

Nomini and Rosier Creeks

Nomini Creek in Westmoreland County and Rosier Creek in
Westmoreland and King George Counties

First Shellfish TMDL Development Public Meeting

January 20, 2011
Northern Neck, VA



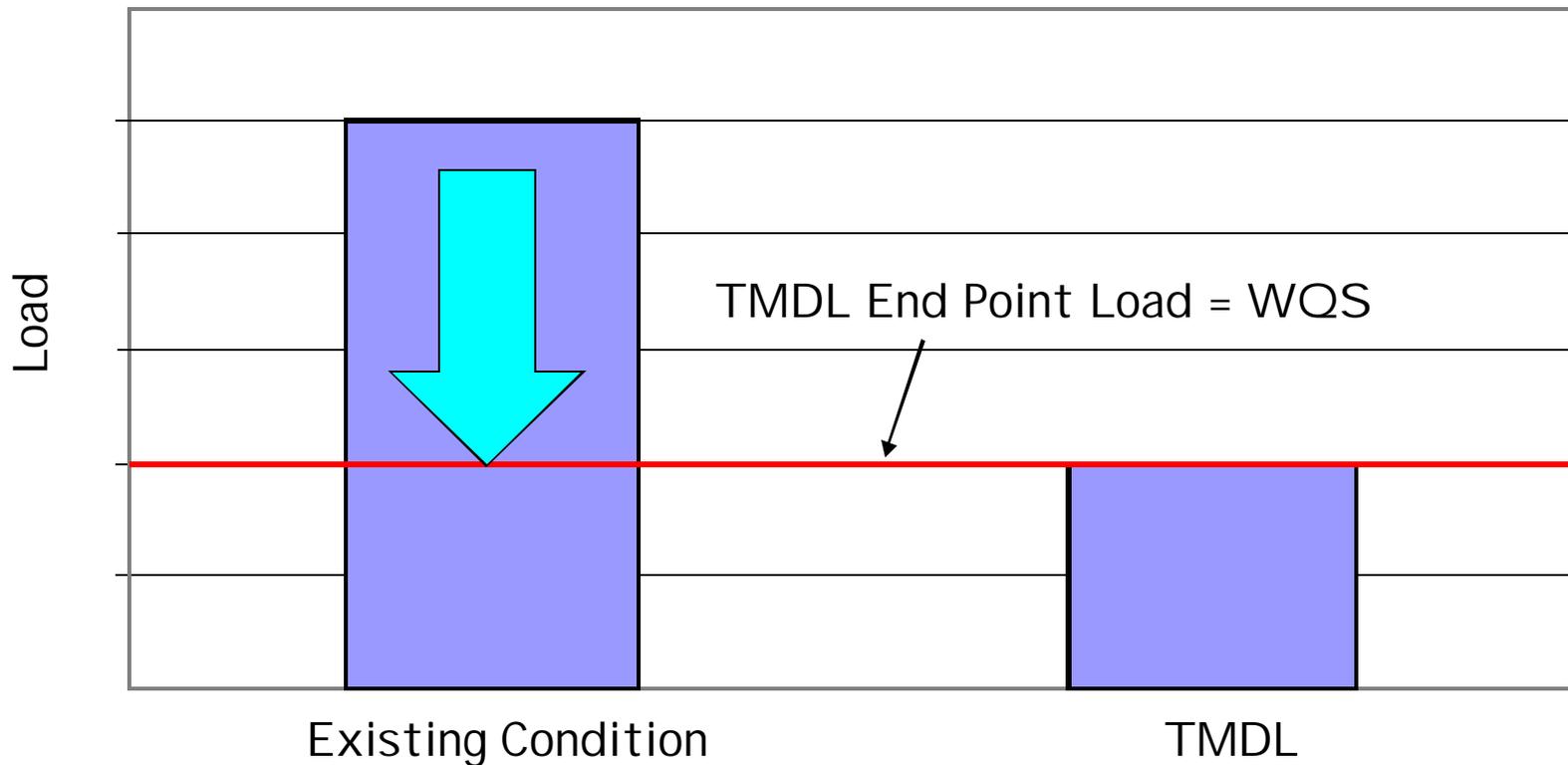
What is a TMDL?

TMDL = Total Maximum Daily Load = maximum amount of a pollutant that a waterbody can contain without violating water quality standards (WQS)



WQS = numeric or narrative limits on pollutants that ensure the protection of human health and aquatic life

A Visual Example of a TMDL



Reducing existing bacteria load to the TMDL end point load is expected to restore water quality. The “end point” is the water quality standard.

Why are TMDL studies necessary?

- Federal & State Laws
 - 1972 Clean Water Act
 - 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA)
 - 1999 Consent Decree (American Canoeist Association Lawsuit)
- Developed for waterways where WQC not met for applicable designated use
 - Designated Uses
 - Primary Contact (Swimming), Aquatic Life, Fish Consumption, Public Water Supply, Shellfish consumption
 - DEQ published Integrated Report every 2 years - “303d” list includes waters which don’t meet WQS for designated uses
 - There are ~1700 TMDLs to be done as of 2008

TMDL Development Process

- TMDL process includes a special study that:
 - Identifies pollutant sources (non-point and point sources)
 - Determines pollution contributed by source
 - Estimates pollution reductions necessary to attain WQS

$$\mathbf{WLA + LA + MOS = TMDL}$$

WLA = waste load allocation (point sources)

LA = load allocation (non-point sources)

MOS = margin of safety (usually implicit)

TMDL = total maximum daily load

What information is used to develop a TMDL?

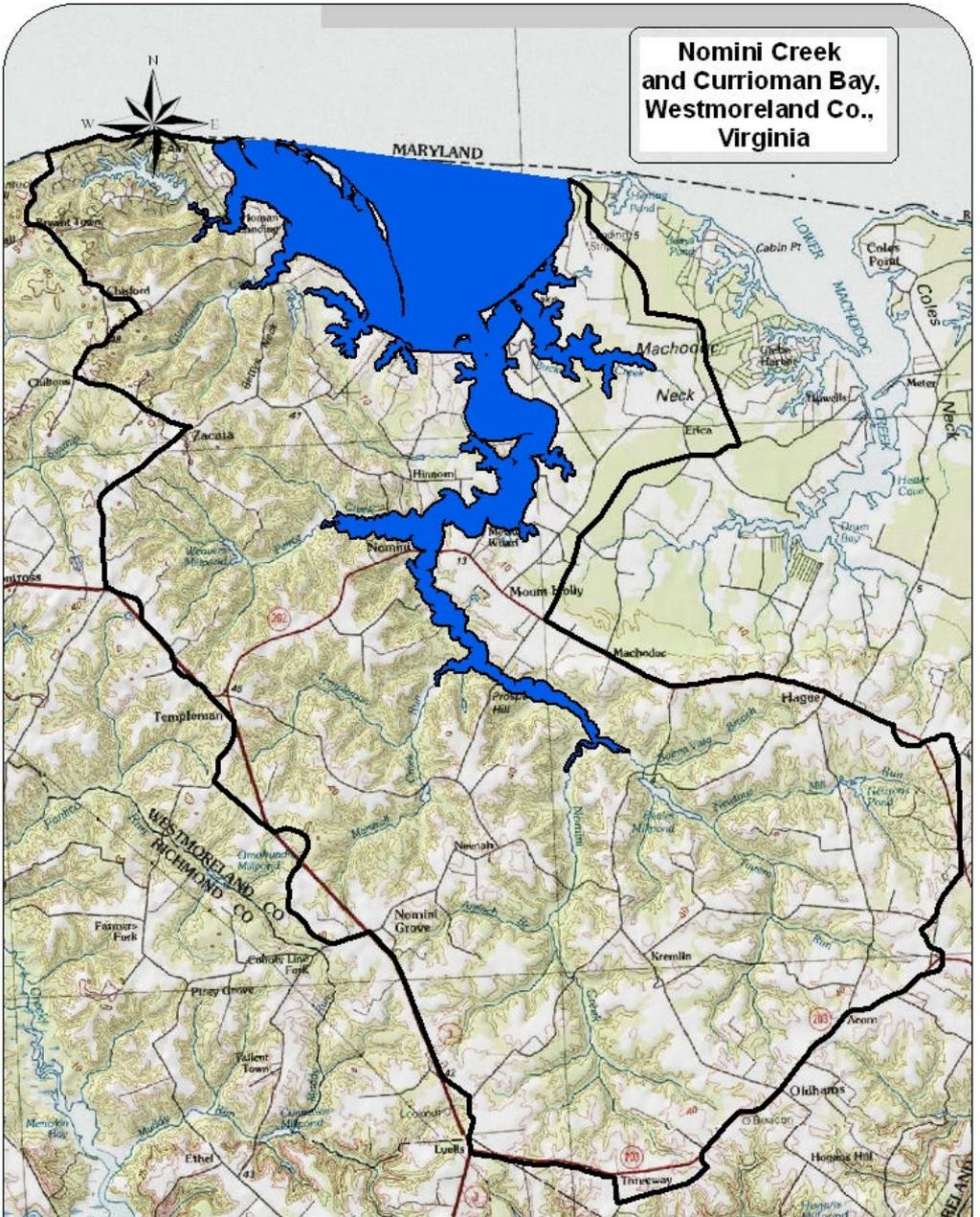
- VDH Bacteria monitoring data
- VDH Sanitary Shoreline Survey
- Population estimates for humans, pets, wildlife, livestock (Census, DEQ survey, DGIF, VIMS, DCR, SWCD, & the public)
- Population fecal density and amount/unit time
- Land Use, Climate, Tide, etc.
- DEQ permit data

People involved in the Process:

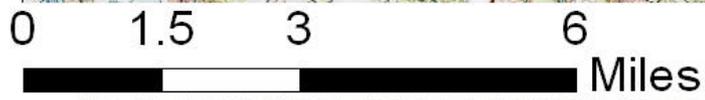
- Virginia Department of Health - Division of Shellfish Sanitation
- Virginia Department of Conservation and Recreation
- Virginia Department of Environmental Quality
- Other State Agencies, Local Governments and Planning Districts
- U.S. Environmental Protection Agency and other appropriate federal agencies
- Citizens groups, educational institutions environmental groups, & local business
- **YOU!**



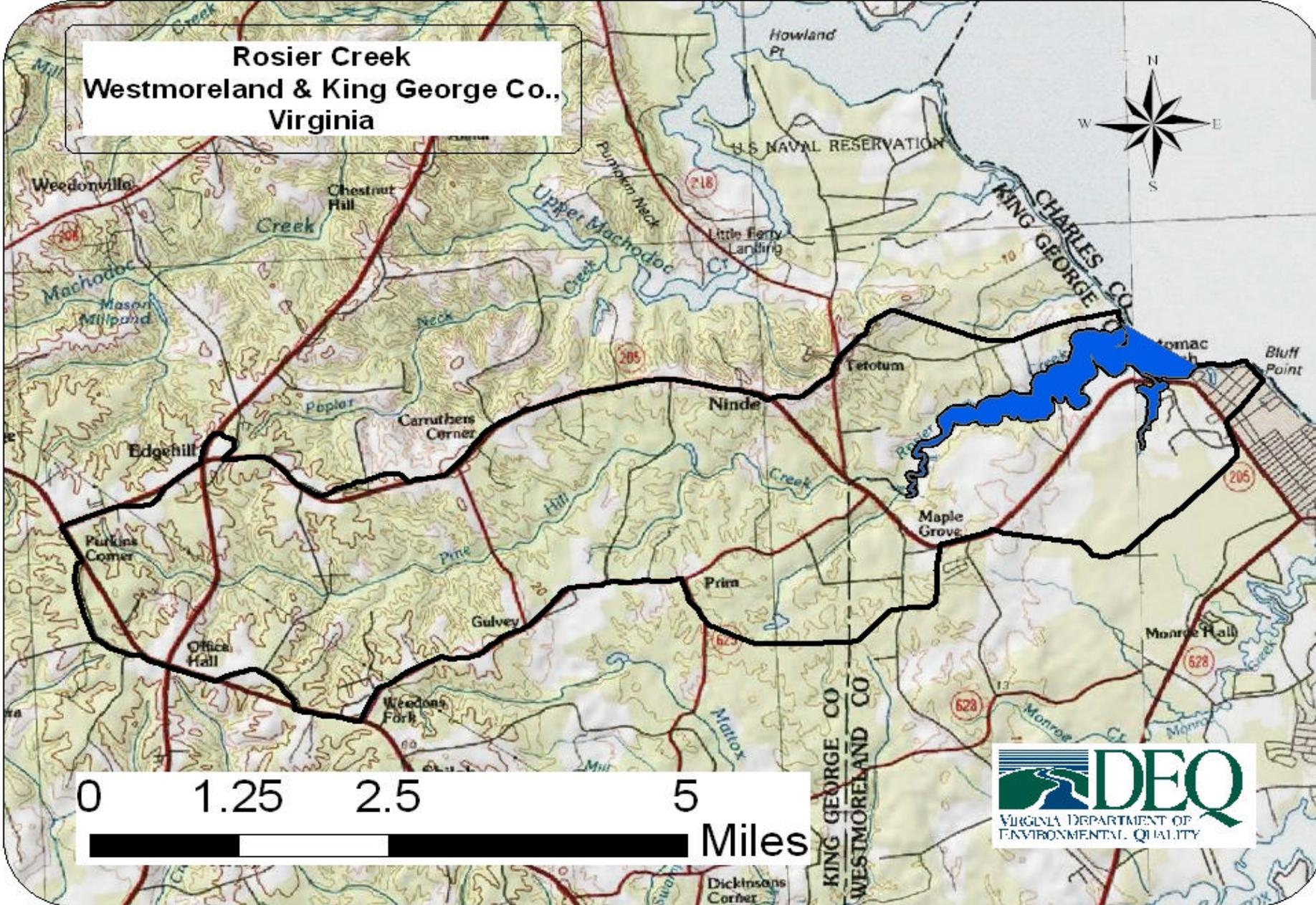
**Nomini Creek
and Currioman Bay,
Westmoreland Co.,
Virginia**



Nomini Creek Watershed



**Rosier Creek
Westmoreland & King George Co.,
Virginia**



Why is a TMDL needed for these Watersheds?

- VDH Division of Shellfish Sanitation (DSS) monitors fecal coliform levels in shellfish waters
- Applicable water quality standards
 - 30-month geometric mean not exceeding 14 MPN/100 mL
 - VDH uses this standard to update the condemnations viewable on their website:
<http://www.vdh.virginia.gov/EnvironmentalHealth/Shellfish/closureSurvey/index.htm>
 - and a 90th percentile not exceeding 49 MPN/100 mL
- The portions of Nomini and Rosier Creeks which currently fail these standards are:

Potomac River

2010



Cold Harbor Creek

Currioman Creek

Poor Jack Creek

Mathews Cove

Barnes Creek

Peirce Creek

North Prong

Buckner Creek

Jules Creek



Nomini and Corrioman Bay
VDH Shellfish Condemnations

-  Open
-  Condemned
-  Prohibited
-  Seasonally Condemned
-  Prohibited-Nonproductive

0 0.2 0.4 0.8 1.2 1.6 Miles

4-13

2-13 54-13 5

4-14

4-10

4-11

4-8

4-8 5

4-7

4-17

4-31

4-32

4-33

4-34

4-35

4-36

4-18 5

4-19

4-20

4-19 5

4-21

4-23

4-22

4-21 5

4-23 5

4-24

4-25

4-38

4-37

2010



Barnes Creek

Jules Creek

Peirce Creek

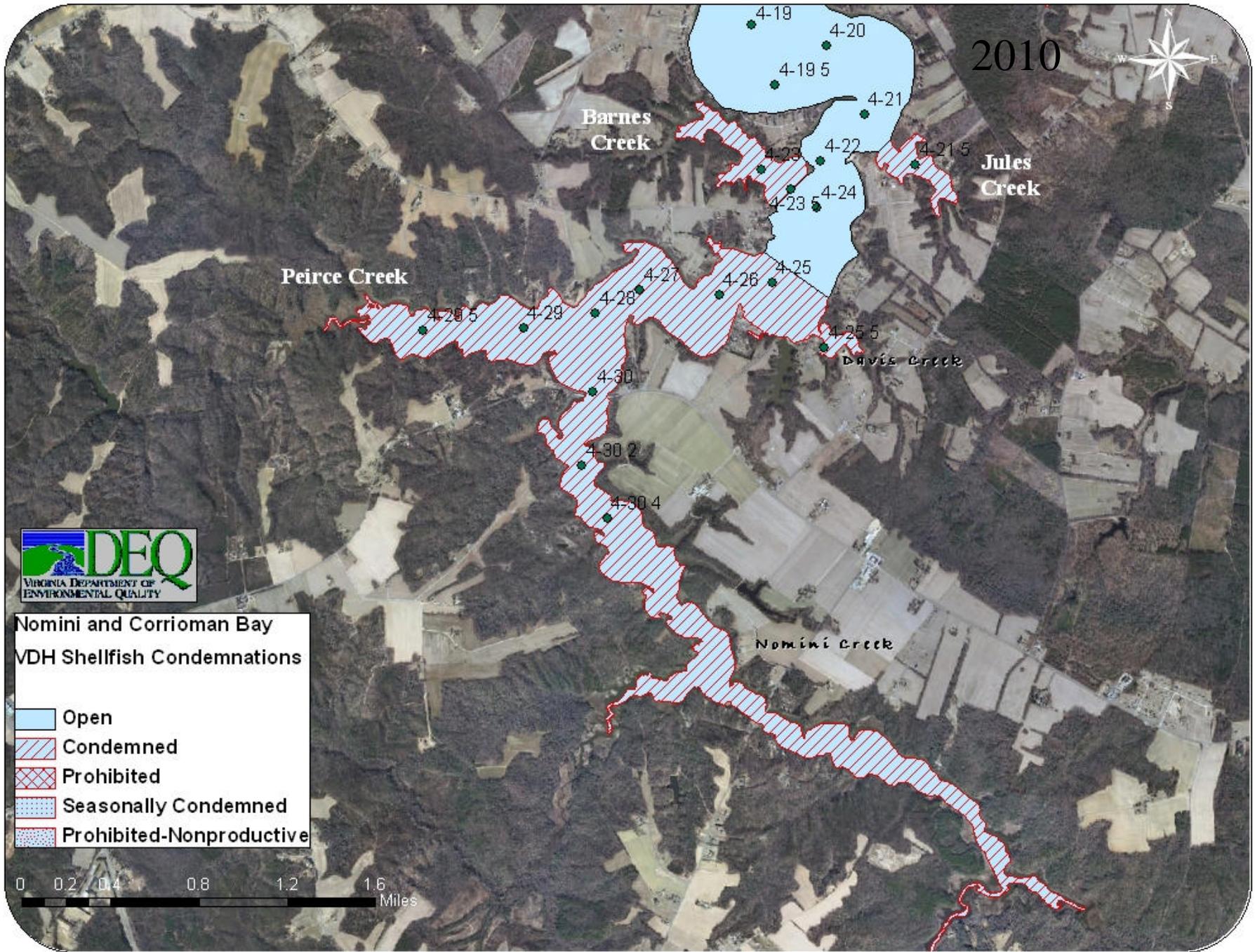
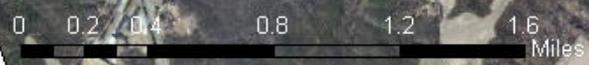
Davis Creek

Nomini Creek



Nomini and Corrioman Bay
VDH Shellfish Condemnations

-  Open
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Water Quality Data Summary for Nomini Creek

90th Percentile represents the more stringent reduction

Station	Condemnation	Condemnation Area	Total Observations	Geometric Mean	Station Violates Geometric Mean Standard (14 MPN/100 mL)?	90th Percentile	Station Violates 90th Percentile Standard (49 MPN/100 mL)?	Station Violates Geometric Mean Standard for Last 30 Samples?	Station Violates 90th Percentile Standard for Last 30 Samples?
4-7	184	Currioman Bay	221	7	No	29	No	No	No
4-8	184	Currioman Bay	273	6	No	25	No	No	No
4-10	184	Currioman Bay	272	5	No	14	No	No	No
4-13	184	Currioman Bay	271	8	No	31	No	No	No
4-13.5	184M1	Cold Harbor Creek	54	5	No	28	No	No	No
4-14	184A	Cold Harbor Creek	268	33	Yes	201	Yes	Yes	Yes
4-11	184B	Currioman Creek	268	28	Yes	173	Yes	Yes	Yes
4-8.5	184C	Poor Jack Creek	69	13	No	74	Yes	No	Yes
4-37	082A	North Prong	189	14	No	58	Yes	No	No
4-38	082A	North Prong	189	21	Yes	132	Yes	No	Yes
4-31	082B	Buckner Creek	275	10	No	60	Yes	No	No
4-32	082B	Buckner Creek	276	15	Yes	69	Yes	No	No
4-33	082B	Buckner Creek	273	17	Yes	106	Yes	No	No
4-34	082B	Buckner Creek	273	19	Yes	120	Yes	No	No
4-35	082B	Buckner Creek	272	27	Yes	246	Yes	No	Yes
4-36	082B	Buckner Creek	264	51	Yes	314	Yes	Yes	Yes
4-21.5	082C	Jules Creek	64	32	Yes	193	Yes	Yes	Yes
4-25.5	082D	Davis Creek	71	50	Yes	297	Yes	Yes	Yes

Water Quality Data Summary for Nomini Creek

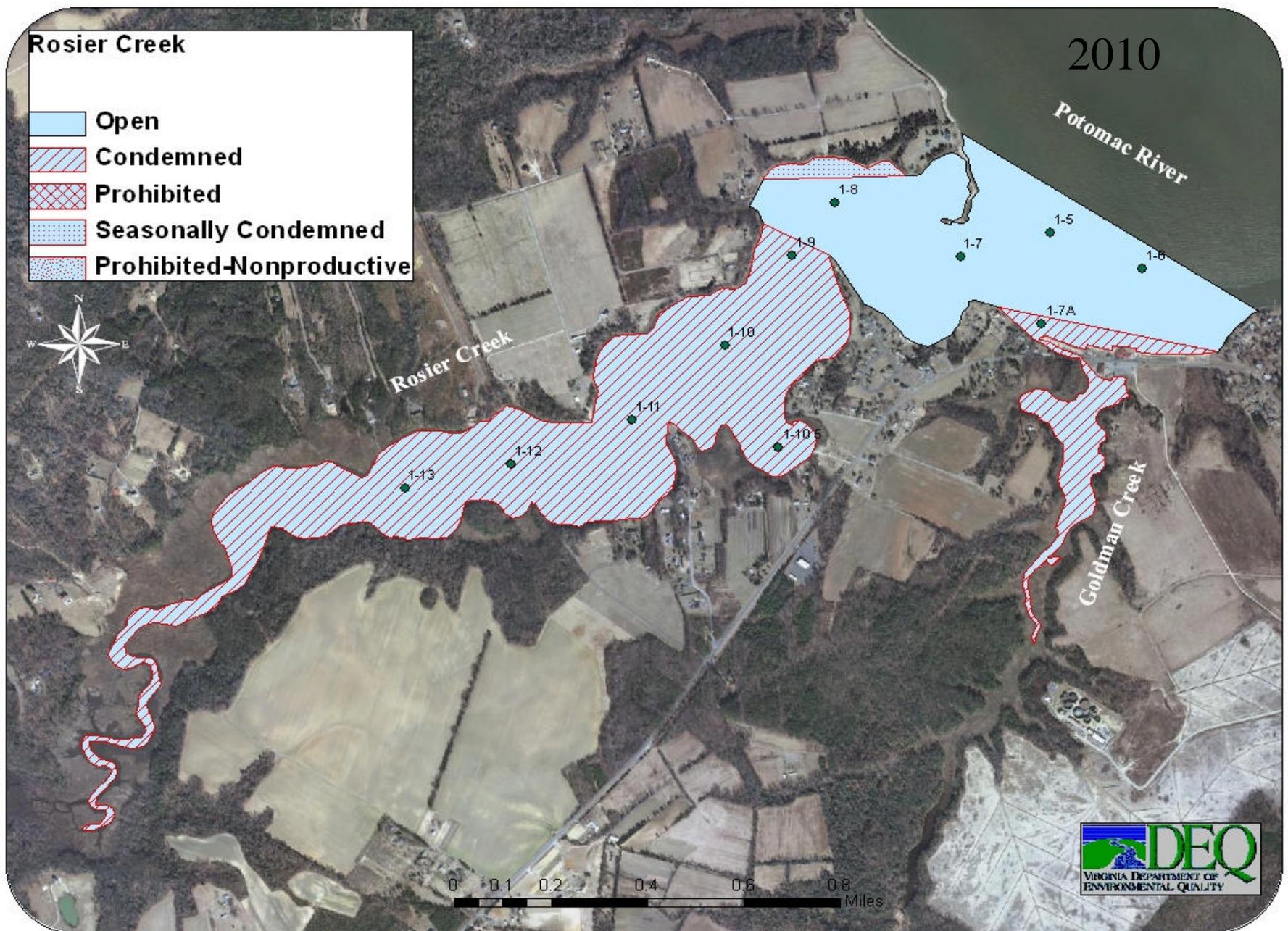
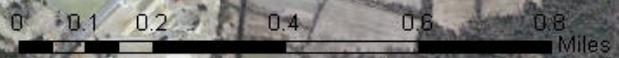
90th Percentile represents the more stringent reduction

Station	Condemnation	Condemnation Area	Total Observations	Geometric Mean	Station Violates Geometric Mean Standard (14 MPN/100 mL)?	90th Percentile	Station Violates 90th Percentile Standard (49 MPN/100 mL)?	Station Violates Geometric Mean Standard for Last 30 Samples?	Station Violates 90th Percentile Standard for Last 30 Samples?
4-17	082E	Nomini Creek, Pierce Creek	285	6	No	21	No	No	No
4-19	082E	Nomini Creek, Pierce Creek	284	7	No	22	No	No	No
4-19.5	082E	Nomini Creek, Pierce Creek	70	5	No	14	No	No	No
4-20	082E	Nomini Creek, Pierce Creek	285	7	No	33	No	No	No
4-21	082E	Nomini Creek, Pierce Creek	284	9	No	37	No	No	No
4-22	082E	Nomini Creek, Pierce Creek	286	9	No	40	No	No	No
4-24	082E	Nomini Creek, Pierce Creek	286	10	No	39	No	No	No
4-25	082E	Nomini Creek, Pierce Creek	286	12	No	64	Yes	No	No
4-26	082E	Nomini Creek, Pierce Creek	285	17	Yes	77	Yes	No	No
4-27	082E	Nomini Creek, Pierce Creek	285	15	Yes	72	Yes	No	No
4-28	082E	Nomini Creek, Pierce Creek	284	17	Yes	79	Yes	No	No
4-29	082E	Nomini Creek, Pierce Creek	285	20	Yes	130	Yes	Yes	Yes
4-29.5	082E	Nomini Creek, Pierce Creek	282	55	Yes	421	Yes	Yes	Yes
4-30	082E	Nomini Creek, Pierce Creek	284	32	Yes	189	Yes	No	Yes
4-30.2	082E	Nomini Creek, Pierce Creek	284	44	Yes	242	Yes	Yes	Yes
4-30.4	082E	Nomini Creek, Pierce Creek	284	37	Yes	177	Yes	Yes	Yes
4-23	082F	Barnes Creek	286	22	Yes	132	Yes	No	Yes
4-23.5	082F	Barnes Creek	52	8	No	32	No	No	No
4-18.5	082G	Mathews Cove	71	24	Yes	91	Yes	No	Yes

Rosier Creek

2010

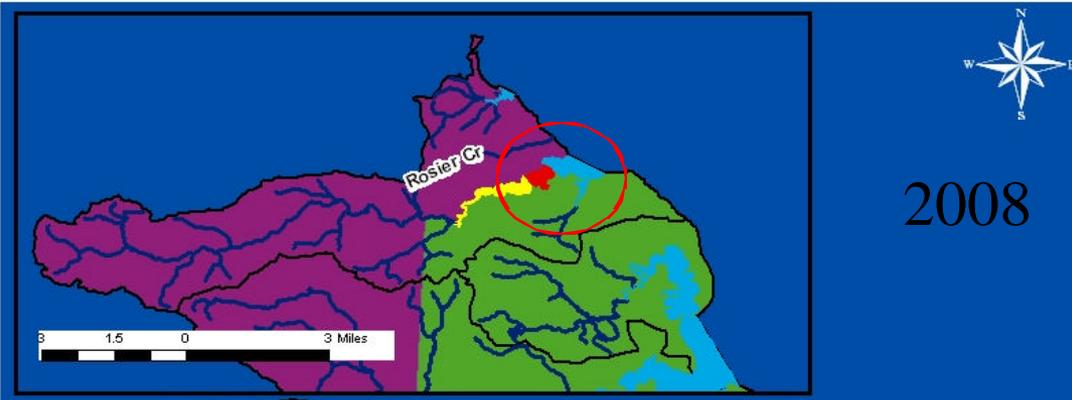
- Open
- Condemned
- Prohibited
- Seasonally Condemned
- Prohibited-Nonproductive



Water Quality Data Summary for Rosier Creek

Station	Condemnation	Condemnation Area	Total Observations	Geometric Mean	Station Violates Geometric Mean Standard (14 MPN/100 mL)?	90th Percentile	Station Violates 90th Percentile Standard (49 MPN/100 mL)?	Station Violates Geometric Mean Standard for Last 30 Samples?	Station Violates 90th Percentile Standard for Last 30 Samples?
1-5	088	Rosier Creek	285	7	No	34	No	No	No
1-6	088	Rosier Creek	230	8	No	31	No	No	No
1-7	088	Rosier Creek	287	11	No	65	Yes	No	No
1-7A	088B	Rosier Creek	283	16	Yes	106	Yes	No	No
1-8	088	Rosier Creek	287	14	No	85	Yes	No	No
1-9	088A	Rosier Creek	287	17	Yes	90	Yes	No	No
1-10	088A	Rosier Creek	286	20	Yes	117	Yes	No	No
1-10.5	088A	Rosier Creek	69	18	Yes	97	Yes	Yes	Yes
1-11	088A	Rosier Creek	285	23	Yes	125	Yes	Yes	Yes
1-12	088A	Rosier Creek	228	40	Yes	253	Yes	Yes	Yes
1-13	088A	Rosier Creek	209	72	Yes	550	Yes	Yes	Yes

Stations are listed from mouth to headwater



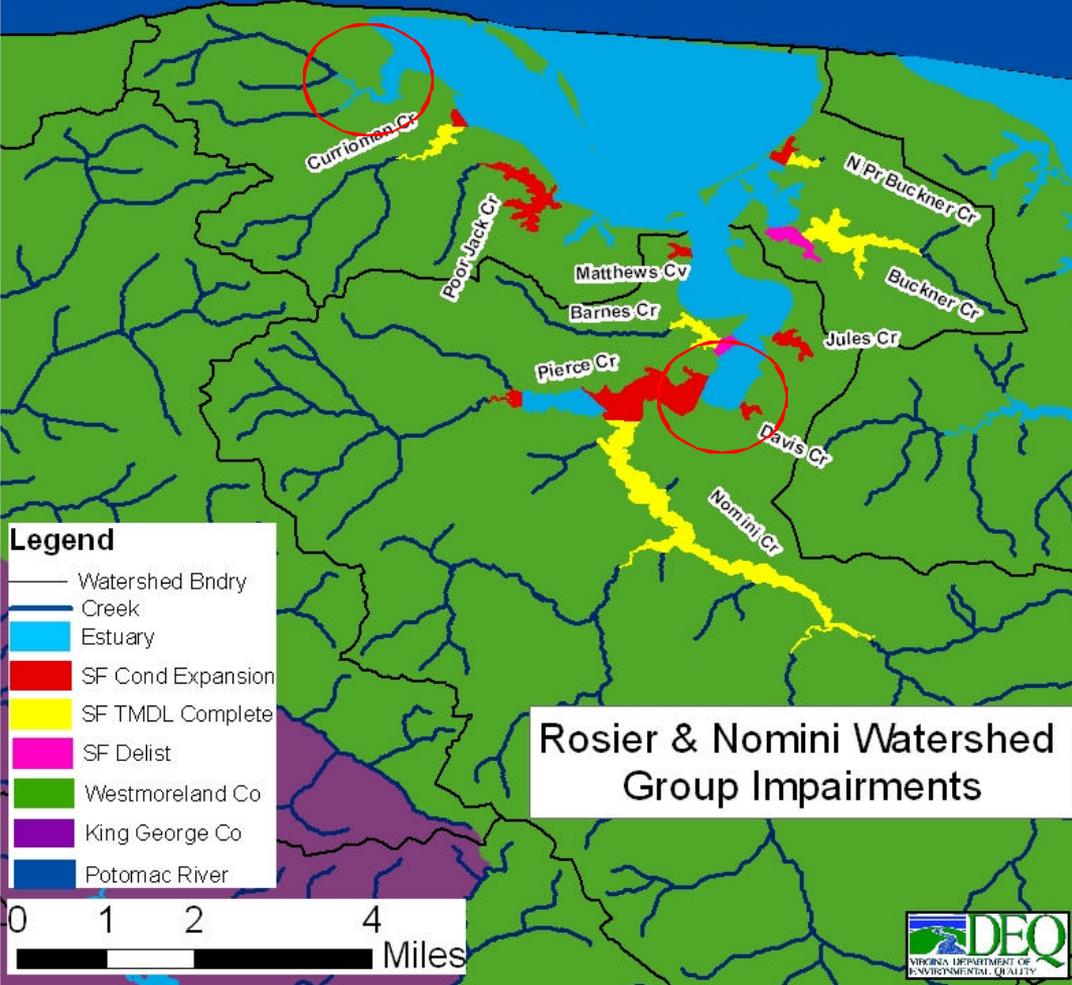
- A TMDL was developed for Nomini Creek and Tributaries in 3/2007; see DEQ website for report:

- <http://www.deq.virginia.gov/tmdl/apptmdls/shellfish/nomini.pdf>

- Extent of impairments in Rosier and Nomini have expanded since TMDL development

- TMDL will be developed for entire Creek versus the extent of impairment

- Discussions regarding having consecutive IP development are underway



Source Assessment

Source Assessment

Evaluation of the watershed to determine known and potential sources of the pollutant – quantify each type and amount of pollutant contributed

Pollutant = **bacteria**

Potential sources : point source (WLA)+ nonpoint source (LA)

$$\mathbf{WLA + LA + MOS = TMDL}$$

Point sources – any pollutant source coming from a pipe (permitted/not permitted)

Non-point source – any pollutant source which is put on ground and rain runoff carries pollutant to waterbody (human, pet, livestock, wildlife)



Permitted Point Sources

Permit No	Facility Name	Outfall Number	Permitted for Bacteria Control?	Maximum Design Flow (MGD)	Receiving Stream
VA0070106	Purkins Corner Wastewater Treatment Plant	001	Yes	0.5	Pine Hill Creek

- Also 2 seafood GPs, and 2 SW Industrial Permits (will not get a WLA)

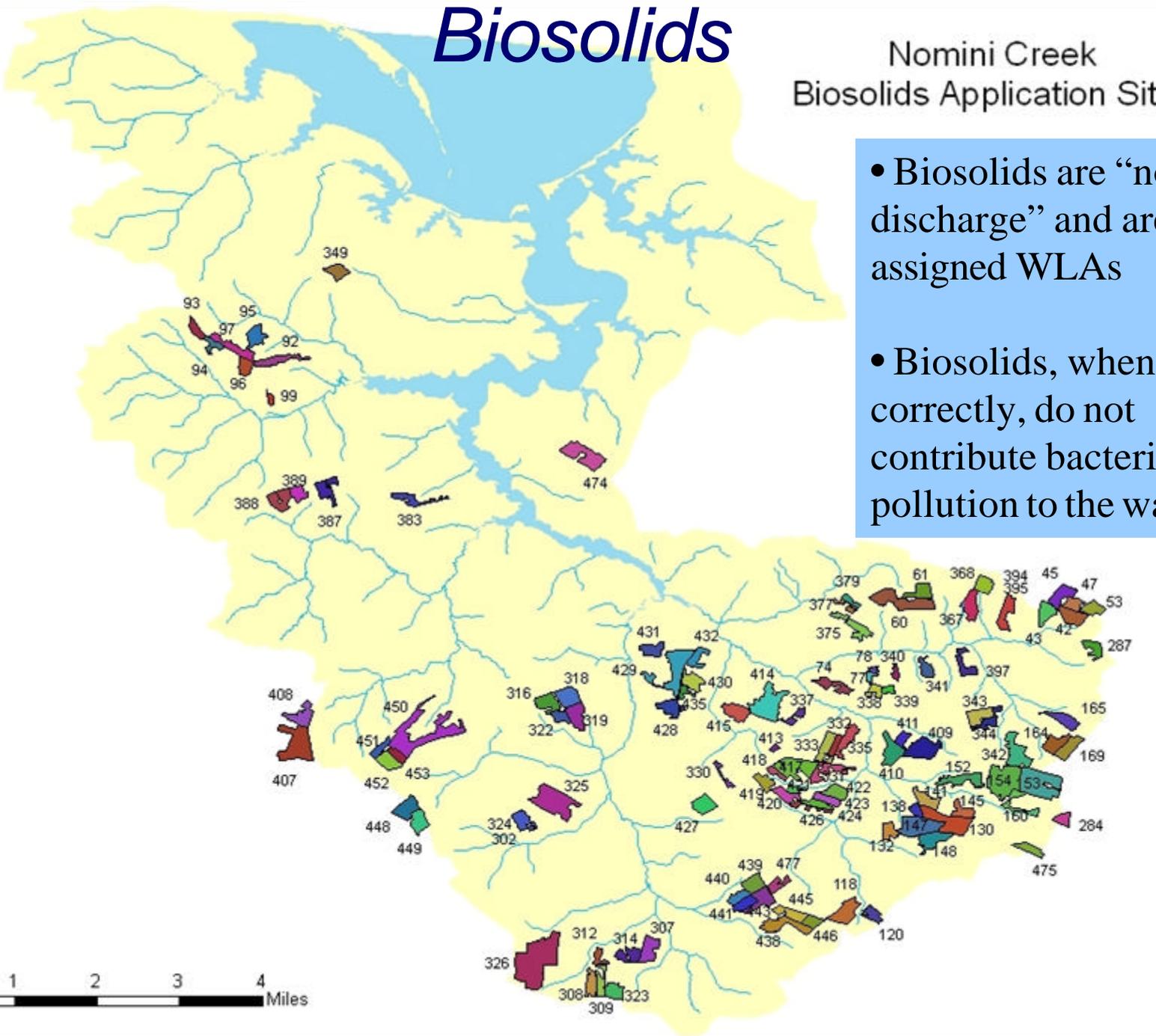
- Perkins Corner WWTP ~ 11 miles upstream of SF impairment – will evaluate further



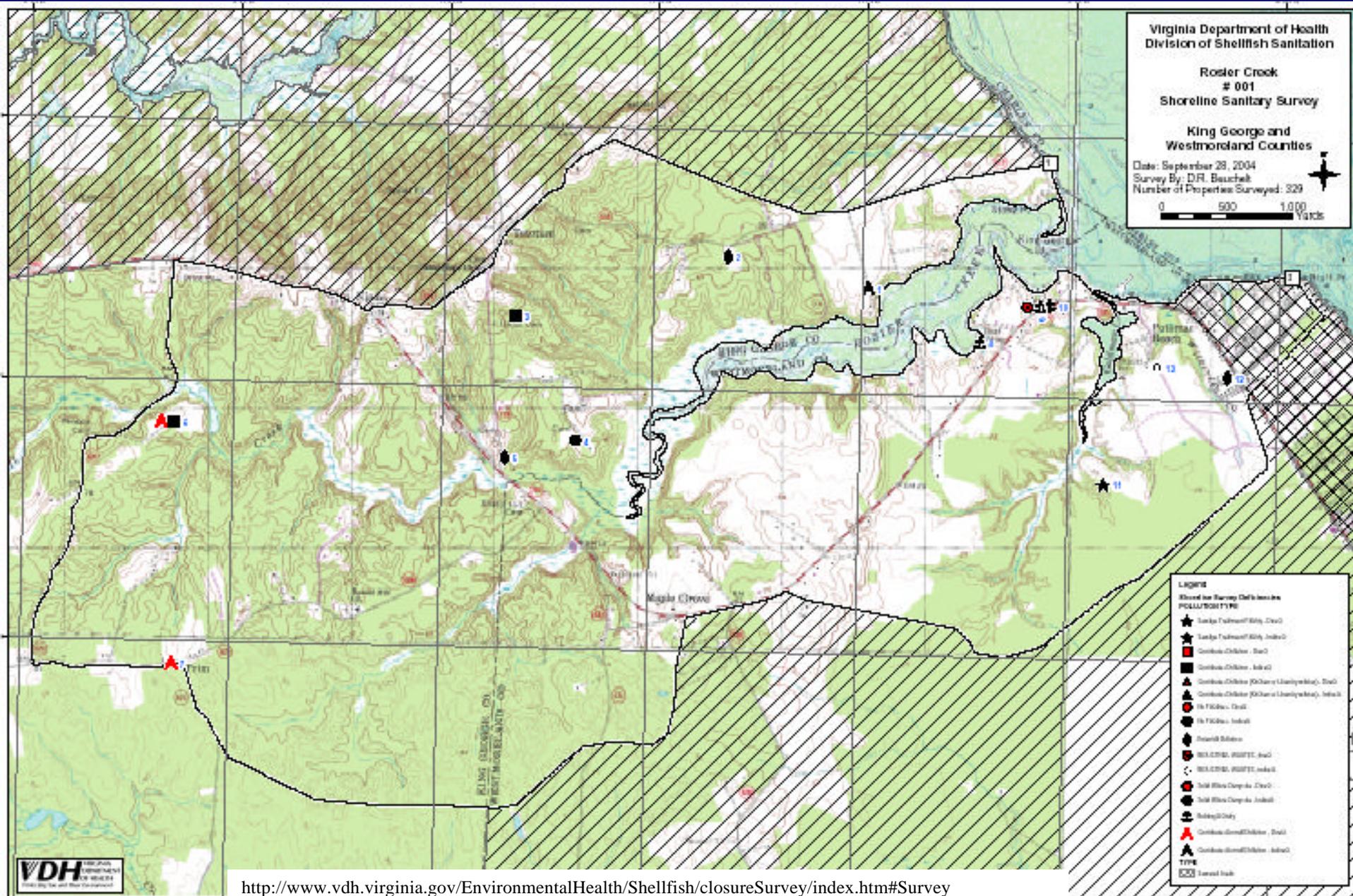
Biosolids

Nomini Creek Biosolids Application Sites

- Biosolids are “non-discharge” and are not assigned WLAs
- Biosolids, when applied correctly, do not contribute bacteria pollution to the waterway



VDH Shoreline Sanitary Survey, Rosier Creek Sept 2004



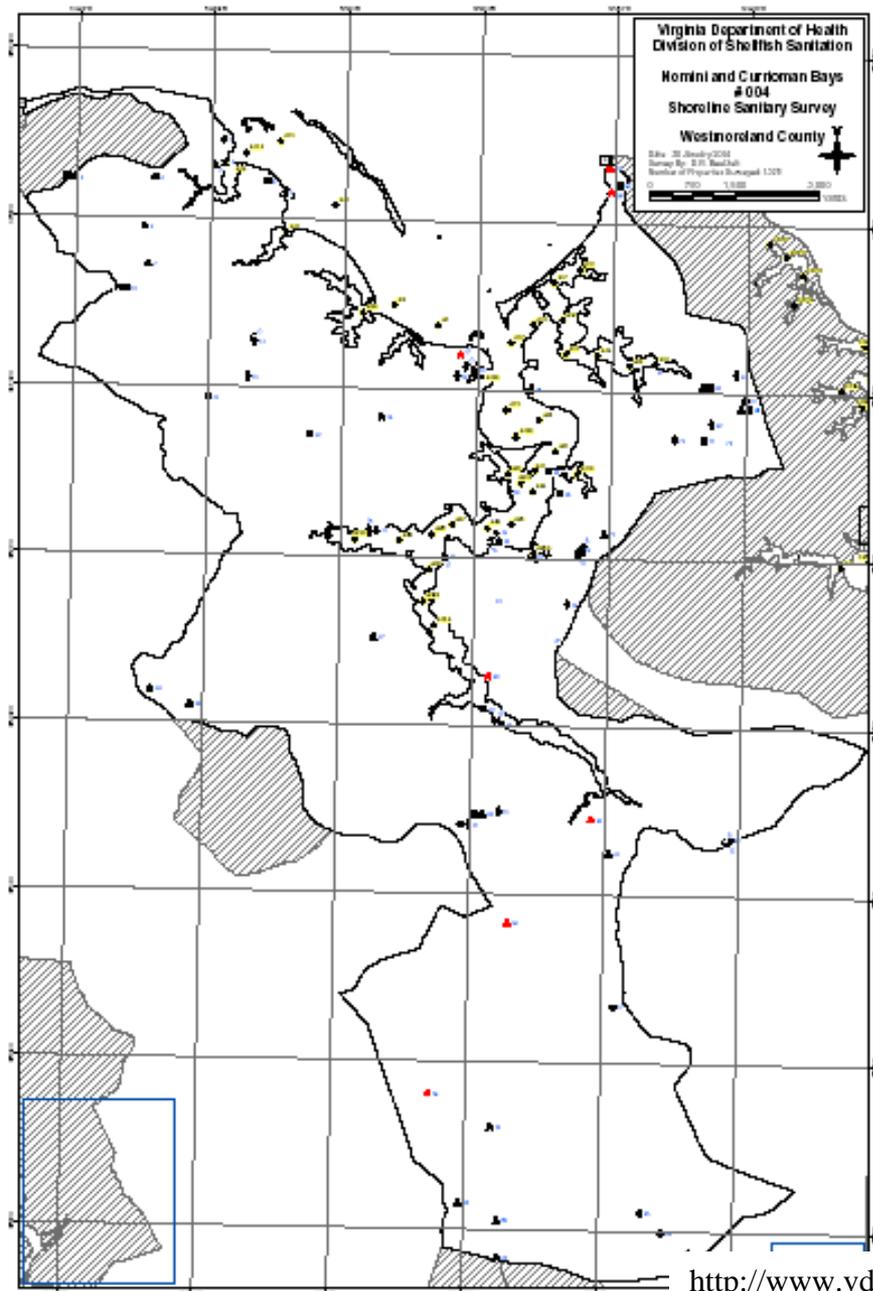
VDH Shoreline Sanitary Survey, Rosier Creek, Sept 2004

Sewage	Direct	Indirect
Sewage Treatment Facilities	2	0
On-site sewage deficiencies	0	2 (1)
Kitchen/laundry Waste	0	0
No facilities	0	0
Potential Pollution (3)		
Non-sewage		
Industrial Waste	1	3 (1)
Solid waste	0	1
Boating - Marinas (0)		
Boating - Other moorings (3)		
Boating - Under surveillance (0)		
Animal Pollution	2 (2)	1 (1)

Numbers in red are deficiencies uncorrected as of 12/2010

VDH Shoreline Sanitary Survey, Nomini Creek Jan 2006

<http://www.vdh.virginia.gov/EnvironmentalHealth/Shellfish/closureSurvey/index.htm#Survey>



Sewage

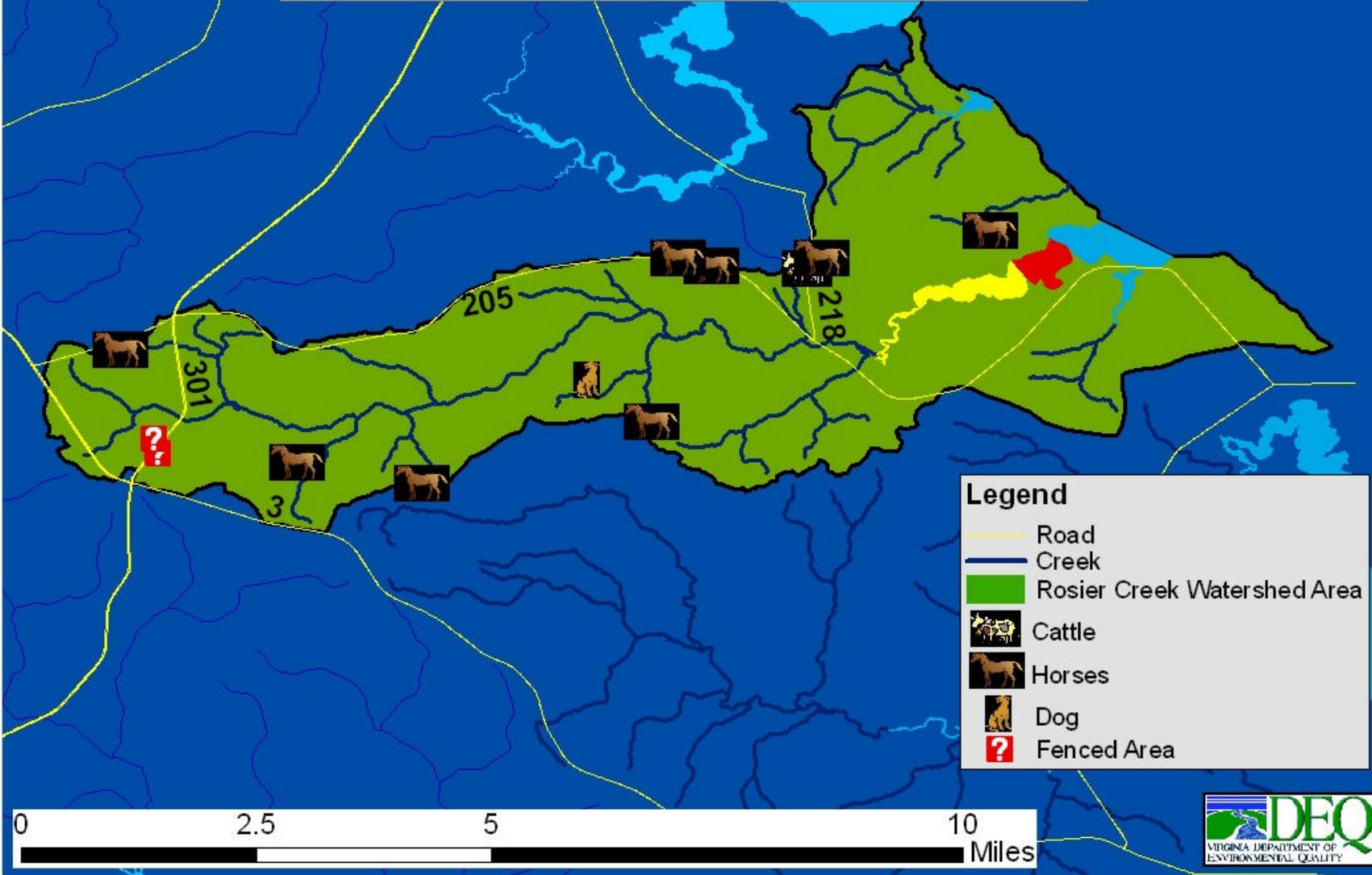
	Direct	Indirect
Sewage Treatment Facilities	0	3
On-site sewage deficiencies	2	10(4)
Kitchen/laundry Waste	1	0
No facilities	0	2(1)
Potential Pollution	(21)	

Non-sewage

Industrial Waste	2	3
Solid waste	0	6
Boating - Marinas	(1)	
Boating - Other moorings	(6)	
Boating - Under surveillance	(7)	
Animal Pollution	5(5)	15(15)

Numbers in red are deficiencies uncorrected as of 12/2010

Rosier Creek - DEQ Watershed Survey Dec 2010

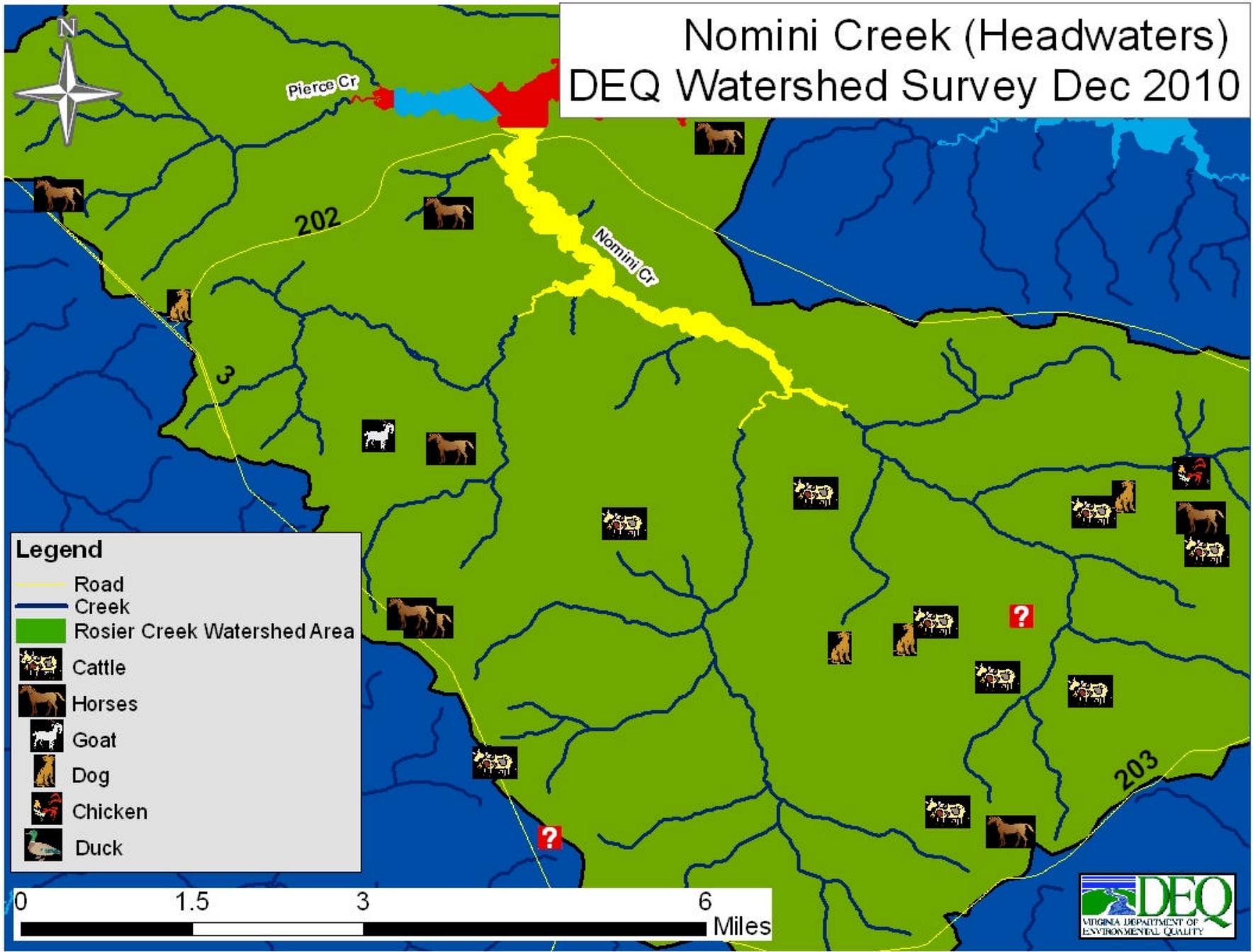


Legend

- Road
- Creek
- Rosier Creek Watershed Area
- Cattle
- Horses
- Dog
- Fenced Area



Nomini Creek (Headwaters) DEQ Watershed Survey Dec 2010

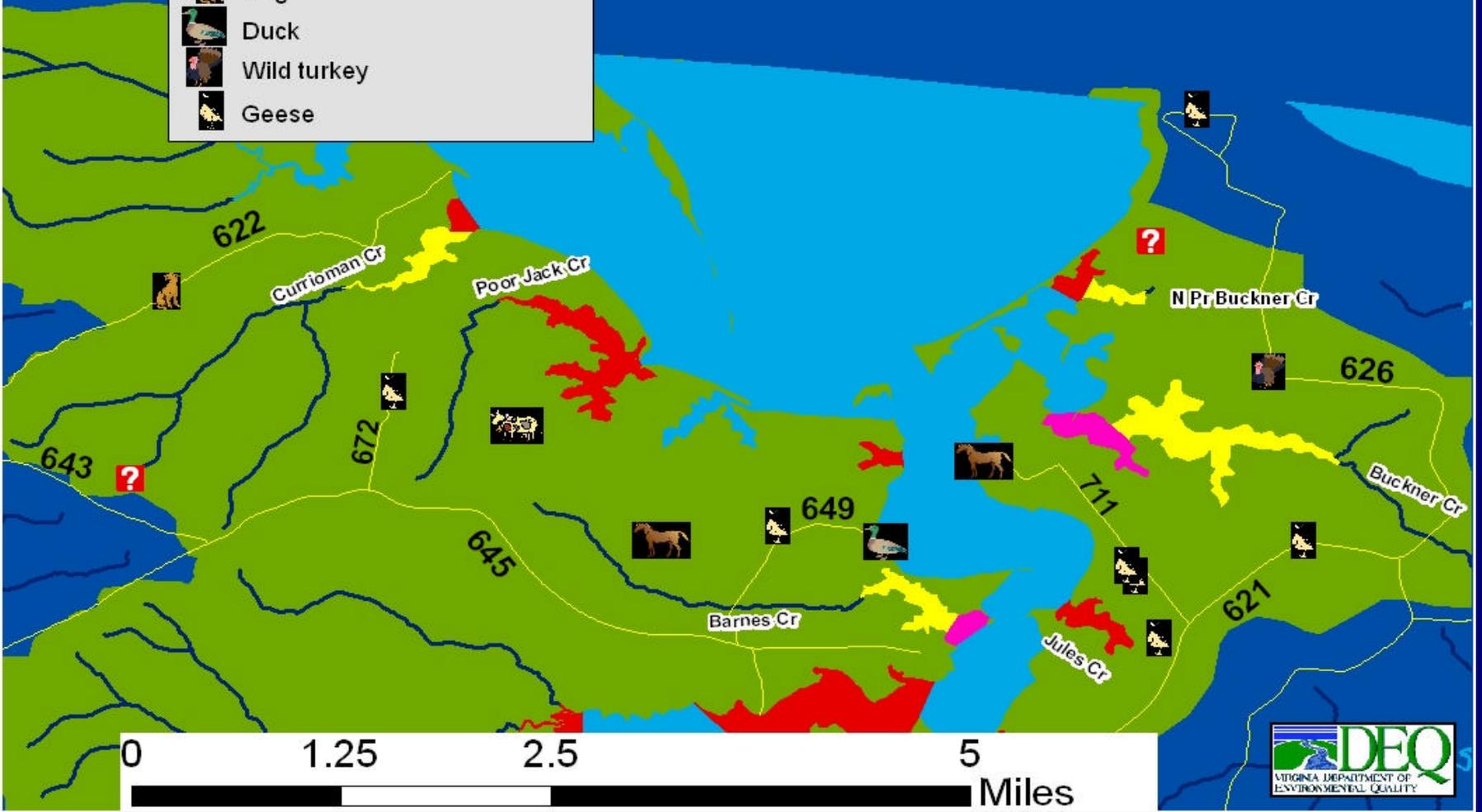


Nomini Creek (Near Mouth) DEQ Watershed Survey Dec 2010



Legend

- Road
- Creek
- Rosier Creek Watershed Area
- Cattle
- Horses
- Dog
- Duck
- Wild turkey
- Geese



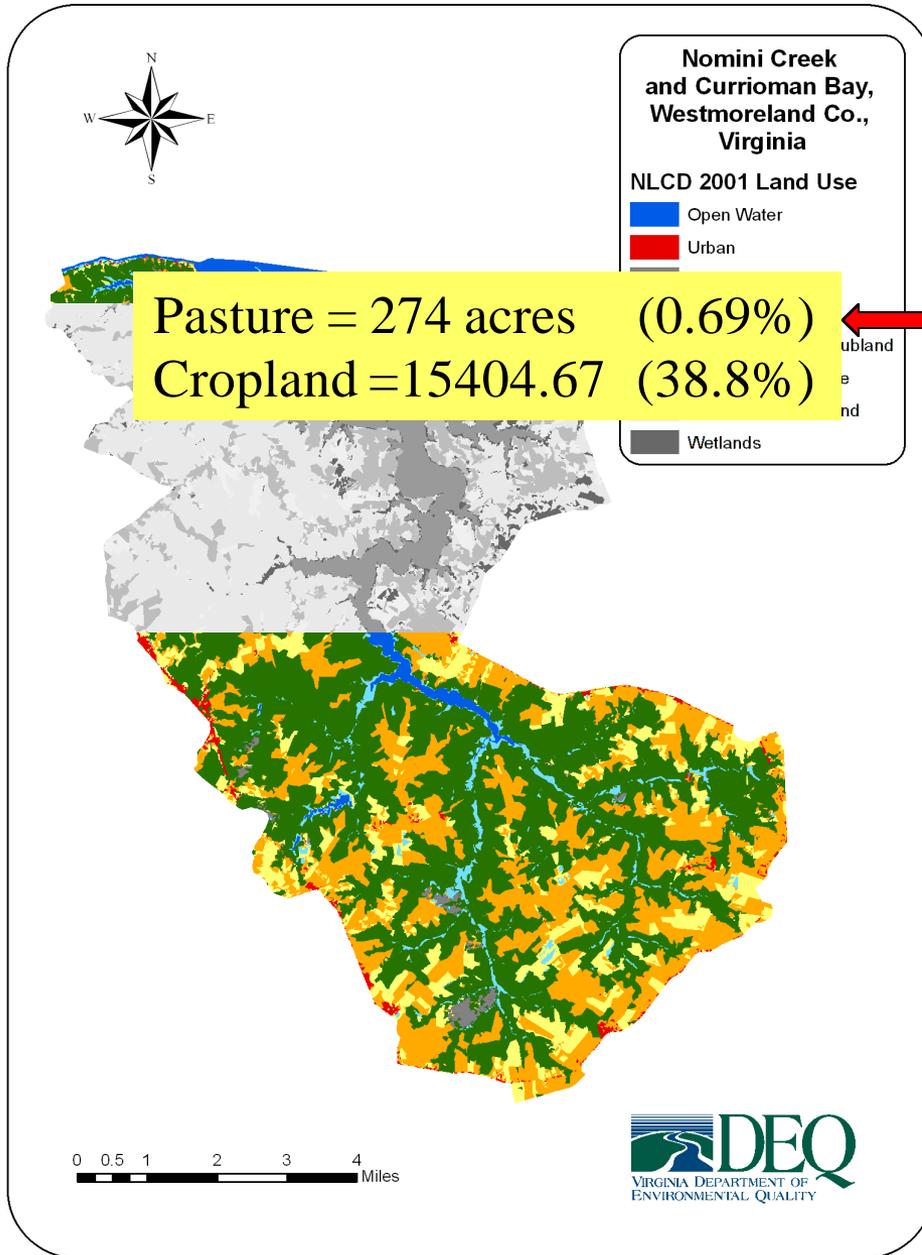
DEQ Dec 2010 Survey Summary

Watershed	Cattle	Horses	Chickens	Dog	Turkey	Goats	Ducks	Geese	Pasture Acreage Estimated*
Nomini	475	7	12	60	2	3	250	7250	274
Rosier	28	18	0	10	0	0	0	0	92.2

*Pasture was visually estimated during survey and verified using topographic maps (using a planimeter and aerial photography)

- Pasture acreage will be used to correct land use totals for pasture and cropland in both watersheds
- Horse and cattle numbers will be used to correct population estimates
- Geese numbers in Nomini will be used to correct population estimates

Land Use: Nomini Creek



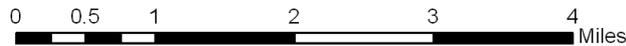
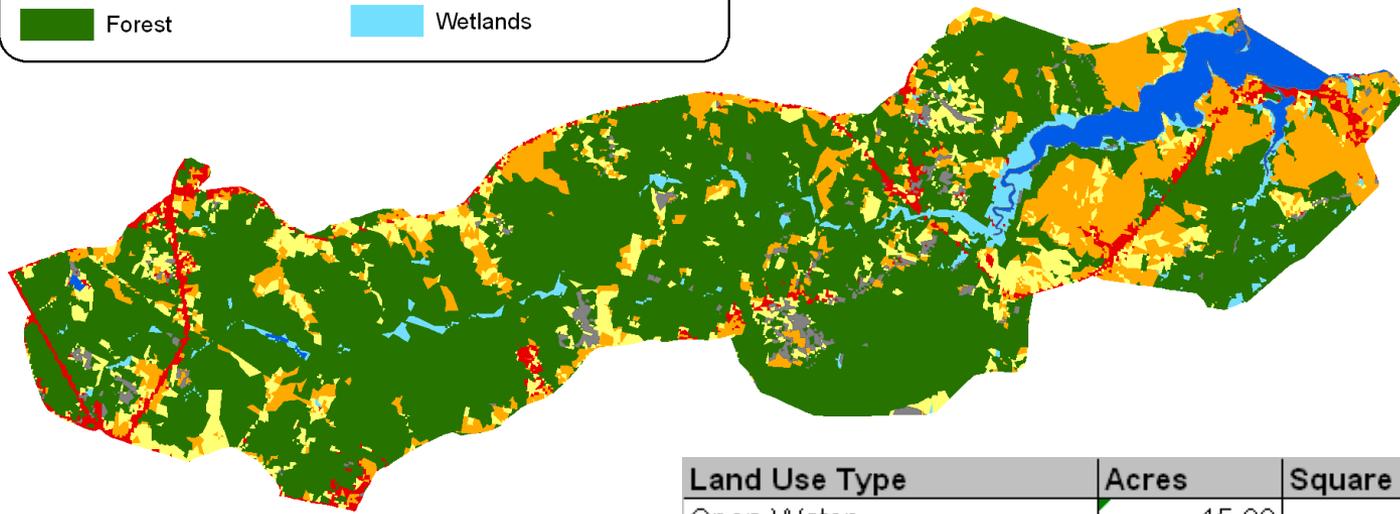
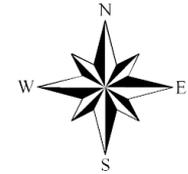
Nomini Land Use	Acres	Square Miles	Percentage
Open Water	334.74	0.52	1%
Urban	465.87	0.73	1%
Barren	427.93	0.67	1%
Forest	20893.82	32.65	53%
Agriculture - Pasture	10980.00	17.16	28%
Agriculture - Cropland	4698.67	7.34	12%
Wetlands	1873.35	2.93	5%
Total	39674.38	61.99	100%

- DCR indicated that Pasture land use for both Rosier and Nomini Creeks are overestimated
- DEQ will correct the land use for pasture/cropland of both creeks using numbers derived from 12/2011 survey

Land Use: Rosier Creek

Rosier Creek Westmoreland & King George Co., Virginia

NLCD 2001 Land Use



Land Use Type	Acres	Square Miles	Percentage
Open Water	15.88	0.02	0.1%
Urban	391.08	0.61	3%
Barren	244.74	0.38	2%
Forest	7272.14	11.36	64%
Agriculture - Pasture	1808.49	2.83	16%
Agriculture - Cropland	1210.85	1.89	11%
Wetlands	344.85	0.54	3%
Total	11288.04	17.64	100%

Pasture = 92.2 acres (0.8%)
 Cropland = 2927.14 (25.9%)



Population Estimates – domestic/wildlife

Watershed	² Cattle	Chickens	² Horses	¹ Ducks	Geese	¹ Deer	¹ Raccoon	¹ Muskrat	¹ Beaver	³ Dogs
Nomini	475	² 12	7	1740	² 7250	1058	2127	18734	506	756
Rosier	28	⁴ 11	18	321	¹ 239	491	101	3449	189	238

¹From calculations based DGIF land area by species density

²From DEQ Survey 2010

³Calculated using County Treasurer's total county dog tags issued for most recent year available - extrapolated to watershed acreage

⁴Calculated by CCRM using USDA 1997/2001 census data

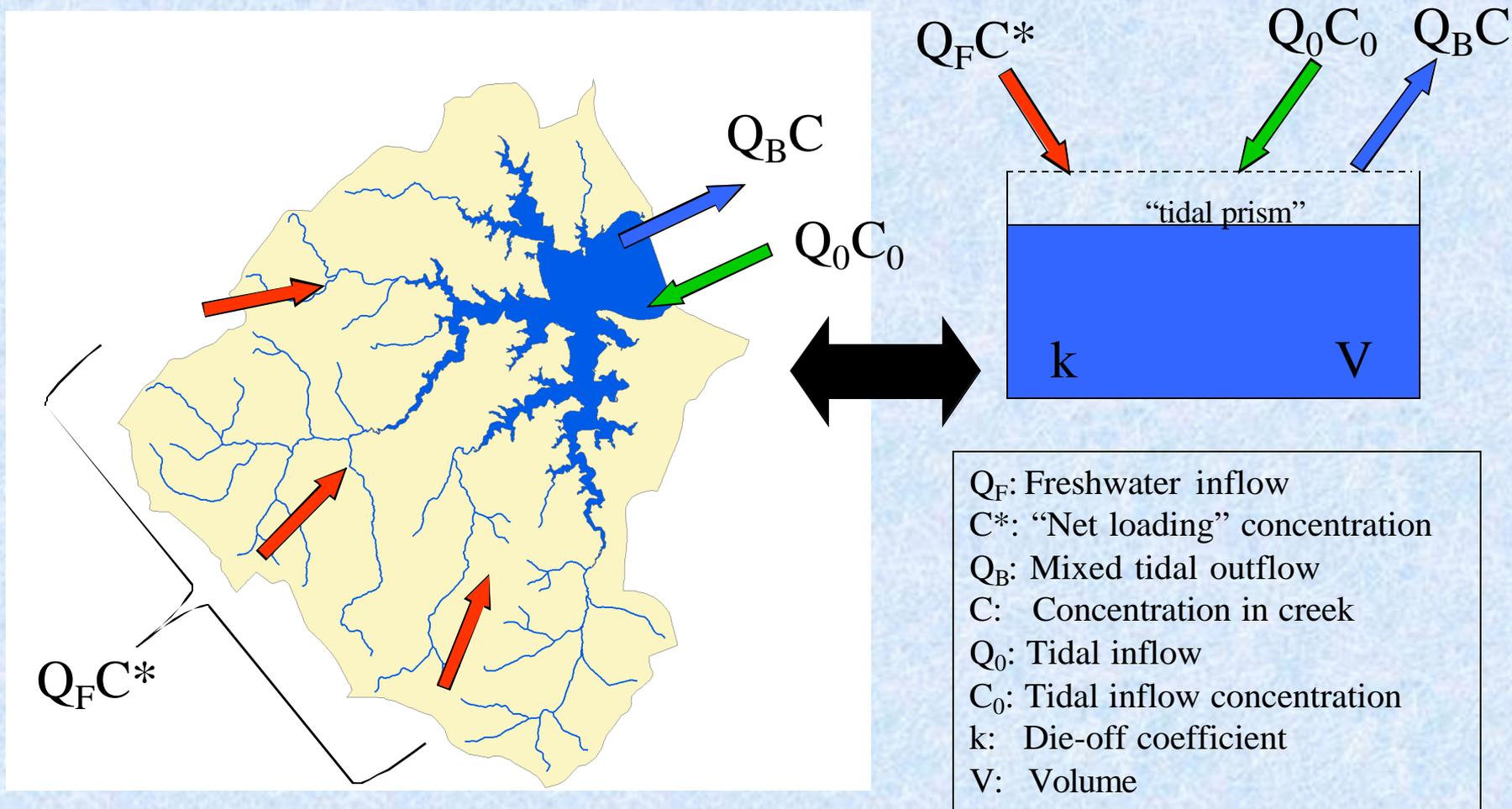


Population Estimates – Septic and straight pipes

Watershed	*Total Number of Homes	¹Connected to public sewer	²Total Number of Septic Systems	³Septic Failures	⁴Straight Pipes
Nomini	1758	29	1678	201	51
Rosier	1021	0	1007	121	14

- *Homes were counted using 2007 aerial photography for watershed
- ¹ Connections to public sewer must be validated by Montross STP staff
- ² Total # septic derived by (total # homes – connections to STP)
- ³ Septic Failures derived by (total # septics x 12% default failure rate)
- ⁴ Straight Pipe number derived from 2000 Census data for counties and percent of homes with incomplete plumbing (King George = 0.8% and Westmoreland =2.9%)

Steady State Tidal Prism Model



WLA + LA + MOS = TMDL

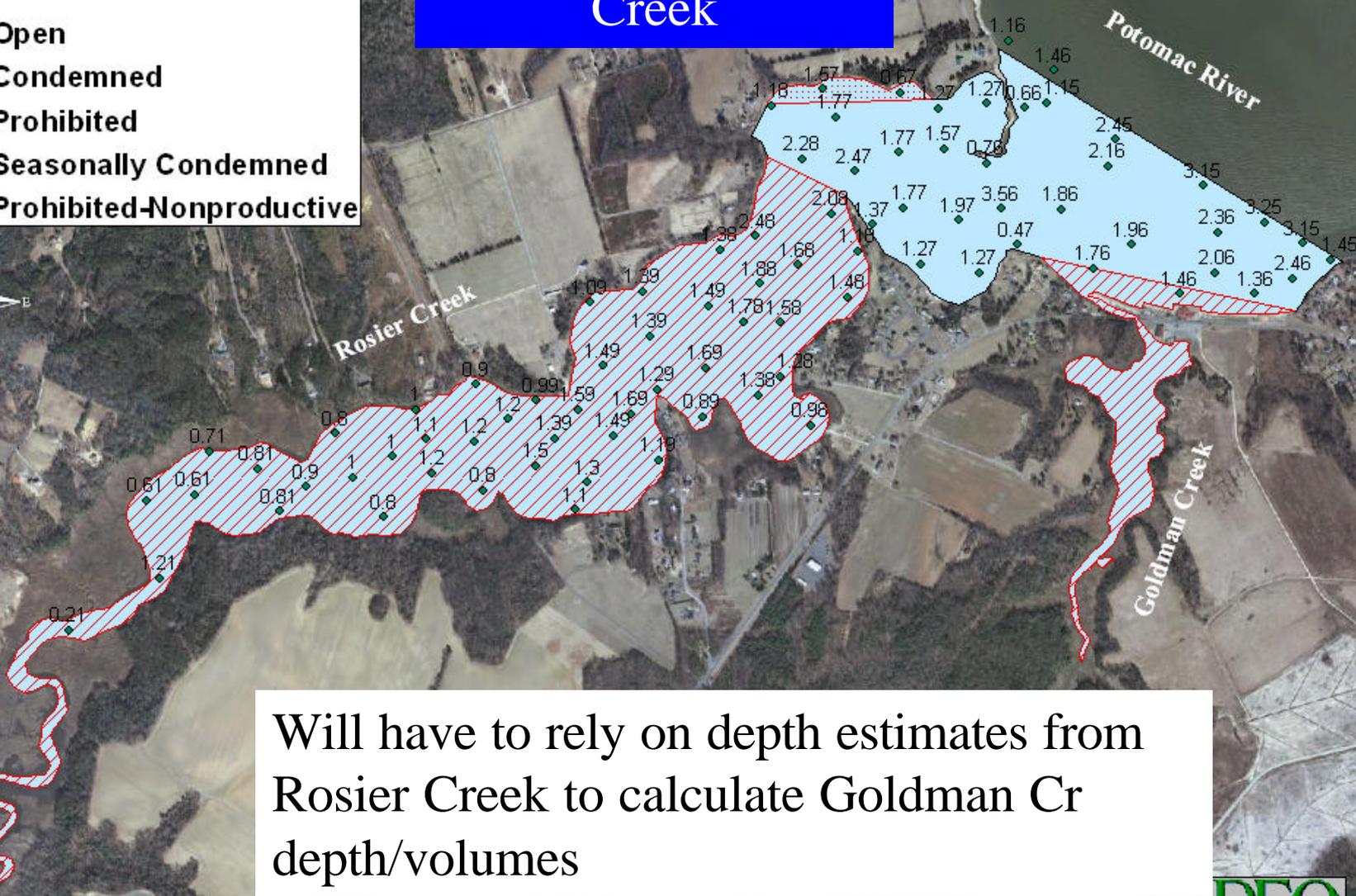
Steady State Tidal Prism Model

- Represents tidal water body as a well-mixed reservoir
- Solves coupled mass-balance equations for water and bacteria, averaged over a tidal cycle
- Processes accounted for:
 - Freshwater inflow
 - Net bacteria loading (what model “solves” for)
 - Tidal flushing
 - “Die-off” (net effect of bacteria concentration via any process other than flushing)
- “Steady-state” means the observed concentration - therefore the inputs and outputs are not changing (net balance)
- Model estimates “net loading” that is consistent with the observed concentration in creek given processes listed above

Rosier Creek

- Open
- Condemned
- Prohibited
- Seasonally Condemned
- Prohibited-Nonproductive

Bathymetry Rosier Creek

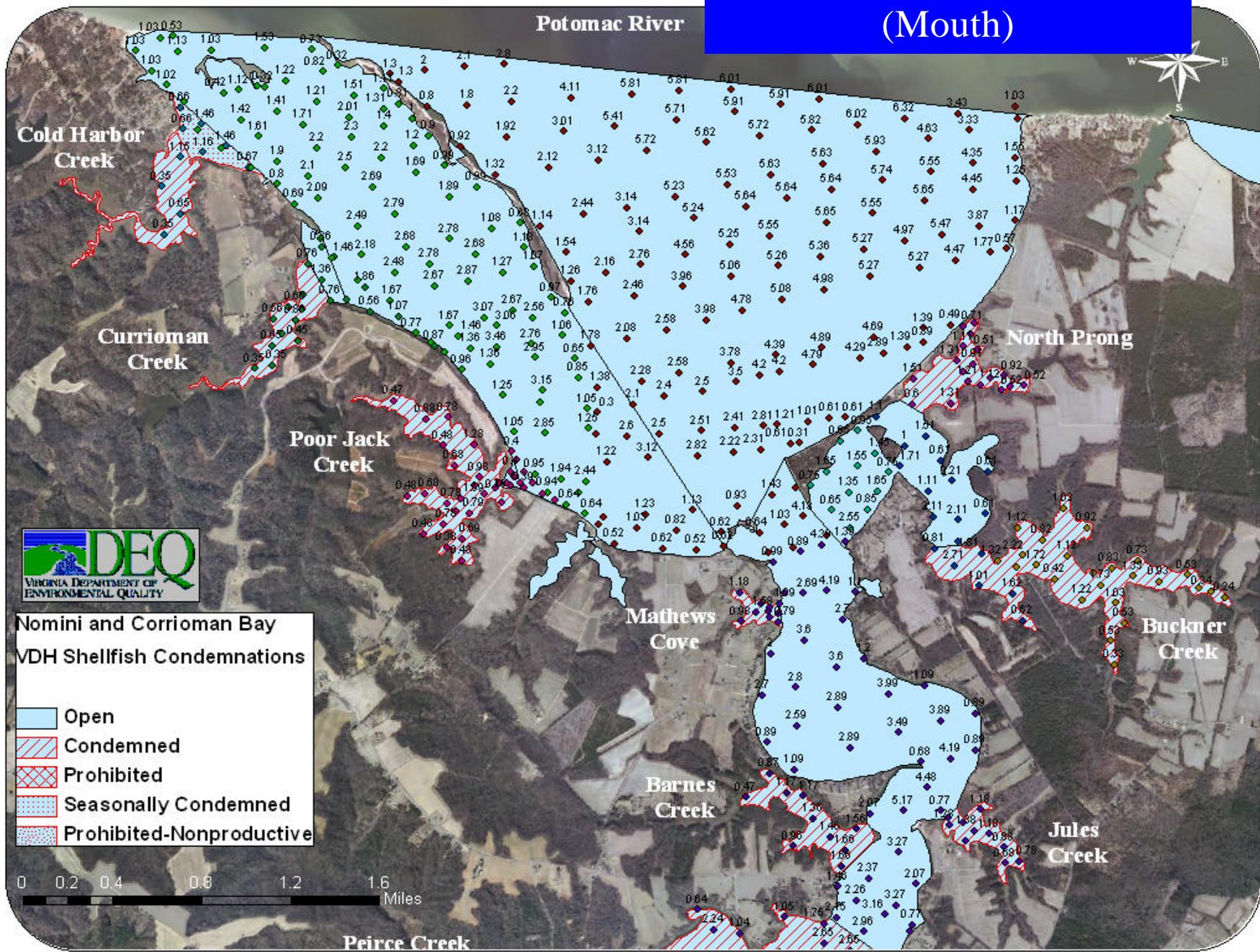


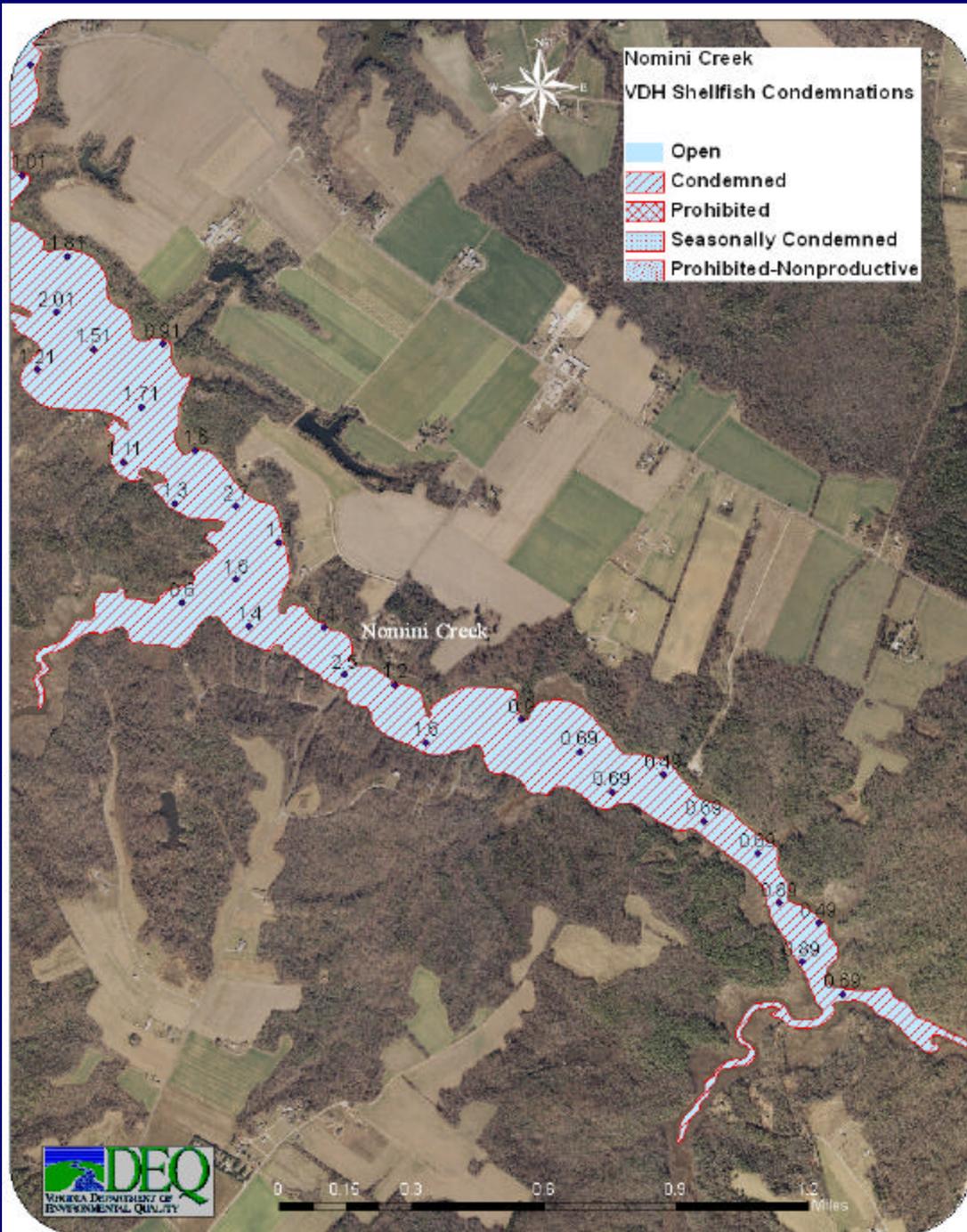
Will have to rely on depth estimates from Rosier Creek to calculate Goldman Cr depth/volumes





Bathymetry Nomini Creek (Mouth)





Bathymetry Nomini Creek (Headwaters)

Next Steps...

- **30 Day Public Comment Period**

Ends February 22, 2011

- **TMDL Development Continues...**
- **Final Public Meetings**
- **Final 30 Day Public Comment Period**
- **Report Submitted to EPA and SWCB
for approval**
- **Implementation Planning**



Questions?? Comments??

Please send written comments or questions to:

DEQ - Piedmont Regional Office

Attn: Margaret Smigo

4949-A Cox Road

Glen Allen, VA 23060

Email: Margaret.Smigo@deq.virginia.gov

*Please include name, address,
email, telephone #*

Presentation is available at:

<http://www.deq.virginia.gov/tmdl/mtgppt.html>

TMDL Website: <http://www.deq.virginia.gov/tmdl>

