Rapidan Watershed Resiliency Plan

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To maintain the health and happiness of the people in the Rapidan watershed, the natural systems of the watershed need to be healthy and resilient to change. Natural systems also have inherent value for future generations, that can't be fully described or understood now, but could well be critically important in the future. This is the basis of conservation work. The combination of human livelihoods, keystone species, and water quality are sufficient indicators for the purpose of our work.

The Rapidan Watershed is challenged with human-induced changes to landcover, biodiversity, climate, and soils. These changes have resulted in a degradation of systems that support humans in the watershed. Water is more expensive to clean, and crops are more difficult to grow. Livelihoods connected to agriculture and forestry are increasingly less likely to support families, and less likely to attract young adults to live in the region.

There's no going back to the pre-industrial condition of the watershed, but continuing to accept the shortcomings of the environment in the watershed is both unnecessary and counterproductive. This proposed watershed plan seeks to address these shortcomings through systemic improvements in livelihoods where those improvements also improve the long-term resilience of the tourism, agriculture and forestry sectors.

The metrics proposed are traditional i.e. family annual income, poverty rates, health indices, water quality measurements, soil organic carbon and crop yield. What's unusual with this plan is the linkage between the economic and environmental indices. Our philosophy is that one can't ignore the other, and particularly as climate change becomes more apparent in coming decades, the only logical way forward is to make sure that natural systems are resilient so that human systems can also be resilient.

Context

The Rapidan Watershed begins in Shenandoah National Park at Big Meadows and extends 78 miles eastward to the confluence of the Rappahannock River. The watershed was settled in the early 18th century first at Germanna, 1714, in the east and later at Madison, VA. The oldest continuously used Lutheran Church in the United States, founded in 1726, is found in Madison, VA.

The typical lifespan of a white oak in Virginia is 300 years. Germanna was first settled 306 years ago. Since then, a large part of the watershed was cleared for agriculture, and a surprisingly large portion of that has reverted to forest again. Poor soil management practices brought from Europe, resulted in extensive and severe erosion of topsoil, and the legacy of that period can still be detected in streams where bank cutting through legacy sediment is apparent, cutting off streams from floodplains. Much of the best agricultural land is still farmed, but the value of that land is very low as indicated by annual rental rates of under $75/acre. For comparison, rental rates in Illinois are more typically averaging $200/acre, or Iowa $222/acre.

During the Great Depression of the 1930's and World War II ending in 1945, farmland abandonment struck the region, and many acres previously farmed were abandoned to forest succession. The largest age class of forest in the watershed is estimated at 75-95 years. True old growth forest is very rare.

While deer were believed to be absent in the Piedmont portion of the watershed in 1938, with careful restocking and a lack of predators (other than motor vehicles), the deer population is at a maximum and targeted for stabilization due to deer damage complaints. Deer in Virginia drastically reduce understory vegetation.

Beavers, a keystone species for wetlands, were believed to have been extirpated in Virginia by 1900, resulting in a drastic reduction in wetland habitat and the flashiness of watersheds where floods should be running through tens of thousands of beaver dams, but instead are running straight through steeply incised stream banks. Beavers have also recovered but not to an extent where they are recolonizing small streams in the watershed to any great degree. Populations are mostly restricted to large stream courses and lakes.

Anadromous and catadromous fish (e.g. shad, eels, stripers, and others) were once common in the rivers and streams of the Rapidan watershed. A restoration effort started some years back removed a dam near Fredericksburg, VA that opened up fish migration to Rapidan, VA. With the modification or removal of the Rapidan dam, the maximum amount of fish habitat will be made available in the watershed and a restocking effort can begin.

The Rapidan watershed has a very high proportion of bottomland acres, and although the row crop acres are likely to have cover crops or perennial grasses, the watershed is still emitting large sediment and phosphorous loads into the Chesapeake Bay. Row crop profitability is marginally profitable and highly variable from year to year.

Humans in the watershed are struggling with a reduction in rural populations in some counties (e.g. Rappahannock and Madison) and a drastic increase in population of other counties (e.g. Orange, Greene, and Culpeper). Climate change driven population changes are already resulting in people moving away from at risk coastal communities, fire risk communities in the western US, and drought prone communities elsewhere. Demand for farmland in the mid-Atlantic and New England states is expected to increase.

Emerging Threats

While the current pandemic focuses attention on direct health risks due to the COVID-19 coranavirus, the connection between health, climate, and environmental contaminants is well established. The very complicated relationship between all these issues is numbing. The cumulative impact to communities is both obvious and yet difficult to quantify with current monitoring techniques.

There are well-documented emerging contaminant threats. Microplastics, microscopic particles from degraded plastic packaging and other discarded plastic objects, have been shown to cause health problems in humans and also to be ubiquitously found throughout the environment. Endocrine disrupting chemicals found in plastics and discarded/excreted pharmaceuticals and other man-made objects is another source of health concern found in water throughout the watershed. Research is underway to develop techniques for reducing both microplastics and endocrine disrupters at wastewater

treatment plants, and at least one company in the watershed is evaluating options for implementing that technique.

Climate change is a well-known and documented threat, but the full implications of the impacts in the watershed are yet to be fully determined. Continental scale models suggest higher humidity, day time temperature, and night time temperature along with more powerful hurricanes and intense rain events. The connection between climate change and diseases, invasive species, etc.. is being researched, but a connection is likely.

Planning Horizon

2021-2025

Goal

The goal of this plan is to instigate positive, measurable improvements in watershed health as indicated by metrics that describe human livelihoods, keystone species, and water quality as indicators.

Objectives

The following are the measurable objectives to obtain by 2025. Not all objectives will be addressed from the beginning. The best strategies address multiple objectives and will be repeated as needed.

Objective 1: Improve 90% of all streams in the watershed to fishable, swimmable, drinkable standards.

Water quality degradation in the Rapidan watershed is attributed to a combination of failing septic tanks and agricultural runoff. Failing septic tanks are being addressed by public agencies.

Strategy 1.1: Institute a new, sustainable agricultural system using perennial crops that eliminate field runoff particularly in floodplains.

Strategy 1.2: Reconnect floodplains and streams and slow runoff with beaver habitat.

Strategy 1.3: Remove trash, especially plastics, from streams.

Strategy 1.4: Restore floodplain forests in the watershed to slow runoff and provide habitat for riparian biodiversity.

Strategy 1.5: Establish a water monitoring station at Rapidan, VA.

Objective 2: Restore anadromous/catadromous fish habitat by 540 miles.

The primary constraint is the dam at Rapidan. Maintenance at the fish ladder near Orange is also a concern.

Strategy 2.1: Remove or sufficiently modify the dam at Rapidan, VA if technically and financially feasible.

Strategy 2.2: Repair and/or maintain the fish ladder at Orange, VA.

Strategy 2.3: Institute a shad fry grow-and-release program with local schools to recolonize new habitat.

Objective 3: Restore beaver habitat by 5,000 acres.

Stocking beavers is both illegal and unnecessary in Virginia. Restoring habitat for beavers is necessary. Beaver dam analogues coupled with riparian vegetation restoration is envisioned.

Strategy 3.1: Work with private landowners to restore beaver habitat.

Strategy 3.2: Work with public agencies and animal damage control specialists to install beaver management devices rather than removal.

Objective 4: Improve agricultural rental rates by 50%.

Current rental rates reflect relatively low productivity for conventional commodity agriculture (e.g. corn, soybeans, wheat). Rebuilding soils coupled with more stable income-producing crops is the overarching strategy.

Strategy 4.1: Institute a new, sustainable agricultural system using perennial crops that eliminate field runoff particularly in floodplains.

Strategy 4.2: Start a small grain milling operation to add value to small grains produced by Strategy 4.1.

Objective 5: Create 100 sustainable jobs sufficient to support a family of 4.

Green job creation is the primary focus.

Strategy 5.1: Institute a lump charcoal operation to take advantage of waste wood from local mills.

Strategy 5.2: Institute a new, sustainable agricultural system using perennial crops that eliminate field runoff particularly in floodplains.

Strategy 5.3: Start a small grain milling operation to add value to small grains produced by Strategy 4.1.

Strategy 5.4: Start a mitigation bank based on the work in Strategy 2.1 to generate revenue for StreamSweepers operations.

Strategy 5.5: Establish a blueway on the Rapidan that would support a recreational industry.