

U.S. Fish & Wildlife Service

Mid-Atlantic Highlands Action Program

Realizing the Legacy



Report Prepared by:

Daniel Murphy
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401

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Unless otherwise noted, maps were prepared by Leslie Gerlich.

Cover Photo by: Joseph Rossbach Photography



Photo: Christine Carpenter/USFWS

Executive Summary

Beginning in 2002, Congress provided funding and support for the Mid-Atlantic Highlands Action Program (HAP), a federal, state, and local partnership to benefit Highland communities and their environment. The HAP partnership leveraged \$8.8 million in federal planning and implementation funds with partner resources to protect over 10,000 acres of forests and wetlands; restore over 100 acres of strip-mined land, repair 12,000 feet of streams; treat 60 miles of brook trout streams for acid mine drainage; remove 3 fish passage barriers; provide environmental leadership training to 100 youth and 50 community leaders; and plan and assess 16 watershed restoration and protection projects.

The HAP partnership, facilitated by the U.S. Environmental Protection Agency (EPA) used environmental indicators, strong science, and public and private partnerships to identify sources of problems and develop solutions and management actions with an on-the-ground implementation emphasis. The HAP partnership concept employs a Natural/Green Infrastructure approach to strategically identify places of ecological and cultural significance. Specifically, HAP improves natural resources and socioeconomic conditions by:

- Highlighting and protecting special places
- Revitalizing damaged ecosystems
- Empowering people and their communities to strengthen the bonds between cultural heritage, economic viability, and the health of the environment
- Creating lasting employment opportunities in the restoration industry for Highlands residents
- Leveraging resources to achieve these goals

Located in the Appalachian Mountains of Virginia, West Virginia, Maryland, and Pennsylvania, the Mid-Atlantic Highlands boasts some of the highest biodiversity on Earth¹. This is mostly due to the rugged mountain terrain dotted with thousands of isolated hollows and ridges⁴. This same rugged isolated landscape gave rise to a rich cultural heritage and independent and self-reliant people⁵.

Hundreds of years of human occupation and resource extraction have resulted in numerous ecological and social challenges for the future of the Highlands. Human activities, namely urban infringement, logging, mining, energy development, and

agricultural practices have resulted in environmental degradation and lower quality of life in many parts of the region. Additionally, the same isolation that favors high ecological diversity and strong cultural heritage has resulted in economic challenges, high unemployment, and poverty in many mountain communities³³.

There are many environmental stressors acting on the Highlands. Climate change is among the most challenging. In a recent Nature Conservancy publication³⁸ the Mid-Atlantic Highlands were identified as one of the most resilient landscapes in the region to climate change with the greatest potential to support the migration of species from south to north and from low elevations to high elevations as the climate warms. The forested ridgelines of the Mid-Atlantic Highlands provide an important linkage for species movement between the southern and northern Appalachians. The Nature Conservancy concluded that climate change migration corridors in the Central Appalachians must be protected if we are to increase the odds for many species to survive climate change. This has important implications for wind development, which generally occurs on ridges, as well as mountain top removal mining.

For years, many communities in the Mid-Atlantic Highlands have struggled with serious economic problems, including high rates of children in poverty, low educational attainment, high unemployment, and low per capita income. While the standard of living in Appalachia has seen notable improvements in recent years, the region continues to rank below the national average for many quality of life indicators⁵¹. The Highlands' isolation and undiversified economies are the main reason for this disparity, resulting in high rates of out-migration of youth and working-age residents, low levels of educational attainment, and stagnant income in many areas.

The unbroken cycle of socioeconomic distress in the Highlands has resulted in the loss of human, natural, and physical capital over time, which in turn stifles economic growth⁶⁷. The paradox is that the region is rich in energy and water, providing conditions that sustain industries such as farming, forestry, mining, and manufacturing that benefit the entire nation, yet it continues to lag behind the rest of

the country in quality of life issues⁶⁸. In recent years, this has been attributed to patterns of global trade that have upset the region's already fragile natural resource-based economy⁶⁹. Many rural highland communities are weighing the short-term benefits and long-term costs of resource extraction industries such as mining and oil and gas development. Too heavy a reliance on these industries has contributed to the endless cycle of poverty and habitat degradation in Appalachia. Local Highland economies that are invested in natural and human capital in addition to extractive industries are better prepared to weather the effects of fluctuating global markets and provide a higher quality of life for current and future citizens⁷⁹.

Despite all of the forces that continue to act upon them, the Mid-Atlantic Highlands still function as an intact mountain ecosystem. With a renewed effort to target and fund conservation projects in the Highlands, The Mid-Atlantic Highlands Action Program will aid in protecting the

Appalachian landscape and culture and foster economic growth in Appalachian communities.

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Photo: Joseph Rossbach Photography

“I am encouraged by the knowledge that there are millions in America who care about wilderness and mountains; who go for strength to Mother Earth; who defend her domain and seek her secrets.”

~Benton MacKaye, Founder of the Appalachian Trail

I. A Special Place: The Natural and Cultural Story of the Highlands

The Mid-Atlantic Highlands encompass 79,000 square miles in the Appalachian Mountains of Pennsylvania, Maryland, West Virginia, and Virginia. The region boasts some of the highest biodiversity on Earth¹ (Figure 1). Forests in the Mid-Atlantic Highlands are the most diverse in North America, supporting exceptionally high floral diversity, which translates into high animal diversity, especially

Forests of the Mid-Atlantic Highlands are the most diverse in North America.

with regard to amphibians and migratory songbirds². Mid-Atlantic Highlands streams harbor over 150 fish species, including Eastern brook

trout, 75 mussel species, and 20 crayfish species³. The rich aquatic diversity of the highlands is due in large part to the rugged mountain terrain dotted with thousands of isolated hollows and ridges⁴. The rugged isolation of the Appalachian Mountains also gave birth to a rich cultural heritage and independent and self-reliant people⁵.

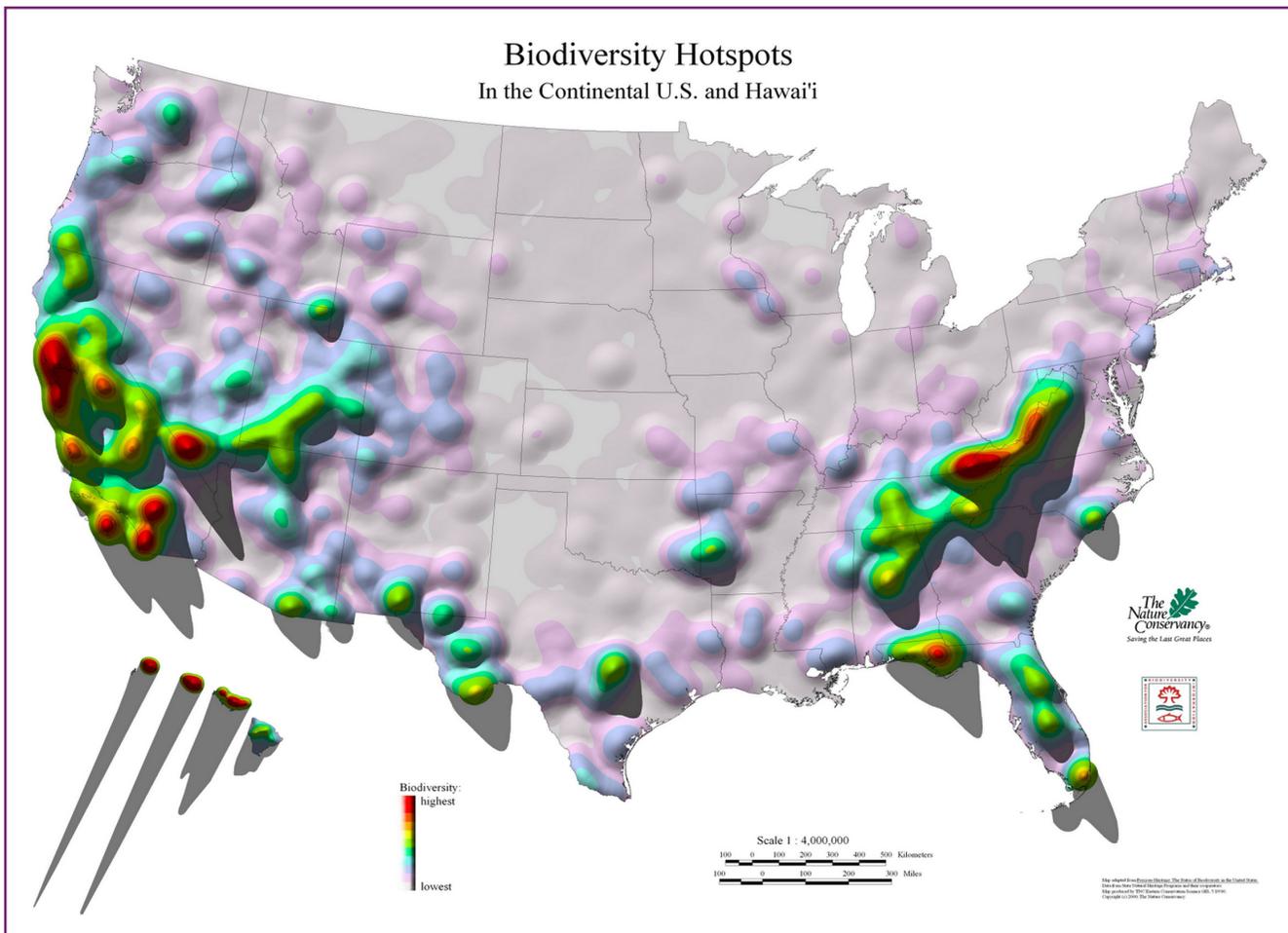


Figure 1. Hot spots of biodiversity in the U.S., from The Nature Conservancy

Natural History

Historically, agriculture has been limited in the Mid-Atlantic Highlands due to topographical features, climate, and poor soils⁶. Because of this, extensive forests still cover much of the region. While forest is the dominant land cover, the Highlands are sprinkled with natural communities of more limited distribution, including mountain bogs, grass balds, shrub balds, and shale barrens. This communal diversity contributes to the high biodiversity of the region⁷.

One major determinant of where different vegetative communities occur is soil type⁸. Soils derived from limestone are nutrient rich with low acidity, whereas soils derived from sandstone are nutrient poor and fairly acidic⁹. Many species with more narrow requirements for soil condition are limited to limestone soils. These include sugar maple, redbud, dogwood, and red cedar. Hardier species that can withstand conditions in nutrient poor sandstone soils include red maple, most oaks, red spruce, balsam fir, eastern



Photo: Christine Carpenter/USFWS

hemlock, mountain laurel, and blueberry¹⁰. Topography and aspect in relation to the sun result in vastly different moisture, temperature, and light regimes that change with elevation and between north and south facing mountain slopes¹¹.

The Mid-Atlantic Highlands consist of three north-south running physiographic mountain provinces (Figure 2). These are, from east to west, the Blue Ridge, Ridge and Valley, and Appalachian Plateau. The Blue Ridge province consists of two sections with different features, separated by the Roanoke River¹². The northern Blue

Ridge is comprised of rugged wide flat-topped mountains, while the southern Blue Ridge is an elevated plateau cut by deep stream valleys¹³. The Ridge and Valley province is characterized by steep ridges separated by deep valleys¹⁴. Most of the ridge-tops consist of sandstone. The Appalachian Plateau province encompasses much of the state of West Virginia and parts of Virginia and Pennsylvania and consists of mountains with broad flat summits and horizontal layers of rock underlain by coal seams¹⁵.

Notable faunal species include freshwater mussels, many of which are endangered due to degradation of streams and rivers with sediment and contaminants from human activities. There are 30 species of endangered mussels in the Mid-Atlantic Highlands¹⁶.

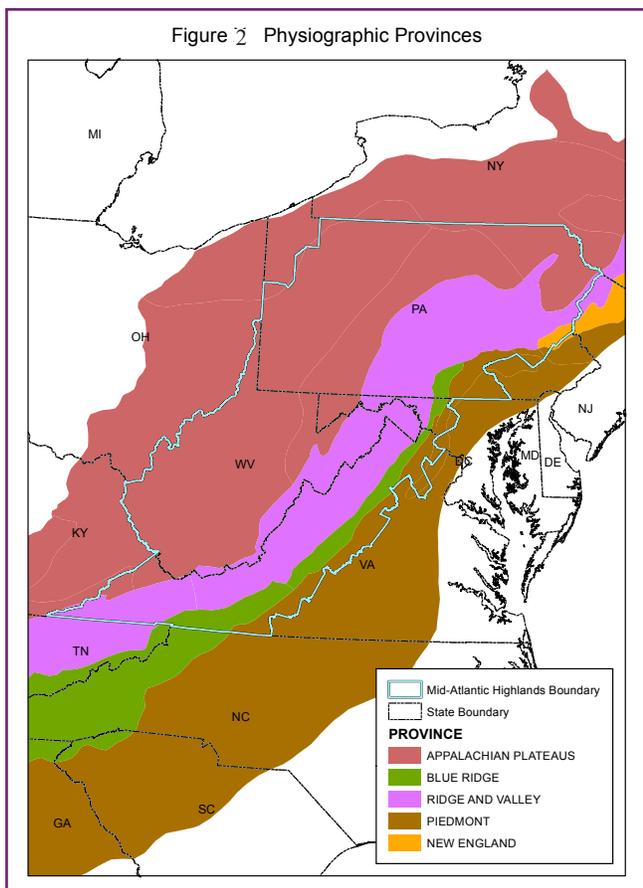


Figure 2. Map of Physiographic Provinces in the Mid-Atlantic Highlands



Clubshell mussel. Photo: USFWS

Salamanders are an important Mid-Atlantic Highland fauna that hold a key position in the forest food chain¹⁷. The common red-backed salamander is said to have a greater total biomass in forests than common mammals like deer¹⁸. Red-backed salamanders feed on insects and other invertebrates on the forest floor and serve as food for raccoons, skunks, snakes, and other woodland animals¹⁹. Several closely-related salamander species are rare, occurring in small isolated mountain pockets. These include the Peaks of Otter salamander (Federal candidate for listing; globally imperiled), the Cheat Mountain salamander (federally threatened; globally imperiled), the Big Levels salamander (globally imperiled), and the Shenandoah salamander (state endangered; federally endangered; globally critically imperiled) which occurs only in Shenandoah National Park.



Golden winged warbler.
Photo: Bill Hubrick



Cerulean warbler.
Photo: Bill Hubrick



Cheat mountain salamander.
Photo: Ryan Hagerty/USFWS



Red-backed Salamander © John White - Virginia Herpetological Society

mature forests are experiencing the most drastic declines. Extensive forest clearcutting prior to the 20th century and selective harvesting of larger trees and fire suppression

declines center on changes in land use over the last 100 years that have permitted grassland and shrub land to succeed to forest. Mountain top removal mining, which has destroyed thousands of acres of Mid-Atlantic Highland forests needed by species like the cerulean warbler, actually benefits early successional species when the mines are reclaimed and managed as early successional vegetative communities.

Cerulean Warblers are declining due to changes in the forest structure from human activities

The ridges and river valleys of the Mid-Atlantic Highlands are a major flyway for migrating passerines, raptors, and waterfowl²⁰. The region supports 80 out of 86 priority bird species identified by the Appalachian Mountain Joint Venture in the Appalachian Mountain Bird Conservation Region. High priority birds of particular concern include the Atlantic Canada goose, American black duck, American woodcock, upland sandpiper, and nine neotropical migratory songbirds, namely Bewick's wren, Henslow's sparrow, wood thrush, cerulean warbler, Kentucky warbler, worm-eating warbler, golden-winged warbler, prairie warbler, and blue-winged warbler²¹.

Nesting birds that require early successional scrub-shrub and grassland habitat and those that use

thereafter have reduced habitat quality and quantity for these species²².

Early successional bird species in decline include the Henslow's sparrow and upland sandpiper, which require grasslands, and the golden-winged warbler and the Appalachian subspecies of Bewick's wren, which nest in shrub lands. The Appalachian Bewick's wren is thought to be extinct through most of its range²³. Reasons for these

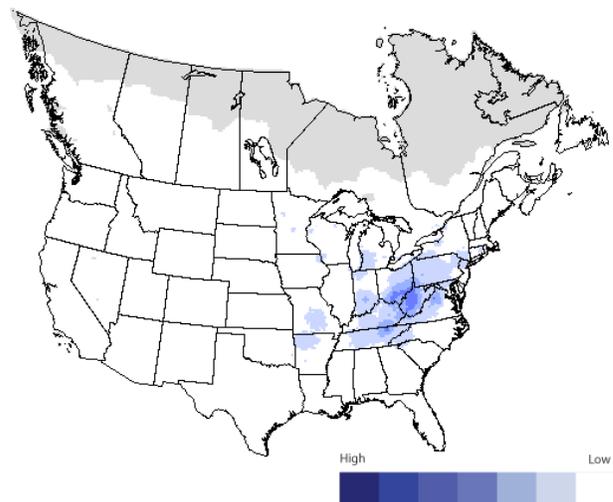


Figure 3. Relative Abundance of Cerulean Warbler (Breeding Bird Survey Data 1994-2003; USGS Map)

Parts of the Mid-Atlantic Highlands serve as the core of the cerulean warbler range where they nest in the greatest numbers in mature forests (Figure 3). Yet, they are declining even in these areas²⁴. This is attributed to major changes to forest structure and function over the last 200 years due to human activities. Fire suppression, selective harvesting, the introduction of exotic species, diseases, and suburban development are some of the causes of these changes. Mountain top removal mining and valley fill activities are particularly destructive to both mountain and valley forests used by cerulean warblers for breeding and migrating.

Listed above are regional human impacts to birds and their habitat. The effects of global climate change to natural communities and native species in the Mid-Atlantic Highlands will most likely result in

the extinction of less mobile and adaptable species and migration northward of more resilient flora and fauna. Native cold water fish species such as eastern brook trout will be increasingly vulnerable as the Mid-Atlantic Highlands warm. For years, eastern brook trout have been declining throughout their range²⁵. In Mid-Atlantic Highlands streams, this decline has been attributed to high water temperature, agriculture, poor riparian conditions, non-native fish species, and urbanization (Figure 4).

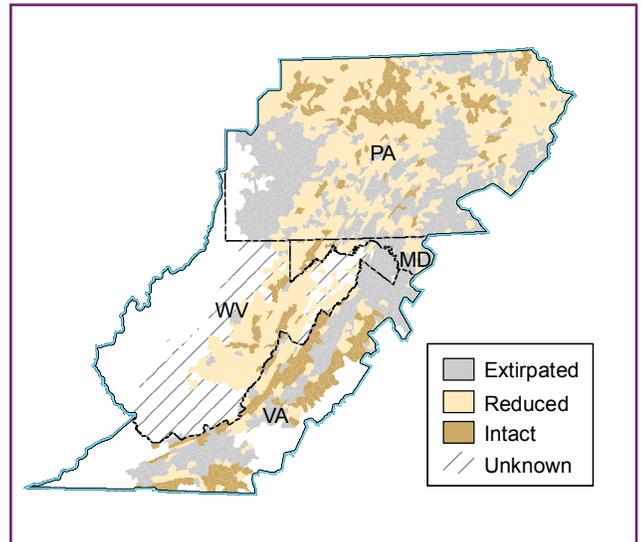


Figure 4. Brook Trout Distribution Map



Photo: Christine Carpenter/USFWS

Highland Culture

Appalachian culture developed through a rich blend of Native American, Irish, English, Scottish, German, and Polish traditions. A distinctive Appalachian culture became established over the years because of the isolation of the people and communities within the rugged terrain of the mountains. Unique Mid-Atlantic Highlands arts and crafts, music, food, customs, traditions, and language distinguish the region from other parts of the United States²⁶. Mid-Atlantic Highlands traditions that continue to this day include group games, homemade objects, story-telling, natural remedies, unique styles of dancing, tool making, basket weaving, quilting, and traditional music played on handmade instruments²⁷.

In a tradition inherited from the Cherokee and other Native American tribes, the Appalachian people developed a culture of applying natural and herbal remedies to treat various illnesses and injuries²⁸. These include wild plants, such as American ginseng and onions, and other substances including kerosene, whiskey, and tobacco juice²⁹.

While the use of many mountain remedies has died out through the years, American ginseng harvesting is still practiced, particularly in West Virginia, one of three Appalachian states that lead the U.S. in the export of this increasingly rare plant³⁰. American Ginseng is used as a cold remedy and is sold primarily to the Chinese market. Habitat destruction and overharvesting for local and foreign use has reduced the occurrence of wild American ginseng in the mountains. The rarity of American ginseng has translated into high market prices so that, per pound, American ginseng is considered by some to be the most valuable renewable natural resource in the mountains of West Virginia and several southern Appalachian states³¹. Another consequence of habitat loss and overharvesting is that wild American ginseng is listed as at-risk and vulnerable with a moderate threat of extinction³².



Eastern Brook Trout. Photo: USFWS

Native Coldwater fish species such as Eastern brook trout will be increasingly vulnerable as the Mid-Atlantic Highlands warm.



American Ginseng. Photo: USFWS

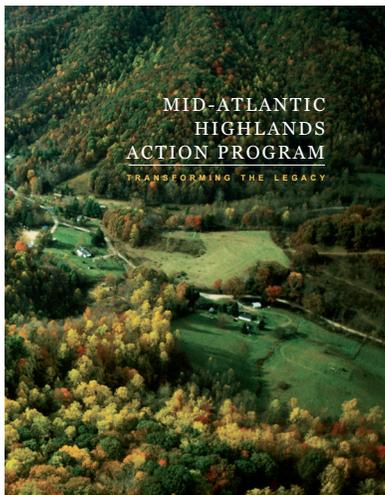


*[Earl Palmer Collection, (ep.206)], Digital Library and Archives, University Libraries, Virginia Tech
[<http://spec.lib.vt.edu/imagebase/palmer/full/ep206.jpeg>]*

II. Challenges and Opportunities

Hundreds of years of human occupation and resource extraction have resulted in numerous ecological and social challenges for the future of the Mid-Atlantic Highlands. Urban infringement, logging, mining, energy development, and agricultural practices have degraded the environment and lowered the quality of life in many parts of the region. Additionally, the same isolation that favors high ecological diversity and strong cultural heritage has resulted in economic challenges, high unemployment, and poverty in many communities³³.

To begin to address the challenges faced by this unique region, Congress established the Mid-Atlantic Highlands Action Program (HAP), a federal, state, and local partnership, to cultivate and support restoration and conservation activities in rural Mid-Atlantic Highlands communities. In their 2002 report for Congress titled “Mid-Atlantic Highlands Action Program Transforming the Legacy,” the HAP partnership documented the need for a Highlands Action Program by highlighting environmental stressors, human activities contributing to environmental stressors, and factors affecting economic conditions in the Mid-Atlantic Highlands³⁴.



*AES Laurel Mtn looking at Bielington in Barbour County WV.
Photo: John Terry*

Environmental Stressors

Environmental stressors are both natural and human-caused³⁵. The major environmental stressors identified in the Transforming the Legacy Report were riparian and aquatic habitat loss, sedimentation, acid mine drainage, acid deposition, forest fragmentation, flooding, ozone pollution, waterborne pathogens, invasive species, persistent pollutants, and climate change³⁶. These are still major concerns in 2016, with the addition of potential environmental impacts from oil and gas extraction through hydraulic fracturing (fracking), mountain top removal mining, and the placement of wind farms on ridge tops.

The Mid-Atlantic Highlands harbor the highest species diversity in the

Northeast and Mid-Atlantic regions, with a total of 7,452 flora and fauna³⁷.

In a 2012 study by The Nature Conservancy, the Central Appalachians of Pennsylvania, Maryland, Virginia, and West

Climate change migration corridors such as forested ridge lines in the Central Appalachians must be protected if we are to increase the odds for many species to survive climate change.

Virginia (roughly synonymous with the Mid-Atlantic Highlands) were determined to be one of the most resilient landscapes in the region to climate change with the greatest potential to support the migration of species from south to north and from low elevations to high elevations as the climate warms³⁸. The forested ridgelines of the Mid-Atlantic Highlands provide an important linkage for species



Mountain top Removal near Rawl, WV. Photo: Kent Kessinger of Appalachian Voices. Flight courtesy of Southwings.

movement between the southern and northern Appalachians. The Nature Conservancy concluded that migration corridors in the Central Appalachians must be protected if we are to increase the odds for many species to survive climate change. This has important implications for wind development, which generally occurs on ridges, as well as mountain top removal mining.

In recent years, coal mining activities have declined and are being replaced by hydraulic fracturing (fracking) as the major resource extraction industry in the Mid-Atlantic Highlands³⁹. Fracking carries with it its own environmental burdens in the form of land clearing for well pads, use of large quantities of water and chemicals, and the disposal of used fracking waste fluid into underground wells⁴⁰.

Appalachia has some of the largest reserves of gas-bearing shale deposits in the country. This is expected to create many jobs in this exceedingly poor area of the country. However, to date, job creation is far below what was expected and many of the gas development jobs are temporary, since fewer workers are required once well construction is complete⁴¹. As with coal, the long-term contribution of gas development to the Mid-Atlantic Highlands economy may prove unsustainable and gas extraction may have its own long-term environmental consequences.

Among its many predicted impacts, climate change is expected to alter species distribution worldwide. This is true for the Mid-Atlantic Highlands, which are projected to see many species migrations northward and upward in elevation

as the climate warms. Mountain top species and communities, some of which are already rare, may not survive, especially if their limited dispersal ability leaves them with no alternative but to migrate upward in elevation, where they

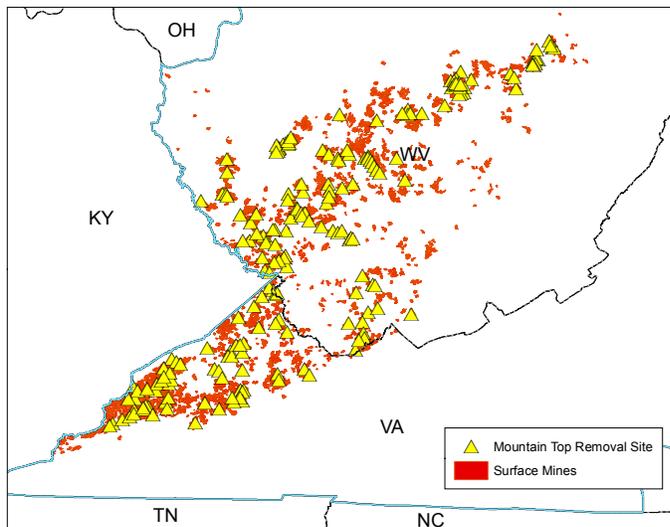


Figure 5. Two million-acre surface mine footprint

may eventually run out of mountain and become extinct. This may be particularly important for high elevation forest communities in the Mid-Atlantic Highlands, like red spruce forests which are the climax floral community in many mountain ecosystems⁴². Species that inhabit high elevation cold water streams, like eastern brook trout, may also see declines in the Mid-Atlantic Highlands as the climate warms and instream temperatures increase.

Surface mining is the major force of landscape change in the Mid-Atlantic Highlands⁴³. Mountain top removal with valley fills is the form of surface mining that has the most dramatic impact on the landscape. Mountain top removal with valley fill operations remove up to 600 feet of soil and rock that lies above layers of coal⁴⁴. The rock and soil is deposited into adjacent headwater stream valleys, effectively eliminating large sections of stream habitat. Mountain top removal operations in the central and southern Appalachians have converted 2 million acres of mountain forests into surface mines and buried more than 1,200 stream miles since 1990^{45, 46} (Figure 5). Appalachian headwater streams support a high diversity of amphibian and fish species. Some of these species' only occurrence in the world is in one or two small watersheds in the Mid-Atlantic Highlands. The effects of valley fills do not stop at the headwaters. The removal of forests and underlying soils and rock and the placement of tons of this material into small stream valleys releases large amounts of flood water, sediment, nutrients, and rock-derived chemical toxicants downstream, altering the natural, chemical, and physical processes of entire watersheds⁴⁷.

Some of the climate-related changes predicted to be experienced by people of Mid-Atlantic Highlands states include: increased number of days over 90 degrees Fahrenheit compounding health issues for vulnerable people; reduced air quality; heat stress-related declines in milk production in cows; reduced yield and increased pest infestation in agricultural crops; reduced tourism due to the decline in winter sports like skiing and snowmobiling; decline in economically important hardwood tree species like sugar

maple, black cherry, and American beech; and the loss of habitat for many migratory and resident bird species important for hunting and bird watching⁴⁸. For example, as much as one-half of bird species in Pennsylvania could be reduced by 25 percent, including several songbird species and ruffed grouse, an important game species⁴⁹.

Socioeconomic Conditions

For years, many communities in the Mid-Atlantic Highlands have struggled with serious economic

problems, including high rates of poverty, low educational attainment, high unemployment, and low per capita income⁵⁰. While the standard of living in Appalachia has seen notable improvements in recent years, the region continues to rank below the national average for many quality of life indicators⁵¹. The Mid-Atlantic Highlands' isolation and undiversified economies are the main reason for this disparity, resulting in high rates of out-migration of youth and working-age residents, low levels of educational attainment, and stagnant income in many areas⁵². Environmental and socioeconomic issues are often connected. This can be particularly evident in poor rural communities where jobs are scarce, incomes are low, and people

are struggling to meet basic needs. The result being that many have difficulty recognizing the potential economic and quality of life benefits that can be derived from good environmental stewardship⁵³.

Using U.S. Census Bureau data^{54, 55}, HAP compared socioeconomic conditions in the Mid-Atlantic Highlands region with the rest of the United States. In almost every socioeconomic indicator that was consulted, the Mid-Atlantic Highlands lags behind the rest of the U.S. Over the years there has been some improvement, but in general, this is still the case in the region.

In the U.S. Census Bureau's 2013 American Community Survey, thirteen HAP counties, five in Virginia and eight in West Virginia, had over one-third of children living in poverty and 47.4 percent of HAP counties had child poverty rates that were greater than the national average of 21.6 percent (Figure 6a).

While the standard of living in Appalachia has seen notable improvements in recent years, the region continues to rank below the national average for many quality of life indicators.

In 2013, 66.5 percent of HAP counties fell below the national average for adult high school graduation. However, at 87.5 percent, the aggregate number of adults in the Mid-Atlantic Highlands had a greater high school graduation rate than the national average of 86 percent (Figure 6b).

Figure 6a

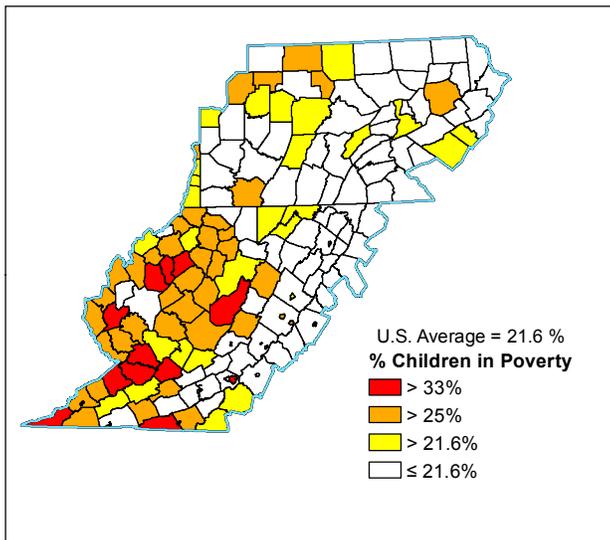
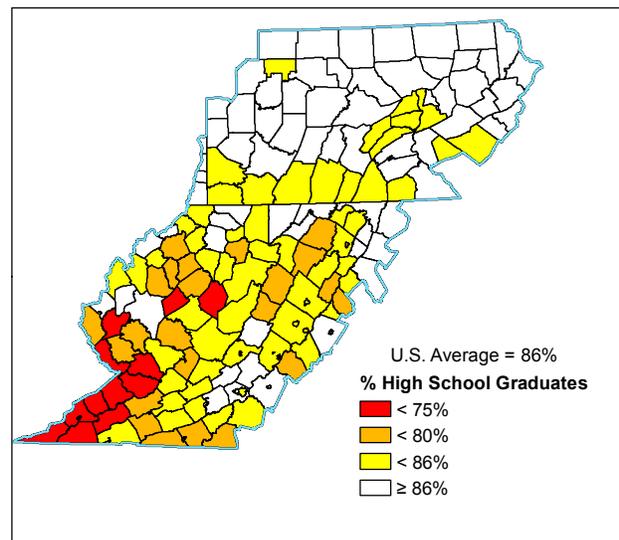


Figure 6b



Socioeconomic quality of life indicators in the Mid-Atlantic Highlands. (a) percent of children in poverty; (b) percent of adults with a high school diploma; (c) percent unemployment; (d) percent of population participating in the workforce; (e) per capita income; (f) percentage of population with access to high-speed internet; (g) percent population change; (h) outmigration as indicated by change in percent of children.

Figure 6c

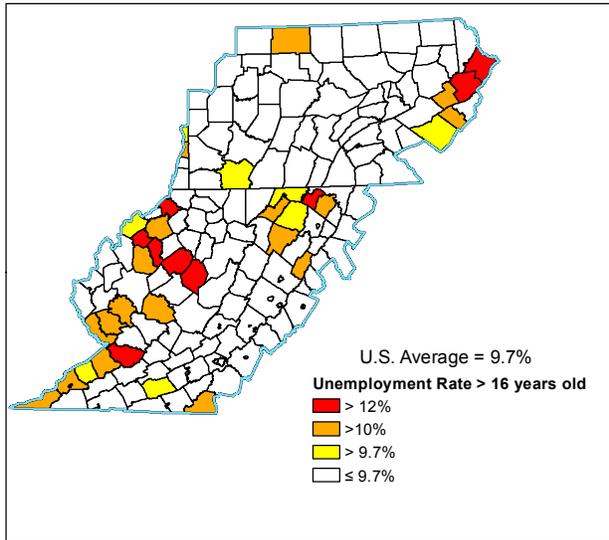


Figure 6d

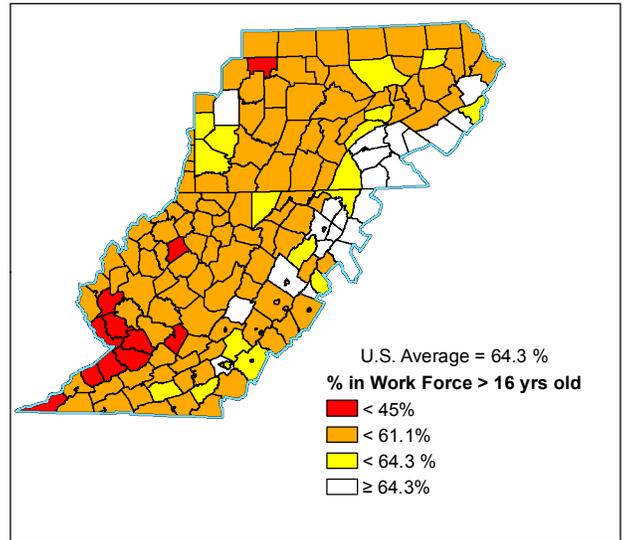


Figure 6e

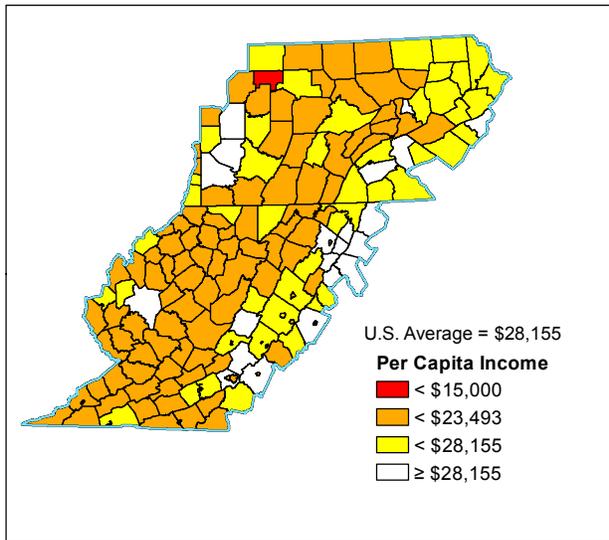


Figure 6f

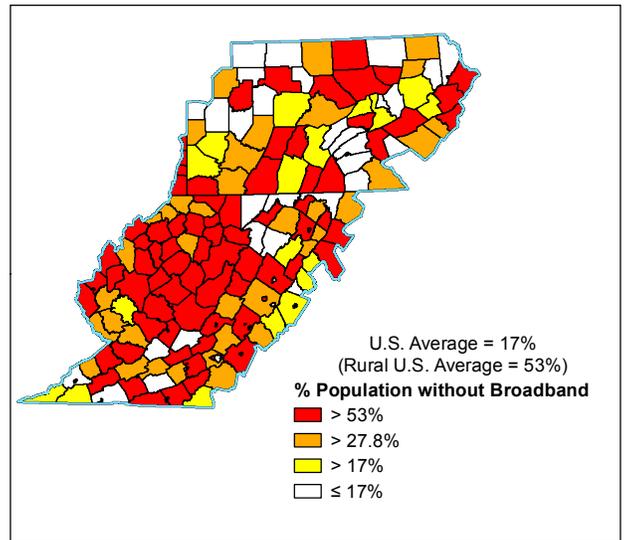


Figure 6g

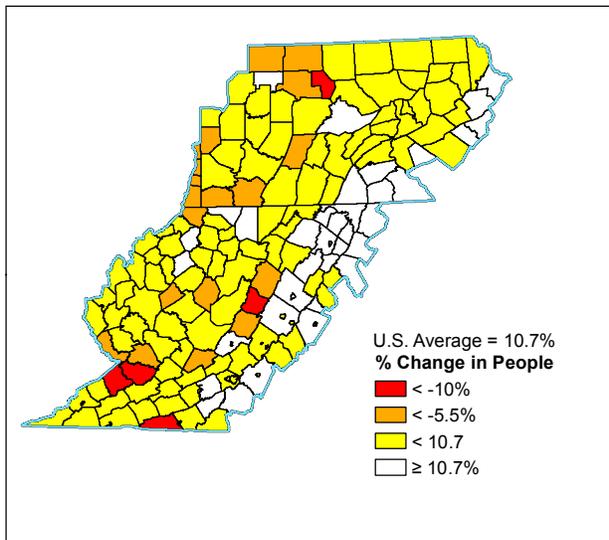
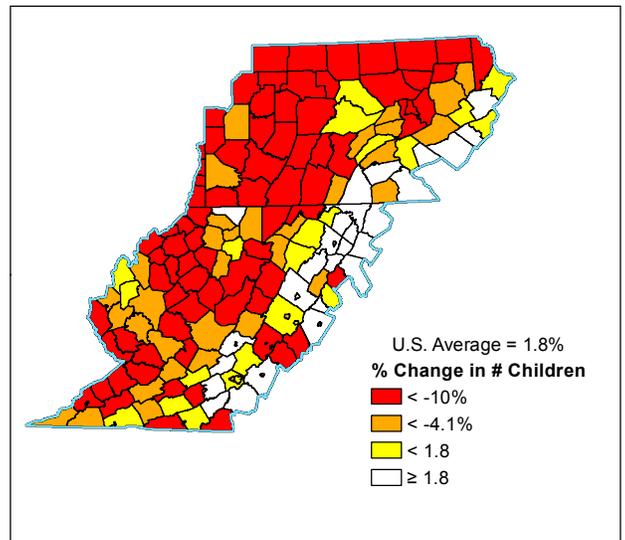


Figure 6h



Unemployment rates are higher than the national average in many HAP counties. In 2013, 20.2 percent of HAP counties had unemployment rates that were greater than the national average of 9.7 percent. Some HAP counties greatly exceeded the national average for unemployment. In 2013, 27 HAP counties experienced over 10 percent unemployment and the highest HAP county unemployment rate was greater than 20 percent (Figure 6c).

In 2013, 86.7 percent of HAP counties had lower labor force participation than the national average (Figure 6d). The labor

force consists only of workers who are employed and those who are unemployed but actively looking for jobs. High unemployment and low labor force participation suggest an insufficient number of jobs, low wages, and barriers to employment, such as lack of transportation, daycare, or job skills⁵⁶.

High unemployment in the Mid-Atlantic Highlands has been attributed to the loss of blue collar mining, silviculture, and agricultural jobs as these industries have declined or reduced their workforce due to greater mechanization⁵⁷. In 1980, there were 100,000 coal miners

in the Mid-Atlantic Highlands⁵⁸. In 2011, the region employed only 37,721 coal miners⁵⁹.

Earnings for Highlands residents are 16.6 percent lower than the national average, at \$23,493 compared to \$28,155 nationally. In addition, income is lower than the national average in 87 percent of Mid-Atlantic Highlands counties. (Figure 6e).

High speed internet access is indicative of a good technology base. In addition to highways and other infrastructure like wastewater treatment facilities, high speed internet is considered to be vital for sustainable local economies⁶⁰. According to Federal Communications Commission data⁶¹, 27.8 percent of Mid-Atlantic Highlands residents are without high speed internet, while nationwide, only 17 percent of Americans are without high speed internet (Figure 6f). In rural parts of the U.S., 53 percent of the population is without high speed internet. For rural areas of the Mid-Atlantic Highlands states, non-access to high speed internet is 50 percent. The breakdown for each state is 27 percent in Maryland, 38 percent in Pennsylvania, 60 percent in Virginia, and 74 percent in West Virginia⁶². In the Mid-Atlantic Highlands, there are 28 counties where more than 95 percent of residents have no access to high speed internet. Three counties, Highland County, VA and Hampshire and Hardy Counties, WV, have no high speed internet access.

Between 2000 and 2013, the total population of the Mid-Atlantic Highlands increased by 5.5 percent, but many counties experienced negative growth (Figure 6g). Nationwide the total population increased by 10.7 percent. The slow population growth in the Mid-Atlantic Highlands has been attributed to the loss of high paying blue collar jobs in the manufacturing and natural resource extraction industries causing out-migration of the working population⁶³. Out-migration of the younger working age population as evidenced by the number of children in households is consistently greater than the national average. In 2013, the percentage of children in the Mid-Atlantic Highlands population was



WV miners preparing for their shift. Photo: Lyntha Scott Eiler courtesy of American Folklife Center, Library of Congress

20.8 percent, compared to 23.6 percent nationwide. From 2000 to 2013, the percent of youth in the Mid-Atlantic Highland population declined by 4.1 percent, with seventeen counties declining by over 20 percent, whereas the U.S. experienced a 1.8 percent increase in the percent of children in the total population (Figure 6h).

Human Health

Many studies have demonstrated links between socioeconomic status and health⁶⁵. It is not surprising, therefore, that trends in the health of communities in the Mid-Atlantic Highlands are similar to those illustrated above for socioeconomics. The annual County Health Rankings measure vital health factors, including high school graduation rates, obesity, smoking, unemployment, access to healthy foods, the quality of air and water, income, and teen births in nearly every county in America. Using The County Health Rankings developed and summarized by the University of Wisconsin Population Health Institute⁶⁶, the health of Mid-Atlantic Highlands communities lagged behind the national average for many indicators. For those metrics examined, 90 percent of HAP counties were worse than the national average for at least one metric. Overall Highlands counties were worse than the national average for premature death, number of adults reporting fair or poor health, number of poor health days and mental health days, as well as adult obesity. However, Highlands counties fared better or equal to the national average for proportions of low birthweight infants, number of insured, and access to healthy food.

As with the socioeconomic metrics, the most extreme HAP counties paint a sober picture of community health for certain parts of the Mid-Atlantic Highlands. For example, the 10 unhealthiest counties ranged up to double the national average for premature deaths, adults reporting fair or poor health, and number of sick or poor mental health days.

The unbroken cycle of socioeconomic distress in the Mid-Atlantic Highlands has resulted in the loss of human, natural, and physical capital over time, which in turn stifles economic growth⁶⁷. The paradox is that the region is rich in energy and water, providing conditions that sustain industries such as farming, forestry, mining, and manufacturing that benefit the entire nation, yet it continues to lag behind the rest of the country in quality of life issues⁶⁸. In recent years, this has been attributed to patterns of global trade that have upset the region's already fragile natural resource-based economy⁶⁹.

Communities benefit from protecting healthy watersheds and restoring damaged ecosystems in terms of economic savings, job creation and improved quality of life.

Over time, communities benefit from protecting healthy watersheds and restoring damaged ecosystems in terms of economic savings, job creation, and improved quality of life. Ecological services provided by healthy watersheds include water filtration and storage, air filtration, carbon storage, nutrient cycling, soil formation, recreation, food, and timber⁷⁰. Protecting healthy watersheds reduces drinking water treatment costs, alleviates the need for expensive ecosystem restoration,

supports the outdoor recreation and tourism industries, lowers the impacts of natural disasters, increases property values, and provides the foundation of a healthy economy for future generations⁷¹.

Watersheds with greater forest cover have been found to decrease water treatment costs substantially. An analysis of 22 water supply systems in the U.S. found that an increase in forest cover from 10 percent to 60 percent reduced the cost of drinking water treatment by 68 percent⁷². In New York City, the cost of land conservation estimated to protect water quality (\$1.5 billion) was dwarfed by estimates to construct a new drinking water filtration plant (\$8 to \$10 billion⁷³). Natural landscapes also reduce the impacts of flooding, allowing rainwater to slowly infiltrate through the soil, reducing erosion and high stream flows, and permitting groundwater recharge.

Sustainable Environmental Stewardship

In areas impacted by environmental degradation, activities are frequently required to restore the ecological services lost to the community. Restoration construction can take many forms depending on the magnitude of the damage and the type of habitat to be repaired. Wetlands and streams are typically



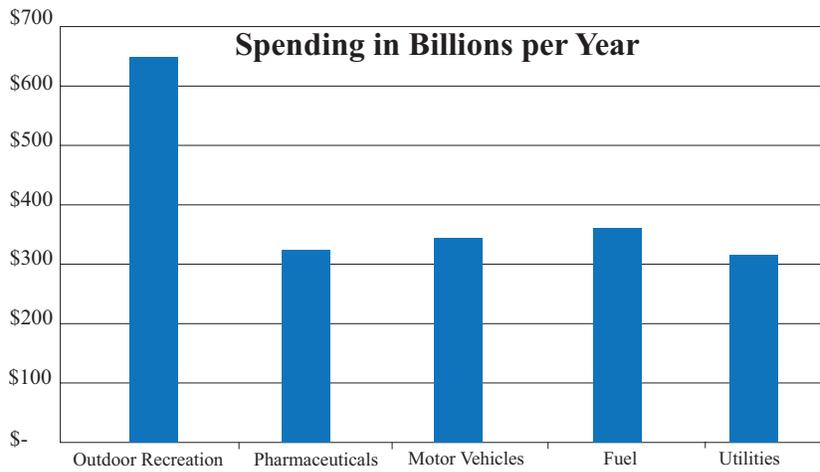
Photo: USFWS

restored by reestablishing hydrology and function. This can be very expensive, but also provides jobs in both skilled (e.g. engineering and large equipment operation) and unskilled (e.g. tree planting) occupations. According to Restore America's Estuaries⁷⁴, the ecological restoration industry provides between 20 and 32 jobs per \$1 million spent, compared to road infrastructure projects (7 jobs) and oil and gas development (5 jobs).

The ecological restoration industry provides between 20 and 32 jobs per \$1 million spent, compared to road infrastructure projects (7 jobs) and oil and gas development (5 jobs).

Many rural highland communities are weighing the short-term benefits and long-term costs of resource extraction industries such as mining and oil and gas development. Too heavy a reliance on these industries has contributed to the endless cycle of poverty and habitat degradation

in Appalachia. Local Mid-Atlantic Highlands economies that invest in natural and human capital in addition to extractive industries are better prepared to weather the effects of fluctuating global markets and provide a higher quality of life for current and future citizens⁷⁹.



The majority of environmental restoration jobs and money remain in the local community. In Oregon, for example, \$0.80 from every dollar spent stays within a given county and \$0.90 of every dollar stays in the state⁷⁵.

Another economic driver, especially important to rural communities is the outdoor recreation industry, which supports and services activities such as bicycling, camping, fishing, hunting, off-roading, snow sports, trail sports, water sports, and wildlife viewing. Every year Americans spend \$646 billion on outdoor recreation, supporting 6.1 million jobs and providing almost \$40 billion each in state and federal tax revenue⁷⁶. The national outdoor recreation economy grew 5 percent annually during the recent economic recession when many industries contracted. Spending on outdoor recreation nationally exceeds spending on pharmaceuticals (\$331 billion), motor vehicles (\$340 billion), fuel (\$354 billion), and utilities (\$309 billion) (Figure 7)⁷⁷. The national outdoor recreation industry employs more workers than the real estate, oil and gas development, information technology, education, transportation, finance, and construction industries⁷⁸.



Randy Sprouse fishing on the Coal River at Hazy Creek, West Virginia. Photo: Terry Eiler courtesy of American Folklife Center; Library of Congress



Photo: Joseph Rossbach Photography

Mid-Atlantic Highlands economies that invest in natural and human capital in addition to extractive industries are better prepared to weather effects of fluctuating global markets and provide a higher quality of life for current and future citizens.

III. History of the Highlands Action Program

Initially led by the U.S. Environmental Protection Agency (EPA) and the Mid-Atlantic Highlands States, the Highlands Action Program employed environmental indicators, reliable science, and public and private partnerships to identify problems and develop solutions and management actions, emphasizing on-the-ground activities. At present, the U.S. Fish and Wildlife Service (USFWS) is working to reinvigorate the HAP initiative, in order to attract more resources and attention to this ecologically important yet underfunded geography.

The HAP concept employs a Natural/Green Infrastructure approach to strategically identify places of ecological and cultural significance with the goal of protection and restoration⁸⁰. Specifically, HAP aims to improve natural resources and socioeconomic conditions by:

- Highlighting and protecting special places
- Revitalizing damaged ecosystems
- Empowering people and their communities to strengthen the bonds between cultural heritage, economic viability, and the health of the environment
- Creating lasting employment opportunities in the restoration industry for Mid-Atlantic Highlands residents
- Leveraging resources to achieve these goals

From 2002 to 2012, HAP leveraged \$8.8 million in federal funds with partner resources to protect more than 10,000 acres of forests and wetlands; restore over 100 acres of



HAP uses a Natural/Green Infrastructure approach to strategically identify places of ecological and cultural significance with the goal of protection and restoration.

strip-mined land by planting native red spruce, creating wetlands, and repairing 12,000 feet of streams; treat 60 miles of eastern brook trout streams for acid mine drainage; remove 3 fish passage barriers; provide environmental leadership training to 100 youth and 50 community leaders; and plan and assess 16 watershed restoration and protection projects.

Congress funded the establishment of the Mid-Atlantic Highlands Action Program in 2002 with an initial appropriation of \$1 million. Each of the Mid-Atlantic Highlands States (Maryland, Pennsylvania, Virginia, and West Virginia) designated an official state liaison for HAP. The state liaisons together with key EPA staff comprised the HAP Management Team responsible for planning and conducting the program. The HAP

Management Team agreed upon a charter signed by the Governors of the four Mid-Atlantic Highlands States that identifies long-term goals and near-term objectives and highlights the significance of the Mid-Atlantic Highlands as a special place where stewardship of the environment is an important part of the community, quality of life, and economics of the region. With the initial Congressional appropriation, HAP and its state and local partners leveraged the federal funds to complete 25 restoration and conservation projects in the Mid-Atlantic Highlands.

Examples include:

- Improved water quality and aquatic habitat in the Coal River watershed in West Virginia, through stream restoration and sewer service extensions. Part of a comprehensive plan to address water quality, stream habitat, and public access in the Coal River watershed, including the establishment of a water trail on the Coal River, the project also enhanced economic opportunities by attracting recreational tourism to impoverished communities in the watershed.
- Obtained \$500,000 from The Nature Conservancy's Aquatic Trust Fund to design and construct a stream restoration project on one-mile of eroding stream bank in Blacks Run in Harrisonburg, Virginia. The project, located in a popular public park, significantly reduced sediment, improved water quality, enhanced aquatic habitat, and provided environmental education opportunities through interpretive signage.

- Worked with partners to restore and protect the 250-mile long Kittatinny Ridge in Pennsylvania, a globally significant flyway for raptors and songbirds. The Kittatinny Ridge also supplies clean drinking water for 600,000 people and provides a critical ecological connection between northern and southern Appalachian forests. HAP guided the expenditure of \$400,000 in state grant funds to conservation organizations for planning, outreach, and land protection.

- Worked with state, federal, and local partners to restore eastern brook trout access to Cash Valley Run in Maryland by mitigating three culvert barriers. HAP leveraged

\$15,000 in design funds to complete this project which reestablished connectivity of aquatic resources, increased sport fishing, and raised public awareness of eastern brook trout and riverine issues.

In 2010, HAP received \$2,000,000 from Congress to benefit

Despite all of the forces that continue to act upon them, the Mid-Atlantic Highlands still function as an intact mountain ecosystem. With a renewed effort to target and fund conservation projects in the Mid-Atlantic Highlands, HAP will aid in protecting the Appalachian landscape and culture and foster economic growth in Appalachian communities.

communities and to protect and restore rivers and watersheds in the Potomac Highlands. The Potomac Highlands Implementation Grant (PHIG) Program, administered by American Rivers, awarded funds for eight conservation and restoration

partnerships in the four Mid-Atlantic Highlands States. The PHIG program was completed in 2015 and benefits were reported to partners via the “EPA Potomac Highlands Implementation Grants: Helping Lands, Rivers, and communities of the Potomac Highlands” final report⁸¹. The following projects were selected because collectively they supported local economies, improved quality of life, and protected and restored valuable ecosystems in the Mid-Atlantic Highlands.

- Frostburg Grows Project – This partnership of the Western Maryland Resource Conservation

and Development Council, Frostburg State University, and Maryland Department of Natural Resources constructed a greenhouse complex using sustainable building practices on five acres of reclaimed mine lands to raise native tree seedlings for projects that restore abandoned strip mines.

The facility also produces a sustainable source of local fruits and vegetables and helps to train members of the community in state-of-the-art cultivation and production techniques.

- Marsh Creek Watershed Conservation Easement – Grant funds were awarded to the Land Conservancy of Adams County, Pennsylvania, to purchase a conservation easement on 145 acres of woodland in the headwaters of Marsh Creek as part of a project that protected 585 acres of high quality forests and working orchards.

- Restoring the Riparian Corridor in Waynesboro’s Riverfront Parks – Working with Trout Unlimited and the Virginia Department of Game and Inland Fisheries, the City of Waynesboro, Virginia restored riverside habitat and stabilized stream banks to benefit water quality along the South River, which once supported eastern brook trout.
- Shenandoah Valley Priority Lands Project – HAP partnered with the Potomac Conservancy to protect 1,100 acres of priority farmland and forests in Virginia’s northern Shenandoah Valley. In addition to supporting farms, conserving forests, and preserving heritage and recreational opportunities, the project improved water quality in the Shenandoah River, the Potomac River’s largest tributary.

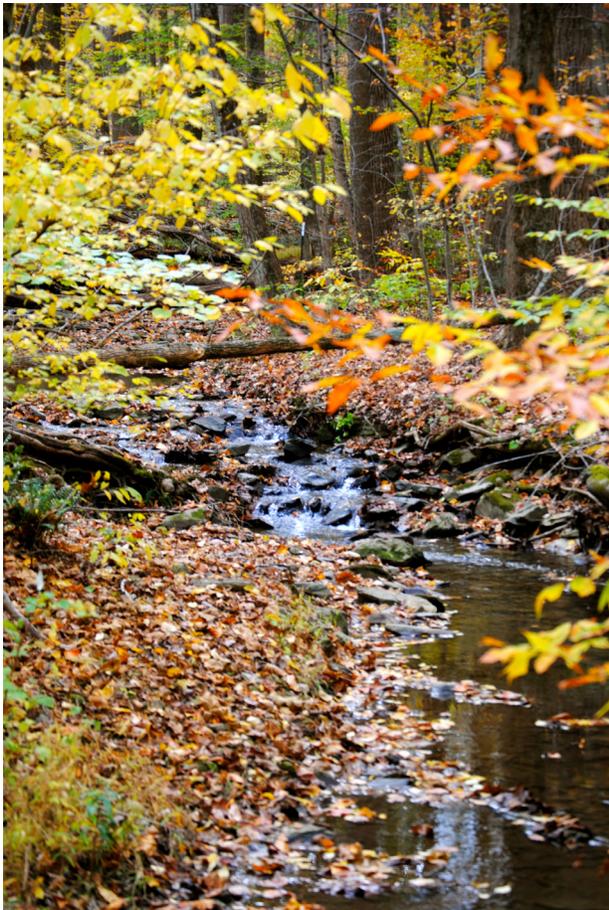


Photo: Christine Carpenter/USFWS

- Pharis Knob-Gandy Creek Restoration Project – In collaboration with the U.S. Forest Service, USFWS, and four non-governmental organizations (NGOs), The Nature Conservancy protected and restored 555 acres of land that connects the Laurel Fork Wilderness and the Seneca Rocks/Spruce Knob Recreation Area of Monongahela National Forest in West Virginia. This forest restoration project enhanced habitat for the rare West Virginia Northern flying squirrel and Cheat Mountain salamander.
- Cacapon Legacy Project – HAP helped the Cacapon and Lost Rivers Land Trust, Inc. protect 2,540 acres that links other protected lands to an existing conservation hub in West Virginia. The project closed a key gap in the Land Trust's Cacapon River Protection Corridor and resulted in the protection of a continuous 2-mile stretch of the main stem of the Cacapon River.
- Mower Tract Ecological Restoration – Green Forests worked with Federal and State agencies and several regional NGO's to restore 181 acres of reclaimed strip mine lands along Lambert Run in West Virginia. Restoration activities included soil decompaction, native red spruce and aspen planting, and wetland, forest, and stream channel restoration. The project will improve habitat for the Northern flying squirrel, native eastern brook trout, and numerous wetland species.



Cacapon River Photo: Historichampshire.org

IV. The Future Highlands Action Program

Apart from EPA Headquarters providing \$200,000 for oversight and management of the Potomac Highlands Implementation Grant Program, HAP has not received Congressional funding since 2010 due to budget constraints. As a result, there have not been any additional projects funded under the HAP Potomac Highlands Implementation Grant Program and the state liaison program has been discontinued. The HAP Management Team, staffed by EPA Region 3 and the USFWS Chesapeake Bay Field Office, is developing a strategy to build capacity and plan future conservation activities in the Mid-Atlantic Highlands using state-of-the-art Green Infrastructure analyses.

Despite all of the forces that continue to act upon them, the Mid-Atlantic Highlands still function as an intact mountain ecosystem. With a renewed effort to target and fund conservation projects in the Mid-Atlantic Highlands, HAP will aid in protecting the Appalachian landscape and culture and foster economic growth in Appalachian communities.

Putting Into Practice

Maryland, Virginia and West Virginia have completed Natural/Green Infrastructure analyses and an analysis for Pennsylvania is in development. Armed with updated, and integrated across states boundaries, Natural/Green Infrastructure tools for all four Mid-Atlantic Highland States, the HAP partnership is poised to embark on a larger scale strategic effort to protect and restore the most significant Mid-Atlantic Highlands landscapes (Figure 8). In addition to state Natural/Green Infrastructure Assessments, HAP will consult and coordinate with highland communities, the Appalachian

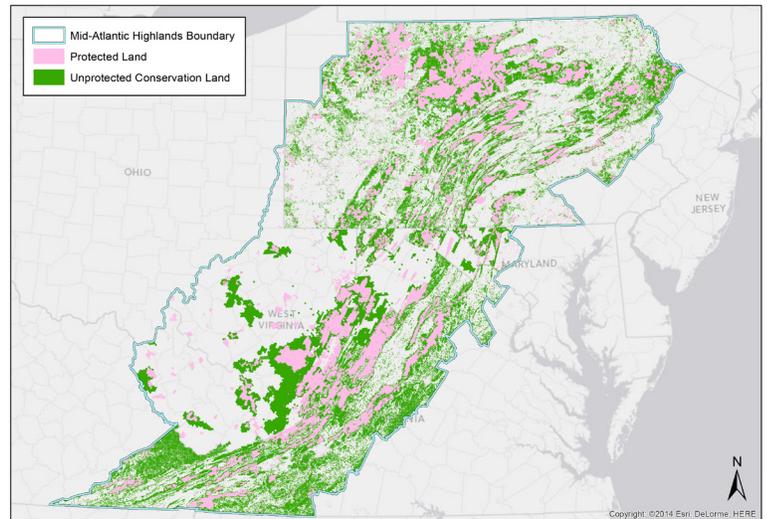


Figure 8. Mid-Atlantic Highlands Conservation Lands

Landscape Conservation Cooperative, Appalachian Mountain Joint Venture, Eastern Brook Trout Joint Venture, Trout Unlimited, The Nature Conservancy, and other conservation organizations engaged in the Mid-Atlantic Highlands to identify areas for conservation and restoration, focusing on working landscapes. As in previous years, funding permitting, HAP will provide funding to qualified stakeholders located in HAP focus landscapes through a competitive proposal process.

The Appalachian Mountains are a culturally and ecologically important landscape and the Highlands Action Program will continue on-the-ground conservation activities to protect and restore the Appalachian land and culture for future generations. HAP aims to enhance the quality of life in the Mid-Atlantic Highlands region, through improvement to the economic, social and environmental systems that make up the community, in order to ensure they are providing a healthy, productive, meaningful life for all community residents, present and future. To accomplish this, HAP will protect a hub/corridor network of ecologically

and culturally important landscapes in the Appalachian Mountains through fee-simple purchases, the purchase of conservation easements, and restoration of degraded habitat. HAP priority landscapes are forests, wetlands, streams, farms, and working rural communities. Target stakeholders include land trusts, state and local government, and watershed associations.

Options and avenues for renewing HAP are being investigated, and if successful the program will focus on the following:

HAP Liaisons - Revive the HAP state-liaison program in each Mid-Atlantic Highland state to promote HAP activities and objectives and work with state and local governments, communities, and NGOs on conservation planning, outreach, and implementation projects. Each state liaison will serve on the HAP management team with the EPA and USFWS to assist with planning and conducting the Highlands Action Program.

Request for Proposals - The expected number of awards per year will be four. The breakdown for successful proposals should be as follows – at least 80 percent on-the-ground implementation; up to 10 percent capacity building/stewardship; up to 10 percent monitoring. The Request for Proposals (RFP) will be managed by a qualified as yet to be named NGO.

HAP Federal Agency Coordination and Oversight - 1 Full-time Staff.

- Serve on HAP Management Team
- Oversee HAP Liaisons
- Coordinate with Landscape Conservation Cooperatives, AMJV, EBTJV
- Active Member of Appalachian Landscape Conservation Cooperative
- Manage budget
- Oversee RFP with managing NGO - assist with selection of awardees
- Prepare annual report for Congress
- Produce E-newsletter
- Pursue additional funding – Land and Water Conservation Fund, grants, foundations, etc.
- develop website



Teacher with students looking at a macroinvertebrate. Photo: USFWS

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Photo: Christine Carpenter/USFWS



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