# NATURE IS INFRASTRUCTURE

## The Economic, Health, and Safety Benefits of Nature

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# Executive Summary

**Nature is essential to American livelihoods, traditions, and well-being.** Decades of research support the immense value of the benefits provided by nature. These benefits include enormous economic activity and cost savings; supporting farms, ranches, working forests, and fisheries; protecting communities from hazards; and promoting individual and community health. This report outlines findings from over 1,000 articles and studies, including hundreds of peer-reviewed papers, as well as analysis from industry and public agencies. Collectively, the research compiled here tells a powerful story: **Nature is the foundation for thriving economies, as well as healthy and safe communities. Protecting, restoring, and enhancing nature provides cost-effective and irreplaceable benefits.** *(See Figure 1. Nature is Infrastructure Infographic on page 7.)*

## KEY FINDINGS

Studies show that the **benefits of investing in nature** include:

- **Driving local job creation and consumer spending.** Investing in nature drives migration of businesses and workers to areas with more natural amenities. In 2023, the outdoor recreation economy accounted for $640 billion, 2.3% of national GDP. Outdoor recreation supports nearly 5 million jobs, 3% of national employment. Wildlife-based recreation alone is big business. In 2022, 39.9 million Americans fished, 14.4 million hunted, and 148.3 million participated in wildlife-watching, generating $395 billion in economic activity.
- **High return on investment.** Data show that the benefits of investing in nature through conservation come at a relatively small cost. The return on investment for conservation in the form of natural services like clean drinking water is 4:1 nationally and as high as 11:1 in individual states.
- **Supporting farms, ranches, working forests, and fisheries.** Conservation funding supports working lands and waters and the

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communities that depend on them. Conservation investments have helped support hundreds of thousands of farmers, ranchers, and forest landowners. Voluntary conservation easements have helped keep nearly 8 million acres of farm and ranch land in production. A wide variety of conservation approaches and investments in nature support commercial fisheries and the traditions and livelihoods of fishing communities.

- **Protecting communities from the risks of flooding and extreme weather and wildfires.** Investing in nature helps protect people from hazards. Investing in federally funded mitigation, such as floodplain protection, can save the nation $7 in future disaster costs for every $1 spent on conservation. Good forest and grassland management, including fuels reduction, reduces the risk of catastrophic fires. Every $1 invested in forest restoration and fuels reduction returns over $7 in benefits.
- **Improving military readiness.** Conservation of natural buffer areas surrounding military installations protects personnel and military activities. Between 2003 and 2024, the Department of Defense matched $1.5 billion with nearly $1.4 billion from partner contributions to protect over 1.3 million acres of land at 140 locations across 40 states and territories to preserve key operational assets, infrastructure, and capabilities.
- **Cost-effectively providing cleaner water and air.** Protected watersheds can supply clean drinking water much more cost-effectively than water treatment plants; treating drinking water from an unprotected watershed can cost 10 times as much as from protected watersheds. Urban trees provide $3.8 billion in air pollution removal each year, and forests overall provide $6.8 billion in air pollution removal services.
- **Promoting community health:** Studies show that close-to-home access to green space is linked with lower rates of major diseases, improved mental health, and even lower crime rates. A large-scale study shows that people with the most close-to-home green space have lower rates of 15 diseases, including heart disease (15% lower), diabetes (20% lower), and depression (25% lower).

It is perhaps unsurprising, then, that Americans intuitively understand what the data show: **Investing in nature is essential to our safety, our health, and our economy.** Recent polling shows that:[1]

- Nine in ten (89%) agree that "even with federal budget problems, funding to safeguard land, air and water should not be cut."
- More than half (55%) "strongly agree" with this statement—and agreement cuts across party and demographic lines.

This is the highest share of agreement in 13 years of polling. Broad majorities want to see funding for water quality, land, wildlife habitat, and access to nature maintained. Most voters want to see increases in funding from the federal government for water quality, land and habitat, and access to nature. As few 3% want to see less funding for these priorities.

# NATURE IS INFRASTRUCTURE

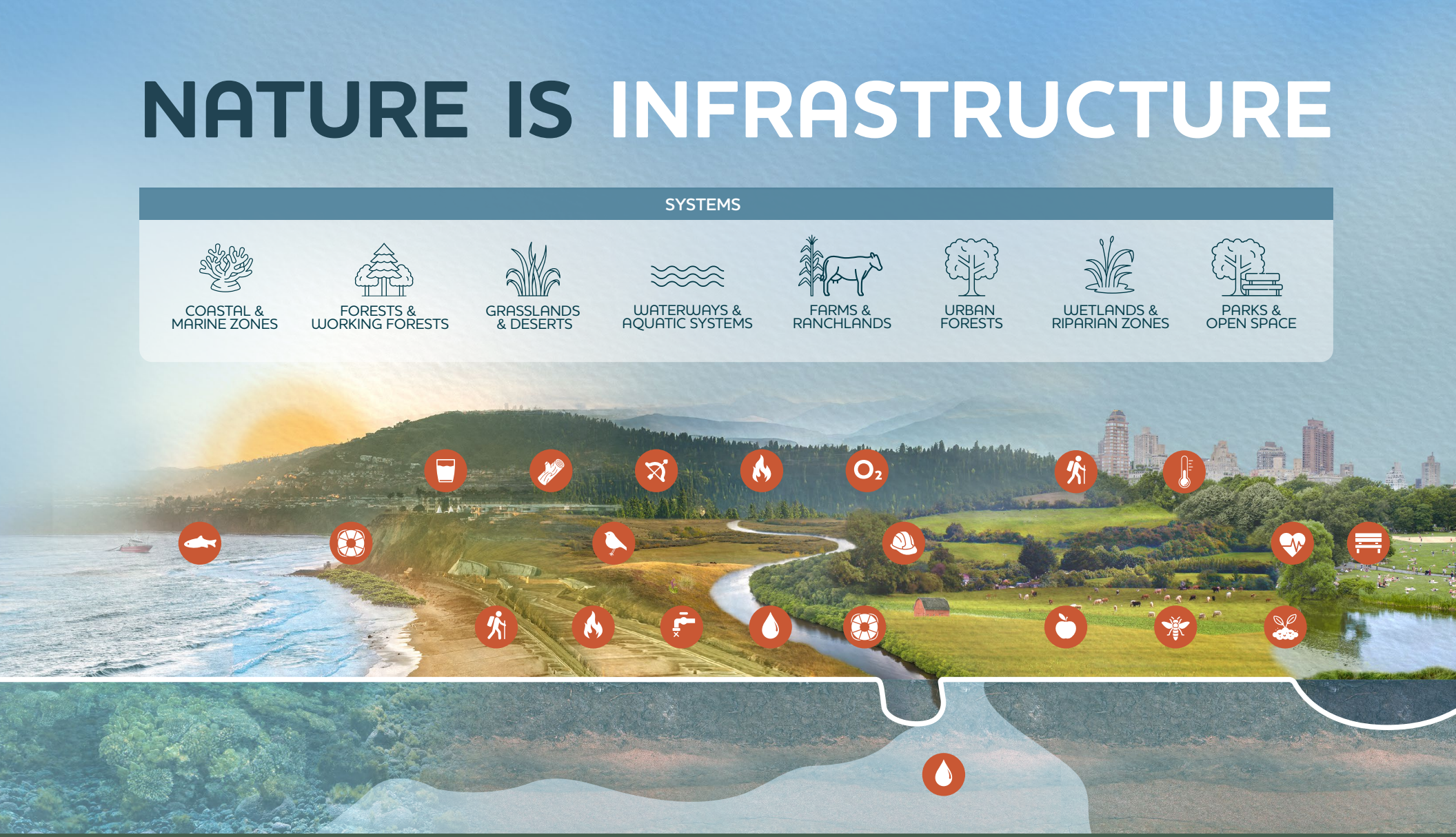


**Figure 1.** Nature is Infrastructure

# 01 Introduction

Americans value our natural infrastructure, and our connections with natural lands and waters run deep. Whether an Idaho fisherman who visits the same nearby stream as his father and grandfather, a Cincinnati school group that enjoys regular trips to a local park, or members of a North Carolina church who experience awe during their annual retreat to the Smoky Mountains, we find meaning and connection in nature. Part of what we gain from nature cannot be quantified—connection, inspiration, fun—but much of it can.

Over the past two decades, a growing body of literature has demonstrated the fundamental role that healthy natural lands and waters play in our local economies and communities. Taken together, these diverse studies paint a clear picture of the importance of nature. **Nature is infrastructure that creates jobs and economic growth while saving communities money through providing important services like clean drinking water. It supports our working lands and waters (farms, ranches, working forests, and fisheries). It helps keep us safe by reducing the impacts of wildfire, flooding, and extreme weather, and it promotes individual and community health.** *(See Figure 1. Nature is Infrastructure Infographic on page 7.)*

The data prove what Americans have long understood. In recent polling, 89% of Americans agree that "even with federal budget problems, funding to safeguard land, air and water should not be cut."[1] And Americans' votes have followed their beliefs. Since 2005, voters in conservative and liberal communities alike have approved over 78% of local and state ballot measures to fund land and water conservation and outdoor recreation.[2]

The cumulative evidence for the benefits of investing in natural infrastructure is powerful, and it paints a compelling picture: **Nature is the infrastructure of thriving local economies.**

Behind each of the statistics in this report are stories. A story of a family that takes deep pride in having stewarded their ranch for four

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generations. A story of a grandfather who feels joy and connection in taking his grandchildren fishing each summer. A story of a small business owner who finds meaning in creating jobs and helping to revitalize her rural community by renting bikes and outdoor gear. A story of a child who feels awe and inspiration each summer during their time at a nature-based camp. And at the heart of each story, is our shared natural heritage of healthy lands and waters.

Americans across the country have a deep stake in ensuring that the benefits of nature—those that can be quantified and those that cannot—are protected for future generations. **Ongoing funding for conservation and nature-based solutions is critical to the economic, safety, and health benefits that nature brings to Americans today and in the future.** Each dollar invested returns many more in economic growth, natural services, and improved health. Providing public funding for conservation and natural infrastructure will increase all these benefits in turn—helping ensure that communities all across America thrive.

## KEY TERMS AND CONCEPTS

### Natural Infrastructure and Nature-Based Solutions

This report describes how nature as infrastructure provides a wide range of benefits. Two terms are particularly relevant to these benefits, and they are sometimes used interchangeably: natural infrastructure and nature-based solutions. Natural infrastructure is the systems, and nature-based solutions are the ways that the systems are invested in and used.

Natural infrastructure encompasses waterways and wetlands, woodlands and forests, grasslands and rangelands, urban forests and parks, as well as other nature-based systems that benefit people by providing clean water and healthy food, generating economic activity, protecting communities from hazards, and supporting health.

Nature-based solutions use natural systems (and modified systems that support natural processes) to address issues facing communities, such as risks posed by flooding or drought or the need for local sources of healthy food and clean water.

### Ecosystem Services

Another term used to describe the benefits of nature is "ecosystem services." Ecosystem services are the benefits that natural ecosystems provide to communities. They are often divided into provisioning services (examples: food, fresh water, timber), regulating services (examples: water purification, crop pollination, flood control), cultural services (examples: recreational and aesthetic benefits), and supporting services (examples: soil formation, nutrient cycling, plants producing oxygen).

### Working Lands and Waters

Working lands and waters are areas that are actively managed for economic production while also providing environmental benefits. These lands and waters are typically used for agriculture, forestry, ranching, commercial fishing, and other resource-based activities.

### Conservation

Conservation is the protection and management of land, water, and natural infrastructure for the future. Conservation is not only the acquisition of land and conservation easements, but also restoration and long-term stewardship. Conservation should benefit local communities and local economies through promoting the health and prosperity of communities and working lands, providing clean water and air, and protecting people from environmental harms.

### Conservation Easements

Conservation easements are voluntary legal agreements that allow landowners to sell or donate the rights to develop and use their land in certain ways (generally restricting development) in order to protect its conservation values. Agricultural conservation easements preserve farm and ranchland for ongoing agricultural use.



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AXIS
seed

# 02
# Nature is Economic Infrastructure

**Nature is the backbone of the U.S. economy.** In addition to the benefits outlined in more detail in Sections 3 through 5 (many of which have direct and indirect economic benefits), natural infrastructure benefits economies through:

1. Natural amenities drawing new businesses and residents to areas with strong natural infrastructure
2. Expansion of the workforce for restoration and nature-based solutions
3. Economic activity from outdoor recreation, including hunting and fishing
4. Minimized risk and avoided costs through ecosystem services that promote resiliency
5. Benefits to local communities from visitors to local, state, and national parks
6. Avoided costs for health care through access to the benefits of green space

*(See Figure 2. Nature is Economic Infrastructure Infographic on page 19.)*

## HIGHLIGHTS

- Ecological restoration is a growing sector, directly employing approximately 126,000 workers and generating approximately $9.5 billion in sales annually.[3] It also supports an additional 95,000 jobs and $15 billion in economic output through indirect spending.
- The outdoor recreation economy is a significant and growing contributor to the U.S. economy. In 2023, the outdoor recreation economy accounted for $640 billion, 2.3% of national GDP.[4] Outdoor recreation supports nearly 5 million jobs, 3% of national employment.
- Wildlife-based recreation is big business. In 2022, 39.9 million Americans fished, 14.4 million hunted, and 148.3 million participated in wildlife-watching, generating $395 billion in economic activity.[5]

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- Spending on conservation has a strong return on investment in the form of ecosystem services, from 4:1 nationally ($4 returned in natural services such as clean water and flood control for every $1 invested) to as high as 11:1 in individual states.[6]
- Local public park and recreation agencies enrich community life while generating $201 billion in economic activity and supporting 1.1 million jobs every year.[7]

## DRAWING NEW BUSINESSES AND RESIDENTS

**Studies demonstrate that new businesses and residents are drawn by scenery, clean water and air, and access to recreation and public lands**.[8] Many workers will choose to relocate for a new job based on an area's quality of life, which is increased by the availability of open spaces. A survey by the National Parks and Recreation Association indicates that for 85% of Americans, high-quality parks and recreation opportunities are important in choosing where to live.[9]

- Three-quarters of corporate executives report that quality-of-life amenities are important in choosing where to locate.[10]
- A study of Colorado small businesses ranked parks, recreation, and open space as most important quality of life factors influencing choice of location,[11] and a recent poll found that **90% of small business owners in four western states think that public lands boost local businesses**.[12, 13]

Conserving land can also help local economies. A recent study of all major towns and cities in New England found that land conservation increased local employment numbers and the labor force, without reducing new housing permits.[14] This was found to be especially true in rural areas. Parks and open space attract workers and retirees to urban areas too. Studies show that both millennials and baby boomers prioritize walkable cities with quality of life-enhancing features like parks.[15] Investments in parks and green space are helping draw millennials back to mid-sized cities in particular.[16]

### CASE STUDY

**The Role of Protected Land and Recreation Opportunities in Diversifying a Small Town Economy; Sandpoint, Bonner County, Idaho.** Sandpoint is a small town in Bonner County in the remote northern Idaho panhandle. Despite a decline in local extractive industries and the closure of some key businesses, Sandpoint has been able to continue to grow and thrive in large part because of its natural amenities and corresponding high quality of life. Sandpoint's location along Lake Pend Oreille and near extensive recreation opportunities in the public lands of its surrounding mountains mean it has been able to attract both retirees and businesses and workers from aerospace, pharmaceutical, and software industries.[17] According to Sandpoint's former planning and economic development director, the area's natural and recreational amenities "are huge attractants and incentives for the creative class and people who want to live in very high-quality communities."[18] Between 1970 and 2013, Bonner County's population grew by 160% and employment grew 321%.[19] A study estimated that expanding outdoor recreational opportunities in Bonner County could further diversify the area's economy and generate up to $4.5 million in additional spending by visitors.[20]

## WORKFORCE DEVELOPMENT

Investments in restoration and nature-based solutions provide career opportunities for people with all levels of education and work experience. Natural infrastructure projects may include parks, urban forests, greenways, along with rain gardens, green roofs, bioswales, and rainwater harvesting.

- Roughly 239,000 full-time workers nationwide are employed in natural infrastructure sectors, including forest and conservation workers, roofers, tree trimmers, and landscaping workers.[21]
- Community-led restoration makes a significant contribution to local, state, and national economies. $72.5 million invested across 12 habitat restoration projects in Florida is estimated to support more than 1,000 jobs and $70 million in wages and increase both spending and economic activity.[22] In total, more than $100 million will be added to the economy.
- In Colorado, Trust for Public Land found that state conservation investment by Great Outdoors Colorado and the Conservation Trust Fund programs supported 11,800 jobs and $507 million in labor income.[23] That is, every $1 million invested supported 17.2 jobs.

**Investing in conservation and natural infrastructure supports millions of jobs across the country in a broad variety of sectors vital to local communities.**

- Agriculture, food, and related industries support 22.1 million jobs,[24] 10.4% of U.S. employees, and $1.05 billion in wages.[25]
- Outdoor recreation supports nearly 5 million jobs, 3.1% of U.S. employees, and $294 billion in compensation.[26]
- Approximately 950,000 people are employed in the forest products industry with a payroll of approximately $50 billion annually.[27]
- The commercial fisheries and seafood industry supports 1.6 million full- and part-time jobs and $47.2 billion in income.[28] Recreational fishing supports 692,000 jobs and $45.1 billion in income.

Investing in restoration projects can create jobs and stimulate economic growth in local communities.

- The ecological restoration sector directly employs approximately 126,000 workers and generates approximately $9.5 billion in sales annually.[29] It also supports an additional 95,000 jobs and $15 billion in economic output through indirect spending.
- A major program to restore trees across the U.S. could put 150,000 people to work planting the seedlings that will reduce extreme heat and improve air and water quality for years to come.[30]
- $600 million federal dollars invested in eight coastal management and conservation projects created more than 7,800 jobs, with a total labor income of $553 million, and will generate an estimated $1.4 billion in economic output.[31]
- The $3.47 million investment in the implementation phase of the Lone Cabbage Reef restoration project in Florida supported 44 full-time and part-time jobs earning $1.01 million in labor income and generated $5 million in total industry output, including $3 million in total value added within the regional economy.[32]

Investing in parks and public lands also creates and supports millions of jobs across the U.S.

- Local public park and recreation agencies support 1.1 million jobs that pay salaries, wages, and benefits totaling $63 billion.[33]
- National parks support 415,400 jobs and $19.4 billion in labor income.[34]
- Visitors to national forests and grasslands support about 161,000 full- and part-time jobs.[35]
- The National Wildlife Refuge system supports more than 41,000 jobs and generates approximately $1.1 billion in employment income.[36]
- Bureau of Land Management managed lands support 783,00 jobs.[37]

## OUTDOOR RECREATION ECONOMY

Outdoor recreation relies on publicly accessible streams, lakes, and beaches, and protected parks and open spaces. These natural places benefit residents, attract tourists, and boost local economies. **Nearly 181.1 million Americans participated in outdoor recreation in 2024**.[38] That represents 59% of all Americans aged six and older.

- In 2023, the outdoor recreation economy accounted for $640 billion, 2.3% of national GDP.[39] Outdoor recreation supports nearly 5 million jobs, 3% of national employment.
- The Great American Outdoors Act provides $3 billion to restore national parks and support land and water conservation, creating at least 100,000 jobs in communities surrounding popular public recreation areas.[40]

**Hunting, Fishing, and Other Wildlife-Based Recreation are big business**. According to the U.S. Fish and Wildlife Service, 39.9 million Americans fished, 14.4 million hunted, and 148.3 million participated in wildlife-watching in 2022, generating $395 billion in economic activity.[41]

Hunting and fishing are major drivers of local economies—and conservation funding. Excise taxes on hunting and fishing equipment have generated over $29 billion since 1937,[42] which has funded conservation programs and helped manage fish and game populations.[43] In 2025, $1.3 billion in funding was provided to states to support fish and wildlife conservation and outdoor access.[44] Excise taxes and license fees provide approximately 60% of the total funding for state wildlife agencies. A recent study indicates that because efforts to increase fishing and hunting opportunities have been so successful, equipment manufacturers have received a 1,100% return on investment that they have made through these taxes.[45]

## STRONG RETURN ON INVESTMENT THROUGH NATURAL GOODS AND SERVICES

**Spending on conservation provides strong return on investment (ROI) in the form of natural goods and services; it also directly supports economic growth, thriving local economies, and avoided infrastructure costs**.[46] Studies across the country show the ROI resulting from both public and private conservation dollars.

- The federal Land and Water Conservation Fund (LWCF) has an estimated 4 to 1 ROI. That is, for every $1 invested in land conservation, $4 is returned in natural goods and services such as drinking water protection and flood control.[47]
- The ROIs of state conservation funding can be even higher: a study in Colorado found the value of public benefits to be between $31 and $49 for every dollar invested in the state's tax credit program that supports land protection.[48]
- Texan by Nature identified a return of $4.39 for every $1 invested in conservation.[49]
- A series of studies by Trust for Public Land found publicly funded land conservation in Virginia has an estimated ROI of 4 to 1;[50] it's 9 to 1 in Vermont;[51] and in Maine[52] and New Hampshire,[53] it is as high as 11 to 1.

These investments in natural infrastructure directly benefit community members through water filtration and clean water, air pollutant removal and cleaner air, flood control, and more.

Many studies have shown the dollar value of individual natural goods and services provided by conserved lands.[54] *As shown in Table 1 on the next page*, the total estimated value of these services is $2,757 to $300,649 per acre per year depending on land cover type.

**Table 1. The Estimated Value of Ecosystem Services**
*(Adapted from "FEMA Ecosystem Service Value Updates")*[55]

| Ecosystem Service | Estimated Value (per acre per year) |
|---|---|
| Aesthetic value | $327 (coral reefs) to $223,840 (beaches and dunes) |
| Air quality benefits | $201 (urban green open space) to $711 (forest) |
| Pest, weed, disease control | $99 (riparian) |
| Climate regulation | $54 (urban green open space) to $199 (forest) |
| Erosion control | $78 (green open space) to $13,823 (riparian) |
| Flood and storm hazard reduction | $316 (urban green space) to $6,052 (riparian) |
| Food supply | $18 (coral reefs) to $1,905 (shellfish reefs) |
| Habitat | $2,021 to $5,890 (rural/urban green space) |
| Pollination | $350 (urban/rural green open space) |
| Water filtration | $435 (forest) to $1,584 (inland wetland) |
| Water supply | $103 (forest) to $643 (inland wetland) |

## CONSERVATION FUELS LOCAL ECONOMIES

Research shows that conservation can play a big role in creating thriving, diversified economies.[56] **Investments in conservation are powerful drivers of economic growth that ripple through local, state, and national economies.** Conserved lands and waters, from neighborhood parks to national parks and national marine sanctuaries, provide major economic benefits.

- Local public park and recreation agencies generate $201 billion in economic activity and support 1.1 million jobs every year.[57]
- National parks generate $26.4 billion in visitor spending, support 415,400 jobs, $19.4 billion in labor income, $32 billion in value added, and $55.6 billion in economic output.[58]
- Visitors to national forests and grasslands contributed $13.7 billion to U.S. GDP in FY21 and sustained about 161,000 full- and part-time jobs.[59]
- The National Wildlife Refuge system supports more than 41,000 jobs and creates more than $3 billion of value for local communities every year.[60]

By restoring degraded reefs within the Florida Keys National Marine Sanctuary, federal agencies and partners help support almost 20,000 local jobs tied to tourism, fishing, and ocean recreation. Each year, these activities generate more than $2 billion for the region.[61] Across all national marine sanctuaries, approximately $8 billion is generated annually in local economies from activities like commercial fishing, research, recreation, and tourism.[62]

While the economies of many rural areas are growing more slowly than their urban counterparts, access to public open space can help strengthen and diversify them.[63] Some rural towns have been able to attract new jobs, highly skilled workers, retirees, and tourists because of recreational and natural amenities provided by protected lands, offering a road map for other communities.

- Studies have shown that rural counties in the West with the largest percentage of federal public land had higher population, employment, and income growth between 1970 and 2014 than counties with smallest percentages.[64]
- Proximity to national parks and national monuments brings clear economic benefits. National parks generated $26.4 billion for gateway region communities in 2023.[65] That same year National Park visitors supported 415,400 jobs in local economies, and total economic benefits to local communities were $55.57 billion.[66] Employment and per-capita income improved in regions adjacent to national monuments.[67]
- A study from Headwaters Economics found that jobs in rural western counties with more than 30% federal protected land increased by 345% between 1970 and 2010, while in rural western counties with no protected federal land, jobs increased by only 83% during the same period.[68]

## AVOIDED HEALTH CARE COSTS

Access to green space and nature improves individual and community health. **The health conditions that can be improved by access to nature have major economic costs**, as summarized below. See Section 5 (Nature is Health Infrastructure) for more information on the links between access to nature and improved physical and mental health.

- **Cardiovascular Disease.** One in three U.S. adults received care for a cardiovascular risk factor or condition in 2020.[69] Annual health care costs for cardiovascular conditions are projected to almost quadruple, from $393 billion to $1.49 trillion, and productivity losses are projected to increase by 54%, from $234 billion to $361 billion.
- **Diabetes.** Diabetes affects 38.4 million Americans, 11.6% of the population, and costs the U.S. economy an estimated $413 billion in 2022.[70] Diabetes can affect the circulatory and nervous systems and impair kidney function and vision.[71]
- **Asthma.** Each year, over 15 million people in the U.S are treated for asthma.[72] In 2022, 44.2 million Americans, or 13.5%, had been diagnosed with asthma by a health professional.[73] The estimated annual cost of medical expenses, missed work, and asthma-related mortality is $80 billion.[74]
- **Obesity.** Nearly 42% of U.S. adults and 19.7% of children are obese.[75] Obesity is linked to increased mortality, high blood pressure, type 2 diabetes, heart disease, osteoarthritis, and some forms of cancer.[76] Annual obesity-related medical care costs in the U.S. are nearly $173 billion.[77]
- **Preterm Birth.** Preterm babies, those born before 37 weeks of pregnancy face potential issues with breathing, feeding, vision, hearing, and developmental delays—especially if they are born earlier than 32 weeks.[78] The economic cost of preterm birth is estimated to cost $25.2 billion per year in the U.S.[79]
- **Depression.** Depression is the leading cause of disability in the U.S., contributing to an estimated 490 million disability days per year, accounting for $23 billion in lost workdays, taking an economic toll of over $100 billion from businesses.[80]
- **Attention-Deficit/Hyperactivity Disorder** (ADHD). ADHD is one of the most common disorders in children—affecting nearly 11% of 3 to 17-year-olds.[81] The total annual societal excess costs associated with ADHD were estimated at $19.4 billion among children and $13.8 billion among adolescents.[82]

Conservation funding is critical to the benefits of green space. Publicly-funded parks are one of the best ways to expand access to close-to-home nature, and the kinds of dramatic landscapes that improve mental health through inspiring awe can often be found on protected public lands.

# NATURE IS ECONOMIC INFRASTRUCTURE


**Figure 2.** Nature is Economic Infrastructure

# 03

# Nature is Infrastructure for Working Lands and Waters

**Working lands and waters are critical to local economies and ways of life.** When these lands and waters are imperiled, it threatens local communities and endangers national food security. *(See Figure 3. Nature is Infrastructure for Working Lands and Waters Infographic on page 25.)*

## HIGHLIGHTS

- Agriculture, food, and associated industries added $9.5 trillion to the U.S. economy in 2023 and supported 47 million jobs.[83]
- 58 million acres of farm and ranch land (a land area the size of Illinois) was lost to development between 2002 and 2022.[84] Without conservation easements, the country could have lost an additional nearly 8 million acres.[85]
- Through harvesting timber, the forest products industry generates $435 billion in economic activity each year and directly supports nearly one million jobs.[86]
- Commercial fisheries generate over $180 billion in sales annually and are highly dependent on clean water and the protection of fish habitat.[87]

## FARMS AND RANCHES

America's farms and ranches, which sustain livelihoods and contribute to local economic growth and agricultural production, are disappearing. Between 2002 and 2022, the U.S. lost over 58 million acres of farmland. This represents 6.2% of the nation's total agricultural land, the equivalent of the size of the state of Illinois.[88] During the same time period, nearly 230,000 farms were lost (11%). The number of U.S. farms peaked at 6.8 million in 1935, and there are now only 1.9 million farms.[89]

**Farmers and ranchers are irreplaceable. Through committed and purposeful stewardship, they support vibrant local economies and rural culture, protect domestic food security, and maintain enormous expanses of open space—providing viewsheds, flood control, wildlife habitat, and much more**.[90] Given that 97% of U.S. farms are

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family-owned, the decline in agricultural lands is a risk to family farms and ranchers, and has national economic repercussions. **Altogether, agriculture, food, and related industries added $9.5 trillion to the U.S. economy in 2023 and supported 47 million jobs**.[91]

The USDA has programs that support conservation practices, provide technical assistance, and fund voluntary conservation easements.[92] Its Agricultural Conservation Easement Program, and its predecessor programs, have worked with landowners for twenty-eight years, protecting more than 5 million acres of wetlands and agricultural lands.[93] From 2017 to 2022, $438 million was invested in the Agricultural Land Easements program, and $813 million in the Wetland Reserve Program.[94] The USDA's conservation programs also provide farmers and ranchers with technical assistance and funding for stewardship practices that help save energy, benefit soil and water quality, and protect wetlands and wildlife habitat.[95]

**Federal investments in farm and ranchland conservation programs create jobs and support local communities.** Together the 2019-2024 Farm Bill and 2023-2024 Inflation Reduction Act funds for agricultural conservation created an impact of:[96]

- More than 46,700 jobs annually with more than $1.9 billion in annual employee wages for 10 years.
- About $3.4 billion in annual GDP (value added), a return of $1.59 for each dollar invested.
- Nearly $213 million in annual local, state, and federal tax revenue for 10 years.

One important way to invest in natural infrastructure is through agricultural research and technical assistance for farmers and ranchers:

- USDA Natural Resource Conservation Service staff operate in almost every county in the U.S. and provide conservation technical assistance to thousands of farmers every year. Their efforts help farmers get paid for their conservation work—to the tune of over $4 billion in financial assistance from Farm Bill programs last fiscal year alone.[97]

Researchers from the USDA's Agricultural Research Service (ARS), collaborate with private companies and university partners to tackle urgent challenges facing farmers and ranchers, from water conservation to human health outcomes.

- Each dollar invested in U.S. agricultural research results in $20 of economic impact.[98]

ARS research produces practical tools and information for producers. For example, the National Laboratory for Agriculture and the Environment in Iowa has helped upper Midwest farmers identify and apply cost-effective edge-of-field best management practices to improve water quality and support habitat for biodiversity while maintaining financial returns and economic stability.[99]

Many farmers and ranchers face major economic obstacles to staying on their land and maintaining their way of life. Conservation funding has helped slow this trend, keeping farms and ranches intact and younger generations working the land.

- Tools like voluntary agricultural conservation easements, which protect working farms and ranches from development while leaving it in private hands, can reduce landowners' annual tax liability and estate taxes and help families continue farming and ranching.

Tax credit programs, in states like New Mexico, Colorado, Georgia, Virginia, and South Carolina, also allow private landowners to sell these tax reductions as credits for cash.[100] Money from conservation easements circulates back into local farm communities and economies.[101] A study in Colorado found the value of public benefits to be between $31 and $49 associated with every dollar invested in the state's tax credit program that supports land protection.[102] American Farmland Trust estimates that

nearly 8 million acres of working farms and ranches have been protected through conservation easements.[103]

National and state funding is critical to these conservation efforts. The USDA's 2024 budget, for instance, included $5.3 billion in funding for Farm Bill conservation,[104] bringing program enrollment to approximately 466 million acres.[105] States and the federal government also help support voluntary conservation easements through tax credits and deductions.

## CASE STUDY

**Protecting Family Farming Traditions through Conservation; Taos County, New Mexico.** Two-hundred years ago, Crestina Trujillo-Armstrong's great-grandfather settled on 75 acres in the San Cristobal Valley in Taos County, New Mexico. The family's homestead extends across the width of the valley and is bisected by San Cristobal Creek—a critical source of water for irrigation and livestock. Crestina is now in her 60s. Her house sits in the middle of the property, and the family still does the daily chores of corralling livestock and tending to the garden. "I can talk to this land. Ask it for advice or direction. It's made me laugh and it's made me cry," Crestina says. "It's hard to explain. You have to experience it." It's an experience that's getting harder and harder to pass to the next generation in Taos County. Development pressure and rising land values mean many old families are selling or subdividing their land. For decades, Crestina has watched as old family farms surrounding hers were subdivided and sold. However, Crestina was determined to preserve the land and the family's way of life. In 1999, she and her brother put a conservation easement on 38 acres of the family homestead, including all the irrigated land. The easement means the land can never be developed and can be passed to future generations of her family. *(Adapted from the Taos County Community Conservation Plan, 2017*[106]*)*

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## WORKING FORESTS

**Through harvesting timber, the forest products industry generates $435 billion in economic activity each year and directly supports nearly one million jobs.**[107] The forest products industry is among the top 10 manufacturing sector employers in 45 states.[108] Family-run forests are under threat too. Over one-third of the forest land in the U.S. is family-owned—15% of all the nation's land.[109]

- By 2060, though, the country is projected to lose 16 to 34 million acres of forest.[110] Thousands of acres of family-owned forests are lost each year—converted for development, subdivided, or destroyed by wildfire, drought, insects, and disease.[111]

As with farmers and ranchers, operational expenses, taxes, and supporting the next generation of forest managers are major concerns for owners of working forests. Voluntary conservation easements have helped ease tax burdens and provide needed funding to keep land forested and maintain sustainable timber harvesting.[112] Forests can also be protected through community forestry programs in which forests are preserved and managed by local governments or nonprofits for the benefit of local communities. In 2025 alone, the U.S. Forest Service provided $106 million in funding for private forest conservation through its Forest Legacy Program and $3.1 million for community forests.[113]

In addition to the many challenges faced by privately-owned working forests, National Forests are under threat from severe wildfires, insect and disease outbreaks, invasive species, drought, and other stressors. Major investments are needed in forest management (including thinning and timber harvest) to reduce threats to these forests and nearby communities.[114]

## COMMERCIAL FISHING

In fishing communities from Alaska to Maine to Louisiana, fishing and harvesting shellfish are more than just occupations. Fisheries are central to identity, traditions, and social ties. In many coastal communities, particularly those in rural or remote areas, commercial fishing is the only significant economic driver and offers the most stable job opportunities. Commercial fishing has a broad economic reach that goes beyond the sale of fish and seafood. Commercial fishing hubs support local economies by creating business for boat and ship manufacturers, tackle suppliers, and other related services. **Nationwide, in 2022, the commercial fisheries and seafood industry generated $183 billion in sales and supported 1.6 million full- and part-time jobs.**[115]

A wide variety of conservation approaches and investments in natural infrastructure support commercial fisheries. These include protection of fish habitat in wetlands, rivers, and coral reefs; removing dams and other barriers to the movement of migratory and forage fish; and preserving access to and improving the resilience of working waterfronts.[116] In addition, water quality in coastal areas is directly affected by the water purification, flood control, and stormwater protection provided by nearby natural areas. Management and research by the National Marine Fisheries Service support sustainable fisheries across the country.[117]

# NATURE IS INFRASTRUCTURE FOR WORKING LANDS AND WATERS

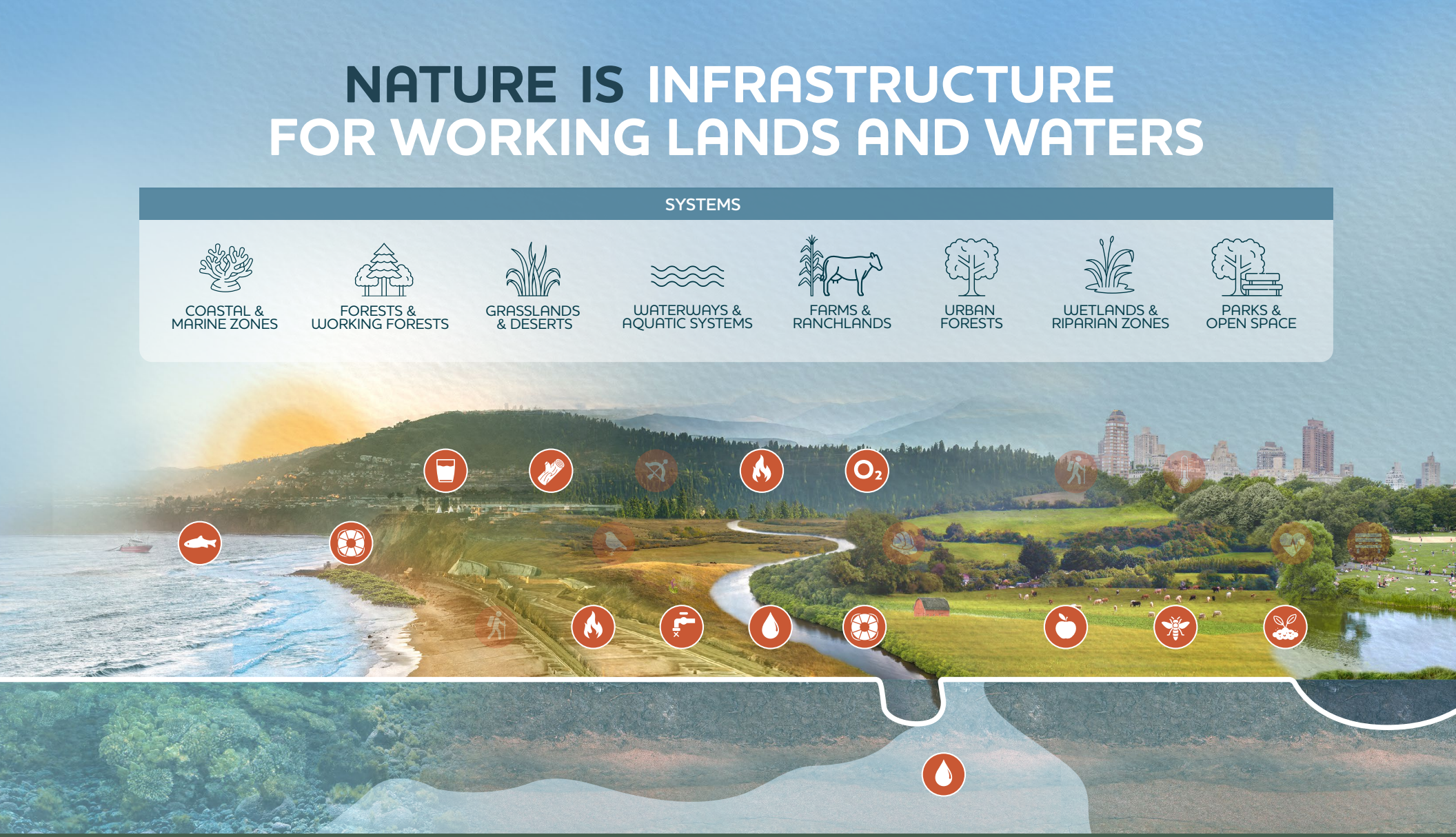


**Figure 3.** Nature is Infrastructure for Working Lands and Waters

# 04

# Nature is Public Safety Infrastructure

**Protecting and restoring nature provides critical infrastructure for public safety.** Natural infrastructure including protected floodplains, wetlands, and coastal mangroves helps protect communities from dangerous flooding. Well-managed forests reduce the risks of extreme wildfires. Trees and green spaces dramatically reduce temperatures, protecting people from extreme heat. Land and water conservation practices help prevent and mitigate drought. Finally, conservation surrounding military bases and other installations creates important buffers that support military readiness. (*See Figure 4. Nature is Public Safety Infrastructure Infographic on page 34.*)

## HIGHLIGHTS

- Protected watersheds can supply clean drinking water much more cost-effectively than water treatment plants; treating drinking water from an unprotected watershed can cost 10 times as much as from protected watersheds.[118]
- Flooding is the most expensive natural hazard across the country, with $215 billion in total losses from 2000 to 2019.[119] Scientists estimate that U.S. coastal wetlands provide $23.2 billion in storm protection services each year.[120]
- Protecting inland wetlands and riparian areas can also be a cost-effective way to minimize damage caused by flooding. A recent study found that conserving large areas of floodplain provided cumulative avoided future flood damages exceeding land acquisition costs by a factor of at least five to one.[121]
- Prolonged drought can deplete groundwater aquifers that many communities rely on for drinking water and irrigation.[122] In 2024, drought, excessive heat, and wildfires led to over $11 billion in crop losses.[123]

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*ERIKA NORTEMANN/TNC*

- Urban trees provide $3.8 billion in air pollution removal each year,[124] and forests overall provide $6.8 billion in air pollution removal services.[125] Areas shaded by trees can be 20-45°F cooler than unshaded areas.[126]
- A majority of Americans believe more should be done to restore forests, protecting human and ecological communities from wildfire, with 4 in 5 voters supporting increased federal investment to proactively reduce the threat and intensity of wildfires.[127]
- Conservation improves military readiness. Between 2003 and 2024, the Department of Defense leveraged $1.5 billion with nearly $1.4 billion from partner contributions to protect over 1.3 million acres of land at 140 locations across 40 states and territories to preserve key operational assets, infrastructure, and capabilities.[128]

## CLEAN DRINKING WATER

Conserved natural lands, including parks, open spaces, wetlands, and forests, help filter rainfall and stormwater runoff and protect sources of drinking water. About half of the river and stream miles and lake acres that have been studied across the U.S. are so polluted they are classified as "impaired."[129] Conserved forested lands within watersheds are especially critical to protecting drinking water quality.[130] Protecting wetlands and buffers around rivers is also cost-effective and can substantially improve water quality.[131]

- Forests supply drinking water for 180 million Americans in 68,000 communities; they are the largest source of drinking water in the U.S.[132]
- Forests managed by the U.S. Forest Service provide water to 66 million people in 3,400 communities across 33 states.[133] The estimated value of water from Forest Service lands is at least $8.35 billion per year.[134]

**Protected watersheds can supply clean drinking water much more cost-effectively than water treatment plants;** treating drinking water from an unprotected watershed can cost 10 times as much as from protected watersheds.[135] New York City spent $1.5 billion conserving forested watershed lands, avoiding the cost of a $8-10 billion new water filtration plant.[136] A study of 27 water suppliers showed that for every additional 10% of forest cover (up to 60%), water treatment costs decreased 20%.[137]

## PROTECTION FROM FLOODING AND EXTREME WEATHER

Catastrophic flooding and impacts from extreme weather have become increasingly common, and many Americans live in vulnerable areas.[138] Conserved areas including parks,[139] natural floodplains,[140] wetlands,[141] salt marshes,[142] coral reefs,[143] and mangroves[144] help reduce the impacts of storms and flooding. **Studies show that conserving and restoring these natural places is among the most cost-effective ways to protect coastal areas**.[145]

Flooding and extreme weather has cost American lives and livelihoods, and future losses are on track to be even more costly:

- From 1980 to 2024, the U.S. faced 45 separate billion-dollar flooding disasters totaling $203 billion, for an average of $4.5 billion a year.[146] These disasters resulted in 765 deaths.
- Flooding is the most expensive natural hazard across the country, with $215 billion in total losses from 2000 to 2019.[147]
- There are more than 33.1 million residential properties nationally, spanning from Texas to Maine, at moderate or greater risk of sustaining damage from hurricane-force winds. These properties have a combined reconstruction cost value of $11.7 trillion.[148]

Investing in natural infrastructure can be a cost-effective solution:

- Scientists estimate that U.S. coastal wetlands provide $23.2 billion in storm protection services each year.[149] Wetlands prevented more than $625 million in property damage during Hurricane Sandy and reduced damage across 12 coastal states by 11%.[150]
- **Protecting wetlands,[151] and natural floodplains[152] can be a cost-effective way to minimize damage caused by flooding.** A recent study found that conserving large areas of floodplain provided cumulative avoided future flood damages exceeding land acquisition costs by a factor of at least five to one.[153]
- The cost of conserving wetlands is repaid through reduced damage from flooding within 6 to 22 years.[154]
- Coral reefs are estimated to help avoid $825 million in flood damages annually.[155]
- According to the National Institute of Building Sciences, investing in federally funded mitigation, such as acquisition and removal of buildings from the floodplain, can save the nation $7 in future disaster costs for every $1 spent.[156]

Mangroves can function as a first line of defense for coastal communities.[157] A recent study showed that mangrove forests in Florida provided significant flood damage reduction benefits annually, across multiple storms, and during catastrophic events like Hurricane Irma. In Collier County, mangroves reduced annual flood risk by 26% to properties behind them. The value of mangrove forests during Hurricane Irma was also very high. Mangroves averted $1.5 billion in storm damages, amounting to a 25% savings in counties that have mangroves. They also protected more than 626,000 people across Florida.

## CASE STUDIES

**Coastal Conservation to Support Military Readiness; Marine Corps Air Station Beaufort, South Carolina:** Rising tides and storm surges can damage the shoreline and inundate roads at the Marine Corps Air Station Beaufort.[158] The Laurel Bay housing complex, where many marines and their families live, is particularly at risk. The Nature Conservancy (TNC) and air station leaders, with a grant from the National Oceanic and Atmospheric Administration's Community-based Restoration Program, are implementing a large-scale living shoreline to help protect Laurel Bay and to make the base more resilient. More than 250 Marine and civilian volunteers built an oyster reef to protect the coast by dissipating the force of incoming waves.

**Parks as Essential Infrastructure; Houston, Texas.** Hurricane Harvey devastated Houston, Texas, and surrounding Harris County in August 2017. Sixty inches of rain fell in some areas.[159] At least 88 people were killed,[160] and more than 200,000 homes were damaged;[161] The total estimated cost of storm damage was over $125 billion.[162] Exactly one year later, Harris County residents passed a $2.5 billion bond measure to fund projects, including urban parks and green spaces, to reduce the impacts of future storms with the support of 85% of voters.[163] Thinking of parks as part of the solution to flooding is not new in Houston. The Harris County Flood Control District has used parks as a flood-control strategy along 31 miles of Brays Bayou. "Project Brays" includes detention basins that can hold 3.5 billion gallons of stormwater; the detention basins have been designed so that they can also serve as five parks and a trail system.[164] According to Harris County Commissioner Rodney Ellis, "parks and greenways enhance community resilience. Just days after Hurricane Harvey, our office received a constant stream of calls asking if and when our parks would be open again. Those calls reaffirmed my belief that parks and green spaces are not amenities, instead they are integral to the lives of our residents."

## REDUCING THE RISK OF DROUGHT

Drought can be part of natural cycles; however, prolonged droughts can impact drinking water quality, threaten public safety through air quality impacts from dust and wildfires, threaten local food economies and food security, and reduce hydropower generation, jeopardizing energy security.[165]

- Droughts are costly. From 1980 to 2024, the U.S. faced 32 separate billion-dollar drought disasters totaling $368 billion, for an average of $8.2 billion a year.[166]
- Drought can have a profound impact on hydropower generation in the U.S. A recent study found that from 2003 to 2020 drought led to a considerable decline in hydroelectricity generation, amounting to approximately 300 million MWh, and resulting in an estimated loss of $28 billion to the sector.[167]
- Prolonged drought can deplete groundwater aquifers that many communities rely on for drinking water and irrigation.[168] In 2024, drought, excessive heat, and wildfires led to over $11 billion in crop losses.[169]

Nature-based solutions play a critical role in reducing risks.[170] These approaches include native habitat restoration, urban tree planting, restoring floodplains, riparian areas, and wetlands, and recharging aquifers. **Land conservation and conservation-oriented best management practices are also crucial for mitigating drought impacts.**[171] Programs through the USDA Natural Resources Conservation Service like the Conservation Reserve Program (CRP) and Environmental Quality Incentives Program (EQIP) play an important role in drought preparedness through farm practices such as retirement of sensitive lands, investment in technology that improves irrigation efficiency, and adoption of tillage practices that conserve soil moisture.[172]

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## REDUCING THE RISK OF CATASTROPHIC WILDFIRE

Fire can be an important element of forest and grassland ecology and of good forest and grassland management. In many cases, natural and managed wildfires can support the health of fire-adapted ecosystems and reduce vegetation that could fuel extreme fires.[173] Unfortunately, fire suppression, drought, pests and disease, and extreme heat have left many forested and grassland areas very vulnerable to intense, catastrophic wildfires that jeopardize both communities and natural resources.

- Wildfire costs American lives and livelihoods. From 1980 to 2024, the U.S. faced 23 separate billion-dollar wildfire disasters totaling $148 billion, for an average of $3.3 billion a year.[174] These disasters resulted in 537 deaths. In 2024 alone, there were 64,897 wildfires reported nationally that burned 8.92 million acres.[175]
- A majority of Americans believe more should be done to restore forests, protecting human and ecological communities from wildfire, with 4 in 5 voters supporting increased federal investment to proactively reduce the threat and intensity of wildfires.[176]
- **Good forest and grassland management, including fuels reduction, reduces the risk of catastrophic fires.** A recent study shows that every $1 invested in forest restoration and fuels reduction returns over $7 in benefits.[177]

Over the past two decades, wildfires have become larger, longer lasting, more frequent, and more destructive in terms of lives lost and economic costs.[178] Wildfires can endanger lives and structures directly. Between 2015-2024, wildfires destroyed, on average, more than 8,000 structures annually.[179] The annual economic burden of wildfires is estimated to be between $71 billion and $348 billion, including local, state and federal suppression costs.[180]

Smoke from wildfires can have very significant impacts on health and productivity—even far away from the fire itself. A recent study estimated that health impacts from particulate matter in wildfire smoke contributed to an economic burden of $160 billion and 15,000 deaths between 2006 and 2020.[181] Another study found that wildfire smoke led to annual declines in labor market activity totaling $125 billion per year between 2006 and 2015.[182]

Wildfire risks are most pronounced in the wildland-urban interface, areas where homes are located inside and adjacent to wildlands.[183] Over the past two decades, the number of homes in this interface has grown by about 350,000 per year.[184] As of 2020, roughly 44 million homes, or 32% of U.S. homes, were in the wildland-urban interface. This growth often results in more human-caused wildfires, putting more lives and homes at risk.

### CASE STUDY

**Watersheds Threatened by Wildfire; Colorado.** In 1996 and 2002, Colorado experienced two devastating wildfires; the Buffalo Creek fire burned 12,000 acres and the Hayman fire burned 137,760 acres, much of it within watersheds of Denver Water, the state's largest water utility that provides water to 1.4 million people in the Denver Metropolitan area. The fires were hugely costly for Denver Water, requiring $27 million in repairs to Denver Water's collection system and reservoirs. To prevent future costly clean-ups, Denver Water is investing in forest conservation and restoration. Partnering with the U.S. Forest Service, which manages 90% of Colorado's lands with watersheds that supply public water, Denver Water is focused on the restoration of 88,000 acres of forest lands. According to Jim Lochhead, Denver Water CEO, "Those big fires taught us that investing in forest health is less expensive than dealing with the aftereffect of a catastrophic wildfire."[185]

## MANAGING STORMWATER

Conserved lands can protect water quality and help reduce flooding through supporting stormwater management.[186] Green spaces can capture and absorb precipitation, slow runoff, and recharge groundwater. They can also function like reservoirs for rainwater, dramatically reducing runoff.

- Protecting an acre of natural land provides stormwater management values ranging from $48,000 to $79,000.[187]

In the Galveston Bay region in Texas, conserved lands improve water quality by filtering pollutants such as nitrogen and phosphorus.[188] The economic value provided by conserved lands capturing 87,000 acre-feet of stormwater is $61.9 million annually.

**Protected green spaces, wetlands, and natural floodplains can absorb excessive nutrients that would otherwise disrupt drinking water systems** by contributing to algal blooms and low levels of oxygen. Algae outbreaks can produce toxins that pose serious health hazards to people, pets, and aquatic life. From 2010 to 2020, cities and towns in 22 states spent over $1 billion to prevent or treat outbreaks of potentially toxic algae in lakes, rivers, bays, and drinking water supplies.[189]

## CLEANER AIR AND COOLER TEMPERATURES

Air pollution is linked to 200,000 premature deaths[190] and 16,000 preterm births[191] annually in the U.S. Both inside and outside of cities, **trees help remove health-threatening pollution from the air**, including nitrogen dioxide, sulfur dioxide, ozone, and particulate matter.[192] Trees play a particularly important role in reducing the effects of urban air pollution.

- Air pollution from the energy sector alone is associated with $131 billion in damage to health, crops, and built infrastructure annually in the U.S.[193]
- Urban trees provide $3.8 billion in air pollution removal each year,[194] and forests overall provide $6.8 billion in air pollution removal services.[195]

Extreme heat causes a range of health problems, including heat exhaustion, heat stroke, even death. Many of these premature deaths could be prevented through increasing tree canopy cover. This is especially important for households that lack access to air conditioning.[196] Heat waves are particularly dangerous for seniors, people who work outdoors, and other vulnerable populations.[197]

- Across 297 counties, representing 62% of the U.S. population, an estimated 5,608 deaths are attributable to heat annually.[198]

**Urban trees help reduce high temperatures exacerbated by "urban heat islands"**—a phenomenon created by surfaces in cities (such as sidewalks, streets, and roofs) retaining heat during hot days. The urban heat island effect means that cities with at least one million people can be up to 5°F warmer during the day and 22°F warmer in the evening than surrounding areas.[199]

- Areas shaded by trees can be 20-45°F cooler than unshaded areas.[200]

Warmer temperatures from urban heat islands cause higher peak energy demand, especially for air conditioning, and exacerbate air pollution, impair water quality, and increase heat-related illnesses and mortality.[201] A recent study indicates that the economic cost of rising temperatures will likely be over twice as high in cities because of the urban heat island effect.[202] Natural infrastructure, including urban parks and forests, can reduce the energy demand of nearby buildings by 10%.[203]

## NATIONAL DEFENSE IS STRONGER THROUGH CONSERVATION

Military lands comprise over 30 million acres across 300 military installations in the U.S.[204] Natural lands and open space surrounding military installations provide valuable ecosystem services and support military readiness. The federal Readiness and Environmental Protection Integration Program (REPI) facilitates cost-sharing agreements between the military, other federal agencies, state and local governments, and private conservation organizations for land conservation efforts near military ranges and installations to address challenges posed by development near military lands. **The benefits to the military of conserving natural buffer areas include reducing lost training days, mitigating noise conflicts, preserving night operations, preserving live-fire and maneuver training, reducing electromagnetic spectrum interference, providing for mission growth and multi-service missions, and supporting operational safety and installation security**.[205]

- From FY 2003 through FY 2024, the Department of Defense leveraged $1.5 billion with nearly $1.4 billion from partner contributions to protect over 1.3 million acres of land at 140 locations across 40 states and territories to preserve key operational assets, infrastructure, and capabilities.[206]

The Sentinel Landscapes Partnership also strengthens military readiness.[207] The Sentinel Landscapes Partnership is a coalition of Federal agencies, state and local governments, and private organizations that work with willing landowners and land managers to advance sustainable land use practices around high-value military installations and ranges.

- Through FY 2022, the Sentinel Landscapes Partnership has attracted federal matching funds of approximately $341 million in state funds, $26 million in local funds, and $142 million in private funds. These contributions have permanently protected 677,100 acres of land preserving wildlife habitat, bolstering agricultural and forestry production, and reducing land-use conflicts around military bases.

### CASE STUDY

**Kittatinny Ridge Sentinel Landscape, Pennsylvania: In the Lenape language, Kittatinny means "Big Mountain," which describes the geography of Kittatinny Ridge Sentinel Landscape well.**[208] Located in eastern Pennsylvania's Appalachian Mountains, it encompasses forested ridges and fertile valleys that provide clean water, sequester vast amounts of carbon, and serve as a crucial corridor for rare wildlife and songbird migration. The landscape is anchored by Fort Indiantown Gap, the busiest National Guard training center, the Army's second busiest heliport, and one of only three specialized Army National Guard aviation facilities. "With the primary mission of preserving military mission readiness, operations, testing and training capabilities, partners are focused on increasing coordinated and holistic land conservation, natural resource protection, and stewardship initiatives; supporting working lands productivity and economic development; and improving nature-based recreational resources and access to sustain small-town economies," said Denise Coleman, Pennsylvania State Conservationist. USDA's Regional Conservation Partnership Program was the foundation for the Kittatinny Ridge Sentinel Landscape designation. Investments in the project between NRCS, Pennsylvania Department of Agriculture, and non-government organizations, totaled $38.9 million. *(Adapted from NRCS, "Kittatinny Ridge Among Five Sentinel Landscapes Selected to Address Climate Change Impacts and Strengthen Military Readiness.")*

# NATURE IS PUBLIC SAFETY INFRASTRUCTURE




**Figure 4.** Nature is Public Safety Infrastructure

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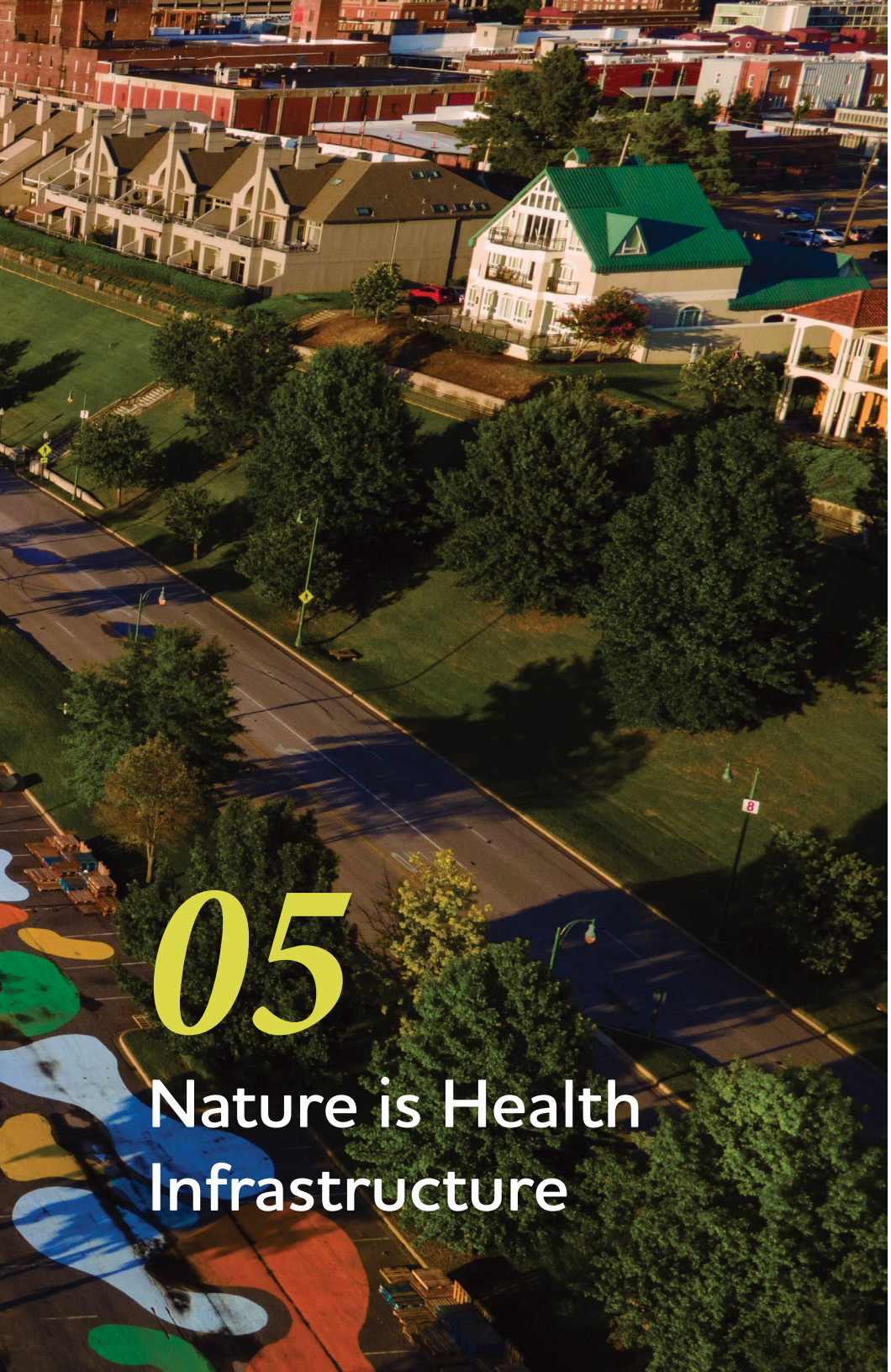

# 05 Nature is Health Infrastructure

**Nature supports healthy, productive lives and resilient, cohesive communities.**[209] Over the past two decades, a significant body of scientific research has drawn a connection between access to nature and improved physical and mental health.[210] This link remains strong from small towns to big cities across many countries, even when socioeconomic differences are taken into account.[211] Many recent studies use measures like blood pressure, cognitive tests, immune system function, and even crime statistics to show that increased exposure to nature has positive impacts on mental and physical health.[212] (*See Figure 5. Nature is Health Infrastructure Infographic on page 42.*)

## HIGHLIGHTS

- A large-scale study shows that residents living within 0.6 miles of greater amounts of green space had significantly lower rates of 15 diseases, including heart disease, depression, asthma, and diabetes.[213]
- Diabetes affects 38.4 million Americans, nearly 12% of the population, and costs the U.S. economy an estimated $413 billion in 2022.[214] More access to green space has been linked to 20% lower rates of diabetes.[215]
- Depression is the leading cause of disability in the U.S., contributing to an estimated 490 million disability days per year, accounting for $23 billion in lost workdays, taking an economic toll of over $100 billion from businesses.[216] More access to green space has been linked to 25% lower rates of depression.[217]

## HEALTH BENEFITS OF GREEN SPACE

**Research has established connections between increased green space and lower rates of chronic diseases such as heart disease, diabetes, and asthma.**[218] Diverse studies have strengthened evidence for ties between time spent in nature and lower rates of depression and

PHOTO CREDIT | *RORY DOYLE*

anxiety.[219] Studies have also shown links between close-to-home green space and lower rates of obesity, including childhood obesity, and lower risks of preterm birth and low birth weight.[220] **Research also indicates that exposure to nature can reduce symptoms of post-traumatic stress disorder[221] and attention deficit hyperactivity disorder[222] and can increase cognitive abilities and creativity.**[223] Finally research points to the powerful role of green space in reducing stress,[224] improving immune function,[225] reducing mortality,[226] and increasing overall sense of well-being.[227]

Unfortunately, not everyone has access to green space. One in three urban residents does not have a park with a 10-minute walk of their home.[228] Even when parks are accessible, many people seem to be spending less time in nature despite the demonstrated benefits. Studies show that Americans spend 90% of their time inside buildings or vehicles.[229] The American Academy of Pediatrics has drawn attention to the importance of playing outdoors for children's physical and mental health.[230] Instead of spending time outside, the average American child spends five to eight hours a day in front of a screen, and this disconnection from nature has major impacts on health.[231]

- **The Land and Water Conservation Fund is especially critical for expanding access to green space.** The LWCF supports everything from national parks to neighborhood parks. Without any cost to taxpayers, LWCF provides a critical source of matching funds for state and local governments, and 98% of American counties have an LWCF-funded park.[232]

A 2009 study provides particularly strong evidence for the link between close-to-home green space and health outcomes. The study looked at medical records for over 345,000 people and controlled for socioeconomic status.[233] Results showed that when people had just 10% more green space than average within 0.6 miles of home, they had significantly lower rates of 15 diseases, including heart disease, depression, asthma, and diabetes, and the same rates of the remaining nine other diseases examined in the study. The study also looked at the differences in health outcomes for those living in very green areas (90% green space within 0.6 miles) versus minimally green areas (only 10% green space within 0.6 miles). Those differences are shown below in Table 2.

**Table 2. Health Outcomes Linked to Living in Areas with 90% Green Space Versus 10% Green Space** *(adapted from Maas et al. 2009)*[234]

| Negative Health Outcome | Percent Decrease in Very Green Areas (90% green space) |
|---|---|
| **Cardiovascular Disease** | |
| Heart disease | -15% |
| Coronary heart disease | -21% |
| High blood pressure | -6% |
| Stroke | -17% |
| **Respiratory Disease** | |
| Upper respiratory tract infection | -19% |
| Asthma, chronic obstructive pulmonary disease | -23% |
| **Other Diseases** | |
| Diabetes | -20% |
| Cancer | -10% |
| **Mental Illness** | |
| Depression | -25% |
| Anxiety Disorder | -31% |

Overall, the evidence of hundreds of studies shows the following positive impacts on health from exposure to nature:

- Lower levels of chronic diseases, including heart disease and diabetes
- Lower rates of obesity
- Lower risk of preterm birth and low birth weight
- Lower levels of depression and anxiety
- Reduced symptoms of post-traumatic stress disorder
- Reduced symptoms of attention-deficit/hyperactivity disorder
- Increased cognitive ability and creativity
- Reduced stress (and lower levels of stress hormones)
- Improved immune function (and higher levels of natural killer cells)
- Lower mortality
- Increased overall sense of well-being

**Many possible mechanisms may explain the connection between exposure to nature and improved health.**[235] **These mechanisms include: healthier environmental conditions, stress reduction, improvements to immune system function, providing opportunities for physical activity, and supporting stronger social ties.** Each of these is described below.

## HEALTHIER ENVIRONMENTAL CONDITIONS

Investments in natural infrastructure and having natural areas close-to-home can support health through reducing pollution and improving environmental conditions. Some of the most important health-related benefits include clean drinking water, cleaner air, and cooler temperatures. In addition, natural lands and waters are important infrastructure for public safety: reducing the threats posed by flooding, extreme wildfires, and drought. These benefits are described in more detail in Section 4 (Nature is Infrastructure for Public Safety).

## STRESS REDUCTION AND IMPROVED IMMUNE SYSTEM FUNCTION

Most Americans report that they experience unhealthy levels of stress; 20% say their level of stress is extremely high, and only 37% of people say they are managing their stress well.[236] One estimate indicates that workplace stress may cause 120,000 deaths and up to $190 billion in costs per year in the U.S.[237] Many studies have shown that seeing and hearing nature reduces stress.[238]

- A study of workplace stress indicates that simply having views of trees through windows reduces stress for workers of all ages across all types of work.[239]
- Another study shows that just 15 minutes of walking in the forest reduces stress hormone (cortisol) levels, pulse rate, blood pressure, and increased parasympathetic nervous system activity—all signs of significantly reduced levels of stress.[240]
- **Studies have also linked exposure to awe-inspiring nature with reduced PTSD for veterans**.[241]

Contact with nature also seems to increase immune system function, particularly the number of "natural killer" cells, which fight infections and tumors.[242] The immune system plays a role in inflammation, which can affect cardiovascular disease, allergies, anxiety, asthma, diabetes, and birth weight.[243] One study compared the impacts of three-day trips to forested and urban areas and on immune function and found that forested areas boosted the number of natural killer cells by 50%, and the effects were still pronounced after 30 days.[244] A possible explanation for the role of green space in improving immune function is that exposure to nature may help switch the body from the high-stress of "fight of flight" mode to the low-stress of "rest and digest" mode.[245]

## SUPPORTING PHYSICAL ACTIVITY AND STRONGER SOCIAL CONNECTIONS

**Studies have shown that close-to-home parks and open space encourage people to get more exercise, which is one of the most reliable ways to improve health.**[246] Exercise improves both physical fitness and mental acuity, especially for older adults.[247] Only one-third of youth and one-half of adults are currently meeting the federal exercise guidelines, and the CDC estimates that lack of physical activity leads to $117 billion in annual health care costs.[248]

- Adults who exercise regularly save $1,230 to $2,460 per year in healthcare costs.[249]
- The Oregon Parks and Recreation Department estimated outdoor recreation in the state provided $735 million to $1.42 billion in cost of illness savings associated with eight chronic illnesses affected by physical activity.[250]
- Studies have shown that exercising outdoors can be more restorative than exercising indoors, and that the benefits of exposure to green space can be increased through exercise.[251]

**Studies show that green space, parks, and other protected open space help promote stronger social connections, build a stronger sense of community, and even help reduce aggression.**[252]

- An early study looking at nature and social connections found that buildings in the same area with the same resident demographics that were surrounded by more green space had lower crime rates.[253]
- The ability of green space to bring people together is particularly important in vulnerable communities with limited access to the restorative benefits of nature and for older adults—for whom loneliness threatens health more than physical inactivity or obesity.[254]
- Experiencing nature can also elicit feelings of awe, which in turn encourages altruism and strengthens social connections.[255]
- A recent study demonstrated the effectiveness of experiencing awe in nature in reducing symptoms of PTSD in military veterans and at-risk youth.[256]

### CASE STUDIES

**Faith-based Camps Connect Young People to Nature and Religious Identity; Camp Tawonga, Groveland, California.** Camp is a big part of childhood for many young people, and many camps incorporate outdoor adventures and time in nature. The estimated 14,000 camps in the U.S. generate $18 billion per year and employ 1.5 million staff. One-fifth of accredited camps are faith-based, and an estimated 40% of teenagers have attended a faith-based camp.[257] Faith-based camps that bring together outdoor experiences with religious education and community-building are becoming more common. Camp Tawonga is a Jewish camp in the Sierra Nevada mountains in California surrounded by the Stanislaus National Forest. The camp has been focused on building Jewish identity and connections to nature since 1925.

**According to Camp Tawonga's Director, Rebecca Meyer, "Immersion in nature is fundamental to the camp experience.** There is no WiFi and no cell service at our site. Campers see the Milky Way at night, catch frogs by the lake, swim in the Tuolumne River, and backpack into nearby Yosemite National Park. When children have the opportunity to unplug and take a break from screen time, they develop social skills like empathy and cooperation. With fewer distractions, the natural setting fosters human connection. On their backpacking trips, campers build group identity and resilience. Sitting in our outdoor sanctuary, campers are poised to experience holiness, as they sense the interdependence of all living things and feel connected to something much larger than themselves."

**Exploring the Connections between Nature, Awe, and PTSD; American River, California.** Awe experienced in nature can dramatically reduce symptoms of post-traumatic stress disorder, according to UC Berkeley research that tracked psychological and physiological changes in war veterans and at-risk inner-city youth during white-water rafting trips. Psychologists tested nature's healing powers on 72 military veterans and, separately, on 52 teens from Bay Area communities during and after dozens of one- and two-day rafting excursions along the South Fork of the American River in California. They also studied a dozen veterans during and after a four-day white-water rafting trip along Utah's Green River. Their findings, reported in two articles published in the journal Emotion suggest that awe—as opposed to joy, pride, amusement, contentment and other positive emotions—is the singular sensation that goes the furthest in boosting one's overall sense of well-being. "It's the active ingredient that explains why being in nature is good for us," said study lead author Craig Anderson, a postdoctoral researcher and fellow at UC Berkeley and at UCSF. "The more awe people felt during the white-water rafting trips, the happier and less stressed they were a week later." *(Adapted from "Nature is proving to be awesome medicine for PTSD" in Berkeley News)*[258]

**Using Trails and Adventure to Get Kids Active in Parks; Blue Ridge Parkway Foundation.** The Blue Ridge Parkway Foundation's Kids in Parks program provides a national network of trails, called TRACK Trails, designed to get kids and families engaged in outdoor recreation to improve their health through the increased use of parks and public lands. There are currently more than 130 TRACK Trail locations in seven states (NC, VA, SC, WV, MD, SD, CA), and Washington, D.C. Kids in Parks has been endorsed by the American Academy of Pediatrics and recognized as a practice-tested intervention by the Center for Training and Research Translation (funded by the CDC). Over the past decade, kids have completed 1 million adventures, hiked more than 1 million miles, spent 500,000 hours outdoors, and burned more than 150 million calories on TRACK Trails. Now, Kids in Parks is working with doctors, hospital systems, and other health-care providers to promote and prescribe TRACK Trails and outdoor recreation to young patients to combat the negative effects of a sedentary lifestyle. *(Adapted from "TRACK Trails" ParkRx Case Studies)*[259]

# NATURE IS PUBLIC HEALTH INFRASTRUCTURE




**Figure 5.** Nature is Health Infrastructure

## Author Biographies

### Dr. Amy Wilson Morris

Dr. Amy Wilson Morris has over 25 years of experience in environmental research, conservation policy, and strategic planning. Before working as a consultant, Amy served as the Associate Director of Planning at the Trust for Public Land and a Senior Associate at Aspen Environmental Group. At the Trust for Public Land, she led conservation planning projects throughout the western United States and Texas. During her five years at Aspen Environmental Group, Amy led efforts related to land-use policies and siting for large-scale solar projects.

As a consultant, Amy works with clients to develop more effective and strategic planning approaches. Recent clients include The Nature Conservancy of Nevada, Save the Redwoods League, California State Parks, the Texas Hill Country Conservation Network, the Sierra Cascade Land Trust Council, and the Cities of Boulder (Colorado) and Pasadena (Texas). Amy is committed to finding data-driven solutions that improve both community and environmental health. She has led over a dozen large-scale conservation and climate planning efforts.

Amy has published research (including peer-reviewed and law review articles) on oversight of conservation easements, public access to land conservation data, using forest carbon offsets to fund conservation, renewable energy policy, endangered species mitigation, and the connections between health and access to open space. She has presented at national and international conferences about topics ranging from lowering barriers to participation in planning to tradeoffs in renewable energy siting. Amy has a Ph.D. in Environmental Studies from UC Santa Cruz (with a dissertation focused on land conservation policy) and a B.A. in Environmental Biology from Columbia University (magna cum laude).

### Jessica Sargent

Jessica Sargent has over 23 years of experience in the land and water conservation field. She created Primrose Research Group to support public, community, and non-profit partners on a range of parks, trails, land, and water conservation research, planning, advocacy, and analysis efforts. Jessica is a national expert on the economic benefits of land conservation.

Recent partners include the Society for the Protection of New Hampshire's Forests, City of Kansas City Missouri, the Connecticut Land Conservation Council, Lincoln Institute of Land Policy, Highstead Foundation, San Gabriel Valley Council of Governments and Regional Housing Trust, National Recreation and Park Association, Land Trust Alliance, Massachusetts Land Trust Coalition, and Galveston Bay Foundation.

Before founding Primrose Research Group, Jessica was the Director of Conservation Economics at the Trust for Public Land. She established the Conservation Economics program to leverage economic research to create parks and trails, protect land, and enhance funding for special places in communities large and small. In that role, she advocated extensively for local, state, and federal funding for land and water conservation. As an Associate with Industrial Economics, she conducted analyses of costs and benefits of proposed environmental and natural resources policies, performance metrics and program evaluation, and natural resource damage assessment for various state, federal, and international agencies. Jessica has a M.S. in Ecology and Environmental Sciences with a concentration in Resource Economics and Policy and a B.S. in Natural Resources from the University of Maine.

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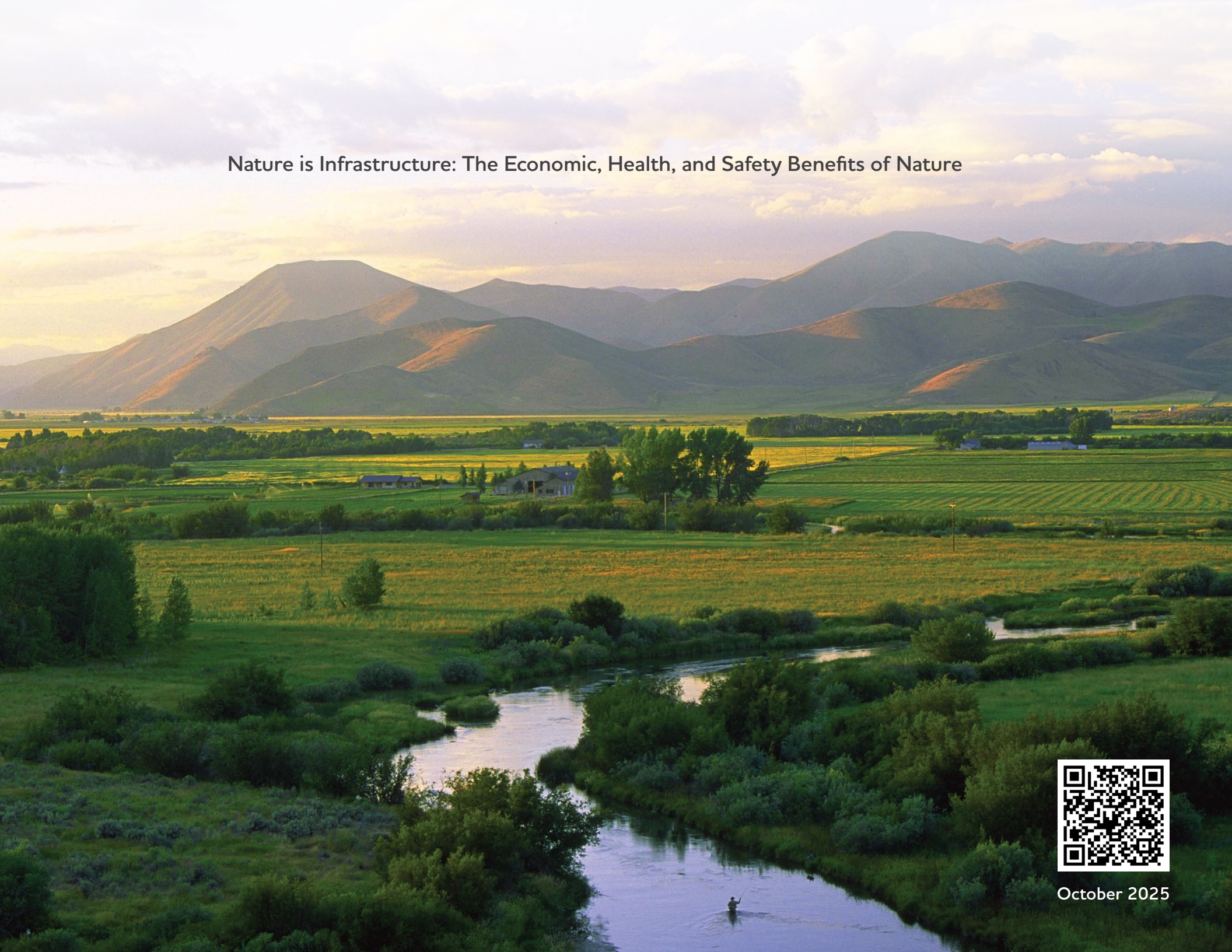
# Nature is Infrastructure: The Economic, Health, and Safety Benefits of Nature



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