Managing Cove Forests with Water Quality and Watershed Health Considerations

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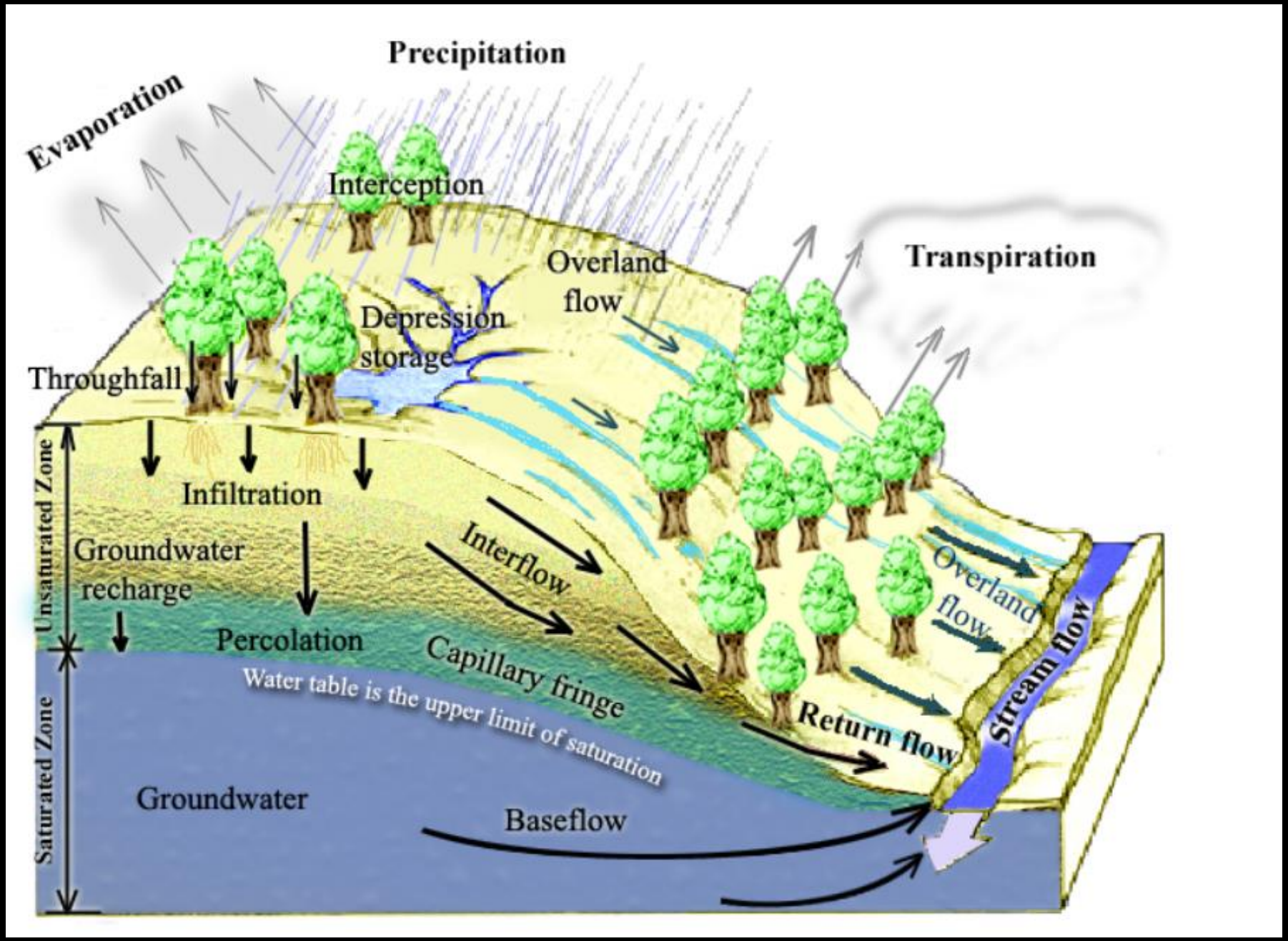
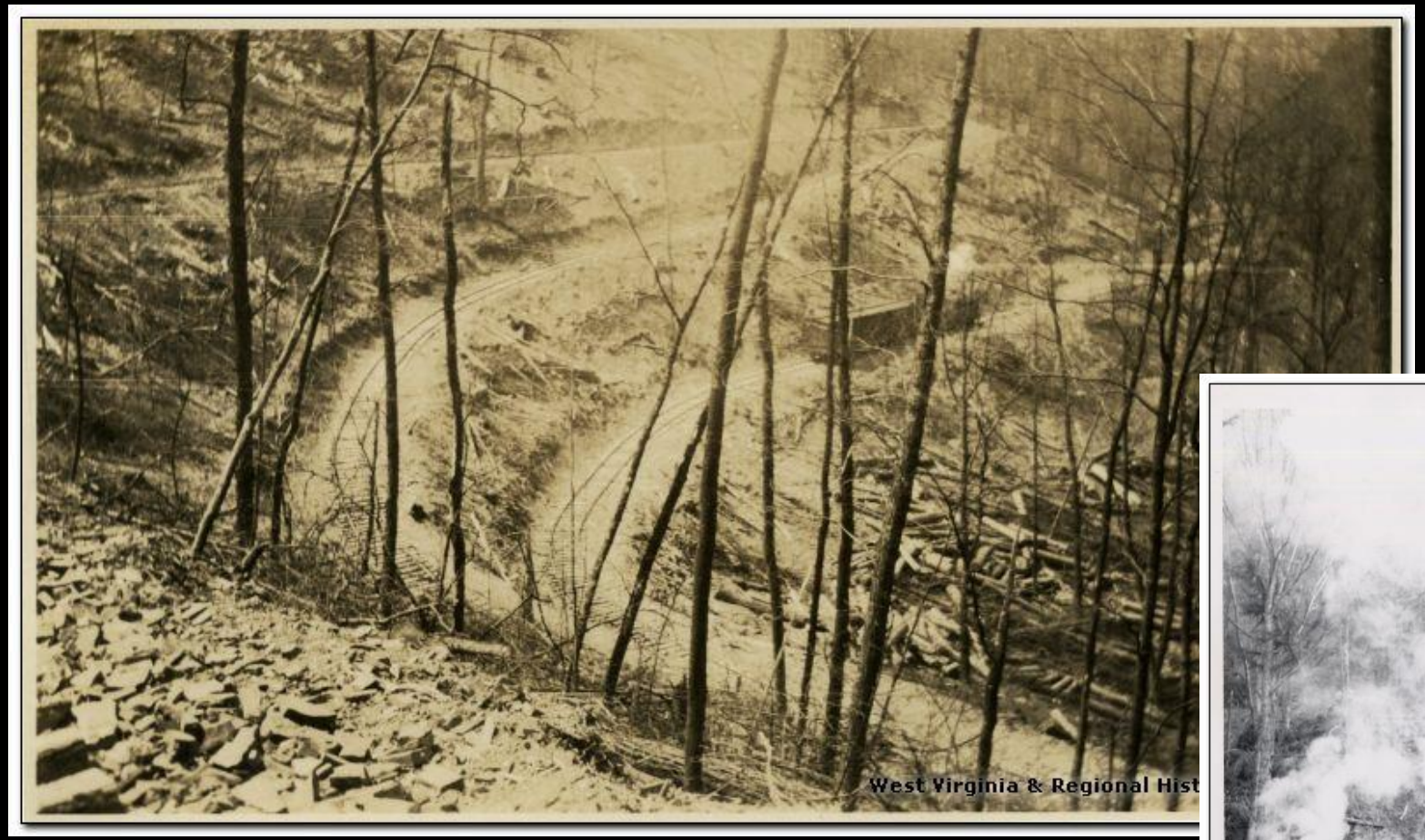

Precipitation
Evaporation
Interception
Transpiration
Overland flow
Depression storage
Throughfall
Infiltration
Unsaturated Zone
Groundwater recharge
Interflow
Percolation
Capillary fringe
Water table is the upper limit of saturation
Saturated Zone
Groundwater
Baseflow
Return flow
Overland flow
Stream flow


West Virginia & Regional Hist


West Virginia & Regional History Collection

ORGANIC ACT OF 1897: "TO IMPROVE AND PROTECT THE FOREST WITHIN THE RESERVATION, ... SECURING FAVORABLE CONDITIONS OF WATER FLOWS, AND TO FURNISH A CONTINUOUS SUPPLY OF TIMBER FOR THE USE AND NECESSITIES OF CITIZENS OF THE UNITED STATES."

WEEKS ACT OF 1911: THE RIVERS OF THE APPALACHIANS WERE "ABSOLUTELY ESSENTIAL TO THE WELL BEING OF THE NATION.... THE REGULATION OF THE FLOW OF THESE RIVERS CAN BE ACCOMPLISHED ONLY BY THE CONSERVATION OF THE FORESTS."

Potential management effects on water

Road & Trail Effects and Vegetation Removal Effects

- Soil moisture
- Downslope moisture subsidies effects
- Sediment/erosion
- Temperature modifications
- Altered hydrology (water yield and storm run-off)
- Productivity/solute export
- Carbon management

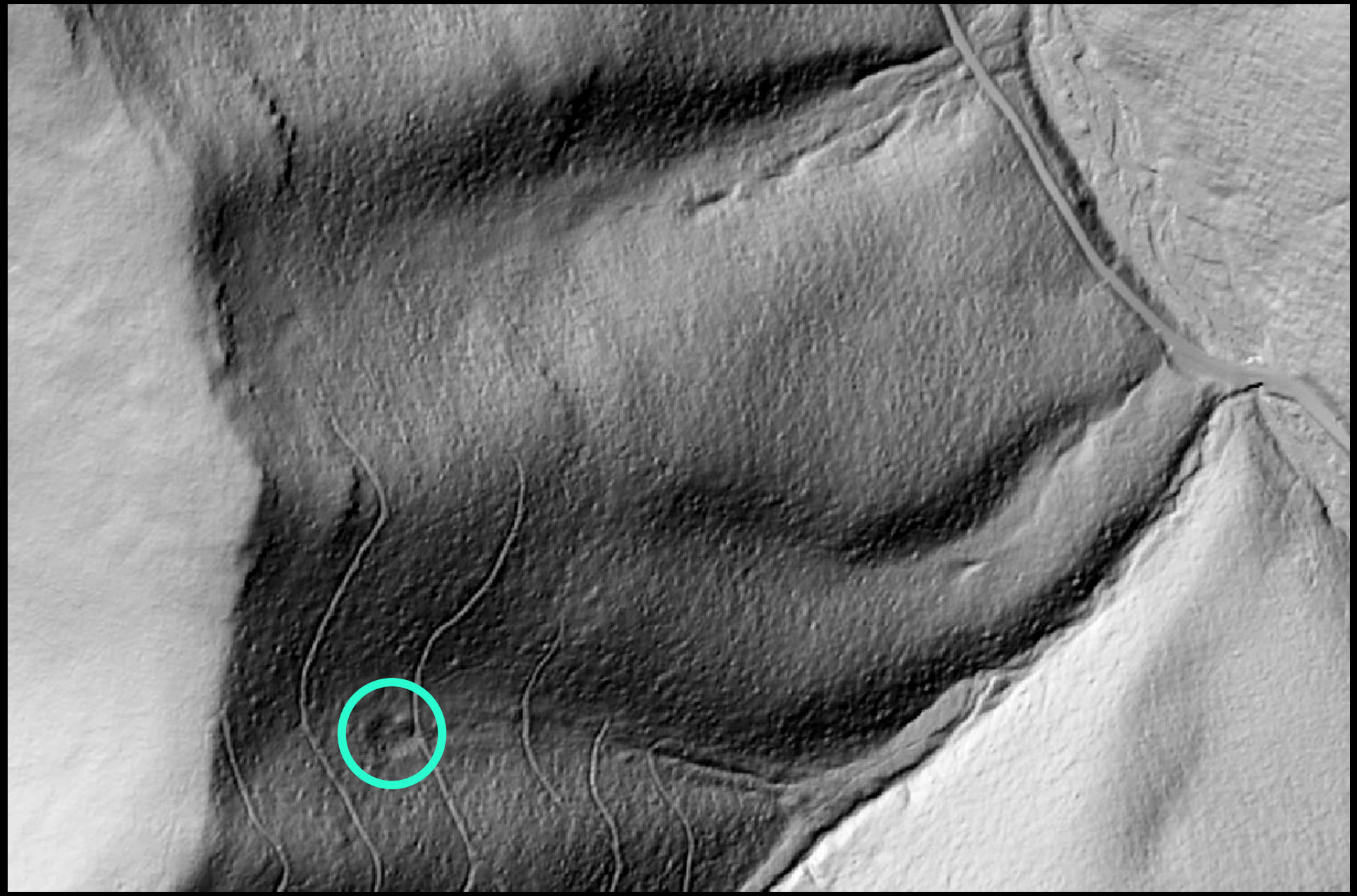
Definition

- Roads range from forest roads engineered at specified standards to those built by logging contractors for regulated use, including access and haul roads, tractor skid trails, and foot trails.

Spot issues

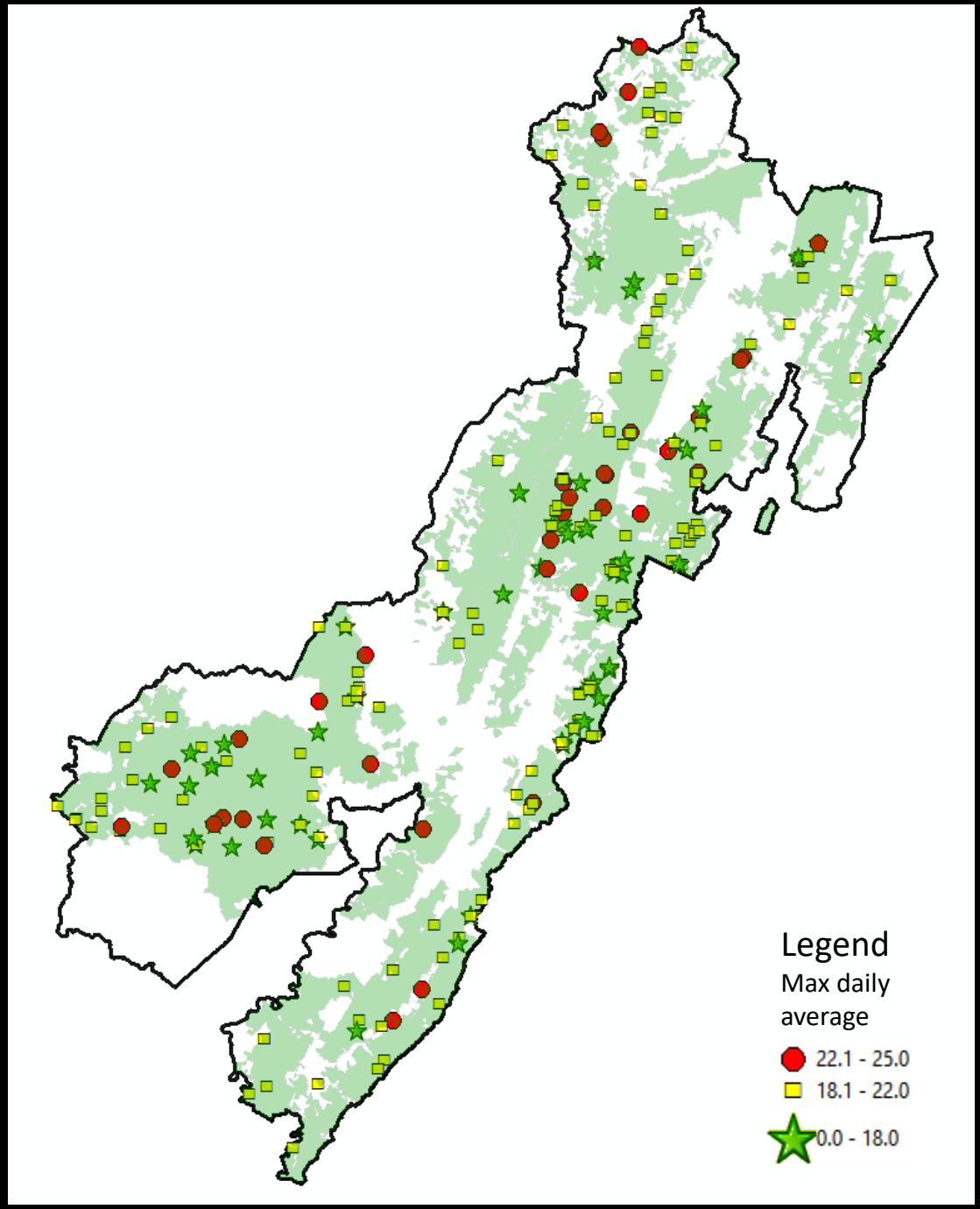
Systematic issues

Extent



Water Temperature & Trout

- 17% optimal
- 66% suboptimal/stressed
- 17% severely suppressed or eliminated

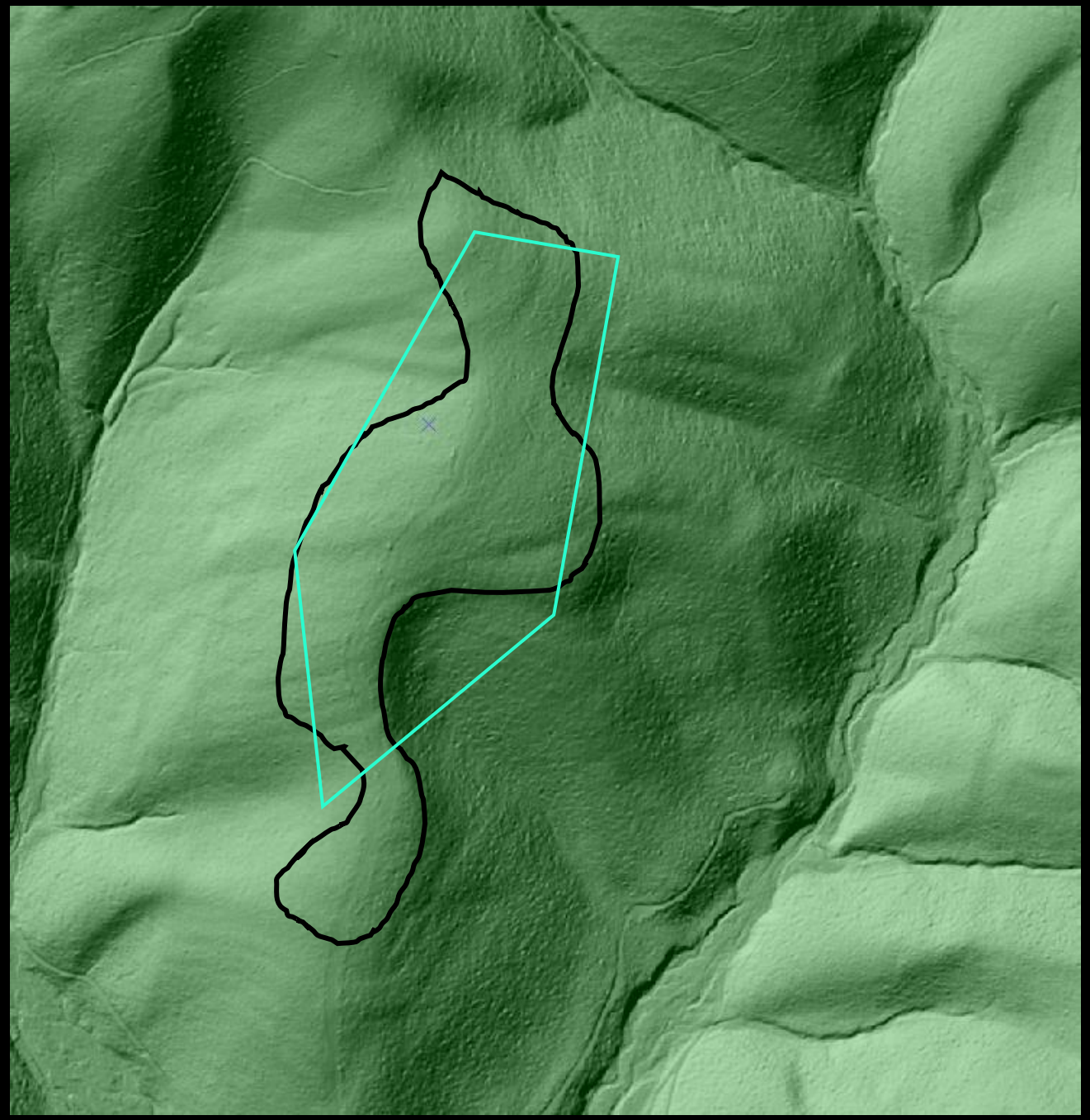


Climate Change Implications

- Management in coves is the connection to ephemeral and intermittent stream channel (>80% of stream network).
- Change in winter precipitation from snow to rain, increased summer season evapotranspiration, and more extreme rain events = more extreme drought and flood peaks
- Combination of periodically drier soil, lower streamflow, and higher temps work cumulatively to further stress stream ecosystems
- Hydrologic processes are more maintainable with a top to bottom approach to management

BMPs and enhanced BMPs

- Planning
  - Avoidance or restructuring units
  - Buffers
  - Planned access
- Can’t avoid a concavity (BMPs during harvest (e.g., truck mats), post harvest treatment)
- Roads
    - Location
    - Ripping
    - Recontour & decompaction



Legacy roads

Legacy roads

Legacy roads

Post-treatment

Downslope subsidy processes

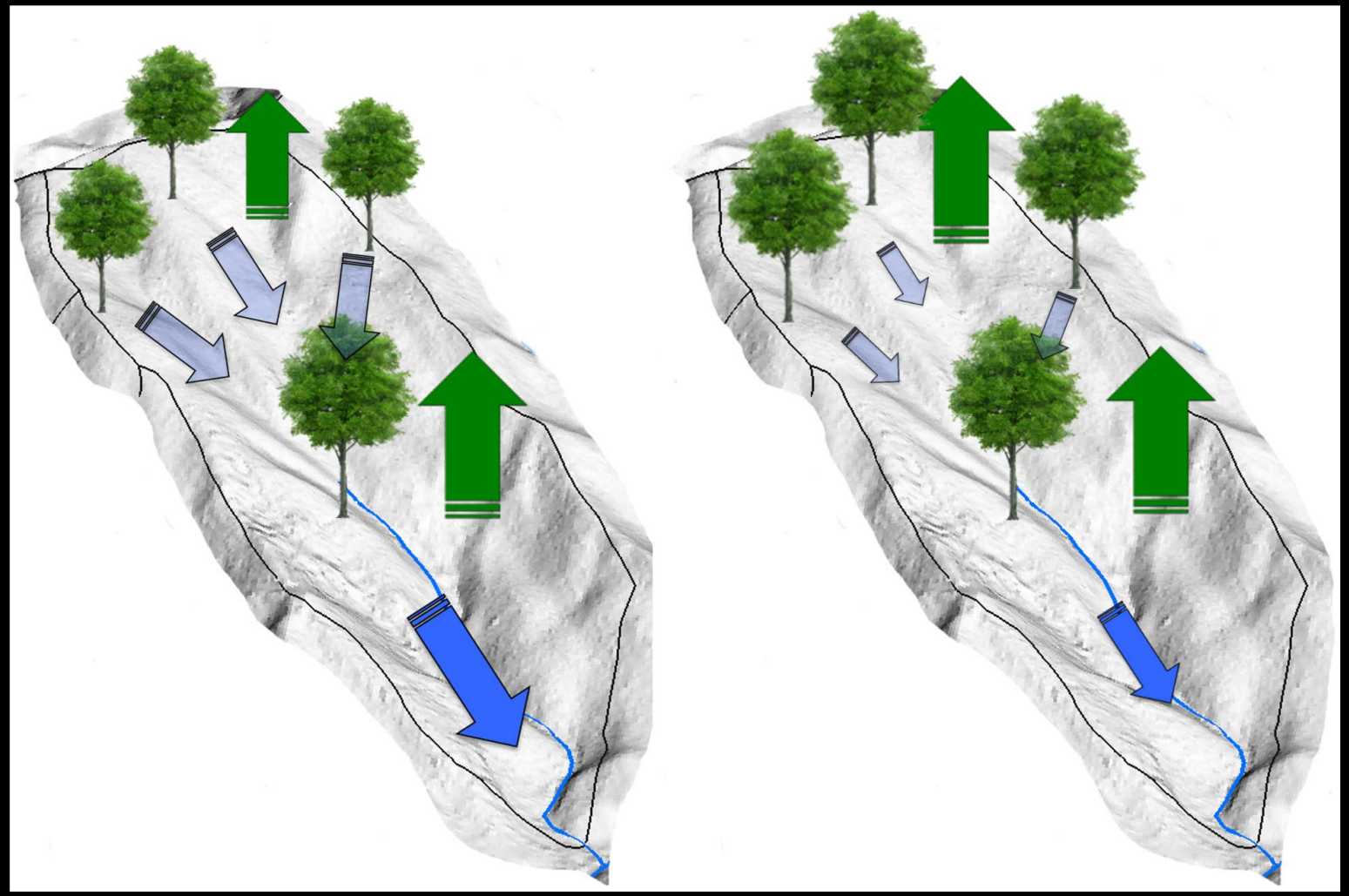
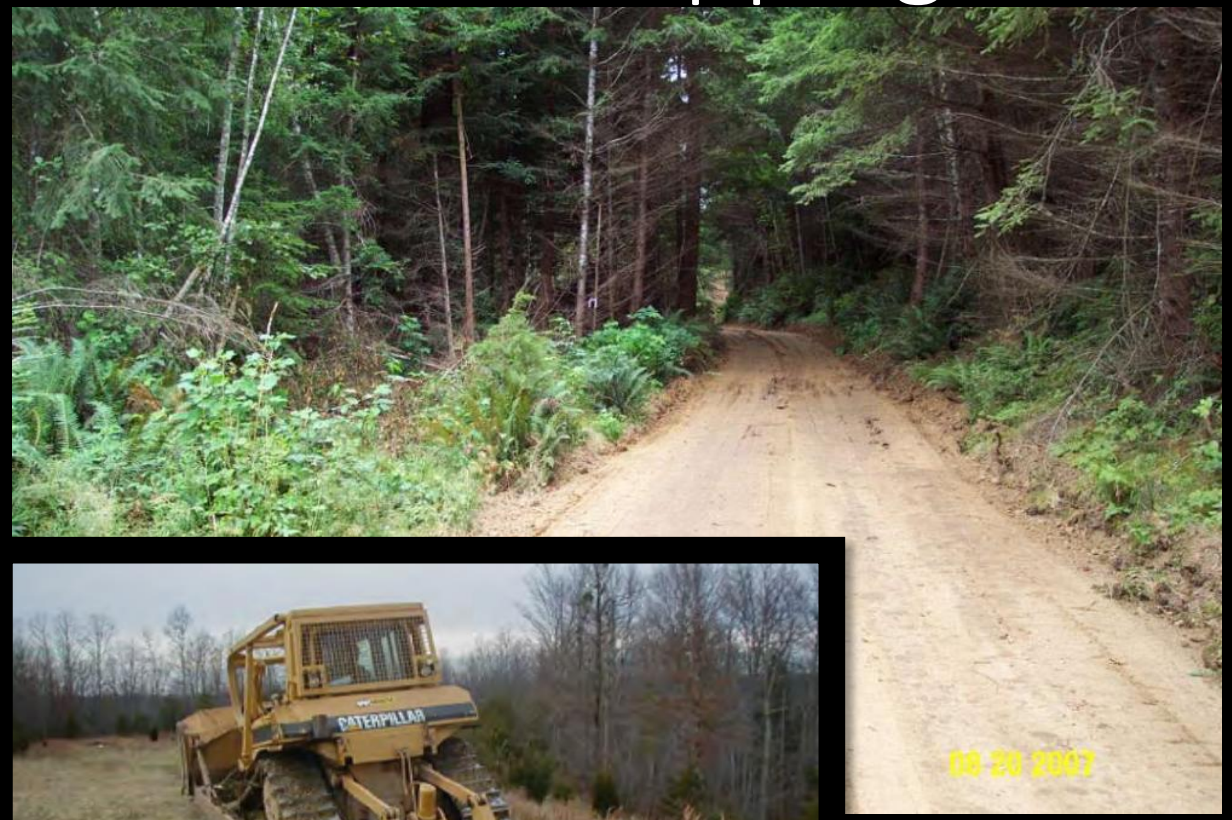


Figure from Hwang et al 2020. Conceptual models for hydrologic partitioning between localized water use and lateral hydrologic flows between vegetation in up- and downslope positions at the watershed scale.

New roads

Process – decompaction & recontour

Process - ripping



Carbon

- Treatment of 264 miles of logging roads saved 80,000 tons of C through on-site soil erosion prevention, revegetation, and soil development on formerly compacted roads. Carbon sequestration will increase in time as forests and soils develop more fully on the restored sites (Madej et al 2013).

- ~70% of the ecosystem C stock in the boreal forest, ~60% in temperate forests is in the soil

Thank you

FS Core BMPs (internet search for “FS Core BMP technical guide”)