Developing a Watershed-based Ecological Health Conservation plan for the Chowan Basin

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What Is VA’s Healthy Waters Initiative?

Inter-agency partnership led by DCR, VCU, and DEQ to identify and maintain watersheds with *high ecological integrity*

--High number of native spp, and broad biodiversity; high native predators (fish and insects); presence of migratory fish spp; low incidences of disease or parasites; intact riparian areas and instream habitat and maintain natural flows.

--Provide ecosystem services and social and economic benefits

Success based upon broader partnerships with TNC, EPA, Conservation Districts, Local govt, neighboring states, APNEP, etc.
What Is VA’s Healthy Waters Initiative?

• Began 2002 as an aquatic living resources inventory, initiated by Virginia DCR

• Expanded to a stream and river bioassessment program with support from DCR, VCZMP, DEQ, and EPA

• Objective, statistically-valid approach to identify healthy waters and watersheds based on ecological integrity

• A blue/green conservation program that benefits water quality, administered by DCR/DNH in cooperation with DEQ
Interactive Stream Assessment Resource (INSTAR)

- Multi-metric ecological assessment - physical condition of streams, habitat, fish and macro invertebrate assemblages
- It uses high quality archival and field collected data through a probabilistic sampling approach
- More than 2500 rivers and streams have been assessed
- All data and the assessment methodology is available on an interactive, searchable website housed by VCU: http://instar.vcu.edu/
- To date, more than 350 waters have been identified as having high ecological integrity (healthy)
Reference Model Metrics

- Species Richness (native spp.)
- Ecological Diversity (Shannon index)
- Ecological Evenness
- Number of species in taxonomic guilds (darters, sunfishes)
- Functional guilds (cyprinid insectivores, benthic insectivores, apex predators, benthic cryptics)
- Tolerance guilds (sediment, chemical, biological; coastal plain specialists)
Stream Ecological Integrity Classes

‘Healthy’ defined as >71% comparable to appropriate regional reference condition

n=1,302
http://instar.vcu.edu
Chowan Basin Goals

• Identify ecologically healthy waters in the Chowan Basin (VCU) and develop a healthy watersheds conservation plan with broader application (DCR)

• Provide suggested modifications to the USEPA and Virginia Implementation Plan Guidance (A-I) with a focus on Protection instead of Restoration
Chowan Basin Objectives

• Advance interstate watershed and basin activities
• Expand the partnership with NC on shared watershed activities and create a comprehensive Interstate Watershed MOU
Chowan Basin Objectives

• Partner with Albemarle-Pamlico National Estuary Partnership (APNEP), TNC, NC DENR, VA Agencies and others to develop a Chowan Basin protection plan:
  • Advance the APNEP Comprehensive Conservation and Management Plan (CCMP)
  • Identifies and recommends protection strategies for ecologically sensitive resources
Chowan Basin Overview

• Land area: 3.2 million acres or 5,000 sq mi
• Shared basin: 75% in VA, 25% in NC
• EPA Region 3 and Region 4
• Sub-basins: Blackwater, Nottoway, Meherrin, Chowan
• Miles of Streams: 9,916
• Scenic Designation in VA: +170mi
• Primary Landuse: Forestry and Agriculture
  • Peanuts and Pine
Applied Index of Terrestrial Integrity
Fiber baskets
75mi radius
Data Development, Analysis and Modeling

- 109 streams evaluated on-site; 14 of these non-wadeable; 20 sites could not be effectively sampled; 89 sites sampled for biotic communities (quantitative electrofishing) and in-stream habitat in 2012-13.

- >200 archival collections selected and used for model development (establish Regional Reference Conditions)

- Data analyzed using several multivariate methods, including Ordination and Detrended Correspondance Analysis (DCA), to develop four model reference conditions (elevation, stream order)

- Streams scored (provisionally) based on percent comparability to the most appropriate regional state (one of four models)

- Scores ranged between 86 to 12 percent comparable; scores ≥ +1 S.D. were classified as ecologically *healthy*; ≥ +2 S.D. were considered ecologically *exceptional*
Raccoon Creek
Mouth Buckhorn Creek
Black-banded sunfish (*Enneacanthus chaetodon*)
Banded and Bluespotted Sunfish
(Enneacanthus obesus, Enneacanthus gloriosus)
Flier (*Centrarchus macropterus*)
Redfin Pickerel (*Esox americanus*)
Provisional Conclusions

• Remote (GIS) prioritization of HUCs based on Terrestrial Integrity Index prior to field assessment was highly effective (stratified random study design)
• Leverage provided by archival data was important but limited
• Healthy Streams were more common in higher gradient landscapes (upper coastal and lower piedmont) of the Chowan…and in Virginia cp. to North Carolina
• Compared to Chesapeake Bay watersheds, a comparable proportion (17%) of Chowan systems exhibited high ecological integrity; however….
• Conservation of ecological communities (aquatic systems), not just species; emphasizes Blue↔Green linkage
EPA Key Elements for Watershed Implementation Plan ("a.-i.")

- A. Identify and quantify causes and sources of impairments
- B. Estimate expected load reductions
- C. ID BMPs and critical areas to achieve load reductions
- D. Estimate needed technical and financial resources
- E. Provide info, education and public participation component
- F. Include schedule for implementing NPS management measures
- G. ID interim measurable milestones for implementation
- H. Establish criteria to determine if load reductions are achieved
- I. Provide a monitoring component to evaluate effectiveness
A-I Criteria for Ecologically Healthy Wshed Consv

• A. Quantify and verify the empirical basis for aquatic communities identified with high ecological integrity
• B. Identify the conditions needed to maintain existing ecological integrity
• C. Identify the best management practices and other preventative actions to achieve and maintain the system with high ecological integrity
• D. Estimate needed technical and financial resources
• E. Provide info, education and public participation component
• F. Include schedule for implementing NPS management measures
• G. ID interim measurable milestones for implementation
• H. Establish criteria to determine high ecological integrity is maintained, at baseline conditions
• I. Provide a monitoring component to evaluate effectiveness
Developing an Ecological Health Conservation Plan for Raccoon Creek
Nottoway River Overview

- Land area: 1.1 million acres (largest sub-basin)
- Contains Fort Pickett, 41,000ac Army Natl Guard
- EPA Region 3 and Region 4
- Miles of Streams: 9,916
- Primary Landuse: 55% forested, 19% agriculture, 10% wetlands
Applying the Virginia Conservation Vision
Formerly the VA Conservation Lands Needs Assessment
Wellhead Protection Areas
A-I Criteria for Ecologically Healthy Wshed Consv

A. Quantify and verify the empirical basis for aquatic communities identified with high ecological integrity

• Site 25201 Raccoon Creek is identified as an Ecologically Exceptional Healthy Water, the highest characterization of the VA Healthy Waters Program

• Water quality is dominated by high concentrations of natural organic acids (i.e., ‘blackwater systems’), low pH (4-6 units), seasonal hypoxia, unstable sand substrates, and heavily vegetated riparian zones.

• Fish assemblages support populations of rare or uncommon ‘acid-endemic’ species, including Swampfish, Mud Sunfish, Blackbanded Sunfish, and Sawcheek Darter, with limited (and declining) distributions in their native ranges. Most other fishes here are native habitat generalists (e.g. Pirate Perch, Bluespotted Sunfish) that are able to tolerate the unique physio-chemical conditions.
A-I Criteria for Ecologically Healthy Wshed Consv

A. Quantify and verify the empirical basis for aquatic communities identified with high ecological integrity

• Raccoon Creek site has a total of three individual Natural Heritage Element Occurrences with both Global and State Rankings

• Two G4 S1 Vascular Plants and one G3 T3 S2 Vertebrate Animal. {S1 - Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer populations or occurrences, or very few remaining individuals (<1000). S2 - Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6 to 20 populations or occurrences or few remaining individuals (1,000 to 3,000) Natural Heritage Global Ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note GX means the element is presumed extinct throughout its range. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". }.
A-I Criteria for Ecologically Healthy Wshed Consv

A. Quantify and verify the empirical basis for aquatic communities identified with high ecological integrity

- Sites contain two core areas identified by the Virginia Natural Landscape Assessment as B3-High and B2-Very High Values, at approximately 1408ac and 4322ac, respectively.

- Contains a Nature Conservancy conservation easement of 1406ac that encompasses much of the B3-High Value Core

- Upper reaches of Nottoway providing source water protection for groundwater serving the Tidewater Christian Service Area, including three identified well-heads and a source water drinking locations
A-I Criteria for Ecologically Healthy Wshed Consv

A. Quantify and verify the empirical basis for aquatic communities identified with high ecological integrity

• National Land Cover Database landuse and land cover:

<table>
<thead>
<tr>
<th>Raccoon Creek Land Use</th>
<th>Acres</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Water</td>
<td>18.45</td>
<td>0.15</td>
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<tr>
<td>Open Space</td>
<td>373.24</td>
<td>2.94</td>
</tr>
<tr>
<td>Developed- Low Intensity</td>
<td>18.23</td>
<td>0.14</td>
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<tr>
<td>Developed- Medium Intensity</td>
<td>1.32</td>
<td>0.01</td>
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<tr>
<td>Barren Land</td>
<td>19.11</td>
<td>0.15</td>
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<tr>
<td>Deciduous Forest</td>
<td>1047.66</td>
<td>8.25</td>
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<tr>
<td>Evergreen Forest</td>
<td>3622.53</td>
<td>28.54</td>
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<tr>
<td>Mixed Forest</td>
<td>387.08</td>
<td>3.05</td>
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<tr>
<td>Shrub/Scrub</td>
<td>2167.37</td>
<td>17.07</td>
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<tr>
<td>Grassland/Herbaceous</td>
<td>1835.65</td>
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<td>Pasture/Hay</td>
<td>574.68</td>
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<td>Cultivated Crops</td>
<td>1178.37</td>
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<td>Forested Wetlands</td>
<td>1365.53</td>
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<tr>
<td>Emergent Herbaceous Wetlands</td>
<td>84.80</td>
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<tr>
<td><strong>Total</strong></td>
<td>12694.03</td>
<td>100.00</td>
</tr>
</tbody>
</table>
A-I Criteria for Ecologically Healthy Wshed Consv

• B. Identify the conditions needed to maintain existing ecological integrity

  • A maintained forested riparian habitat (31.4mi), hydrology and instream habitat and protection of High Ecological Value areas and forested wetlands to ensure the baseline ecological health remains in the current Exceptional condition
A-I Criteria for Ecologically Healthy Wshed Consv

• C. Identify the best management practices and other preventative actions to achieve and maintain the system with high ecological integrity

  • Ensure protection of 1365ac of Forested Wetlands per NLCD, 31.4 miles of stream corridor
    • Direct acquisition of those areas to include the 1365ac (10% of total area)
    • Create conservation easements that include language and criteria to protect aquatic integrity ensuring Ecologically Healthy Waters to be held by TNC, VOF, SWCDs or water districts
  • Apply 100% of SFI Water Quality standards and practices, for forestry operations standards at point of extraction
  • Prioritization will be given to those areas directly associated with the protection of lands in the 1408ac B3-High Value Core, inclusive of the Nature Conservancy conservation easement and 4322ac B2-Very High Value Core
A-I Criteria for Ecologically Healthy Wshed Consv

• C. Identify the best management practices and other preventative actions to achieve and maintain the system with high ecological integrity

  • Create conservation easements to protect areas associated with the VA Department of Natural Heritage Element Occurrences for two Vascular Plants and one Vertebrate Animal
  • Coordinate with regional water districts to encourage application of riparian protection measures that would minimize impacts to source-water and headwater areas
  • Maintained forested buffers with minimal impacts
  • Implementation of DCR DNH recommendations to protect critical habitats and resources utilizing Stream Conservation Unit protection language
  • Integration with other regional planning efforts
A-I Criteria for Ecologically Healthy Wshed Consrv

E. Provide info, education and public participation component

- VDCR DNH, the Healthy Waters Program HWP will
  - Establish a Project Team to implement those protection measures.
  - Coordinate all aspects of education, coordination and outreach
  - Create and deliver training on HWP priorities, applicability and goals.
  - Coordinate with partners on their local planning efforts to integrate HWP
- Ensure Sustainable Forestry Initiative (SFI) standards are applied at timber extraction sites and offer training to SFI Board
- Develop incentive-based program for landowners in source water protection areas
- Coordinate with regional water districts to meet source water protection goals
A-I Criteria for Ecologically Healthy Wshed Consrv

• G. Identify interim measurable milestones for implementation
  • Protection of 1365ac of NLCD forested wetlands
    • In year 1, outreach will be initiated to implement programs and objectives identified above. Including the development of language for conservation easements that include specific mention of, “protection of aquatic integrity” as a maintained criteria
    • At year 5, 100 acres of the 1365ac will be under conservation easement or other natural area protections that include the specifics for maintaining aquatic integrity
    • At year 10, 700 acres of the 1365ac
    • At year 15, all 1000ac
    • At year 20, all 1365ac
A-I Criteria for Ecologically Healthy Wshed Consv

• H. Establish criteria to determine high ecological integrity is maintained, at baseline conditions
  • 1365ac of Forested Wetlands conserved to ensure those lands are left in a natural condition
    • Direct acquisition of those areas to include the 1365ac (10% of total area) and;
    • Conservation easements that include language and criteria to protect aquatic integrity ensuring Ecologically Healthy Waters to be held by TNC, VOF, SWCDs or water districts and;
    • 100% of SFI Water Quality standards and practices, for forestry operations standards at point of extraction
A-I Criteria for Ecologically Healthy Wshed Consv

H. Establish criteria to determine high ecological integrity is maintained, at baseline conditions

- Streamside Management Zones are established and maintained to a minimum of 100’ with preference toward 150’ per side, based on slope increasing and;
- VDCR DNH Vascular Plant and Vertebrate Animals are protected and maintained and;
- VDCR DNH Healthy Waters Program characterization of Exceptional Ecological Health is maintained
A-I Criteria for Ecologically Healthy Wshed Consv

I. Provide a monitoring component to evaluate effectiveness

• Conduct a re-assessment of the Chowan basin to ensure ITI accuracy as a means to validate criteria as identified in B, above at 5, 7 and 10 yr intervals

• Conduct an INSTAR re-assessment of the focal area (Raccoon Creek) to quantify aquatic conditions meet baseline conditions ensuring aquatic habitat and integrity maintained 1, 2, 3, 5, 7 and 10 yr intervals

• Conduct a Land Use, Land Cover Analysis to determine if assessed conditions remain in baseline status 1, 2, 3, 5, 7 and 10 yr intervals
Questions?

http://www.dcr.virginia.gov/healthywaters
http://instar.vcu.edu

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