

Managing Forests for Water Supply Protection

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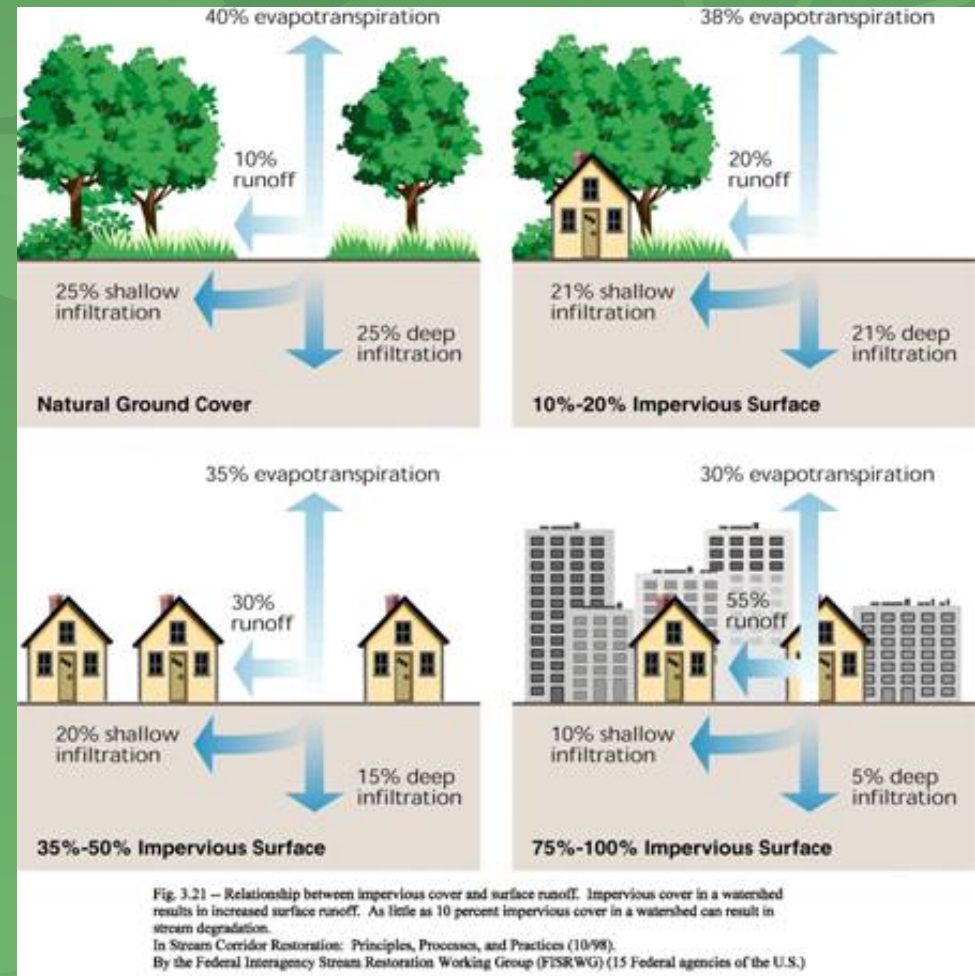
Forest Hydrologist

MD DNR Forest Service

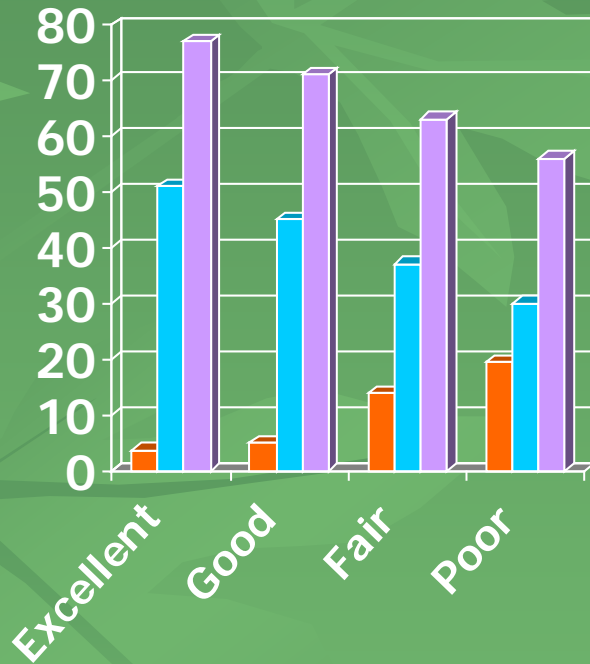


Forests: the first barrier to pollution

- Forests have
 - lowest runoff
 - greatest soil infiltration
 - least nutrient output



Forests support healthy streams and ecosystems



Imp. Surf % Forest
% For. Buffer

- Index of Biotic Integrity
 - Piedmont in MD, IKONOS analysis (Goetz et al., 2003)
- Excellent IBIs not found if impervious over 6% and buffers less than 65% forest
- Good IBIs not found if impervious over 10% and buffers less than 60% forest

Forest Water Program Approaches

- Forest Management Assistance for Reservoir Properties
- Forest and Buffer Conservation in Watersheds
- Targeting Restoration of Buffers and Wetlands in Watersheds
- Sustainable Forest Certification

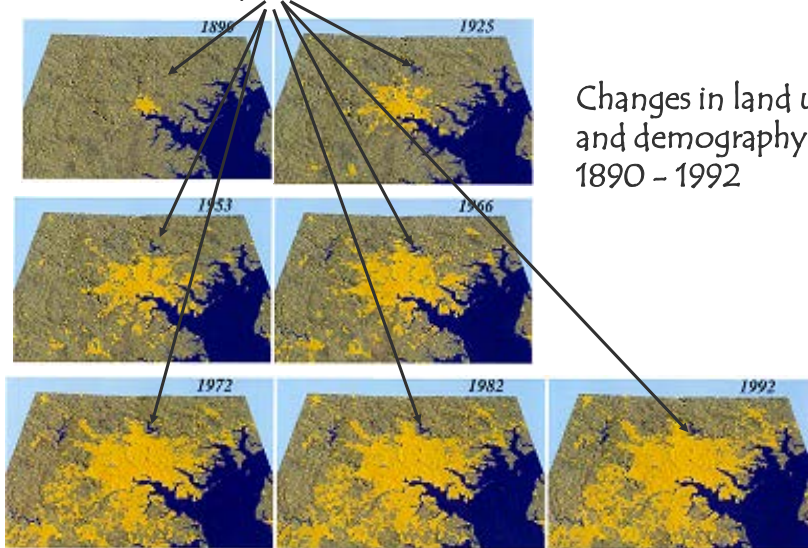


Context for Management

City of Baltimore, Reservoir Forests

Landscape context

Loch Raven Reservoir



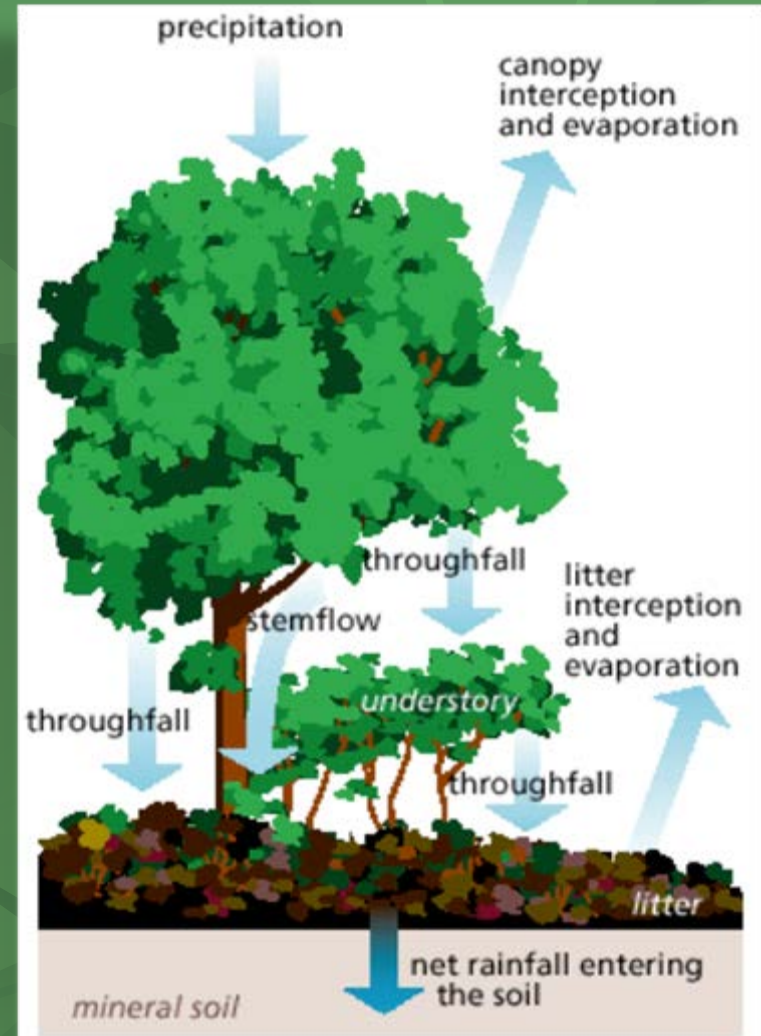
Changes in land use
and demography,
1890 - 1992

Image analysis by NASA

- Changing landscape and climate, esp. near cities
 - Wildlife- expansion of deer population and selective browsing of native trees
 - Fire Suppression- species shift from oak/hickory to maple/gum
 - Invasive Species- insects, diseases, plants
- The Forest Management Plan is designed to develop forests that are:
 - Resistant to disturbance
 - Resilient after a storm

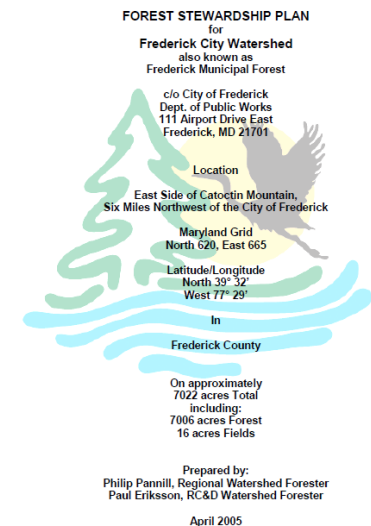
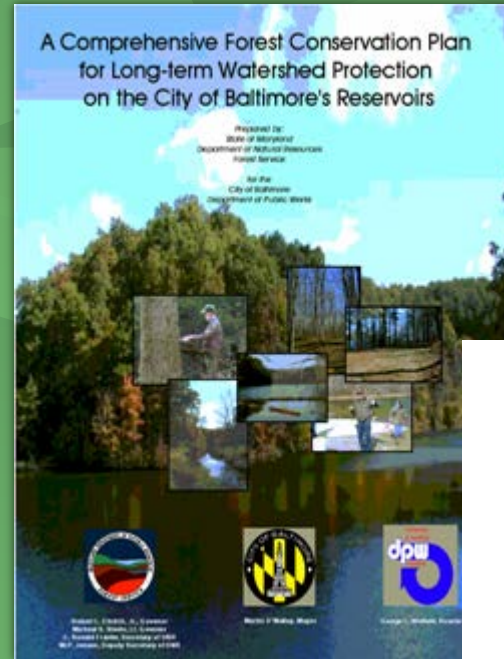
Desired Forest Condition

- Resistant to and Resilient after Disturbances
 - Diverse Forests
 - Species- mix of native sp.
 - Stand types/ages
 - Stand structure
 - Multiple Layers
 - Multiple barriers to nutrient/ sediment
 - Backup functions
 - Actively Regenerating
 - Seedlings and saplings
 - Seed sources



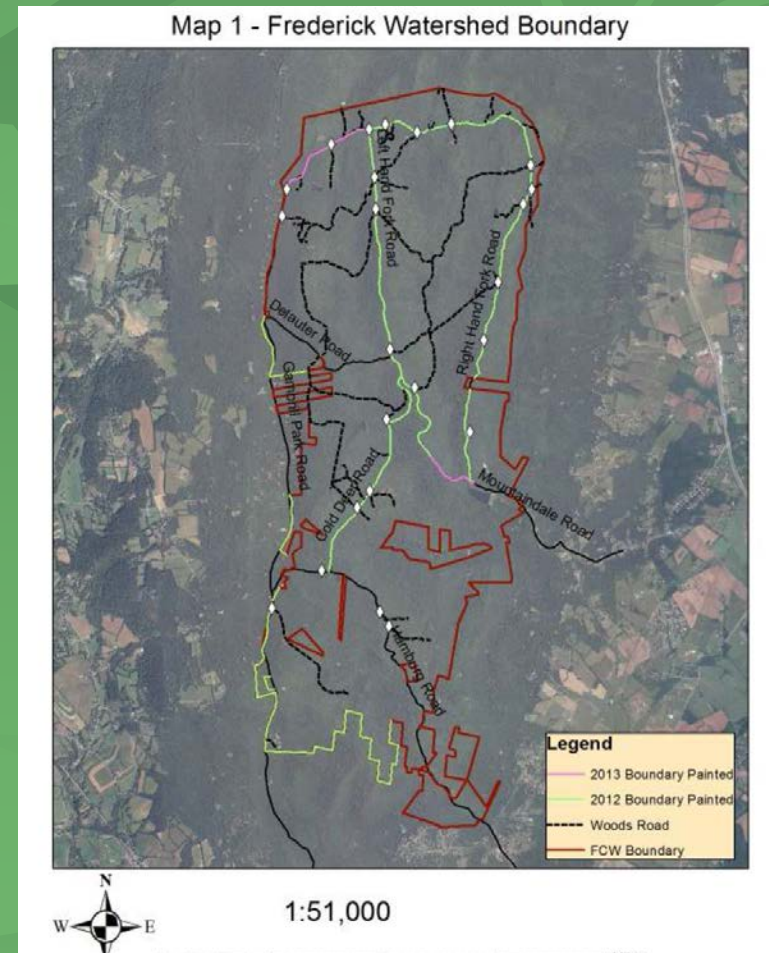
Forest Management Plan Elements

- Stand Delineation
- Soils, Geology, History
- Forest Inventory
 - Overstory
 - Midstory
 - Ground/regen
- Silviculture Recommendations
- Habitat/Rare Species
 - Snags, wood, rocks, seeps
- Forest Health issues
- Roads and Streams
- Recreation



Frederick City Watershed

- Long-term MOAs with DNR
 - Wildlife Management
 - Deer hunting
 - Forest Management
 - Boundary/gate maintenance
 - Silviculture/markings
 - Harvest oversight/BMPs
 - Invasive species control
 - Roads/crossings
 - Adding Recreation/Trails
- Timber Sales competitively bid
 - Insurance requirements for bidders
 - Thinning and variable retention
- Noncommercial operations through training/classes
 - Timber stand improvement
 - Crop tree release
- Annual Work Plan
 - Interdisciplinary Team Review



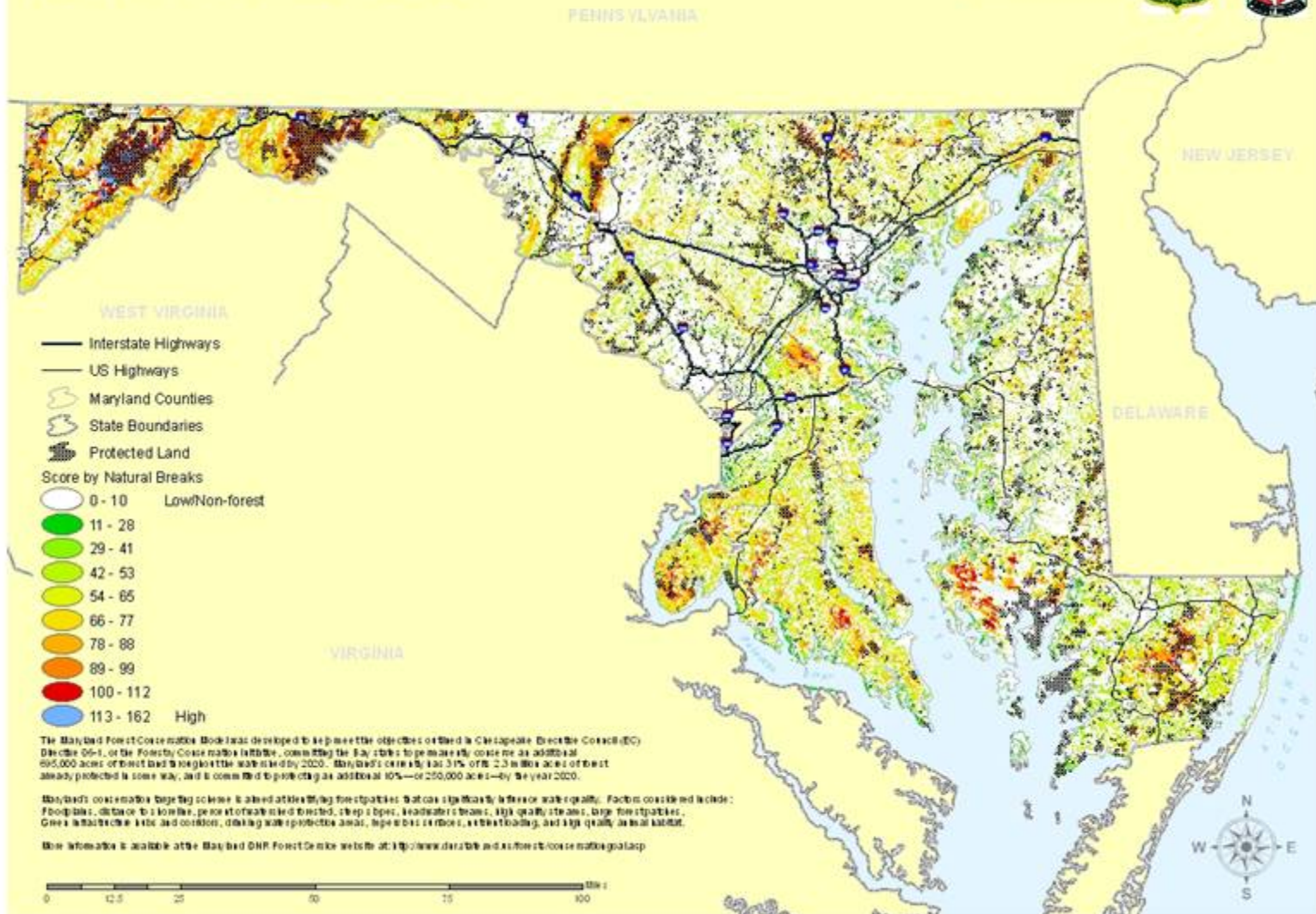
Forest Conservation

- Cheaper to conserve than restore
- Some elements not easily restored (e.g. rare aquatic sp.)
- Forests used as one layer in Program Open Space targeting

Maryland's Forests for Healthy Watersheds						
Scoring						
	10	7	5	3	1	0
	<i>Important Forest Resource Layers</i>					
Percent of watershed forested (12 digit)	>80	60 - 79	40 - 59	20 - 39	<20	N/A
100 Foot Forested Buffer of streams, coasts, lakes	Present					Absent
Floodplains	Present					Absent
Wetlands	Present					Absent
Steep slopes	25%		15%			Absent
Headwater wetlands and headwater streams in forest interior	Present					Absent
Green Infrastructure Hubs	Tier 1	Tier 2	Tier 3			Outside
	<i>Water quality for nutrients and sediment</i>					
Nitrogen efficiency ranking (based on hydrogeomorphic regions)	85% removal	60%-70% removal	45% - 55% removal	40% removal	25% removal	N/A
Phosphorus efficiency ranking (based on hydrogeomorphic regions)	75% removal	70% removal	65% removal	60% removal	50% removal	N/A
Saturated Hydraulic Conductivity (Ksat)	.9-27.4	27.4-63.8	63.8-138.3	138.3-232.6	>232.6	Not Rated

Forest Conservation Prioritization Map

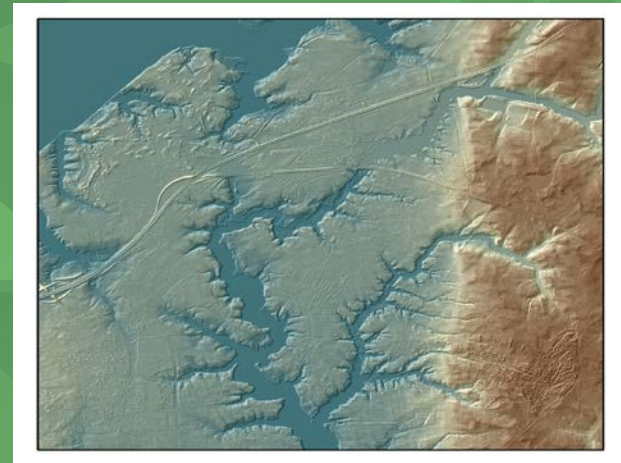
MARYLAND FOREST CONSERVATION POTENTIAL PRIORITIZATION: EXISTING FOREST WITH PROTECTED LANDS



Targeting: Biggest bang for the buck



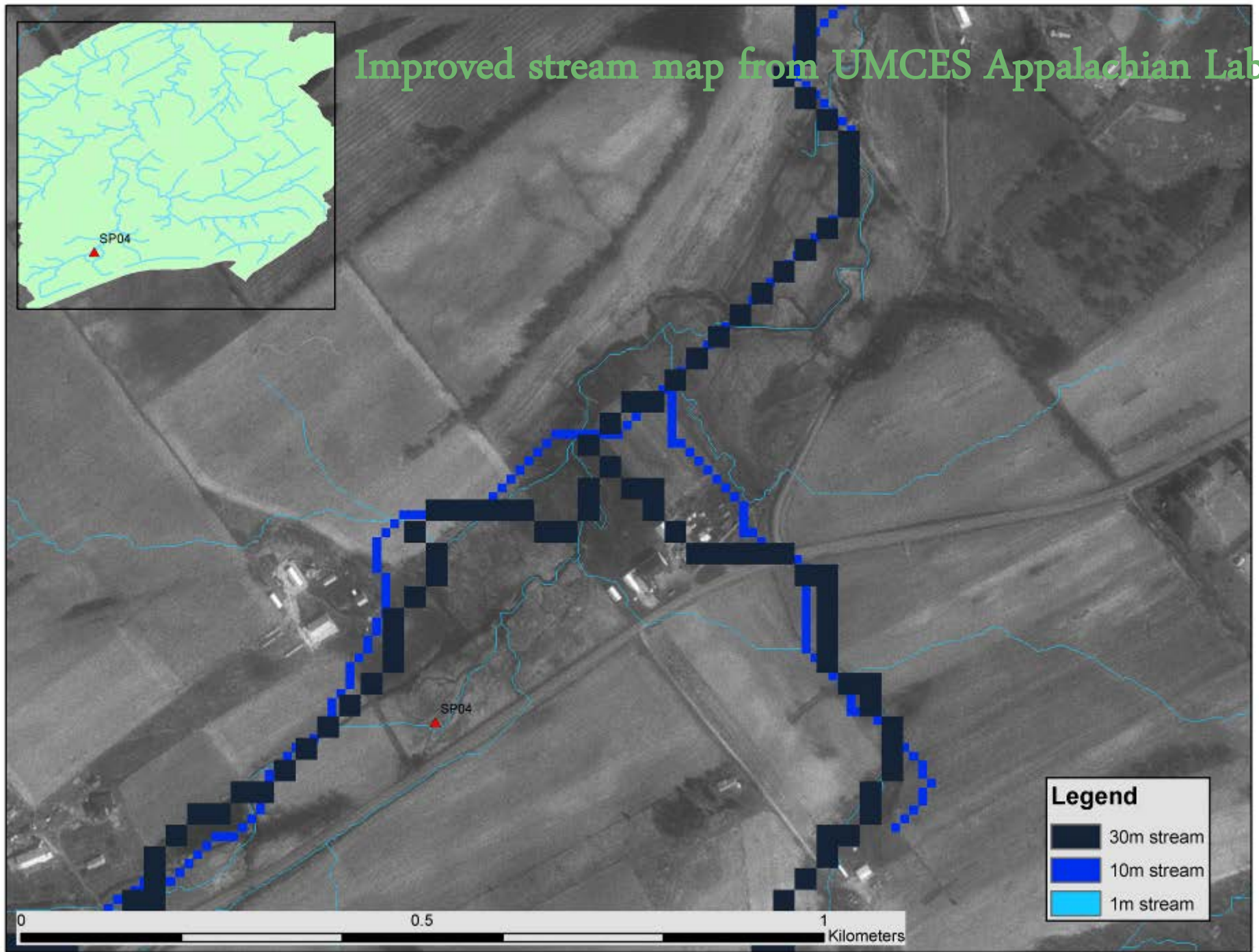
30m vs 2m



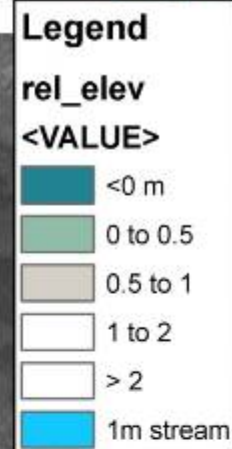
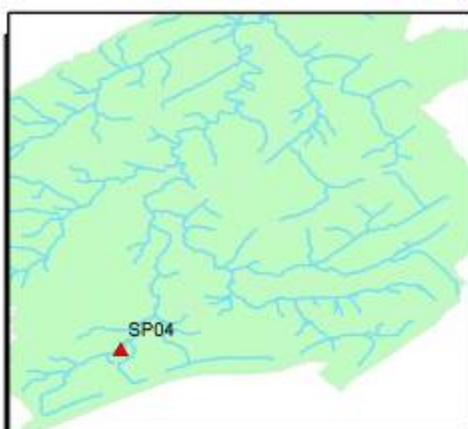
Images: Kathy Boomer, TNC

- Using finer scale data to better target outreach
 - Hydrologically functional area with The Nature Conservancy
- Landowner willingness is the bottom line, but targeting encourages projects in the best areas

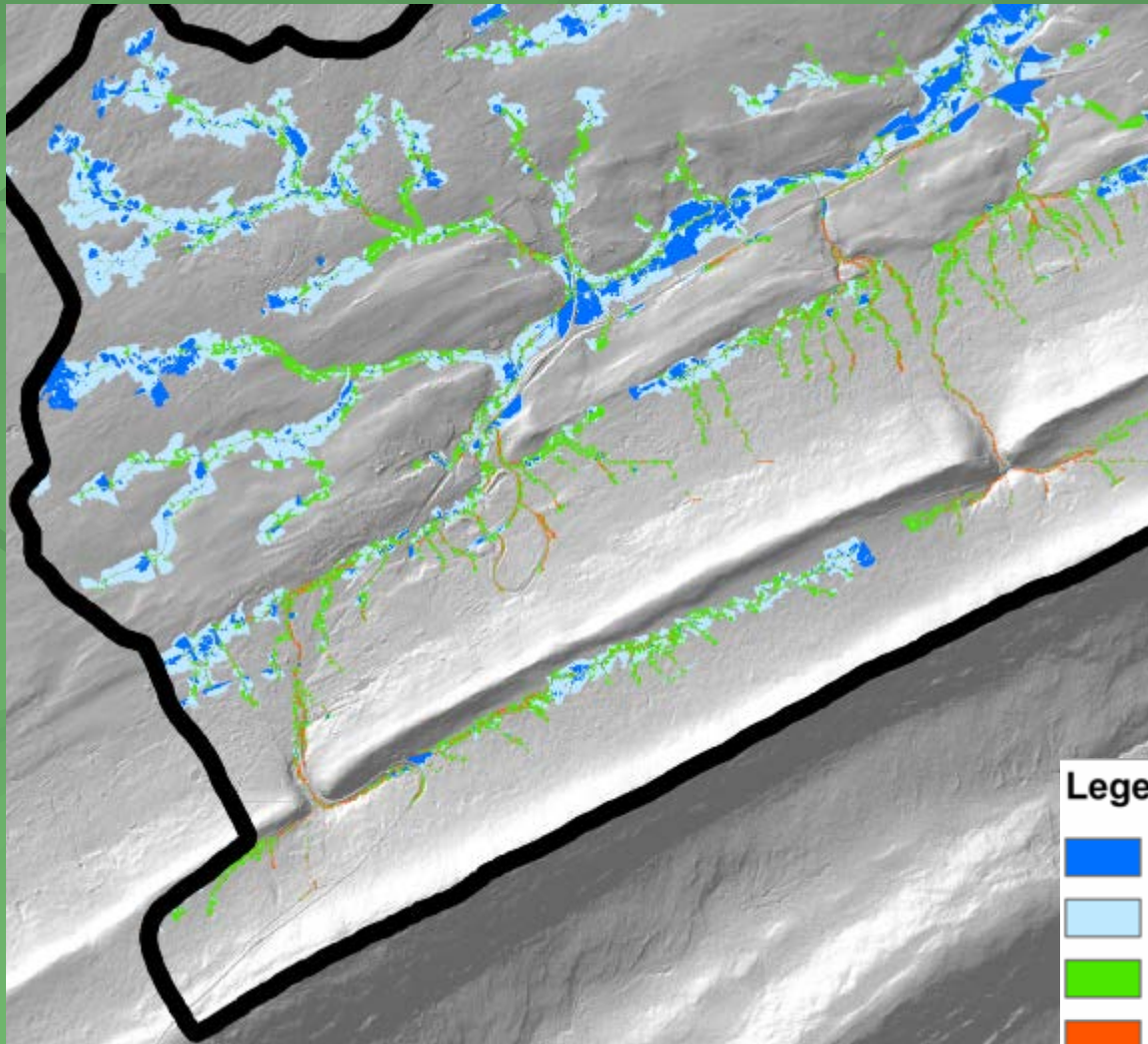
Improved stream map from UMCES Appalachian Lab







TNC Analysis of Floodprone areas (elevation relative to water surface)



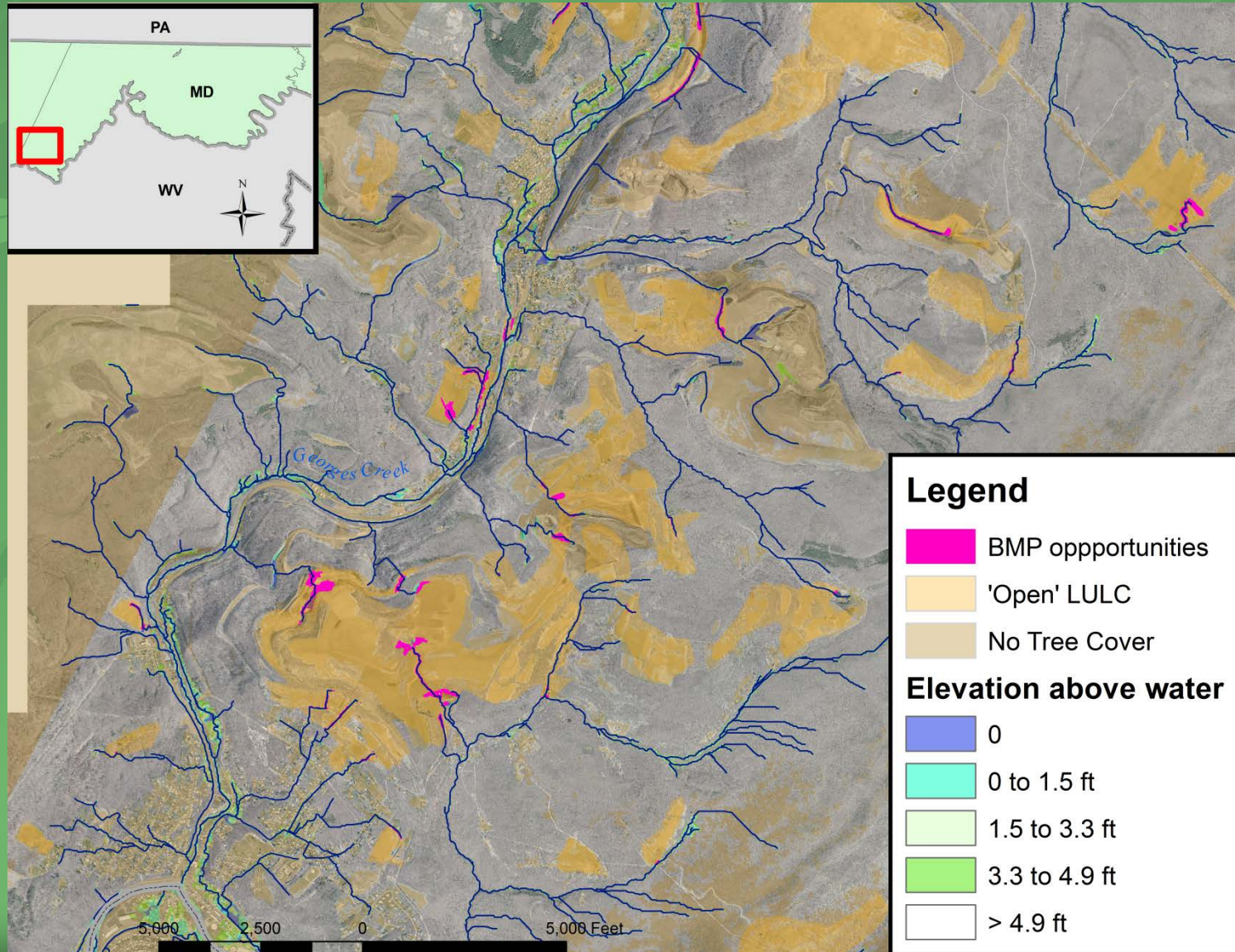
Wetland function of floodprone areas(Ecohydrologically Active Areas-EHAs)



Legend

-  Open Water
-  Floodplain Area (0 to 3° slope)
-  Riparian Area (3 to 15° slope)
-  Incised Area (> 15° slope)

Identification of Potential BMP Sites



Sustainable Forest Certification

- Criteria & Indicators
 1. Biodiversity
 2. Productive Capacity
 3. Forest Ecosystem Health
 4. Soil & Water Resources
 5. Forest Carbon Cycles
 6. Socioeconomic Benefits
 7. Legal, Institutional, & Economic Framework



Criteria and Indicators
for the Conservation and Sustainable
Management of
Temperate and Boreal Forests

The Montréal Process



Fourth Edition, October 2009



Sustainable Forest Certification

Multiple Systems

- SFI- Sustainable Forestry Initiative
- FSC- Forest Stewardship Council
- Tree Farm- PEFC, Programme for Endorsement of Forest Certification
- Group Certifiers- Consultant or organization certified



Forest Certification

- Independent 3rd party audit
- Consistency with all 7 criteria
- Documentation of policies, procedures, and practices
- Process for continued improvement
- Market Access



Management Approaches

- In-house
 - Staff Training
 - Forester
 - Sawmill
- Contracted
 - Long-term Management Agreement
- On-call Consultant
 - Tasks, Rates, and Cap
- Combination
 - In house, manage boundaries, roads, weed control, data collection
 - Contract timber sale planning, marking, and oversight
 - Collaborate on annual work plan and review

Baltimore Watershed



Baltimore Watershed



Frederick City Watershed

