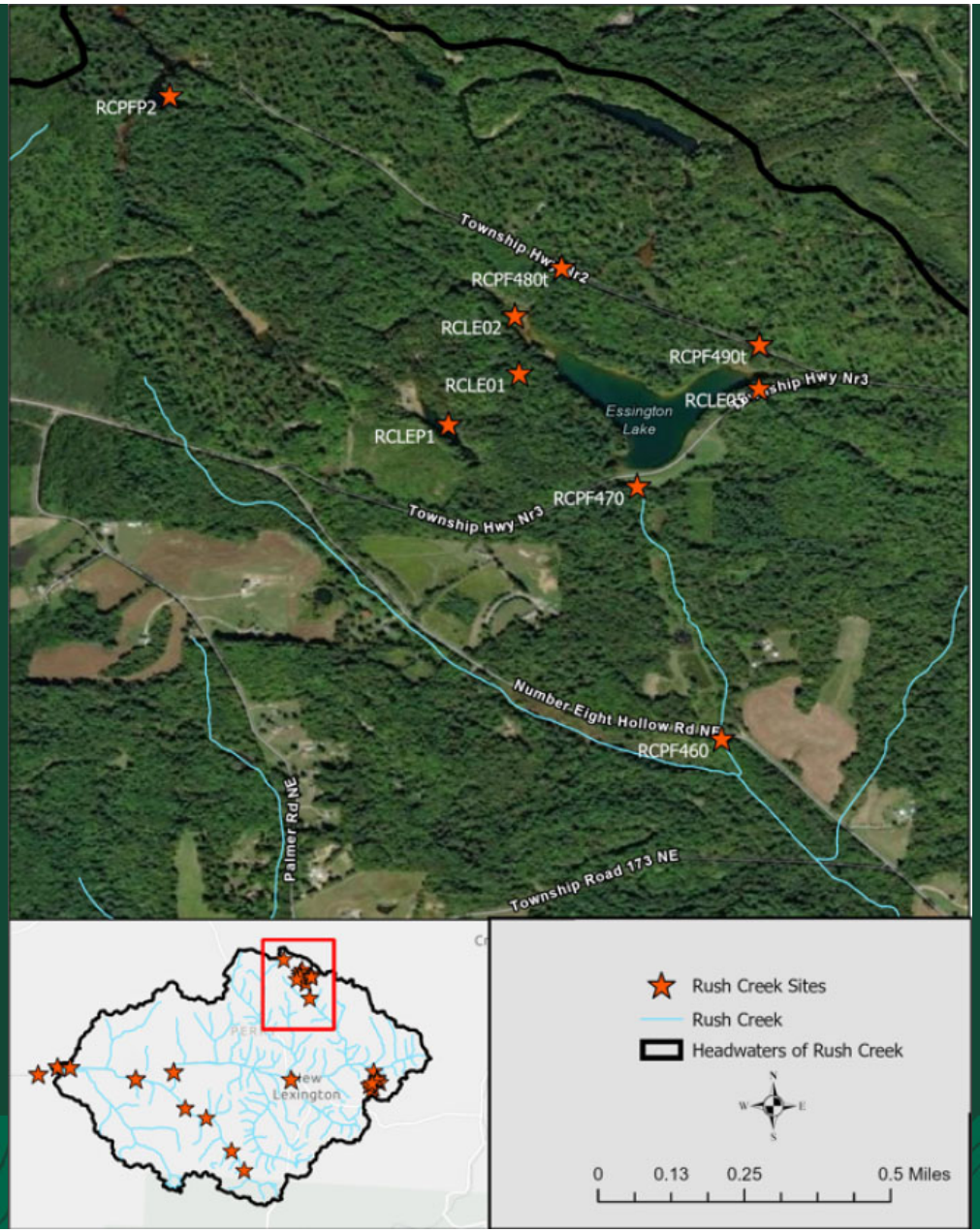
Perry State Forest

&

Essington Lake



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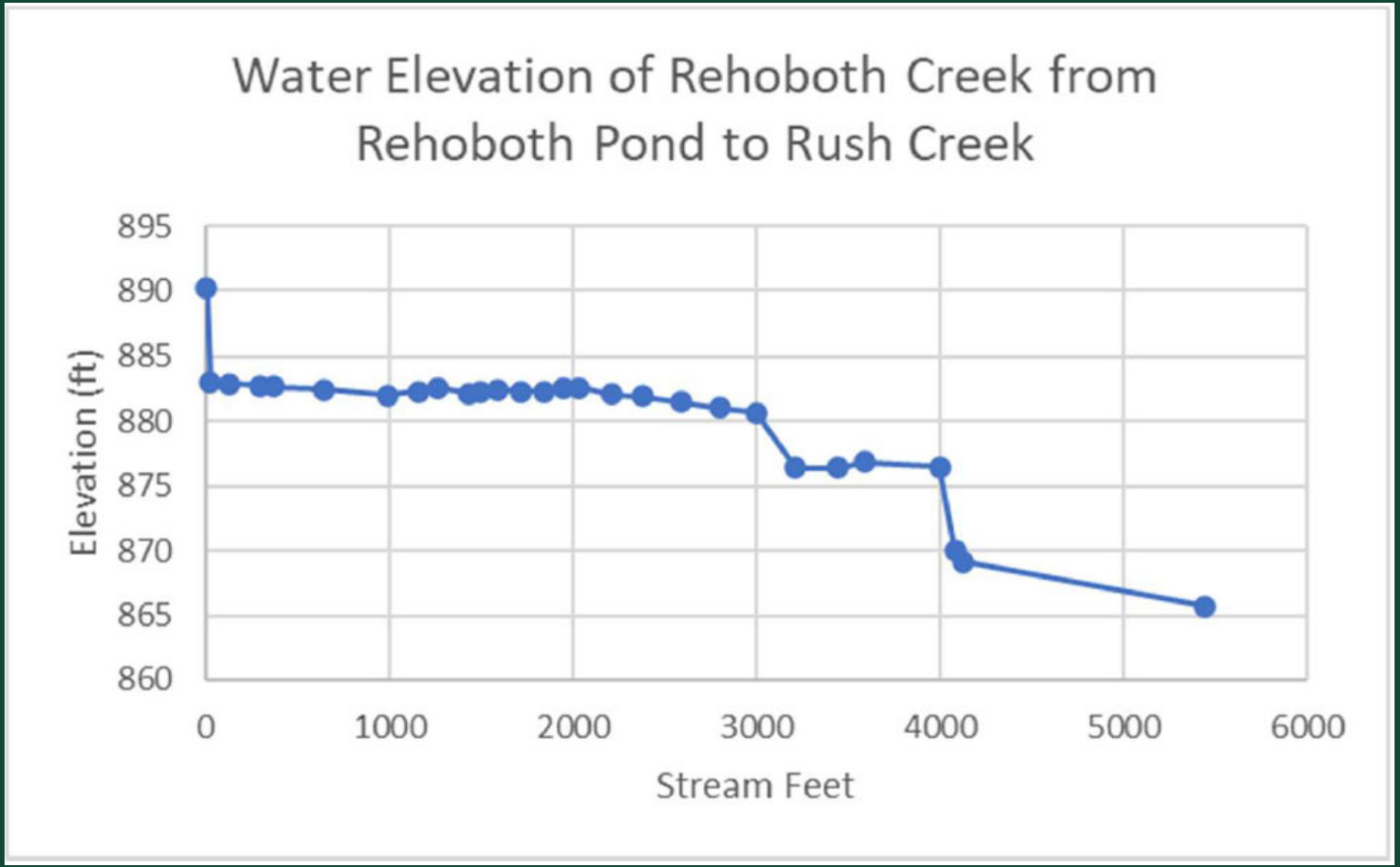
Water Elevation of Rehoboth Creek from Rehoboth Pond to Rush Creek
Elevation (ft)
895
890
885
880
875
870
865
860
0
1000
2000
3000
4000
5000
6000
Stream Feet

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Wetland/pond at downstream end of Rehobeth Tributary

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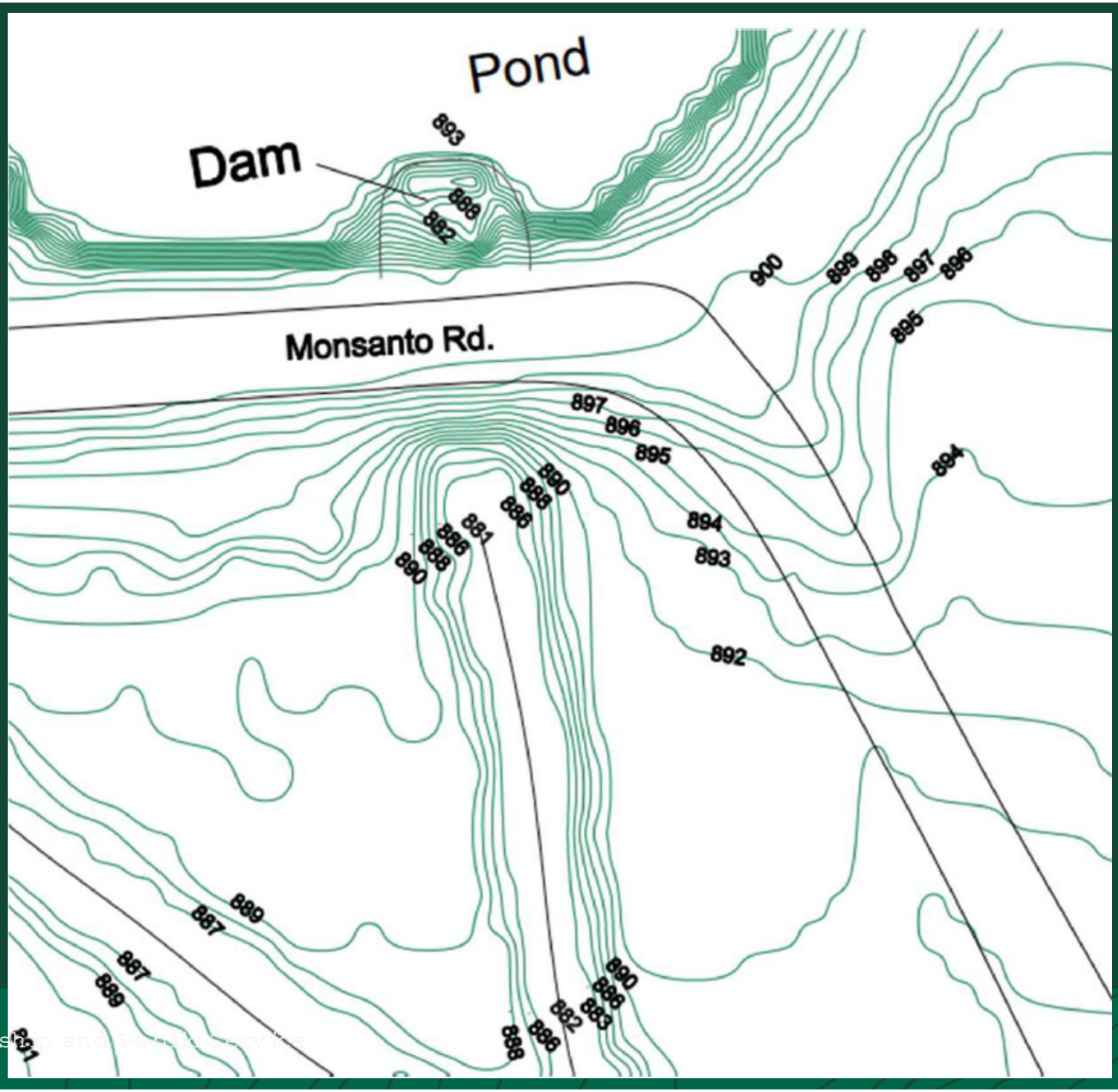
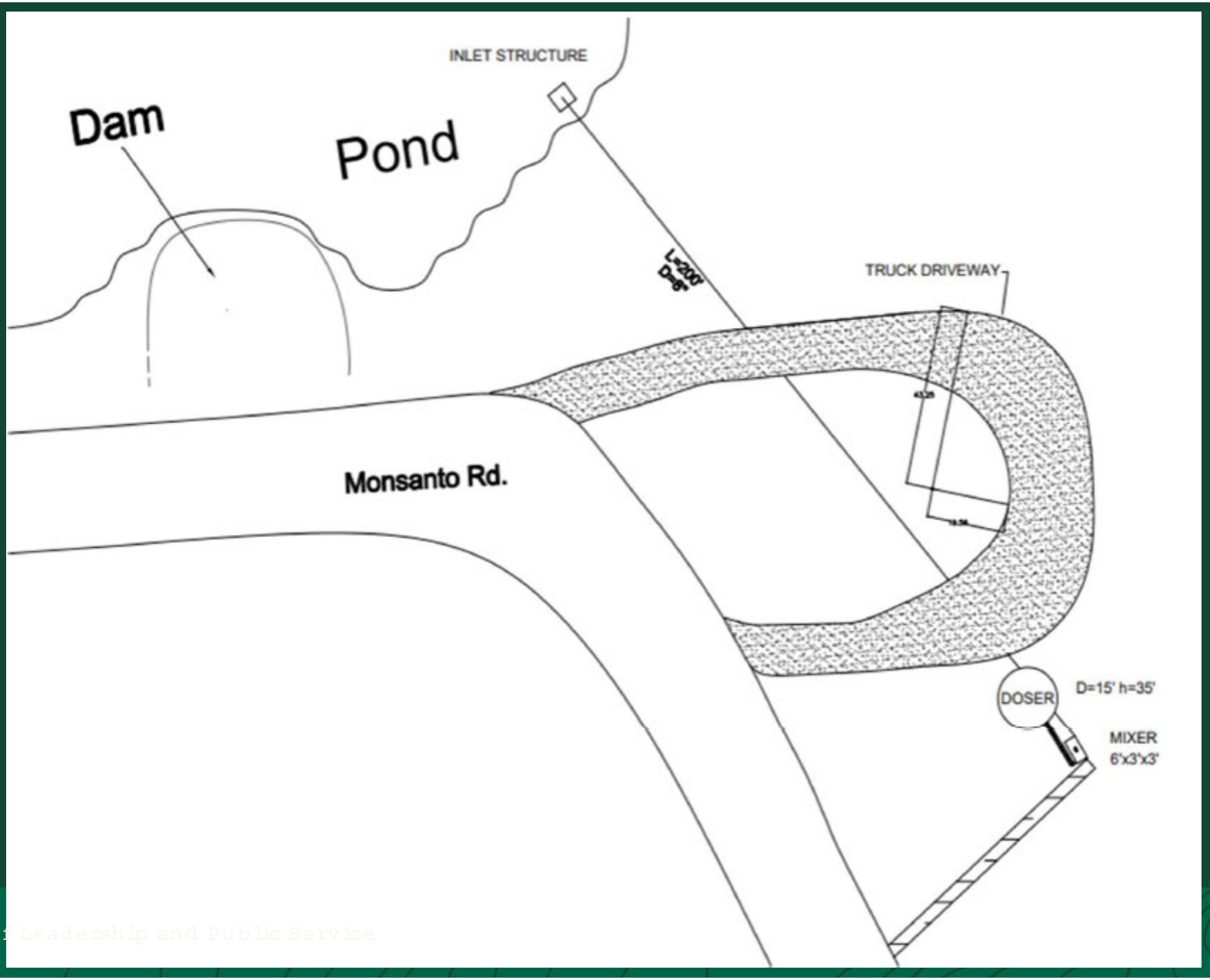

Pond
Dam
Monsanto Rd.
893
898
902
900
899
896
897
895
894
892
891
889
887
890
888
886
885
884
883
881


INLET STRUCTURE
Dam
Pond
L=200'
D=6'
TRUCK DRIVEWAY
Monsanto Rd.
DOSER
D=15' h=35'
MIXER
6'x3'x3'

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Gosline Treatment Planning

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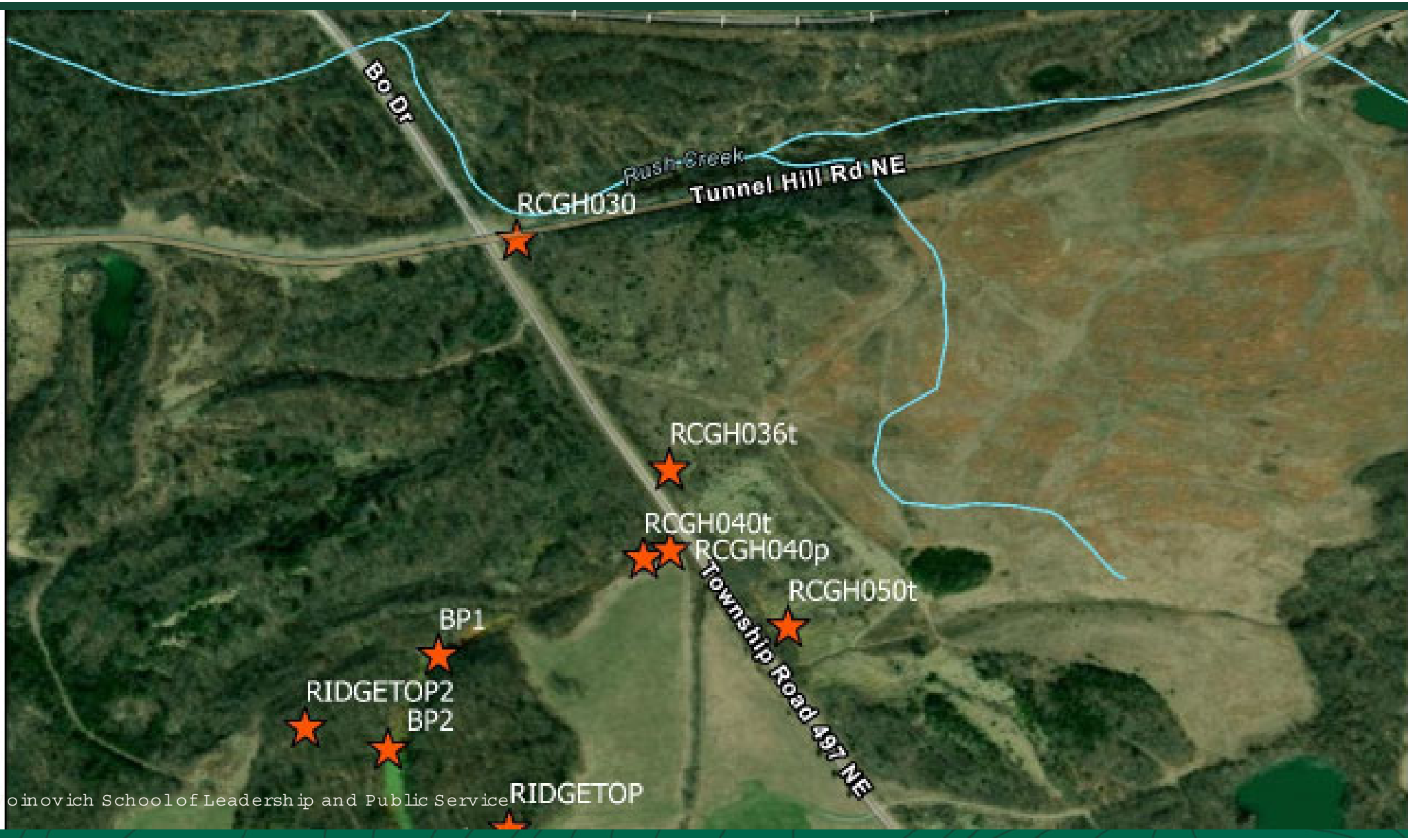

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TABLE 2. WATER QUALITY DATA FOR SITE RCGH030, THE MOUTH OF GOSLINE TUNNEL HILL SUBWATERSHED, 2007-2021 (BLUE HIGHLIGHT = STORM EVENT)

Sample Date	Disch (CFS)	Disch GPM	pH (lab)	pH (field)	SpC (lab) uScm	SpC (field) uScm	Acidity (lab) mgl	Alk. (lab) mgl	Net Acidity (mgl)	Acid Load (lb/day)	Fe total mgl	Al total mgl	Metal Load (lb/day)
7/31/2007				2.8		2440			0	0.0			
9/18/2007	0.130	58.35	3.02	3.36	2380	2460	276	0	276	193.2	61.4	8.44	48.9
4/9/2008	1.260	565.53	3.26	4.55	2210	2220	209	0	209	1418.3	52.4	5.73	394.5
2/24/2021				5.09		828.7			0	0.0			
4/12/2021	0.751	336.94	3.39	3.62	1640	1554	123	0	123	497.3	33.4	2.68	145.9
6/22/2021	0.534	239.68	3.35	2.27	1650	1652	125	0	125	359.5	36.3	2.69	112.1
8/25/2021	0.383	171.68	3.18	3.15	1850	1827	148	0	148	304.9	32.7	2.86	73.3
9/22/2021	0.687	308.35	3.21	2.95	1760	1786	141	0	141	521.7	32.3	2.78	129.8

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Gosline Source Data 2021

(Voinovich School 2021)

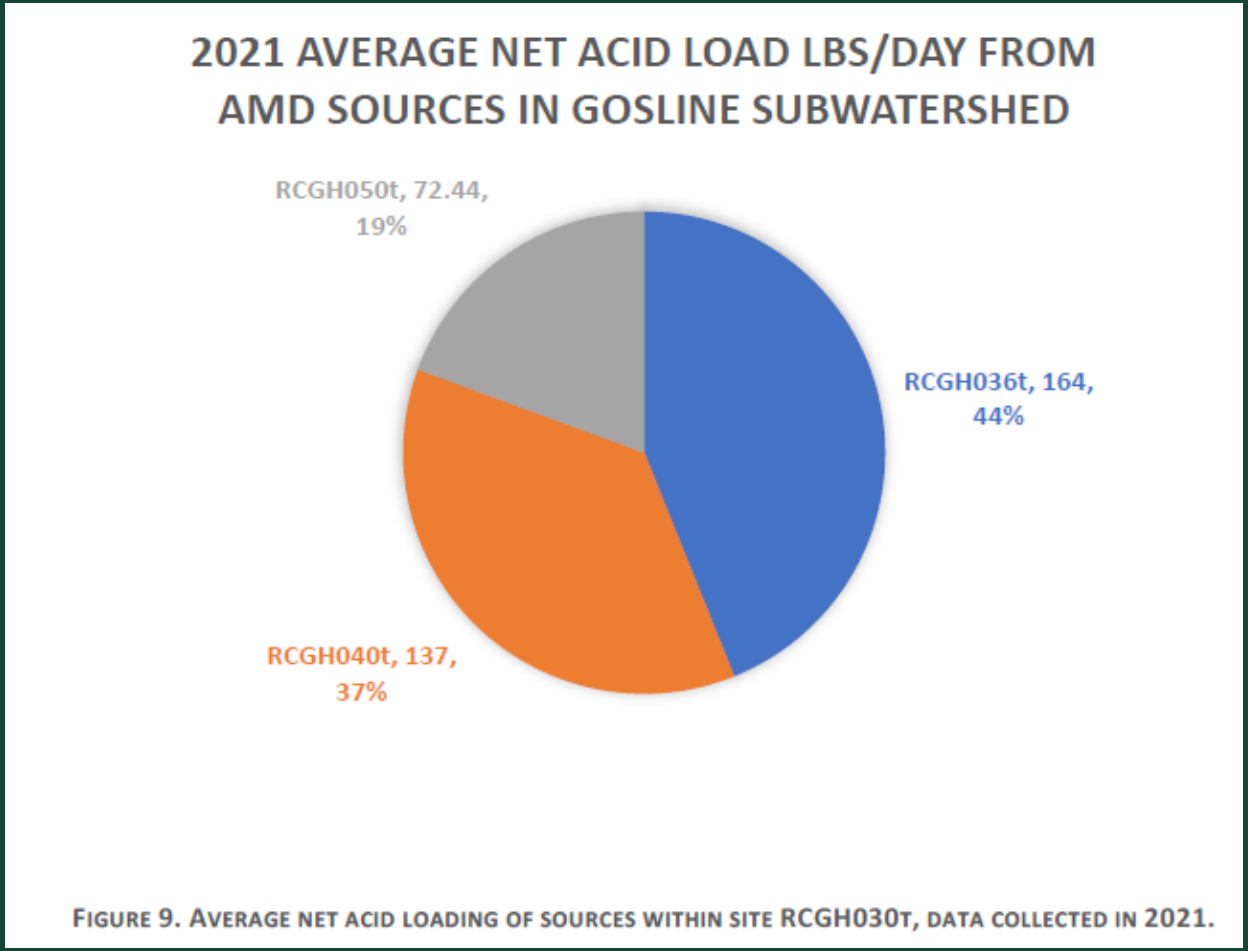

FIGURE 9. AVERAGE NET ACID LOADING OF SOURCES WITHIN SITE RCGH030T, DATA COLLECTED IN 2021.

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FIGURE 15. HISTORIC AERIAL PHOTOGRAPH OF GOSLINE TUNNEL HILL TRIBUTARY RCGH030, FOCUSED ON SITE RCGH050T AND RCGH036T. SOURCE OF AMD WATER FOR SITE RCGH050T FOUND IN 2009 SHOWN BY RED DOT.

FIGURE 16. UPWELLING OF ACID MINE DRAINAGE, SOURCE WATER FOR SITE RCGH050T FOUND IN 2021, RED DOT.

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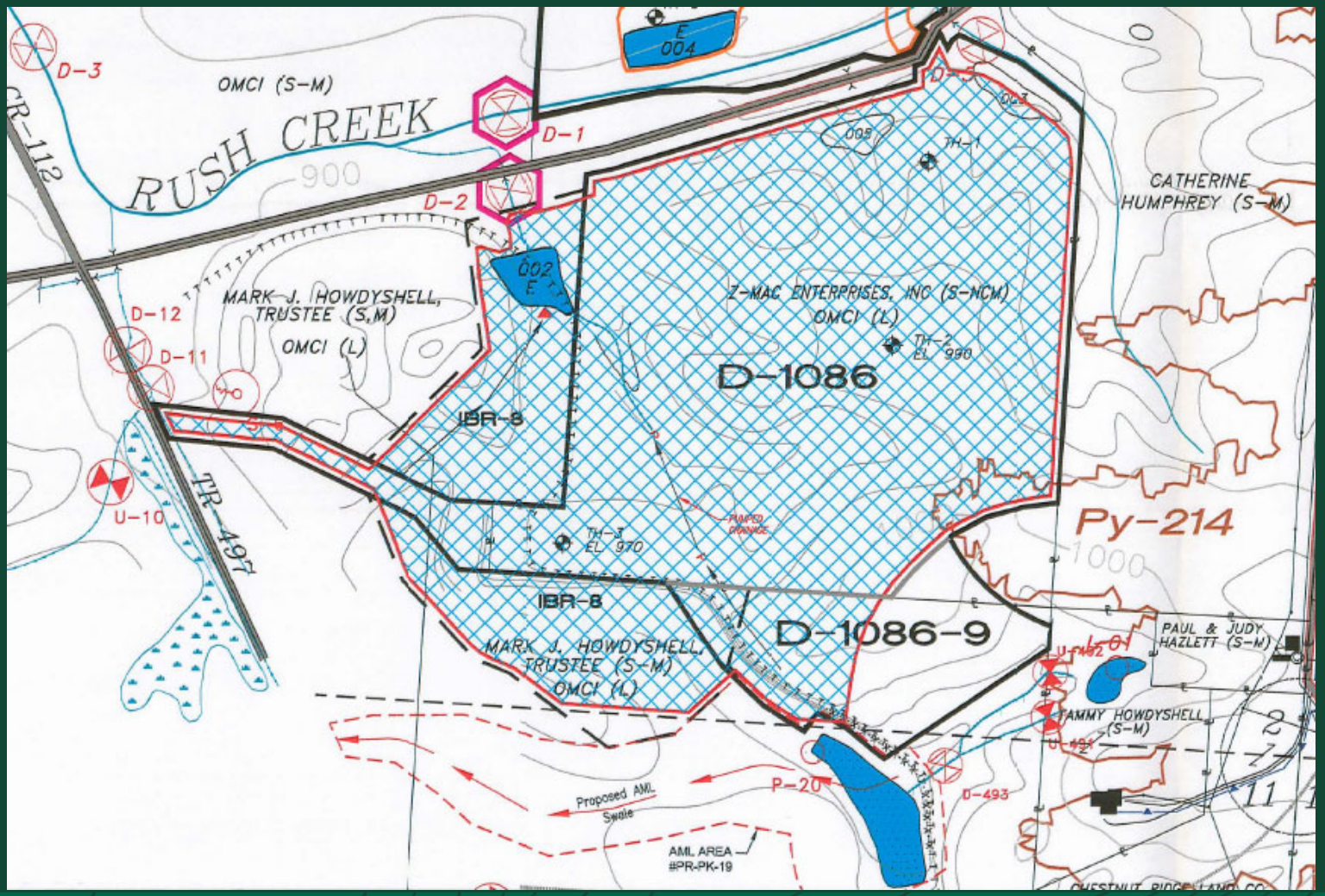

D-1086 Permit

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Treatment Planning NE Side

About half the acidity and metal loading

Exposed acid generating spoil

Approximately 20 acre land reclamation with wetland enhancement

No work on D-Permit

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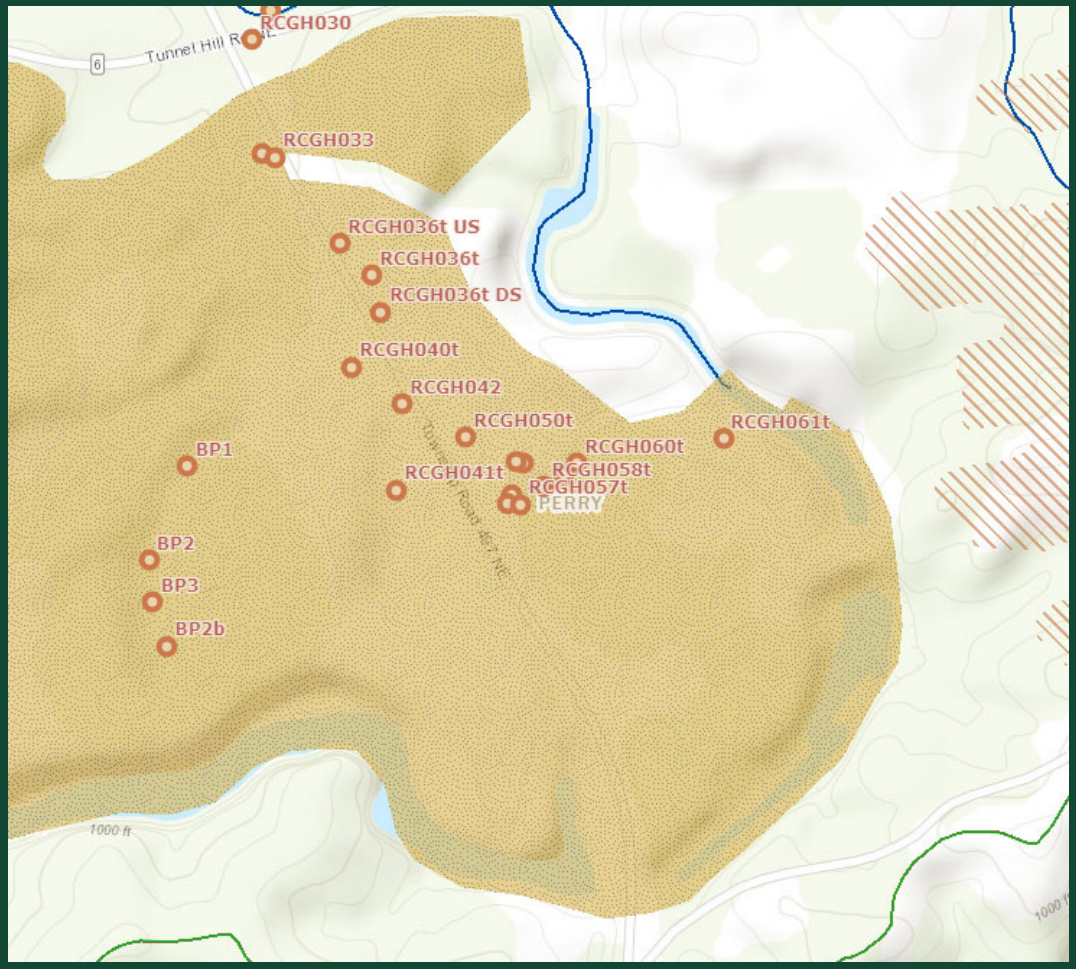
Treatment Design Planning: SW Side

Diffuse acidity sources from upwellings and unreclaimed surface workings

Forested hillside

Draft Approach:

- Passive treatment train in 41t tributary
- Potentially limestone leach beds with settling or wetlands



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Thank you:

Ohio Department of Natural Resources DMRM
Rural Action
Ohio University Civil and Environmental Engineering Senior Design Class
Upper Rush Creek Revitalization Project

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