Forests and Water Quality in the Potomac

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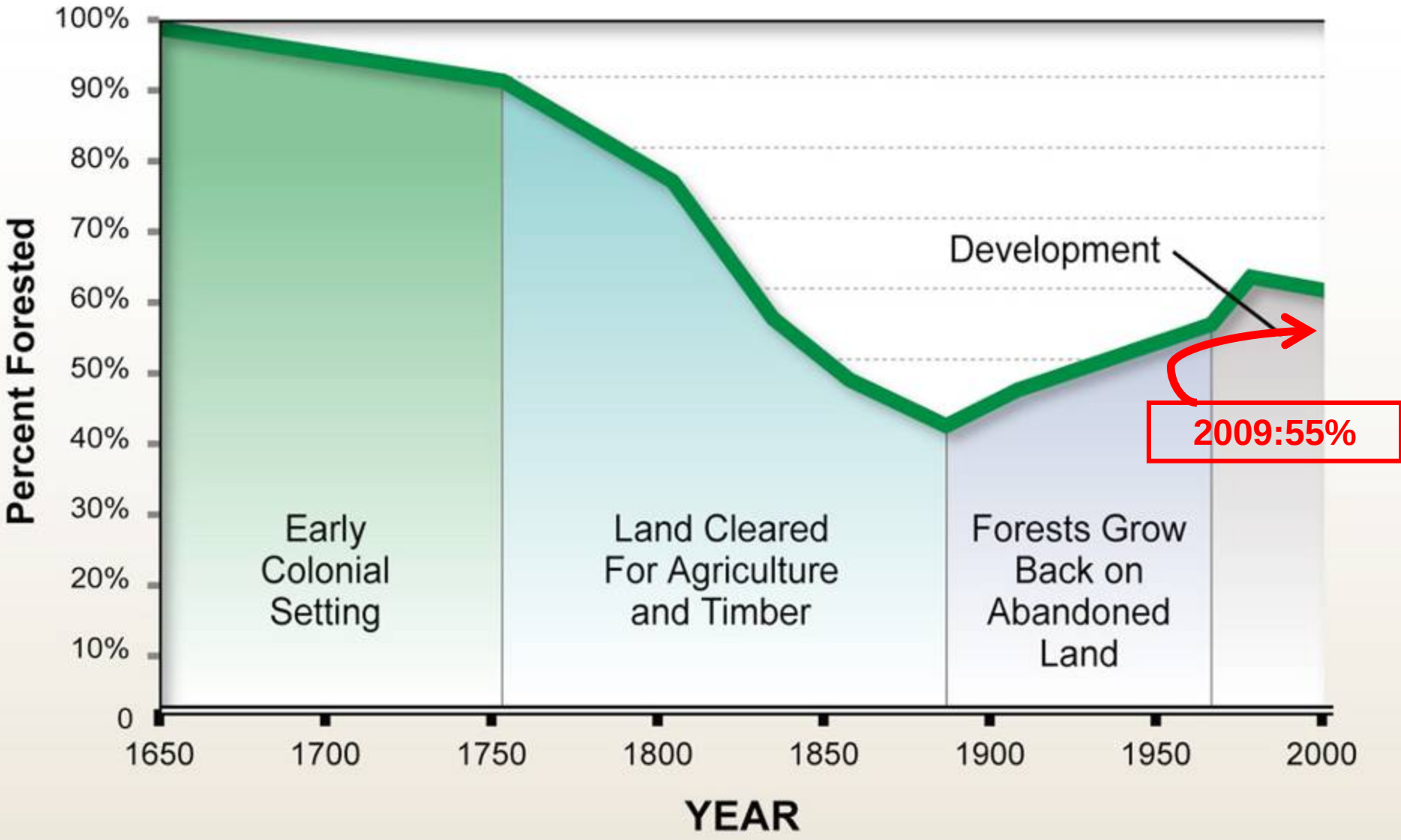
Chesapeake Bay Liaison

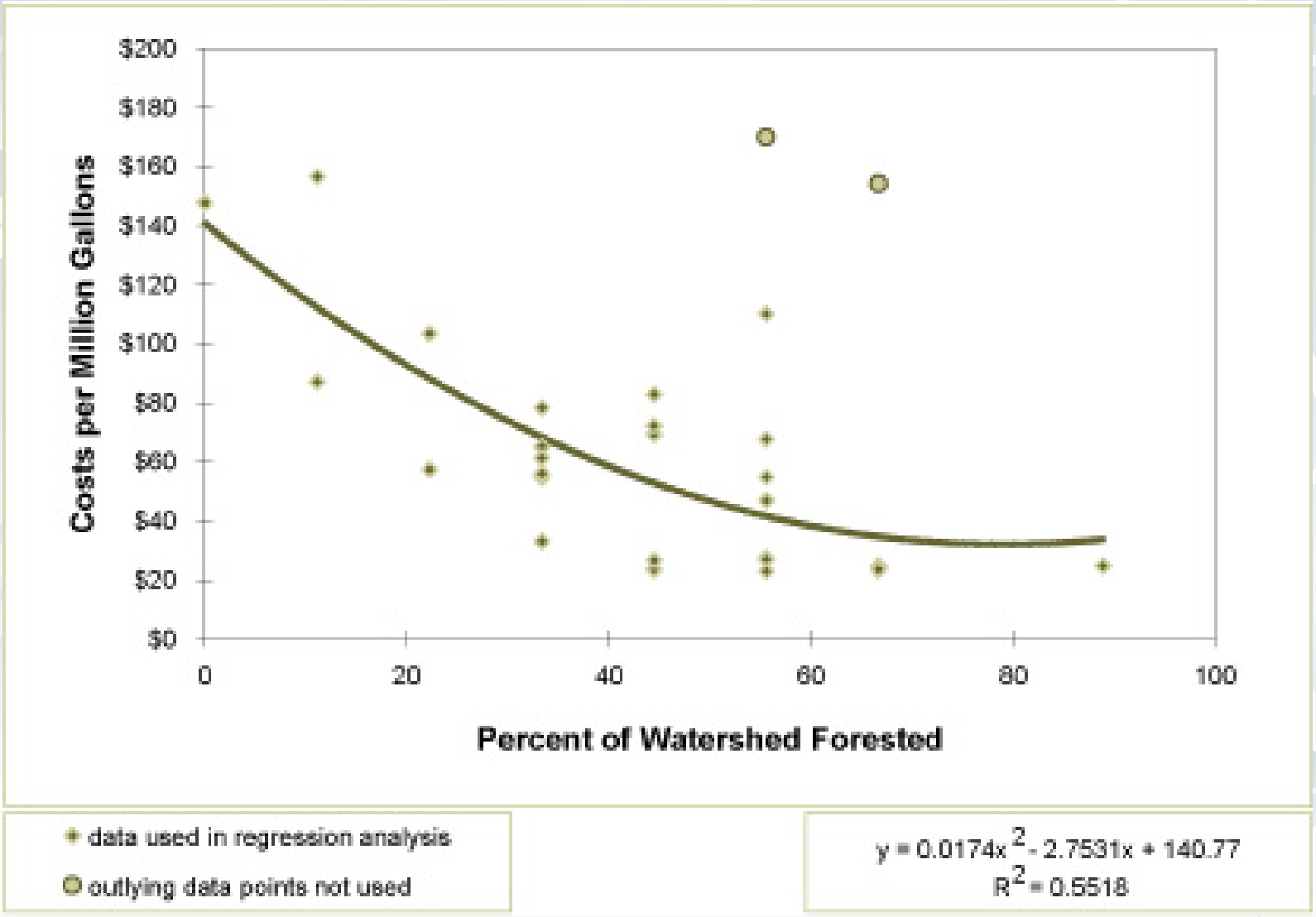
Gifford Pinchot believed that we ought to value forests for their "*effects on the climate and floods, rainfall and runoff, springs and erosion.*"
1905

Forest Cover in the Chesapeake Bay Watershed: 1650 - 2000

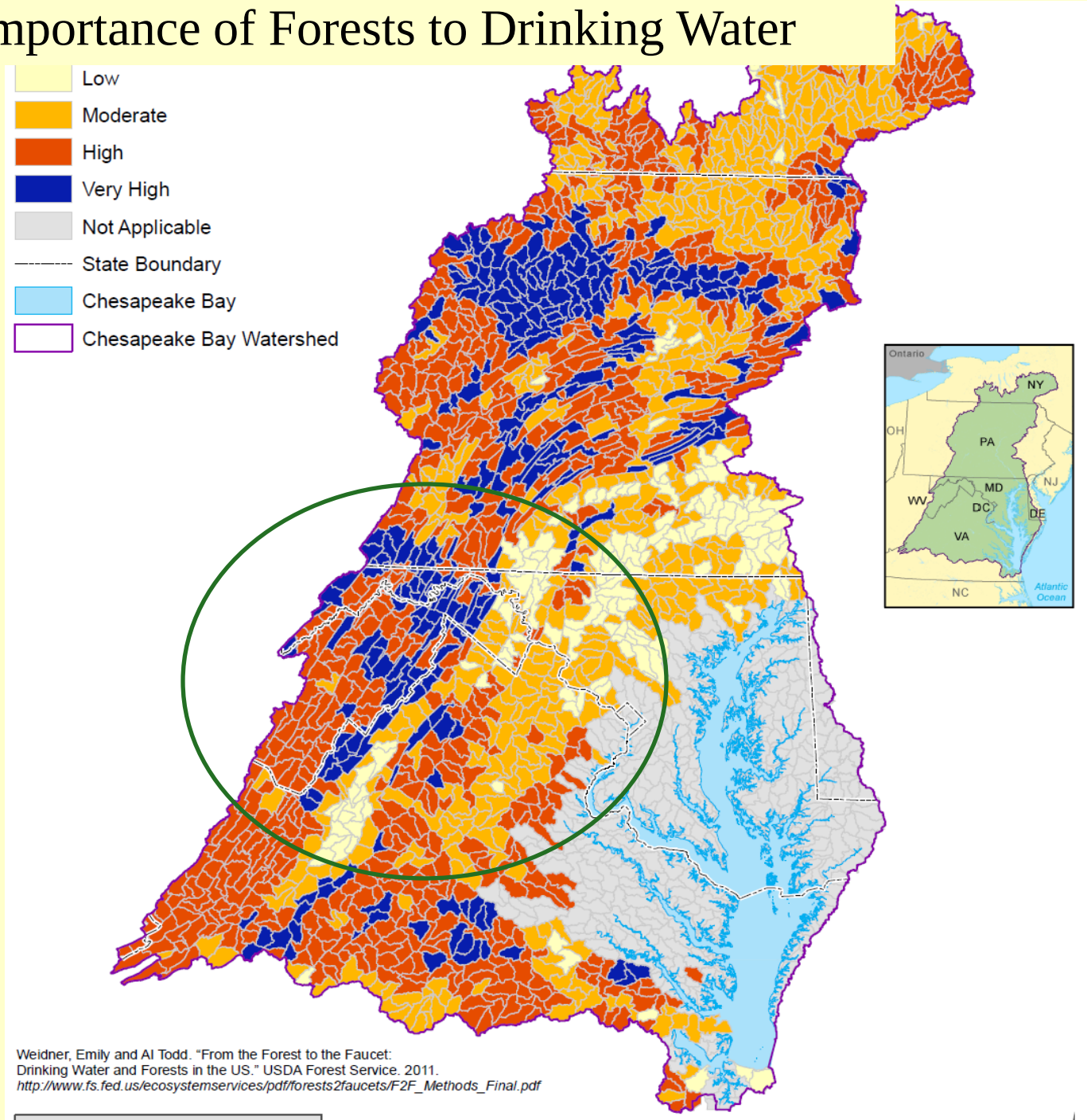


Source: Todd and Mountford 1994

TPL and AWWA Study on Water Treatment Costs



Importance of Forests to Drinking Water



Weidner, Emily and Al Todd. "From the Forest to the Faucet:
Drinking Water and Forests in the US." USDA Forest Service. 2011.
http://www.fs.fed.us/ecosystemservices/pdf/forests2faucets/F2F_Methods_Final.pdf

Forests, infiltration, & adaptation

- Canopy intercepts water and atmospheric pollutants
- Evapotranspiration uses water and creates more soil storage capacity
- Forest floor/ litter layer acts as sponge and supports insects/microbial community
- Deep rooting develops macropores for rapid infiltration

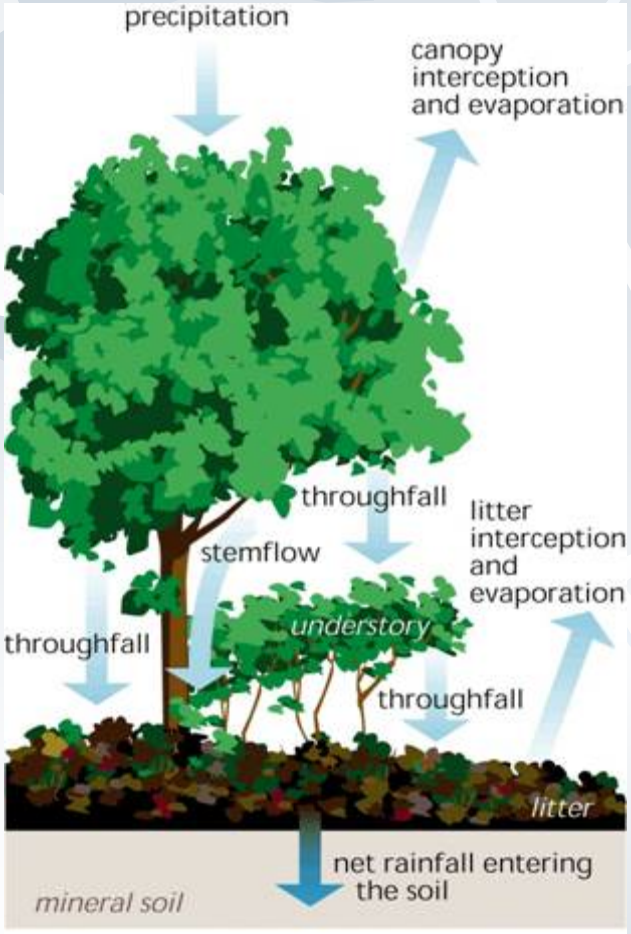


Fig. 2.3 -- Typical pathways for forest rainfall. A portion of precipitation never reaches the ground because it is intercepted by vegetation and other surfaces.
In Stream Corridor Restoration: Principles, Processes, and Practices (10/98).
Interagency Stream Restoration Working Group (15 federal agencies)(FISRWG).

The moderating influence of forests

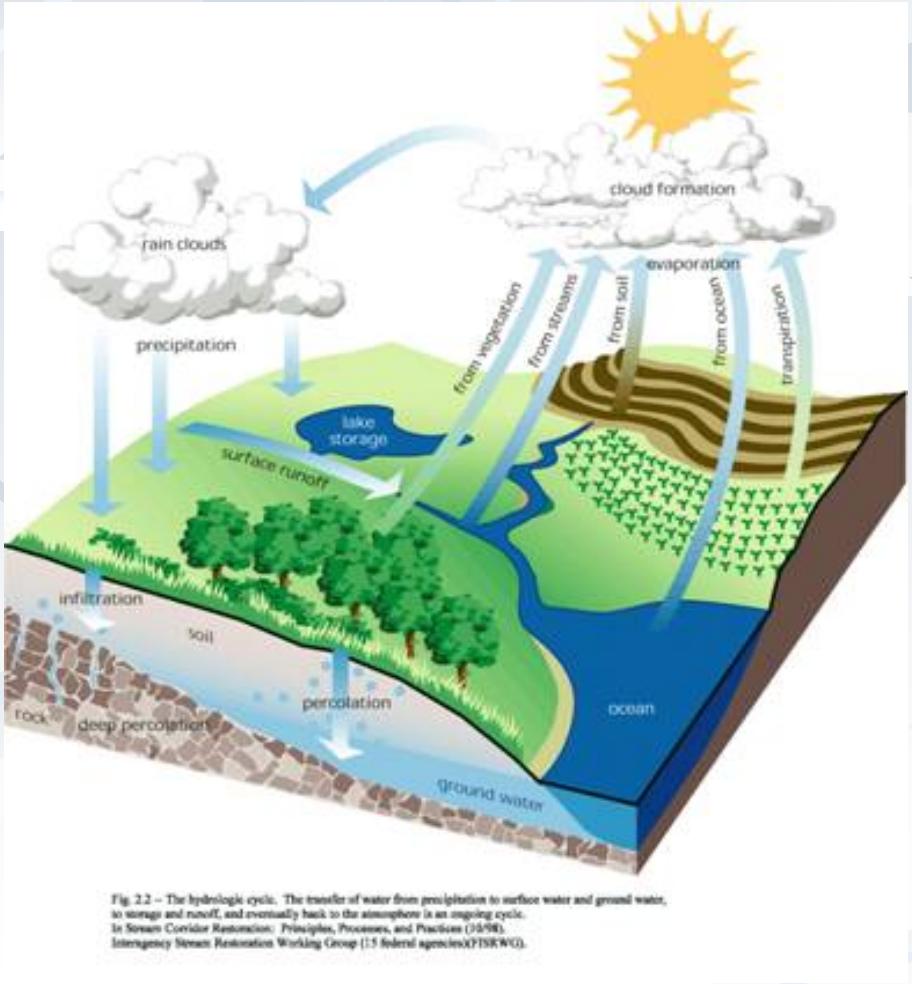


Fig. 2.2 – The hydrologic cycle. The transfer of water from precipitation to surface water and ground water, to storage and runoff, and eventually back to the atmosphere in an ongoing cycle.
In Stream Corridor Restoration: Principles, Processes, and Practices (10/98).
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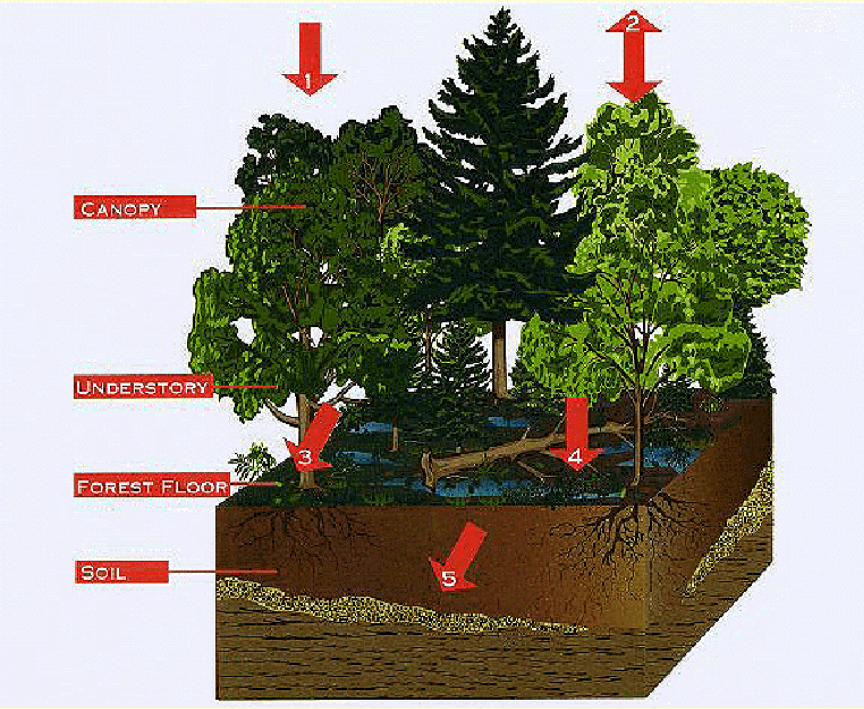
Forests protect

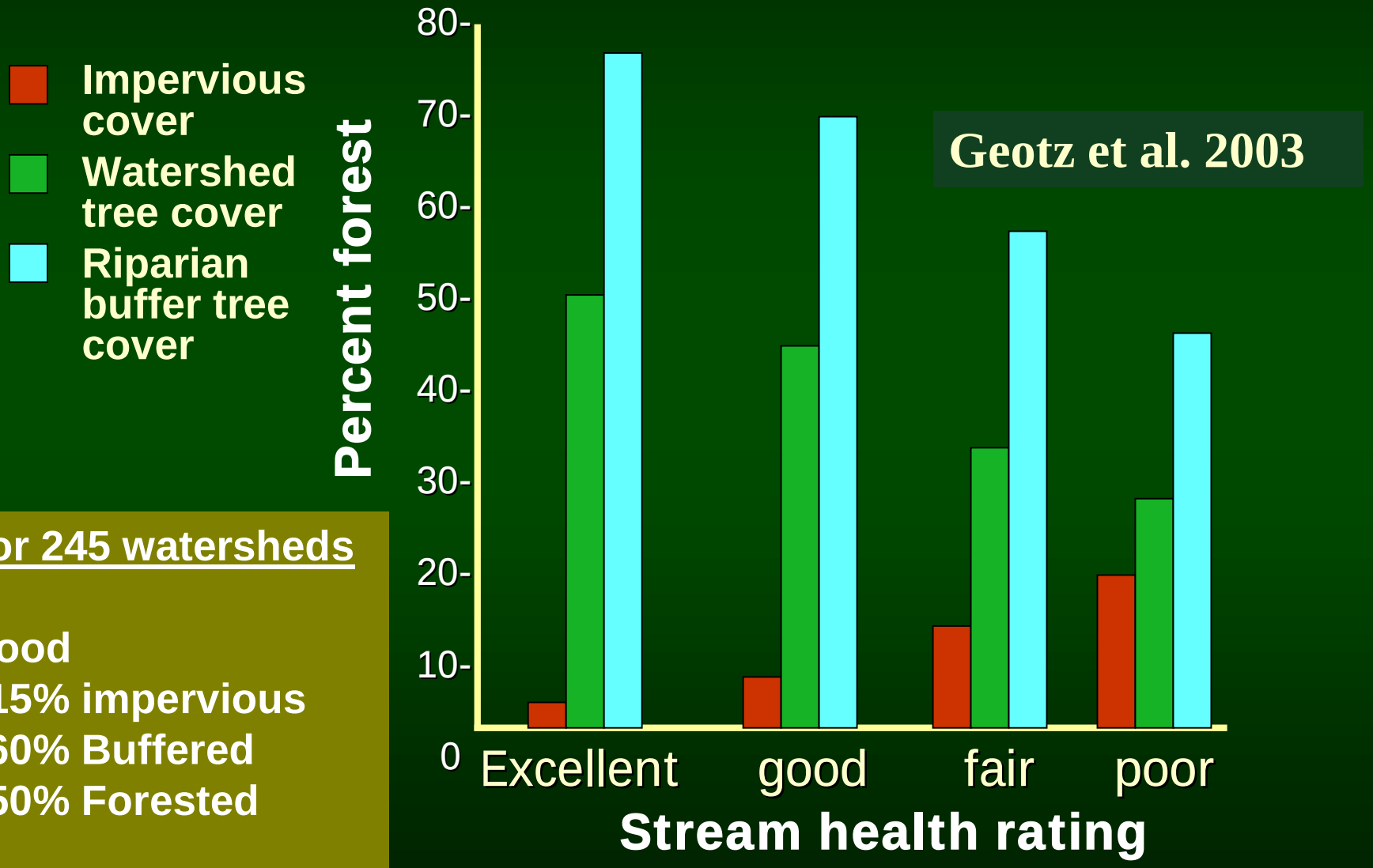
- Air quality
- Flooding
- Summer low flows
- Water quality
- Groundwater recharge
- Habitat (water and land)
- Quality of life

Watershed health and water quality depends on:

- Percent of forest land in a watershed
- Extent of forests remaining on critical landscapes – riparian areas, wetlands, steep slopes and erodible soils, & recharge areas
- Distribution and location of forests – degree of fragmentation
- Forest age, health and condition
- Stewardship and management knowledge



Influence of forests and imperviousness on Stream health (IBI)



For 245 watersheds

Good
<15% impervious
>60% Buffered
>50% Forested

Forest loss by 1900- Dramatic effects

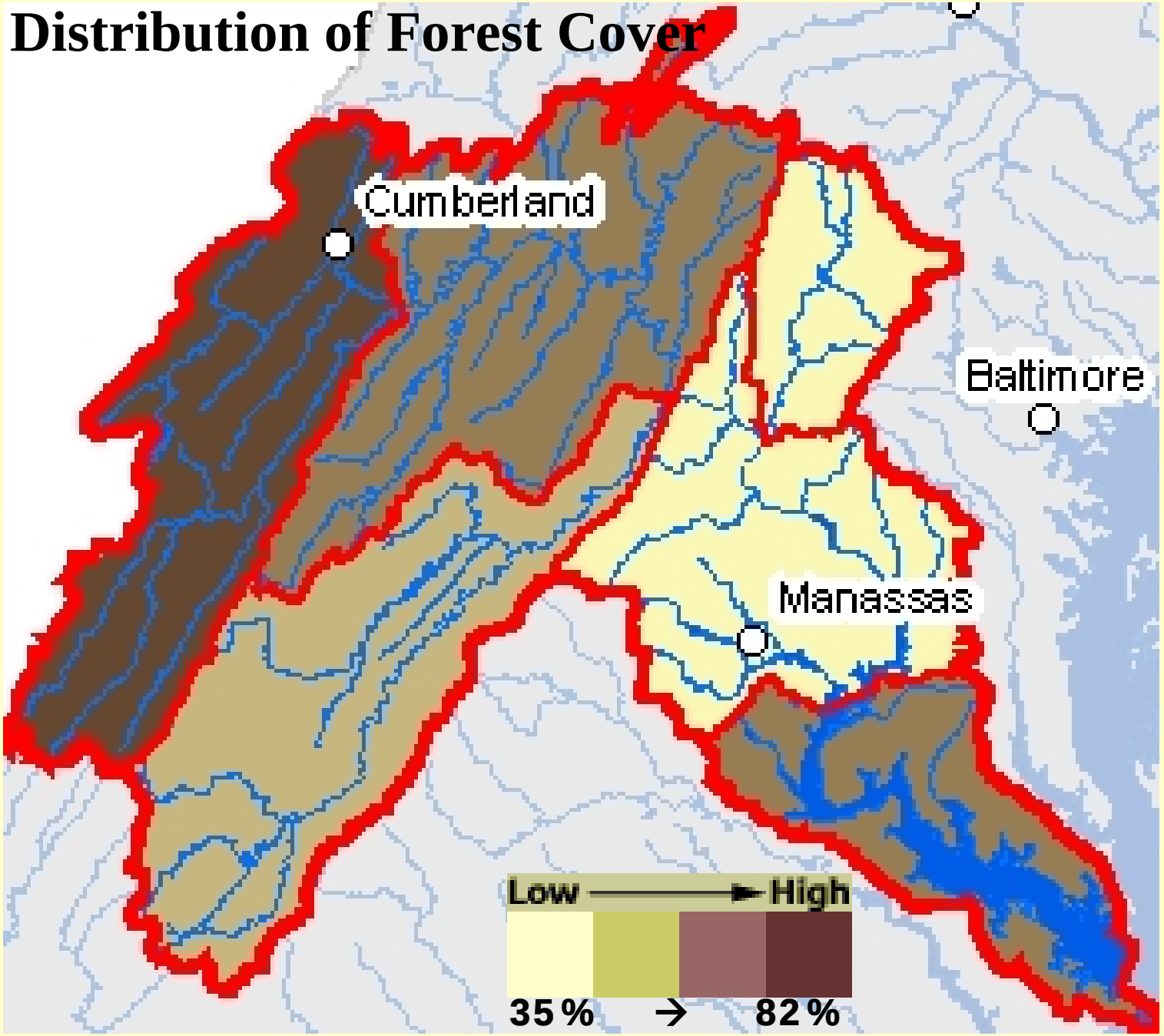
Massive clearing of forest land in the East for agriculture and fuel.

Settlers cleared forests at the rate of 13.3 sq. miles per day.

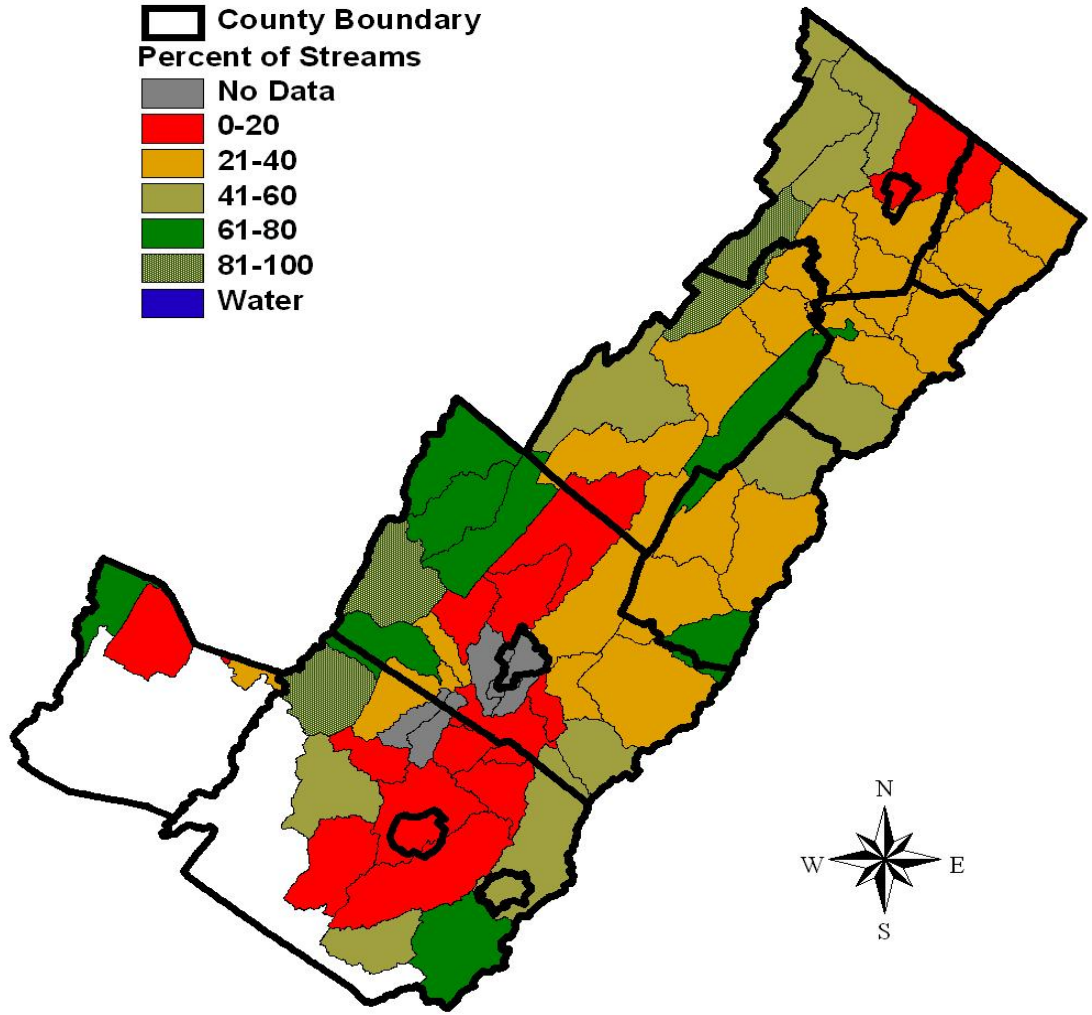
Our rivers were the highways to get timber to the mills … and rivers were damaged.

Wildfire commonly consumed 20 million acres annually.

The Distribution of Forest Cover



Shenandoah River Watershed - Percent of Streams Buffered 100 ft or More

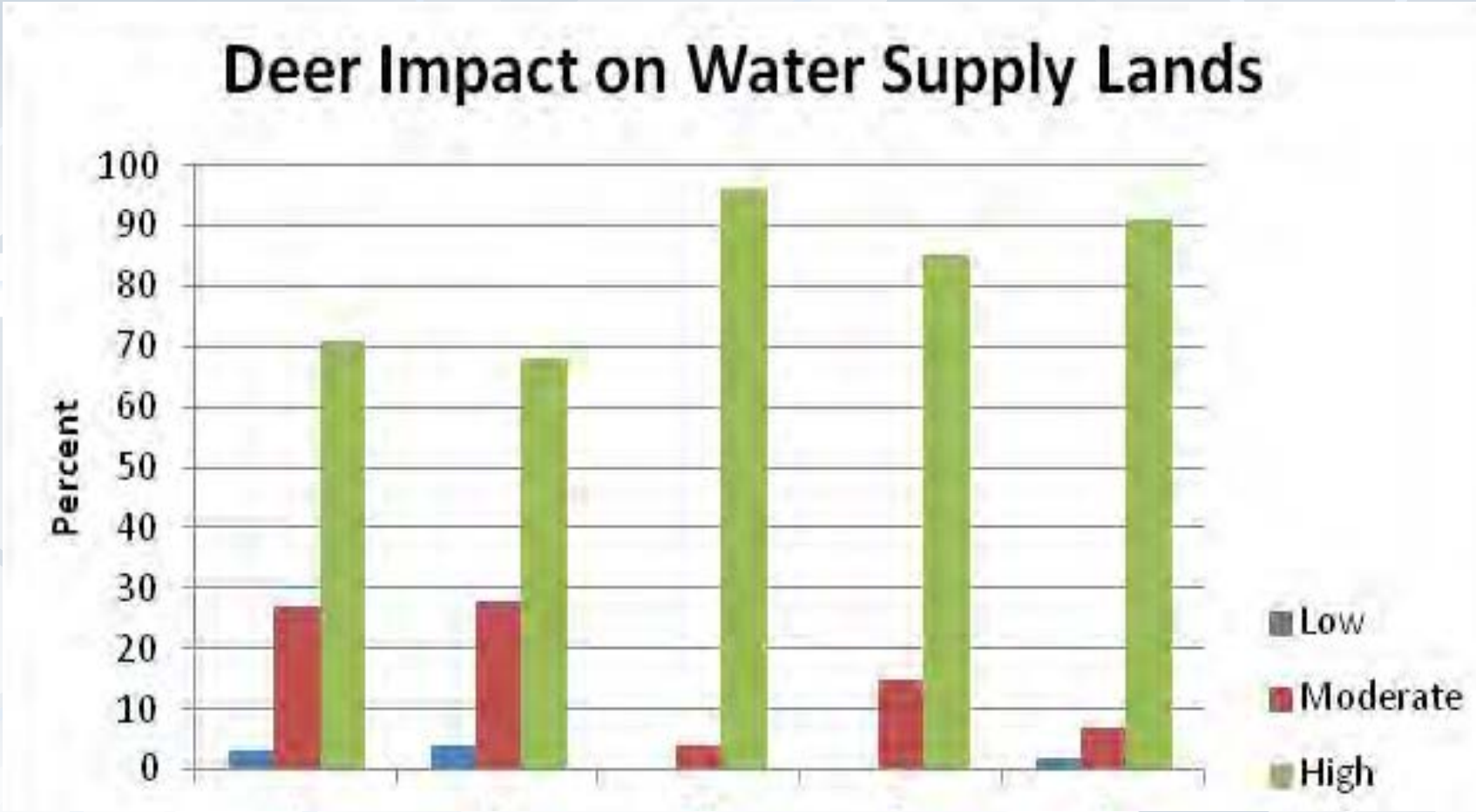


Notes
Software: ArcView Version 3.1
Data Sources: Penn State Chesapeake Bay Riparian Buffer Inventory Data and DCR Hydorlogic Unit Data
Projection: Virginia (North 4051) State Planar

10 0 10 20 Miles

Forces of Change

- **Land use and management**
  - *Afforestation*
  - *Conservation*
  - *Development patterns*
  - *Forest ownership*
  - *Forest Management*
  - *Deer*
- **Invasive Plants**
- **Air pollution**
- **Climate Change**
- **Fire**
- **Insects and diseases**


Deer Impact on Water Supply Lands
Percent
100
90
80
70
60
50
40
30
20
10
0
Low
Moderate
High

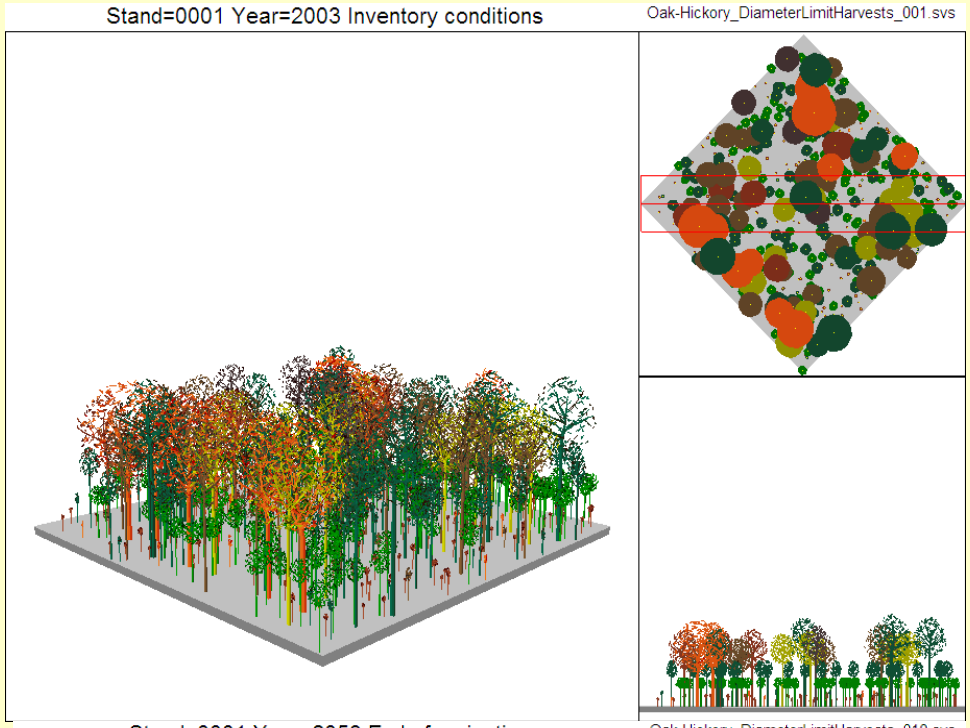
Forest Management

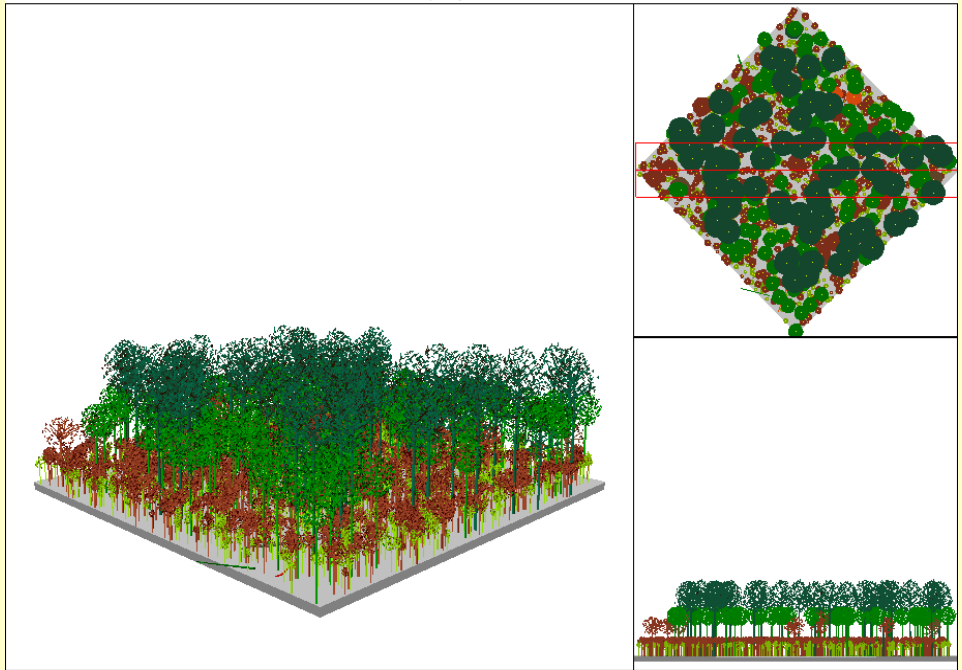
Current

- Only 8% of forests in Potomac have written management plans
- Active harvesting practices take place on about 1% of all forests at any given time
- High grading is common
- Rate of BMP implementation is largely unknown

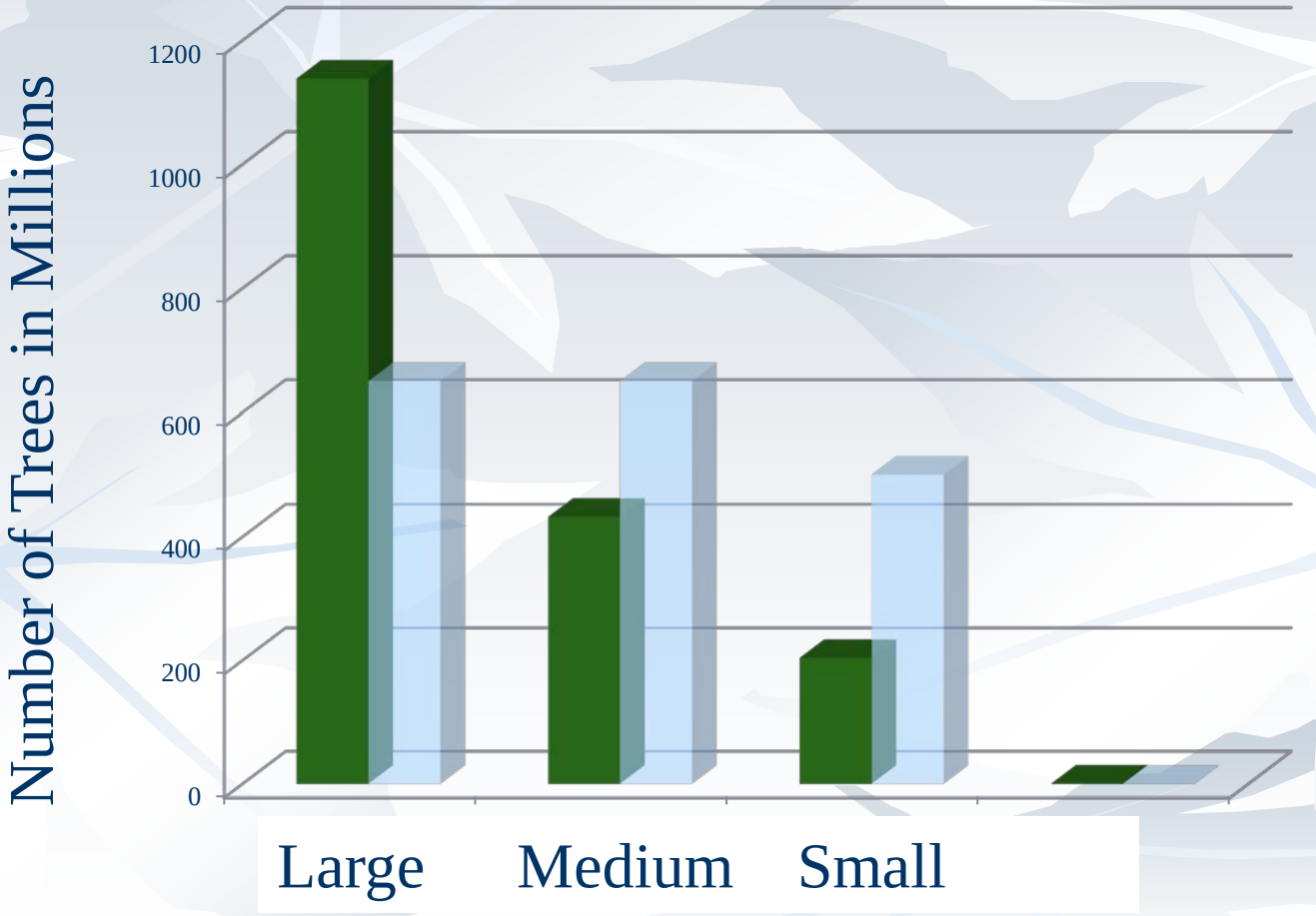
Future

- More owners, less knowledge
- Decrease in long-term timber value when high-graded
- Shifts in forest composition, more uncertainty





Tree Size Class in Potomac:
Current vs Ideal



Climate Change: Eastern Forests are feeling effects now

Fire -Fire season is coming earlier and lasting longer. Fires are hotter and bigger and more damaging.

Insects - Both the natives and the invaders—are spreading more rapidly than ever, killing more trees.

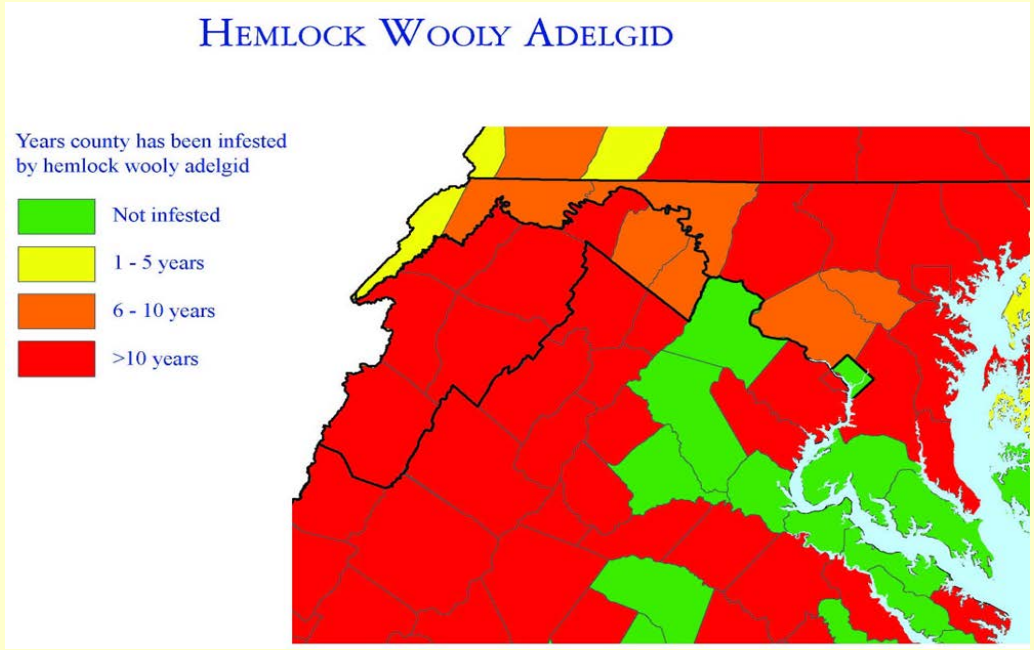
Water - Warmer winters are affecting our water supplies. Snowpacks are thinner and melt earlier; water runs off from the forest earlier in summer. Droughty forest soils makes trees more vulnerable to fire and insects.

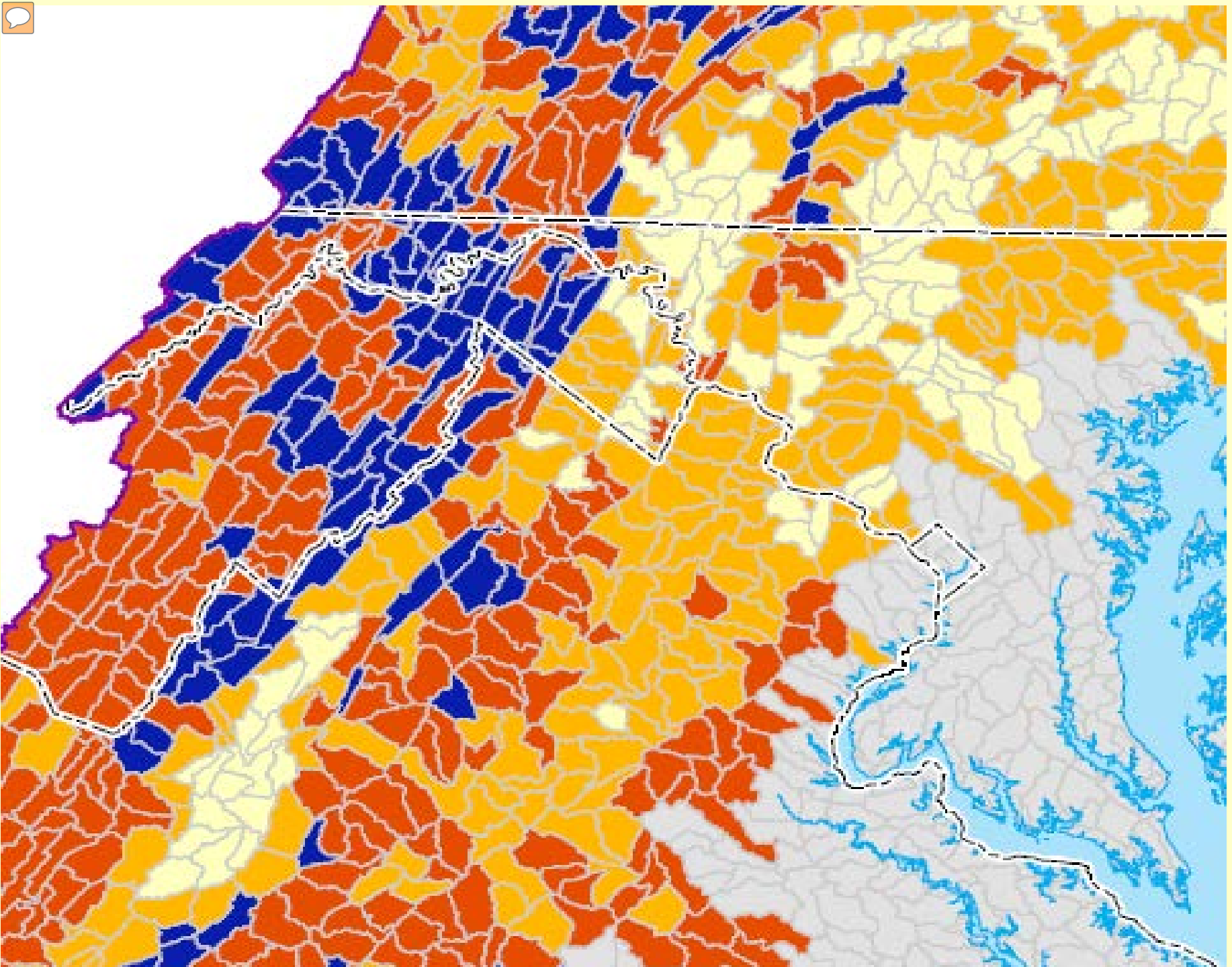
Big Losers:

Red maple
American beech
Black cherry
Sugar maple
White ash
Sweet birch
Eastern hemlock
Striped maple
Aspen

Insects

- >100K acres impacted by gypsy moth just between 2000-2003
- Most of Potomac impacted by hemlock wooly adelgid for >10 years – no infected tree known to survive
- Emerging threats – emerald ash borer, sudden oak death, Asian longhorned beetle, others?





Thank-you!