

FARMS UNDER THREAT: THE STATE OF THE STATES

Julia Freedgood • Mitch Hunter • Jennifer Dempsey • Ann Sorensen



Acknowledgments

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PHOTO: Lijy Pei



PHOTO: Shawn Linhart



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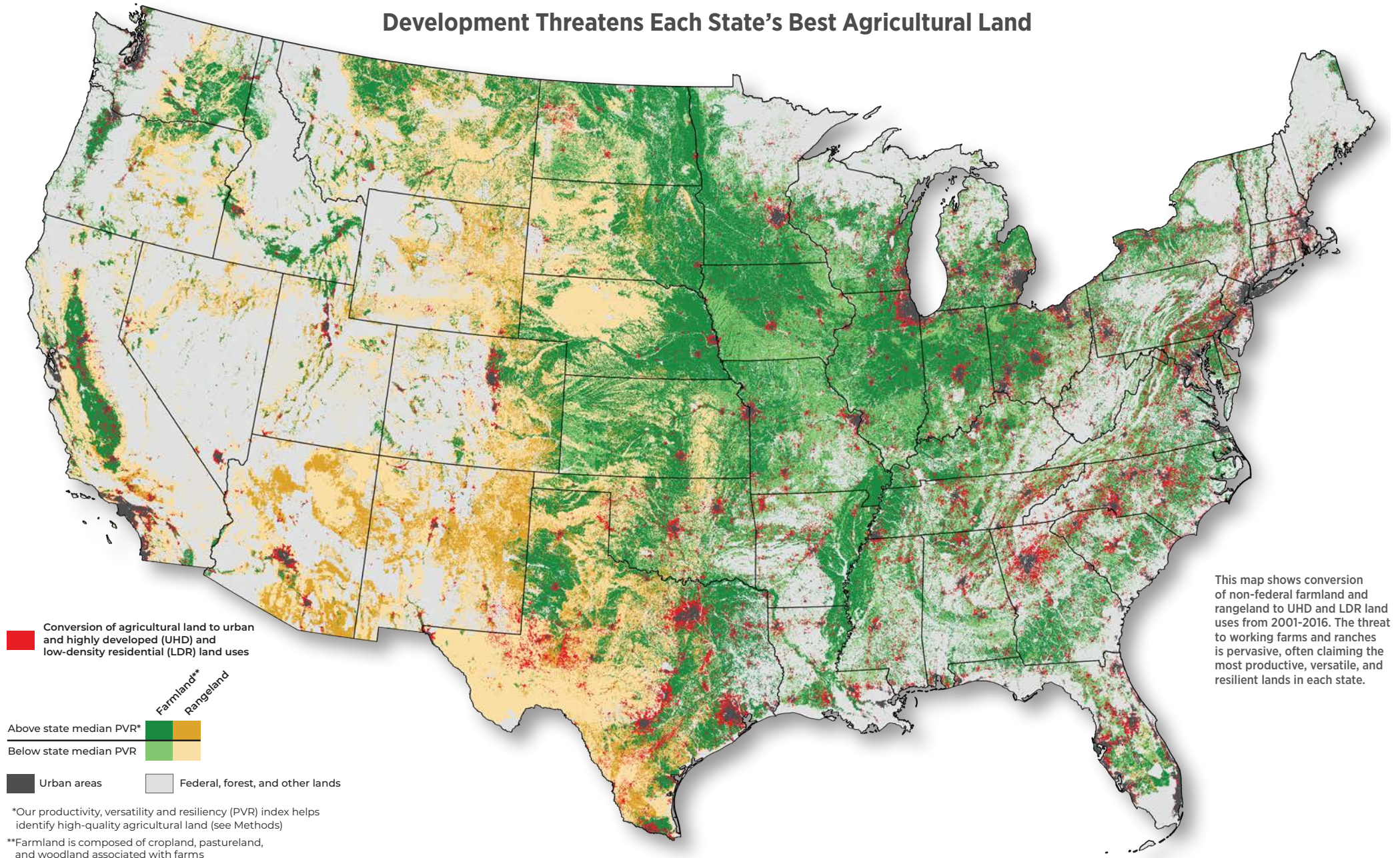
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Development Threatens Each State's Best Agricultural Land



Executive Summary



Executive Summary

***Farms Under Threat: The State of the States* paints a striking picture of America’s agricultural landscape—and the threats facing working farms and ranches in every state.**

Between 2001 and 2016, 11 million acres of farmland and ranchland were converted to urban and highly developed land use (4.1 million acres) or low-density residential land use (nearly 7 million acres). That’s equal to all the U.S. farmland devoted to fruit, nut, and vegetable production in 2017—or 2,000 acres a day paved over, built up, and converted to uses that threaten the future of agriculture.

This assault on our working farms and ranches occurred despite the Great Recession, plummeting housing starts, and declining population growth. While every state has taken steps to protect their agricultural land base, they all could—and must—do more.

For 40 years, American Farmland Trust (AFT) has used high-quality research to demonstrate the need to protect farmland and ranchland—and to provide solutions. From our game-changing [Farming on the Edge](#) reports to our seminal book, [Saving American Farmland: What Works](#), we have informed and inspired farmers and ranchers, legislators and planners, land trusts and conservationists across the United States.

In 2016, AFT launched the *Farms Under Threat* initiative to update our research for the 21st century. Working in partnership with CSP, we are harnessing the latest technological advancements to accurately document the extent, diversity, location, and quality of agricultural land in the continental United States—as well as the threats to this land from expanding commercial, industrial, and residential development. At the same time, we are conducting extensive policy research to assess states’ policy solutions to respond to the threats.

Our first report, [Farms Under Threat: The State of America’s Farmland](#), was released in May 2018. It provided the most scientific, detailed, and up-to-date spatial analysis of agricultural lands and development patterns available for the continental United States. AFT has now dug deeper with *The State of the States*. Our new spatial analyses incorporate updated datasets and refined methods, allowing us to map agricultural land at the state, county, and even sub-county levels. At the same time, we conducted an extensive analysis of six state policy responses to the forces that lead to agricultural land conversion: development pressure, weakened farm viability, and the challenges of transferring land to a new generation. Linking our spatial findings to policy solutions will help advocates and decision-makers plan for and protect their valued agricultural resources for future generations.

Every State Converted High Quality Farmland

Our findings provide unprecedented insights into the status and fate of American farmland. From 2001 to 2016, 11 million acres of agricultural land were paved over, fragmented, or converted to uses that jeopardize agriculture, curtailing sustainable food production, economic opportunities, and the environmental benefits afforded by well-managed farmland and rangeland.

Our pioneering analysis of low-density residential (LDR) land use is the first nationwide attempt to spatially identify the impacts of large-lot housing development on the agricultural land base. Filling a critical knowledge gap left by previous spatial assessments, it finds that LDR paves the way to urban and highly developed (UHD) land use: between 2001 and 2016, agricultural land in LDR areas was 23 times more likely to be urbanized than other agricultural land. Whereas UHD development is closely tied to population growth, LDR expansion is not: only five out of the top 12 states for LDR are in the top 12 for population growth, thus likely due to weak land use regulations.

Compounding these impacts, 4.4 million acres of Nationally Significant land were converted to UHD and LDR land uses—an area nearly the size of New Jersey. AFT developed the Nationally Significant farmland designation to identify the most productive, versatile, and resilient (PVR) land for sustainable food and crop production.

The United States is home to 10 percent of the planet's arable soils—the most of any country on Earth. Yet even here, in what appears to be a vast agricultural landscape, only 18 percent of the continental U.S. is Nationally Significant land. As we face growing demand for high quality food and environmental protection along with increasingly complex challenges from epidemics, extreme weather, and market disruptions, it is especially important to protect the land best suited to intensive food and crop production, including fruits, nuts, vegetables, and staple grains.

PHOTO: Rebecca Drobbis



How States Have Responded to Threats to Their Agricultural Land Base

AFT created an Agricultural Land Protection Scorecard to show how states have—or have not—responded to the threats of agricultural land conversion. We assessed six policy tools commonly used to protect farmland, support agricultural viability, and provide access to land:

- Purchase of agricultural conservation easements (PACE) programs (aka Purchase of Development Rights) that permanently protect working farmland and rangeland,
- Land use planning policies that manage growth and stabilize the land base,
- Property tax relief for agricultural land that improves farm and ranch profitability,
- Agricultural district programs that encourage landowners to form areas to protect farmland,
- Farm Link programs that connect land seekers with landowners who want their land to stay in agriculture, and
- State leasing programs that make state-owned land available to farmers and ranchers.

The results of the Scorecard show that every state has taken steps to retain land for agriculture, but all could

do more. All 50 have enacted property tax relief and laws enabling local governments to plan and adopt land use policies to offset development pressure on agricultural land. Nearly every state has a program to lease state-owned land for farming and ranching and more than half have PACE programs. Some have gone further with innovative programs to address agricultural viability and facilitate land transfer. Yet only New Jersey and Virginia have adopted the full suite of the programs we examined. And while Oregon stood out for its high score in planning, no state earned a perfect score for a single policy, much less a full suite of policies.

We found coordination is key—especially between state and local governments. The leading states for high-policy response linked multiple programs and created frameworks to harness local efforts. They enacted complementary efforts, using PACE programs to permanently save a supply of land for future generations and land use planning to curb conversion. But because it often is not visible, states have not yet recognized or responded to the impacts of LDR on agriculture. Addressing the threat and potential opportunities of LDR is a critical challenge for the coming decades.

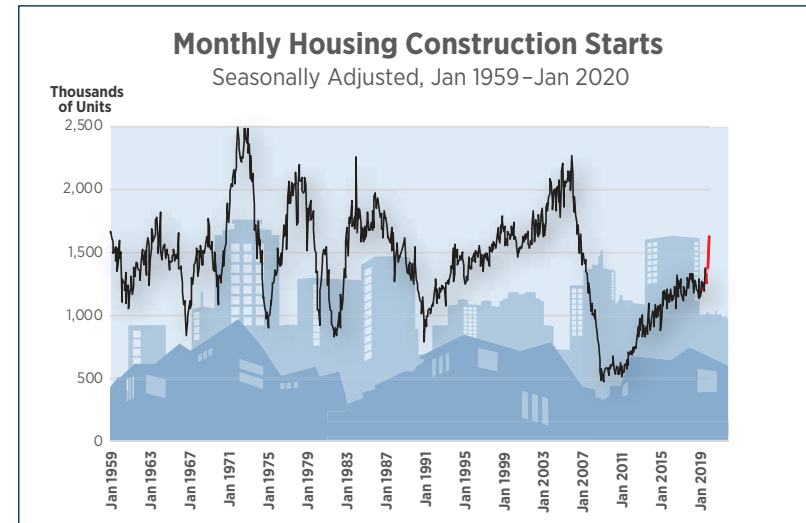
Call to Action

Our research shows that people act when changes to their landscape are visible. In this century, land use changes have been hard to see. As a result, compared to the 1980s and 1990s, states have done little to secure their agricultural land base. This is shortsighted.

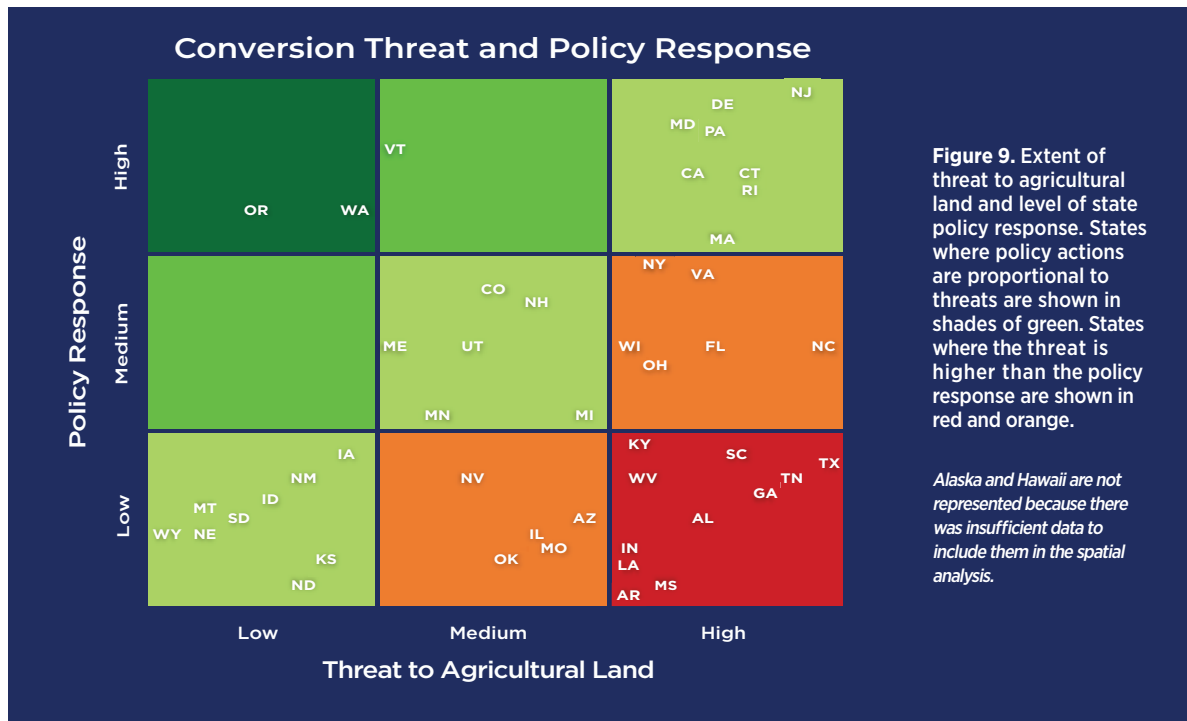
While development trends always have peaks and valleys, and real estate bubbles always burst, the force and extent of the last decade's decline were an anomaly—far below the rates from recessions dating back to the 1960s (see figure on right). Yet states still converted 11 million acres of agricultural land. According to the 2017 Census of Agriculture, this is slightly more than all the land used to grow fruits, nuts, and vegetables across the U.S.

Even in uncertain economic times, it is urgent that states—especially states with high rates of conversion—step up to save their farmland and ranchland.

Of most concern are the high-threat states that have taken very little policy action. Led by Texas, most are in the South, but Indiana and West Virginia also fell into this category. States with a high threat and a reciprocally high policy response have worked for decades to address farmland loss (see figure below). But even in cases of relatively wide policy adoption, they need to do more, better, faster—especially to address the spread of LDR.



Source: U.S. Census Bureau, New Residential Construction Survey 2020.



Explore our findings and learn more about our analyses at www.farmland.org/farmsunderthreat

What States Can Do

There is no silver bullet. Since conversion is driven by several interrelated factors, states need to use multiple policy approaches to protect their vital agricultural resources. Choices will depend on the nature and extent of the threat, its underlying causes, each state’s policy framework, and public support. What follows is a list of five high-level actions states can take to secure their agricultural land base.

Action 1: Analyze and Map Agricultural Land Trends and Conditions

Effective strategies are based on solid data. Toward that end, states should track agricultural land use trends and conditions, map their agricultural land, and conduct both state and local policy audits.

Action 2: Strengthen and/or Adopt a Suite of Coordinated Policies to Protect Farmland

States should address these trends and conditions with clear goals and a suite of coordinated policies. They can start by looking for opportunities within existing programs. While not always politically feasible, programs with regulatory teeth are more effective than those that rely on incentives alone. But if a regulatory approach is not achievable, states must offer strong enough incentives to have meaningful results.

Action 3: Support Farm Viability and Access to Land for a New Generation of Farmers and Ranchers

Competition for land drives up land values and prices, and a tight supply makes it hard for beginners and historically disadvantaged producers to enter the field. When farms and ranches consolidate or go out of business, it becomes harder for the remaining operations to thrive. The vital infrastructure that supports them also goes out of business or consolidates, making it more expensive and time consuming to obtain needed goods and services and to process, market, and distribute farm products. States need policies to support agricultural viability and to facilitate the transfer of land to a new, more diverse generation of farmers and ranchers.

Action 4: Plan for Agriculture, Not Just Around It

“A failure to plan is a plan to fail.” State and local governments plan for many things—from transportation and housing to health, safety, and economic wellbeing. Few plan for agriculture. This needs to change.

Planning for agriculture establishes a public policy framework to support agricultural economic development as well as to retain and protect farmland for current and future generations. It can occur at state, regional, or local levels and result in a stand-alone plan or be included as part of a comprehensive or other type of plan, including sustainability and emergency management plans.

Action 5: Save the Best, but Don’t Forget the Rest

America’s agricultural landscape is extensive and diverse. Some is ideally suited to producing food, feed, and other crops; some is better suited to grazing livestock. All of it is important to state and local economies and to our food system. Nevertheless, states should make a special effort to protect their Nationally Significant land, which is critical for long-term food security and environmental quality. States can use the interactive maps available at www.farmland.org/farmsunderthreat to identify where their highest threats converge with their best quality agricultural lands. Working with local government partners, they can help ensure that local land use policies address the quality as well the quantity of their agricultural resources.



PHOTO: Fayette Alliance

Rural Smart Growth

Smart growth is a well-respected approach to development that protects farmland, open space, and the environment, while encouraging walkable neighborhoods, mixed land uses, and a range of housing and transportation choices. It directs development toward existing communities, promotes compact design, and fosters attractive communities with a strong sense of place. It also encourages stakeholder engagement and collaboration to ensure development decisions are desired as well as equitable and cost effective.⁹⁷

Rural communities face a host of challenges, including changing demographics, lack of economic growth, environmental protection, and community health and preservation.⁹⁸

Key drivers for their success include protection of natural resources, workforce development, and access to broadband and transportation. Employing smart growth strategies will help communities guide development while protecting working lands and preserving rural character.⁹⁹ This would include identifying a community’s full suite of assets—from the built to the natural environment—and creating an economic climate to enhance agricultural viability, create jobs, and support food system and other needed infrastructure.

What the Federal Government Can Do

Federal policies and programs play a major role in directing development. Yet while we have strong protections in place for wetlands, endangered species, and other natural resources, protecting agricultural land has largely been left to state and local governments. It is time for stronger and more coordinated federal action. What follows are five actions the federal government can take to stop the loss of the nation's valuable agricultural resources.

Action 1: Double Funding for ACEP

The Agricultural Land Easement (ALE) program is the federal government's only program focused specifically on agricultural land protection. Providing matching funds to qualified entities to purchase agricultural conservation easements, ALE receives funding as part of the broader Agricultural Conservation Easement Program (ACEP). At just \$450 million of annual funding, ACEP currently meets only a small fraction of its demand. Doubling funding for this popular program would increase ALE's capacity to protect farmland and ranchland.

Action 2: Strengthen the Farmland Protection Policy Act to Stop Agricultural Land Loss

To limit the federal government's role in agricultural land conversion, Congress should strengthen the FPPA by adding mitigation requirements and penalties for conversion by federally funded projects. It also should provide higher levels of protection for eased, Nationally Significant, and other high-quality agricultural land. Further, USDA should devote more resources to NRCS to conduct the National Resources Inventory to deliver reliable state and county-level estimates and spatial data on the status, condition, and trends of land and related resources to inform FPPA as well as state and local land use planning decisions.

Action 3: Develop Federal Policies that Facilitate Farm Transfer to a New Generation

Congress and USDA must step up efforts to support succession planning, land transfer, and access to land. Suggested actions include tax policy changes such as a capital gains exclusion to incentivize the sale of land to young, beginning, socially disadvantaged and veteran producers; a beginning farmer tax credit; an increase of the cap on the estate tax's 2032A Special Use Valuation; and expansion of the Conservation Reserve Program-Transition Incentives Program. To inform these policies, NASS should update the 2014 Tenure, Ownership, and Transition of Agricultural Land (TOTAL) survey, which provides invaluable information on land ownership, consolidation and tenure challenges and trends.

Action 4: Increase Support for Agricultural Viability

A greater share of USDA funding is needed for programs and research to help producers add value to their products, develop new markets, diversify their operations, and otherwise improve economic viability. Programs like the Beginning Farmer and Rancher Development Program and Outreach and Assistance for Socially Disadvantaged and Veteran Farmers and Ranchers Program should be expanded, and greater support should be provided for Farm Service Agency beginning farmer loan programs. Congress also should consider enacting a "Debt for Working Lands" program. Modeled on FSA's Conservation Contract Program, it could offer lowered or restructured debt on FSA loans in exchange for a permanent agricultural easement. Finally, funding should be increased for the Agricultural Research Service and National Institute of Food and Agriculture (NIFA).

Action 5: Provide Federal Funding to Plan for Agriculture

The federal government can do more to incentivize regional, state, and local planning to support agriculture, from preventing agricultural land loss and improving the siting of agricultural infrastructure to improving economic opportunities for farmers, ranchers, and agribusinesses. This could be done through federal block grant funding to state and local governments to develop comprehensive plans for agriculture or to provide planning expertise and technical assistance. Funding also should be expanded for the Local Foods, Local Places (LFLP) program to provide technical assistance to municipalities to reinvest in neighborhoods as they develop local food systems.



We Must Act Now!

American farmland is threatened by development, consolidation and weakening farm viability, and by barriers to transferring land to a new generation of farmers and ranchers. At the same time, global demands on food production are colliding with the environmental impacts of eroding soils, declining aquifers, and extreme weather events. We need farmers and ranchers to grow food and provide for other human needs, and we need them to provide essential environmental services—from clean drinking water and wildlife habitat to carbon sequestration to cool the planet.

Especially in tandem with smart growth strategies, protecting agricultural land and adopting regenerative farming practices are powerful solutions to climate change. With the world population projected to reach 10 billion by 2050, and climate change posing an existential threat, we must act now to secure the agricultural land base for future generations.



Introduction

Introduction

“No issue will be more important to 21st century America than how we use our dwindling land resources. The competition for land—especially productive agricultural land—will intensify as our population grows and communication technologies make it easier for us to live and work in widely dispersed communities. The irreplaceable land that produces our food and provides us with scenic open space, wildlife habitat, and clean water is increasingly at risk from urban sprawl and rural subdivisions. To ensure a prosperous future, we must save our farmland.¹”

Those words from former EPA Administrator William K. Reilly appeared as the opening message in *Saving American Farmland*, published in 1997 when Reilly served as AFT board chair.

Today, our farms are under even greater threat—in part because we have not yet adopted adequate measures to stop misguided development, but also because of our changing climate.

In its 2019 report, the United Nation’s Intergovernmental Panel on Climate Change (IPCC) found land is under growing human pressure, and that climate change is adding to these pressures. It stated, “Climate change, including increases in frequency and intensity of extremes, has adversely impacted food security.²” IPCC also found that less productive and degraded agricultural lands restrict what can be grown and reduce the soil’s ability to absorb carbon, exacerbating climate change. In contrast, well-managed agricultural lands sequester carbon, prevent floods and fires, support wildlife habitat, and provide clean drinking water, among other natural services.³

While all agricultural lands have value, they are not all created equal. Thus, it is important to concentrate food and crop production on soils that offer optimum productivity, versatility, and resiliency. If we destroy the land best suited for cultivation, we drive production to marginal land with fragile soils, reducing overall ecological benefits.

Beyond that, we weaken the viability of the agricultural sector. Agriculture, food, and related industries contribute more than \$1 trillion to U.S. gross domestic product (see figure 1) and 11 percent of U.S. employment.⁴

They are also engines of state and local economic activity.⁵ California—a diversified powerhouse—produces over 400 agricultural commodities, more than a third of the country’s vegetables and two-thirds of its fruits and nuts.⁶ Beyond earning nearly \$50 billion in cash receipts, food and beverage processing contributed another \$82 billion to the California economy, including 760,000 jobs.⁷ The scope of economic impact is similarly high in other states, where tens of billions of dollars of food and agricultural revenue support hundreds of thousands of jobs.^{8, 9, 10}

Yet despite farming’s importance to food security, economic prosperity, and environmental quality, USDA reports that the United States has developed more than 25 million acres of irreplaceable farmland since 1982.¹¹ Millions more acres became fragmented by low-density residential development outside of urban limits.^{12, 13, 14} But until *Farms Under Threat*, the nature and extent of this threat were unknown.

Value Added to GDP by Agriculture and Related Industries, 2007-17

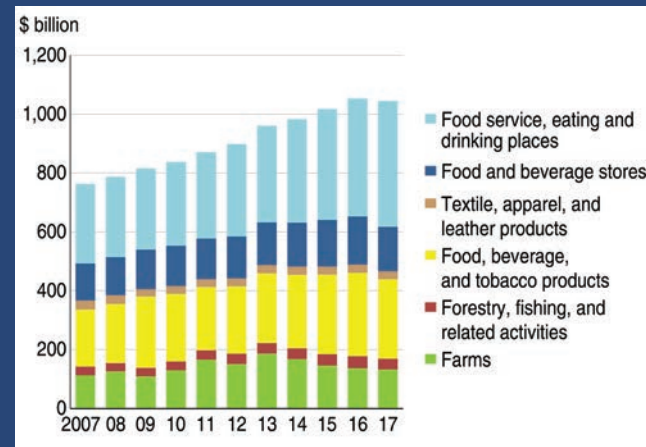


Figure 1. Note: GDP refers to gross domestic product

Source: USDA, Economic Research Service using data from the U.S. Department of Commerce, Bureau of Economic Analysis, Value Added by Industry series.

What is Farms Under Threat?

Farms Under Threat is AFT's multi-year initiative to document the status of, and threats to, U.S. farmland and ranchland, while offering policy solutions to save that land. The most comprehensive assessment ever undertaken of U.S. agricultural land use, it builds upon AFT's [Farming on the Edge](#) research conducted from 1993 to 2007, which documented how sprawl was consuming high quality farmland across the country, as well as our authoritative guidebook, [Saving American Farmland: What Works](#).

The first *Farms Under Threat* report, [The State of America's Farmland](#), examined the loss of agricultural land to development between 1992 and 2012. We worked with Conservation Science Partners (CSP) to produce the most scientific, detailed, and up-to-date spatial data and maps of agricultural lands and development patterns available for the continental United States. We also received data, guidance, and support from USDA NRCS and a National Advisory Committee of experts in related fields.

Although overall development nearly ground to a halt during the Great Recession, changes in consumer preferences and land use patterns, coupled with increasingly complex threats to most states' agricultural lands, led us to reassess the status and fate of American farmland in the 21st century. Technological advancements and improvements in national datasets made it possible to more accurately track the location and extent of agricultural land conversion, including low-density residential (LDR) development. They also make it possible to measure the land's productivity, versatility, and resiliency (PVR) for sustainable food and crop production.

The State of the States report is the second in a series of *Farms Under Threat* reports. Refining the methods from the first report and using recently released and improved datasets, we worked with CSP to analyze the conversion of each state's agricultural land. At the same time, we conducted an extensive analysis of six state policy responses to the three main forces that lead to agricultural land conversion: development pressure, weakened agricultural viability, and intergenerational transfer of land. By linking spatial findings to policy solutions, we hope to provide decision-makers with vital data and insights to inform policy advances that retain and protect valued agricultural resources for future generations.

Spatial Analysis

We set out to create the most detailed map ever created of the extent, diversity, location, and quality of agricultural land in the United States—as well as the threats to this land from expanding commercial, industrial, and residential development. We started by mapping the full extent of the agricultural land base for the 48 continental states (insufficient data for Alaska and Hawaii prevented analysis). Then, we worked with expert advisors to evaluate the productivity, versatility, and resiliency (PVR) of agricultural land.

This analysis resulted in the most comprehensive national map of the land's suitability for producing food and other crops, as well as the first index of soil quality to specifically account for versatility and resiliency.¹⁵ It shows that in some states, like Illinois and Delaware, the vast majority of their land has high enough PVR values to qualify as Nationally Significant, meaning it is the best land for sustainable food and crop production. States like Arizona and New Mexico have low PVR values, but vital rangeland resources. Still others, like California, have both.

The next step was to map development on these lands. First, we focused on the spread of highly developed commercial, industrial, energy, and residential land uses. We relied on the comprehensive National Land



PHOTO: Adobe Stock

Cover Database (NLCD), which provides satellite-based maps of this type of development.¹⁶ It identifies areas where the land cover is highly impervious, typically due to buildings and roads. We refer to this category as urban and highly developed (UHD). Typically considered “developed” areas, which preclude large-scale commercial agriculture, they may still hold opportunities for urban agriculture.

Based on long experience, we recognized a threat that went beyond the traditional development patterns described above. By the mid-1990s, it appeared that development patterns were changing.^{17,18,19} While development seemed better managed in urban areas, it appeared to be spreading out to exurban and rural areas, following roads and flanking growing cities and towns. Yet this had not been documented with spatial mapping, because NLCD is unable to distinguish residential areas with homes built on lots larger than one to two acres.

As a result, NLCD misses a hidden threat to production agriculture: large-lot developments that increasingly

threaten working farms and ranches by fragmenting the landscape and disrupting agricultural economies.^{20,21} Some large-lot residential developments, which typically include a house, barn, and possibly a few animals, are referred to as “farmlets,” “farmettes,” or “ranchettes.” A study of California’s Central Valley found that by its very nature, a ranchette removes more land from agriculture than any higher-density suburban dwelling.²² Other research has found that large-lot residential properties stop contributing to rural economies and lead to declining open space, wildlife habitat, water quality problems, and increased demand for public services.^{23,24,25} However, the absence of spatial data made it difficult to determine how this land use pattern was affecting agriculture.¹⁴

To address this challenge, we partnered with CSP to develop a unique, nationwide analysis. We identified a new low-density residential (LDR) land use class in which the average housing density is above the level where agriculture is typically viable. This is the first nationwide attempt to spatially identify the impacts of large-lot housing development on the agricultural land base.

LDR is concentrated in areas where development pressure is increasing and developed and undeveloped land are interspersed, often following roads or on the outskirts of cities and towns. This incredibly rich data is enabling new insights into how these LDR areas lead to urbanization and fragmentation—and also into what new opportunities they might present. Together, these spatial analyses are an invaluable resource for understanding, and saving, the land that sustains us.

State Policy Responses

It is not enough to say that agricultural land is threatened by development. Competition for land takes place in a global context, strongly influenced by federal, state, and local policy. Along with answering questions about the status of, and threats to, each state’s agricultural land base, we wanted to answer the question: what can states do about it? So, in tandem with the spatial analyses, we assessed six state policy responses and created a scorecard to inform future policy action. We selected approaches identified in the literature and by expert advisors, and focused on those that are tied to the land and adopted by at least 10 states.



Rangeland represents 43% of the nation’s agricultural land base and is especially prevalent in 17 western states.

Rangeland provides valuable forage for livestock, supporting meat and fiber production. It also acts as a unique reservoir of native plant species and provides critical habitat for a wide range of wildlife. With regenerative management systems, livestock grazing on rangelands can lessen the impacts of climate change by increasing carbon in the soil, offering a valuable resource to mitigate greenhouse gas emissions. Despite these many benefits, rangeland is less well-suited to intensive crop production, so it receives lower scores in our PVR analysis.

PHOTO: Coleman Natural Foods

The Agricultural Land Protection Scorecard (scorecard) is a state-by-state analysis of policies and programs that support agricultural viability and address the loss of farmland to development, inspired by the American Council for an Energy Efficient Economy's [State Energy Efficiency Scorecard](#)²⁶ and similar efforts.²⁷ Intended to inform decision-making and legislative action, it assesses state actions, measures their performance, and highlights effective aspects of the following programs and policies:

1. Purchase of agricultural conservation easement programs (PACE) programs (aka Purchase of Development Rights)
2. Land use planning and growth management (planning)
3. Property tax relief for agricultural land
4. Agricultural district programs (districts)
5. Farm Link programs
6. State leasing programs

State and local governments have led the way. They have responded to threats to agricultural land by developing policies to address farm viability, development pressure, and the transfer of land to a new generation. Underlying their responses, they have sought to manage new development that drives up land values and property taxes beyond what the agricultural economy can support and brings farmers into conflict with new neighbors.²⁸ Common goals include protecting high quality soils and rural character and supporting agriculture for its importance to the local economy and increasingly for local food.²⁹

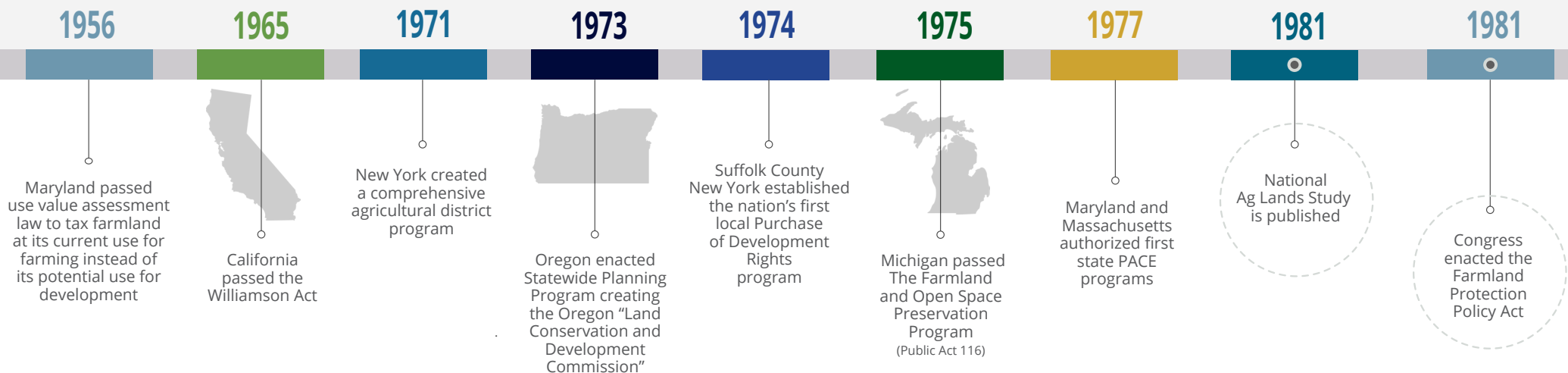
Land use decisions largely are made at the local level and on individual farms and ranches. Municipal and county governments often are in the best position to assess local conditions and address local needs. But their resources are limited, especially in rural communities, and their efforts to protect farmland can easily be undermined if their neighbors promote new development. Local plans and policies are influenced by state and even federal policies, and they are strengthened when reinforced and supported by state goals and funding.

Committed state action is an essential response to the loss of farmland and ranchland.

As far back as 1956, Maryland passed a use-value assessment law to tax farmland at its current use for farming instead of its potential use for development. Nearly a decade later, California passed the Williamson Act, adding agricultural district programs to the toolbox. Combining tax incentives and protections from annexation, eminent domain, and unreasonable regulations, these district programs support agricultural viability and stabilize large contiguous blocks of agricultural land.

In 1970, Oregon passed SB 10 to address haphazard development and protect farmland by requiring comprehensive planning and local zoning to implement those plans. SB 100 followed in 1973, creating the Oregon Land Conservation and Development Commission which adopted statewide land use planning goals and continues to review local plans for consistency with those goals.

The regulatory authority that came with growth management was not widely embraced, so state and local governments continued to pursue incentive-based solutions.



In 1974, Suffolk County, New York, piloted the first local purchase of development rights (PDR) program. PDR programs go by many names, but most accurately are called purchase of agricultural conservation easement (PACE) programs, because they compensate agricultural landowners for permanently protecting their land with a conservation easement. Responding to intensifying development pressure, Maryland and Massachusetts launched PACE programs in 1977.

USDA and the President’s Council on Environmental Quality released the seminal *National Agricultural Lands Study* (NALS) in 1981.³⁰ A landmark achievement, NALS documented—for the first time—the causes and extent of farmland conversion and the actions state and local governments had taken to address them. Propelled by the study’s results, the 1981 Farm Bill included the [Farmland Protection Policy Act](#),³¹ which discourages federal activities that convert farmland to nonagricultural purposes.

Over the next 15 years, development pressure mounted and state and local activity accelerated and spread across the country.

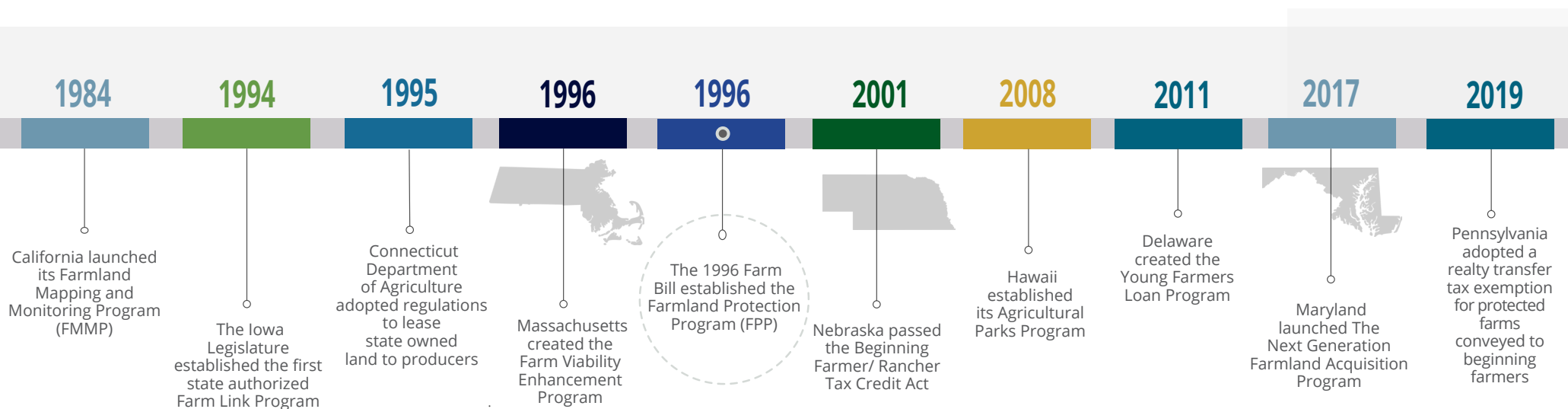
In 1996, Congress passed a pilot Farmland Protection Program (FPP) to purchase agricultural conservation easements.

Through the next three Farm Bills, FPP grew into the Agricultural Conservation Easement Program (ACEP), which was reauthorized in the 2018 Farm Bill with \$450 million of annual funding. Between 1996 and 2019, over \$1.8 billion of federal financial assistance was obligated as matching funds to state, local, and private protection efforts. State and local programs together have invested more than \$6.3 billion. In addition, more than 50 private land trusts have protected significant agricultural acreage, typically by accepting donated easements or partnering with public programs. To date, the combined impact of public and private efforts has permanently protected more than 6.5 million acres.

Over time, lawmakers came to understand how these farmland protection tools—as important as they are—are not enough to address farm transfer and access to land. This is partly because the dynamics of farm succession and transfer are changing. Tra-

ditionally, agricultural land passed from generation to generation within families through cradle, altar, or grave. Today it is mostly acquired from a non-relative.³² Gaining access to affordable land has become a significant barrier for farmers and ranchers who will not inherit land. In 1992, the Center for Rural Affairs pioneered the first Farm Link program to connect retiring farmers with entering farmers. Since then, at least 30 private programs and 10 states have experimented with the approach, often partnering with nonprofits. More recently, some state PACE programs have begun to list properties through Farm Link programs. This has the dual benefit of keeping protected land in agricultural use and helping farmland seekers find more affordable land.³³

Finally, some states use leasing programs to provide access to land. Most lease state-trust lands: lands long ago gifted to states when they joined the Union and dedicated to generating revenue for public institutions. But a handful of small states concerned with their supply of agricultural land have adopted innovative policies that make other state-owned land available to producers.





21st Century Threats

21st Century Threats

American farmland provides food security, economic prosperity, and environmental quality. Yet all of these benefits are threatened by 21st century trends, including poorly planned development, weakening agricultural viability, an aging farm population, and climate change. On their own, each of these threats is troubling; together they point to the need for immediate public action.

Food Security

Food is affordable to most people in the United States, ranking third behind housing and transportation in typical household expenditures.³⁴ Indeed, in 2018, Americans spent less than 10 percent of their disposable incomes on food.³⁵ Still 11.1 percent (14.3 million) of U.S. households were food insecure in 2018 and households with children had a substantially higher rate of food insecurity (13.9 percent) than those without.³⁶

Poorly planned housing, energy, and transportation development threaten to destroy the land we use to grow our food—especially fruits, vegetables, and nuts. Yet while agriculture faces increasing pressures and challenges, consumers' expectations for plentiful, high-quality food are increasing. This includes demand for environmentally, ethically, and locally sourced products identified as humane, ecologically friendly, fair trade, organic, or GMO free.³⁷

Part of this trend is toward “local” food, a sector expanding so quickly it is catching up to decades of strong growth in demand for organics.³⁸ We define “local” broadly to mean short supply chains within states or regions where farmers often perform value-added functions, from storing and packaging, to marketing, distribution, and promotion.³⁹ Only partly based on geography, our definition is values-based, emphasizing transparency, ecological farming practices, and connection between growers and eaters.

Including direct-to-consumer (DTC) and intermediated sales,⁵ most local food is produced on small farms near metropolitan areas,⁴⁰ farms that our analyses show are increasingly threatened.

Food in the Path of Development

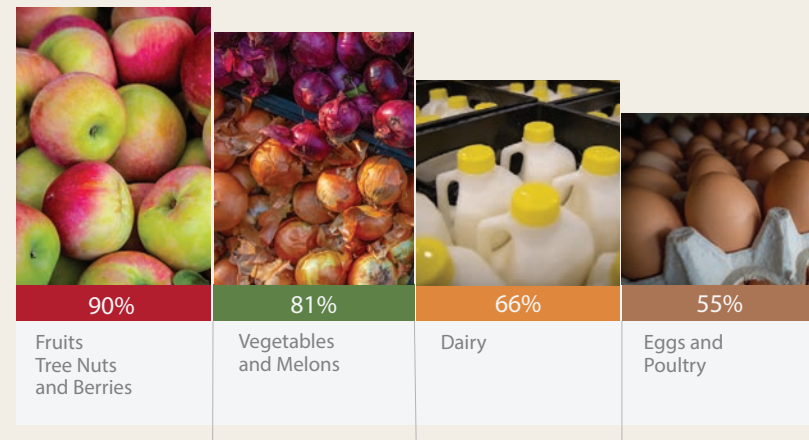


Figure 2. Percentage of U.S. production by market value of select food types that are produced in metro or metro-influenced counties, 2017.

Source: USDA National Agricultural Statistics Service, 2017 Census of Agriculture.

DTC sales more than tripled since 2002,⁴¹ indicating that consumer appetite for local food keeps growing. Two thirds of DTC sales come from farms in metro counties, and more than 80 percent of these farms sell all their DTC products within a 100-mile radius of the farm.⁴² But intermediated markets are driving the sector's rapid growth, reporting more than three times the sales of DTC markets in 2017⁴² as institutional demand increased from schools, hospitals, and restaurants.

Meeting demand from these markets will require more land, and more farmers will have to balance the challenges and opportunities of farming in metro and adjacent communities. These areas supply nearly 60 percent of total farm market value for U.S. farm production: 90 percent of fruits, nuts, and berries; 81 percent of vegetables and melons; 66 percent of dairy; and 55 percent of eggs and poultry.⁴³

Poorly Planned Development

By the year 2000, sprawl had become a distinctive landscape feature surrounding most American cities.^{45, 46, 47, 48} Since then, a combination of economic conditions, changing consumer preferences, planning practices, and public policies have slowed urbanization.⁴⁹ This is borne out by USDA's National Resources Inventory (NRI), which found the rate of development on agricultural land was four times higher from 1992-1997 than from 2012-2015. The steady growth in new home construction that started in the 1990s peaked in 2005, then plunged between 2006 and 2008 with the Great Recession and a decline in population growth. While the economy strengthened in the decade since, annual housing permits and starts still had not returned to pre-Recession levels.

Despite the slowdown, as our findings will show, poorly planned development still threatens the

Direct-to-Consumer sales have tripled in the past 15 years reaching \$2.8 billion in 2017.

As low-density residential development expands across the countryside, this land—and the bounty of fresh food and other products it supports—are especially at risk of conversion.

Furthermore, many of these farms are small with low profit margins, thus especially vulnerable to foreign competition as well as competition for land.⁴⁴ Indeed, since the 1990s, imports have risen 12 to 34 percent for fruits and 10 to 34 percent for vegetables.

To sustain domestic food supply and increase our ability to produce food locally, we must address the 21st century threats to our most productive farmland. It is shortsighted to rely on a small handful of states to supply so much of the food we eat—especially our fruits and vegetables.

It takes regionally diverse and sometimes redundant systems to support the growing and increasingly complex public demands from agriculture. To ensure resiliency as well as prosperity in our food and farming systems, each state needs to secure a critical mass of high-quality farmland, support agricultural viability and a new generation of farmers and ranchers, and promote regenerative farming practices to build healthy soil and combat climate change.

future of America's family farms and ranches. High quality agricultural land was converted to urban and highly developed land use in every state. But low-density residential land use in rural regions has become a greater threat than denser development on the urban edge. This form of land use fragments the agricultural land base, limits management

and marketing options, weakens farm and ranch economies, and paves the way for urbanization.²⁰ Also, because it is not immediately visible, it has not provoked a policy response. We explore these issues at length in the section Visualizing the Threats: Findings from the Spatial Analyses.

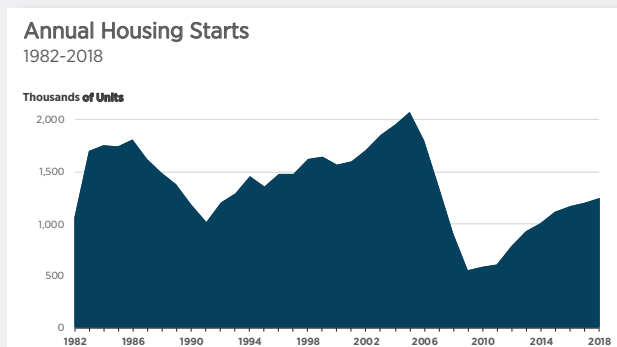


Figure 3a. Annual housing starts, 1982-2018. Source: U.S. Census Bureau, New Residential Construction Survey 2019.

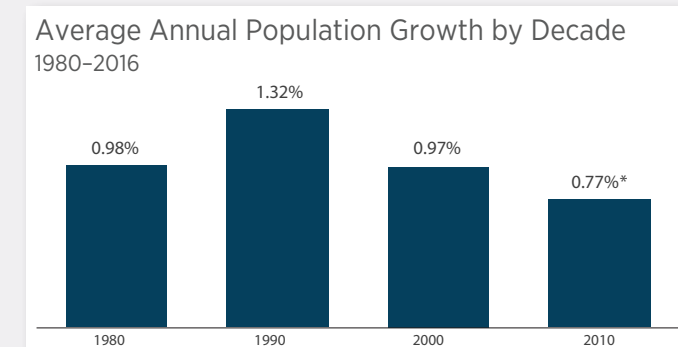


Figure 3b. Average annual population growth by decade, 1980-2016. *Average annual growth rates for 2010 decade displayed through 2016. Source: U.S. Census Bureau, National Population Estimates 1900-1999 and National Population Totals 2000-2018.

Weakening Agricultural Viability

According to the 2017 Census of Agriculture, U.S. farms are getting bigger, input costs are increasing, and most farm incomes are declining. Whereas in 1982, when most producers worked full time on the farm, today most have off-farm jobs to make ends meet.

Over the course of the 20th century, the number of U.S. farms fell by more than 60 percent while average farm size increased by 67 percent.⁵⁰ The trend is accelerating. In 1987, farms with over \$1 million in sales accounted for 28 percent of all agricultural production value. By 2017, they accounted for 68 percent. The share of production value by small and mid-sized farms has continually decreased. In 1987, farms with under \$250,000 in revenue accounted for over 45 percent of all production value; by 2017 that had dropped to roughly 10 percent. While a small percentage of very large farms is thriving, overall, this trend is weakening the viability of the agricultural sector. The “disappearing middle” has been tracked for several decades,^{51, 52} raising concerns about the health of rural communities as well as agricultural economies. Small and mid-sized commercial farms typically employ more people and contribute more to local economies than very large farms, as they are more likely to purchase livestock, equipment, and supplies locally.^{53, 54} But they are very vulnerable to consolidation, which threatens their access to land and markets.

Consolidation in farm sales has become nearly universal across commodity crop production,⁵⁵ with agricultural wealth concentrated on fewer and larger farms. Family farms with at least \$1 million in annual sales accounted for 39 percent of the value of U.S. farm production in 2017 compared to 31 percent in 1991, whereas smaller commercial farms only accounted for about 26 percent, down from 46 percent in 1991.

Along with consolidation of wealth came significant consolidation of cropland. In 1987, mid-sized farms (100-999 acres) operated more than 57 percent of all U.S. cropland, while large farms (at least 2,000 acres) only operated 15 percent. By 2012, this had shifted so that both large and mid-sized farms held 36 percent of cropland.⁵⁶ At the same time, farmland conversion further limited supply and led to increased land values, reinforcing consolidation among established producers.⁵⁷ As farmers consolidate, they tend to bid up land prices. This intensifies competition for land, removes land from rental markets, and makes it harder for a new generation to enter agriculture.



PHOTO: Howard Owens/ The Batavian

The Shrinking Middle

Share of U.S. Production Value by Sales Class

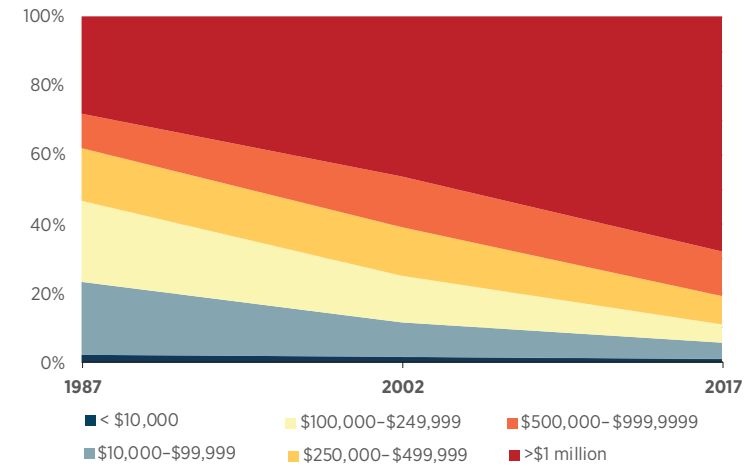


Figure 4. Share of U.S. production by market value of agricultural products sold, 1987-2017.

Source: National Agricultural Statistics Service, 2017 Census of Agriculture.

Impending Transfer of Land

More than four times as many farmers and ranchers are age 65 and older as are under age 35,⁵⁸ and the percentage of senior producers at or above retirement age keeps creeping up (Figure 5). In most states, seniors comprise at least a third of the farming population. Regionally, the trend is most pronounced across southern states: in Texas, more than 155,000 of the state's 408,500 producers are over age 65, versus fewer than 25,000 who are under 35.⁵⁹

Including nonoperator landlords, seniors aged 65 and older own more than 40 percent of the agricultural land in the United States.⁶⁰ This suggests an impending transfer of more than 370 million acres of farmland. In the meantime, these ownership patterns have led to a tight land supply, with very little acreage available to rent or to buy, especially on the open market.⁶¹

Success for a new generation of farmers and ranchers depends on their ability to secure suitable and affordable land to start and expand their operations. In the past, land usually transferred from generation to generation within a farm family. Now, this is less and less true. Today most producers do not inherit their land,³² making land access a major challenge. And even where it is true, family dynamics and issues like fractionated ownership and heirs' property rights complicate transfers between relatives.

Mostly managing small operations, beginning farmers and ranchers face long odds given farm consolidation,⁵⁵ rapid appreciation of land values,⁵⁷ conversion of agricultural lands to development,¹¹ and a very tight supply of available land to rent or to purchase. These factors converge to favor large farms and established operators.⁵⁶ Acquiring land has become increasingly difficult, especially for the diverse new generation of young, beginning, and socially disadvantaged farmers and ranchers who want to enter the field.

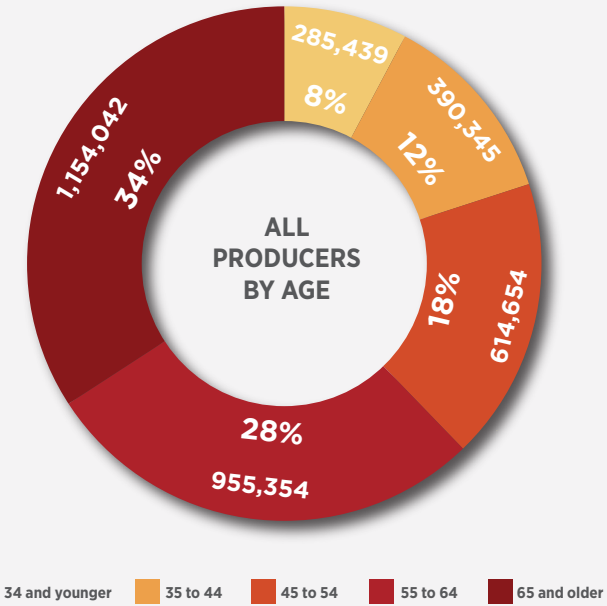
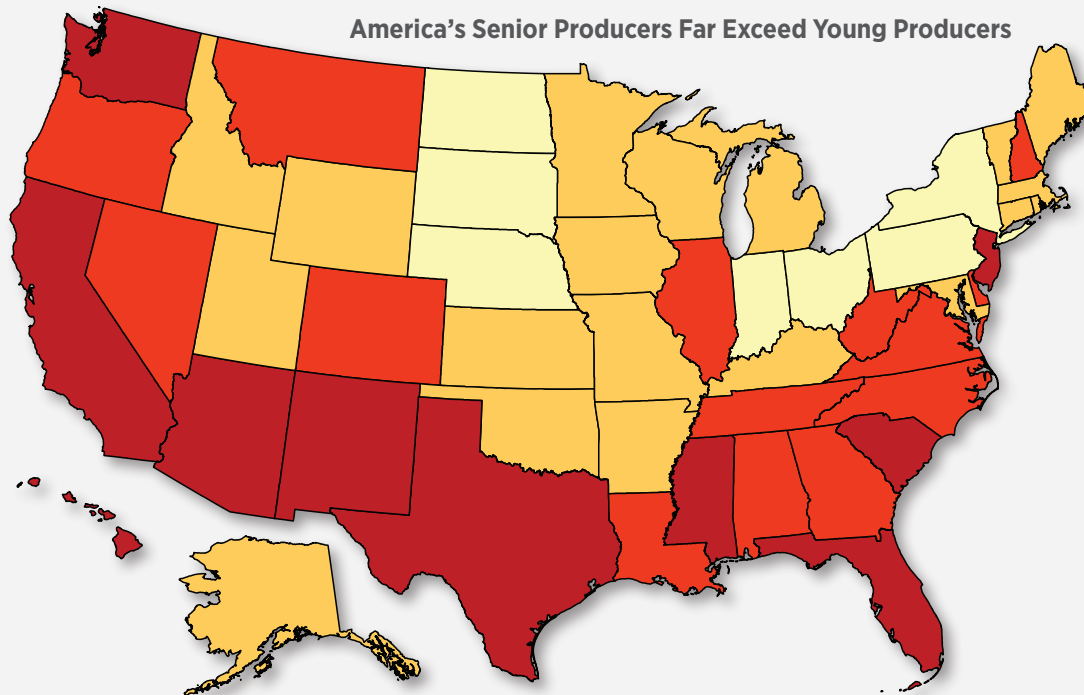


Figure 5. Percent and number of producers by age in 2017.
Source: USDA National Agricultural Statistics Service, 2017 Census of Agriculture



Map 1. Ratio of all producers over 65 to producers under 35 in each state, 2017. Nationwide, states average over four times as many senior producers as young producers. Many states across the south and southwest have much higher ratios—both Texas and New Mexico have more than six times as many producers over 65 as under age 35. This stands in stark contrast to the general workforce, where more than six times as many people under 35 are employed than people over 65.
Source: USDA National Agricultural Statistics Service, 2017 Census of Agriculture

Climate Change

Extreme weather events have increased dramatically over the last 40 years.⁶² Food crops like fruits and vegetables are especially sensitive to climatic stressors.⁶³ Heat waves and cold snaps result in lower yields and/or reduced quality,⁶² with potentially devastating impacts on profitability. High temperatures also are stressful for livestock. In 2011, a heatwave in the southern United States caused over \$1 billion in losses.⁶⁴

Increasing water shortages and deteriorating water quality pose additional threats.⁶² California idled more than six percent of its irrigated cropland during the 2012-2016 drought.⁶⁵ Risks are especially great in the Southwest. Facing drier and warmer conditions, and groundwater depletion, the region also must cope with escalating competition for water due to rapid population growth.

Warming leads to heavier rainfall. Between 1938 and 2016, downpours increased 42 percent in the Midwest and 55 percent in the Northeast.⁶⁶ Intense rains cause erosion, reduce soil fertility, and lower water quality in lakes, rivers, and streams.⁶⁷ In 2019, heavy rainfall and flooding took 19.6 million cropland acres out of production because they were too wet to plant, resulting in \$4 billion of insurance claims.⁶⁸ Rising sea levels are flooding farmland and will present com-

pounding challenges as they are projected to drive as many as 13 million people inland by 2100.⁶⁹

Yet, agriculture can help combat climate change. The 2019 IPCC report confirmed that this is not only possible, but necessary.² Regenerative farming practices that build soil health and sequester carbon are among the most cost-effective and immediate climate solutions. If all the world's farmers and ranchers used these practices, every year they could sequester enough carbon to offset 10 to 20 percent of global fossil fuel emissions.⁷⁰

Regenerative practices are most effective when used in combination. AFT research shows that if American farmers were to adopt a core set of practices—cover crops, conservation tillage, and nutrient management—on all cropland acres, they could sequester enough carbon to counter more than 85 percent of American agriculture's current emissions.⁷¹ This ambitious scenario highlights the vast potential of our croplands to serve as carbon sinks. Implementing regenerative practices on rangeland and pastureland would provide even more benefits.

Developing agricultural land exacerbates climate change in three dramatic ways:

1. Higher Emissions. Agricultural land produces far fewer GHG emissions than land converted to housing or commercial use. Greener Fields, a

study conducted by AFT with the University of California Davis—and later replicated by AFT in New York state—demonstrated that due to multiple negative impacts, farmland that is converted to other uses emits greenhouse gases at a level 58-70 times greater than if it had remained in farming.⁷²

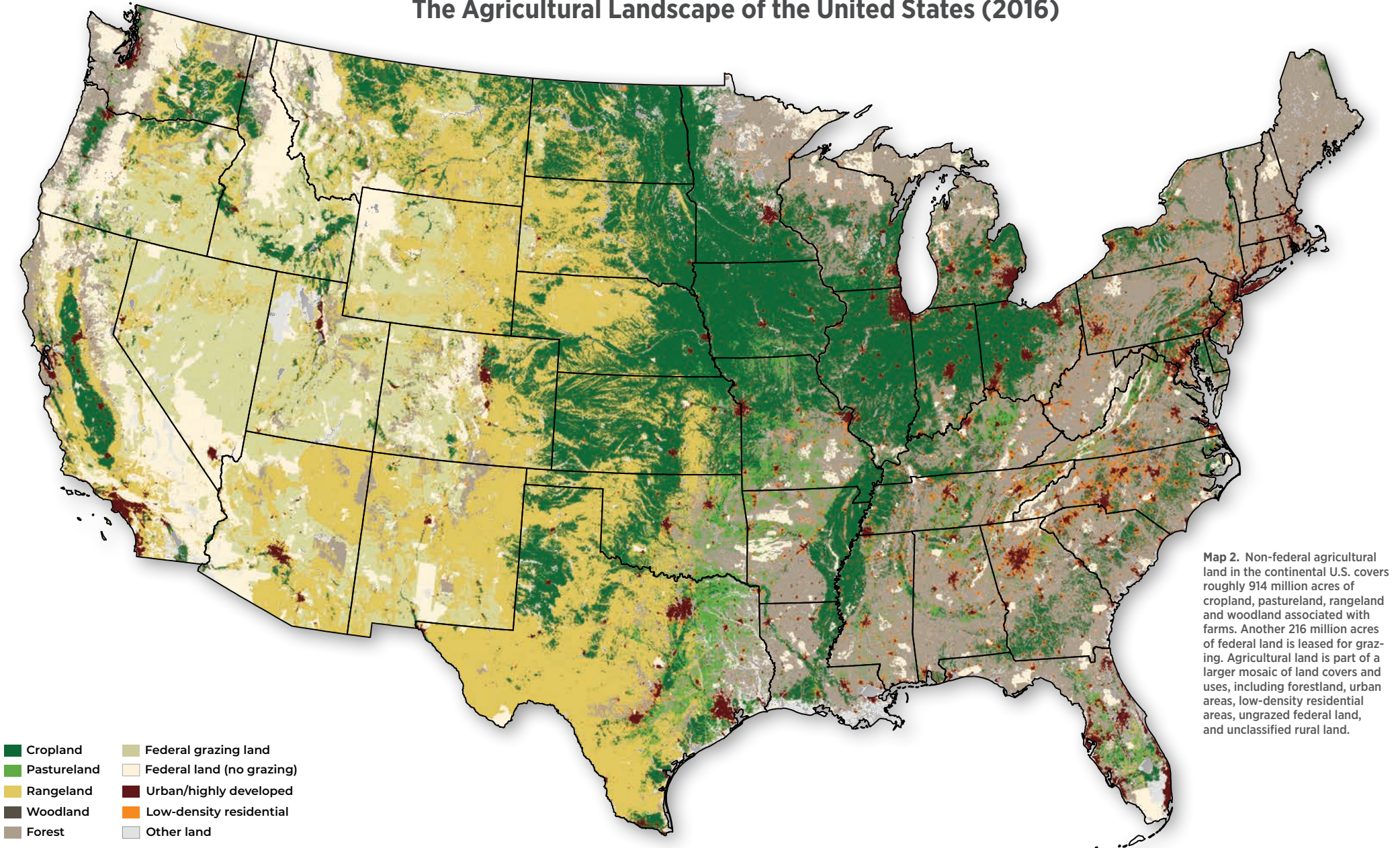
2. Lost Opportunities. When farmland is converted to developed uses, we lose the ability to steward it using regenerative practices. Further, additional pressure is put on remaining acres to be farmed more intensively. This limits opportunities to farm in ways that provide environmental co-benefits. Thus, losing farmland is a double hit which thwarts our essential need to sequester more carbon in farmland soils.

3. Risk of Backsliding. The benefits of regenerative agriculture are temporary unless the farmland on which the practices are undertaken continues to be managed wisely. If the land is ultimately lost to development, much of the carbon that had been stored in the soil will be released back into the atmosphere.

Bottom line: We need farmland to grow our food and other crops and to provide essential environmental services, including carbon sequestration. The case for farmland protection has never been stronger.



The Agricultural Landscape of the United States (2016)



Map 2. Non-federal agricultural land in the continental U.S. covers roughly 914 million acres of cropland, pastureland, rangeland and woodland associated with farms. Another 216 million acres of federal land is leased for grazing. Agricultural land is part of a larger mosaic of land covers and uses, including forestland, urban areas, low-density residential areas, ungrazed federal land, and unclassified rural land.

Methods

Methods

To launch *Farms Under Threat* in 2016, AFT surveyed and conducted telephone interviews with national experts, including leading academics, state policy leaders, land trust staff, and farmland protection program managers. Subsequently, we consulted with technical staff at NRCS and formed a National Advisory Committee of experts in relevant fields, from agriculture and conservation to geography, planning, and public policy. This informed our research questions and approach to both the spatial analyses and policy research, as well as our interpretation of findings.

SPATIAL ANALYSES

Our spatial analysis was designed to:

1. Demonstrate the extent, location, and quality of each state's agricultural land, and
2. Show the conversion of each state's agricultural land to:
 - **Urban and highly developed (UHD) land use:** built-up and other developed lands identified by the National Land Cover Database (NLCD), and
 - **Low-density residential (LDR) land use:** a new land use class developed in *Farms Under Threat* to identify distributed, low-density housing development in rural and exurban areas, which is not captured by NLCD.

See Appendix I for a comparison of these categories to NLCD and the USDA NRCS National Resources Inventory (NRI).

Land Cover/Use and Conversion

We developed detailed maps of agricultural lands and their conversion to UHD and LDR in the continental United States between 2001 and 2016 (data was not available for Alaska and Hawaii). We merged high-resolution land cover/use data from NLCD with county-level estimates of agricultural acreage from NRI, as well as many additional data sources (see Appendix II).

We created baseline land cover/use maps (Map 2) county by county. Drawing evidence from multiple datasets, we calculated the suitability of every 10 m by 10 m pixel of land for four agricultural land types: cropland, pastureland, rangeland, and woodland associated with farms. Using NRI acreage estimates as a guide, we mapped cropland, pastureland, and rangeland, and modeled woodland based on proximity to cropland or pastureland acreage informed by the 2017 Census of Agriculture acreage.⁷³

The LDR land use analysis assumes that commercial farm or ranch viability is threatened below a certain minimum farm size because production options become more limited. It also recognizes that this minimum size varies across the United States.

We considered the amount of land currently being used by agricultural operations and identified a conservative minimum size threshold using the 10th percentile of each county's farm size distribution from the 2017 Census of Agriculture.⁷⁴ Then we identified U.S. Census blocks where the average acreage per dwelling was below the county's minimum farm size threshold and classified all non-UHD land in these blocks as LDR.

To identify agricultural land that was converted to UHD or LDR, we compared maps for 2001 and 2016. We identified areas that shifted from agricultural land cover to UHD or LDR and totaled their area by county and state. Then we combined the total acres and percent of agricultural land converted into a single Threat Score on a scale from 0 to 100, with 100 indicating the highest threat. Conversion to LDR received half the weight of conversion to UHD because some agricultural land remains in LDR areas, and we wanted to be conservative. We also calculated an LDR Multiplier to determine whether agricultural land in LDR areas was more or less likely to be converted to UHD: values above 1 indicate that remaining pockets of farmland and ranchland in LDR areas were more likely to be converted to UHD.

Our mapping was unable to account for the myriad of local land use regulations across the United States. Likewise, we have not yet incorporated land protection status, because the available data⁷⁵ has inconsistent coverage across the country. AFT is currently developing our own Protected Agricultural Land Database, which will be incorporated into future *Farms Under Threat* analyses. As a result of these data limitations, some agricultural land that is already protected from development could be classified as LDR land use. However, a preliminary analysis of easement-protected properties suggests that less than five percent have been classified as LDR, as well as less than one percent of PACE protected lands, even in states with significant PACE activity.

Agricultural Land Productivity, Versatility, and Resiliency

To identify the most important land to protect for long-term food security, we developed a method to analyze the land's productivity, versatility, and resiliency (PVR) (see box). We mapped soil productivity, production limitations, land cover/use, and ability to produce important crop types, then combined these maps using prioritized weights elicited from a group of national experts (see Map 3). This map—and the interactive version on our website—can help states identify their most productive, versatile, and resilient agricultural land, which is a critical step in prioritizing land protection efforts.

We used our PVR analysis to identify Nationally Significant agricultural land, which is the land best suited for long-term, intensive crop production, especially for food crops such as fruits, nuts, vegetables, and staple grains. To do so, we calculated a minimum PVR value threshold based on the following condi-

tions: soils that are designated by USDA NRCS as prime, unique, or prime with limitations; areas that are mapped as cropland and pastureland; and recent history of producing food crops. All agricultural land with PVR values above this threshold, or the top 39 percent, was classified as Nationally Significant.

STATE POLICY ANALYSIS

In tandem with the spatial analyses, AFT conducted research on programs and policies that protect farmland and ranchland, support agricultural viability, and ensure land is available for future as well as for current farmers and ranchers. Our purpose was to:

- Identify ways states have responded to threats to their agricultural land base,
- Measure their performance, and
- Inform future state policy efforts.

Our state-by-state analysis of six policies and programs in all 50 states resulted in the Agricultural Land Protection Scorecard.

Selecting Policies

To select state policies and programs, we reviewed key literature, including the seminal policy guide from the *National Agricultural Lands Study, The Protection of Farmland: A Reference Guidebook for State and Local Governments*,³⁰ AFT's publication, *Saving American Farmland: What Works*,¹ which updated information from the NALS report; and *Holding Our Ground*.⁷⁶ We also interviewed leading planning, policy, and farmland protection experts. We did preliminary research on nine programs and policies but, in the end, limited in-depth investigation to approaches tied to the land and adopted by at least 10 states.⁷⁷

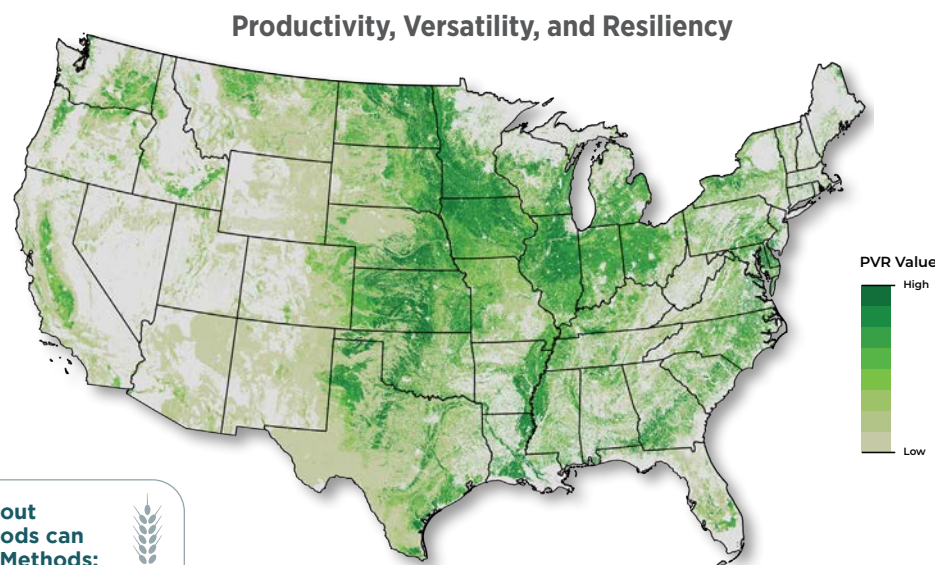
Ultimately, we included six approaches:

1. **Purchase of agricultural conservation easements (PACE)** programs (aka Purchase of Development Rights) that permanently protect farmland and ranchland from non-farm development. PACE programs pay property owners to sell agricultural conservation easements to a government agency or qualified private conservation organization.
2. **Land use planning policies** that manage growth and stabilize the land base. Most states delegate planning authority to local governments, but some play a more active role, and a few encourage localities to identify agricultural resources and adopt policies to protect them.
3. **Property tax relief** for agricultural landowners. The most common programs are use-value assessment (UVA), which assess farmland and ranchland at their current use value. A handful of states allow agricultural landowners to claim state income tax credits to offset property tax bills.
4. **Agricultural district programs** that encourage landowners to form special areas to support agriculture. Farmers receive protection and incentives ranging from limits on annexation, eminent domain, and public facility and infrastructure siting to tax incentives and exemptions. Less common is requiring district enrollment to participate in state-administered PACE programs.

PRODUCTIVITY is output per unit of input (often measured as crop yield per acre). The highest productivity occurs where climate and soil conditions are most conducive to plant growth. In addition, certain factors favor production of perishable food crops, such as special microclimates or length of growing season.

VERSATILITY is the land's ability to support production of a wide range of crops. It is mainly assessed in terms of soil characteristics and climate.

RESILIENCY is the land's ability to adapt to extreme weather events while still producing food and other agricultural products and providing ecosystem services over time. Resiliency depends on the same factors that determine productivity, especially soil properties and topography.



Map 3: The range of PVR values on agricultural land across the continental U.S.

More information about our spatial analysis methods can be found in our Extended Methods: www.farmland.org/farmsunderthreat

5. Farm Link (aka Land Link) programs that connect land seekers with landowners who want their land to stay in agriculture. Administered by public or private entities, they offer a range of services and resources, from online real estate postings to technical assistance, trainings, and educational resources. For this report, we only investigated publicly supported programs.

6. State leasing programs that make state-owned land available to farmers and ranchers for agriculture. Sometimes their purpose is to make land available for agriculture. Other times, agricultural use is secondary to stated purposes like generating income for a public purpose or protecting wildlife habitat.

Developing Factors

We developed 39 factors to compare approaches across 50 states. Twelve are based on quantitative data such as the ratio of acres protected to acres converted for PACE programs, or acres developed per new person for planning. The rest are based on qualitative criteria that could be applied consistently, such as statutory authority for all programs and withdrawal penalties for property tax relief. We refined factors based on feedback from national experts including our National Advisory Committee.

Examining State Policies

We examined state laws, regulations, and guidelines. We also visited program websites to review applications and other program materials, and interviewed state agency staff to confirm information and ask follow-up questions. For PACE and agricultural districts, we also used results from AFT surveys.

Calculating Scores for Individual Policies

We assigned points ranging from zero to 50 for each factor. For qualitative factors, we awarded a flat number of points when the elements were present. For quantitative factors, we assigned zero points for calculated values equal to zero, and 50 points to the state with the highest calculated value.

With input from Advisory Committee members, we decided on the relative importance of each factor. We assigned numeric weights that ranged from five percent to 35 percent. For all policies, Authority accounted for 15 percent and Outcome Measures for 10 percent of the score. To calculate the final score for each policy, we added up the weighted scores for all factors, divided by the total possible points and multiplied by 100 to generate a final policy score out of 100.

Calculating Policy Response Scores

Finally, we rolled up scores from each policy to generate combined Policy Response Scores (see Table 7 Agricultural Land Protection Scorecard). The combined scores serve as a broad indicator of each state’s policy response. We surveyed 20 national experts to rank the relative importance of each policy/program⁷⁸ and received 14 usable responses. Respondents ranked PACE and land use planning as the most important policies. We generated the overall score by summing the weighted policy scores.

Analysis of Policy Response

We used the overall policy scores to evaluate:

1. What type of development drove state policy responses,
2. How effective key approaches were at curbing conversion, and
3. How the responses compare to the current degree of threat.

We looked at the relationship between the percent of agricultural land converted to development and

states’ overall Policy Response Scores. Then, to evaluate the effectiveness of planning, we compared each state’s planning score to the efficiency of its development, based on the number of acres of agricultural land developed per new resident.⁷⁹ Because most of the policies were in place prior to 2001, we used development data from the NRI covering 1982-2012 for these two analyses.

Lastly, we created a rubric to compare states’ overall policy response to the degree of threat (see Call to Action). We grouped the top two quartiles of the threat score into a “high” threat category and labeled the next two quartiles as “medium” and “low,” respectively. We then grouped the lowest two quartiles of the policy response scores into the “low” policy response category and labeled the next two quartiles up as “medium” and “high.”

Comparing policy success across six types of programs and 50 states is challenging. Many variables influence land use decisions and confound analysis. These range from economic conditions and housing preferences to natural resource factors and historic settlement patterns. Further, some of the programs are widely used while others are not, and some have been around for 50 or more years, while others are more recent. Finally, while we compared programs for their roles in retaining agricultural land to support food and other farm production, this was not always their stated purpose. Therefore, we encourage states to conduct their own analyses to dig deeper into their trends, conditions, and needs. Such assessments will be strengthened by close coordination with local governments both in gathering data and assessing policies.

POLICY	RANK	WEIGHT
Purchase of Agricultural Conservation Easement Programs	1	32.5%
Land Use Planning Policies	1	32.5%
Real Property Tax Relief Programs	3	15.8%
Agricultural District Programs	4	10.3%
Farm Link Programs	5	6.1%
State Leasing Programs to Lease State-Owned Land	6	2.8%

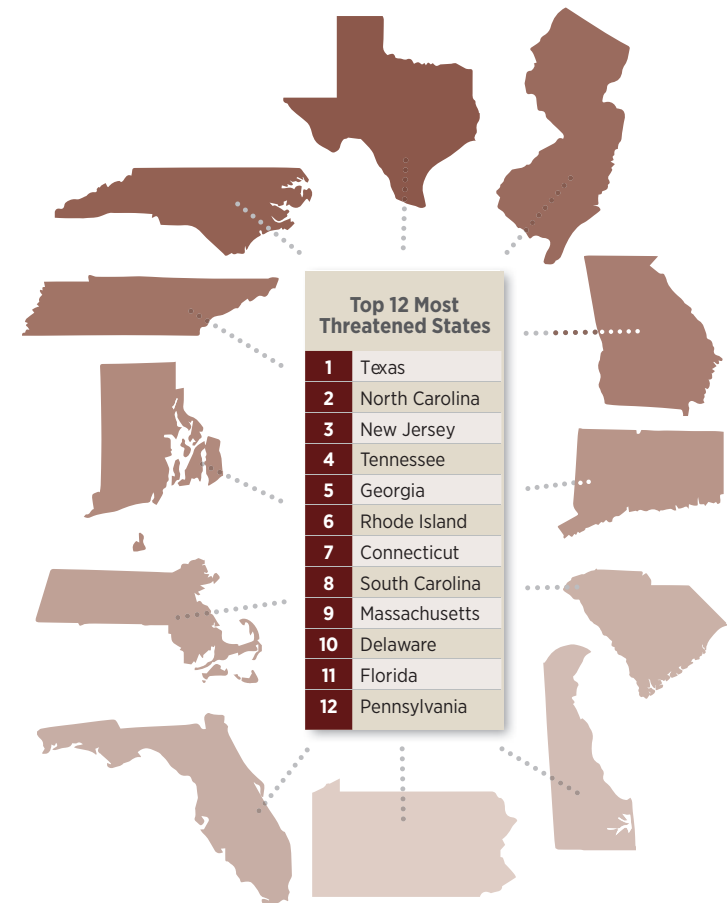


Visualizing the Threats

Visualizing the Threats: Findings from the Spatial Analyses

Our extensive research paints a striking picture of the threats facing working farms and ranches in the 48 contiguous states. From 2001-2016, 11 million acres of agricultural land were paved over, fragmented, or converted to uses that compromise agriculture. This jeopardizes sustainable food production, economic opportunities, and the environmental benefits afforded by well-managed farmland and rangeland. This is equal to the total amount of U.S. farmland devoted to fruit, nut, and vegetable production⁸⁰ or all the cropland in Ohio. Of these 11 million acres, more than 4 million were converted to urban and other highly developed (UHD) uses, while nearly 7 million acres went to low-density residential (LDR) land use.

Compounding these impacts, 4.4 million acres of Nationally Significant land were converted to UHD and LDR land uses. This is the nation's most productive, versatile, and resilient (PVR) land, so it can take two to three times the amount of marginal land to make up for its loss. **Protecting Nationally Significant land from development—and farming it with regenerative practices—is especially critical in the face of extreme weather disruptions.**



4.1 million acres of farmland and rangeland were developed as UHD expanded around cities and towns.

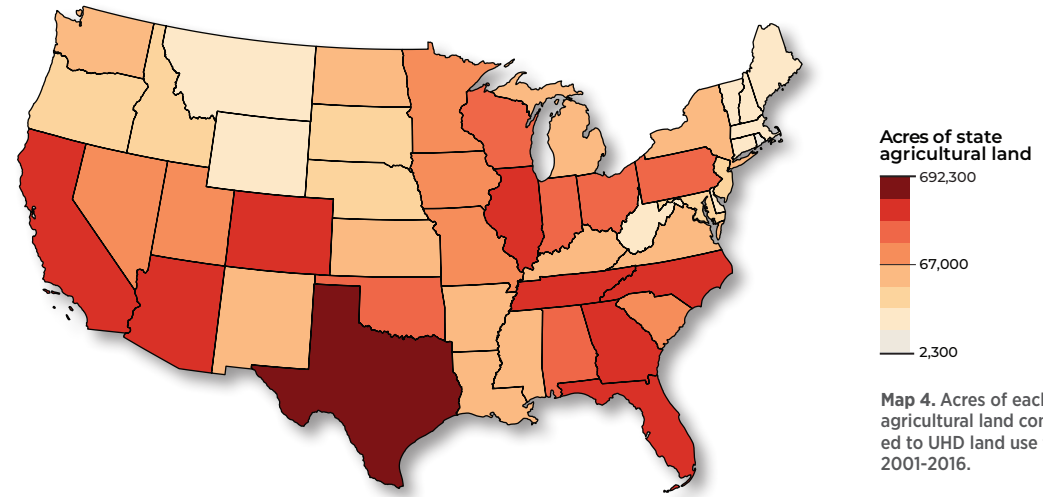
The UHD category includes moderate-to-high-density residential development, commercial and industrial sites, and even solar fields and well pads. Due to data limitations, the effect of new road construction was not included in this analysis, so the true conversion number would be slightly higher. The impact of UHD was most severe in large states with rapid population growth such as Texas and California (see Table 2).

Urbanization closely tracked population growth. The correlation between acres converted to UHD and population growth was very high (0.88) and eight out of 12 states with the highest acreage of UHD conversion were also in the top 12 for population gains from 2001-2016 (see Tables 1 and 2). It is especially concerning that several states with high UHD conversion also are endowed with large amounts of Nationally Significant land, including Texas, Illinois, North Carolina, Indiana, and Ohio.

Notably, Washington and Oregon are nowhere near the top of the list for UHD conversion, despite adding large numbers of new residents. Washington was 7th in population growth but 31st in urban conversion; Oregon was 15th in population growth but 34th in urban conversion.

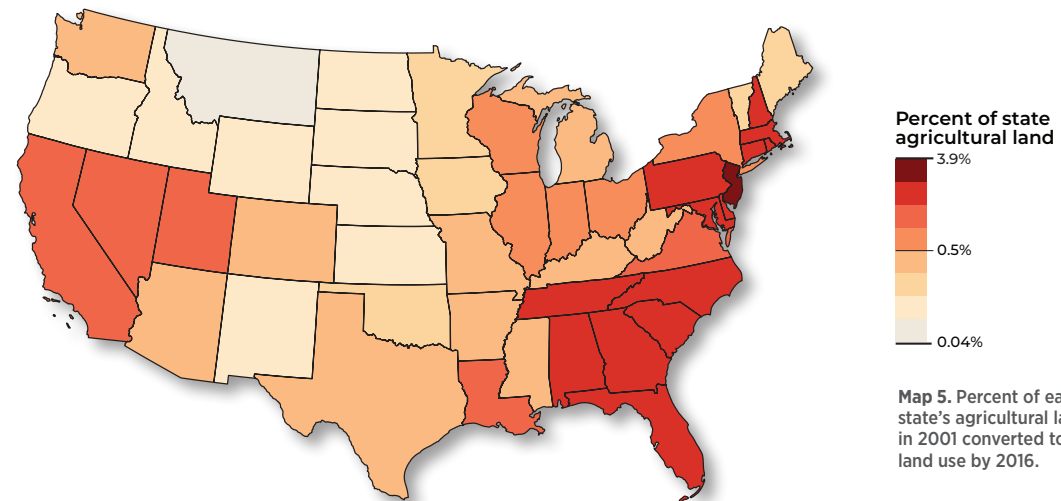
Nationally, historical data suggests that progress has been made to curb the loss of agricultural land to development. According to the most recent NRI, conversion has dropped by 75 percent from its peak in the mid-1990s. Some of this drop can be explained by the Great Recession and the decline in housing starts, which fell by 28 percent between the two periods. It also can be explained by more efficient development. Compared to the 1990s, in this century a greater portion of single-family homes were built on smaller lots, and a greater portion were multi-family homes built with more units. According to the 2017 American Housing Survey, 66 percent of homes built since 2000 were on lots smaller than half an acre, compared to just 59 percent of those built between 1990 and 1999.⁶¹ In addition, the proportion of new houses built on lots between half an acre and one acre and one to five acres also decreased. This suggests that smart growth policies and changing consumer preferences are leading to more compact development and reducing the rate of urban conversion of agricultural land.

Acres Converted to Urban and Highly Developed (UHD) Land Use



Map 4. Acres of each state's agricultural land converted to UHD land use from 2001-2016.

Percent Conversion to Urban and Highly Developed (UHD) Land Use



Map 5. Percent of each state's agricultural land in 2001 converted to UHD land use by 2016.

	Acres	Percent
1	TX 692,000	1 NJ 3.9
2	CA 317,000	2 RI 3.7
3	AZ 191,000	3 MA 2.7
4	GA 173,000	4 CT 2.5
5	IL 162,000	5 DE 1.9
6	FL 160,000	6 FL 1.8
7	NC 160,000	7 NC 1.5
8	TN 148,000	8 GA 1.4
9	CO 124,000	9 SC 1.3
10	OH 109,000	10 MD 1.3
11	PA 103,000	11 TN 1.1
12	IN 102,000	12 PA 1.1

Table 1. Top 12 states for agricultural land converted to UHD use from 2001-2016, by acres and percent. Percent refers to the percent of each state's agricultural land in 2001 converted to UHD land use by 2016.

State	New Residents
Texas	6,618,000
California	4,730,000
Florida	4,273,000
North Carolina	1,947,000
Georgia	1,928,000
Arizona	1,672,000
Washington	1,309,000
Virginia	1,213,000
Colorado	1,115,000
Tennessee	894,000
South Carolina	893,000
Nevada	821,000

Table 2. Top 12 states in population growth from 2001-2016.

Source: U.S. Census Bureau

What is Urban and Highly Developed Land Use?

Most UHD areas fit traditional definitions of urban or suburban development. From skyscrapers in city centers to strip malls in outlying towns, this category includes largely built-up areas where most of the land has been converted to commercial, industrial, or residential uses. These include parks, golf courses, urban farms and forests, and other open spaces found in and around cities and towns.

UHD also includes highly developed land in rural areas, such as oil and gas well pads, solar panels, and warehouses. These rural industrial sites are identified by satellite remote sensing because the land surface is highly impervious.

Nuances within UHD are important. Not all residential areas are included in UHD areas. Based on the limitations of the underlying dataset, residential areas with houses on lots of 1-2 acres or larger are not included. To better understand this type of development and its impacts on agriculture, we developed a targeted analysis of LDR land use (see box on next page).



PHOTO: USDA Photo by Preston Keres

From community gardens to commercial production on multi-acre farms, urban agriculture is growing in cities and towns across the U.S. Pictured above, a volunteer waters crops at a commercial farm that once was an empty lot in the Far Rockaway section of Queens, New York. Far Rock Farm produces local food for area residents and institutions and trains others to do the same, uniting agriculture with nutrition and community development to spur economic opportunities through entrepreneurship.

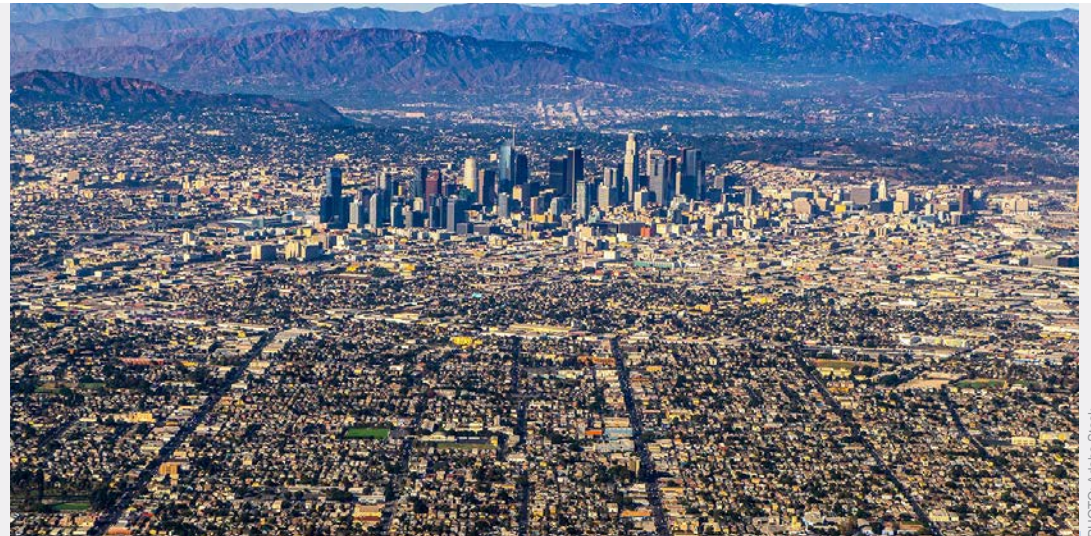


PHOTO: Adobe Stock



PHOTO: Adobe Stock



PHOTO: Adobe Stock

Nearly seven million acres of agricultural land were converted to LDR land use between 2001 and 2016—an area larger than the state of Maryland.

While agricultural land is being converted to LDR in every state, this land use trend is most widespread in the South, Midwest, and Northeast (see Table 3 and Maps 6-7). Expansion of LDR is highest by acreage in Texas, but North Carolina and Tennessee are a close second and third. With much less agricultural land, these two states have a disproportionately high rate of LDR conversion, as do Georgia, Mississippi, Virginia, and Alabama. In the Midwest and Northeast, LDR expansion is especially high in Missouri, Ohio, Pennsylvania, and New York

Unlike UHD development, conversion to LDR is not closely tied to population growth. Only five out of the top 12 states for LDR are in the top 12 for population growth, and the correlation between conversion to LDR and population growth is only 0.54.

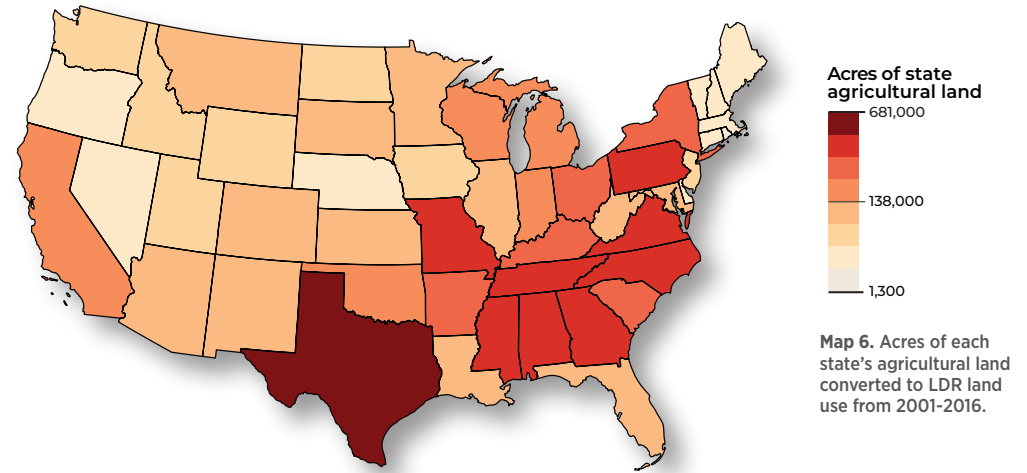
Our pioneering analysis enables us, for the first time, to show the extent and location of LDR areas and begin to understand their impacts on agriculture. This fills in the critical knowledge gap left by previous spatial assessments.

LDR land use is best understood as a continuum. It ranges from large-lot subdivisions to rural areas where residential use is intensifying¹³ (see box). Typically, this kind of scattered large-lot housing fragments the agricultural land base and limits production, marketing, and management options for the working farms and ranches that remain. However, in some places and contexts, especially those that value local food and other farm products, agriculture may benefit from a large customer base.^{20, 82, 83} More research is needed to fully understand the implications of LDR expansion for the land, working farms and ranches, and the communities it affects.

LDR paves the way to urbanization. Using the “LDR multiplier” (see Methods) between 2001 and 2016, agricultural land in LDR areas was 23 times more likely to be converted to UHD than other agricultural land. In other words, new housing development rapidly occurs on the remaining farmland and ranchland in LDR areas.

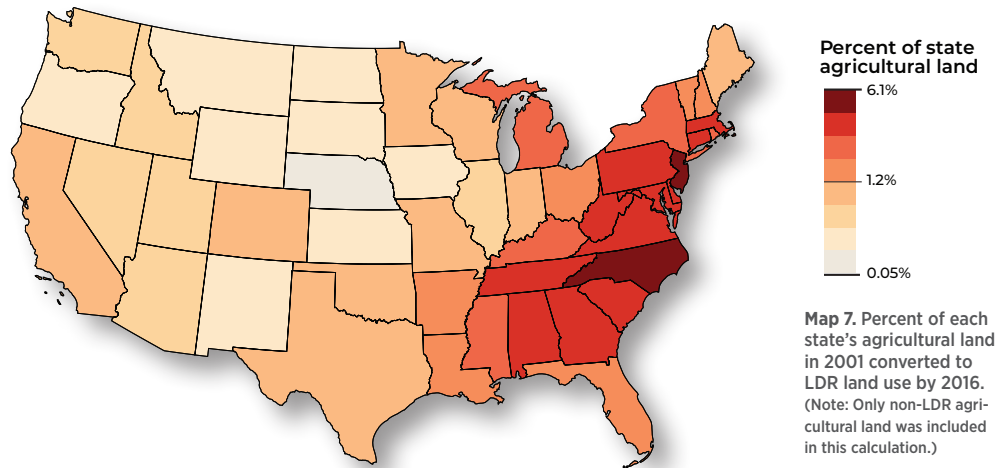
State policies can help keep agriculture viable in LDR areas and reduce the risk of final conversion to UHD. For example, land use policies that encourage compact development, such as area-based allocations and sliding scale zoning, can protect large contiguous blocks of agricultural land even when average housing density increases. In addition, PACE programs can save agricultural land in perpetuity, even if surrounding population pressure is high. Pennsylvania is an example of a state with significant permanent protection as well as a variety of local land use policies.

Acres Converted to Low-Density Residential (LDR) Land Use



Map 6. Acres of each state’s agricultural land converted to LDR land use from 2001-2016.

Percent Conversion to Low-Density Residential (LDR) Land Use



Map 7. Percent of each state’s agricultural land in 2001 converted to LDR land use by 2016. (Note: Only non-LDR agricultural land was included in this calculation.)

Acres		Percent	
1	TX 681,000	1	NC 6.1
2	NC 572,000	2	NJ 5.6
3	TN 511,000	3	TN 4.5
4	GA 371,000	4	CT 4.4
5	MS 279,000	5	DE 4.3
6	VA 273,000	6	VA 3.5
7	AL 262,000	7	SC 3.5
8	PA 244,000	8	MD 3.4
9	MO 243,000	9	GA 3.3
10	KY 205,000	10	WV 3.2
11	OH 203,000	11	PA 3.0
12	AR 202,000	12	AL 2.8

Table 3. Top 12 states for agricultural land converted to LDR use from 2001-2016, by acres and percent. Percent refers to the percent of each state’s non-LDR agricultural land in 2001 converted to LDR land use by 2016.

What is Low-Density Residential Land Use?

Much of LDR area is comprised of large-lot subdivisions (left image below) that are not dense enough to be identified using remote sensing, from two acre lots on the edges of cities to 20, 30, or even 40 acre lots in the countryside, likely including farmettes and ranchettes. Some areas would be considered suburbs or exurbs.

LDR also includes open agricultural land that is adjacent to or surrounded by existing development (middle image below). These areas can include blocks of agricultural land, as well as forested areas and other open space. They are identified as LDR because they are in a U.S. Census block with enough houses to push the average housing density above the LDR threshold (see Methods). These LDR acres are highly susceptible to further urbanization.

Much of the remainder of LDR is found where individual houses and small housing clusters are spread out along rural roads, increasing the local housing density but leaving adjacent agricultural fields intact (right image below). This occurs most frequently in varied rural landscapes, such as forested areas of the East and South where farms and forests are intermingled. This increase in housing density fragments the rural landscape and limits production, marketing, and management options for the remaining farms and ranches.

Spectrum of Low-Density Residential Land Use



Figure 6. Examples of LDR land use along a continuum from areas that are developed to areas where agriculture is compromised. In the left image, large-lot housing covers a field in Eagle, Idaho, with houses on two-to-five-acre lots. In the middle, development is putting pressure on cropland on the edge of Joliet, Illinois. In the right image, scattered home building along rural roads is threatening agricultural viability in Litaker, North Carolina.



PHOTO: Adobe Stock



PHOTO: Adobe Stock



PHOTO: Faron Collins

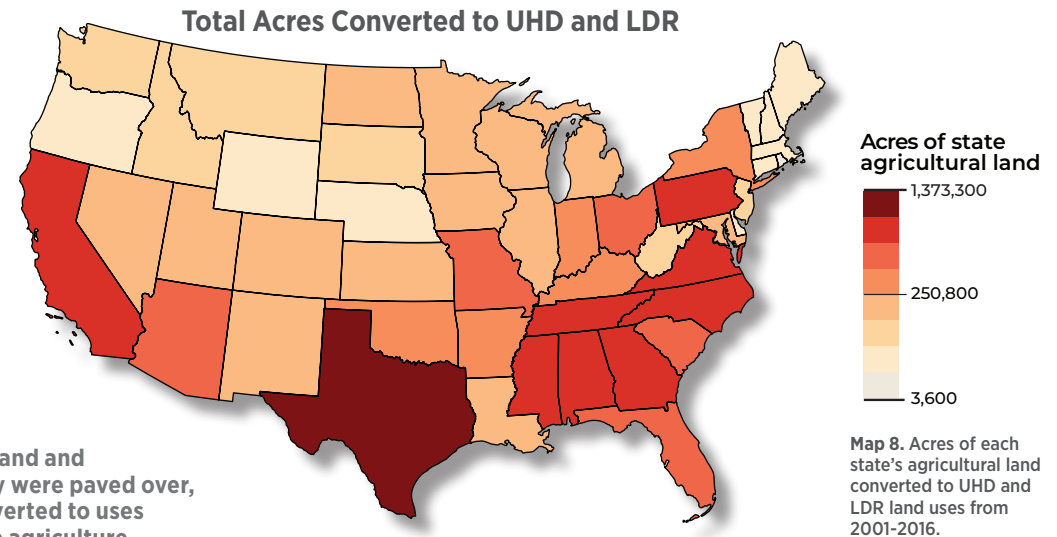
11 million acres of agricultural land were converted to UHD or LDR uses between 2001 and 2016.⁸⁴

That's equal to all the U.S. farmland devoted to fruit, nut, and vegetable production in 2017—or 2,000 acres a day paved over, built up, and converted to uses that threaten the future of agriculture. This occurred despite the Great Recession, plummeting housing starts, and declining population growth.

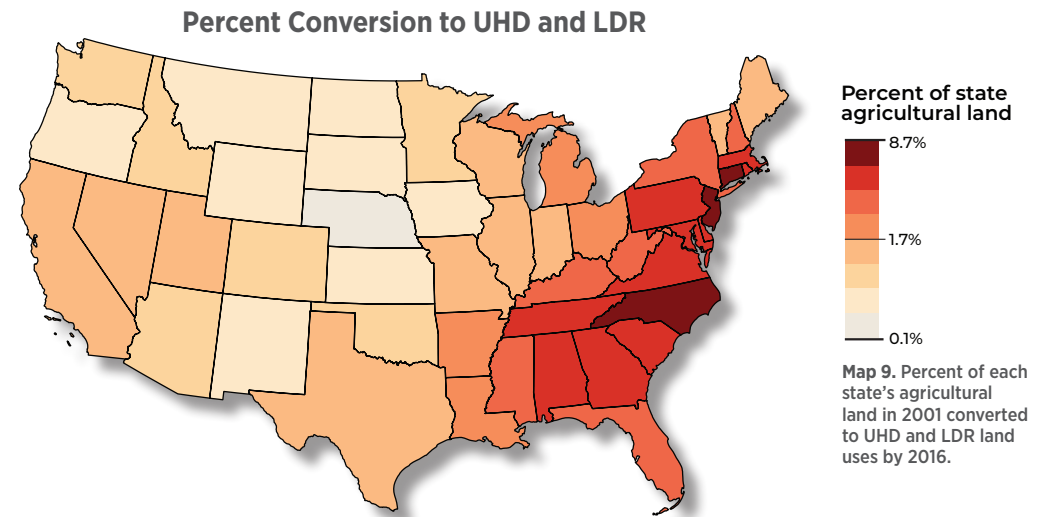
Texas tops the list with 1.3 million acres converted (see Table 4). However, North Carolina was second nationally, even though it is only 30th in total agricultural acreage, with UHD and LDR claiming 732,000 acres (seven percent of its agricultural land base). The rapid pace of conversion in these states can be partly explained by population growth, since Texas added the most residents and North Carolina the fourth most from 2001-2016 (see Table 2). However, it likely also had to do with weak land use policies (see Policy Scorecard), since California and Florida both added more than twice as many residents as North Carolina yet developed or compromised less land.

On a percentage basis, small Northeastern states stand out. Expansion of UHD and LDR affected almost nine percent of agricultural land in New Jersey and roughly six percent in Connecticut, Delaware, and Rhode Island. If these rates continue, by 2100 a third or more of the farmland in these states will be converted to UHD or LDR land uses.

While the Northeast has faced intense development pressure for decades, in this century, a heightened level of threat has emerged in the South.⁸⁵ Tennessee, Georgia, South Carolina, and Virginia are experiencing considerable urban development and very high rates of LDR expansion. Between 280,000 and 660,000 acres were converted in each of these states, or between 4 and 5 percent of their 2001 agricultural land base. With six out of the 12 most threatened states in the South, it is clearly a hotspot for agricultural land conversion (see figure on page 25). A ranking of states by overall Threat Score is included in Appendix III. The states with the highest threat had either a large percentage threat, a large acreage threat, or both.



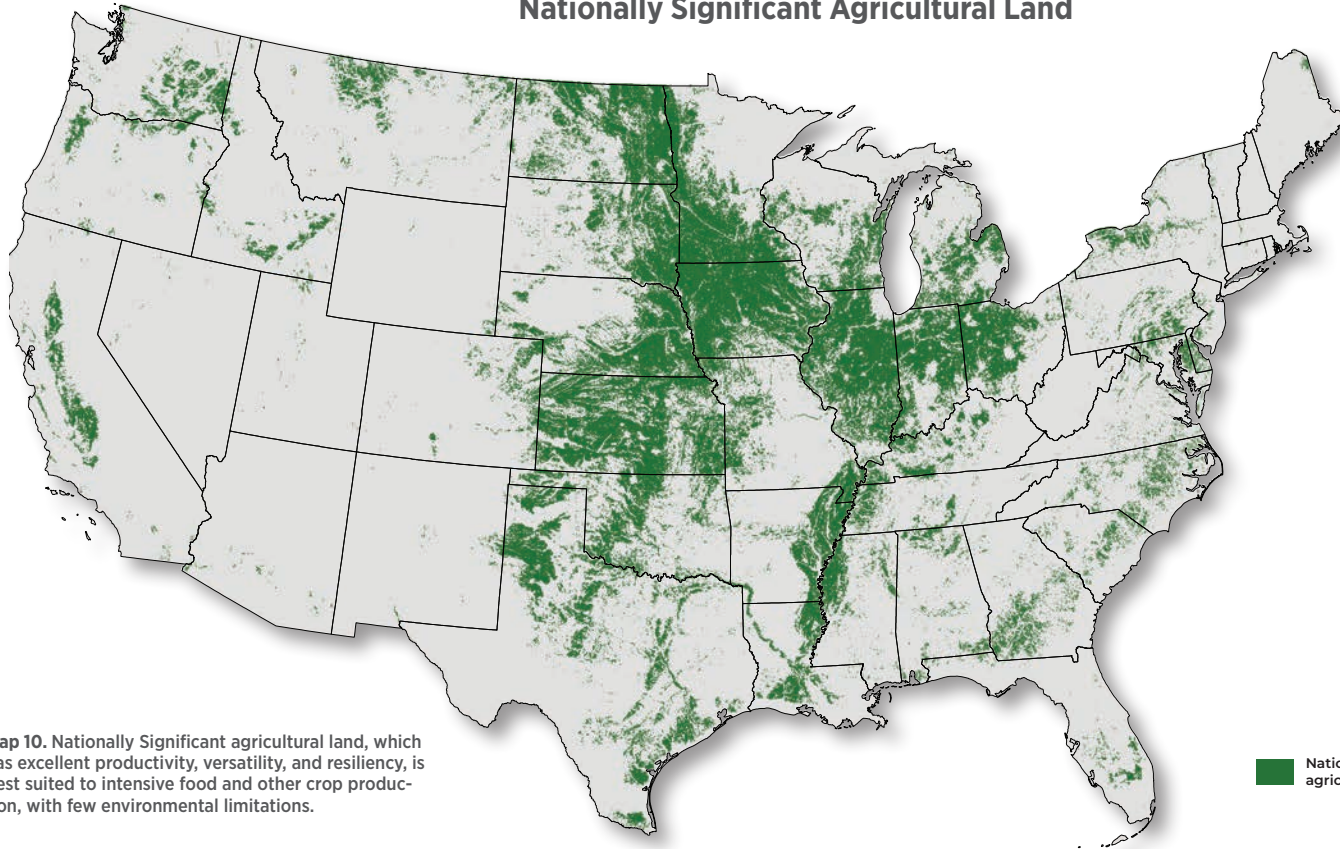
2,000 acres of farmland and ranchland per day were paved over, fragmented, or converted to uses that jeopardize agriculture



Acres			Percent		
1	TX	1,373,000	1	NJ	8.7
2	NC	732,000	2	NC	6.7
3	TN	659,000	3	CT	6.4
4	GA	544,000	4	DE	5.8
5	CA	466,000	5	RI	5.8
6	AL	362,000	6	MA	5.2
7	PA	347,000	7	TN	5.1
8	VA	340,000	8	SC	4.5
9	MS	336,000	9	GA	4.4
10	MO	325,000	10	MD	4.3
11	OH	312,000	11	VA	4.0
12	FL	298,000	12	PA	3.8

Table 4. Top 12 states for agricultural land converted to UHD and LDR uses from 2001-2016, by acres and percent. Percent refers to the percent of each state's agricultural land in 2001 converted to UHD and LDR land uses by 2016.

Nationally Significant Agricultural Land



Map 10. Nationally Significant agricultural land, which has excellent productivity, versatility, and resiliency, is best suited to intensive food and other crop production, with few environmental limitations.

Developing Nationally Significant land threatens food security, the environment and rural communities.

Acres		Percent	
1	TX 555,000	1	NJ 9.1
2	NC 387,000	2	CT 6.2
3	TN 212,000	3	NC 6.1
4	GA 195,000	4	DE 5.8
5	AL 191,000	5	RI 5.8
6	PA 187,000	6	MA 5.0
7	OH 181,000	7	TN 4.6
8	IL 177,000	8	AL 4.0
9	IN 162,000	9	WV 3.9
10	MS 153,000	10	PA 3.9
11	WI 147,000	11	MD 3.8
12	LA 145,000	12	SC 3.7

Table 5. Top 12 states for Nationally Significant agricultural land converted to UHD and LDR from 2001-2016, by acres and percent.

Percent refers to the percent of each state's Nationally Significant land in 2001 converted to UHD and LDR by 2016

Every state converted high quality agricultural land to UHD and LDR.

Between 2001 and 2016, 4.4 million acres of Nationally Significant agricultural land were converted to more highly developed land uses, an area nearly the size of New Jersey. Every state converted some Nationally Significant land.

Developing Nationally Significant land threatens food security, the environment, and rural communities. This land is best suited to produce abundant yields of nutritious food with the least environmental impacts, even as weather conditions become more unpredictable. It lays a strong foundation for thriving agricultural economies and offers high potential for carbon sequestration.

Converting this land to UHD and LDR can have negative environmental impacts by putting pressure on lower quality land to be farmed more intensively.

Nationally Significant land is geographically concentrated (see Map 10). Some states, most notably Delaware, Illinois, Iowa, and Minnesota, contain almost exclusively Nationally Significant agricultural land. Nineteen states contain at least 50 percent. On the other hand, states dominated by desert or mountains have very little.

The risk to the nation's highest PVR value farmland also is geographically concentrated: Texas, North Carolina, and Tennessee accounted for more than a quarter of the total conversion, and well over half (2.7 million acres) occurred in the top 12 states (see Table 5). Ohio, Illinois, Indiana, and Wisconsin also converted large

amounts of high-quality agricultural land. Further, in some states, Nationally Significant land was disproportionately converted. In Wyoming, Utah, Texas, Montana, and Oregon, Nationally Significant land comprised 25 percent or less of their total agricultural land base but was roughly twice as likely to be converted as other farmland (see Table 6), typically because it was concentrated near large and growing cities.

While not all states have abundant Nationally Significant land, they still have a range of their own best quality land: agricultural land with PVR values above the state median. Some converted a disproportionate amount of this land, as well. For example, Idaho converted its best land four times faster than other agricultural land.

State	Factor
WY	2.5
UT	2.0
TX	2.0
MT	1.9
OR	1.8
NE	1.4
AL	1.4
AZ	1.3
WV	1.2
OK	1.2
VT	1.2
NJ	1.2

Table 6. Factor by which Nationally Significant land was more likely to be converted to UHD or LDR than other agricultural land from 2001-2016.



Our analysis is designed to anticipate future challenges and opportunities. As the population grows, development spreads, demand for healthy food increases, and the changing climate makes farming and ranching riskier, it will be vital to secure a critical mass of productive, versatile, and resilient (PVR) land (see Map 3 in Methods).

As described on page 31, our PVR analysis can be used to identify Nationally Significant land—but working farms and ranches can thrive in states where this land is scarce. For instance, Nationally Significant land only makes up two percent of Arizona’s land base, but agriculture had a \$23.3 billion economic impact in 2017.⁸⁶ Likewise, Nevada’s 8.3 million acres of private rangeland may have low PVR scores, but, in combination with nearly 45 million acres of public grazing land, they support a vibrant ranching community.

States need to identify the agricultural land resources that are most important for their own food systems and landscapes. A state-specific alternative to Nationally Significant land is to focus on the better half of each state’s agricultural land: the land that has PVR values above the state median. In many states, such as Utah, Idaho, California, Montana, and Texas, conversion is concentrated on this land. This jeopardizes the future of farming and ranching in these states.

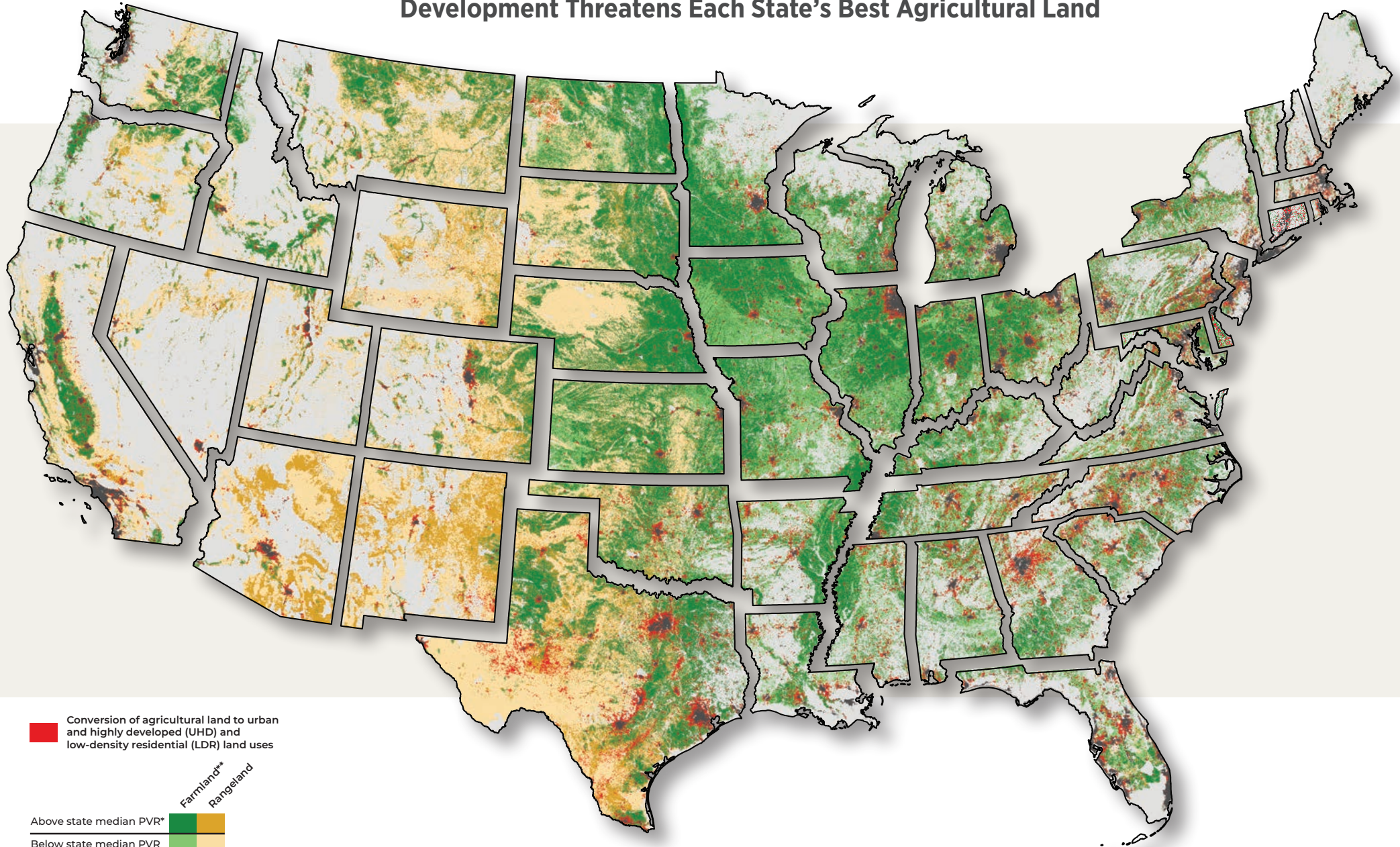
Map 11 (at right) shows where non-federal farmland and rangeland were converted to UHD and LDR land uses from 2001-2016. Farmland includes cropland, pastureland, and woodland associated with farms. Farmland and rangeland with PVR values above the state median are shown in dark green and dark yellow, respectively. Lands with PVR values below the state median are shown in lighter shades. Existing urban areas in 2001 are shown in dark gray and federal, forest, and other lands are shown in light gray. Conversion to UHD or LDR has occurred in all areas shown in red, but this does not indicate that every acre in those areas has been converted.



Explore our interactive maps and learn more about our analysis at www.farmland.org/farmsunderthreat



Development Threatens Each State's Best Agricultural Land



Map 11. Conversion of non-federal farmland and rangeland to UHD and LDR land uses from 2001-2016.

*Our productivity, versatility and resiliency (PVR) index helps identify high-quality agricultural land (see Methods)

**Farmland is composed of cropland, pastureland, and woodland associated with farms



Assessing the Response

Results from the Policy Scorecard

The Agricultural Land Protection Scorecard shows how all 50 states have—or have not—responded to the leading threats to agricultural land: development pressure, weakening agricultural viability, and the transfer of land to a new generation. Since Maryland passed its use assessment law in 1956, every state has taken some policy action. Our research finds that large acreage losses of agricultural land to development did not spur a high policy response. Instead, high percentage losses prompted action. The 12 leading states implemented a mix of approaches and linked their programs to enhance effectiveness. They created guidelines to ensure local actions achieve broader goals and continue to innovate.

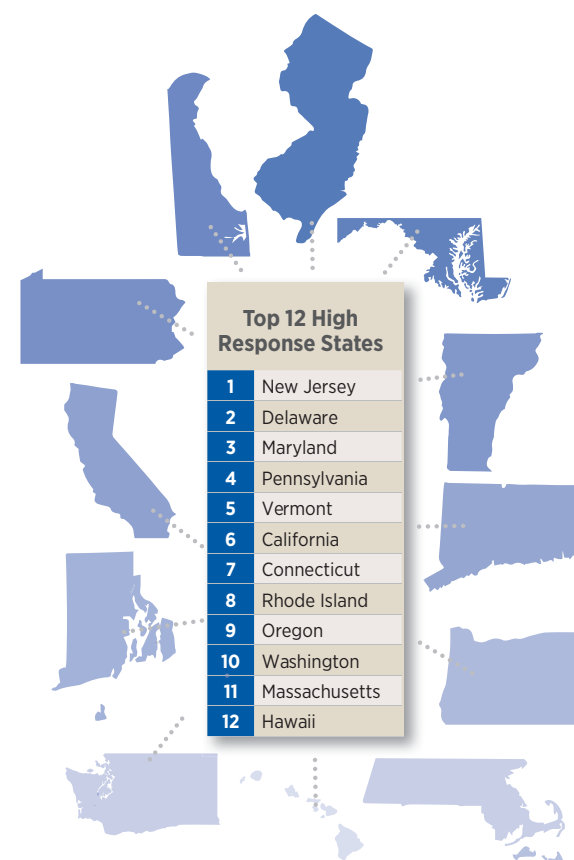
Every state has taken steps to protect its agricultural land, but all could do more.

All 50 states have enacted property tax relief programs and authorized local governments to plan and implement local land use regulations. Nearly every state has a program to lease state-owned land for agriculture, and more than half have PACE programs. Even the least widespread approach, Farm Link programs, are found in 11 states.

No state received a perfect score for any individual policy. In other words, every state has the potential to do more. For instance, only three PACE programs have protected at least an acre of farmland for every acre developed. While property tax relief is a universal approach, only a handful of states incorporate term easements or dedicate withdrawal fees to land protection. Likewise, few district programs include restrictive covenants, which limit non-farm development for the enrollment period, or prohibit annexation or eminent domain.

Leading states responded to visible changes in their agricultural landscape.

The top 12 high response states are clustered on the coasts where intense development pressure has threatened agriculture for decades (see Map 12). The most robust response is concentrated between Maryland and Vermont where states implement the nation's most effective PACE programs. All the West Coast states, plus Hawaii, also landed in the top 12. Seven leaders were among the top 10 most densely populated states in 1950.⁸⁷ The other three—California, Oregon, and Washington—experienced double-digit population increases between 1950 and 1980. Half experienced double-digit percentage losses of agricultural land between 1982 and 2012—from 27 percent in New Jersey to 12 percent in Maryland.¹¹ Their policy responses track these trends. Maryland enacted the first property tax relief program in 1956. California passed the Williamson Act, their agricultural districts law, in 1965. Oregon enacted its statewide growth management program in 1973. Maryland, Massachusetts, and Connecticut created the first state PACE programs in the late 1970s. We performed a regression analysis which found a strong relationship between the proportion of agricultural land developed and the policy response score. This suggests that the intensity, rather than the extent of development, spurred action.



Coordination is key: Leaders linked multiple programs and created effective frameworks to harness local efforts.

States with multiple policies received the highest combined scores. The leaders all used at least four approaches and have effective planning and funded PACE programs. Adopting more than one policy is effective because different programs achieve different outcomes, and the strengths of one approach can offset the shortcomings of another. Oregon recently enacted a PACE program to save a permanent supply of farmland to augment the state’s cost-effective planning and zoning to contain development.

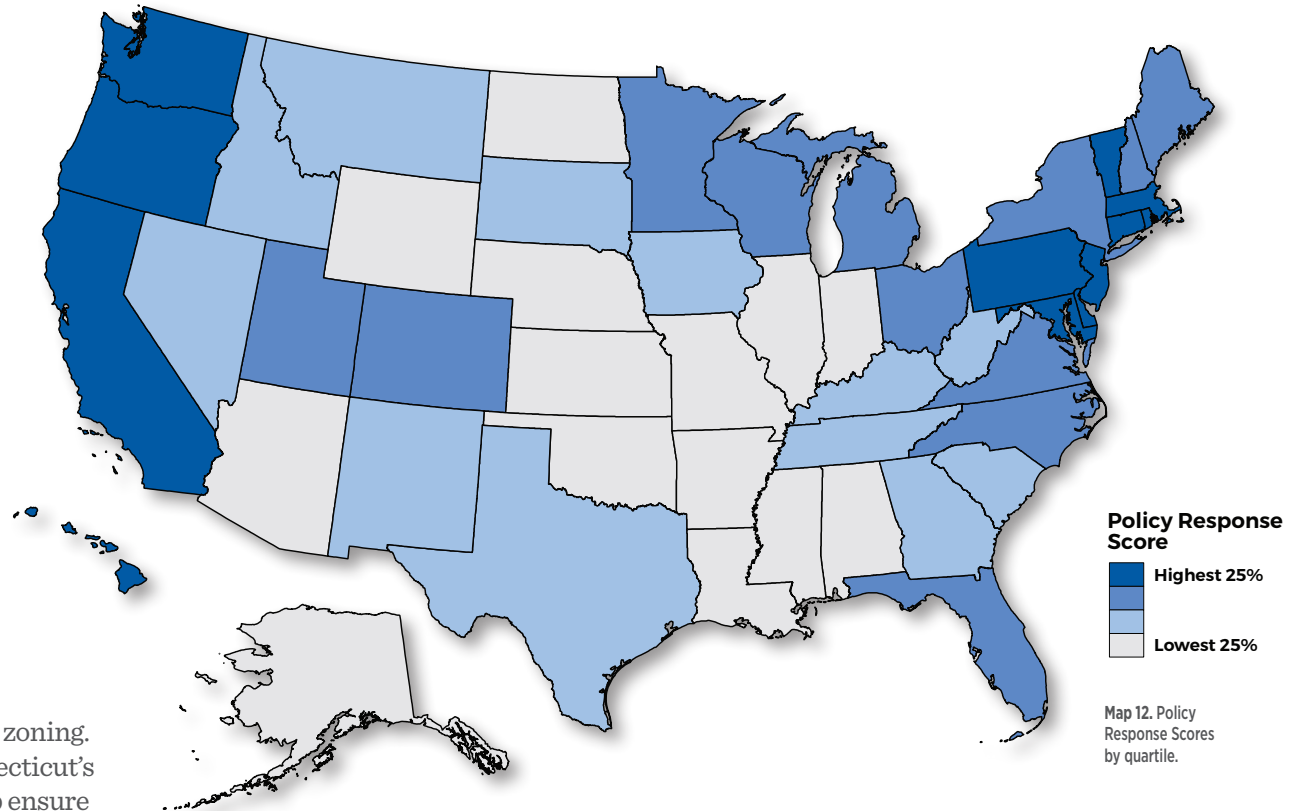
The leaders also *link* programs to enhance effectiveness. Delaware and Pennsylvania tie PACE eligibility to enrollment in agricultural districts, which helps assemble contiguous blocks of agricultural land prior to permanent protection. In addition, the review and approval process for districts streamlines the easement application process. In Maryland and Michigan, farmland protection planning informs comprehensive plans and either increases, or is a prerequisite for, PACE funding. This ensures state investments in permanent protection align with local plans. Oregon ties eligibility for use value assessment to implementation of exclusive farm use (EFU) zoning. Searchable property listings for Maryland, New Jersey, and Connecticut’s Farm Link programs showcase PACE protected properties to help ensure that protected land stays in agricultural use.

Effective programs establish statewide goals and priorities to guide local actions and create systems to encourage coordination and consistency. For instance, PACE programs in Maryland, New Jersey, and Pennsylvania have established state ranking criteria. Local governments have some flexibility to assert their priorities within this framework but still are working toward state goals.

To achieve larger outcomes, the planning programs in Oregon and Washington require consistency between state goals and local plans; programs in California, Connecticut, Delaware, Maryland, Rhode Island, and Vermont encourage alignment, often making state funding contingent upon conformance.

What follows are additional observations based on our assessment of individual policies and programs. These may be useful to states as they consider ways to expand or strengthen their programs.

State Policy Responses to the Threat of Conversion



Policy Response Score
 ■ Highest 25%
 ■ [Medium-Dark Blue]
 ■ [Medium-Light Blue]
 ■ Lowest 25%
 Map 12. Policy Response Scores by quartile.

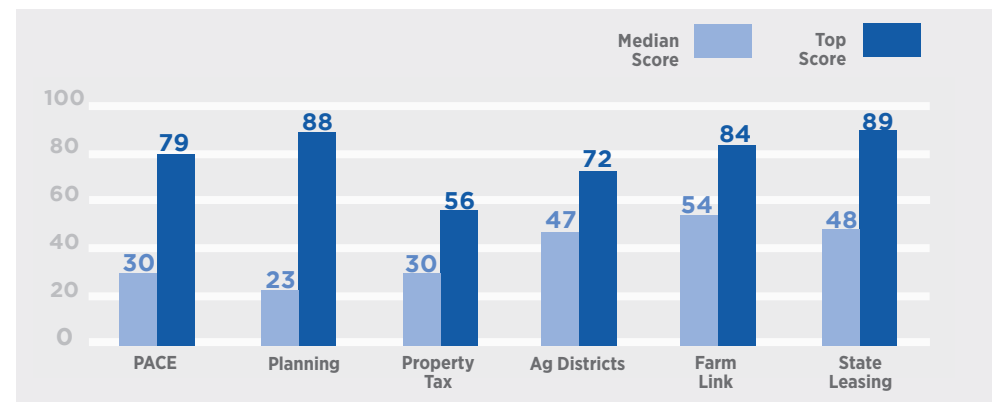


Figure 7. Median and top policy scores earned among all states implementing the policy.

AGRICULTURAL LAND PROTECTION SCORECARD

POLICIES & PROGRAMS	weight and points	NJ	DE	MD	PA	VT	CA	CT	RI	OR	WA	MA	HI	NY	VA	CO	NH	WI	UT	NC	ME	FL	OH	MI	MN	KY	SC	IA	TX	WV	TN	NV	NM	GA	ID	MT	SD	AL	AZ	NE	IL	AK	WY	MO	IN	KS	OK	LA	ND	MS	AR		
PACE	32.50%	79	79	66	65	76	33	46	46	12	25	50	29	32	30	49	40	26	28	27	37	31	38	30	0	31	23	0	25	30	0	0	17	12	0	9	0	6	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0
Land Use Planning	32.50%	47	53	62	47	50	51	50	58	88	79	34	52	20	27	34	32	32	29	18	28	47	13	21	28	19	23	23	15	15	27	26	19	19	33	18	24	16	22	21	13	15	20	11	22	17	13	12	8	9	10		
Property Tax Relief	15.80%	40	42	48	50	55	56	35	37	51	42	42	47	37	37	21	38	28	30	30	35	8	37	52	36	8	22	17	29	16	33	46	8	34	19	21	19	20	17	19	13	31	17	18	17	14	13	18	16	8	8		
Agricultural Districts	10.30%	63	72	0	57	0	68	0	0	0	0	18	0	63	55	0	0	49	45	38	0	0	45	0	57	36	0	31	0	0	20	0	0	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0		
Farm Link	6.10%	54	0	53	0	0	0	79	17	0	0	0	0	84	54	0	0	0	0	75	0	0	0	0	52	0	24	77	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State Leasing	2.80%	63	52	40	59	59	30	77	68	63	57	84	89	7	7	69	48	7	9	7	33	43	7	19	51	45	0	57	51	7	54	62	50	7	40	64	47	49	57	54	29	39	60	46	7	0	50	7	40	48	0		
Total Raw Score	MAX 600	345	298	269	279	240	238	287	227	214	203	228	217	242	209	174	159	142	141	194	134	128	139	122	224	139	92	205	120	68	133	133	142	72	91	111	90	91	96	94	96	86	97	83	45	31	76	37	64	65	18		
Weighted Policy Response Score	Max 100	59	58	53	52	51	44	44	43	42	42	38	36	34	33	32	31	28	28	28	28	28	27	25	25	22	20	20	19	17	17	17	17	16	15	14	12	12	12	11	11	11	11	10	10	8	8	7	6	6	5		
QUARTILE		1										2										3										4																					

Table 7.

The Agricultural Land Protection Scorecard

shows how all 50 states have—or have not—responded to the leading threats to agricultural land: development pressure, weakening agricultural viability, and the transfer of land to a new generation.

PURCHASE OF AGRICULTURAL CONSERVATION EASEMENTS

PACE programs are the only approach that saves a permanent supply of agricultural land for working farms and ranches. They also free up capital to improve viability and help facilitate the transfer of land to a new generation.⁸⁸ This voluntary, incentive-based approach was introduced as an alternative to restrictive land use regulations, but in Maryland, Pennsylvania, Washington, and Oregon, it bolsters local regulations, which could potentially change or weaken over time.⁸⁹ Some states buy and hold easements directly while others make grants to eligible entities, often land trusts.

Thirty states have authorized PACE, and 29 have funded easement acquisitions.⁹⁰ Only nine acquire an average of more than 10 easements per year, and only six have invested an average of more than \$1 per capita to date. Together, the five top performing states of Delaware, New Jersey, Vermont, Maryland, and Pennsylvania have permanently protected more than one million acres of farmland. New Jersey led in the average proportion of agricultural land protected, while Vermont stood out for protecting 3.3 acres for every acre converted. Delaware and Maryland both protected more than one acre of land for each acre converted.

High ranking states had the following characteristics:

- **Ag-focused, comprehensive authorization.** Statutes included clear purpose statements that prioritized protecting agricultural land for agriculture, identified a state entity to implement the program, and established a fund to buy easements. Among the top five, Maryland and New Jersey include authority to buy land in fee.
- **Consistent state investment.** States used dedicated funding such as a real estate transfer tax to generate steady funding. Delaware earned the top score for average funds spent per capita, spending an average of more than \$6 per person/year over 27 years. Notable funding sources include lottery proceeds in Colorado; a cigarette tax, municipal landfill fees, and unconventional gas well impact fees in

Pennsylvania; and a corporate business tax in New Jersey. California invests proceeds from the state's emissions trading system, because protecting farmland combats climate change by heading off conversion to more greenhouse-gas-intensive uses.

- **Capacity to do deals.** Programs closed a significant number of projects each year. Pennsylvania stood out for buying an average of 175 easements per year. This volume is likely due to consistent funding and program structure. Pennsylvania's Bureau of Farmland Preservation works in partnership with county Agricultural Preserve Boards to get deals done. Maryland and New Jersey, which buy an average of more than 70 easements per year, also have partnerships with county boards. The Vermont Housing and Conserva-

tion Board (VHCB) awards grants to land trusts leveraging their staff and expertise.

- **Effective easement stewardship programs.** Three of the top five programs conduct annual, on-site monitoring of conservation easements. In Delaware and New Jersey, state program staff conduct site visits. VHCB provides a per project payment to the primary easement holder to help fund the perpetual stewardship.

In addition, several states have added affirmative farming provisions. Massachusetts and Vermont use an Option to Purchase at Agricultural Value (OPAV), while New York authorizes pre-emptive purchase rights to maintain agricultural use and future affordability.

Delaware's Ag Lands Preservation Program



PHOTO: Dietrich Gehring

Delaware runs one of the most effective farmland protection programs in the country. Its Agricultural Lands Preservation Act, passed in 1991, protects and encourages the improvement of agricultural lands for the production of food and other agricultural products. Its Agricultural Lands (Aglands) Preservation Program combines PACE and Agricultural Districts to save farmland and support farm enterprises. Seven Department of Agriculture employees administer the program.

Participating landowners enroll in an Agricultural District by signing a voluntary 10-year agreement to commit their land to farming. The land must meet farm income requirements for the state's Farmland Assessment Act and achieve a minimum score using an automated Land Evaluation and Site Assessment (LESA) model. LESA predicts the farm's viability based on soil type, surrounding land use, zoning,

and other attributes. Once enrolled, landowners receive a package of benefits including tax incentives and notification requirements for adjacent landowners. After a year, they may sell an agricultural conservation easement to the Agricultural Lands Preservation Foundation. The process involves farm appraisals, landowner bid-downs from the appraised values, and finally selection. Once protected, Delaware Department of Agriculture staff monitor the easements to ensure compliance. As of 2019, the program had purchased 1,004 easements, protecting over 133,000 acres—25 percent of the state's farmland. At the same time, 400 farms totaling over 40,000 acres were enrolled in agricultural districts.

Purchase of Agricultural Conservation Easement Scoresheet

FACTORS	weight and points	DE	NJ	VT	MD	PA	MA	CO	RI	CT	NH	OH	ME	CA	NY	FL	KY	WV	MI	VA	HI	UT	NC	WI	TX	WA	SC	NM	GA	OR	MO	MT	AL	
Authority	15%	40	50	50	50	40	30	30	50	40	40	30	50	40	40	40	40	40	30	30	40	20	30	30	40	15	35	40	40	40	30	0	0	
Average Percentage of Ag Land Protected	20%	49	50	36	38	27	32	17	32	29	18	9	9	6	11	8	6	6	6	7	6	9	5	4	2	5	10	3	0	0	0	4	4	
Average Number of Easements Acquired	20%	22	33	19	32	50	18	17	7	12	7	18	5	11	14	6	11	5	10	10	4	6	8	6	3	9	8	3	0	0	0	5	5	
Average Funds Spent Per Capita	20%	50	39	41	37	33	19	28	20	19	13	10	12	7	13	9	8	7	8	7	16	9	5	7	2	10	11	5	0	0	0	9	4	
Provisions Promoting Agricultural Use and Ownership	5%	25	0	25	0	0	50	0	0	0	0	25	0	0	25	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency of On-site Monitoring	10%	50	50	50	9	25	20	50	17	25	50	50	50	50	0	34	25	50	50	50	25	50	50	50	50	50	0	0	0	0	0	0	0	0
Acres Protected to Acres Converted	10%	31	24	50	32	22	24	28	22	25	16	7	10	5	9	2	7	4	5	5	6	11	4	3	1	3	5	4	0	0	0	7	3	
Total Raw Score	MAX 350	267	246	271	198	197	193	170	148	150	144	149	136	119	112	124	122	112	109	109	97	105	102	100	98	92	69	55	40	40	30	25	16	
Total Weighted Score	MAX 50	40	39	38	33	33	25	25	23	23	20	19	19	16	16	15	15	15	15	15	14	14	14	13	13	12	12	9	6	6	5	4	3	
FINAL SCORE	MAX 100	79	79	76	66	65	50	49	46	46	40	38	37	33	32	31	31	30	30	30	29	28	27	26	25	23	17	12	12	9	9	6		

How We Scored It

Authority

Awarded 10 pts for: state authorization; named state entity to implement; stated purpose to save land for agriculture; acquisition fund & authority to buy land in fee.

Average Percentage of Ag Land Protected

Calculated average proportion of "land in farms" protected through 2017, created 50 brackets for the resulting values and assigned points.

Average Number of Easements Acquired

Calculated average number of easements acquired through 2017, created 50 brackets for the resulting values and assigned points.

Average Funds Spent Per Capita

Divided average spending through 2017 by state's population, created 50 brackets for the resulting values and assigned points.

Provisions Promoting Agricultural Use and Ownership

Awarded 25 pts for: option to purchase at agricultural value OR preemptive purchase right & provisions requiring eased land to be kept in ag use.

Frequency of On-site Easement Monitoring

Averaged the number of on-site inspections over 10 years, developed 50 brackets for the resulting values and assigned points.

Acres Protected per Acre Converted

Compared acres protected through 2012 to ag land converted between 1982 and 2012, created 50 brackets for the resulting values and assigned points.

Table 8. Purchase of Agricultural Conservation Easement Scoresheet

Sources: American Farmland Trust annual PACE surveys; USDA National Agricultural Statistics Service, 2017 Census of Agriculture; U.S. Census Bureau, 2017 National and State Population Estimates (2018), and the USDA Natural Resources Conservation Service, 2012 National Resources Inventory.

LAND USE PLANNING

Strong state planning programs are the best way to manage and contain development,⁹¹ and the most cost-effective approach to protecting strategic agricultural resources. States with low land use planning scores converted five times as much land per new resident between 2001 and 2016 as states with high planning scores.

All 50 states have enabling laws that delegate some responsibility for planning and zoning to local governments. But only 12 have land use goals related to farmland protection or compact growth and just two require consistency with state goals and mandate local land use regulations to protect agricultural resources. The best programs are found in Oregon and Washington, but Maryland, Delaware, Rhode Island, Hawaii, California, Connecticut, Vermont, and Pennsylvania have asserted a state role (see below). Several states, including Florida, Georgia, Indiana, New Hampshire, New Mexico, Oregon, Pennsylvania, Vermont, Washington, and Wisconsin, provide technical assistance and grant funds to support local planning efforts.

Planning programs that effectively addressed agricultural land conversion had the following features:

- **Goals to protect agricultural land and to promote compact growth.** Small states, like Hawaii, Delaware, and Rhode Island, included goals in state comprehensive or land development plans. Maryland, Oregon, Vermont, and Washington articulate goals in state law or administrative rules.

- **Requirements to develop comprehensive plans.** Strong programs require local governments to develop comprehensive plans. Oregon is the best example (see box). Other states encourage planning, by requiring creation of a comprehensive plan in order to form local planning bodies and/or adopt zoning.

- **Consistency between state goals and local plans.** Oregon and Washington require consistency and have strong mechanisms to ensure alignment. Both states can impose penalties, including the suspension of local revenue sources, on communities that don't conform. Other states offer incentives to encourage conformance. Maryland reinforces state development goals through investments in the state's Priority Funding Areas (PFAs). In Rhode Island, approved plans are binding on state agencies, so state projects must be consistent with local comprehensive plans.

- **Requirements to adopt local policies to protect farmland.** Oregon requires all cities and counties to adopt Exclusive Farm Use (EFU) zoning and land division ordinances to protect agricultural resources. This EFU zoning limits non-farm

development that conflicts with agricultural practices and prohibits subdivision into parcels too small for commercial farming. All 36 of Oregon's counties have implemented EFU zoning.

Some states engage in farmland protection planning. Maryland certifies local farmland protection programs, which allows counties to retain a greater share of tax revenue. Certified counties must use land use tools to protect farmland, set goals, and establish priority preservation areas in their comprehensive plans. Michigan, Minnesota, New Jersey, New York, and Wisconsin also employ farmland protection planning and tie to other farmland protection approaches.

Oregon's Land Use Planning Program



PHOTO: Oregon Department of Land Conservation and Development

Oregon's legislature passed the Land Conservation and Development Act in 1973, creating a statewide framework for land use planning. The act requires cities, counties, and state agencies to adopt comprehensive plans that are consistent with 19 state goals. Planning Goal 3 calls for the protection of agricultural lands.

As part of the planning process, counties must identify and inventory agricultural land and adopt policies to preserve it. Specifically, communities must enact exclusive farm use zoning (EFU) to limit non-farm uses and establish large minimum parcel sizes. Land that is farmed in an EFU zone is eligible for lower property taxes and offered protection from nuisance complaints. Oregon also requires cities, counties, and regional governments to establish urban growth boundaries—perimeters around developed areas that can accommodate growth for the next 20 years—that contain development and save agricultural land from development.

State oversight and effective penalties help make Oregon's program effective. When a community adopts a comprehensive plan, it submits a package that includes implementation tools and ordinances to Oregon's Department of Land Conservation and Development (DLCD) for review. Then it goes to the Land Conservation and Development Commission (LCDC) for approval. The LCDC determines whether the plan is consistent with state goals. Compliance is ensured through various mechanisms, including the state's ability to suspend local tax revenue and to assume jurisdiction over land use controls. All of Oregon's 36 counties and 242 cities have adopted comprehensive plans and all counties have implemented EFU zoning, retaining more than 16 million acres in agriculture. State officials also report that the program has helped control land speculation and head off conflicting land uses.

Land Use Planning Scoresheet

FACTORS	weight and points	States																																																									
		OR	WA	MD	RI	DE	HI	CA	CT	VT	PA	FL	NJ	MA	CO	ID	NH	WI	UT	ME	MN	TN	VA	NV	SD	IA	SC	AZ	IN	MI	NE	NY	WY	GA	KY	NM	NC	MT	KS	AL	AK	WV	TX	OK	IL	OH	LA	MO	AR	MS	ND								
Authority	15%	50	50	50	50	50	50	50	50	38	25	38	50	25	13	13	50	13	13	25	13	38	13	13	13	38	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13			
State Plan for Agriculture	5%	0	0	50	50	0	38	25	25	50	0	0	50	50	25	0	0	0	0	0	0	0	0	0	13	0	0	0	0	38	38	0	0	0	0	0	38	0	25	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Support for Comprehensive Planning	5%	50	50	25	25	25	25	25	25	50	50	50	25	25	25	0	50	50	25	25	25	25	0	25	0	0	0	0	50	0	0	0	0	50	0	50	0	25	0	0	25	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0		
Farmland Protection Planning	5%	0	0	38	0	0	0	0	0	0	0	50	0	0	0	0	50	0	0	38	0	0	0	0	0	0	0	0	0	25	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Comprehensive Planning Requirement	15%	50	35	50	50	50	50	50	13	13	13	50	13	35	50	50	13	13	50	13	35	13	50	25	50	0	13	13	0	13	13	13	50	0	13	13	13	13	0	13	25	13	13	13	0	13	13	0	0	0	0	0	13						
Consistency with State Goals Requirement	20%	50	38	25	25	25	0	0	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Requirement to Protect Ag Resources	25%	50	50	5	5	5	15	15	15	15	50	15	15	0	5	15	0	15	0	15	0	5	0	5	0	15	15	15	5	5	15	5	0	5	5	0	0	5	15	0	0	15	0	0	5	0	0	0	0	0	0	0	0	0	0	0			
Acres of Ag Land Developed Per New Person	10%	39	41	40	42	38	42	41	42	35	28	40	40	42	37	33	42	33	37	35	35	34	40	41	25	20	38	37	33	26	31	39	7	41	27	30	39	26	29	32	N/A	1	37	27	33	25	22	34	33	28	1								
Total Raw Score	MAX 400	289	264	283	247	193	220	206	195	225	166	193	243	177	155	111	155	173	125	113	145	114	103	121	88	73	78	77	138	119	71	94	70	109	95	105	89	81	57	82	63	41	62	52	51	50	47	47	46	41	26								
Total Weighted Score	MAX 50	44	39	31	29	26	26	25	25	25	23	23	23	17	17	16	16	14	14	14	13	13	13	12	11	11	11	11	11	11	10	10	10	10	9	9	9	9	8	7	8	7	6	6	6	6	5	5	5	5	4								
FINAL SCORE	MAX 100	88	79	62	58	53	52	51	50	50	47	47	47	34	34	33	32	32	29	28	28	27	27	26	24	23	23	22	22	21	21	20	20	19	19	19	18	18	17	16	15	15	15	13	13	13	12	11	10	9	8								

How We Scored It

- Authority**
Awarded 12.5 pts for: state authorization; state planning entity; state goal to protect ag land & state goal to encourage compact growth.
- State Plan for Agriculture**
Awarded 12.5 pts for: efforts led by or involving state entities; clear goals to protect farmland; references to farmland protection & references to ag viability.
- Support for Comprehensive Planning**
Awarded 25 pts for: grants for comprehensive planning & provision of technical assistance for local planning.
- Farmland Protection Planning**
Awarded 12.5 pts for: link to other farmland protection programs; integration with local planning; grants to prepare plans & technical assistance to support plan development.
- Comprehensive Planning Requirement**
Awarded 50 pts for state requirements; 25 pts if applicable to certain communities; & 10 pts for encouragements: tying ability to form planning bodies and/or ability to adopt zoning to plan development.
- Consistency with State Goals Requirement**
Awarded 50 pts for consistency requirement & 25 pts for states with incentives to encourage consistency.
- Requirement to Protect Agricultural Resources**
Awarded 50 pts for mandate to protect & only 12.5 pts for requirement that communities merely address ag resources in local plans.
- Acres of Ag Land Developed Per New Person**
Calculated acres developed per new person added to the state's population between 1982 and 2012; developed 50 brackets for the resulting values and assigned points.

Table 9. Land Use Planning Scoresheet
Sources: USDA Natural Resources Conservation Service, 2012 National Resources Inventory and population estimates from the U.S. Census Bureau.

PROPERTY TAX RELIEF FOR AGRICULTURAL LAND

All 50 states provide property tax relief for agricultural land. These programs help protect farmland by offsetting the increase in land values and property taxes that result from non-farm competition for land. Forty-nine states offer use-value assessment (aka current use or differential assessment programs), while Michigan provides an income tax credit. Iowa, Michigan, and New York offer supplemental programs to further reduce agricultural landowners' property tax burden. However, only a few programs incorporate provisions to protect agricultural land.

High-ranking states had the following features:

- **Criteria to ensure that enrolled land is in active agricultural use.** Thirteen states include minimum income requirements and require independent verification of active agricultural use. Oregon disqualifies landowners if land is removed from an EFU zone.
- **Penalties for a change in use.** Twenty-nine states assess withdrawal penalties. Most collect roll back taxes. Others require landowners to pay a conversion tax. Delaware, Maryland, Michigan, and Pennsylvania dedicate a portion of penalties to farmland protection; in New Hampshire, towns may do so if they choose.

- **Provisions to protect and conserve farmland.** Six states include provisions to protect farmland. California, Michigan, and Hawaii⁹² require landowners to restrict the use of their land for a specified term; 20 million acres have been stabilized by these agreements. Massachusetts is the only state to incorporate a right of first refusal. Three states require conservation adoption or compliance. Vermont's Agency of Agriculture, for example, can direct the Department of Taxes to remove farmland and farm buildings if the operation violates state water quality requirements.

- **High enrollment and state tracking of acres enrolled.** Most of the top five states track enrolled acres and reported acreages, which represent at least 30 percent of their agricultural land, up to 65 percent in California and more than 90 percent in Oregon.

The Michigan Farmland and Open Space Preservation Program



PHOTO: Ellie Johnson, courtesy of Grand Traverse Regional Land Conservancy

The Farmland and Open Space Preservation Program (Public Act 116) was established in 1975 to preserve farmland through tax incentives and special assessment exemptions for farmers who agree to keep their land in agricultural production. It is a partnership between landowners, the Michigan Department of Agriculture and Rural Development (MDARD), and the Department of Treasury. Landowners sign up voluntarily, agreeing to preserve their land for agricultural use for a minimum of 10 years. In exchange, they receive an income tax credit equal to the amount of property taxes on the land and improvements covered by the agreement, minus 3.5% of their total household income, as well as exemptions from special assessments such as sewer, water, or non-farm drainage projects.

Interested landowners file an application with their local governing body. At the end of a contract, they can extend it for a minimum of seven years or allow it to expire. If it expires, they must repay tax credits. In 2017, Michigan farmers received \$53 million dollars in tax credits and 40,000 new acres were enrolled in the program. As of June 2018, the program had helped stabilize 3.3 million acres of farmland.

AGRICULTURAL DISTRICT PROGRAMS

Agricultural district programs bundle benefits and protections to save land and support farm viability. Sixteen states have authorized districts, including Massachusetts, which never implemented its program. A few states include restrictive agreements to protect agricultural land and/or link to other policies like property tax relief or PACE. The top programs are in Delaware, California, New Jersey, and New York. Enrolled acres expressed as a percentage of land in farms is significant, ranging from about 30 percent in Delaware to more than 90 percent in New York.

The most important provisions are:

- **Restrictions on non-farm development.** The most direct way to protect enrolled land is to use restrictive covenants for a specified time period. California, Delaware, Minnesota, New Jersey, and Wisconsin use this approach. In Delaware, participants enter into an Agricultural Preservation District Agreement which prohibits rezoning or major subdivision, limits activities to agricultural and related uses, and restricts acreage used for housing. California includes 10-year Williamson Act or 20-year Farmland Security Zone (FSZ) contracts. Other programs include withdrawal penalties to discourage changes in use.
- **Protection from public conversion.** New Jersey and New York limit siting of public facilities, and New York limits public investment that could spur future development. California's Farmland Security Zones offer protection from the siting of public schools. Ten states require administrative review of eminent domain actions, and New Jersey, Pennsylvania, Utah, and Virginia empower authorities to prevent takings of enrolled land through eminent

domain. New Jersey landowners enrolled in municipally approved programs receive the most powerful protection from eminent domain as public actions are prohibited unless deemed necessary by the governor. California, Kentucky, and Minnesota prohibit annexation, which can head off increases in property taxes and land use conflicts that often lead farmers to sell land for development.

- **Links to local planning.** Except for Iowa and North Carolina, every program has a link to local planning. The most effective approach is to require notification to local planning bodies about district formation and to grant them the authority to review and approve the district. These provisions ensure alignment with, and reinforcement of, goals articulated in comprehensive plans.

- **Tax Incentives.** Tax incentives help increase profitability and reduce the financial pressure to sell land for development. Delaware offers the best package. Enrolled land is *exempt* from local property taxes, special assessments, and real estate transfer taxes. It also incentivizes transfer of agricultural land. Prospective buyers can use a con-

tingent sale application to enroll land they plan to buy in a Preservation District. If the application is approved prior to settlement, both buyer and seller are exempt from realty transfer tax on unimproved land. In California, land under Williamson Act or FSZ contracts enjoy property tax assessments based upon farming and open space use as opposed to full market value.

- **Provisions to improve the business climate for agriculture.** Eleven states offer protections from nuisance suits or unreasonable local regulations. New York's protections are among the most robust. Its districts laws authorize the Commissioner of Agriculture for the Department of Agriculture and Markets to issue opinions about the soundness of specific agricultural practices. If a practice is sound, it cannot be considered a nuisance. The Department of Agriculture and Markets also reviews existing and proposed local laws to determine if they are farm friendly. In cases where a local law is determined to be unreasonable, staff work with local governments to negotiate changes.



PHOTO: USDA photo by Preston Keres

Agricultural Districts Scoresheet																		
FACTORS	weight and points	DE	CA	NJ	NY	MN	PA	VA	WI	OH	UT	IL	NC	KY	IA	TN	MA	
Authority	15%	50	50	50	50	50	50	38	38	25	25	50	38	50	38	38	25	
Restrictions on Non-Farm Development	15%	50	50	50	17	33	17	17	50	33	17	17	33	0	17	0	17	
Protection from Public Conversion	15%	0	38	38	25	38	25	38	0	25	25	0	13	25	0	13	0	
Coordination with Local Planning	10%	50	50	50	25	50	50	50	50	25	50	50	0	25	0	25	50	
Permanent Protection Enabled	5%	17	0	17	0	0	33	0	17	0	0	0	0	17	0	0	33	
Tax Incentives	15%	50	33	0	17	17	0	33	33	33	0	17	17	17	17	0	33	
Improved Climate for Agriculture	15%	33	0	17	50	17	33	17	0	17	50	17	17	0	33	0	0	
Acres Enrolled	10%	26	34	25	50	6	33	14	5	2	0	3	14	9	0	0	0	
Total Raw Score	MAX 400	276	255	246	233	210	241	206	193	160	167	153	131	142	104	75	158	
Total Weighted Score	MAX 50	36	34	31	31	29	29	28	24	23	23	20	19	18	16	10	9	
FINAL SCORE	MAX 100	72	68	63	63	57	57	55	49	45	45	41	38	36	31	20	18	

How We Scored It

<p>Authority Awarded 12.5 pts for: authorization; identification of a state entity to administer; purpose statement that asserts the importance of ag land; & siting criteria to prevent formation of districts in developed areas.</p>	<p>Restrictions on Non-farm Development Awarded 16.67 pts for: restrictive covenants; recording requirements & withdrawal penalties.</p>	<p>Protection from Public Conversion Awarded 12.5 pts for: prohibition on taking land by eminent domain; establishing review process for proposed takings; protection from public facilities; & prohibition on annexation.</p>	<p>Coordination with Local Planning Awarded 25 pts for: notification to local planning entities & requiring review and approval by local planning entities.</p>	<p>Permanent Protection Enabled Awarded 16.67 pts for: tying enrollment to PACE program eligibility; considering district enrollment in PACE ranking criteria; & incorporating a right of first refusal.</p>	<p>Tax Incentives Awarded 16.67 pts for: exemption from special assessments; property tax relief; & other tax incentives.</p>	<p>Improved Climate for Agriculture Awarded 16.67pts for: protection from nuisance suits; neighbor notification; & protection from unreasonable local regulations.</p>	<p>Acres Enrolled Calculated acres enrolled as a percentage of "land in farms," created 50 brackets for resulting values and assigned points. Assigned 0 points to states that did not track enrollment. Massachusetts had no acres enrolled</p>
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Table 11. Agricultural Districts Scoresheet
 Sources: USDA National Agricultural Statistics Service, 2017 Census of Agriculture and the most current state reports or estimates of acres enrolled.
 Note: Massachusetts Total Weighted Score was reduced by 50% because the program has not been implemented.

FARM LINK PROGRAMS

Eleven states implement and/or invest significant public dollars in Farm Link programs to help transfer land to a new generation of farmers and ranchers. This is in addition to the 30 or more programs operated by NGOs. Eight are implemented by state entities, including Cooperative Extension System (CES) and Councils of Governments (COGs), operate statewide, and receive state funding. Three have explicit state authority, which can help ensure more consistent funding, and four provide direct technical assistance to support land access transactions. Two programs reported the equivalent of full-time staffing while six reported less than a quarter time equivalent. Only New York tracked successful matches while others tallied connections made among seekers and landowners, reporting an average of between six and 50 referrals a year. The most robust programs were found in New York, Connecticut, Iowa, and North Carolina.

We assessed Farm Link programs based on the following factors:

- Staff capacity.** The top programs had more staff capacity, provided by the entity implementing the program and/or by leveraging partners and contractors. AFT administers New York's program with nearly two full-time equivalents and assistance from a network of partner organizations who receive state-funded micro-grants to support their work. North Carolina's program is managed by 1.5 full-time Extension employees. Connecticut's program is a partnership between the Department of Agriculture and Connecticut Farmland Trust with additional support from consultants that amounts to a half-time position.

- Technical assistance related to land access transactions.** New York's program provides formal intakes, guides land seekers on the website and offers help negotiating leases and purchasing land. Connecticut provides site assessments along with help developing lease arrangements, assistance crafting purchase and sale agreements, and advice on bringing land back into production or protecting it with an agricultural easement. Iowa and North Carolina also provide one-on-one assistance including lease preparation and support with purchases and sales.

- Tools and resources.** The strongest programs have websites with resources including sample leases and farm transfer materials, event calendars, and searchable databases for land postings. A few allow farm seekers to limit their search to protected farmland, which tends to be more affordable. Virginia's program provides workshops and trainings through a contract with Virginia Tech Extension. It also has experimented with a certified farm seeker program. This helps farm seekers demonstrate their abilities to agricultural landowners and guides them through a whole farm planning module to identify their goals and help develop a farm business plan.

Farm Link Scoresheet													
FACTORS	weight and points	NY	CT	IA	NC	VA	NJ	MD	MN	NM	SC	RI	
Authority	15%	10	50	50	0	50	0	0	0	0	0	0	
Staff Capacity	15%	50	28	28	49	14	20	13	25	9	9	14	
Technical Assistance	30%	50	50	50	50	17	33	33	33	42	17	8	
Tools and Resources	20%	45	35	35	50	40	50	50	20	45	10	5	
Number of Land Postings	10%	50	30	18	32	15	39	45	34	13	15	12	
Average Number of Referrals Per Year	10%	38	30	30	20	29	0	0	50	6	20	16	
Total Raw Score	MAX 300	243	223	211	201	165	142	141	162	115	71	55	
Total Weighted Score	MAX 50	42	40	39	38	27	27	26	26	25	12	8	
FINAL SCORE	MAX 100	84	79	77	75	54	54	53	52	50	24	17	

How We Scored It

Authority

Awarded 20 pts for authorization and 15 pts for: identification of a state entity to administer & purpose statement that asserts the importance of ag land for agriculture.

Staff Capacity

Calculated average number of hours spent per week, created 50 brackets for the resulting values and assigned points.

Technical Assistance

Awarded 16.67 pts for: intake screening and referrals; facilitation of land access transactions & provision of complementary services.

Tools and Resources

Awarded 10 pts for: website; available list of land opportunities; searchable and current listing database; workshops and events; & original educational materials

Number of Land Postings

Recorded the number of land postings as of Fall 2019, created 50 brackets for the values and assigned points.

Average Number of Referrals Per Year

Averaged the number of referrals per year, created 50 brackets for the resulting values and assigned points.

Table 12. Farm Link Scoresheet

Sources: Program websites and estimates from program staff.

STATE LEASING PROGRAMS

Leasing programs have great potential to make land available to a new generation of producers. Forty-seven states have a law that can or does allow leasing of state-owned land for agriculture. Arkansas, Kansas, and South Carolina authorize leasing for non-agricultural purposes. Thirty-eight have programs that include standard application procedures, lease terms, and enrolled acres. However, only five preferentially direct state-owned land for agriculture. In nine others, state natural resource agencies allow land managed as wildlife habitat to be used for agriculture, with restrictions on agricultural activity. In 17 more, predominantly in the western and southern United States, state departments of natural resources or land offices make state trust lands available for agriculture (see box). All told, the 38 programs made more than 34 million acres available for agriculture in 2019. The best programs were found in Hawaii, Massachusetts, and Connecticut. Hawaii's Agricultural Parks Program leases public land to small, diversified farmers to improve the viability of local agriculture. To ensure the land is stewarded properly for long-term production, farmer lessees must either be established farmers or qualified beginners who hold a degree in agriculture or aquaculture.

Effective leasing programs provide the following:

- **Agriculture-friendly authorization.** Statutes included clear purpose statements primarily dedicated to making state-owned land available for agriculture (versus wildlife habitat or revenue generation) and identified a state entity with some familiarity with agriculture to help implement the program.
- **Agriculture-friendly lease terms.** States authorize long-term leases, enable farmers to renew them, do not require public access, and do not limit agricultural practices.
- **Inventory and assessment of available state-owned land.** State policies call for an inventory of state-owned land to determine suitability for agriculture. Connecticut, Hawaii, and New Jersey outline this role in statute; Massachusetts describes it in an Executive Order. Several trust land states, including Colorado, are directed to assess suitability for grazing.
- **Regular and transparent application process.** States offer regular application cycles, have an easily accessible and transparent process for applying to lease land, and conduct outreach to the agricultural community to make them aware of available opportunities.



State trust lands were gifted to Western states by the U.S. Congress upon entering the Union. Trust lands are intended to support essential public institutions, primarily public schools as well as agricultural colleges. State trust land offices sometimes sell and lease these lands for a variety of purposes, including agriculture, to generate revenue for designated purposes. More than 30 million acres of state trust land were used for agriculture in 2019.

State Leasing Scoresheet

FACTORS	weight and points	HI	MA	CT	CO	RI	MT	NJ	OR	NV	WY	VT	PA	IA	WA	AZ	TN	NE	DE	TX	MN	OK	NM	AL	NH	MS	SD	MO	KY	FL	MD	ND	ID	AK	ME	CA	IL	MI	UT	GA	IN	LA	NY	NC	OH	VA	WV	WI		
Authority	15%	50	50	50	33	46	38	38	25	29	25	33	33	33	38	33	33	25	33	25	33	25	29	33	33	29	25	17	25	25	33	25	25	38	17	25	33	33	17	17	17	17	17	17	17	17	17	17	17	
Assesment	25%	50	50	50	13	33	17	50	21	13	17	17	33	8	8	0	8	4	8	8	33	8	8	21	25	21	17	25	8	8	8	8	0	8	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Application Process	25%	42	38	25	42	29	25	13	33	42	29	33	12	50	29	33	33	33	29	25	17	38	25	12	8	25	33	21	29	29	17	33	29	8	12	12	25	8	8	0	0	0	0	0	0	0	0	0	0	
Lease Terms	25%	50	44	44	50	34	50	38	44	47	44	44	50	31	41	41	41	44	38	47	31	28	31	41	38	28	19	34	38	28	28	19	19	25	25	31	13	6	0	0	0	0	0	0	0	0	0	0	0	
Acres Leased as Proportion of All Rented Agricultural Land	10%	15	16	15	36	27	37	9	32	12	39	13	7	12	34	50	14	27	21	18	0	26	43	8	14	10	25	5	0	15	19	10	41	35	13	4	0	11	0	0	0	0	0	0	0	0	0	0		
Total Raw Score	MAX 250	207	197	184	174	170	166	147	155	142	154	140	136	135	150	157	130	133	129	123	115	125	137	115	118	113	119	102	100	106	105	95	114	114	80	73	71	59	25	17	17	17	17	17	17	17	17			
Total Weighted Score	MAX 50	44	42	39	35	34	32	32	31	31	30	30	30	29	29	28	27	27	26	26	25	25	25	24	24	24	23	23	23	22	20	20	20	20	16	15	14	10	5	3	3	3	3	3	3	3	3	3		
FINAL SCORE	MAX 100	89	84	77	69	68	64	63	63	62	60	59	59	57	57	57	54	54	52	51	51	50	50	49	48	48	47	46	45	43	40	40	40	39	33	30	29	19	9	7	7	7	7	7	7	7	7	7		

How We Scored It

Authority
Awarded 16.67 pts for: state authorization; role designated for ag entity; & purpose statement that asserts the importance of leasing land for agriculture.

Assessment of Suitable Agricultural Land
Awarded 16.67 pts for: efforts to inventory and assess land suitable for ag; interagency cooperation; & clear role for ag entities.

Application Process
Awarded 16.67 pts for: requirements that applicants be bona fide farmers; accessible program materials & dependable and transparent application cycle.

Lease Terms
Awarded 12.5 points for: ability to renew leases; ability to limit public access; no significant limitations on ag production; & encouragement to manage in accordance with conservation plan.

Acres Leased as Proportion of All Rented Agricultural Land
Divided acres leased by the total acres of rented ag land in state. We created 50 brackets for the resulting values and assigned points.

Table 13. State Leasing Scoresheet
Sources: USDA National Agricultural Statistics Service, 2017 Census of Agriculture and the most current state reports or estimates of acres leased.

Promising Approaches

Beyond the policies we examined for the policy scorecard, we found several programs that as yet have not been widely adopted.

Farmland mitigation is an appealing approach because it ties protection to development activity. Programs require protection of an equal or greater amount of comparable land to offset the impact of development. Protection can be accomplished by fee purchase, purchase of an agricultural conservation easement, or the dedication of funds to a qualified farmland protection entity. Massachusetts and Vermont have the most significant statewide policies.⁹³ In both states, staff review the impact of proposed projects. In cases when there is no feasible alternative to developing important agricultural land, the state has received funds for the state PACE program. In California, mitigation programs are more widespread. More than a dozen local governments require mitigation, and, more recently,

the state's High Speed Rail Authority and Department of Conservation established an Agricultural Land Mitigation Program to provide grants to acquire agricultural easements in the counties surrounding railway corridors.

Four states (Massachusetts, Vermont, Maine and Minnesota) offer Farm Viability programs with teams of experts to help farmers develop business plans to improve their operations. Vermont also supports farm transfer planning. Most provide grants to implement the plans. The approach began in Massachusetts, where the program has a direct link to farmland protection and grants for the Massachusetts Farm Viability Enhancement Program (FVEP) are conditioned upon the execution of term easements.

Three Mid-Atlantic states have used the framework of PACE to create opportunities for beginning farmers to gain access to land. Delaware created a Young Farmer Loan Program to provide zero-interest loans in

exchange for an easement on the land to be purchased. Maryland's Next Generation Farmland Acquisition Program (see box) is an easement option purchase program designed to facilitate transferring farmland to a new generation of farmers. Pennsylvania just adopted an exemption from the state's realty transfer tax if a protected farm is conveyed to a beginning farmer. These types of programs could be emulated by other states with PACE programs

Lastly, Beginning Farmer Tax Credit programs in Iowa, Nebraska, Minnesota, Kentucky, and Pennsylvania offer agricultural asset owners state income tax credits to help beginning farmers gain access to land. Minnesota and Pennsylvania offer credits for the sale or rental of agricultural assets, while Iowa and Nebraska (see box) limit the credit to lease arrangements, and Kentucky incentivizes sales to beginning farmers.

Maryland's Next Gen Farmland Acquisition Program

Maryland's Next Generation Farmland Acquisition Program (Next Gen) is an easement option purchase program designed to facilitate transferring farmland to a new generation of farmers. A competitive program, it gives preference to young and beginner farmers with some farm experience. Selected applicants receive down payment funds to meet the equity requirements of commercial lenders so they can buy land.

Next Gen is administered by MARBIDCO, a state economic development authority. MARBIDCO pays qualified farm seekers up to 51 percent of fair market value of the farmland—up to \$500,000. Farmers have several years to sell an easement to a county or state program. Once the easement is in place, they repay MARBIDCO the original Program Option Purchase amount, plus a three percent administrative fee. If they cannot sell an easement within the timeframe, the option is exercised, and the easement assigned to a county program or a private land trust.

The program grew out of recommendations from Maryland's 2006 Statewide Plan for Agricultural Policy and Resource Management, which AFT coordinated. It was enacted in 2008 when the General Assembly authorized funds from the state's agricultural land transfer tax. Due to the subsequent downturn in the real estate market, funds were not allocated until 2018.

In its first year, Next Gen Program funded \$2.2 million for easement option purchases to six beginning farmers. Maryland's state budget includes \$2.5 million for the program in 2020.



PHOTO: USDA photo by Lance Cheung



Call to Action

CALL TO ACTION

PHOTO: Food Solutions News/England



Call to Action

The United States is home to 10 percent of the planet’s arable soils—the most of any country on Earth.⁹⁵ Yet even here, in what appears to be a vast agricultural landscape, only 18 percent of the continental U.S. is Nationally Significant farmland best suited for sustainable food and crop production.

High quality farmland is a scarce and irreplaceable resource.

American farmland is threatened by competition for land, which increasingly takes place in a global context. It is also threatened by consolidation and weakening farm viability, which make it hard for most producers to earn a living on the land. And it is threatened by obstacles in transferring land from senior landowners to a new generation of farmers and ranchers.

Increasing global and domestic demands on food production are colliding with the environmental impacts of eroding soils, declining aquifers, and extreme weather events. Beyond needing farmers and ranchers to grow food and provide for other human needs, we also need them to employ sound farming practices to provide essential environmental services—from clean drinking water and wildlife habitat to carbon sequestration to cool the planet.

Especially in tandem with smart growth strategies, protecting agricultural land and adopting regenerative practices are powerful solutions to climate change. With the world population projected to reach 10 billion by 2050, and climate change posing an existential threat, we must act now to secure the agricultural land base for future generations.

“The challenge of preserving enough farmland for food production will be a defining challenge for the 21st century.”

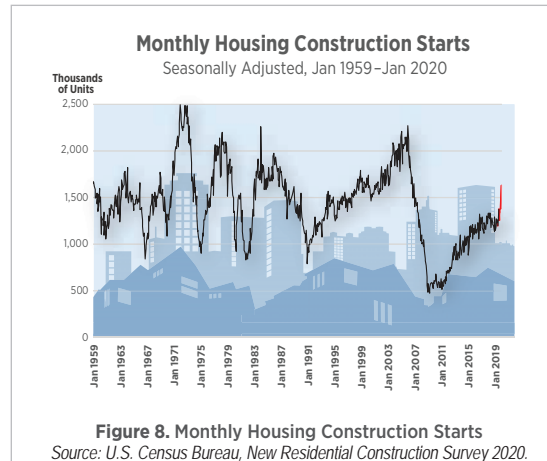
– John Ikerd⁹⁴

What the States Can Do

Since conversion is driven by several interrelated factors, states need to use multiple policy approaches to protect their vital agricultural resources. Choices will depend on the nature and extent of the threat, its underlying causes, each state's policy framework, and public support. What follows is a list of five high-level actions states can take to secure their agricultural land base.

As we learned from our policy research, people act when changes to their landscape are visible. In this century, many land use changes have been hard to see. Yet states still converted 11 million acres of agricultural land from 2001-2016—slightly more than all the land used to grow all fruits, nuts, and vegetables in the United States.⁸⁰

While development trends always have peaks and valleys, and real estate bubbles always burst, the force and extent of the last decade's decline was an anomaly—far below the rates from recessions dating back to the 1960s (see Figure 8). The subprime mortgage crisis that began in 2006, and the Great Recession that followed, had a chilling effect on all new development, not just housing starts. This makes the 11-million-acre figure all the more alarming.



Since hitting an all-time low in 2009, new construction has risen steadily—up nearly eight percent to \$1.3 trillion per year since 2016. Spending on new residential construction increased 10 percent to over \$520 billion.⁹⁶ Given this trajectory, it is urgent that states—especially states with high rates of conversion—step up efforts to save their farmland and ranchland.

By the turn of this century, every state had responded to sprawling development with property tax relief and land use policies to offset pressure on agricultural land. Some went further with programs to permanently protect farmland, address agricultural viability, and facilitate land transfer. Yet while great progress has been made, these efforts have neither been bold nor comprehensive enough to secure an adequate agricultural land base for future generations (see Figure 9).

Since there are several drivers of agricultural land conversion, and there is no silver bullet, states need to use multiple policy approaches. Choices will depend on the nature and extent of the threat, its underlying cause, the state's policy framework, and ultimately public support.

Of most concern are the high-threat states that had a low or extremely low policy response. Led by Texas, most were in the Southeast, but Indiana and West Virginia also fell into this category. These states especially need immediate policy action. Other states with low statewide development pressure had an understandably low response. Yet even those states have hotspots of conversion that likely will continue to expand without state policy action.

States with a high threat and a reciprocally high policy response have worked for decades to address farmland loss. But even in cases of relatively wide policy adoption, few have gone far enough. This likely is because they mostly have relied on policies that provide tax and other economic incentives rather than strong land use regulations. Further, new policy approaches are needed to respond to LDR conversion. Unlike UHD, LDR is not strongly driven by population growth, thus likely due to weak land use regulations. While many states recognized and addressed urbanization, the time has come to create policies to deal with LDR and fragmentation.

As the old saying goes, you can't manage what you can't measure. While imperfect, our pioneering effort to measure and map LDR land use is a major leap forward, capturing important changes to agricultural land use that previous mapping methods left out. More research is needed to examine the typology of LDR and tease out its impacts on agricultural economies. **But given that on average, agricultural land under LDR is converted to UHD 23 times faster than other agricultural land, it is a threat we need to measure and manage.**

Action 1: Analyze and Map Agricultural Land Trends and Conditions

Effective strategies are based on solid data. Toward that end, states should track agricultural land use trends and conditions.

States are in an ideal position to monitor and map their agricultural land and conduct both state and local policy audits. While our LDR analysis was unable to account for the myriad local land use regulations across the United States, states can collect the necessary data to conduct this type of assessment.

Most states have Geographic Information System (GIS) capacity they could build on by enhancing soils data with their own criteria to map the importance of their agricultural lands. The most sophisticated effort is California's Farmland Mapping and Monitoring program (see box), which tracks and reports on land cover/use change over time. Virginia has a well-developed model to identify strategic agricultural resources. Connecticut's Center for Land Use Education and Research provides information and assistance to land use decision makers. Its research, outreach, and training programs address the overlapping issues of land use planning, water management, climate resiliency, and geospatial mapping technology.

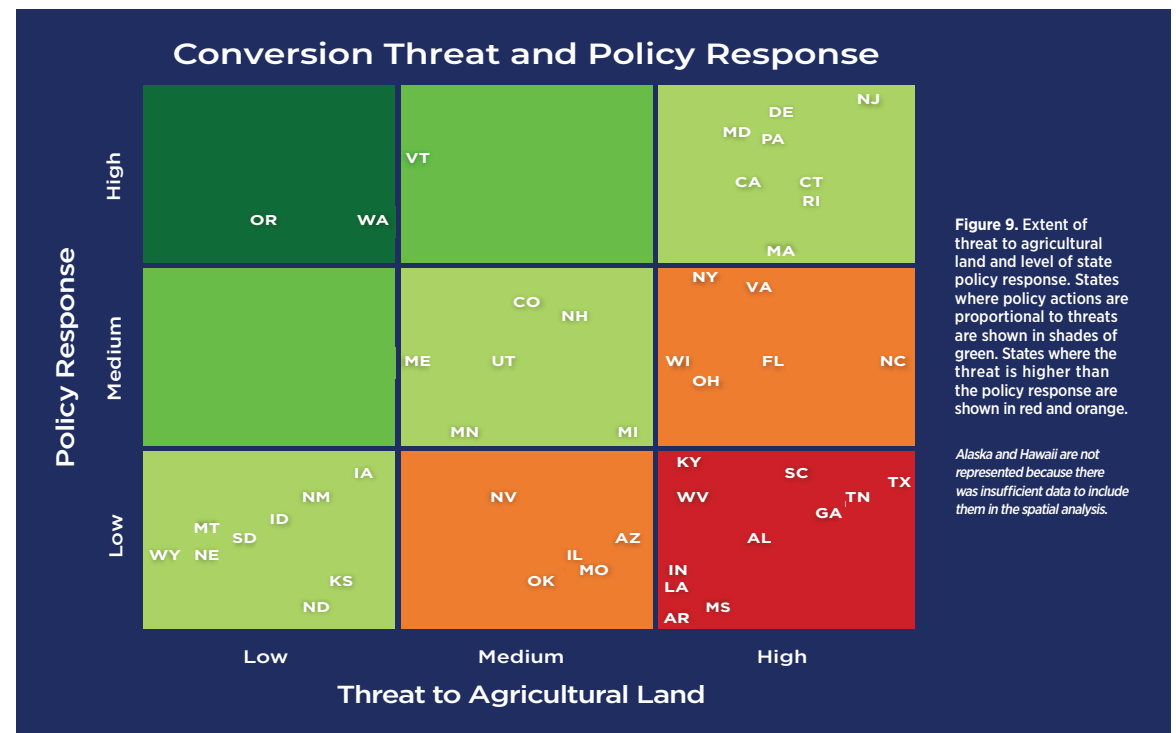


PHOTO: USDA photo by Lance Cheung

California Farmland Monitoring and Mapping Program

California's Farmland Monitoring and Mapping Program (FMMP) is the only state-led program that both monitors and maps farmland to inform planning and policymaking. It compares NRCS soil surveys with areas designated as "Land Committed to Nonagricultural Use" and "Urban and Developed Land" and reports on farmland conversion every two years since 1984. It is housed within the state's Department of Conservation and funded by payments from Williamson Act contract cancellation fees. Improvements in spatial analysis technologies and aerial photography have honed the accuracy of the maps while local participation helps identify each area's most important land. The program makes maps available through an online, searchable database and is widely used by state agencies. The Land Conservation Act relies upon its designations for administering Farmland Security Zone Contracts. Planning agencies use the maps to understand agricultural trends and natural resource use and to make better land use decisions.

Action 2: Strengthen and/or Adopt a Suite of Coordinated Policies to Protect Farmland

States should address agricultural trends and conditions with clear goals and a suite of coordinated policies. They can start by looking for opportunities within existing policies/programs. Our research clearly shows that strong land use planning effectively curbs agricultural land conversion. Yet very few states use planning authority to encourage compact development or to retain farmland. Most could strengthen their authority by adopting smart growth goals, requiring consistency and coordination with local governments, calling for measures to protect agricultural land, and directing growth to urbanized areas with existing infrastructure and affordable transportation options. Further, while all states offer Property Tax Relief, most could improve their programs by adding provisions such as restrictive agreements, a right of first refusal, or penalties for a change of use—which could be invested in purchasing agricultural conservation easements.

Most states also can create or improve PACE programs. While 29 have funded easement purchases, only nine acquire an average of more than 10 easements a year. The top five programs together were responsible for more than a third of the total acres protected.

States can strengthen PACE programs by incorporating a partnership structure to increase capacity—such as between the state and local governments or qualified entities like local land trusts. They can increase acquisition rates by dedicating sources of funding. They can improve farmland affordability with an option to acquire protected land at agricultural value or by incorporating affirmative farming provisions into their easements. And they can be more strategic by addressing the degree of threat to their high-quality land in ranking criteria.

Although only 16 states have them, agricultural district laws are an effective way to combine programs. The best programs leverage multiple approaches, from tax incentives to coordination with local planning and restrictions on non-farm development. They can be strengthened further by including eligibility for PACE, protection from eminent domain,

and provisions to support agricultural viability. While not always politically feasible, programs with regulatory teeth are more effective than those that rely on incentives alone. Most notably, the relatively large and fast-growing state of Oregon, which received the highest score for land use policy, was in the bottom quartile for conversion. Its land use policy requires local planning and implementation to further state goals *and* imposes penalties to ensure compliance. Combining effective farm use zoning with urban growth boundaries, Oregon only allows development on high quality farmland as a last resort. Vermont's use value assessment program ties compliance with water quality standards to receipt of property tax relief. Its Act 250 provides state review and permitting of large development projects and includes mitigation provisions.

In short, states need sticks as well as carrots to be effective. But if regulations are not achievable, states must offer strong enough incentives to have meaningful results. For example, if PACE is the preferred approach, the state must provide enough consistent funding to keep up with the development threat.



PHOTO: Fayette Alliance

Urban growth boundary in Lexington, KY

Rural Smart Growth

Smart growth is a well-respected approach to development that protects farmland, open space, and the environment, while encouraging walkable neighborhoods, mixed land uses, and a range of housing and transportation choices. It directs development toward existing communities, promotes compact design, and fosters attractive communities with a strong sense of place. It also encourages stakeholder engagement and collaboration to ensure development decisions are desired as well as equitable and cost effective.⁹⁷

Rural communities face a host of challenges, including changing demographics, lack of economic growth, environmental protection, and community health and preservation.⁹⁸ Key drivers for their success include protection of natural resources, workforce development, and access to broadband and transportation. Employing smart growth strategies will help communities guide development while protecting working lands and preserving rural character.⁹⁹ This would include identifying a community's full suite of assets—from the built to the natural environment—and creating an economic climate to enhance agricultural viability, create jobs, and support food system and other needed infrastructure.

Action 3: Support Farm Viability and Access to Land for a New Generation of Farmers and Ranchers

Development pressure is only one of three major factors affecting agricultural land conversion. States also must find ways to improve the viability of their agricultural sector, and facilitate the transfer of land to a new, more diverse generation of farmers and ranchers.

As farms and ranches consolidate and/or go out of business, it becomes harder for the remaining operations to thrive. The vital infrastructure that supports them either goes out of business or consolidates, making it more expensive and time consuming for farmers and ranchers to obtain needed goods and services, as well as to process, market, and distribute their products.

Many state and local governments invest in and have policies to improve agricultural viability. They support land grant universities and Extension to provide technical assistance to help with business planning, financial skills, and farm succession. Some have marketing and lending programs and invest in personnel and infrastructure to support agricultural economic development. Some even have economic authorities like Maryland's Agricultural and Resource-Based Industry Development Corporation (MARBIDCO) to address agricultural development. MARBIDCO is a state-chartered economic development organization that helps farm, forestry, and seafood businesses prosper. It works with lenders, counties, and the state's farmland protection programs.

Finally, a handful of states have Farm Viability programs (see box) to help producers with business planning, and in some cases farm transfer planning and grant funding for capital improvements. Other states can emulate these innovations to strengthen their agricultural sector.

Increasingly, states are supporting farm transfer by helping young and beginning farmers gain access to land. Three states have explicit authority for Farm Link programs, and seven programs receive state funding. But since three quarters of Farm Link programs are managed by NGOs, whether or not states have their own programs, they can provide funding and/or technical assistance and resources to support listing, linking, and matching activities.

States also can make land available through leasing programs. Currently, only five states prioritize agricultural use for state-owned land. This easily could be expanded, and states could identify and map which of their land holdings would be suitable for agricultural production. Finally, states can use Beginning Farmer Tax Credits to connect beginning farmers with agricultural assets and leverage PACE programs to facilitate transfer to a new generation.



PHOTO: Debbie Cook, Playvans of Cook Farm, Haelley, MA

Profile of Massachusetts Farm Viability Enhancement Program

Massachusetts Farm Viability Enhancement Program (FVEP) was established in 1996 to improve the economic viability and environmental integrity of participating farms. Managed by Massachusetts Department of Agricultural Resources (MDAR), it offers farmers technical and business planning assistance to expand, upgrade, and modernize their operations. It also provides capital to implement recommended improvements in exchange for term easements for either five or 10 years.

Through an annual application process, a review committee selects farms to participate based on selection criteria and program funding. Selected applicants receive professional assistance to develop a farm business plan, which MDAR staff reviews and then typically grants funds to support capital improvements identified in the plan. Grants range from \$25,000 to \$125,000, funding things like building or repairing barns, upgrading field equipment, purchasing delivery vehicles, improving retail structures, and increasing food storage and processing capacity. In 2009, MDAR developed a related program to include farmers whose land has been permanently protected through the state's PACE program. Between the two programs, MDAR has provided technical assistance and grants totaling more than \$25 million to 525 farms and placed short-term agricultural covenants on 42,000 acres, with another 41,000 acres leased or used by participating farms.



Nebraska Beginning Farmer/Rancher Tax Credit

Nebraska's Beginning Farmer Tax Credit Act (NextGen) is the nation's first program to link beginning farmers with agricultural assets through a system of tax incentives and lease agreements. NextGen provides reciprocal tax incentives over three-year lease agreements: beginning farmers are eligible for personal property tax credits on the land and equipment they rent, and asset owners are eligible for income tax credits on the assets they loan.

NextGen was passed in 2001 in response to growing concern for the loss of agricultural jobs and out-migration of rural communities. Its main goal was to help beginning farmers gain access to land and machinery amidst widespread agricultural consolidation and a highly competitive farming climate. Formally chaired by a board, a part time Nebraska Department of Agriculture (NDA) employee administers outreach and technical assistance.

Most participating beginning farmers are young or making a mid-career switch. The volume of applicants increased substantially after 2008 when the legislation was amended to allow leasing between family members with a legally binding succession plan. NDA offers free workshops to help beginners navigate land and business transitions. It also reimburses beginners for financial planning education to help them through their first three years of farming. More than 1,600 beginners have participated in the program, which has provided an annual average of over \$5,200 in income tax credits to more than 2,000 asset-owner participants. Nearly 99% of its participants are still farming, and 85% still use or have bought the land they rented through the program.

Action 4: Plan for Agriculture, Not Just Around It

"A failure to plan is a plan to fail." State and local governments plan for many things—from transportation and housing to health, safety, and economic wellbeing. Few plan for agriculture. This needs to change.

Planning for agriculture establishes a public policy framework to support agricultural economic development and to protect and conserve farmland for current and future generations. It can occur at state, regional, or local levels and result in a stand-alone plan or be included as part of a comprehensive or other type of plan. It can address the threats of conversion with land use policies, but it can also, by helping farmers and ranchers take advantage of an expanding consumer base and changing consumer preferences, turn threats into opportunities, building support for working farms and ranches and keeping agricultural land in production.

To support these efforts, states can provide sound information about the fiscal and economic impacts of development choices. They can develop their own plans and/or provide resources to support local governments in their planning efforts. For example, New York has a Farmland Protection Planning Grants Program to help local governments develop policies and projects to maintain the economic viability of the agricultural industry and its supporting land base. It also provides implementation grants to keep the state's farms forever in agriculture.

Working farms and ranches are less likely to be impacted by development in communities with farm-friendly land use policies. Such policies include area-based allocations and sliding scale zoning that encourage compact development to retain large contiguous blocks of agricultural land. Other examples include new unit notifications, and buffers and setbacks from new developments to protect farm

operations from new neighbors. Beyond land use policies, state and local governments can support diversification to value-added agriculture and invest in infrastructure like cold storage, packing, and processing plants, farmers markets, and food hubs.¹⁰⁰ They can take advantage of growing demand for local food by enacting policies to support on-farm processing, agritourism, direct-to-consumer sales, and urban agriculture. And they can promote local procurement and farm-to-institution sales. These and other policies can counter the threats of new real estate development by keeping farms economically viable.

Finally, states should devise emergency management plans to address the resiliency of their agricultural sector. They must begin to address environmental threats to water quality and from floods, droughts, and fire, while integrating agriculture into other resiliency efforts related to transportation and housing as well as food system and sustainability planning.

Action 5: Save the Best, but Don't Forget the Rest

America's agricultural landscape is extensive and diverse. Some of it is highly threatened and some is not. Some acres are ideally suited to producing food, feed, and other crops; some are better suited to grazing livestock. All of it is important to state and local economies and to our food system.

The period we studied was more anomaly than trend. Even though development nearly ground to a halt, every state still converted some of its best farmland—a precious resource we cannot afford to squander.

Going forward, states need to become more sophisticated in how they assess, prioritize, and protect their vital agricultural resources. Special effort should be made to protect Nationally Significant agricultural land, which is critical for long-term food security and environmental quality. Policy action is needed both to stop development on Nationally Significant land and to protect it in perpetuity. Even states that do not have public PACE programs can encourage qualifying entities to protect Nationally Significant land by leveraging federal dollars through NRCS' Agricultural Conservation Easement Program - Agricultural Land Easements (ACEP-ALE) program.

Every state has at least a small supply of Nationally Significant land. In some it is much more threatened than other agricultural land, in other states, less so. Either way, every state should create a strategy to prioritize its protection. Since our PVR analysis covers the full range of land quality (see Map 3 in Methods), it can be used to prioritize land in any state, from the green hills of Vermont to the desert valleys of Arizona. States can use the interactive maps on our website to find actionable information on the location and quality of agricultural land, the threats posed by development, and where their highest threats converge with their best quality agricultural lands.

States should ensure their planning statute addresses the quality as well the quantity of their agricultural resources. They can work with local governments to include the identification and protection of their agricultural lands in comprehensive plans and local land use policies. Recognizing the ability of all kinds of agricultural lands to sequester carbon, states can use smart growth policies to prevent conversion by promoting compact, energy-efficient development, providing transportation alternatives to reduce driving, and using infill and reuse of existing infrastructure and buildings to keep development from spilling into the countryside.¹⁰¹

California took its approach to smart growth one step further. Its Sustainable Agricultural Lands Conservation Program (SALC) invests in PACE with revenue from quarterly cap-and-trade auction proceeds from the California Climate Investments Fund. Recognizing that farmland and ranchland can help mitigate climate change, SALC supports agricultural land strategy plans and other mechanisms to reduce greenhouse gas emissions and create a more resilient agricultural sector.

When states convert farmland to development—especially Nationally Significant land—they put pressure on marginal land to be farmed intensively. This limits opportunities to provide vital environmental services. And they lose the ability to use regenerative farming practices to sequester carbon. Further, the benefits of regenerative practices will be temporary if the land is lost to development and the carbon stored in the soil is released back into the atmosphere.

Explore our findings and learn more about our analyses at www.farmland.org/farmsunderthreat



When prioritizing rangeland, states should use the PVR analysis in conjunction with additional measures of rangeland importance, such as stock water supply, nearness to other ranching infrastructure, and importance for wildlife, native plant species, wildfire protection, and groundwater recharge.

PHOTO: Coleman Natural Foods

What the Federal Government Can Do

Federal policies and programs play a major role in directing development. Yet, while we have strong protections in place for wetlands, endangered species, and other natural resources, protecting agricultural land from development has largely been left to state and local governments. It is time for stronger and more coordinated federal action.

According to [Smart Growth America](#), federal programs tend to promote single-family homes over multi-family regardless of the market or need, even though demand has never been higher for affordable housing with low-cost transportation options nearby. Shifting federal support toward smart growth projects would help curb conversion and reduce the loss of agricultural land. It also would help mitigate climate change. Along with regenerative farming practices and protecting farmland to sequester carbon, effective mitigation strategies include compact development, infill and reuse of existing infrastructure and buildings, and creating communities where people can walk, bike, and drive shorter distances to get to jobs, schools, shopping, parks and so on.

USDA has an important role to play. NRCS has been a leader in farmland protection and conservation. Through ACEP-ALE, it has obligated \$1.8 billion in matching funds to help state, local, and private entities purchase agricultural conservation easements. Yet USDA also has played a role in agricultural land conversion. According to Farmland Protection Policy Act (FPPA) records, USDA-Rural Development is second only to the Department of Transportation when it comes to developing agricultural lands. Elevating the cause and coordinating action across USDA agencies is an important step toward greater federal leadership in stopping the loss of the nation's valuable agricultural resources.

Action 1: Double Funding for ACEP

The Agricultural Land Easement (ALE) program is the federal government's only program focused specifically on agricultural land protection. ALE provides matching funds to qualified entities to purchase agricultural conservation easements. ALE receives funding as part of the broader Agricultural Conservation Easement Program (ACEP), which also provides support for the preservation of wetlands and grasslands. At just \$450 million of annual funding, ACEP currently meets just a small fraction of its demand. Doubling funding for this popular program would increase ALE's capacity to protect farmland and rangeland.

Action 2: Strengthen the FPPA to Stop Agricultural Land Loss

To limit the federal government's role in agricultural land conversion, Congress should strengthen the FPPA by adding mitigation requirements and penalties for conversion in order to minimize farmland loss. It should also provide higher levels of protection for eased, Nationally Significant, and other high-quality agricultural land.

Further, USDA should devote more resources to the National Resources Inventory (NRI) to deliver reliable county-level and spatial data on the status, condition, and trends of land and related resources to inform FPPA as well as state and local land use planning decisions.

Action 3: Develop Federal Policies that Facilitate Farm Transfer to a New Generation

With more than 40 percent of American farmland expected to transition by 2040, Congress and USDA must step up efforts to support succession planning, land transfer, and access



PHOTO: USDA NRCS Montana

to land. Congress should consider tax policy changes that encourage land transfer to a new generation of farmers and ranchers, such as a capital gains exclusion to incentivize the sale of land to young, beginning, socially disadvantaged and veteran producers, and encourage an increase in the present \$1.6 million cap on the estate tax's 2032A Special Use Valuation. A Beginning Farmer Tax Credit could be explored, and the Conservation Reserve Program-Transition Incentives Program expanded.

To inform such transition policies, Congress and federal agencies will need to be equipped with the best information on land use and ownership. To start, NASS should update the 2014 Tenure, Ownership, and Transition of Agricultural Land (TOTAL) survey, which provides invaluable information on land ownership and land tenure challenges and trends.

Action 4: Increase Support for Agricultural Viability

A greater share of USDA funding is needed for programs and research to help producers add value to their products, develop new markets, diversify their operations, and otherwise improve economic viability. More support is needed for programs including Business and Industry Loan Guarantees, Specialty Crop Block Grants, and Value-Added Producer Grants.

Research also is crucial. Funding should be increased for the Agricultural Research Service and National Institute of Food and Agriculture (NIFA). NIFA administers the Cooperative Extension System, capacity funding for land-grant universities, and competitive grant programs such as the Agriculture and Food Research Initiative and the Sustainable Agriculture Research Education program.

Supporting viability is especially important for a new generation of farmers and ranchers to succeed. Programs like the Beginning Farmer and Rancher Development Program and Outreach and Assistance

for Socially Disadvantaged and Veteran Farmers and Ranchers Program (Section 2501 Program) should be expanded and greater support provided for Farm Service Agency (FSA) beginning farmer loan programs. Congress also should consider enacting a "Debt for Working Lands" program. Modeled on FSA's Debt for Nature, it could offer lowered or restructured debt on FSA loans in exchange for a permanent agricultural easement.

Action 5: Provide Federal Funding to Plan for Agriculture

The federal government can do more to incentivize regional, state, and local planning to support agriculture: from preventing agricultural land loss and improving the siting of agricultural infrastructure to improving economic opportunities for farmers, ranchers, and agribusinesses. This could be done through federal block grant funding to state and local governments to develop comprehensive plans for agriculture or to provide planning expertise and technical assistance.

Funding also should be expanded to support the Local Foods, Local Places (LFLP) program. LFLP supports community-driven efforts to preserve open space and farmland, protect the environment, and boost economic opportunities for local farmers and businesses. Through an inter-agency partnership, currently sponsored by EPA, USDA, and the Northern Border Regional Commission, LFLP provides technical assistance to municipalities to reinvest in neighborhoods as they develop local food systems.



PHOTO: Amy Pettit courtesy of Alaska Farmland Trust

Explore our findings and learn more about our analyses at www.farmland.org/farmsunderthreat

What's Next?

The extensive spatial and policy databases underpinning *Farms Under Threat: The State of the States* hold the promise of countless additional insights. We plan to unlock them through future research endeavors. A sample of those are listed here.

To improve our understanding of the development patterns threatening farmland and rangeland, we will dig deeper into our spatial datasets to:

- Better understand the landscape context of UHD areas: i.e., if they are in large urban centers, small towns, or rural areas.
- Explore the spectrum of land use types included in LDR areas to gain additional insights into the range of threats and opportunities that LDR presents and to inform state and local responses.

We also will update our state policy scorecard to include policies aimed at promoting on-farm conservation, regenerative production practices, and climate resilience.

Both analyses will inform Phase III of *Farms Under Threat*, which will explore future scenarios of development and climate change to 2040. We must answer the question: What will happen to our agricultural land as the population continues to grow, consumer housing preferences change, coastal flooding causes in-migration, and farmers and ranchers adapt to raise crops and livestock in the face of worsening droughts, floods, fires, and temperature extremes? This information will help counties, states, and the federal government prepare for future threats and save the land that we will need in 2040 and beyond.

In addition, we also plan upcoming analyses on:

- Wildlife habitat quality and connectivity on agricultural lands;
- Other ecosystem services provided by agricultural lands; and
- Agricultural viability as influenced by availability of land and infrastructure, farm profitability, and the demographics of farmers and farmworkers.



PHOTO: USDA photo by Preston Keres

Planning in a Time of Uncertainty

We complete this report during the Covid-19 pandemic, which has made clear that farmers, ranchers, and farm workers are essential service providers. After all, what is more essential to human life and a society than healthy food and clean drinking water? We need agriculture—especially science-based regenerative agriculture—to survive. This requires a sufficient and secure base of suitable agricultural land in every state.

Agriculture is critical infrastructure. Yet federal, state, and local emergency management and disaster plans do not include guidance or training on how to integrate food supply chains into pandemic responses. No government agency tracks illnesses among farmers or food industry workers with an eye on food disruptions. All parts of the food system will suffer as a result of the pandemic, but the greatest disruptions may occur within consolidated supply chains that employ large numbers of people.

Shortages of staple foods like flour and eggs are already evident. Outbreaks of the virus in major meat and poultry plants are threatening the nation's meat supply with severe repercussions for livestock farmers who have nowhere else to send their animals. Closed schools, cafeterias, and restaurants have caused a downward spiral in crop as well as livestock prices, threatening



PHOTO: USDA photo by Preston Keres

the livelihoods of many farmers and ranchers. If prices drop too low, some farmers may not be able to justify putting another crop in the ground. The risks of our dependency on consolidated food supply chains have never been more evident.

We need resilient food and farming systems to ensure that communities are protected from extreme disruptions and shocks. Resilient systems are flexible, regenerative, and decentralized. Connected to the global food system, they also support localized production of multiple crops and multiple varieties of those crops. Resilient systems encompass the entire soil-to-soil life cycle of food—from field to fork to compost pile and back again.

One positive element that has emerged from this crisis is the adaptability of many small, often direct-to-consumer farmers, who have stepped up to meet local demand. Some are selling at farmers markets or through CSAs. Others have created online ordering systems with curbside pickup or home delivery. While it is critical to help larger growers with infrastructure and markets to redirect their products, it is equally important to recognize the role of small and mid-sized producers in ensuring resiliency and community food security.

AFT's 'Reason to Be' is to Avert Catastrophe

AFT focuses on 'getting farming right' before it's too late by addressing agriculture's major challenges: (1) the loss of irreplaceable farmland, (2) the destruction of topsoil and organic matter, which threaten our ability to sustainably grow food and provide essential environmental services, and (3) demographic and economic realities that threaten future generations of farmers and ranchers. We do this in many ways: through research and education, direct land protection, planning, public policy, and demonstration projects. AFT's work can be viewed as a collection of programs and projects that advance agriculture and the environment—but it is more than that. It is about changing farming now to ensure that we can successfully farm in the future.

Covid-19 should be a wakeup call. Even as society deals with the repercussions of this crisis, we must prepare for the next—especially climate change. The only hope to stop the rise of atmospheric carbon is through natural solutions—with farming (and farmland) in a lead role. Yet while we take those essential steps, we must also build the resilient food systems that our future demands. While protecting farmland and advancing regenerative practices, we must also reorient food production, processing, and distribution to reduce impacts on the climate, lessen our dependency on consolidated industries and supply chains, and create wealth locally. This will take coordinated action. We hope you will join us.



PHOTO: USDA NRCS Montana

How We Can Help

Do you have questions about *Farms Under Threat* or farmland protection, succession, and access? If so, contact AFT's Farmland Information Center. Our staff answers requests for information by phone or email, and our website includes the nation's largest online collection of print materials, laws, and sample documents related to farmland protection and stewardship. Call us at 800-370-4879 or visit us online at www.farmlandinfo.org.

The AFT Research team is interested in partnering with academic researchers, agency staff, and non-profits to leverage the *Farms Under Threat* dataset for additional insights. If you are interested in partnering, please visit farmland.org/research to get in touch with our research team.

Do you want to join a network of professionals working to advance agricultural land retention and protection across the United States? AFT's National Agricultural Land Network provides training and opportunities for peer networking through virtual and inperson convenings. Membership is free and open to staff from state and local farmland protection programs, land trusts engaged in agricultural land protection, state departments of agriculture and conservation, and county and state planning entities. For more information and to sign up, visit www.farmland.org/NALN.

Do you have land you would like to protect? AFT is an agricultural land trust that has permanently protected more than 200 farms and ranches in 25 states. Our land protection staff can help you make decisions about the future of your land. Alternatively, you can make a gift of your farm or ranch to AFT knowing we will permanently protect it through our Farm Legacy program. Depending on your wishes, this could occur as an outright gift, as a retained life estate, or through various annuity or trust arrangements. To learn more about options for partnering with AFT to permanently protect your farm or ranch, please visit www.farmland.org or call our Farmland Information Center at 800-370-4879.

Appendix

APPENDIX I: Comparison Among Definitions of Urban/Developed/Built-Up Areas

	NRI	NLCD	FUT
Terminology	“Developed Land. A combination of land cover/use categories, large urban and built-up areas, small built-up areas, and rural transportation land.”	“Developed”	“Urban and highly developed”
Summary definition	A land cover/use category consisting of residential, industrial, commercial, and institutional land, as well as other human-dominated land uses.	A land cover/use category including areas more than 20% covered by constructed materials like asphalt, concrete and buildings, and developed open space, like large-lot houses, parks, and golf courses.	Mapped using NLCD data, so conforms to NLCD definition, but does not include roads.
Definition	“A land cover/use category consisting of residential, industrial, commercial, and institutional land; construction sites; public administrative sites; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage treatment plants; water control structures and spillways; other land used for such purposes; small parks within urban and built-up areas; and highways, railroads, and other transportation facilities. Also tracts of less than 10 acres that do not meet the above definition but are completely surrounded by Urban and built-up land. NRI recognizes two size categories: areas of 0.25 acre to 10 acres, and of at least 10 acres.”	Ranges from “Developed High Intensity - highly developed areas where people reside or work in high numbers, e.g. apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover” down to “Developed, Open Space- areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.”	Mapped using NLCD data, so conforms to NLCD definition, but does not include roads.
Rough estimate of housing density captured	Captures development at a density down to one house per 10-20 acres, so it includes some large-lot housing.	Developed Classes typically do not include houses on lots larger than one to two acres.	Includes NLCD Developed Classes. The LDR analysis extends to U.S. Census blocks in which the average acres-per-dwelling-unit is below the county farm size threshold, which ranges from one to 335 acres across the country.

Appendix II: Data Sources for Spatial Mapping

GENERATING LAND COVER/USE MAP		
Dataset Name	Source	Primary use of the dataset
National Land Cover Database 2001, 2016 (released May, 2019)	Dept. of Interior/U.S. Geological Survey (USGS)	Supplies land cover data for high-resolution spatial mapping (30 m resolution) for the conterminous U.S.
National Resources Inventory 2002, 2015	USDA Natural Resources Conservation Service (NRCS)	Guides mapping of agricultural lands and provides a check on accuracy of mapping products (obtained county level summaries and sample point location coordinates through confidentiality agreement with NRCS)
Woodland acreage 2002, 2012 and 2017	USDA National Ag Statistics Service (NASS) Census of Agriculture	Guides mapping of woodland by providing woodland acreage data by county
Soil Survey Geographic Database (SSURGO) 2018	USDA NRCS	Guides mapping of agricultural lands
State Soil Geographic Database (STATSGO) 2019	USDA NRCS	Guides mapping of agricultural lands where SSURGO was unavailable
Cropland Data Layer (CDL) 2014 to 2016	USDA NASS	Helps determine suitability for cropland in 2016
National Elevation Dataset 2019	USGS	Guides mapping of agricultural lands
National Hydrography Dataset (High Resolution) 2019	USGS	Identifies water bodies including lakes/reservoirs and wide streams/rivers
Protected Areas Database (PAD-US v2.0) 2018	USGS	Identifies federal lands
BLM National Grazing Allotment polygons 2016	U.S. Bureau of Land Management (BLM)	Identifies grazing on federal lands
USFS Grazing Allotment polygons 2017	U.S. Forest Service Range Management Unit	Identifies grazing on federal lands
Topologically Integrated Geographic Encoding and Referencing (roads) TIGER/Line 2016	U.S. Census Bureau	Provides information for mapping the land cover/use class for “Transportation”
Normalized Difference Vegetation Index (NDVI) 2015	USGS Landsat 8, Copernicus Sentinel-2 satellite imagery	Differentiates areas that are non-productive due to poor soils to improve accuracy of agricultural land mapping
Housing density 2000, 2016	U.S. Census Bureau American Community Survey	Provides estimates of housing density to map low-density residential land use in census blocks
Minimum viable farm size by county 2017	USDA NASS Census of Agriculture 2017	10th percentile farm size for each county used to determine when residential housing density reached a point where it might threaten farm viability in a Census block
MAPPING AGRICULTURAL LAND QUALITY (PVR VALUES)		
Dataset Name	Source	Primary use of the dataset
SSURGO important farmland designations 2018	USDA NRCS	Assigned values to five important farmland designations (e.g. prime, prime with limitations, unique, statewide important, and statewide important with limitations)
SSURGO Land Capability Classes (LCC) 1961	USDA NRCS	Account for environmental limitations to production
Cropland Data Layer (CDL) 2014-2018	USDA NASS	Assigned values to crop types (fruit and nut trees; fruits and vegetables; staple food crops; feed grains, forages and crops grown for livestock feed and processed foods; non-food crops)
Growing Season length 2006	USDA NRCS Major Land Resource Areas v4.2	Account for regional differences in growing season length
FUT 2016 land cover/use	Farms Under Threat	Assigned values to cropland, pastureland, rangeland, woodland and other land types

Appendix

Appendix III: Threat Score and Acreage and Percent Converted To UHD, LDR, and the Combination, By State

STATE	THREAT SCORE	UHD		LDR		UHD+LDR	
		Acres	%	Acres	%	Acres	%
TX	100	692,000	0.5	681,000	0.5	1,373,000	1.0
NC	99	160,000	1.5	572,000	6.1	732,000	6.7
NJ	94	32,000	3.9	39,000	5.6	71,000	8.7
TN	80	148,000	1.1	511,000	4.5	659,000	5.1
GA	72	173,000	1.4	371,000	3.3	544,000	4.4
RI	65	2,000	3.7	1,000	2.3	4,000	5.8
CT	65	9,000	2.5	14,000	4.4	23,000	6.4
SC	57	84,000	1.3	197,000	3.5	281,000	4.5
MA	56	14,000	2.7	13,000	2.7	27,000	5.2
DE	56	10,000	1.9	21,000	4.3	32,000	5.8
FL	55	160,000	1.8	138,000	1.6	298,000	3.4
PA	55	103,000	1.1	244,000	3.0	347,000	3.8
VA	51	67,000	0.8	273,000	3.5	340,000	4.0
AL	51	100,000	1.0	262,000	2.8	362,000	3.5
CA	49	317,000	0.9	149,000	0.4	466,000	1.4
MD	45	30,000	1.3	73,000	3.4	103,000	4.3
MS	40	57,000	0.5	279,000	2.5	336,000	2.8
NY	37	56,000	0.6	197,000	2.4	254,000	2.7
OH	37	109,000	0.7	203,000	1.4	312,000	2.0
KY	33	60,000	0.5	205,000	1.8	265,000	2.2
WV	33	14,000	0.5	75,000	3.2	89,000	3.3
IN	31	102,000	0.6	163,000	1.0	266,000	1.6
WI	31	96,000	0.6	154,000	1.1	250,000	1.7
LA	31	62,000	0.8	115,000	1.5	177,000	2.2

STATE	THREAT SCORE	UHD		LDR		UHD+LDR	
		Acres	%	Acres	%	Acres	%
AR	30	65,000	0.5	202,000	1.5	267,000	1.9
AZ	29	191,000	0.5	90,000	0.3	280,000	0.8
MI	29	45,000	0.4	195,000	1.8	240,000	2.0
MO	28	82,000	0.3	243,000	0.9	325,000	1.2
IL	27	162,000	0.6	83,000	0.3	244,000	0.9
NH	27	5,000	1.1	7,000	1.7	12,000	2.7
OK	24	95,000	0.3	179,000	0.6	273,000	0.8
CO	23	124,000	0.4	111,000	0.3	235,000	0.7
NV	21	78,000	0.8	31,000	0.3	108,000	1.2
UT	21	86,000	0.7	37,000	0.3	123,000	1.1
MN	18	70,000	0.3	110,000	0.5	180,000	0.7
ME	14	3,000	0.3	14,000	1.4	18,000	1.6
VT	14	4,000	0.3	18,000	1.4	21,000	1.6
WA	13	50,000	0.3	48,000	0.3	98,000	0.6
IA	12	75,000	0.2	39,000	0.1	114,000	0.4
KS	11	60,000	0.1	63,000	0.1	123,000	0.3
ND	10	61,000	0.2	45,000	0.1	106,000	0.3
NM	10	53,000	0.1	60,000	0.1	113,000	0.3
ID	9	31,000	0.2	38,000	0.3	69,000	0.5
OR	8	33,000	0.2	33,000	0.2	66,000	0.4
SD	7	23,000	0.1	66,000	0.2	89,000	0.2
MT	6	20,000	0.0	76,000	0.1	96,000	0.2
NE	6	43,000	0.1	23,000	0.1	66,000	0.1
WY	5	20,000	0.1	35,000	0.1	55,000	0.2

Glossary



AGRICULTURAL DISTRICT PROGRAMS: Agricultural district programs allow owners of farmland and ranchland to form special areas where commercial agriculture is encouraged and protected. Programs are authorized by state law but implemented at the local level. Enrollment is voluntary and participating landowners receive a series of protections and tax incentives. Protections may include limits on annexation, eminent domain, and siting of public facilities and infrastructure. Tax incentives include exemptions from special assessments and reductions in property taxes.

AGRICULTURAL LAND: Farms Under Threat (FUT) defines agricultural lands as non-federal cropland, pastureland, rangeland, and woodland associated with farms. These non-federal agricultural lands are commonly referred to as farmland and ranchland by the public.

CENSUS BLOCK: U.S. census blocks are statistical areas defined by the U.S. Census Bureau for use in the decennial Census. They are bounded by visible features such as roads, streams, and railroad tracks, as well as by nonvisible boundaries such as property lines, city, township, school district, and county limits, and short line-of-site extensions of roads.

CONVERSION: Conversion refers to a change in land cover and/or land use. FUT is focused on the conversion of agricultural land to 1) urban and highly developed (UHD) land cover, and 2) non-urban low-density residential (LDR) land use. Conversion also may include changes from one type of agricultural production to another (e.g. conversion from crop to pasture or pasture to range).

CROPLAND: FUT uses the USDA NRCS National Resources Inventory (NRI) definition of cropland: "A Land cover/use category that includes areas used for the production of adapted crops for harvest. Two sub-categories of cropland are recognized: cultivated and noncultivated. Cultivated cropland comprises land in row crops or close-grown crops and also other cultivated cropland, for example, hayland or pastureland that is in a rotation with row or close-grown crops. Noncultivated cropland includes permanent hayland and horticultural cropland."¹¹

DEVELOPED AND COMPROMISED CLASSES: FUT identifies conversion to the following two types of land use, which are defined below: urban and highly developed (UHD) and low-density residential (LDR).

FARMETTE/RANCHETTE: Depending on the region, "farmlets," "farmettes," and "ranchettes" are largelot residential developments typically including a house, a barn, and possibly a few animals such as horses or chickens. These properties are owned for lifestyle values but not as commercial agricultural operations. The size of these properties varies

from a few acres up to 40 acres or more. Although farmettes and ranchettes may preserve rural character, they have been shown to price commercial farmers out of the market and to threaten the agricultural land base.

FARM LINK PROGRAMS: Farm Link (also known as Land Link) programs connect farmers seeking land with senior or retiring agricultural landowners who want their land to stay in agricultural production. They may be administered by public or private entities and offer a range of services and resources, including online real estate postings, technical assistance to connect and advise landowners and land seekers, and educational resources and opportunities including trainings, workshops, and mentoring.

FEDERAL LANDS: Farms Under Threat uses the information about ownership and management attributes in the Protected Areas Dataset (PAD-US v2.0) as the basis for mapping federal lands. State, county or tribal lands are not included. FUT also maps federal lands used for grazing using the most recent Bureau of Land Management and U.S. Forest Service grazing permits (2016-2017).

FORESTLAND: FUT uses the NLCD definition of forest: "areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover." FUT identifies forest land that is associated with farms and re-classes it as woodland (see definition below).

LAND COVER: Land cover refers to the physical features on the land. It is the vegetation or other material, manmade or natural, that covers the surface of the land. Land cover is generally determined using remote sensing techniques or interpretation of aerial photography.

LAND USE: Land use refers to the functions people use land for, rather than the land's natural or physical features, and involves both the modification and the management of the natural environment for society. It includes the built environment (residential, commercial, industrial, energy and transportation) and natural environment, including working land uses such as agriculture and forestry.

LAND USE PLANNING: Planning is a public process to envision and prepare for the future. Land use planning is concerned with the use and orderly development of land and may consider the protection of important natural resources.

In the United States, most states delegate land use planning authority to local governments. Some states, however, play a more active role through state-level planning entities, state land use goals, state support for community planning, and state requirements for communities to develop comprehensive plans consistent with state goals. A few

states direct or encourage localities to identify important agricultural resources and to adopt policies to protect them.

LOCAL FOOD: FUT defines "local" food broadly as food produced, aggregated, processed, and distributed in the state, locality, or region where it is sold. This includes both direct-to-consumer sales and intermediated sales, including food sold to distributors or food hubs for aggregation, and food delivered to restaurants, grocery stores, and institutions like schools. While it includes geography, FUT's definition is based on relationships and transparency and only includes products that maintain their source identification throughout the supply chain.

LOW-DENSITY RESIDENTIAL (LDR) LAND USE: LDR is a new land use class developed in FUT to identify agricultural lands in areas where the average housing density is above the level where agriculture is typically viable. It is the first nationwide attempt to examine and spatially identify the impact of large-lot residential development on the agricultural land base. LDR land use is concentrated in areas where development pressure is increasing, and developed and undeveloped land are interspersed, often on the edges of cities and towns.

LOW-DENSITY RESIDENTIAL (LDR) MULTIPLIER: Farms Under Threat analyzed the rate at which agricultural land that was in LDR land use areas in 2001 had been converted to Urban and Highly Developed (UHD) land use by 2016, in comparison to agricultural lands not in LDR areas. An LDR multiplier value above 1 indicates that agricultural land in LDR areas was more likely to be converted to UHD than agricultural land outside of these areas. Values above 1 indicate that new housing developments were rapidly being built on the remaining pockets of open farmland and ranchland within these areas.

NATIONAL LAND COVER DATABASE (NLCD): The National Land Cover Database is the most comprehensive, publicly available land cover database in the U.S. It is produced by the federal government, provides satellite-based maps of land cover at 30 m resolution, and is released every 2-5 years. When the new 2016 NLCD was released in May 2019, it included updated maps back to 2001 to provide more consistent land cover mapping products through time.¹⁶

NATIONAL RESOURCES INVENTORY: The National Resources Inventory (NRI) is a statistical survey of land use and natural resource conditions and trends on U.S. non-federal lands. Conducted by USDA-NRCS in cooperation with Iowa State University's Center for Survey Statistics and Methodology, it collects and produces scientifically credible information on the status, condition, change and trends of land, soil, water, and related resources.

NATIONALLY SIGNIFICANT AGRICULTURAL LAND: This is a FUT designation for the land that is best suited for long-term cultivation and food production. It was identified using the PVR analysis following consultation with experts.

OTHER (LAND COVER/USE): The "Other" category in FUT's land cover/use mapping includes locations not classed in other cover/use classes, typically occurring on or along rural roads, in barren areas with little vegetation cover, or on steeper slopes.

PASTURELAND: FUT uses the NRI definition of pastureland: "A land cover/use category of land managed primarily for the production of introduced forage plants for livestock grazing. Pastureland cover may consist of a single species in a pure stand, a grass mixture, or a grass-legume mixture. Management usually consists of cultural treatments: fertilization, weed control, reseeding or reinvigoration, and control of grazing. For the NRI, it includes land that has a vegetative cover of grasses, legumes, and/or forbs, regardless of whether or not it is being grazed by livestock."¹¹

PLANNING & LAND USE POLICIES: Planning is a public process to envision and prepare for the future. Some states engage in state-level planning activities; most either enable or encourage planning at the county or municipal level, where most land use decisions are made.

PRODUCTIVITY: Productivity is output per unit of input (often measured as crop yield per acre). The highest productivity occurs where climate and soil conditions are most conducive to plant growth. In addition, certain factors favor production of perishable food crops, such as special microclimates, location near urban centers, and irrigation. Because productivity can often mask environmental or health components of soil quality, FUT's PVR value analysis considered soils, their limitations, climate, type of production and whether the land is capable of producing commonly cultivated crops and pasture plants without deterioration over a long period of time.

PURCHASE OF AGRICULTURAL CONSERVATION EASEMENTS (PACE) PROGRAMS: Purchase of agricultural conservation easements (PACE) programs permanently protect agricultural land from non-farm development and keep land available for agriculture. They compensate property owners for selling agricultural conservation easements to a government agency or private conservation organization. PACE is known as purchase of development rights (PDR) in many locations.

PRODUCTIVITY, VERSATILITY, AND RESILIENCY (PVR): FUT combines multiple datasets to analyze agricultural potential based on the land's productivity, versatility, and resiliency (PVR). The analysis incorporates feedback from a group of national ex-

perts to prioritize and weight a set of criteria to determine which agricultural lands are best suited for long-term cultivation. Maps representing soil productivity and capacity, land cover and use, crop type, and length of growing season were developed and combined using weights elicited from the national experts. The resulting continuum of PVR values apply to the land's suitability for producing food and other crops. The higher the value, the more productive, versatile, and resilient the land is for long-term cultivation when treated and managed according to acceptable farming methods.

PROPERTY TAX RELIEF PROGRAMS: The most common and significant type of real property tax relief for agricultural land is use-value assessment (UVA). UVA programs allow officials to assess farmland at its current use value, rather than its fair market value, which is generally for non-farm development. UVA is also known as differential assessment and current use assessment. Every state except Michigan has a UVA program. In addition, a handful of states, including Michigan, offer programs that allow agricultural landowners to claim state income tax credits to offset their local property tax bills.

RANGELAND: FUT uses the NRI definition of rangeland: land on which the vegetation "is composed principally of native grasses, grass-like plants, forbs or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland." Rangeland productivity is limited by water and nutrients (primarily nitrogen) and varies widely both seasonally and annually. Rangelands are vital for the ecological, environmental, and economic services they provide.¹¹

RESILIENCY: Resiliency is the land's ability to adapt to extreme weather events while still producing food and other agricultural products and providing ecosystem services over time. Resiliency depends on the same factors that determine productivity, especially soil properties and topography.

STATE LEASING PROGRAMS: Many states lease state-owned land to agricultural producers for agriculture. In some states the primary purpose is to protect agricultural resources and keep land available for agriculture. In other states, land is made available to farmers and ranchers to generate income for a public purpose or to protect other resources, like wildlife habitat.

SUITABILITY: The geographic systems (GIS) modeling in Farms Under Threat uses a mixed-method approach to map the best locations for croplands, pasturelands, rangelands and woodlands based on both the likelihood that a location would be occupied by a specific agricultural cover type (i.e. the suitability of the area for that particular agricultural cover type) and remotely sensed land cover products.

TRANSPORTATION: FUT defines transportation as land used for motor vehicle transportation with land cover dominated by paved or unpaved roads. FUT obtained road data from the U.S. Census Bureau Topically Integrated Geographic Encoding and Referencing (TIGER/Line) geodatabase for 2016. FUT then pre-processed the NLCD to remove roads (to avoid an overestimate of road features) and mapped transportation as a separate class.



URBAN AND HIGHLY DEVELOPED (UHD) LAND USE: Largely built-up areas where most of the land has been converted into commercial, industrial, or residential uses; though opportunities may exist for urban agriculture. It also includes parks, golf courses, and other developed open space. Typically, residential areas with less than one housing unit per one-to-two acres are not included in the NLCD developed classes. UHD areas are commonly found in and around cities and towns, but also may include distributed energy production (e.g. well pads or solar panels) and other rural industrial sites.

VERSATILITY: Versatility is the ability of land to support production of a wide range of crops. It is mainly assessed in terms of soil characteristics and climate. FUT's PVR value analysis uses NRCS soils data, the crop types listed in the Cropland Data Layer (2014-2018), and information about growing season length to determine versatility.

WOODLAND: Woodland is a new FUT category of agricultural land with primarily forested cover that is part of a functioning farm unit. Woodland acres are estimated based on Census of Agriculture data and mapped in forested areas that are contiguous to and no further than one tenth of a mile from nearby pastureland.

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FARMS UNDER THREAT

About American Farmland Trust

American Farmland Trust (AFT) works to save the land that sustains us by protecting farmland, promoting sound farming practices, and keeping farmers on the land. Founded in 1980, our research and advocacy have led to major advancements in both federal and state policy, ranging from enactment of the Farmland Protection Policy Act of 1981 to creation of multiple state-based farmland protection programs and a federal easement program that has invested over \$1.8 billion to-date in saving farmland.

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