



DYNAMIC

Solving 21st Century Environmental Challenges

THINKING



What is NREL?

Environmental challenges are highly complex. Addressing them requires diverse perspectives and expertise.

Conserving what sustains us and ensuring we can adapt to global change requires integrating social, ecological, and physical sciences to understand ecosystem dynamics in a changing world.

This is the focus of the Natural Resource Ecology Laboratory – dynamic thinking for dynamic systems.

The NREL is a productive mix of disciplines under one roof, facilitating integrated research for high impact outcomes; positioned to address multi-faceted environmental challenges.

The NREL team studies systems around the globe from tropics to tundra, villages to cities, microbes to humans. NREL scientists are actively working to understand climate change, ecosystem management, food and water security, wildlife management, and sustainable communities.

The Lab also studies how people learn science, emphasizing K-12 science and environmental literacy.



The NREL is at the forefront of developing strategies to create a more sustainable world where people's livelihoods and the natural systems they depend on coexist for the benefit of all.

NREL History

A long legacy and a bright future – the history of the Natural Resource Ecology Lab

The Natural Resource Ecology Lab is celebrating 50 years as a research institution.

Born out of a surge of ecosystem science propelled by the U.S. International Biological Program (1968-1974), the NREL was established at Colorado State University in 1967-68. It was one of the first research groups in the world to apply the burgeoning field of ecosystem science to real-world problems.

Since the beginning, the Lab has strived to bring together researchers with diverse knowledge to work on interdisciplinary teams addressing complex environmental problems facing natural resource managers. In the 1980s, the lab's researchers were among the first to begin incorporating humans as components of ecosystems and to bridge ecological and social sciences.

The Lab has expanded over the past five decades to perform research on every continent, from pole to pole, and study everything from organisms you can't see with the naked eye to large mammals, watersheds, whole regions, and the globe.

The Lab will continue to push the limits of our science to new frontiers in the coming decades with new and evolving technologies and theories, while bringing the latest science to bear on the environmental challenges facing society.

Notable Awards

NREL scientists include Fulbright Scholars, University Distinguished Research and Teaching Scholars, and Fellows in key professional societies, such as the American Association for the Advancement of Science, Ecological Society of America, American Geophysical Union, and Soil Science Society of America

Dr. Keith Paustian, Dr. Stephen Ogle, Dr. Kathy Galvin, and Dr. Dennis Ojima were acknowledged for their contributions to the Intergovernmental Panel on Climate Change that was awarded the 2007 Nobel Peace Prize

Dr. John Moore received the Eugene P. Odum Award for Excellence in Ecology Education from the Ecological Society of America

Dr. Dennis Ojima, shown right, received the Champion of the Environment Award from the government of Mongolia

Dr. Diana Wall received the Tyler Prize and is a Fellow of the American Academy of Arts and Sciences



RESEARCH AREAS

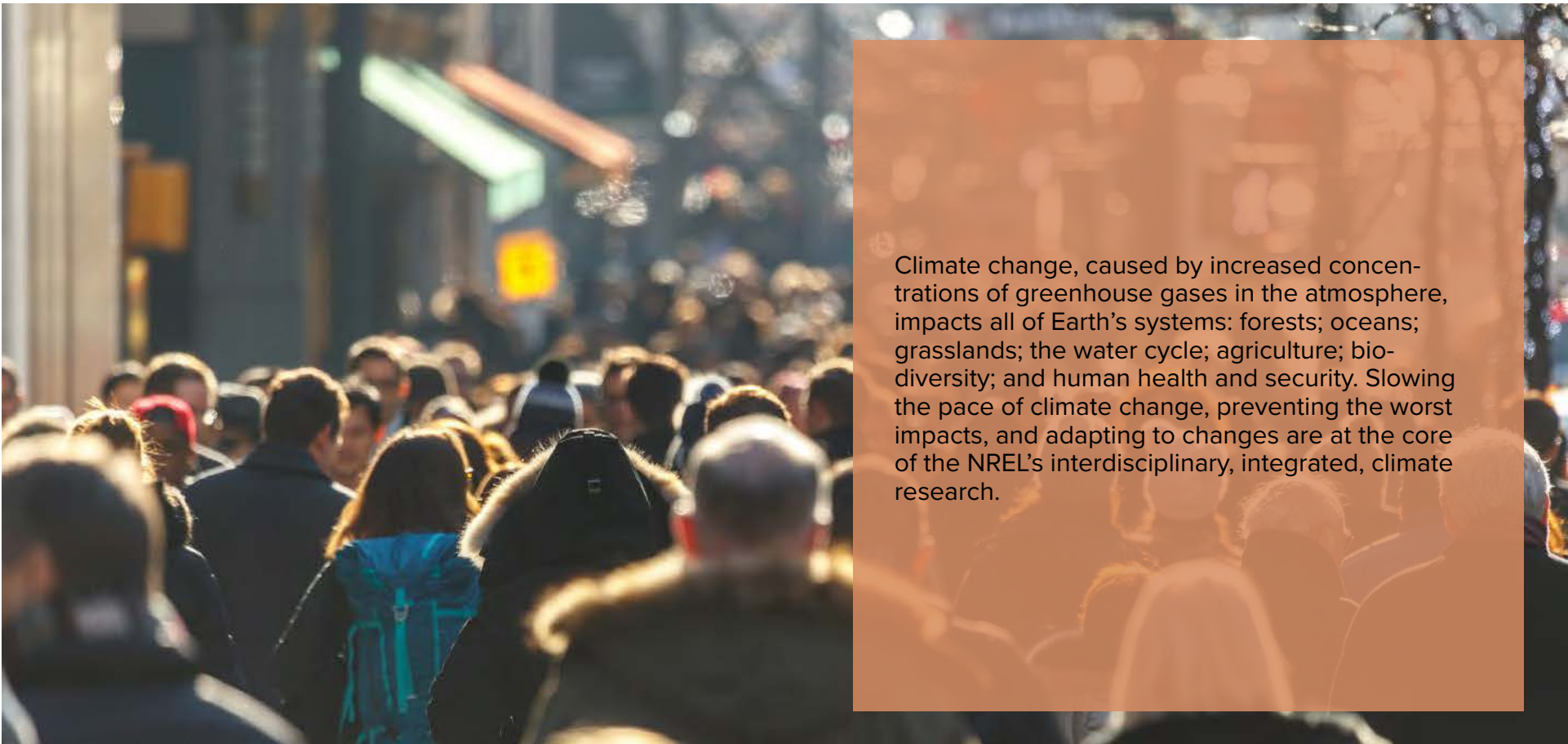
The Natural Resource Ecology Lab brings together diverse researchers to address complex environmental challenges facing society in the 21st Century.



Climate Change

Our greatest challenge – our changing climate.

Climate change is the greatest environmental challenge of the 21st century.



Climate change, caused by increased concentrations of greenhouse gases in the atmosphere, impacts all of Earth's systems: forests; oceans; grasslands; the water cycle; agriculture; biodiversity; and human health and security. Slowing the pace of climate change, preventing the worst impacts, and adapting to changes are at the core of the NREL's interdisciplinary, integrated, climate research.



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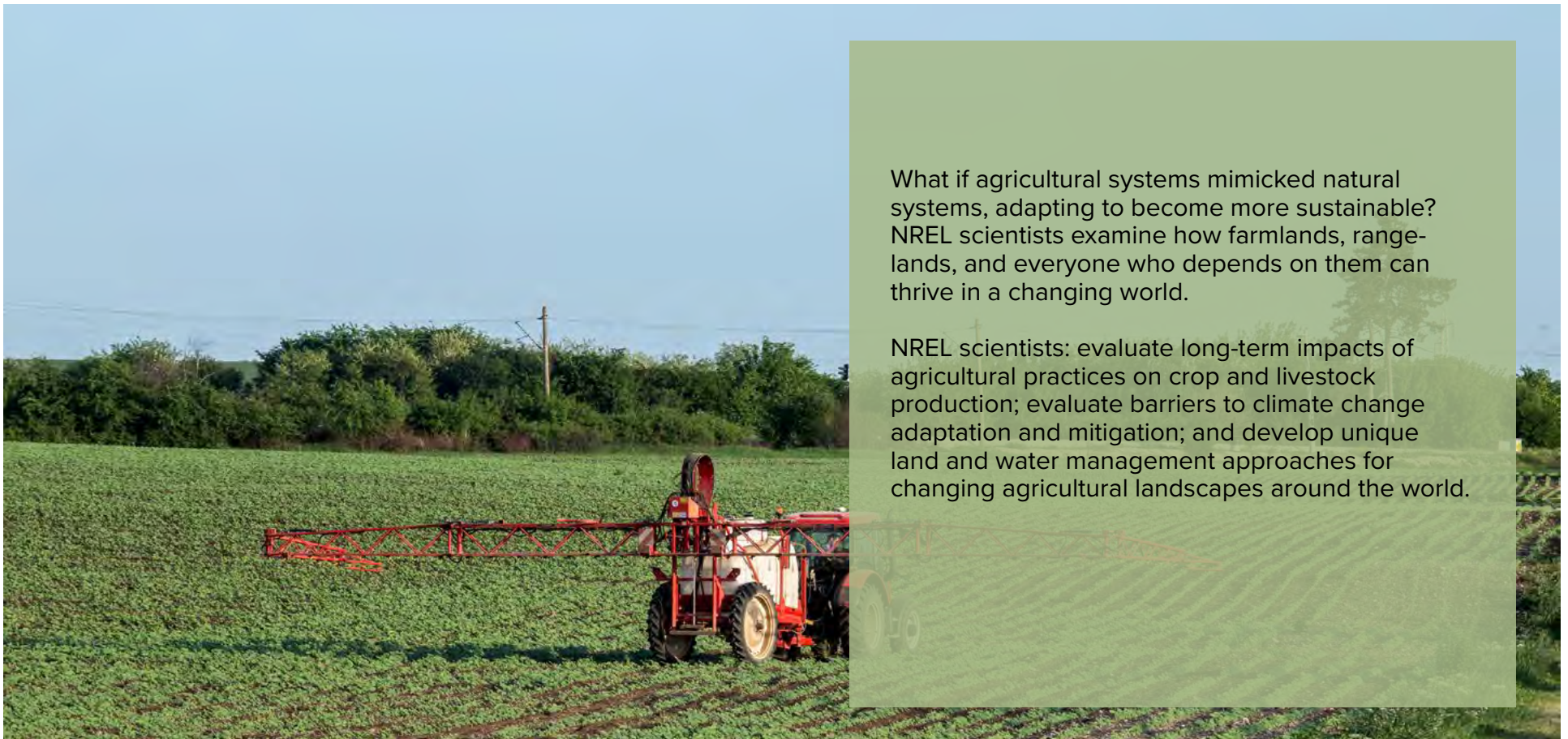
Minimizing environmental impacts of food production

Agriculture accounts for nearly 20% of global greenhouse gas emissions. **Dr. Keith Paustain** and **Dr. Stephen Ogle** are leading the way to evaluate these emissions and demonstrate the impacts of more sustainable production methods. This ongoing research influences policy such as the U.S. Farm Bill and enables state and local governments to develop programs that enable sustainable crop production.

Food Security

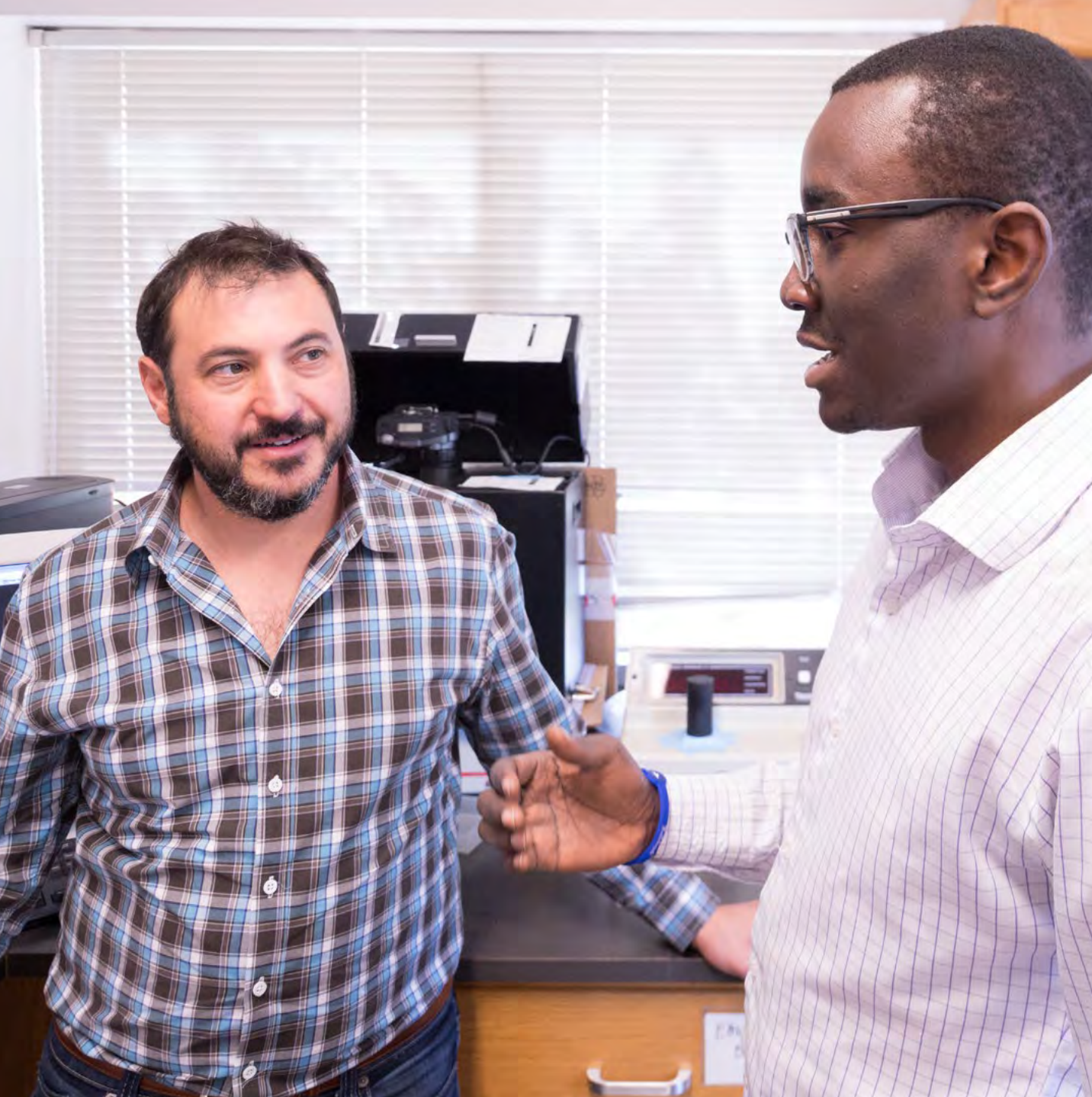
Feeding 9 billion people by 2050 – agriculture must adapt.

Food security ensures that everyone has access to affordable, nutritious food, while protecting the natural resources agriculture depends on.



What if agricultural systems mimicked natural systems, adapting to become more sustainable? NREL scientists examine how farmlands, rangelands, and everyone who depends on them can thrive in a changing world.

NREL scientists: evaluate long-term impacts of agricultural practices on crop and livestock production; evaluate barriers to climate change adaptation and mitigation; and develop unique land and water management approaches for changing agricultural landscapes around the world.



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New horizons for soil microbiology

NREL scientists **Dr. Matthew Wallenstein** and **Dr. Rich Conant** founded Growcentia, a start-up company dedicated to feeding the world. Their unique microbial cocktails increase plant yields by supplementing soils with microbes paired specifically to the plants farmers are growing, reducing the need for fertilizers that harm soils. They take sustainability to a new level by partnering with agricultural producers to turn production byproducts into soil amendments that increase soil capacity to store moisture. Shown here, left, Wallenstein talks with Soil and Crop Sciences doctoral student Peter Olayemi.

Water Security

Water is life. Water is scarce. Water security is critical.

Water security means everyone has adequate access to safe drinking water and ecological systems that depend on clean freshwater are protected.



Access to safe, reliable fresh water is threatened by overexploitation and contamination of streams, lakes, and groundwater around the world, particularly near urban centers and intensive agricultural operations.

Already scant supplies of freshwater are becoming increasingly difficult to utilize, particularly with increasing population.



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Wildfire impacts water security

Wildfires are a concern for communities in the Western U.S., but their impacts are felt long after the flames are extinguished. NREL scientists **Dr. Stephanie Kampf**, shown here, **Dr. Lee MacDonald**, and **Dr. Tim Covino** study the impacts of Rocky Mountain wildfires on water quality. They are measuring post-fire conditions and working with water and forest managers to prepare for future fires and to mitigate impacts to regional water supplies.

Sustainable Communities

Our resilience relies on sustainability.

Sustainable communities balance nature with societies' current needs while preserving resources for future generations.



Sustainability is a pressing concern for communities dependent on natural resources for economic stability and the support of growing populations. Human well-being is inextricably tied to the well-being of natural systems that support society. NREL scientists examine how human and natural systems interact, so they can develop strategies to protect human prosperity and nature simultaneously.



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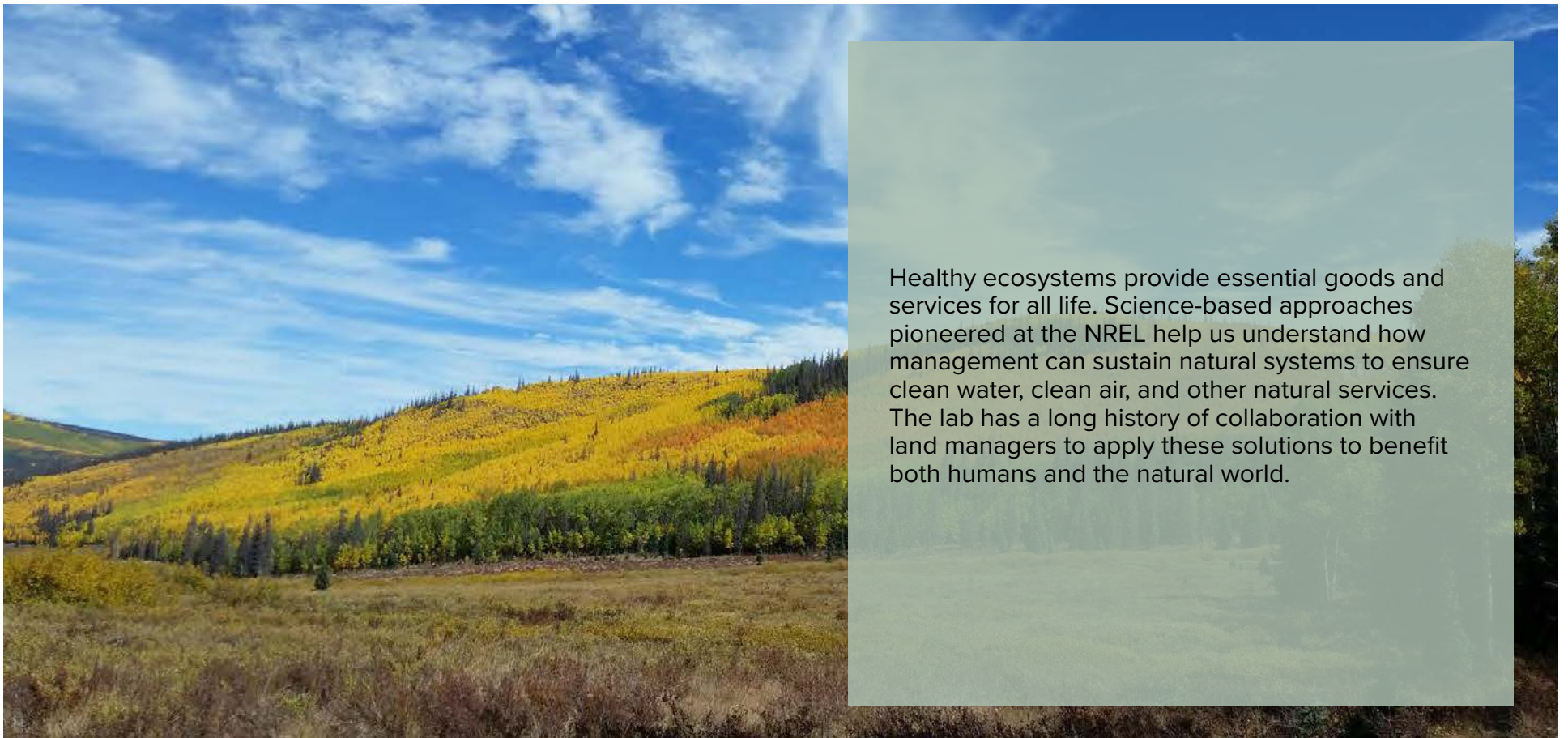
Sustainable livelihoods in Africa

NREL scientists **Dr. Randall Boone**, **Dr. Paul Evangelista**, **Dr. Kathy Galvin**, **Dr. Stacy Lynn**, and **Dr. Robin Reid**, shown here, study land management, wildlife, and livelihoods in East Africa. They work with communities to address water governance, wildlife conservation, and landscape fragmentation due to expanding urban centers, road networks, and other barriers to wildlife migration.

Ecosystem Management

Healthy ecosystems are key to life.

Ecosystem management is the practice of sustaining natural resources and ecological services for present and future generations.



Healthy ecosystems provide essential goods and services for all life. Science-based approaches pioneered at the NREL help us understand how management can sustain natural systems to ensure clean water, clean air, and other natural services. The lab has a long history of collaboration with land managers to apply these solutions to benefit both humans and the natural world.



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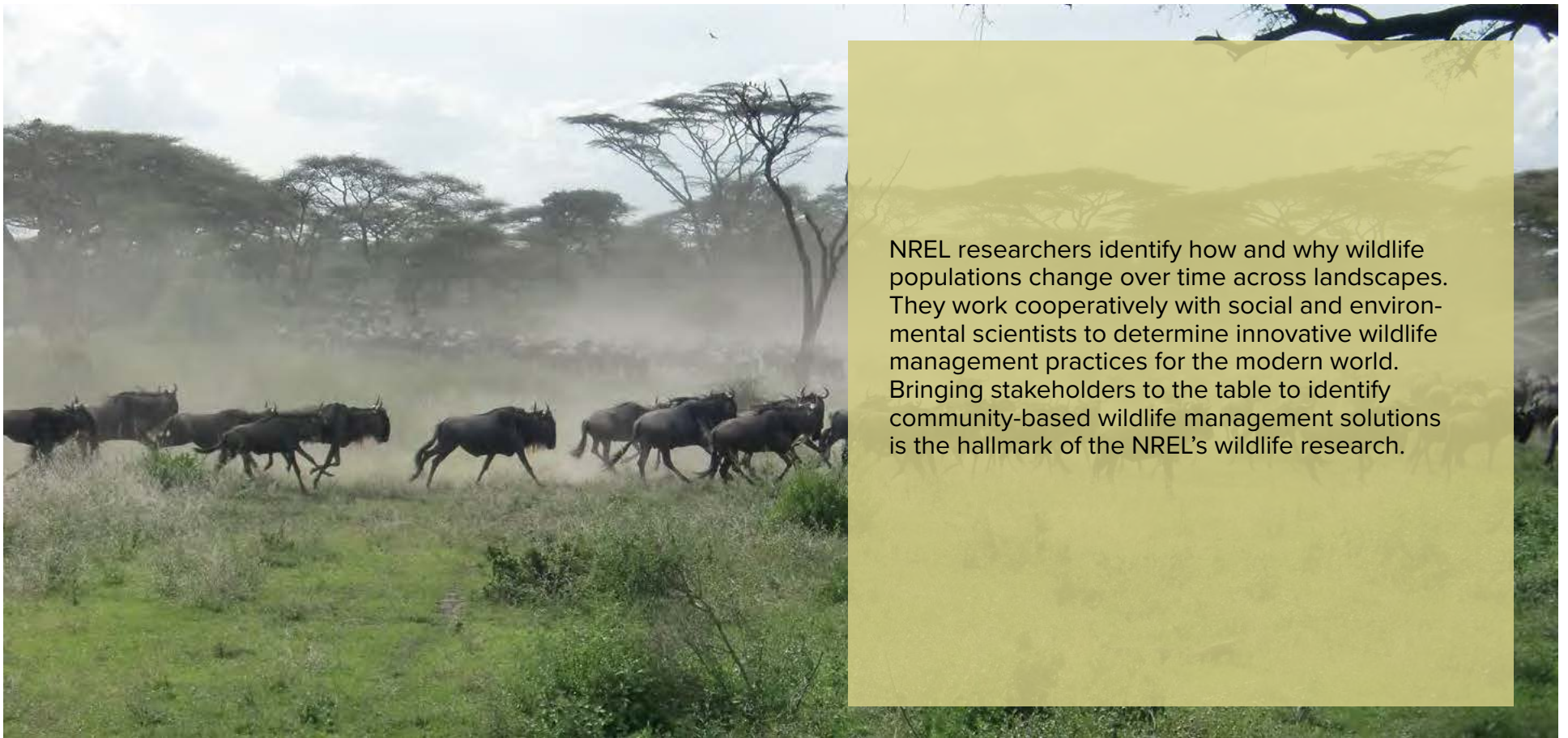
Indirect impacts on ecosystems

Emissions from farms and cities can affect nearby mountains and other natural systems. **Dr. Jill Baron**, shown here, has monitored the Loch Vale watershed in Rocky Mountain National Park for more than 30 years to understand regional air pollution impacts on mountain ecosystems. Her team's work has influenced air quality policies in Colorado.

Wildlife Management

Sustaining habitats for creatures big and small.

NREL scientists work with wildlife managers and stakeholders to develop creative ways to conserve and restore wildlife habitat.



NREL researchers identify how and why wildlife populations change over time across landscapes. They work cooperatively with social and environmental scientists to determine innovative wildlife management practices for the modern world. Bringing stakeholders to the table to identify community-based wildlife management solutions is the hallmark of the NREL's wildlife research.



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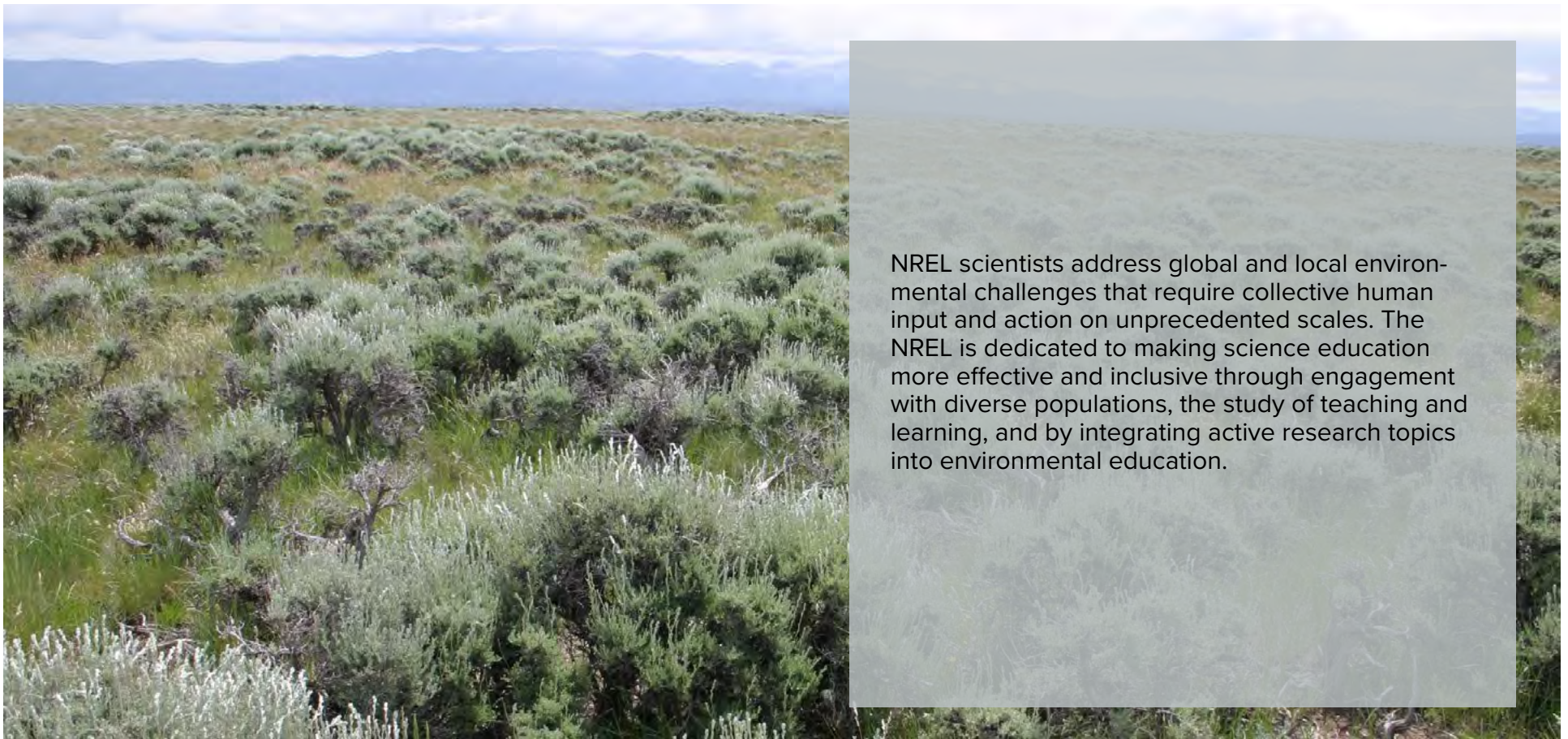
Sustainably managing wildlife populations

Dr. Tom Hobbs develops models to predict ungulate population dynamics in national parks to guide management decisions. These models determine how wildlife are affected by diseases like brucellosis in bison and chronic wasting disease in elk and deer. Wildlife managers rely on these models to maintain healthy wildlife populations in the parks.

Environmental Literacy

An informed and inclusive society can address environmental challenges.

Environmental science literacy is the capacity to participate in discussions and evidence-based decision-making.



NREL scientists address global and local environmental challenges that require collective human input and action on unprecedented scales. The NREL is dedicated to making science education more effective and inclusive through engagement with diverse populations, the study of teaching and learning, and by integrating active research topics into environmental education.



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Societal engagement in environmental science

NREL scientists support environmental science literacy through programs informed by their research on how people come to understand complex issues. NREL programs connect with diverse learners through cooperative engagement, citizen science initiatives, professional development workshops, and formal undergraduate and graduate degree offerings. Shown here, right, **Dr. Gillian Bowser** engages with students during a BioBlitz at Bandelier National Monument in New Mexico.

Join us. Help solve global challenges.

The Natural Resource Ecology Laboratory celebrates 50 years of ecosystem and watershed science in 2017-18. Join us to develop solutions to climate change, food security, water security, sustainable communities, ecosystem management, wildlife management, and environmental literacy. There are many ways to support the next frontier of our impactful science.

Student and Professional Development Fellowships

Fellowships help extend the research capacity of the lab and train a new generation of scientists to address the pressing challenges of the future.

Visiting Scholars

Visiting scholars and seminar speakers create opportunities for scientific exchange, learning, and discourse.

Endowed Research

Endowed positions elevate the prominence of our science and provide support in a shared area of interest between the scientists and donor. Attracting outstanding scholars contributes to our future research legacy.

Creative Research Groups

As environmental challenges become more complex and pressing, scientists must become more creative and work together to solve them. Funds for creative research groups allow the Lab to remain nimble while addressing ever-changing global challenges.

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CELEBRATING 50 YEARS

The **Natural Resource Ecology Lab** is housed within the Warner College of Natural Resources.

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