

HEAL OUR LAND AND OUR PEOPLE:

Create a Modern Civilian
Conservation Corps and Promote
Regenerative Agriculture and
Agroforestry



This white paper was prepared in conjunction with the Reimagine Appalachia coalition by Dr. Patricia DeMarco, Sara Nicholas, PASA Farming, and Dr. Stephen Herzenberg, Keystone Research Center. Thanks to Peggy Berry, Karen Gardner, Jill Kriesky, Allyson Feridun, Amanda Woodrum and the dozens of others across the Reimagine Appalachia coalition that contributed.

[Reimagine Appalachia](#) was created out of a broad recognition that the economy has not been working for most people and places in the Ohio River Valley. In response, a diverse set of economic, environmental and community leaders, and grassroots organizations, came together to find common ground and build the future we want to see—a 21st century economy that's good for workers, communities, and the environment as demonstrated in our campaign [video](#).

Our [policy blueprint, endorsed by nearly 100 organizations](#), was created with the intent that we can rebuild our economy by expanding opportunity through public investments, building a 21st Century economy with investments that create green jobs; and rebuilding the middle class including by strengthening workers' right to form unions in all sectors and boosting local ownership.

These whitepapers are the next stage in Reimagine Appalachia's work to show that federal investments in the people, communities and infrastructure of Appalachia can work to revitalize the region, if politicians are willing to step up to the challenge.

“With its abundance of trees, wetlands, farmland and plants, Appalachia is rich in carbon-absorbing natural resources. Investments in our natural infrastructure to support ‘carbon farming’ would move us toward carbon neutrality by absorbing more greenhouse gases. A modern CCC could protect the climate, create decent work, restore the land and improve public health by promoting healthier diets.”

—[ReImagine Appalachia Blueprint](#)

INTRODUCTION

The ReImagine Appalachia coalition is advancing a sustainable economic vision for a 21st century Appalachia—one that is good for working people, communities, the environment and our health. ReImagine Appalachia’s vision builds on the region’s assets while understanding that vision can’t be achieved without significant public investment, strong public policies, and responsible economic development approaches designed to maximize the benefit to the community as a whole. If done right, national legislation represents an opportunity to secure much-needed federal resources for an Appalachian infrastructure plan, to reimagine our trade policies, and to create a path to more and better jobs in the region and elsewhere.¹ *This white paper addresses the part of the ReImagine vision that relates to land—to our farming and woodlands.*

IN BRIEF

WHY OUR APPROACH TO THE LAND MATTERS

Completely eliminating all carbon emissions, even by 2050, will prove difficult, with eliminating the last 5% to 10% of current emissions levels likely the most difficult. Thankfully, our region is rich in carbon absorbing forests and agricultural land, natural assets on which we should capitalize to achieve net zero emissions and expand economic opportunity.

A substantial share of people in the Ohio River Valley earn some of their living from the land. Farming and forestry account for 6.8% of total employment in Appalachian Kentucky and 2% to 4% in West Virginia and Appalachian Ohio—so we need to creatively bolster farm and forestry income.

CHALLENGES

Parts of our region suffer from persistent poverty and working people in all four states have experienced downward mobility since the 1970s. On top of that, our states have lost 1.1 million jobs since February.²

Our region has experienced a disproportionate share of the environmental damage and other legacy costs from more than a century of coal, oil, and gas extraction.

We are a region of small farms that raised tobacco or mixed small livestock with multiple crops, and with a unique tradition of “forest farming.” But federal policy has favored industrial farming that meshes poorly with our topography and our traditions and failed to support small farmers and landowners.

Over half of the farmers in our region are over age 55 and 85% of primary farmers are white, even though many younger farmworkers are people of color.

Solutions—the Land

Looked at through the lens of climate change, our region’s past land challenges today offer opportunities.

- Our farming and forestry traditions could make our region leaders in the adoption of carbon-absorbing regenerative agriculture and revitalization of agroforestry.
- While urban and even some rural places have lacked access to locally raised food, many factors—environmental, health, quality of life, economic—now encourage support for the local food movement, including community supported agriculture and cooperatives.
- Since we have more mountaintop removal sites, and other places scarred by extraction than other regions, we deserve more federal funds for carbon-absorbing reforestation or reclamation for regenerative agriculture.

Solutions—the People

In the 1930s, the New Deal Civilian Conservation Corps (CCC) employed three million people to plant trees, construct trails, and shelters and perform other conservation and infrastructure projects. A modern CCC could play a vital role providing dignified family sustaining employment capitalizing on the potential in our region for regenerative agriculture, reforestation, and other carbon-absorbing reclamation.

Over the past two decades, a grassroots bottom-up movement in our region has created the foundation for “local wealth creation” that offers a powerful contrast to the tradition of large, rapacious corporations and absentee owners in extractive industries. Local industries tied to the land—in agriculture, forestry, food production with local inputs, and eco-tourism—account for many of the local wealth creators; public policy should help them grow and multiply their ranks including in networks and cooperatives.

THE IMPACT OF OUR SOLUTIONS

We estimate that reforestation of our region’s mountaintop removal sites could absorb 8% to 10% of our four state’s carbon emissions. Conservative estimates put the carbon capture possible by spreading regenerative agriculture in our region at 10%-15% of current emissions, for a total of 18% to 25%.

The recent Political Economy Research Institute (PERI) study of the jobs impact of the ReImagine Appalachia blueprint estimates that it would create about 73,000 direct jobs in Ohio and Pennsylvania. Taking into account the restoration work required in Kentucky and West Virginia this will likely translate into about 100,000 direct CCC jobs in all four states, and another 40,000 or so counting supply chain and consumer industry jobs supported by the buying power of CCC workers.

RECOMMENDATIONS FOR ACTION

- Expand federal farm bill support for regenerative agriculture and agroforestry practices that build healthy soils, reduce pollution, sequester carbon, and create job opportunities and local wealth.

- Revitalize and update the 1930s-era Civilian Conservation Corps into a modern-day employment, job training and conservation program employing about 100,000 people now without jobs, including black and indigenous people of color, low-income workers, rural workers and returning citizens.
- Provide financial incentives for landowners to adopt carbon-absorbing practices, raising incomes while leaving their land healthier for future generations.
- Provide resources and technical assistance for cooperatives and local wealth creation networks (in agriculture, agroforestry, and value-added food and wood products production with locally grown inputs) through agricultural extension and a new Rural Cooperatives and Network Administration (Rural CAN) within the U.S. Department of Agriculture.

1 CHALLENGES

The ReImagine Appalachia campaign seeks to address two overarching challenges in our region: a lack of economic opportunity and the need to reduce carbon emissions. With respect to economic opportunity, parts of our region suffer from persistent poverty and, in all four of our states, the average incomes of the bottom 90 percent have not increased since the late 1970s.³ The need for opportunity has increased significantly because of the COVID recession. The need to reduce carbon emissions stems from our region's carbon footprint. We account for 17% of the electric sector emissions nationwide. Storms, floods, and fires will damage our people and places if climate change continues unabated. This white paper addresses these overall challenges and those specific to our lands, agriculture, and forestry sectors spelled out below.

Legacy costs of extraction: The Ohio River Valley is blessed and cursed by its natural resources and geography. Our mountainous terrain ensured that large swaths of the region were not converted to large-scale industrial agriculture, vast cities with sprawling suburbs, or large-scale industrial complexes. Extractive industries, however, exploited the Ohio River Valley's abundant natural resources and left a legacy of environmental damage—abandoned mines and unplugged wells, chemical contamination, ruined streams, rivers, and groundwater, and even flattened mountains.

The decline of small farms and traditional agroforestry: Our terrain and topography have also put their distinctive stamp on agriculture and forestry in our region (Box 1). Our region is home to farms small by the standards of the nation, and family farms account for between 96 and 99 percent of agricultural land ownership in our four states. Our agriculture and forestry sector also account for a more significant share of employment than in most states. But farmers and farmworkers in our region earn relatively small incomes. Where many homesteaders to the region once carved small farms out of their valleys and rare plateau acreage, and mixed small livestock (chickens, goats) with vegetables, grains, honey, tobacco, and other products, fewer small farms today contribute substantially to family income. Indicative of this, less than half of farmers in the four states list farming as their primary occupation (KY= 37%, OH= 38 %, PA = 46 %, WV =37 %).⁴ One reason for the decline of our small farms: federal farm policy advances industrial agriculture with one or two commodity crops grown on a large scale as opposed to the traditional diverse family farm model on small acreages typical in mountainous Appalachia.

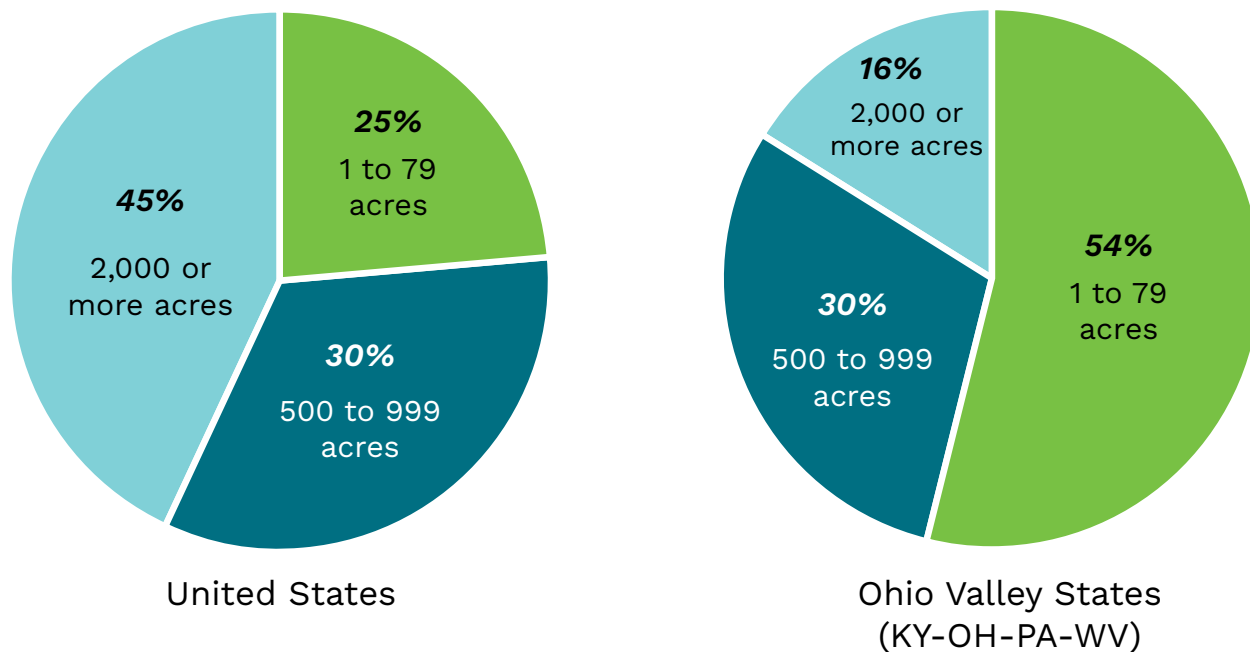
Other factors have hurt traditional small farms and forestry in our region including the decline of tobacco farming, the fluctuations of the wood products industry and, long-term, the American chestnut blight. Tobacco, once a high-value cash crop, especially in Kentucky, has been undercut by public health regulations and the downward trend in smoking.⁵ A typical tobacco farm in the region consisted of three-to-five acres, was labor-intensive to grow and to cure, and fetched about \$2,000 per acre (1997 dollars) so about \$6,000/year on 3 acres—not enough to survive on, but a nice additional source of income.

The need to transition farm ownership to a more diverse next generation: As noted earlier, over half of the farmers in each of our four states are over age of 55 and over 85% of primary farmers are defined as white. As throughout the country, the latter is a direct result of systematic discrimination against Black, Indigenous and people of color farmers and landowners.⁶

The Distinctive Character of Agriculture and Forestry in the Ohio Valley

Consistent with what people see with their own eyes as they travel in our region, state-level data paint a picture of the distinct character of farming and forestry in the Ohio Valley, especially Kentucky, Ohio, and West Virginia. For example, farms in our four-state region are smaller than nationally (Figure 1). Big farms—with greater than 2,000 acres—make up less than 1% (0.7%) of the farms in the region, one sixth the 4.2% total nationally. By contrast 78% of our farms are 179 acres or less compared to 70% nationally. Measured by share of total farm acreage, big farms account for 45% of the total nationally and only a third as much in our region; by contrast farms with 179 acres or less account for more than half of our acreage and only a quarter nationally.⁷

2017 Share of Total Farm Acres by Farm Size

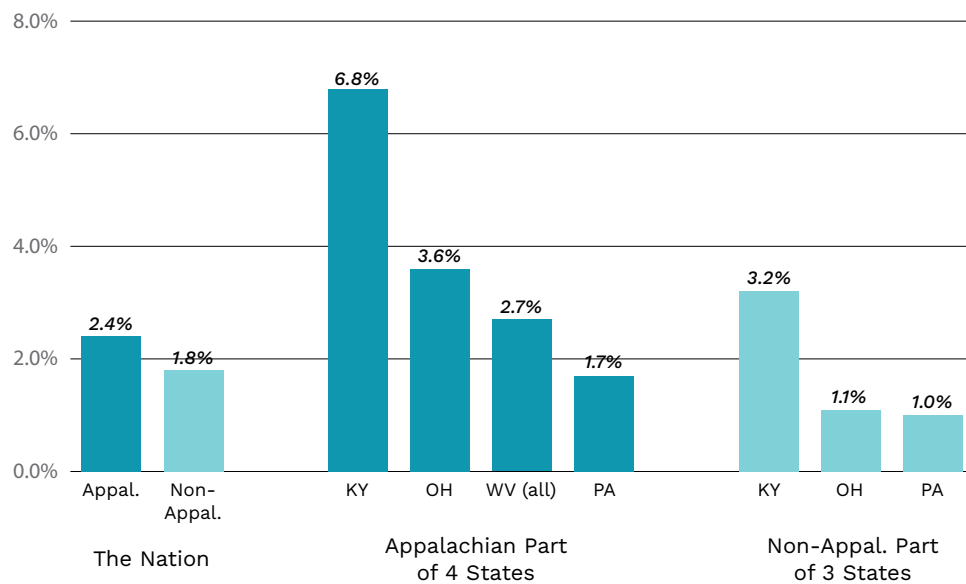


Source: Keystone Research Center estimate based on state data from USDA Agricultural Statistics Survey, <https://www.nass.usda.gov/> and national data from https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_1_US/usv1.pdf. Acreage by farm size estimated as the mid-point of farm size range times the number of farms in the range; acreage of farms with 2000 acres or more estimated as number of farms times 4,000.

Turning to people who work on farms for someone else—as employees—and who are reported as such (and so captured by official data), the Ohio Valley again looks distinct. Substantially higher share of employees work in farming and forestry in the Appalachian portions of our four states, the biggest share being 6.8% in Appalachian Kentucky, nearly four times the 1.8% in the non-Appalachian U.S.

Farming & Forestry Account for More Employment in the Appalachian Ohio River Valley Than the Rest of the Region and County

(Forestry and farming employment as a share of total employment (%) by state and region, 2017)

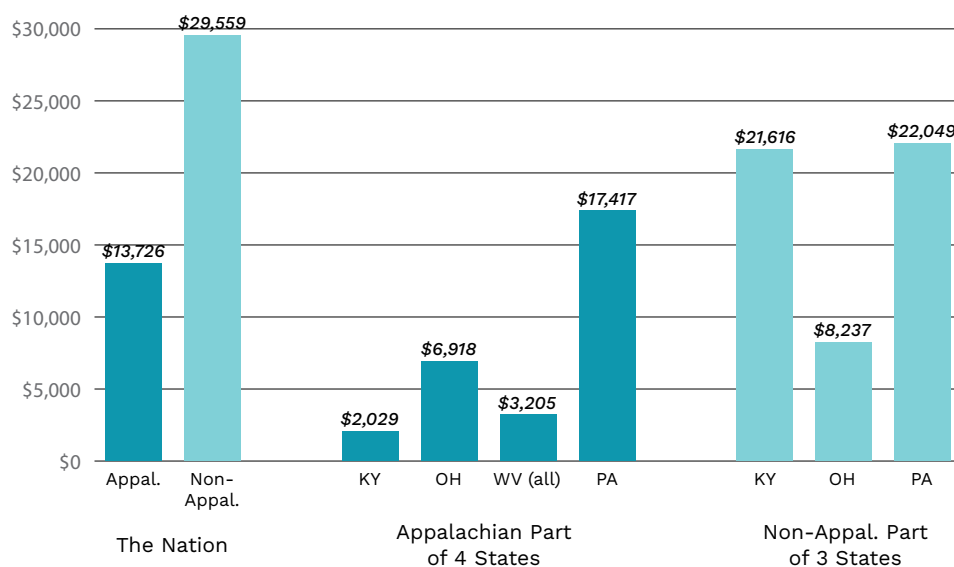


Source: Logan Thomas, Industrial Make-Up of the Appalachian Region: Employment and Earnings, 2002-2017, Appalachian Regional Commission, Nov. 13, 2019; <https://www.arc.gov/report/industrial-make-up-of-the-appalachian-region-employment-and-earnings-2002-2017/>; report based on Bureau of Economic Analysis data.

Measured by (reported) average earnings per employee, by contrast, the Appalachian portions of our four states have much lower earnings than either the non-Appalachian portions of our region or the non-Appalachian US. For many employees as well as many farm owners, farming and forestry in our region provides a bit of supplemental income, not a family supporting income. Federal and state policies more supportive of regenerative agriculture and agroforestry could both maintain the higher employment levels in forestry and farming in our region and potentially enable those employees to earn a bit more.

Farming & Forestry Earnings in Ohio Valley Are Below Non-Appalachian Levels

(earnings per employee in 2017)



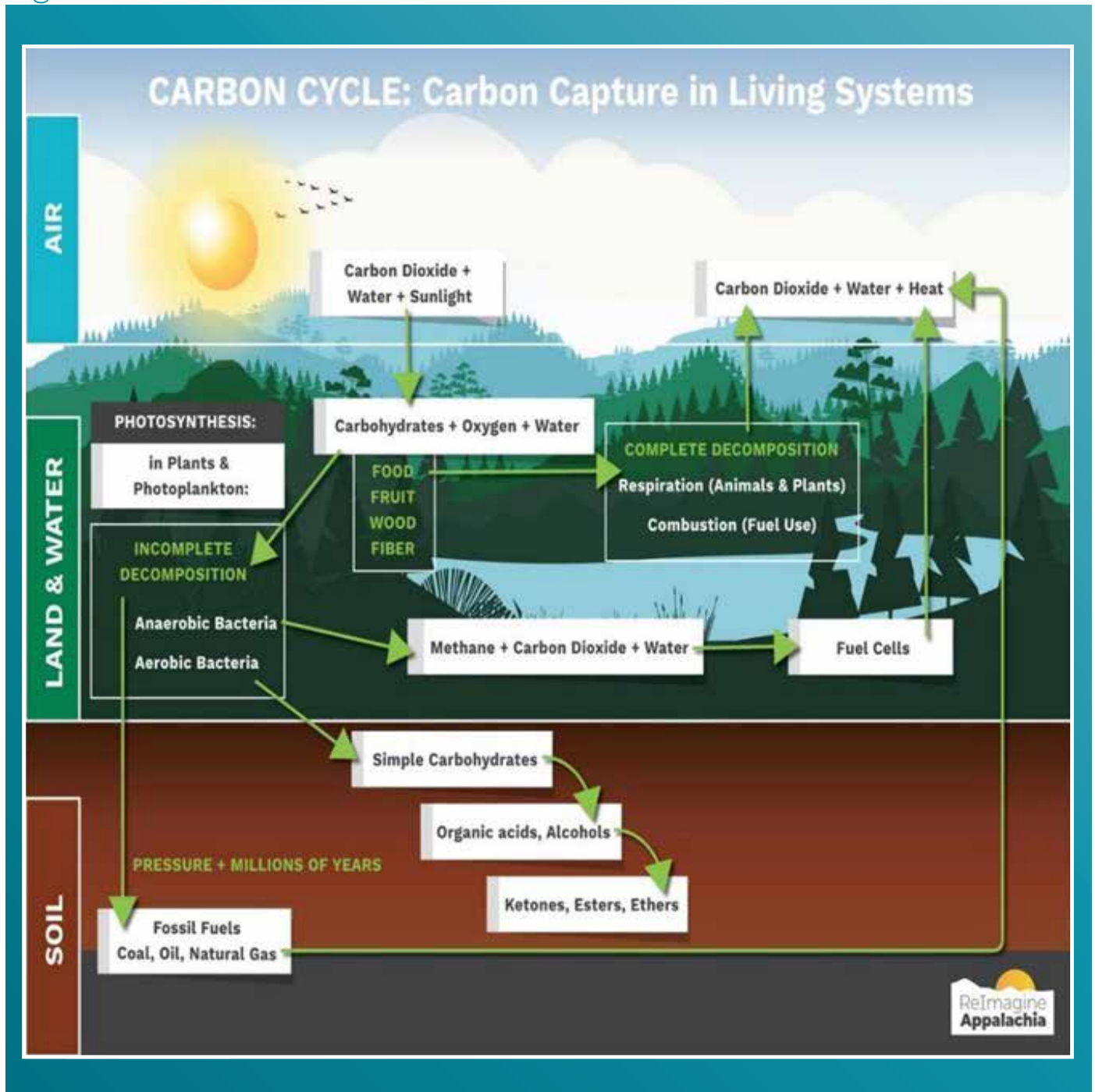
Source: Logan Thomas, Industrial Make-Up of the Appalachian Region: Employment and Earnings, 2002-2017, Appalachian Regional Commission, Nov. 13, 2019; <https://www.arc.gov/report/industrial-make-up-of-the-appalachian-region-employment-and-earnings-2002-2017/>; report based on Bureau of Economic Analysis data.

2 SOLUTIONS

2.1 Solutions: Healing the Land and Capturing Carbon

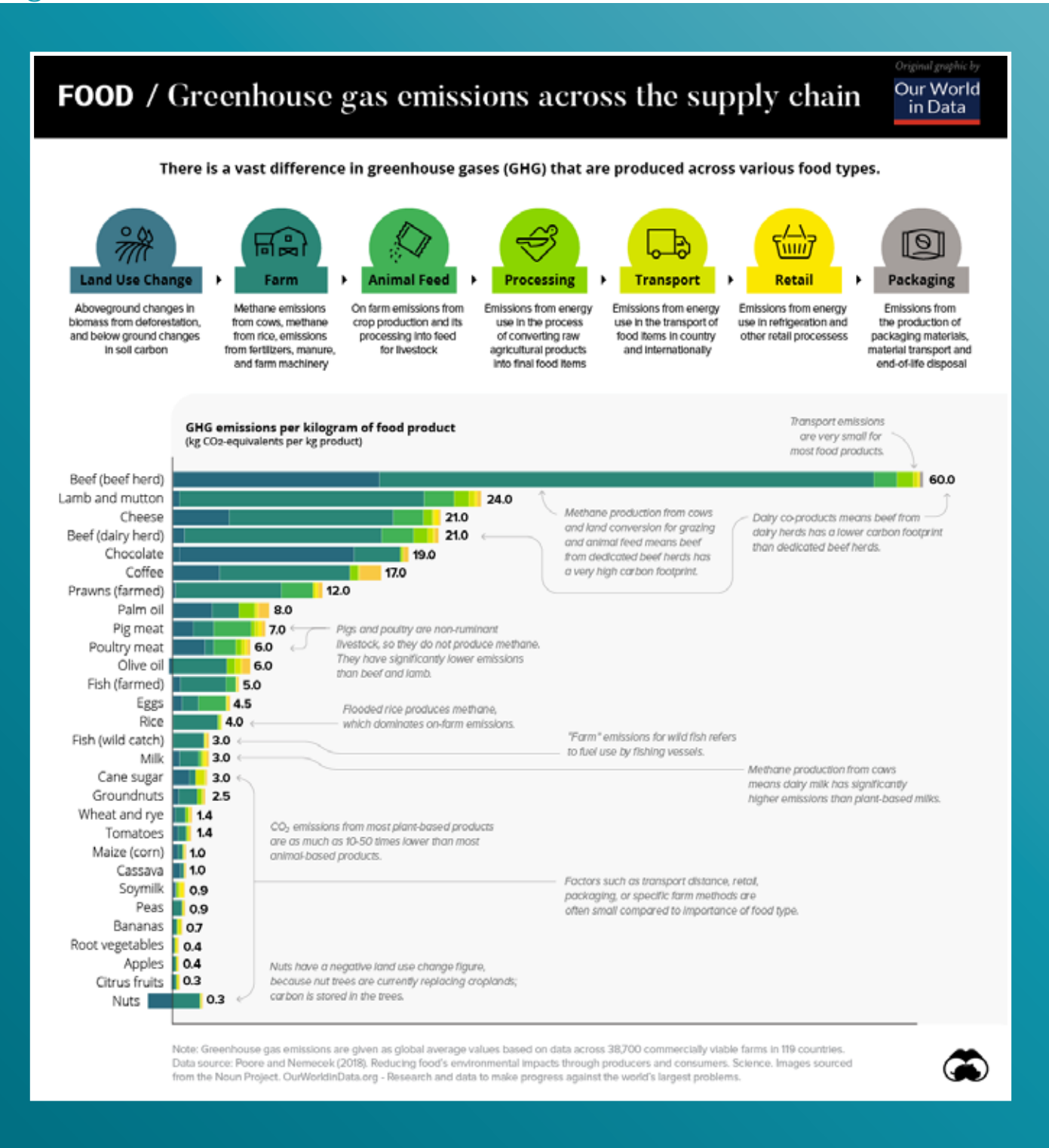
Leveraging federal support to better manage the lands of the Ohio River Valley can create jobs and economic opportunity, absorbing enough carbon to make a major contribution to achieving the goal of net zero emissions by 2050. All of the variations of land management discussed below (see Figure 3) capitalize on sunlight and photosynthesis—the process through which plants, from phytoplankton to vegetables and grasses to towering hardwood trees, capture carbon dioxide from the air and release oxygen into the air (see Figure 1). This carbon absorption—or “sequestration”—can offset carbon emissions accumulated in the atmosphere to help achieve net-zero emissions over time. Agricultural practices as well as reforestation, including of mined lands, can improve the carbon-absorbing properties of the land. Carbon emissions can also be reduced by developing local food supply chains that entail less transportation and packaging.

Figure 1



As shown in Figure 2, the food supply chain's carbon footprint results from its land-use impact, farming practices, animal feed, processing, transportation, retail processes, and packaging. Reducing concentrations of confined cattle can have a significant effect on reducing methane, one of the most damaging greenhouse gases. Practicing regenerative cultivation by integrating livestock into the multi-crop rotation process can improve the soil while reducing the impact of farmed animals on emissions. Organic farming practices also reduce the emissions from manufacturing and using synthetic fertilizers, herbicides, and pesticides.

Figure 2⁸



Shifting food consumption patterns toward lower-carbon-emission food choices also can significantly affect greenhouse gas emissions from agriculture. Organic agriculture practices have expanded as consumer demand for healthy foods has increased. Note in Figure 2 above that nuts have a net negative emissions profile, tying up more carbon than they release; this means that restoring native nut species will have a beneficial effect on the overall carbon profile of the region.

The natural terrain of Appalachia offers four main ways for public investment to capture carbon through land restoration (Figure 3).

1. Transforming our region's approach to agriculture by promoting regenerative practices.
2. Promoting local agriculture and food access in urban and rural areas.
3. Promoting forest restoration and agroforestry, including by growing more native trees and plants that enable landowners to earn more income from the land.
4. Healing land damaged by extractive industries so that trees and plants may thrive again, sequester carbon, and gain economic value.

Figure 3

Examples of Four Ways to Capture Carbon Through Better Land Use



1. Regenerative Farming in Kentucky



2. Black Urban Gardeners and Farmers of Pittsburgh



3. Ohio Forest Restoration



4. Abandoned Mine Reclamation- West Virginia

These four solutions and economic development opportunities emerged in ReImagine Appalachia's own visioning process and listening session. Prior to our four-state campaign, they also emerged repeatedly in local reimagining sessions—such as “A Better Vision for the Valley” in Wheeling, WV on May 11, 2019, bringing together participants from West Virginia, Ohio and Pennsylvania.⁹ A literature survey on innovative and sustainable economic development in our region also demonstrated many dedicated organizations and individuals advancing these approaches for a decade or longer. ReImagine Appalachia seeks to build on these efforts in the Ohio River Valley.

ReImagine Appalachia will examine healing land damaged by extraction in separate, forthcoming white papers so it is only briefly described in this white paper.

2.1.1 Restore Traditional Farming: Promote Regenerative Agriculture

The natural wealth of Ohio River Valley land sustained Indigenous People for centuries. For at least 3,000 years before colonial settlers arrived in Appalachia, Indigenous People shaped the prior cedar and hemlock forests to a composition of black walnut, hickory nut, chestnut, and acorn forests. There is also evidence of edible plants in profusion among these forests that supported diverse species of animals as well as the people.¹⁰

Regenerative agriculture, incorporating some practices that owe a debt to Indigenous peoples, replenishes soils, and ensures their long-term productivity. Interest in regenerative agriculture that leaves the land healthier than before has increased recently in our region and the country, including because of growing consumer demand for healthier food choices. Practices gaining favor include using cover crops and reducing tillage, and organic practices that limit synthetic fertilizer and pesticide inputs. These practices are well suited to the terrain and growing conditions of the Ohio River Valley. They reduce soil erosion and protect the quality of stream water, while increasing the fertility of the land by sequestering carbon into the soil. (Box 2 describes three regenerative practices in more detail.)

Box 2

Three Regenerative Agriculture Practices

Planting cover crops, such as winter wheat or radishes after the spring and fall plantings, helps ensure rain and snow runoff will not carry topsoil into streams. These living roots also keep moisture in the soils and protect them from over-saturation (flooding) as well as drought conditions. A study by the Natural Resource Defense Council (NRDC) found that an addition of 1% of organic matter (carbon) in soils allowed absorption of an additional 20,000 gallons of rainfall PER ACRE avoiding flooding damage—a valuable hedge against climate change-induced extreme weather events.¹¹ Cover crops can provide additional forage for livestock as well, reducing overall farm operation costs and increasing farmers' net incomes.

No-till or reduced tillage cultivation avoids breaking up complex webs of soil-microbe relationships and matrices essential for good root growth and water infiltration. No-till planting equipment is becoming increasingly common as more farmers adopt no-till practices and can be shared through coops or other networks. This equipment interplants seeds into existing vegetative cover, or stubble, without turning over the soil.

Diversifying and rotating crops reduces the amount of fertilizer and pesticide used in farming. A rotation can include grazing of livestock to fertilize soils and reduce the need for expensive manure storage, which can run into streams. Grazing is also healthier for the animals. Other rotational practices include intercropping grains with fruit or nut trees known as alley cropping; silvopasture, a practice of allowing livestock to graze under trees, and many more. In many cases, these practices are not new, but harken back to an earlier era of farming that did not rely on artificial fertilizers, pesticides, and other inputs. Alley cropping is another practice where alternating rows of crops such as vegetables or sorghum crops (for making syrup) with fruit trees (apples and pears) provides soil and pollinator benefits as well as offering multiple cash crops.¹² The annual vegetable or grain crop provides an immediate cash infusion making it easier for farmers to wait five-to-seven years for the fruit trees to produce.

Regenerative practices pursue four primary objectives, as outlined by the USDA Natural Resources Conservation Service (NRCS): keep the soil covered at all times (to prevent erosion and build carbon); maximize living roots (to aerate the soil and keep healthy microbes and other organisms alive); reduce or stop soil disturbance (from plowing and tilling); and diversify what you plant and grow, including pastured livestock.

Alternatives to Tobacco: With the gradual decline of tobacco, farmers need substitute crops on former tobacco acreage, ideally ones that capitalize on infrastructure that supported tobacco plots (e.g., drying sheds). Crops identified as good tobacco substitutes include hops and industrial hemp. World-wide, hemp is used in a growing list of products, from automobiles to rope to hemp seeds used in smoothies and baked goods to other manufacturing uses with world-wide demand. Since it grows and dries in a similar fashion to tobacco, hemp is an ideal crop to cultivate on former tobacco lands.¹³ Hemp as a crop was legalized in the 2018 Farm Bill, leading to rapid expansion. Plastic from the hemp plant is the only plastic that's 100% biodegradable in nature, and is also stronger than the conventional fiber. The going market for hemp fiber is about \$275 per ton, with the average yield between 2.5 and 3 tons of hemp fiber per acre.¹⁴ The cost of production is about \$300 to \$350, yielding about \$480 per acre in profit.

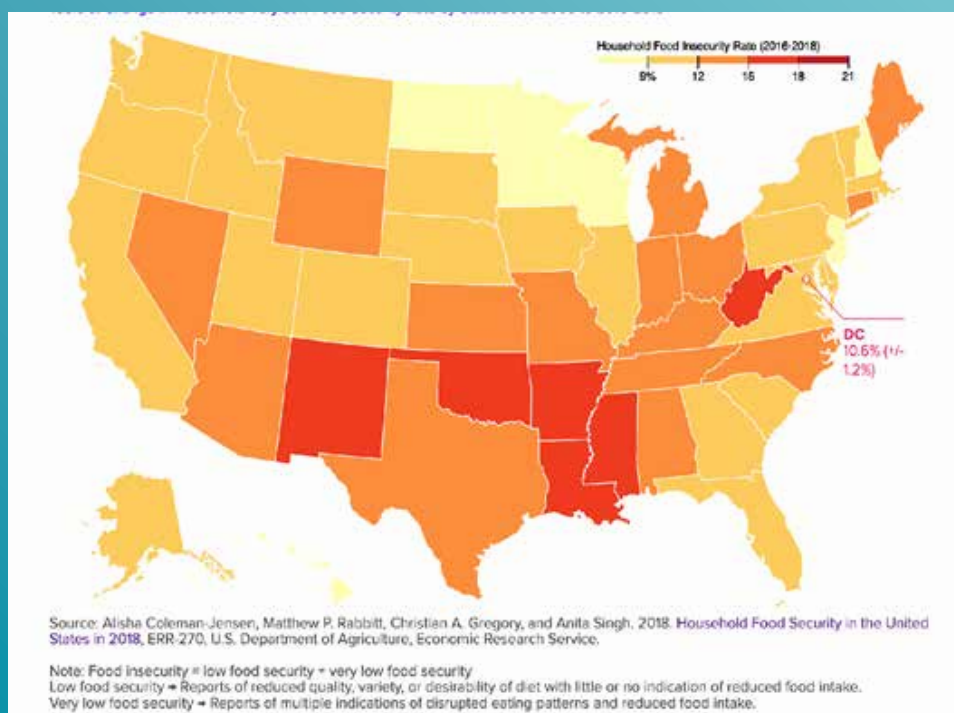
Hops, used in beer making and other uses, also is relatively easy to grow and harvest. Given the explosion of local craft breweries, hops are in demand. Hops do not require huge acreage or expensive or polluting inputs. They can be grown in alley cropping with vegetables or grains.

2.1.2 Promote Local Agriculture and Food Access in Urban and Rural Areas

Reflecting our region's low incomes, food insecurity is higher than the national average in Kentucky and Ohio, and very high in West Virginia (Figure 4). In areas urban and rural, production of crops and livestock for local consumption can increase residents' access to a nutritious diet and food security, raise households' incomes, and create more livable places—at the same time as reducing carbon emissions and delivering other environmental benefits.

Figure 4

Household Food Security of the United States in 2018



Urban agriculture produces food on reclaimed vacant lots as well as urban and suburban lawns converted into edible gardens. Many communities today have community or co-operative gardens. Urban orchards can increase access to vegetables, nuts, and fresh fruits, promote health, support pollinators while providing a diverse habitat for birds and other wildlife. Tree shade coverage reduces the urban heat island effect as well as helping to absorb pollution from nearby traffic corridors.

In rural areas, the US Farm Bill's incentives for growing commodity crops like soy, corn and wheat for export markets often mean locally produced grains are shipped out of the region and do not provide food for local residents. In recent years, diversified farms and community supported agriculture have grown and increased access to locally grown food and meat raised in more humane ways, while improving the land.

2.1.3 Promote Agroforestry

Appalachia is home to a unique tradition of forest farming for woods-grown products like ginseng, black and blue cohosh, and goldenseal which fetch high prices as botanical and pharmaceutical products. These products grow naturally, and intentionally, in woods and in forests. (West Virginia is the nation's third most forested state (79% forest) and Pennsylvania 13th (59%).¹⁵) With the right policies, Appalachia's knowledgeable and resourceful people who produce botanicals and other forest products native to the region could tap burgeoning markets that add significant income and diversity to local economies. For example, a recent episode on public radio of "West Virginia Morning" followed families returning to forest farming after generations for income and forest preservation. Alternative remedies for opioid addiction through ginseng tinctures were highlighted.¹⁶

Sustainable forestry practices increase the ability of forests to remove and store atmospheric carbon while enhancing other ecosystem services, such as improved soil and water quality. Planting new trees and improving forest health through thinning and prescribed burning are practices to increase forest carbon storage through enhanced regrowth long term. Restoring forests also results in net carbon absorption in growing trees and storage in wood products. Healthy forests not only offer habitat for wildlife but support water quality by filtering and holding rainwater and controlling storm runoff. The healthy and diverse forests once dominant in Appalachia also absorb carbon in the mature trees and in the root systems and ground cover of the shaded understory. Trees that produce a nut crop can provide an income stream and sequester more carbon as perennial woody species than annual grains or vegetable crops do. Thus, planting traditional native trees such as pecans, walnuts, hazelnuts—and chestnuts, poised for a comeback after a half century of cross breeding with Chinese chestnuts to create what is essentially a native American chestnut tree with blight resistance¹⁷—should play a significant role in regenerating lands in Appalachia.

Other examples and developments point to the potential of forest farming. A team led by John Munsell, with Virginia Polytechnic University, created an app that helps landowners identify the best places to grow species like black cohosh and goldenseal, products currently in high demand.¹⁸ Another group, Appalachian Sustainable Development, recently received two grants from USDA's Beginning Farmer and Rancher Development Program to pair mentors and apprentices in learning forest farming and agroforestry techniques—the program features on-farm learning and a 200-hour apprenticeship. It began in Tennessee and Virginia but has recently expanded into Kentucky, Ohio, and West Virginia. Further funding with expansion for this federal program would enable many more participants to take advantage of forest farming, ensuring it is done correctly without depleting these native resources.

2.1.4 Heal Damaged and Protect Working Lands

Healing damaged lands has multiple benefits, some of them not easily quantified in economic terms. Restoring forests and rewilding lands cleared by mountaintop removal mining or damaged by acid mine drainage will capture carbon. They will also restore environmental diversity, reduce erosion and, with that, improve water quality, health, and quality of life. As natural systems are restored, communities also regain economic assets and potential business opportunities. The process of restoring forests, wild lands and watershed health can employ people and expand opportunities for economic development based on tourism and recreation. Appalachia has long sustained a tradition of fishing, hunting, trapping as well

as whitewater rafting and the plethora of businesses that support the outdoor recreation industry. It is a powerful force in the overall U.S. economy, with consumers spending \$887 billion annually on outdoor recreation and creating 7.6 million American jobs.¹⁹ Appalachia needs to grow its share of this market while also ensuring the quality of jobs created.

Land Conservation: One of the best ways to limit carbon emissions and sequester additional carbon in soils and living vegetation is to protect working lands—the farms and forests that do this natural work. By contrast, residential, commercial, or industrial development reduce carbon absorption by trees, shrubs, and soils on site while increasing carbon emissions through industrial processes, increased driving and energy consumption, and other ways.

There is a long history in the United States of protecting lands through conservation easements for forests and farms (for a Pennsylvania example, see Box 3). Landowners can voluntarily place their land, or a portion of their land, in a conservation easement with a qualified I.R.S. 501(c)(3) designated organization, such as a land trust. As a benefit for giving up their rights to further develop the land, property owners receive a tax credit. Depending on the choices they make, easements can allow the continued use of farming, or forest production, without penalty. Landowners also have the satisfaction of leaving these lands to their heirs knowing they cannot be converted to other uses and will stay in their current “natural” state or as working lands.

Box 3

The Pennsylvania Farmland Preservation Program

In Pennsylvania, the Farmland Preservation Program has preserved more than 5,329 farms and more than half a million acres of working farmland since it was established in 1989.²⁰ The program is always oversubscribed, with a long waiting list of farms interested in enrolling. Farmers can use the funds they receive in return for the easement to reinvest in their farms, increasing the financial viability of farming for the next and subsequent generations. Across the country, land trusts and states have used a range of innovative programs to meet the needs of young and beginning farmers through public-private partnerships, innovative conservation easements, and farmland purchases.²¹

Pennsylvania also passed a tax abatement program, known as Clean & Green, allowing counties to lower property taxes on working farm lands and forest lands of 10 acres or more in return for landowners not further developing this acreage.²² The program has a roll-back provision to require payback of these tax abatements if landowners violate the terms of the program. The program currently has more than 9.3 million acres enrolled.

Reforestation: Over one million acres of mountain forested land in Appalachia have been lost to mountaintop mining alone.²³ Forest restoration of formerly mined lands includes several steps: 1. Assess the site conditions and develop a forest restoration plan; 2. Prepare the site for forest growth (breaking up the ground, applying organic material); 3. Plant valuable native trees; and 4. Follow-up site management to protect young trees and encourage their growth.²⁴

Forest restoration delivers multiple benefits. The value of the land itself is improved by reforestation, reflecting the co-benefits of water quality improvement, air quality improvement, erosion prevention, biodiversity protection, wildlife habitat, recreational opportunities, and carbon capture. In some states, carbon credits are available for reforestation after five, 25 and 40 years of growth. Reforested land in time can offer all the economic returns of an existing forest, including pulp for paper, logs for building materials, and non-timber forest products like wild edibles, medicinal plants, ornamentals, moss, and more. Finally, forest crops such as nuts create cash harvests on an annual basis, often increasing over time as trees mature.²⁵

Land Reclamation: Coalfield Development launched one of the most exciting reclamation projects in the region to repair damaged lands and to increase employment opportunities for laid-off miners and other low-income job seekers. Coalfield's Refresh Appalachia program takes scarred mountain-top mining sites decimated by surface mining and turns them into working and profitable farm sites. The program teaches workers skills in removing invasive species, mulching to enhance scarce soils, reforesting sites with native hazelnuts, papaws, and berry bushes that generate an income, and introducing livestock—chickens and goats—which thrive in austere landscapes, generate incomes, and further replenish the soils as they forage.²⁶

2.2 Solutions: Invest in Communities and People

This section transitions to solutions focused on people, businesses, and jobs—solutions that directly address the economic opportunity challenge in our region. These solutions also support the solutions above that could “heal our land.” They would, in addition, revitalize communities that have suffered because of the boom-bust cycle and environmental damage associated with extraction.

2.2.1 Revitalize and Update the Civilian Conservation Corps

The Civilian Conservation Corps (CCC) was a work relief program created as part of the original New Deal. Over the course of a decade during the Great Depression, the CCC employed three million people on conservation and infrastructure projects. (Since total employment in the United States is now over three times what it was in the 1930s, employing three million people then is the equivalent of employing 10 million today.) The CCC planted more than three billion trees and constructed trails and shelters in more than 800 parks nationwide during its nine years of existence and helped to shape the national and state park systems. As in the past, a modern CCC would offer temporary employment doing work that builds core skill sets in farming, landscaping, forestry, conservation, and construction trades. Most CCC work would be outdoors and can be performed safely and with social distancing while spreading COVID-19 remains a threat.

A modern CCC could contribute to job creation and carbon absorption by performing all the work of the original CCC—restoring wetlands, planting millions of diverse, native plants and trees (especially hardwoods, including nut and fruit trees), and removing invasive trees and shrubs—and go beyond that by helping farmers implement regenerative practices. It could create cheaper, better ways to protect and purify our water supply, support nature-based recreation and tourism, and grow local economies.

Specific novel features of a modern CCC could include:

- *Helping private farmers and owners of woodlands to adopt healthier, carbon-absorbing land management practices.* The federal government traditionally has subsidized farmers and conservation practices. Paying for CCC labor on private lands—or subsidizing the cost of CCC labor hired by farmers—would simply represent new and smarter subsidies.
- *Targeting historically underserved communities for CCC jobs and pathways into business and farm ownership.* As defined by USDA and applied to the delivery of NRCS conservation programs, historically underserved farmers include minorities, beginning farmers, limited resource farmers, tribal producers, women, and veterans. These same disproportionately Black, Indigenous, People of Color (BIPOC) groups

that faced past discrimination should receive priority and set-asides for CCC jobs in each state and for pathways from CCC jobs into farm and business ownership coupled with mentoring (and grants and loans that enable participants to begin to acquire wealth—see below). CCC jobs should also provide equal opportunities for women and individuals with disabilities.

- *Making returning citizens a priority for CCC positions.* Many citizens regaining their freedom today were incarcerated for possession of small amounts of drugs, including marijuana, or caught up in the opioids crisis, but imprisoned rather than treated for addiction. While significant numbers of formerly incarcerated individuals already end up in outdoor construction work, it is too often for low pay with little skill building and no access to high-quality apprenticeship. By contrast, pre-apprenticeship skill building and employment in the CCC could give the formerly incarcerated access to apprenticeships and credentialed, good-paying lifetime careers. Public investments in these programs can protect the environment, restore our health, and rebuild lives.
- *Training and pathways into apprenticeship should be a core component of the new CCC,* with connections established to building trades apprenticeships, new agricultural and forestry apprenticeships, and training and mentoring provided by experienced farmers in the region. Given the age of farmers in our region noted above, CCC farm positions, plus training, provide a critical opportunity to train a more diverse next generation of farmers. An aging workforce and high rates of retirement among baby boomers also characterize the building trades, enabling CCC to serve as a pipeline into unionized construction careers for diverse CCC participants. There is by now a wealth of experience nationally—and in our four-state region—with “apprenticeship readiness” (or “pre-apprenticeship”) programs that have the support of unions and their management partners and that provide a diverse pipeline into joint building trades apprenticeship programs. In farming and forestry occupations with limited experience of apprenticeship, farms, businesses and/or nonprofits can be incentivized to partner on pre-apprenticeship programs with the CCC and register and administer new apprenticeship programs into which the CCC could feed workers.
- *Strengthening climate resilience and mitigation infrastructure in underserved and overburdened communities.* As well as employing a more diverse workforce, a modernized CCC could give priority to projects that promote environmental justice within underserved communities more vulnerable to flooding or other damage resulting from our changing climate.

2.2.2 Provide Resources and Assistance to Cooperatives and Wealth Creation Networks

Producer cooperatives are not a new idea; they have been around for more than 100 years, and in fact much longer, as a vehicle for small farmers or other businesses—neighbors—to pool their resources to do better individually and collectively. For example, Ohio’s Route 9 Chestnut cooperative has grown exponentially over the past 10 years out of one farmer’s operation that became overwhelmed as his chestnut trees began producing faster than he could harvest the nuts. By inviting community members to come and help with the harvest, he provided a seasonal income for many families. Reaching out to investment partners, the coop is owned by five producers and sells nuts around the world.²⁷ In West Virginia, the Turnrow Appalachian Farm Collective provides cooperative marketing, distribution and shared services for 121 participating farmers and producers.²⁸ Over the past dozen years or more, a bottom-up local wealth creation movement in Appalachia has begun to promote networks of small producers, including cooperatives. One hub in our region, Central Appalachian Network (CAN), fosters networks and peer learning among food and agricultural systems as well as clean energy and creative placemaking. A dozen CAN affiliates in the food and agricultural sectors fall in the Ohio Valley.²⁹ Within the 32 counties of Appalachian Ohio, the Appalachian Center for Economic Networks (ACENet) in Athens, Ohio fosters local wealth-creation networks in both the food and wood sectors.³⁰

Until recently, the government has done little to support cooperatives and networks, including in the food and forest products sectors. This is despite the U.S. Agricultural Extension Service’s long history of providing technical assistance to farmers—a more visible government role in sectoral economic development than typical in the United States. Until recently, agricultural extension services had focused primarily on one-on-one technical assistance to farmers. Government support had not nurtured cooperatives or other

networks of local producers or recognized their vital role in promoting learning and achieving efficiencies (economies of scale and scope)—e.g., by organizing farmers' markets or furniture fairs, allowing share use of commercial scale kitchens, and marketing products jointly (hazelnuts, coffee).

That has begun to change: the U.S. Department of Agriculture (USDA) is beginning to invest alongside private philanthropy in local wealth creation networks. For example, just this year USDA distributed its first “regional food system partnership grants.”³¹ Greater public support for producer cooperatives (including worker cooperatives) and networks could significantly boost local wealth creation in Appalachia. In carbon absorbing sectors and the local food sector—which cuts down carbon emissions in transportation of food—these networks would advance us towards the goal of net-zero carbon emissions as well as increase incomes.

3 THE IMPACT OF OUR SOLUTIONS: Carbon Capture and Jobs

The benefits of restoring the land, reinvesting in communities, and empowering people cannot be fully captured in data. The co-benefits of greater community resilience, better quality of life and improved health, as the economic base shifts to sustainable practices, are priceless. The co-benefits of healing the land include the restoration of water quality in streams, rivers, lakes and ponds, and tangible economic opportunities for businesses, and individuals that depend on the outdoors, as well as on improved agricultural land. No metrics fully capture all the benefits of the transformation we propose in ReImagine Appalachia. Below we present data we do have on carbon capture and jobs.

3.1 Capturing Carbon in Restored Lands and Regenerative Agriculture

Carbon Capture from Reforesting Mined Lands. In the four Ohio River Valley states, over one million acres of mountaintop removal mining has left barren land that once held forested and wild areas.³² Reforesting one million acres of mountaintop removal mined land would sequester 49.3 million tons of carbon if the trees grow for at least five years. If the trees grow for 25 years, reforestation sequesters 63 million tons of carbon.³³ KY, OH, PA and WV combined emitted 627.9 Million Metric Tons of Carbon in 2017, about 12% of all carbon dioxide emissions in the United States.³⁴ Thus the reforestation of mountaintop removal mined lands would capture 8% of current four-state carbon emissions from all sources after five years and 10% after 25 years.

Reduction in Carbon Emissions from Regenerative Agriculture. It is widely accepted that organic and regenerative agricultural practices increase the carbon content of the soil and improve the diversity and number of soil organisms and micro-organisms contained within it to capture atmospheric carbon dioxide. It is difficult, however, to quantify the potential for carbon sequestration from regenerative practices. The methodologies for such computations are not standardized yet. Furthermore, different growing conditions and management techniques can affect the results, an inherent complexity that will confound the effort to standardize measurement. Two recent estimates put the potential carbon capture of regenerative agriculture at 10-15% of current carbon emissions.³⁵ The Rodale Institute in a recent white paper maintains that adopting “exemplary” regenerative practices worldwide could drawdown more than 100% of current CO₂ emissions globally.³⁶

Impact of Carbon Capture in the Appalachia Region

Adding up our estimates from regenerative agriculture and reforestation of mountaintop removal sites, just these two investments would capture 18% to 25% of current carbon emissions. Even the lowest estimate is significant and would also deliver great co-benefits—sustaining fertility of the ground, improving stormwater management, contributing to biodiversity, and providing healthier food products.

3.2 Job Impact

Our best estimates of job creation resulting from our solutions—primarily the impact of a new Civilian Conservation Corps—comes from recent Political Economy Research Institute (PERI) studies of the impact of implementing the ReImagine Appalachia blueprint in Ohio and Pennsylvania.³⁷ The ReImagine Appalachia

campaign produced accessible summaries of these comprehensive PERI reports that identified job creation associated with different parts of the Relmagine blueprint.³⁸ Table 4 of these accessible summaries estimate job creation from investing in CCC to support regenerative agriculture, restore lands (e.g., reforest), conserve farmlands, and invest in natural infrastructure to clean inland waterways, and water and wastewater systems: \$4 billion annually would create an estimated 31,500 direct jobs annually in Ohio; and investing \$4.7 billion would create an estimated 41,680 direct jobs in Pennsylvania. Job creation in West Virginia and Kentucky—where PERI estimates are forthcoming—will likely bring the four-state total to about 100,000 direct CCC jobs, with supply chain (“indirect”) jobs and jobs created by consumer demand (“induced jobs”) bringing the four-state total job creation number from CCC to about 140,000 jobs.³⁹

4 RECOMMENDATIONS FOR ACTION:

CREATE A MODERN CIVILIAN CONSERVATION CORPS AND PROMOTE REGENERATIVE AGRICULTURE

Our solutions aimed at healing our land and our people could have a major impact on achieving the net reduction in carbon emissions and job creation the Ohio River Valley urgently needs.

To Relmagine Appalachian farms and forest, we call upon our federal leaders to take the following concrete actions:

4.1 Establish a Modern Civilian Conservation Corps

CCC jobs should pay at least \$15 per hour and provide training and apprenticeship readiness opportunities that help workers transition from temporary CCC employment to permanent family supporting careers—in farming, carpentry and other trades, tree care/arboriculture, landscaping, conservation, science, forestry and more. Our four-state region should receive a disproportionate share of CCC jobs for several reasons—the compatibility of our land and topography with regenerative as opposed to industrial agriculture; our greater need for economic opportunity than other regions; the concentration of opioids addiction and suicides; and our disproportionate share of lands scarred by the extraction of fossil fuels.

Several different but complementary CCC proposals have been advanced in the U.S. House and echo the themes presented in a recent National Wildlife Federation [New York Times op-ed](#): we can put millions of Americans back to work—especially young people and communities of color—repairing natural resources, increasing resilience, planting trees, reclaiming degraded lands, and restoring wildlife habitat.

Congress should enact legislation immediately that brings together the best of these national ideas that can help Appalachia, and scale it up as quickly as priority projects can be identified.

4.2 Promote Regenerative Agriculture and Agroforestry in the U.S. Farm Bill

The U.S. Farm Bill provides over \$400 billion each year to farmers to grow, harvest, process, and transport food, and implement energy and conservation measures on farms. In recent decades, Farm Bill funding has pushed farmers toward a large-scale commodity-crop model of food production, with many damaging externalities such as water and air pollution, pesticide drift, animal cruelty, loss of pollinators and other wildlife, and a steady loss of smaller family farms. Future farm bills must support small family farms and diverse production of animals and crops. The [Sustainable Agriculture Research and Education \(SARE\)](#) program could spark more innovative regenerative agriculture if its funding were doubled or tripled in the Farm Bill.

The proposed Agricultural Resilience Act (ARA) combines a focus on helping farmers with reducing greenhouse gas emissions and combatting the effects of climate change. Agriculture currently contributes 8.4% of all U.S. greenhouse gas emissions; the ARA would reduce that by 50% before 2030 through six

major efforts; increasing research funding for ag-friendly climate solutions; improving soil health; protecting existing farmland; supporting pasture-based livestock production (as opposed to confinement operations); invest more in on-farm energy initiatives, and reduce food waste.⁴⁰

Looking to other states, there are numerous approaches that could be adopted in the four-state region of Reimagine Appalachia. Iowa and Illinois are subsidizing federal crop-insurance payments to farmers who take active measures to improve their soils, which in the long run result in less flooding or drought losses because carbon-rich soils hold moisture better and protect against these damaging cycles. A climate action plan recently developed by New York State, may be a good model. Commissioned by the state's Department of Agriculture and Markets, it combines incentives to reduce greenhouse gas emissions with efforts to promote and protect family farming. It focuses on what farms can do to lower emissions of the worst greenhouse gases—nitrous oxide and methane—through practices like covering manure storage containers and flaring off methane; adjusting livestock feed to reduce methane, managing the application of nitrogen fertilizer to limit runoff, promoting reforestation, and reusing “underused” lands such as mined lands and fallow fields to expand regenerative farming and increase carbon storage.⁴¹

4.3 Support Producer Cooperatives and Wealth Creation Networks

The federal government should increase funding and technical assistance for cooperatives and wealth creation networks anchored by local agriculture, agroforestry, value-added products made with locally grown materials, and eco-tourism (that also preserves working lands). This could be done through a new Rural Cooperatives and Network (Rural CAN) Administration within the U.S. Department of Agriculture (USDA). Starting in the mid-1930s, the Rural Electrification Administration within USDA brought electricity and then telephone service to rural areas, in many cases with the help of rural electrical cooperatives. A Rural CAN Administration could provide similar subsidies, technical assistance, and ideological legitimacy to a range of cooperatives and networks in today's wealth-creation networks. The federal government should also reorient agricultural extension services towards support for regenerative agriculture, agroforestry and networks of farmers engaged in carbon-absorbing practices, building on an internal reform within extension services that has recognized the power of networks. A third, and complementary, option would provide the Appalachian Regional Commission (ARC) with funds to support cooperative eco-industrial parks.⁴²

4.4 Monetize Carbon Capture by Small Landowners

Recognizing the value of carbon sequestration by forests, many policymakers and stakeholders have explored the potential of providing forest landowners with financial incentives to grow more trees or adopt forest management practices that absorb more carbon.⁴³ Such incentives can come in the form of forest carbon offsets—payments on carbon markets—or through direct payments to landowners from government. A challenge is that smaller landowners tend not to participate with either approach. The uncertain but potentially significant time and upfront costs to learn about the opportunity, the challenges of monitoring and documentation necessary to receive payments, and the modest size of payments for small landowners all discourage participation.

Given the potential of payments to forest landowners for carbon sequestration to grow, policymakers must ensure smaller landowners have equitable access to such payments. Such payments could supplement other forest income and jobs unrelated to the land, enabling more small landowners in the Ohio River Valley to resist development pressure. One approach tailored to small landowners could combine direct government technical assistance (e.g., from conservation district foresters) with CCC labor that implements tree-planting or other forest management. Carbon aggregators—organizations that help small landowners develop projects and undertake the carbon pooling and marketing process—offer another, complementary approach. Producer cooperatives, for example, could serve as aggregators, melding the securing of carbon offset payments with activities that grow income for cooperative members from bio-mass, wood products, selling nuts or other agroforestry.

ENDNOTES

- 1 This white paper was drafted by Patricia DeMarco and Sara Nicholas, with input from Peggy Berry, Karen Gardner, Jill Kriesky, Allyson Feridun, Stephen Herzenberg, Amanda Woodrum, and many other participants in ReImagine Appalachia.
- 2 U.S. Department of Agriculture, National Agricultural Statistical Service, Census of Agriculture, State Data Table 52, “Selected Characteristics: 2012 and 2017.” https://www.nass.usda.gov/Statistics_by_State/index.php Accessed Oct.13, 2020.
- 3 Source: Estelle Sommeiller and Mark Price data base on Internal Revenue Service tax payment data and published in Estelle Sommeiller and Mark Price, “The new gilded age: Income inequality in the U.S. by state, metropolitan area, and county,” Economic Policy Institute 2018, July 19, 2018; <https://www.epi.org/publication/the-new-gilded-age-income-inequality-in-the-u-s-by-state-metropolitan-area-and-county/>
- 4 U.S. Department of Agriculture, National Agricultural Statistical Service, *Census of Agriculture*, State Data Table 52, “Selected Characteristics: 2012 and 2017.” https://www.nass.usda.gov/Statistics_by_State/index.php Accessed Oct.13, 2020.
- 5 An Appalachian Regional Commission (ARC) report notes that tobacco was the nation’s seventh largest cash crop, and 97% of all burley tobacco was grown in the 13 Appalachian states. Kentucky alone produced more than 60% of this crop. See Lawrence E. Wood, “The Economic Impact of Tobacco in Appalachia,” 1998.
- 6 For more information, see <https://www.youngfarmers.org/2019/02/racial-inequity/>
- 7 In addition, our method of estimating share of total acreage by farm size (described in the footnote to the two pie charts) likely underestimates the share of acreage held by large farms and underestimates it more for the United States.
- 8 “The Carbon Footprint of the Food Supply Chain,” <https://www.visualcapitalist.com/visualising-the-greenhouse-gas-impact-of-each-food/> Accessed July 12, 2020.
- 9 Heather Haar, “Summary of League of Women Voters Re-Imagine Process: Regenerative Agriculture,” unpublished report to ReImagine Appalachia, May 2020.
- 10 Lyla June. “The Forest as Farm—The Esperanza Project.” <https://www.esperanzaproject.com/2019/native-american-culture/lyla-june-on-the-forest-as-farm/?unapproved=1241&moderation-hash=f60abbe996954d4cfd224b6b9e57b199#comment-1241> Accessed October 13, 2020.
- 11 Claire O’Connor, “Soil The Secret Weapon in the Fight against Climate Change. National Resources Defense Council,” December 5, 2019. <https://www.nrdc.org/experts/claire-oconnor/soil-secret-weapon-fight-against-climate-change> Accessed October 13, 2020.
- 12 Sustainable Agriculture and Research and Education-Southern, “Agroforestry An Alternative for Farmers Transitioning Away from Tobacco,” June 11, 2020. <https://southern.sare.org/news/agroforestry-an-alternative-for-farmers-transitioning-away-from-tobacco-production/> Accessed October 12, 2020.
- 13 Jonathan Vaught. “Growing Hemp,” *Successful Farmer*. March 27, 2019 <https://www.agriculture.com/news/crops/growing-hemp>.
- 14 The figures in this and the next sentence come from Blue Forest Farms, “How Much Can You Make Per Acre of Hemp,” July 13, 2020; <https://blueforestfarms.com/how-much-can-you-make-per-acre-of-hemp/#:~:text=In%20the%20field%2C%20one%20acre,%24300%20to%20%24350%20per%20acre.>
- 15 Kentucky is the 23rd most forested state (49% forest) and Ohio 39th (31%): https://en.wikipedia.org/wiki/Forest_cover_by_state_and_territory_in_the_United_States
- 16 <https://www.wvpublic.org/post/cultivating-native-plants-appalachia-source-enrichment-income-food#stream/0>
- 17 For the past 47 years, members of the American Chestnut Foundation have been scientifically, methodically, and painstakingly cross-breeding the American chestnut with Chinese chestnuts, which are blight resistant, and are now replanting what are essentially 99.9% American chestnuts with blight resistance. Reestablishing this once dominant species throughout Appalachia has many co-benefits to regenerative agriculture, forest restoration, and potentially reemployment in forest products. See more about this project at <https://www.acf.org/>
- 18 <https://plantshoe.org/Assessment/index/>.
- 19 <https://outdoorindustry.org/resource/2017-outdoor-recreation-economy-report/>.
- 20 https://www.agriculture.pa.gov/Plants_Land_Water/farmland/Pages/default.aspx,
- 21 <https://www.youngfarmers.org/resource/a-path-to-conservation-and-farm-viability-case-studies/>
- 22 https://www.agriculture.pa.gov/Plants_Land_Water/farmland/clean/Pages/default.aspx.
- 23 Ross Geredian. “Assessing the Extent of Mountaintop Removal in Appalachia: Analysis Using Vector Data.” Appalachian

Voices, Boone, NC. 2009. https://ilovemountains.org/reclamation-fail/mining-extent-2009/Assessing_the_Extent_of_Mountaintop_Removal_in_Appalachia.pdf Accessed October 13, 2020.

24 <https://arri.osmre.gov/Legacy/Reforestation%20Guidelines%20for%20Unused%20Surface%20Mined%20Lands%20in%20the%20Eastern%20United%20States%20460-144.pdf> PP 14-15

25 Mary Beth Adams (ed), *The Forestry Reclamation Approach: Guide to Successful Reforestation of Mined Lands*. USDA. General technical Report NRS-169. May 2017. https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs169.pdf

26 Catherine V. Moore, “The Hopeful Work of Turning Appalachia’s Mountaintop Coal Mines Into Farms,” Oct. 12, 2017; <https://www.yesmagazine.org/issue/just-transition/2017/10/12/the-hopeful-work-of-turning-appalachias-mountaintop-coal-mines-into-farms/>

27 <https://route9cooperative.com>

28 <https://turnrow.localfoodmarketplace.com>

29 Central Appalachia Network. <https://www.cannetwork.org/>

30 For more on local wealth creation drawing partly on Appalachian examples, see Shanna Ratner, *Wealth Creation A New Framework for Rural Economic and Community Development*, Routledge, December 2019.

31 Agricultural Marketing Service. U.S. Department of Agriculture. <https://www.ams.usda.gov/services/grants/rfsp>

32 The precise estimate is 1.16 million acres so the estimates in the text are conservative. See Appalachian Voices, “Mountaintop Removal 101,” no date, <https://appvoices.org/end-mountaintop-removal/mtr101/>

33 This assumes that reforestation would capture 49.329 tons of carbon per acre in five years, 63.018 tons of carbon per year in 25 years and 77.218 tons of carbon per acre in 45 years. Katherine Lynn Baker, “Costs of Reclamation on Southern Appalachian Coal Mines: A cost-effectiveness analysis for reforestation vs. hayland/pasture reclamation,” April 24, 2008. Virginia Polytechnic Institute and State University. <https://vtechworks.lib.vt.edu/bitstream/handle/10919/33783/Thesis5.pdf?sequence=1&isAllowed=y>. See also James E. Smith, Linda S. Heath, Kenneth E. Skog, Richard A. Birdsey. “Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States,” U.S. Department of Agriculture. December 21, 2005; https://www.nrs.fs.fed.us/pubs/gtr/ne_gtr343.pdf

34 U.S. Energy Information Administration. Environment Data: Energy-Related Co2 Emissions Data Tables. Table 1 State energy-related carbon dioxide emissions by year 1990 to 2017. <https://www.eia.gov/environment/emissions/state/>

35 Rattan Lal, “Digging deeper: A holistic perspective of factors affecting soil organic carbon sequestration in agroecosystems.” *Global Change Biology*, January 17, 2019; <https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.14054>. Jonathan Sanderman, Tomislav Hengl, and Gregory J. Fiske, “Soil carbon debt of 12,000 years of human land use,” *Proceedings of the National Academy of Sciences*, 114(36), Sept. 5, 2017, pp. 9675-9580. Lal and Sanderman et al., both cited in Virginia Gewin, “Does Overselling Regenerative Agriculture’s Climate Benefits Undercut Its Potential?” *Civil Eats*, October 1, 2020; https://civileats.com/2020/10/01/does-overselling-regenerative-agriculture-climate-benefits-undercut-its-potential/?utm_source=Verified+CE+list&utm_campaign=8242d4485c-EMAIL_CAMPAIGN_7_3_2018_8_13_COPY_01&utm_medium=email&utm_term=0_aae5e4a315-8242d4485c-294311553.

36 Jeff Moyer, Andrew Smith, PhD, Yichao Rui, PhD, Jennifer Hayden, PhD. “Regenerative Agriculture and the Soil Carbon Solution,” Rodale Institute, September 2020, page 9; https://rodaleinstitute.org/wp-content/uploads/Rodale-Soil-Carbon-White-Paper_v11-compressed.pdf. Accessed October 13, 2020. Critics have argued that this estimate extrapolates too much from studies of regenerative grazing in the Midwest and organic corn and wheat farming in the mid-Atlantic. See Gewin, “Does Overselling Regenerative Agriculture’s Climate Benefits Undercut Its Potential?”

37 Robert Pollin, Jeannette Wicks-Lim, Shouvik Chakraborty, and Gregor Semieniuk, “Impacts of the ReImagine Appalachia & Clean Energy Transition Programs for Ohio: Job Creation, Economic Recovery, and Long-Term Sustainability,” Political Economy Research Institute (PERI), University of Massachusetts-Amherst, October 2020, <https://reimagineappalachia.org/wp-content/uploads/2020/10/Pollin-et-al-OHIO-Reimagine-Appalachia-and-Clean-Energy-Programs-10-19-20.pdf>; and Robert Pollin et al., “Impacts of the ReImagine Appalachia & Clean Energy Transition Programs for Pennsylvania: Job Creation, Economic Recovery, and Long-Term Sustainability—Preliminary Summary of Main Results, PERI, October 2020; <https://reimagineappalachia.org/wp-content/uploads/2020/10/Pollin-et-al-PENNSYLVANIA-Reimagine-Appalachia-Clean-Energy-PRELIM-REPORT-10-19-20.pdf>

38 ReImagine Appalachia, “ReImagine Appalachia Blueprint Creates 235,000 Jobs in Ohio: Summary of Results from PERI Economic Recovery Program Analysis,” October 2020; https://reimagineappalachia.org/wp-content/uploads/2020/10/Ohio-Summary_-ReImagine-Appalachia_Ohio-PeriBrief_10-20-20.pdf; and ReImagine Appalachia, “ReImagine Appalachia Blueprint Creates 252,000 Jobs in Pennsylvania: Summary of Results from PERI Economic Recovery Program Analysis,” October 2020; https://reimagineappalachia.org/wp-content/uploads/2020/10/PASummary_ReImagineAppalachia_PennsylvaniaPeriBrief_10-21-20.pdf

39 This 90,000 is consistent with the idea that a modern CCC would have the same scale as the original CCC—i.e., employ 10 million people if it lasted a decade or about 1 million people in any year. Given that our states account for 9.4% of national employment, our share of one million would be 94,000.

40 Highlights of the Agricultural Resilience Act can be found at <https://pingree.house.gov/netzeroagriculture/agriculture-resilience-act.htm>

41 Jennifer L. Wightman and Peter B. Woodbury, “New York Agriculture and Climate Change: Key Opportunities for Mitigation, Resilience, and Adaptation,” Final Report on Carbon Farming project for the New York State Department of Agriculture and Markets, May 1, 2020; https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/2/7553/files/2020/07/CarbonFarming_NYSAGM_FINAL_May2020.pdf.

42 The second and third option draw in part from Todd J. Nesbitt, “West Virginia: A Case for Economic Distributism in Appalachia,” *Journal of Appalachian Studies*, Vol. 25, No. 1 (Spring 2019), pp. 26-48 (23 pages). Nesbitt argues that the Mondragon network of cooperatives in the Basque region of Spain is a model for scaling up cooperatives and local wealth creation in West Virginia.

43 For an accessible primer on the issues in this paragraph, see Rebecca Brooke, “Payments for Forest Carbon: Opportunities & Challenges for Small Forest Owners,” Northern Forest Center, Manomet Center for Conservation Sciences, and Coastal Enterprises Inc., 2009; <https://www.manomet.org/wp-content/uploads/old-files/Payments-for-Forest-Carbon-2009.pdf>. Jennifer Schultz and Jocelyn Durkay, “State Forest Carbon Incentives and Policies,” January 24, 2018.

