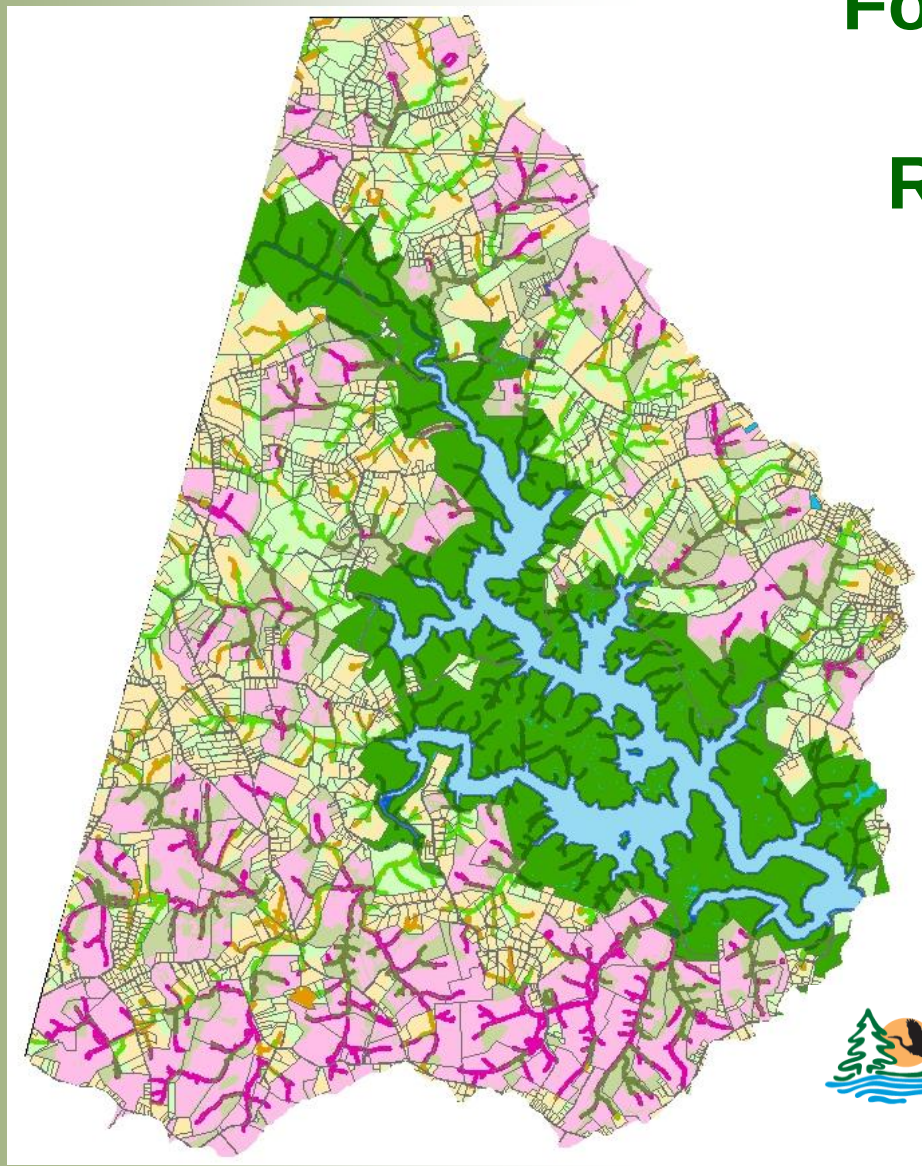
Potomac Watershed Partnership
Winter 2015 Information Exchange
Shepherdstown, WV, December 8, 2015



Forest Characterization of the Prettyboy Reservoir Watershed

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Sustainable Forestry Council
Sustainable Forests Roundtable

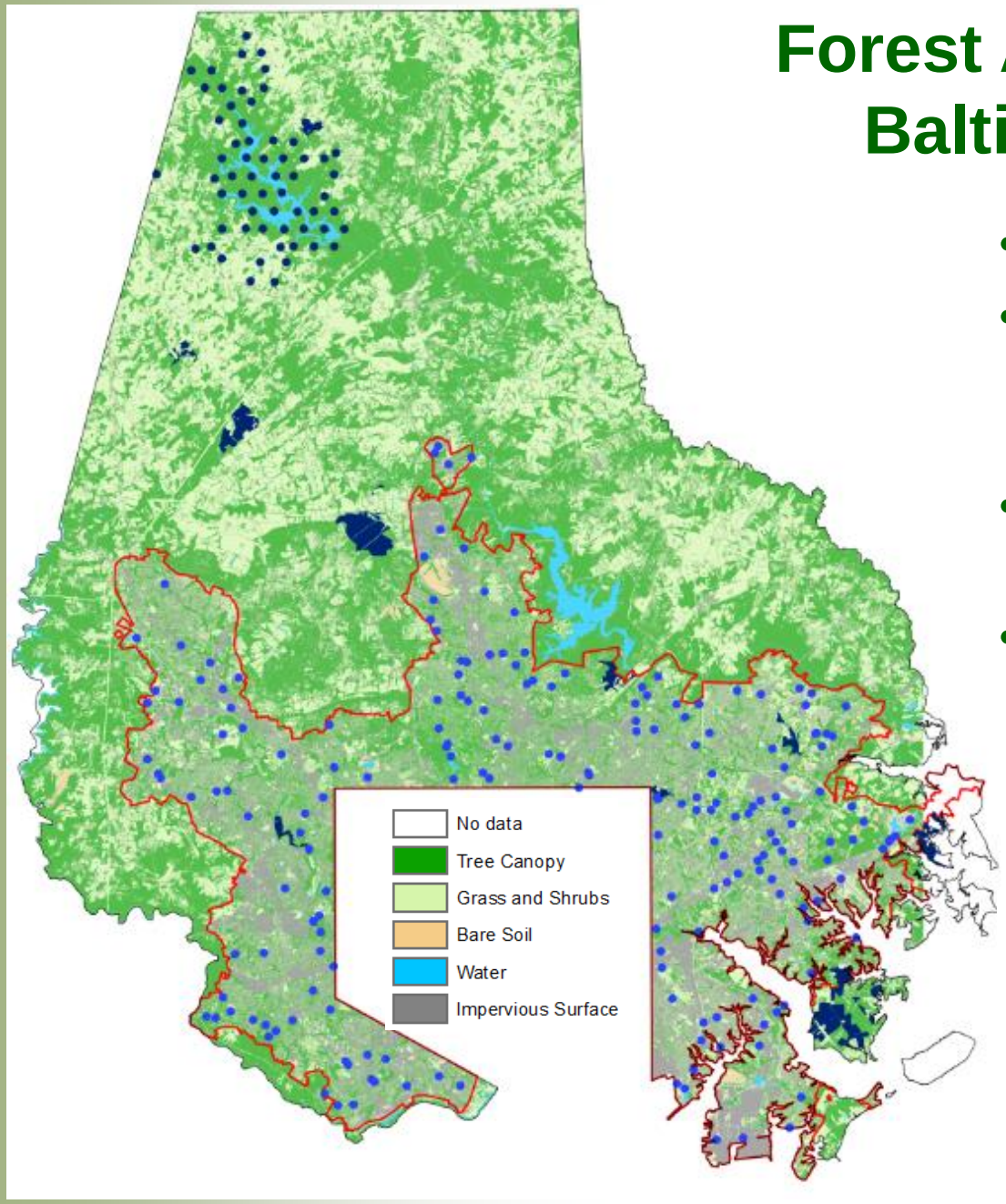
Funded by the MD Department of Natural Resources - Forest Service

MARYLAND DEPARTMENT OF NATURAL RESOURCES

MAR-LEN ENVIRONMENTAL INC.

BALTIMORE COUNTY MARYLAND

Forest Assessments in Baltimore County



- UFORE (183 urban plots)
- County Parks (9 NED forest assessments on 2,962 acres)
- Private multi-owner forest patches (4 for 760 acres)
- Hex plots - 62 NED plots on 27 private, 2 State, and 33 City reservoir sites

Prettyboy Sampled Locations

UFORE Plots

Forest Health Assessments

URDL

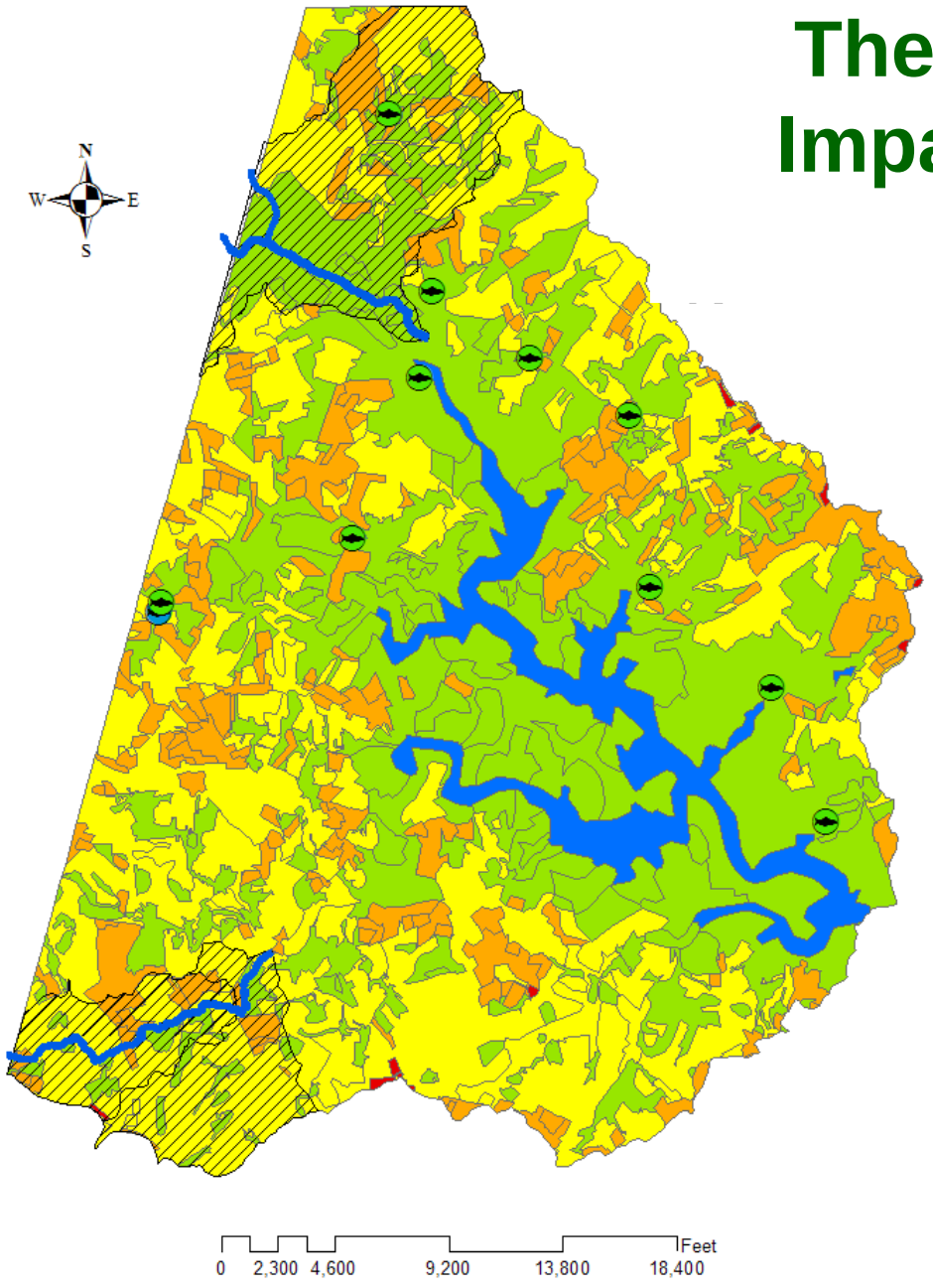
The Prettyboy – What's at Stake?

Baltimore County portion:

- Area: 25,500 acres
- Population: 4,400
- Land Use (excl. 1,306 ac water):
  - 53.1% forest
  - 38.6% agriculture
  - 8.3% developed

- part of the largest public water supply system in MD
- serves 1.8 million or 1/3 of the State's citizens
- 11 trout streams
- 3.78 mi. Tier II streams
- 3,780 acre Tier II drainage (14.6% of watershed)
- Reservoir Watershed Management Agreements: 1979, 1984, 2005

The Prettyboy – An Impaired Watershed

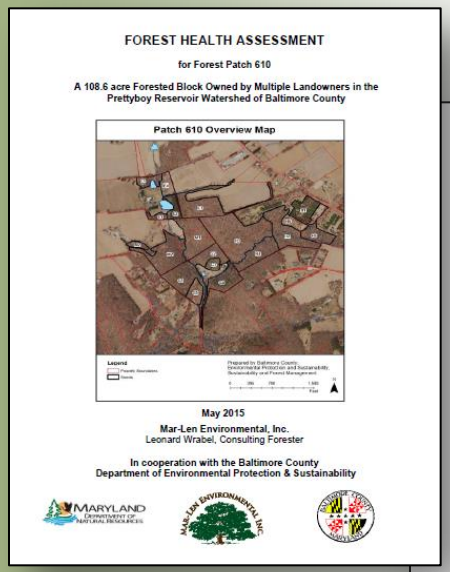


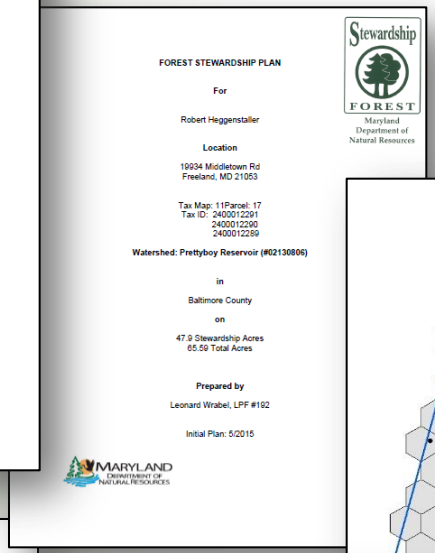
- 1998 MD Clean Water Action Plan: impaired
- Phosphorus TMDL: 37% reduction required
- Bacteria TMDL
- Possible Biological Impairments

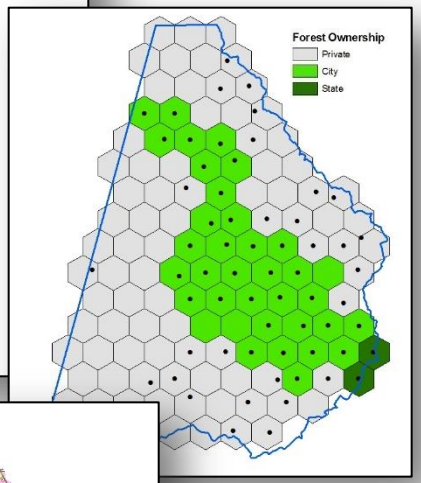
General Land Use

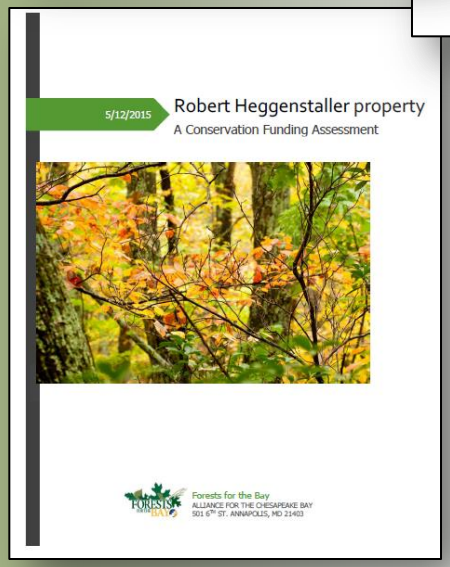
- Urban
- Low Density Residential
- Agriculture
- Forest
- Water
- Brook
- Brook - Brown
- Brown
- Tier II Stream Segments
- Tier II Drainage Areas

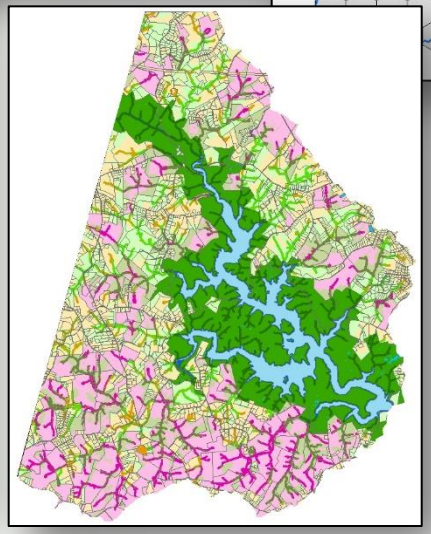
Components of the Prettyboy Forest Assessment Project











$25k DNR grant to EPS & partner in-kind

1. DNR - funded multi-owner NED patch assessment (34%)
2. DNR - funded Forest Stewardship Plans (27%)
3. DNR-funded watershed-wide NED sampling (39%)

- Alliance - provided Conservation Funding Assessments
- EPS - developed Forest Cover Typology and Parcel Analysis

Forest Health Assessments & Management Plans

NED Data and Reports

- **Forest type**
- **Tree size class distribution**
- **Medial diameters and distribution**
- **Effective stand age**
- **Canopy closure**
- **Overstory, midstory, & understory species composition & diversity**
- **Tree condition (acceptable/unacceptable growing stock)**
- **Basal Area**
- **Stand Relative Density**
- **Regeneration**
- **Timber volumes**
- **Carbon sequestration**
- **Patch habitat analysis**
- **Visual quality**

and much more

Purposes:

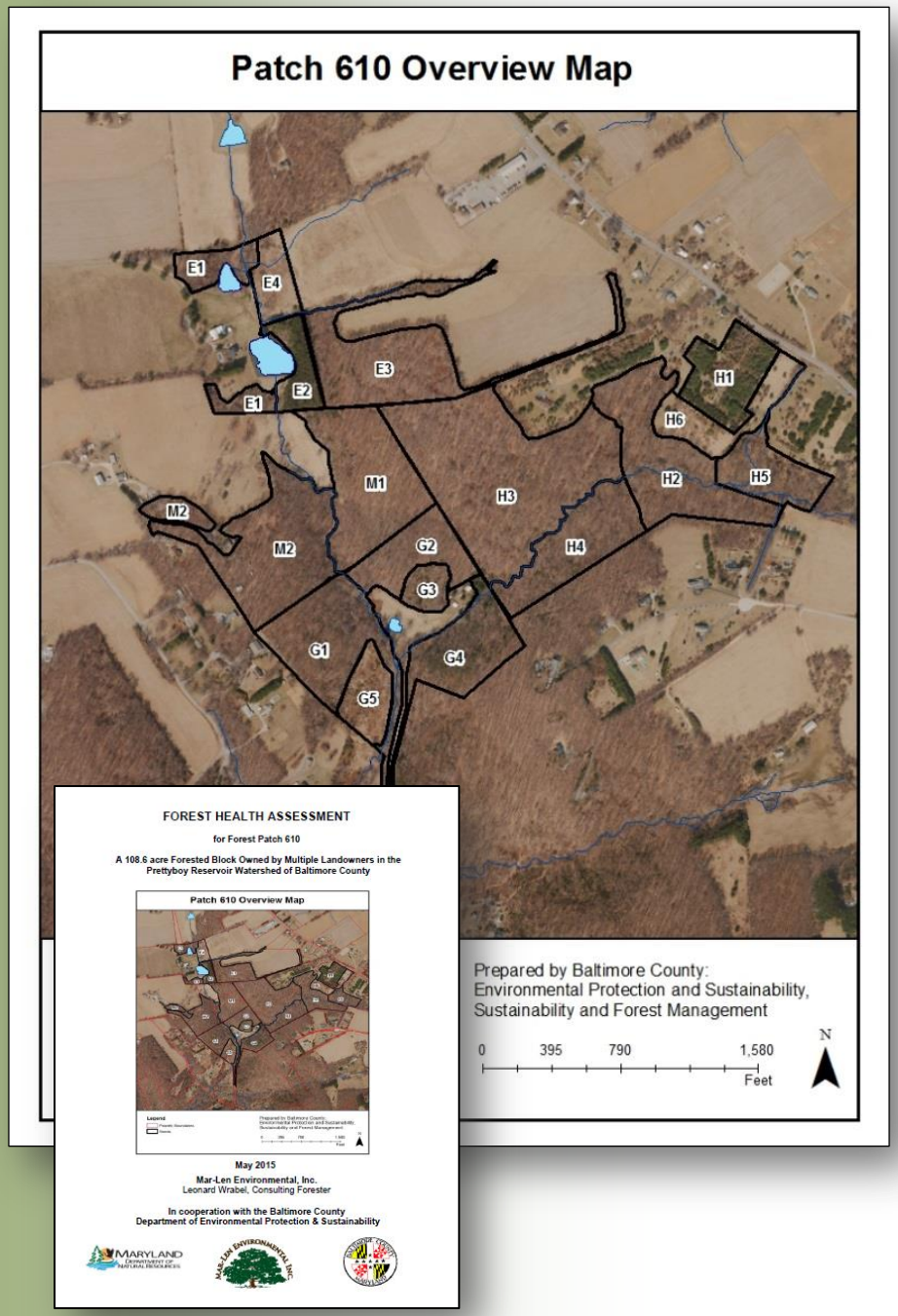
- assess **present condition** of the forest and identify stressors that threaten sustainability
- address defined **management questions**
- prepare a **Forest Management Plan** to assure forest health, regeneration, and structural and biological diversity

Assessments:

- forest plots sampled within delineated stands, including overstory biological and structural characteristics and health; understory and ground-layer biotic and abiotic characteristics

Recommendations:

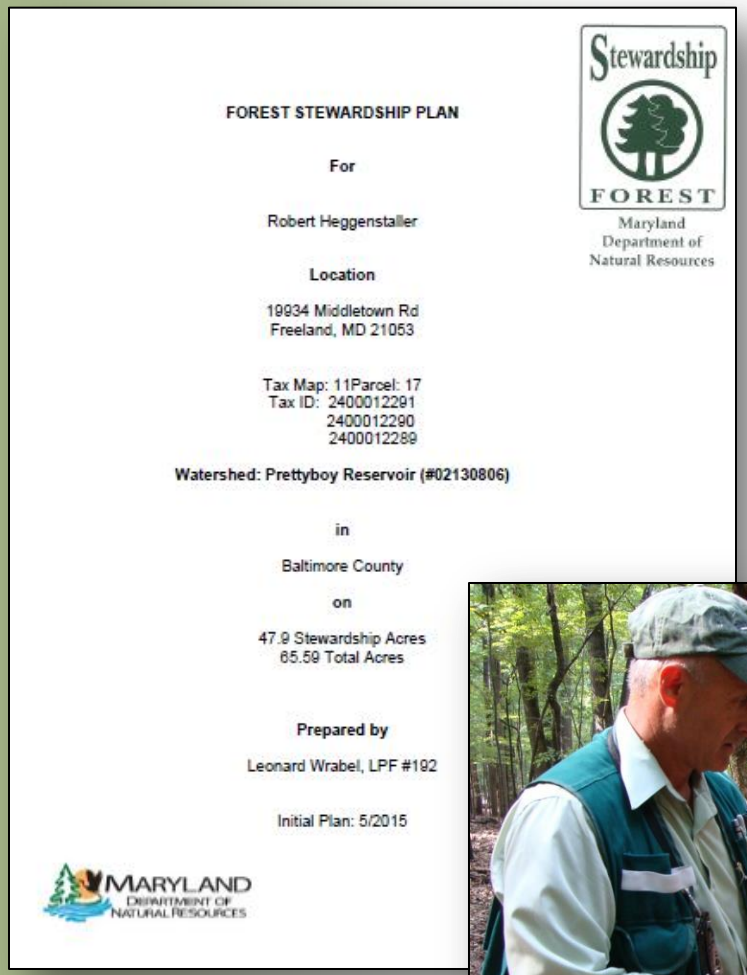
- silvicultural operations to sustain natural oak regeneration while maintaining functional values - water quality, habitat, passive recreation
- prioritized actions for improving forest ecosystem health by suppressing Gypsy Moths, non-native invasive plants, and white-tailed deer



"Patch 610" Forest Assessment

- Patch 610 has >20 landowners
- Most of the acreage is owned by 8 families on 13 parcels
- 4 of the landowners agreed to participate
- Total 108.6 acres, 17 stands
- NED data collected for 15 stands
- Findings:
  - **Oak dominance/co-dominance**
    67% of patch acres
  - **Moderately overstocked stands**
    97 sq.ft./ac. Basal Area
    72% Stand Relative Density
  - **Poor quality trees**
    61% Undesirable Growing Stock
  - **Inadequate oak regeneration**
    4% oak, only 8 species total

Forest Stewardship Plans



FOREST STEWARDSHIP PLAN

For

Robert Heggenstaller

Location

19934 Middletown Rd
Freeland, MD 21053

Tax Map: 11Parcel: 17
Tax ID: 2400012291
2400012290
2400012289

Watershed: Prettyboy Reservoir (#02130806)

in

Baltimore County

on

47.9 Stewardship Acres
65.59 Total Acres

Prepared by

Leonard Wrabel, LPF #192

Initial Plan: 5/2015

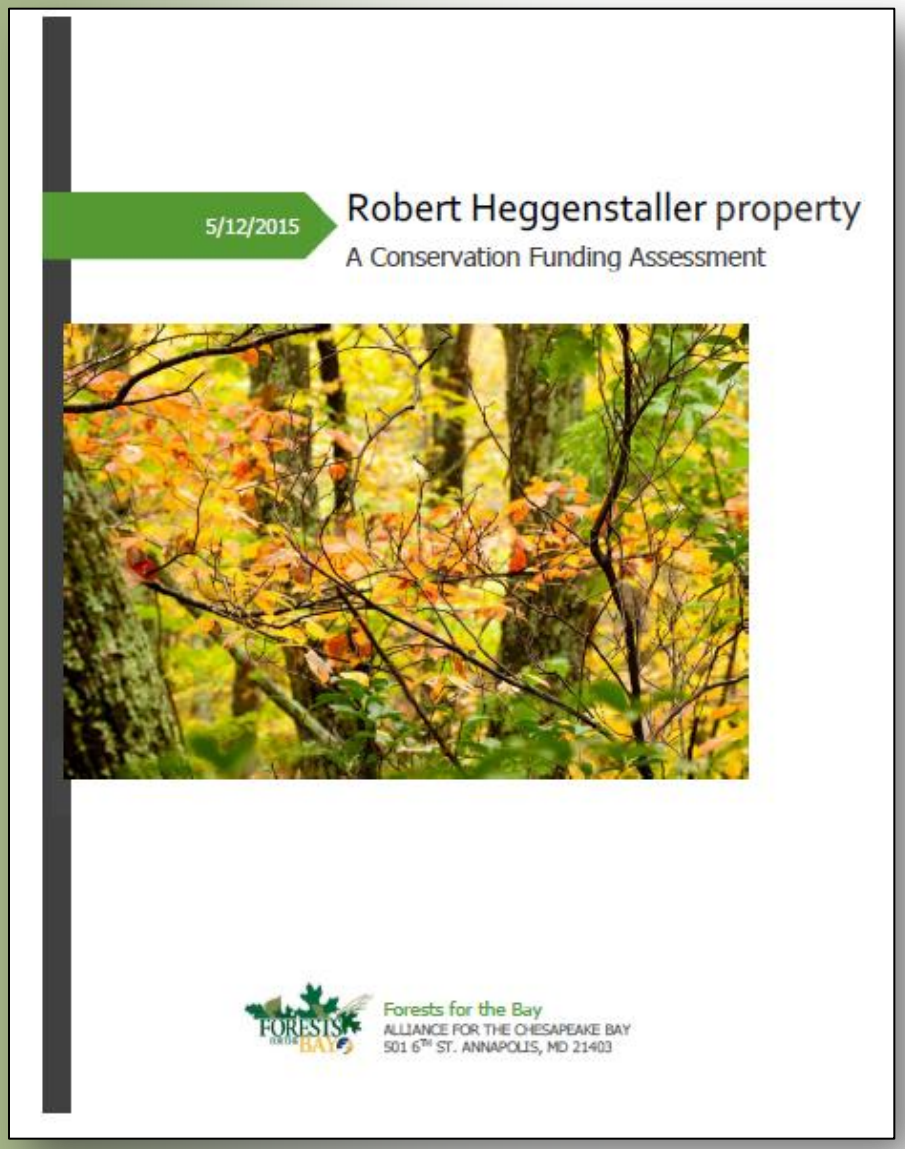
Stewardship FOREST
Maryland Department of Natural Resources

MARYLAND DEPARTMENT OF NATURAL RESOURCES

- FSPs prepared for each of the 4 property owners in the patch assessment
- Plans qualify landowners for federal and state cost-share practices
- Combined elements of NED analysis and DNR PlanWriter

Field work for this project was conducted by Len Wrabel, LPF, Mar-Len Environmental, Inc.

Conservation Funding Assessments



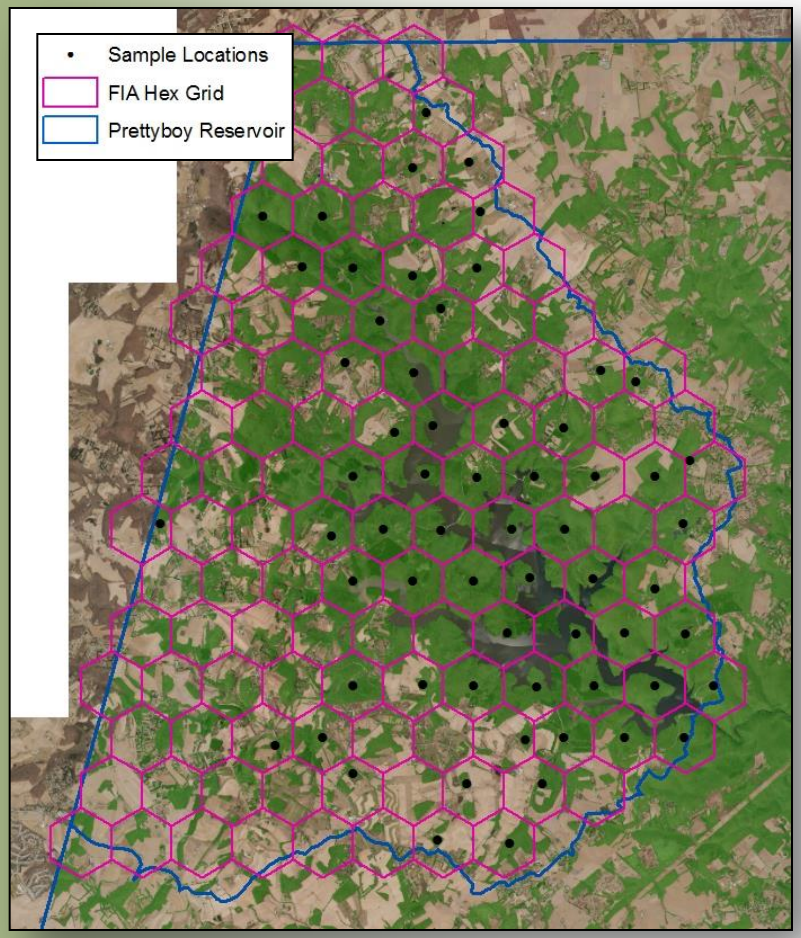
- Prepared by the Alliance for the Chesapeake Bay for each property owner
- Lists programs and funding for 3 broad categories:
- **Woodland Stewardship**

  (cost-share programs for practices to implement Forest Stewardship Plans)
- **Woodland Tax Incentives**

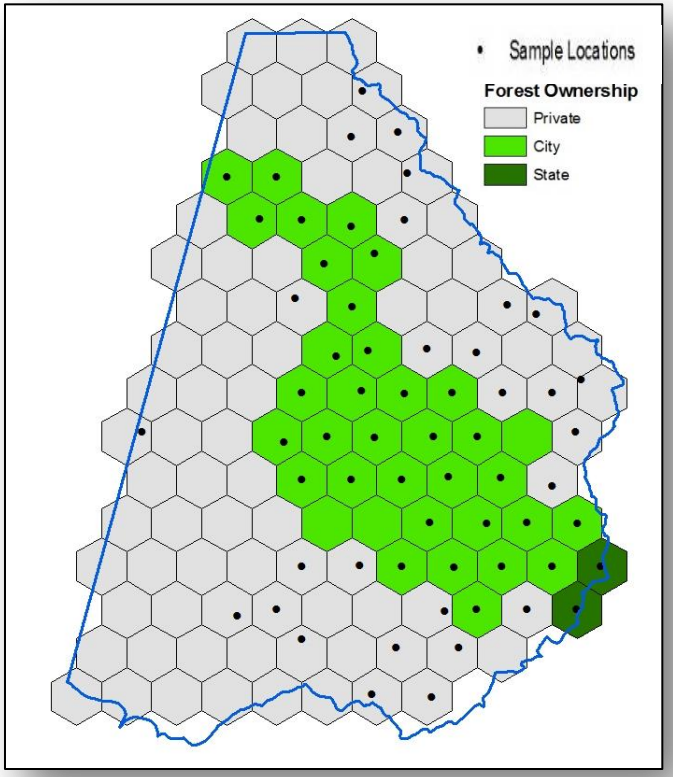
  (tax incentive programs)
- **Woodland Conservation**

  (emerging private conservation markets)

Watershed-wide Forest Sampling



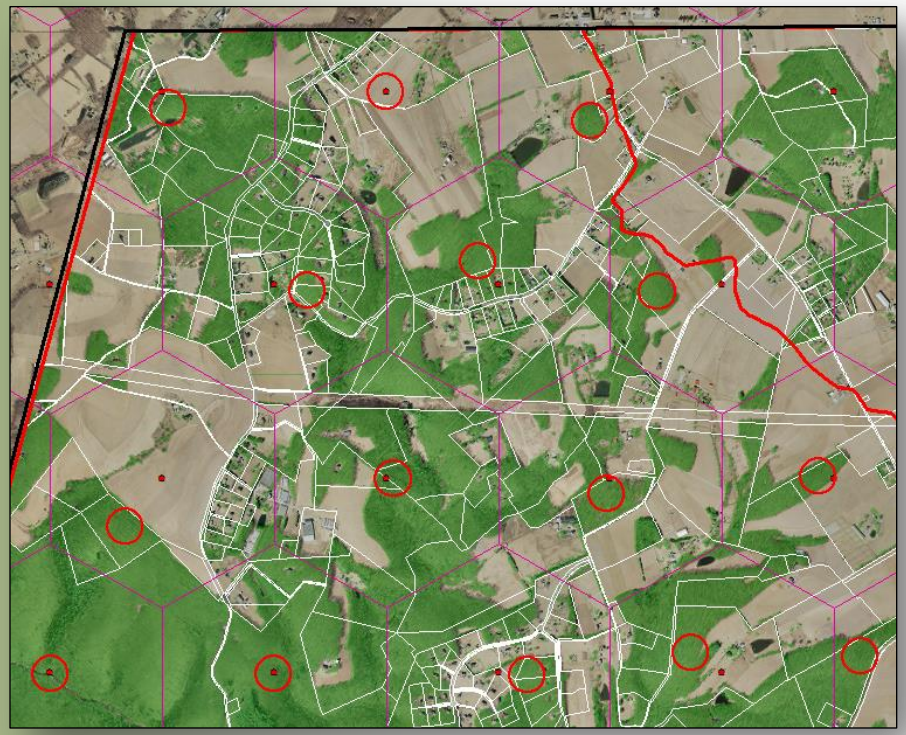
- Replicated USDA FIA hex grids (220 acres each)
- Located centroids and checked for 5-acre circles of contiguous forest
- Moved circles to nearest 5-acre area if not at centroid



- Letters/calls to landowners to allow sampling; used GPS to find plots
- Consulting Forester conducted NED samples at 62 plots: 2 State, 33 City reservoir, 27 private landowner

NED Forest Plot Sampling

snapshot of conditions across the watershed



In general, forest plots on City of Baltimore land are in poorer health than private plots

Stand Maturity

- 27% of trees are >16.5" diameter, 58% are 10.5-16.5", and 14% are 4.5-10.5"

Tree Density/Crowdedness

- mean basal area is 111 sq.ft./ac.
- 45% of plots >120

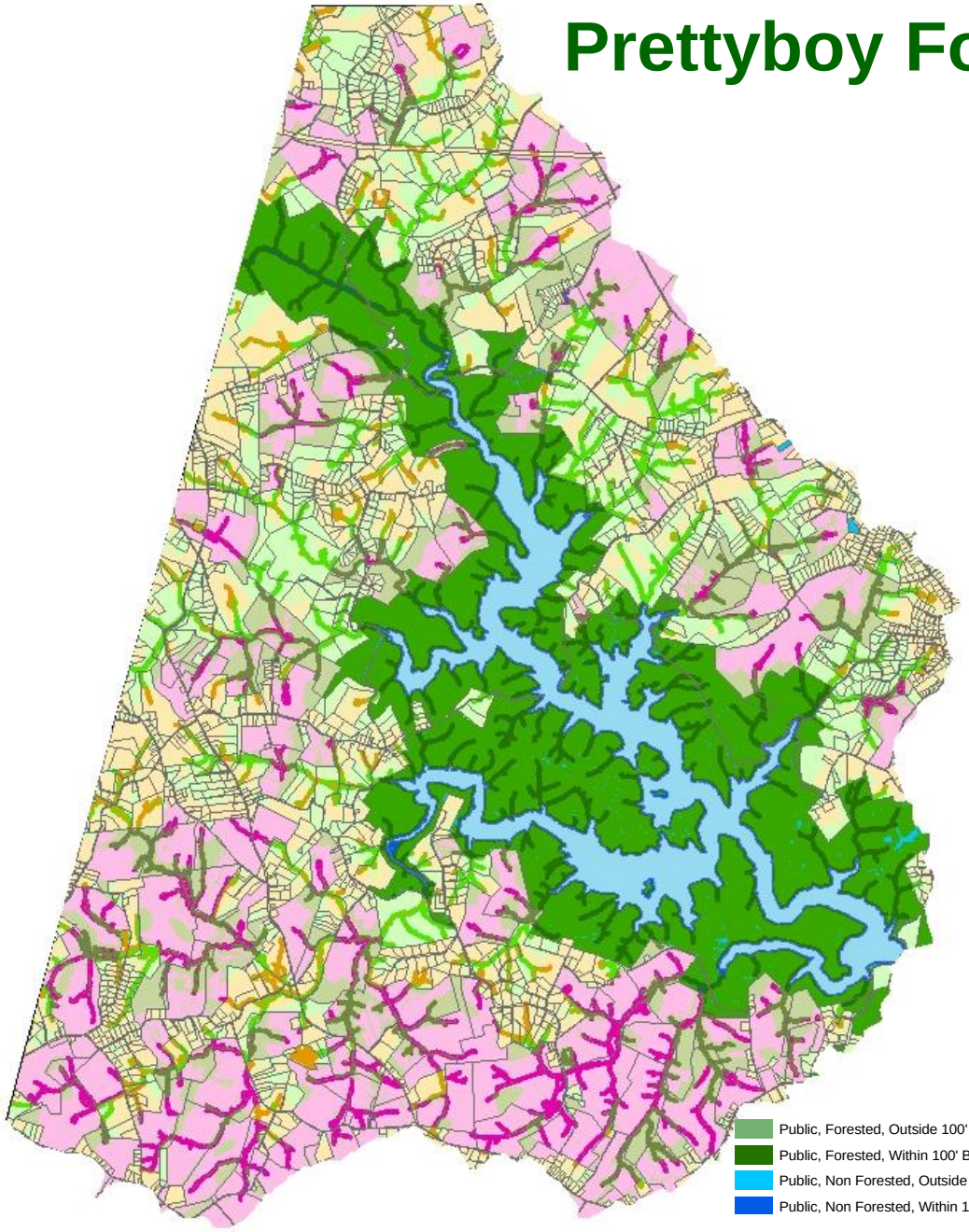
Tree Condition

- mean % UGS is 54.9%
- 39% of plots have >60% UGS with a mean of 75.7% of BA

Regeneration

- species of high value trees (oak, hickory, tuliptree) are present in only 38% of plots
- oaks are found in only 4 of the 62 plots

Prettyboy Forest Cover Typology



- GIS analysis of the distribution of forest cover and parcel ownership-management
- **Forest and non-forest** each within and outside of 100-foot forest buffers
- **Land ownership**: public land, conservation easements, other private properties
- Determined acreages, number and size distribution of parcels for 12 classes; used full parcel records

ACRES	Forest Outside	Forest Inside	Sub-Total Forest	No Forest Outside	No Forest Inside	Sub-Total Non Forest	Total
Easements	2,208.8	908.7	3,117.5	4,624.7	804.4	5,429.2	8,546.65
Private	4,055.0	1,042.7	5,097.7	4,320.1	567.4	4,887.6	9,985.28
Public	4,061.9	1,417.9	5,479.8	86.5	504.1	590.7	6,070.43
Total	10,325.8	3,369.2	13,695.0	9,031.4	1,876.0	10,907.4	24,602.36
% ACRES							
Easements	9.0%	3.7%	12.7%	18.8%	3.3%	22.1%	34.7%
Private	16.5%	4.2%	20.7%	17.6%	2.3%	19.9%	40.6%
Public	16.5%	5.8%	22.3%	0.4%	2.0%	2.4%	24.7%
Total	42.0%	13.7%	55.7%	36.7%	7.6%	44.3%	100.0%

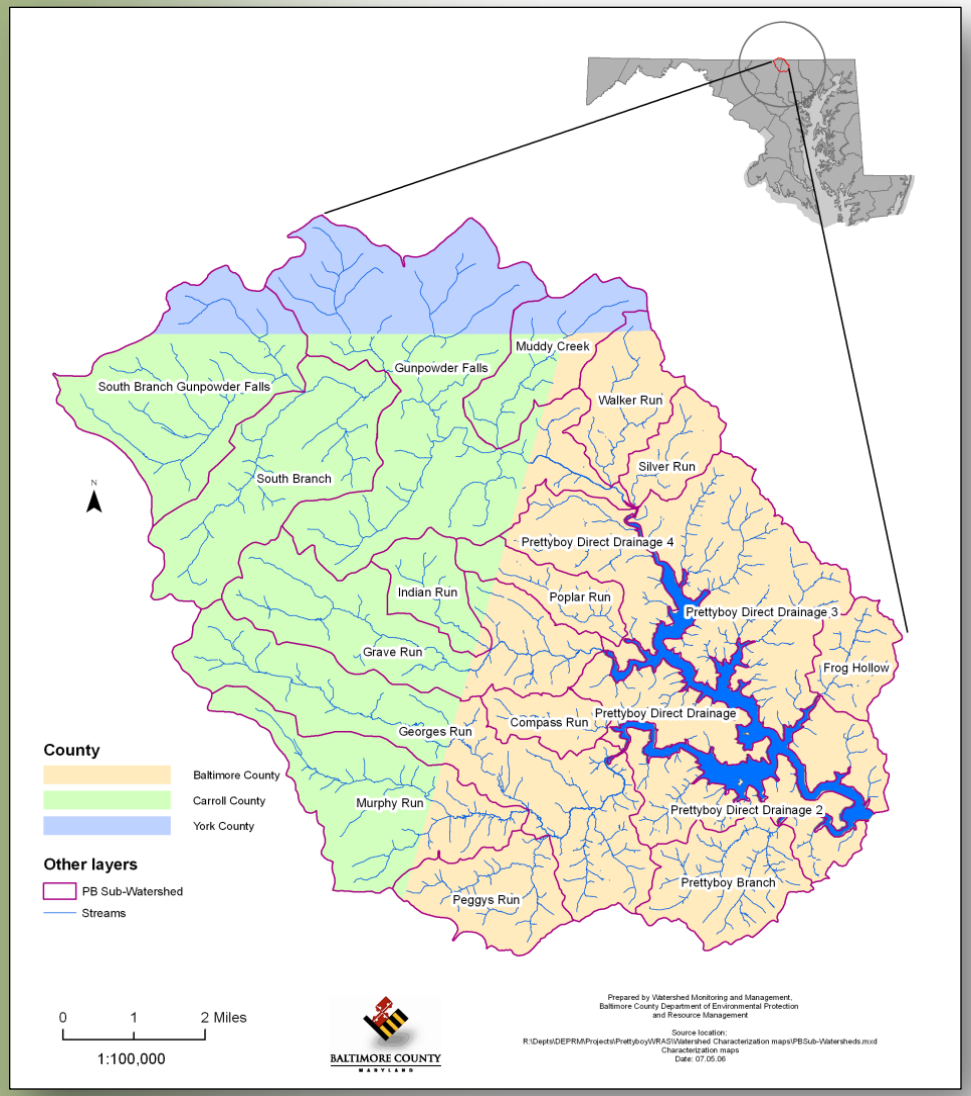
PARCELS	Forest Outside	Forest Inside	Sub-Total Forest	No Forest Outside	No Forest Inside	Sub-Total Non Forest	Total
Easements	210	157	367	197	149	346	713.00
Private	1,951	701	2,652	1,945	610	2,555	5,207.00
Public	19	9	28	18	8	26	54.00
Total	2,180	867	3,047	2,160	767	2,927	5,974.00
% PARCELS							
Easements	3.5%	2.6%	6.1%	3.3%	2.5%	5.8%	11.9%
Private	32.7%						
Public	0.3%						
Total	36.5%						

Data Tell Us Where to Look

- Reforestation potential including riparian buffers
- Forest health management
- Aggregation of parcels

Typology Map Class	1	2	3	4	5	6	7	8
Ownership	Easement	Easement	Easement	Easement	Private	Private	Private	Private
Forest	Forest	Forest	No Forest	No Forest	Forest	Forest	No Forest	No Forest
Buffer	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside
Acres	2,208.8	908.7	4,624.7	804.4	4,055.0	1,042.7	4,320.1	567.4
% of Prettyboy Typology	9.0%	3.7%	18.8%	3.3%	16.5%	4.2%	17.6%	2.3%
# Parcels	210	157	197	149	1,951	701	1,945	610
% of Parcels	3.5%	2.6%	3.3%	2.5%	32.7%	11.7%	32.6%	10.2%
All parcels (median acres)	6.34	3.60	14.07	3.57	0.71	0.51	0.90	0.25
All parcels (mean acres)	10.57	5.79	23.60	5.40	1.98	1.42	2.12	0.88
All parcels (std. deviation)	14.09	6.75	27.24	6.60	4.50	2.68	4.27	1.60
Top 10% Parcels (#)	20	15	19	14	194	69	193	60
Top 10% Parcels (acres)	894.76	332.50	1,615.78	300.44	2,154.67	517.10	2,216.92	281.90
Top 10% Parcels (mean ac)	44.79	22.17	85.04	21.46	11.11	7.49	11.49	4.70
Parcels >10 acres (#)	80	29	114	27	68	9	81	3
Parcels >10 ac (acres)	1,885.13	514.82	4,465.11	451.60	1,365.15	166.72	1,474.41	40.29
Parcels >10 ac (mean ac)	23.56	17.75	89.17	16.72	20.08	18.52	18.20	13.43
Top 25 parcels (list)	79.03	34.30	165.38	41.34	82.25	26.01	75.76	15.23
	74.82	29.57	111.89	30.09	66.63	24.85	47.45	14.70

Prettyboy Resource Collaborative



Healthy watershed, Cooperative stewardship, Sustained benefits

A new watershed-wide effort by watershed organizations, agencies, and businesses to promote cooperative stewardship for forests, agriculture, and more

The Collaborative Partners

Prettyboy Watershed Alliance
Baltimore County
Carroll County
Baltimore City
York County
Alliance for the Chesapeake Bay
MD Dept. of Agriculture
MD Dept. of the Environment
MD Dept. of Natural Resources
Mar-Len Environmental, Inc.
Glatfelter Pulp Wood Co.
Find Your Niche, LLC
Hogan Lovells, US LLC
Johns Hopkins Carey Business School
Harry R. Hughes Center for Agro-Ecology, Inc.
Trout Unlimited - Upper Gunpowder River Brook Trout Conservation Initiative

Building a New Store in the Community

What is needed to "sell" (incentivize) landowners for cooperative stewardship?

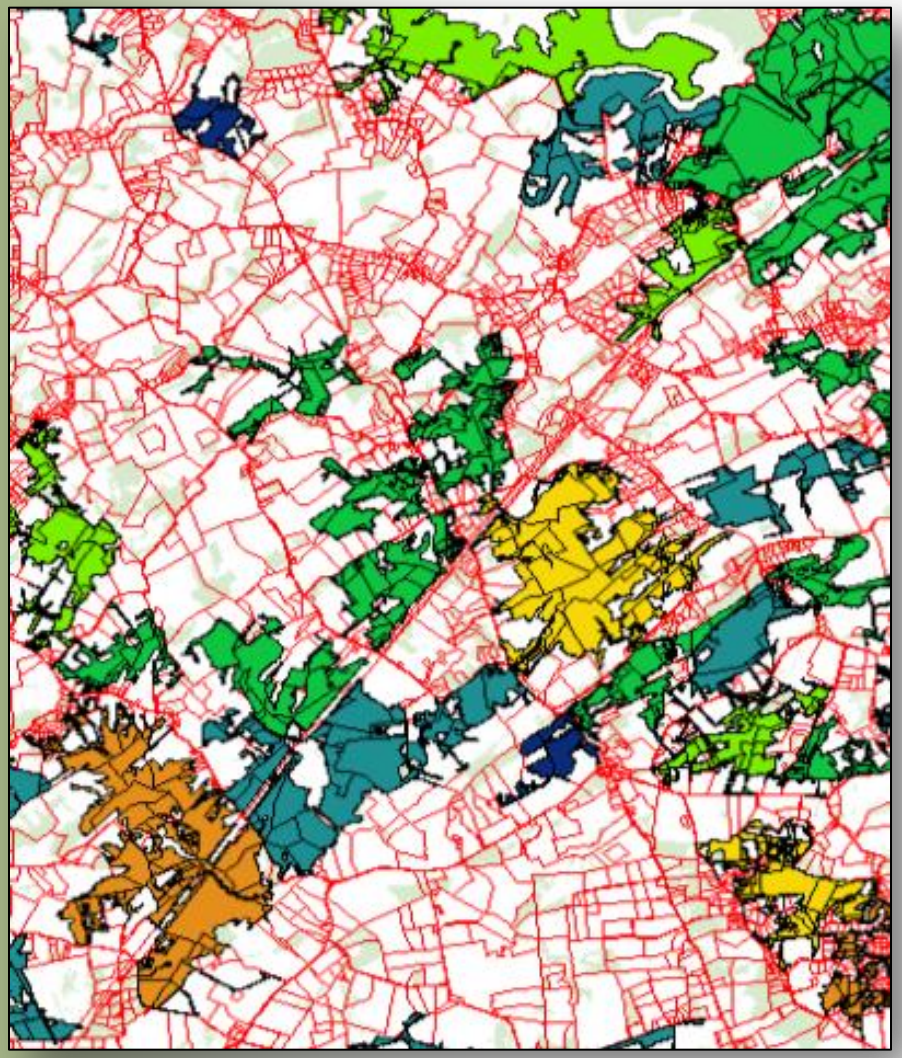
Our rural store (the Collaborative):

- *What do we sell?*
- *Why will people buy from us?*
- *What type of store do we need (business model)?*
- *How do we profit from value we create for others outside our community?*

Ecosystem-serving (*"eco-smart"*) resource management that incentivizes landowner stewardship

provide services, save money, return income

Fragmentation, Parcelization, and Aggregation



A Working Hypothesis:

- The high degree of resource fragmentation and property **parcelization across our watersheds has become a barrier** to sustainable resource management.
- Looking at natural resources, parcels, and project economics **across the watershed instead of by individual properties** is what seems to be necessary.
- In addition to these core analyses, we **need an institutional structure** to take this information and effect changes in how projects are developed and implemented.

Eco-smart Resource Management

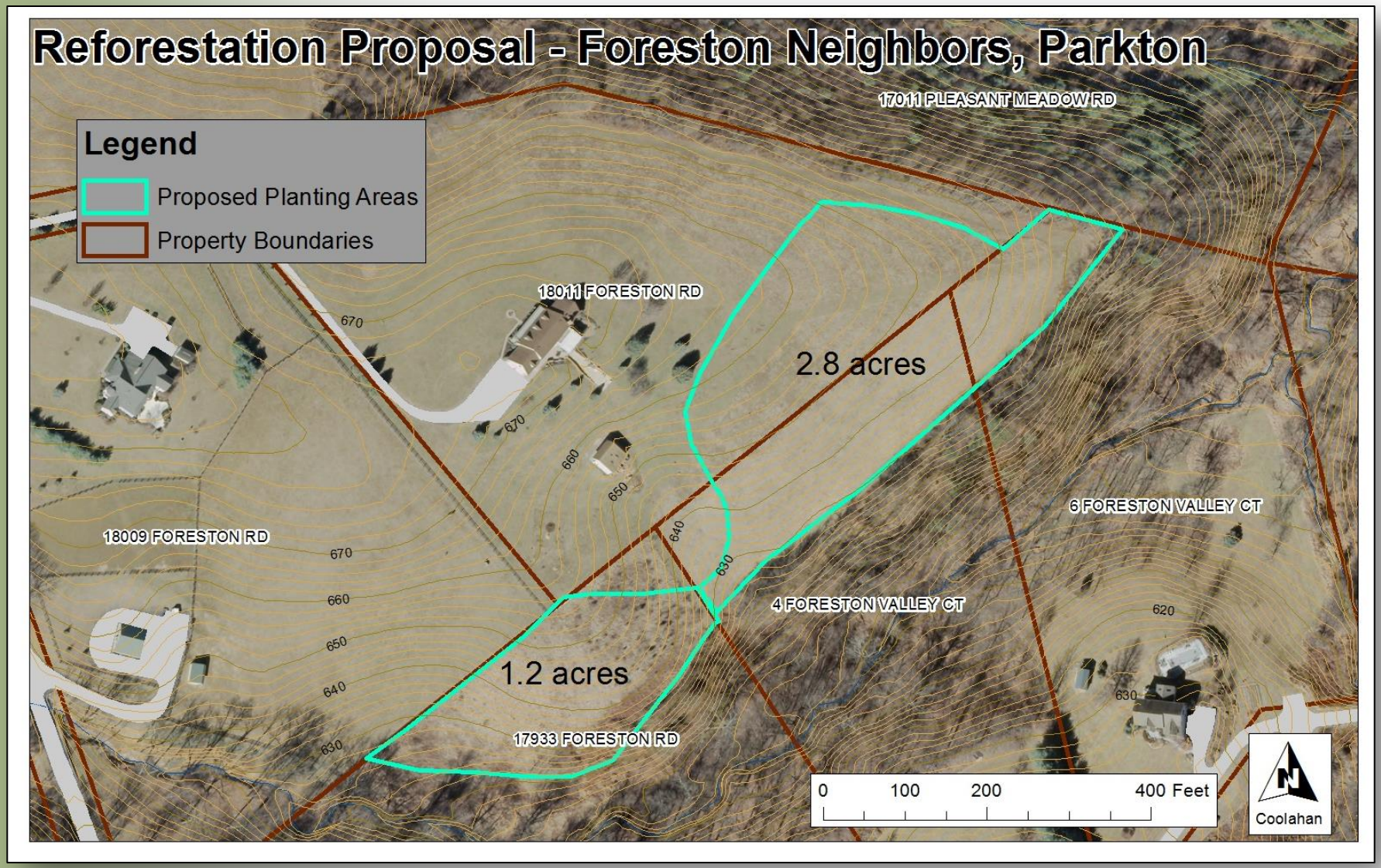
*Help **rural residential lot owners** find alternatives to costly and environmentally wasteful mowing of "excess grass" - save money on mowing through "turf-to-trees"?*

*Help **farmers** improve soil and water quality by participating in the new cross-sector nutrient trading program - plant riparian buffers and sell credits to the City or County for TMDL compliance?*

*Help **woodland owners** thin over-crowded, poor quality, and non-regenerating stands - sell timber for profit and reinvest a portion to pay for control of deer or invasives?*

Forest management is one low-hanging fruit

Multi-owner Turf-to-Trees Project – 2014



Identifying Aggregation Potentials

- What we already know: resources and management needs/opportunities are distributed across property boundaries.
- But do we have the institutional framework to manage across properties?

Management Recommendations for "Patch 610" Properties in the Prettyboy Watershed

Prescriptions	Ernst				Marvel		Gompf					Heggenstaller						Total
Stand	E1	E2	E3	E4	M1	M2	G1	G2	G3	G4	G5	H1	H2	H3	H4	H5	H6	Acres
Acres	3.0	2.4	9.8	2.4	9.3	11.3	8.2	4.3	1.4	5.8	2.8	4.8	9.6	19.4	6.3	4.0	3.8	108.6
Non-commercial TSI to remove UGS																		78.2
Shelter existing oak, hickory, TT seedlings																		38.8
Remove exotic, invasive cover																		3.0
Site prep and native tree replanting																		16.8
Allow natural succession to proceed																		18.4

- Traditional approach – TSIs on 4 separate parcels
- PRC approach – 1 cooperative TSI project (potential 78.2 acres)

Spreadsheet Analyses for Collaborative Projects

Example: Forest Thinning

Using the resource analyses of potential projects from aggregation of landowners, estimate the benefits from ecosystem-serving resource management

Acres for thinning	80	80	100	100
Number of owners	3	4	3	4
FCA Declarations of Intent	180.00	240.00	180.00	240.00
Harvest permit fees	330.00	440.00	330.00	440.00
Construction landings	2,000.00	2,400.00	2,000.00	2,400.00
Total Fixed Costs	2,510.00	3,080.00	2,510.00	3,080.00
Harvest return @ $350/ac.	28,000.00	28,000.00	35,000.00	35,000.00
Net return on harvest	25,490.00	24,920.00	32,490.00	31,920.00
Net return per owner	8,496.67	6,230.00	10,830.00	7,980.00
15% shared w Collaborative	1,274.50	934.50	1,624.50	1,197.00
Final return per owner	7,222.17	5,295.50	9,205.50	6,783.00

Hypothetical example assuming equal acres owned

Bringing Resources to the Table

- $73,500 – **Harry R. Hughes Center for Agro-Ecology** – research grant to EPS to develop & demonstrate a method for incentivizing collaborative stewardship for 8-digit HUC watersheds (aggregation potential & revenues)
- $25k – **MD DNR Forest Service** – to EPS for a landscape forest assessment, a patch assessment, & Forest Stewardship Plans
- $20k – **MDA** – to demonstrate cross-sector nutrient trading
- $20k – **Alliance for the Chesapeake Bay** – to work with landowners as part of the "Mason-Dixon" project under NRCS Regional Conservation Partnership Program (RCPP), EQIP set-aside
- $50-60k – **Alliance for the Chesapeake Bay** (from MD DNR via US Forest Service) for *Leveraging Ecosystem Service Investments in Reservoir Watersheds* project – PWA to hire P/T outreach staff for 3 years
- $250k+ – **Baltimore County** – EPS rural residential "turf-to-trees" reforestation using infrastructure/reservoir program funds for the Bay WIP
- Priceless – **Prettyboy Watershed Alliance, Hogan Lovells**, and **JHU Carey Business School** – work on Collaborative structure, business plan