Our planet faces big challenges

- Will there be enough fresh water?
- Will we have enough food to eat?
- Will there be enough energy?
- Can we help develop cost-effective renewable energy supplies?

We're solving problems together.

Solving these problems takes time.

Solving these problems takes working together because these issues are complex and interconnected.

Finding the answers will help our grandchildren live in **a better world**.

With funding from the **National Science Foundation**, Kansas scientists are working together to address the grand challenges of renewable energy and potential climate change through a project called **Kansas NSF EPSCoR**.

Experimental **P**rogram to **S**timulate **Co**mpetitive **R**esearch

Science is:

- **asking** questions
- **gathering** data
- **being open** to new answers
- **creating** a process for change
- **communicating** what we know

“We are addressing the question: Can we do better?”

John Harrington, Professor of Geography, Kansas State University

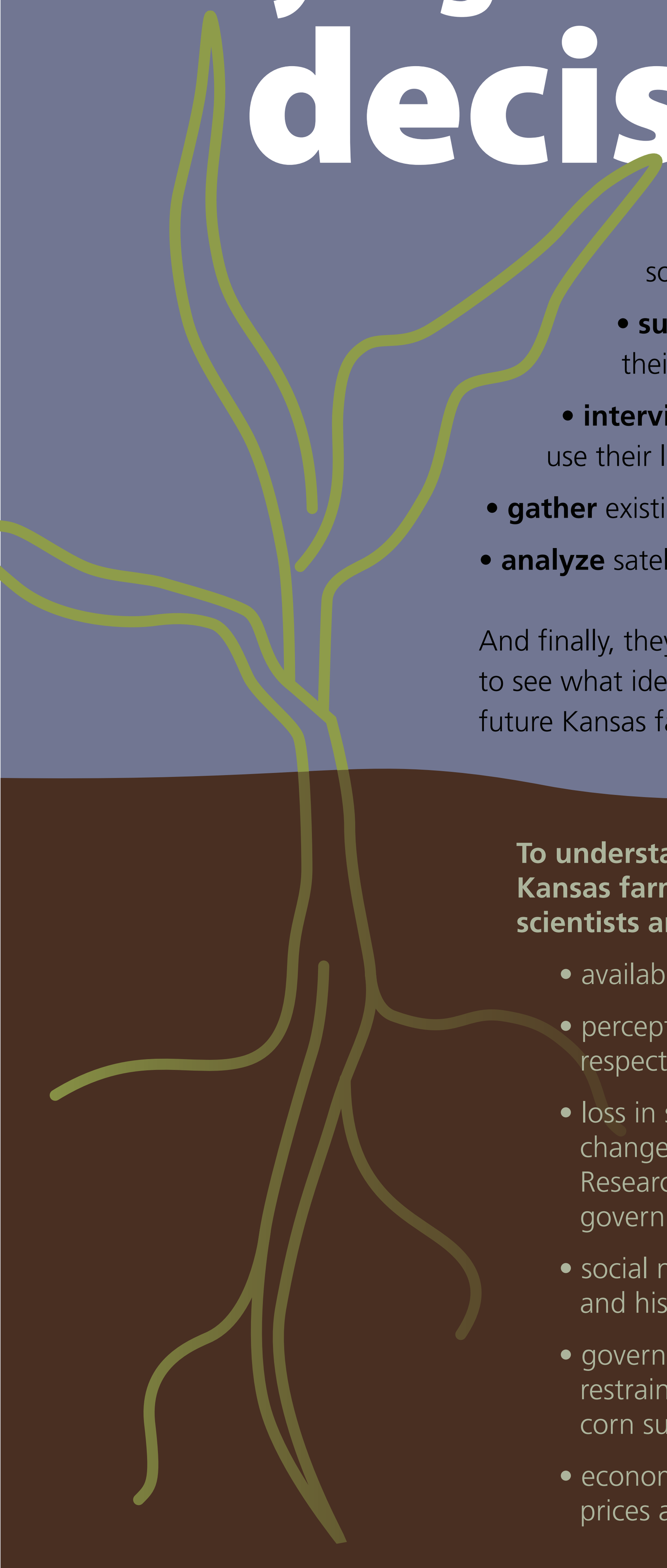
Nanotechnology for Renewable Energy group, making up nearly half of the Kansas NSF EPSCoR team.

The National Science Foundation supports **research that brings Kansas scientists together to solve complex issues of climate and energy**. The Kansas Experimental Program to Stimulate Competitive Research (EPSCoR) is a five-year project that began in 2009, with matching funds from the Kansas Board of Regents, the Kansas Technology Enterprise Corporation, Kansas State University, the University of Kansas, and Wichita State University.

This exhibit was designed and produced by Flint Hills Design in collaboration with Kauffman Museum.

Kansas NSF EPSCoR includes the BACC:FLUD (biofuels and climate change: farmers' land use decisions) team of over 20 scientists.

studying farming decisions



This team is largely made up of social scientists who:

- **survey** Kansas farmers about their crop choices
- **interview** farmers about how they use their land
- **gather** existing county level data
- **analyze** satellite imagery

And finally, they put all of this work together to see what ideas and patterns emerge about future Kansas farmscapes.

To understand the complex choices Kansas farmers make, the land use scientists are focusing on:

- availability of water
- perceptions of sustainability with respect to water and soil productivity
- loss in surface water quality due to change in land use (Conservation Research Program and similar government programs)
- social networks, farmers' values and histories
- government policies that promote or restrain certain land uses (for example, corn subsidies)
- economic factors such as food crop prices and biofuel crop prices.

science in numbers and words

Scientists study the natural and human world. Some focus on experiments that result in **quantitative information**—data presented in numbers. Others do studies that seek **qualitative information**—an understanding from words and stories.

Combining quantitative and qualitative research helps scientists make informed predictions about land use and the impact on water. We all discover more about our world when scientists ask different questions and search for answers in different ways.

Kansas EPSCoR research includes scientists from many different fields of study. They also represent different Kansas universities. Together they are learning how farmers make decisions to grow biofuel crops and their responses to potential climate change.

How many kinds of *scientists* can you find in the BACC:FLUD group?

Joe Aistrup, **Political Science**, K-State
Jason Bergtold, **Agricultural Economics**, K-State
J. Christopher Brown, **Geography**, KU
Marcellus Caldas, **Geography**, K-State
Dietrich Earnhart, **Economics**, KU
Steve Egbert, **Geography/Kansas Applied Remote Sensing**, KU
Johannes Feddema, **Geography**, KU
Jane Gibson, **Anthropology**, KU
Russell Graves, **Agricultural Economics**, K-State
Eric Hanley, **Sociology**, KU
Nathan Hendricks, **Agricultural Economics**, K-State
Jude Kastens, **Kansas Applied Remote Sensing**, KU
László Kulcsár, **Sociology, Anthropology and Social Work**, K-State
Eunmok Lee, **Kansas Applied Remote Sensing**, KU
Joane Nagel, **Sociology**, KU
Dana Peterson, **Kansas Applied Remote Sensing**, KU
Jeffrey Peterson, **Agricultural Economics**, K-State
Val Smith, **Ecology & Evolutionary Biology**, KU
Belinda Sturm, **Civil, Environmental, and Architectural Engineering**, KU
Stacey White, **Architecture, Design & Planning**, KU

Kansas EPSCoR scientists are collecting local data on surface temperature and irrigation practices across Kansas. They are looking for **broad climate trends**, **what the trends mean**, and their **impact on future decisions**.

climate and our future...

The Kansas studies are important because they are directed at the scale of decision making by Kansas residents and will provide locally relevant information.

mitigation
mit-i-gey-shun

noun
efforts to decrease the impact, lessen the force, or make something less severe

“By understanding how drought, changes in weather patterns, changes in climate affect cropping systems, we will help buffer the Kansas economy and agricultural community to changes in weather or climate.”

Chuck Rice
University Distinguished Professor of Soil Microbiology,
Kansas State University

Climate scientists have been collecting data over the last century documenting an increase in temperature for many measurement points around the world.

information data change

so what do we do?

science can inform our choices

is the Kansas climate changing?

Kansas Average Annual Temperatures and Rainfall

data from National Climate Data Center (1895-2011)

"The sun's energy is the singular solution for our increasing energy needs."

Judy Wu
University Distinguished Professor of Physics and Astronomy,
University of Kansas

Every year, we use the equivalent of one hour's worth of the sun's energy. Imagine what we could do if we could collect even a small portion of that clean, renewable resource. That's a challenge that Kansas NSF EPSCoR scientists are working to solve.

growing our own energy!

Kansas EPSCoR researchers developed the first protein-based solar cell.

MspA is an inexpensive bacterial protein that grows easily in sunlight. When mixed with other ingredients, MspA collects solar energy in a process similar to photosynthesis in plants. It becomes a solar cell when light is converted to electrons and electricity.

The goal is to "grow" this solar cell anywhere there is sunlight. Growing our own energy locally means we can reduce manufacturing and shipping costs. MspA solar cells are truly "green" energy.

Stefan Bossman,
Professor of Chemistry at
Kansas State University
whose group is exploring
protein based solar cells.

Photo from K-State Divison of
Communications and Marketing

new directions with nano-technology

We are using up many of the Earth's easy to access energy resources. Solar offers the potential to create renewable local energy supplies. Kansas EPSCoR scientists say that the next generation of solar energy capture depends on nanotechnology.

How do explore something you can't see?

In the last one hundred years physicists have been studying particles that are too small to be seen by the naked eye. Now Kansas EPSCoR researchers are applying that knowledge of nanotechnology to develop new and cost-effective ways to collect renewable energy.

The team is working with nanocomposite materials for high-performance, low cost conductors for solar cells. Because Kansas has abundant resources for solar energy, innovations in nanotechnology can have a high impact on the economy of Kansas.

Graduate students Rose Emergo, Los Baños, Philippines (left) and Hua Zhao, Harbin City, China, research nanotechnology at the University of Kansas.

Photo courtesy Lawrence Journal-World

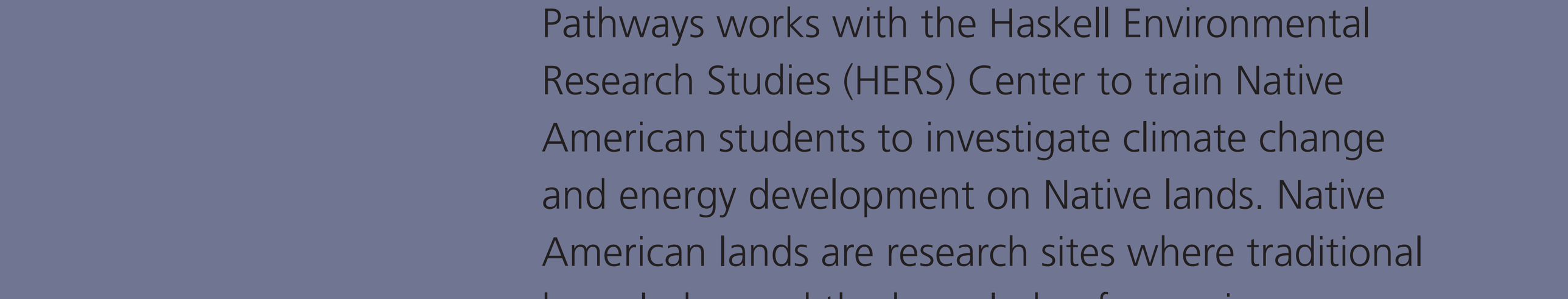
Climate change is altering the landscapes and lifeways of many Native communities. Kansas EPSCoR created the Pathways program to expand the Native American science and technology workforce. ***Pathways* is one step to build the next generation of STEM leaders.**

pathways to STEM

Science **T**echnology **E**ngineering **M**athematics

STEM workers **investigate big problems** and **generate new solutions**.

Pathways works with the Haskell Environmental Research Studies (HERS) Center to train Native American students to investigate climate change and energy development on Native lands. Native American lands are research sites where traditional knowledge and the knowledge from science can be integrated to help solve the climate challenge.



Students and faculty at the HERS Institute Summer 2011.

new paths to advanced degrees

Want to help solve the challenges of the future?

Science, technology, engineering and mathematics need our best and brightest students. The STEM pathway is open to everyone, including students from populations that are underrepresented in the STEM workforce today.

STEM students address global challenges by asking questions, collecting data, sharing ideas, building new intellectual models of the way things can be.

Another sentence about native students using their new knowledge, along with traditional knowledge, to help their people.

You can study science too!

Kansas is leading the way in climate and energy research. If you're inspired, you can study at one of these Kansas schools.

Haskell Indian Nations University

- was established in 1884
- is open to all college students from federally recognized tribes
- enrolls over 1,000 students each semester
- serves as a community training ground for next generation of Native American leaders

HERS (Haskell Environmental Research Studies)

- summer internship program prepares tribal college students for scientific and technical careers
- research that draws on knowledge from Native locales and peoples
- strategies for responding to climate change in Native communities and our world

Baker University
Benedictine College
Bethany College
Bethel College
Butler County Community College
Central Christian College
Emporia State University
Fort Hays State University
Friends University
Haskell Indian Nations University
Hesston College
Johnson County Community College
Kansas State University
Kansas Wesleyan University
Manhattan Christian College
McPherson College
MidAmerica Nazarene University
Newman University
Ottawa University
Pittsburg State University
Southwestern College
Sterling College
Tabor College
University of Kansas
University of Saint Mary
Washburn University
Wichita State University

Experimental

Program to

Stimulate

Competitive

Research

globalization

science

synthesis

adaptation

stewardship

opportunity

collaboration

mitigation

interconnectedness

sustainability

data

stories

climate

questions

variability

pathways

complexity

research

conservation

knowledge

energy

Biofuels And Climate Change: Farmers' Land Use Decisions

Kansas Applied Remote Sensing

Photo from K-State Divison of Communications and Marketing

“Thunder is good, thunder is impressive; but it is lightning that does the work.”

Mark Twain, Letter, 8/28/1908

climate stories

adaptation

Photo from K-State Divison of Communications and Marketing

“This entire process involves biology, chemistry, physics and engineering.”

Judy Wu, physicist,
University of Kansas

Nanotechnology for Renewable Energy

“STEM jobs are the jobs of the future.”

US Department of Commerce,
July 2011

Science
Technology
Engineering
Mathematics

Haskell Environmental Research Studies

National Science Foundation

Photo by Larry Schwarm, Emporia State University

“Everyone believes we can do better, so let’s find ways to do better through science.”

Ken Klabunde, chemist
Kansas State University

“Cold! If the thermometer had been an inch longer we'd all have frozen to death.”

Mark Twain and I, Opie Read

research data

record low

“Climate is what you expect, weather is what you get.”

Robert Heinlein, 1973

Climate Change and Mitigation

opportunity

complexity

collaboration

sustainability

interconnectedness

stewardship

knowledge

have you seen any *armadillos* lately?

As some plants slowly move out of Kansas, others are moving in. Over the last 20 years Kansas has seen a considerable increase in the number of armadillos roaming the land (and unfortunately highways!).

Although historically more common in Oklahoma and Texas, armadillos are being found in Southern and Central Kansas quite frequently.

.... collecting data

Scientists position data collector towers like the one shown above all around the state (and world!) to learn about the climate.

Sensors like this one can be programmed to take a reading every five minutes and save that data to a massive database.

Then scientists take this collection of readings from across the region, and compile it to create charts such as the one below:

credit

Wireless Vantage Pro2 Weather Station
Davis Instruments

climate change **Dangler**

4" x 10"

Will
cottonwoods
grow here in the **future**

The cottonwood became the official state tree of Kansas in 1937.

Can you imagine...
...Kansas without the cottonwood tree?

energy **Dangler**

4″ x 10″

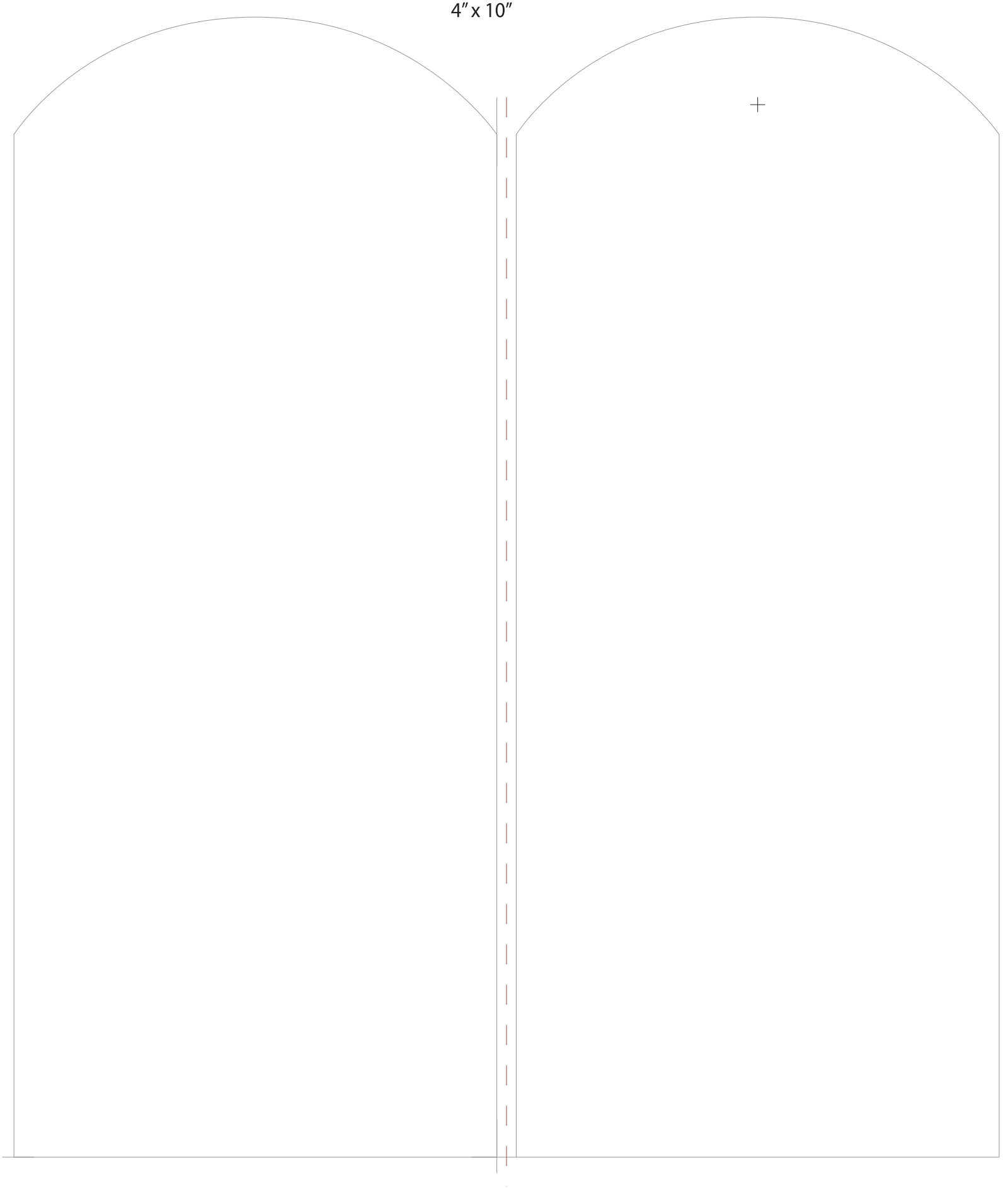
Nanotechnology is science and engineering that works with systems as small as a Rhinovirus (cause of the common cold).

nanometer: one billionth of a meter
Your DNA is 10 nanometers wide.
A human hair is roughly 50,000 nanometers thick.
More than 100 million nanometer dots can fit into the period at the end of this sentence.

"We really need breakthrough technology to speed up use of solar energy."
Judy Wu, physicist, University of Kansas

climate change **Dangler**

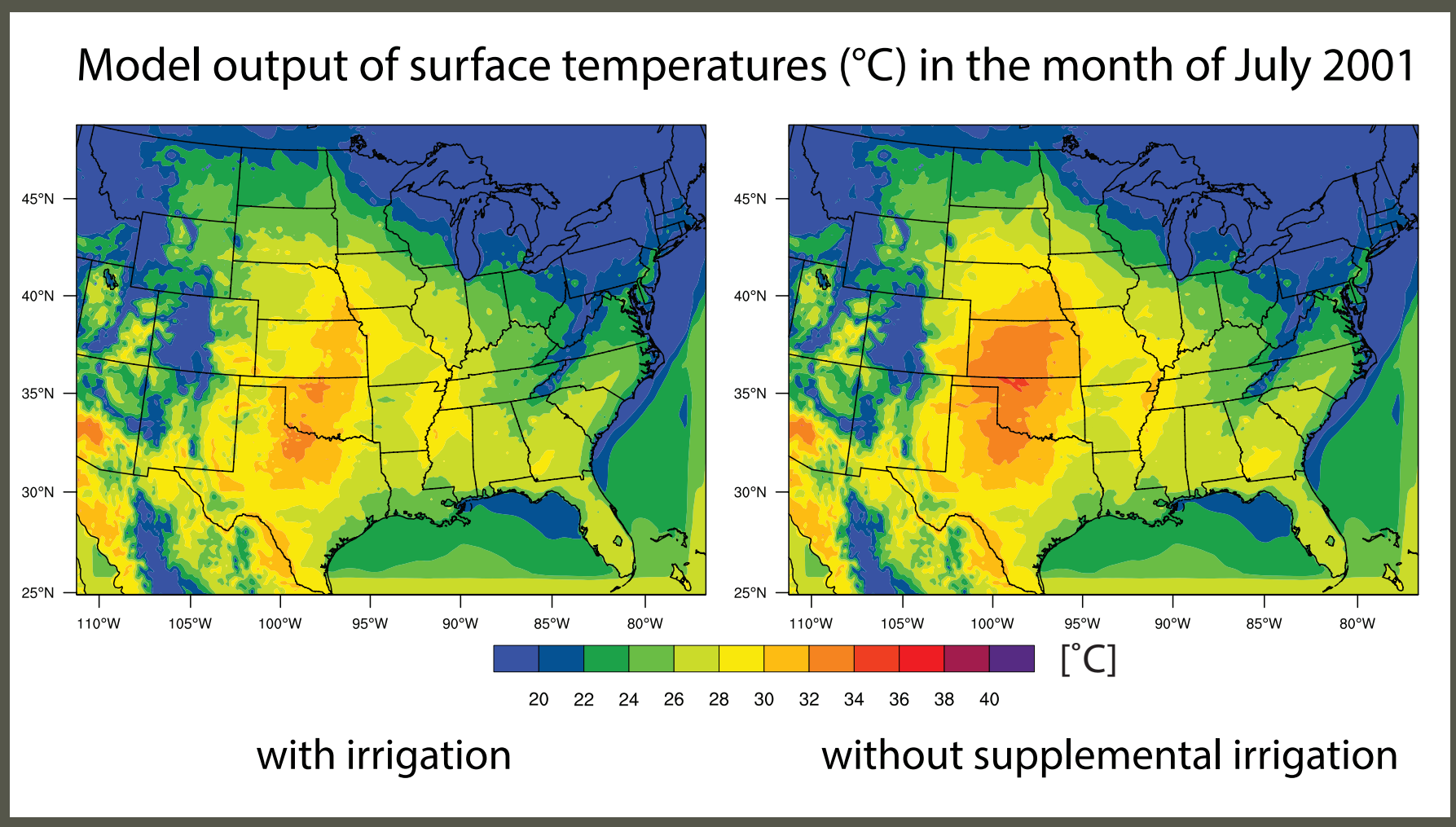
4″ x 10″



irrigation

Research by Kansas EPSCoR has shown that irrigating agricultural crops will cool surface temperatures during warmer months.

Thus irrigation could be concealing evidence of climate warming in our state. Since irrigation water comes from a limited ground water supply, EPSCoR research will provide information to predict how summer temperatures could rise when irrigation slows down.



Huber, D. B., D. B. Mechem, and N. A. Brunsell, 2012: *Effects of Great Plains irrigation on regional climate*. Theor. Appl. Climatol., in review.

Now Kansas EPSCoR are using computer modeling to extend our understanding of climate changes. The EPSCoR team is comparing irrigated areas with an area that hasn't been irrigated. They are finding that as temperatures are lowered in the irrigation area, precipitation increases downstream.

A deeper understanding of the interaction of climate and farming practices might help mitigate the impact of climate changes.

Kansas Department of Agriculture

1 in 5 Kansans

work in jobs related to agriculture and food production.

“June is becoming like July

1

hour

Every year, we use the equivalent of one hours worth of the sun's energy.

“We don’t have a single brain to waste.

Dr. Michael S. Brown,
Nobel Prize winner
for medicine

“Fortunately, tribal elders possess world views and lifeways including technologies closely tied to unique environments where they have lived.

Dan Wildcat

Kansas current annual fossil fuel and nuclear energy consumption

solar energy that falls on Kansas in one year

Enough solar energy falls on Kansas each year to provide about 1,000 times our annual, current fossil fuel and nuclear energy consumption.

The challenge is to harvest this clean, renewable energy resource.

KSU Engineering Extension Service

“what humankind actually requires is a climate change – a cultural climate change, a change in our thinking and our actions”

Dan Wildcat, Haskell Indian Nations University

climatology

noun

the scientific study of general weather conditions for a location averaged over a period of time

no-till farming

adjective & noun

a system for planting crops

- no plowing
- herbicides for weed control
- reduced soil erosion
- preservation of soil nutrients

holistic systems design

adjectives & noun

bringing together researchers from different fields to solve real science problems

bio-based materials

adjectives & noun

new materials produced from plant sources which means that they are renewable and often biodegradable

qualitative analysis

adjective & noun

using scientific information
expressed in words and stories

land-cover mapping

adjective & noun

using satellite images to show how land is covered (grassland vs. cropland) and used (crop types and irrigation)

indigenous realism

adjective & noun

the idea that Native American traditions can return us to a balanced relationship with nature

BJ is a member of the Kansas EPSCoR team that **interviewed 151 Kansas farmers** in the summer of 2011. As a cultural anthropologist, he is trained to do fieldwork in which he participates in the social life of the group he is studying. BJ's background in participant observation prepared him to conduct face-to-face interviews with farmers.

BACC:FLUD team members are studying use of the High Plains aquifer in an effort to learn if farmers are depleting the water source at a faster rate than it can recharge and to learn how irrigating affects farmers' decisions about their crops.

Many farmers in western Kansas do not show concern about the depletion of water resources. Instead they continue to draw down the High Plains aquifer at rates that dramatically exceed recharge.

BJ continues to analyze the interviews for insights into the factors that influence farmers' decision-making regarding land and water use, and biofuel crops, as well as how technology shapes their outlook for the future. Specifically BJ is investigating how farmers are embedded in networks of institutions, people and technologies that extend and constrain their ability to control their approach to farming. This **qualitative analysis** provides valuable insights that can be used to develop theories to explain agricultural decision-making in uncertain times.

Photo by Larry Schwarm,
Emporia State University

“Kansas is a
fantastic state
for research”

name **Benjamin J. (BJ) Gray**

Graduate Research Assistant, University of Kansas

education M.A., anthropology, University of Kansas
B.A., anthropology, Rollins College (2007)

bio BJ Gray is a doctoral student in the Department of Anthropology at the University of Kansas. Originally from Orlando, Florida, BJ has always been interested in agriculture and the plains region.

He is studying how technology influences farmers' decision-making and how the diminishing water resources in western Kansas affect agriculture and communities. Kansas is a fantastic state in which to do this research because the landscape, water availability, and types of farming change from one side of the state to the other, providing BJ with an opportunity to compare decision-making in different contexts.

research interests

agriculture

decision-making

resource usage and preservation, technology

grasslands of the Flint Hills region, 2005

terracing in South Central Kansas, 2008

cropland of Eastern Kansas, 2005

Dana Peterson serves as a Geographic Information Systems Coordinator for Kansas EPSCoR. She works with other scientists at the Kansas Biological Survey to develop geographic data.

Dana uses images acquired by satellites that are more than 400 miles above the earth's surface. From those satellite images she develops geographic data depicting vegetation types like forests and grasslands and crop types like corn, soybean, and wheat.

Mapping irrigated lands is part of a land use/land cover (LULC) database developed as part of Kansas EPSCOR. The LULC time-series will show dominant crop types and irrigation status for the years 2000-2013.

EPSCoR research combines knowledge about land use and land cover with climate, soil, topography and other geographic information to help us **understand how Kansas farmers make decisions** about their farms.

you can learn more about land cover mapping with the large flip book on the table!


OLOGICAL
THE UNIVERSIT

name **Dana L. Peterson**

Research assistant, Kansas Applied Remote Sensing Program, University of Kansas

education M.A., Geography, University of Kansas (1999)
BGS, Environmental Studies, University of Kansas (1996)

"While attending the University of Kansas, I discovered my passion for the environment. I earned degrees in Environmental Science and Geography, and I specialized in Geographic Information Science. My education allows me to try and solve environmental problems by studying them in the real world.

research interests

land cover mapping and analysis

watershed quality and condition modeling

other ecological and agricultural applications using multi-temporal satellite imagery

By using geographic information, I can explore and discover environmental interactions that may be otherwise hidden, and I have the tools to help make informed decisions about our natural resources in Kansas."

- Dana Peterson

Chuck is one of five team leaders for the Kansas EPSCoR project. His team is using climate modeling tactics to predict the effects of climate change and develop **strategies for adaptation and mitigation**.

Chuck's research focuses on **carbon sequestration**—the process of transforming carbon in the air (CO2) into stored soil carbon. Carbon sequestration reduces CO2 in the atmosphere, thus reducing its contribution to global warming.

Kansas agricultural producers can participate in the carbon sequestration process.

Farming practices that enhance carbon sequestration include:

- no-till or reduced till
- eliminating summer fallow which increases crop rotation
- conservation efforts that reduce soil erosion
- planting cover crops or high residue crops such as corn, grain sorghum, and wheat.

Likewise, managers of grazing land can increase carbon sequestration by:

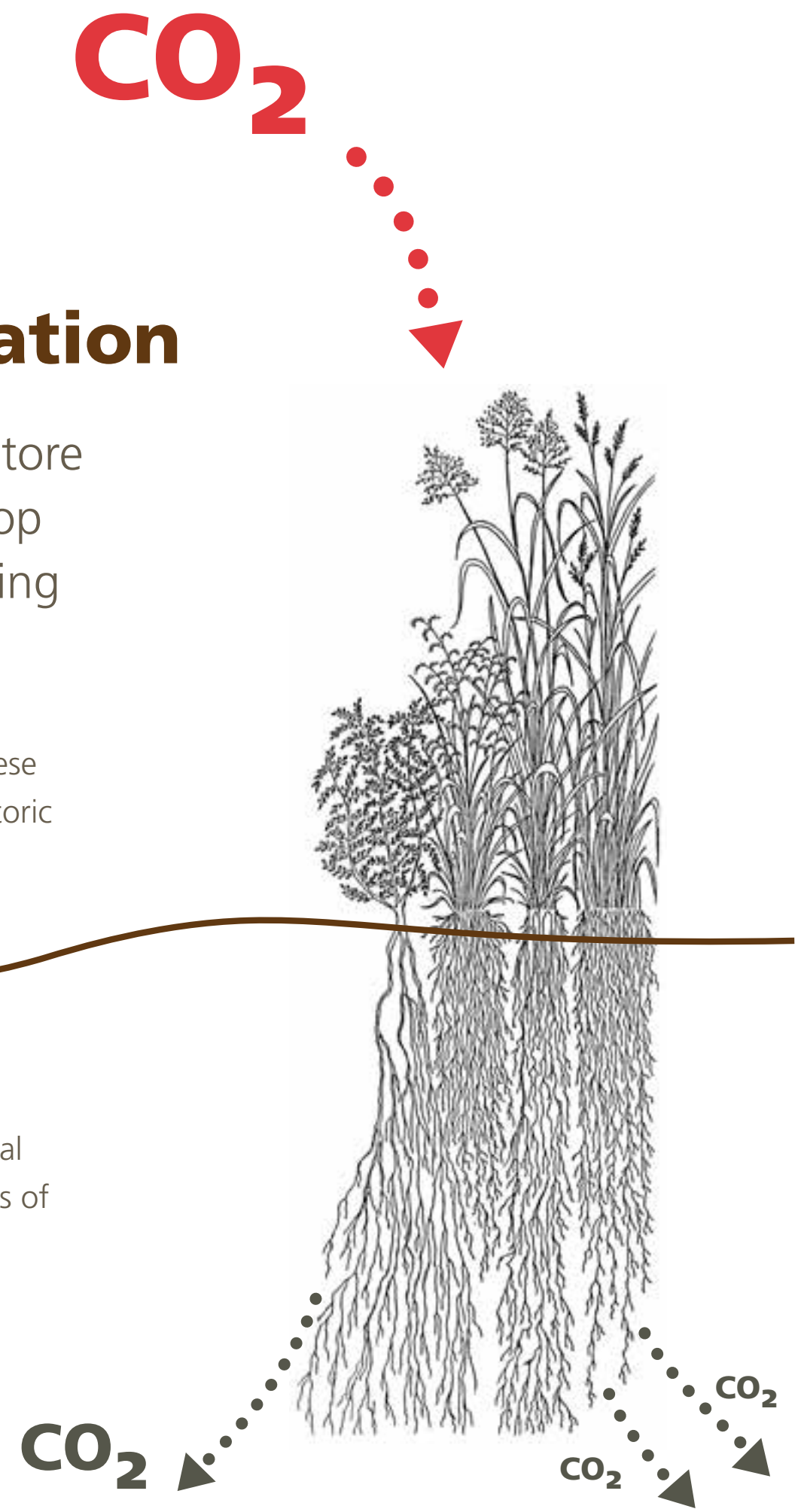
- improving forage quality
- using prescribed burning to increase forage productivity
- reducing overgrazing.

carbon sequestration

Increasing a soil's capacity to store carbon results in increasing crop productivity as well as enhancing soil, water, and air quality.

Kansas EPSCoR is studying the benefits of these cost-effective management practices and historic land use practices.

Evaluating and predicting the biological and ecological consequences of accelerating global climate change is one of the grand challenges of Kansas EPSCoR research.



Dr. Chuck Rice, Professor of Agronomy, Kansas State University, studying a soil sample. This sample is one of thousands taken each year by Dr. Rice and his team of researchers as they study the effects of irrigation on climate change.

Photo by Dan Donnert

name

Dr. Charles W. Rice

University Distinguished Professor of soil microbiology, Kansas State University

education

Ph.D., soil microbiology, University of Kentucky (1983)
M.S., soil science, University of Kentucky (1980)
B.S., geography & natural environmental systems, Northern Illinois University (1977)

bio

Rice is a member of the United Nations' Intergovernmental Panel on Climate Change that received the Nobel Peace Prize in 2007.

Rice's research has been supported by grants from the U.S. departments of Agriculture and Energy, National Science Foundation and others. He is director of the Consortium for Agricultural Soils Mitigation of Greenhouse Gases. In addition to his involvement in research and teaching in soil microbiology at K-State, Rice has been active with the Soil Science Society of America, where he is president-elect. He currently serves on the National Academies Board on Agriculture and the U.S. Department of Agriculture's Agricultural Air Quality Task Force. He chairs the Commission on Soils, Food Security and Public Health of the International Union of Soil Sciences. He is a Fellow of the Soil Science Society of America, American Society of Agronomy and the American Association for the Advancement of Science.

research interests

soil microbial ecology

carbon and nitrogen cycling in terrestrial ecosystems

soil quality

This research will provide valuable information for understanding the adaptations famers will make regarding land use, water resources, and biofuel crops.

To improve our understanding of climate change in relation to Kansas farmlands, Kansas EPSCoR researchers are asking:

- What factors influencing agriculture, resources, and biodiversity are sensitive to climate change?
- How could changes in climate intensify or relieve stress on agriculture, resources and biodiversity?

EPSCoR scientists are working together to:

- **analyze** past climate change and extreme events as well as crop yield data
- **use** crop measurement and remote sensing methods to assess changes in land cover and land use
- **create** crop simulation models to predict the impacts of climate variability.

Palmer Drought Severity Index for Kansas

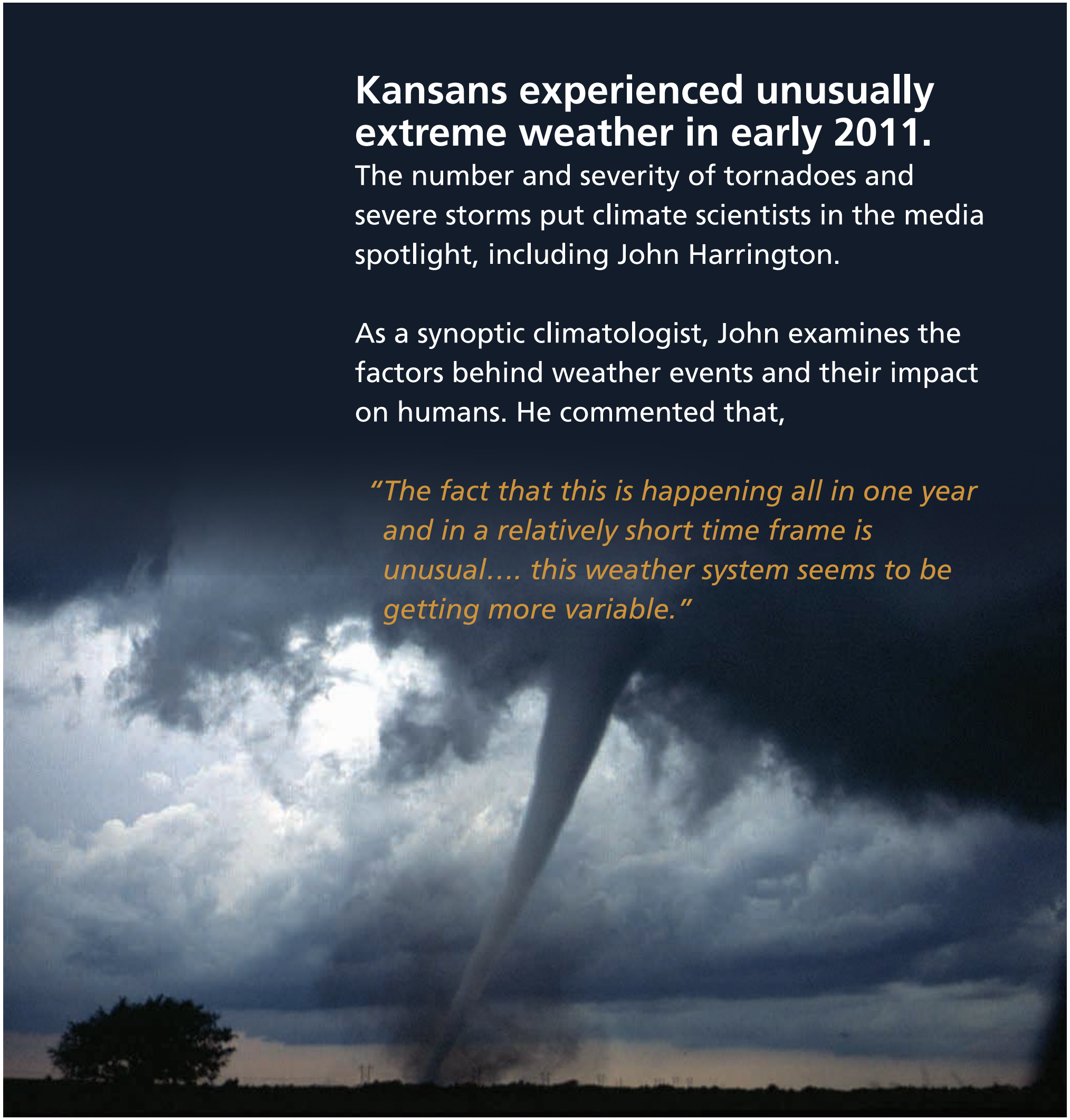
Data were obtained from the National Climatic Data Center

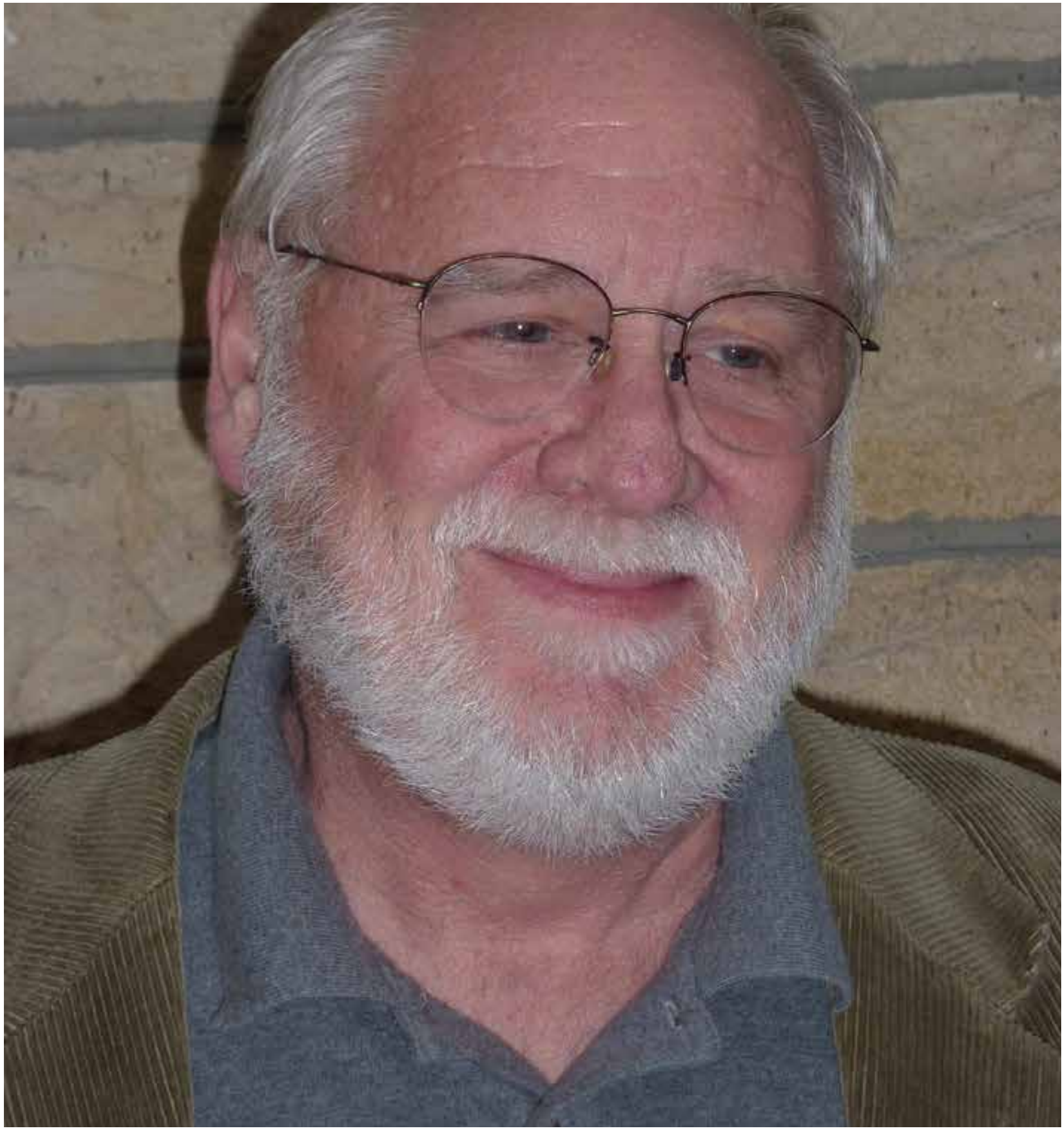
Kansans experienced unusually extreme weather in early 2011.

The number and severity of tornadoes and severe storms put climate scientists in the media spotlight, including John Harrington.

As a synoptic climatologist, John examines the factors behind weather events and their impact on humans. He commented that,

"The fact that this is happening all in one year and in a relatively short time frame is unusual…. this weather system seems to be getting more variable."





name

Dr. John A. Harrington, Jr.

Professor of geography, Kansas State University

education

Ph.D., Geography, Michigan State University (1980)
M.A., Geography, University of Minnesota (1974)
B.S., Geography, Michigan State University (1972)

bio

Dr. Harrington's research interests in remote sensing and GIS led to his work with the USDA ARS National Agricultural Water Quality Laboratory on the scientific relationships behind the use of satellite imagery to estimate surface water quality. During the Sahelian drought in the late 1980s, Dr. Harrington worked with the Livestock Ministry in Niger to help set up a capability to map production of the annual grasslands. Dr. Harrington's team established the first operational GIS in Niger.

research interests

climate of the Great Plains

synoptic climatology

climate classification

climate change

human dimensions of global change

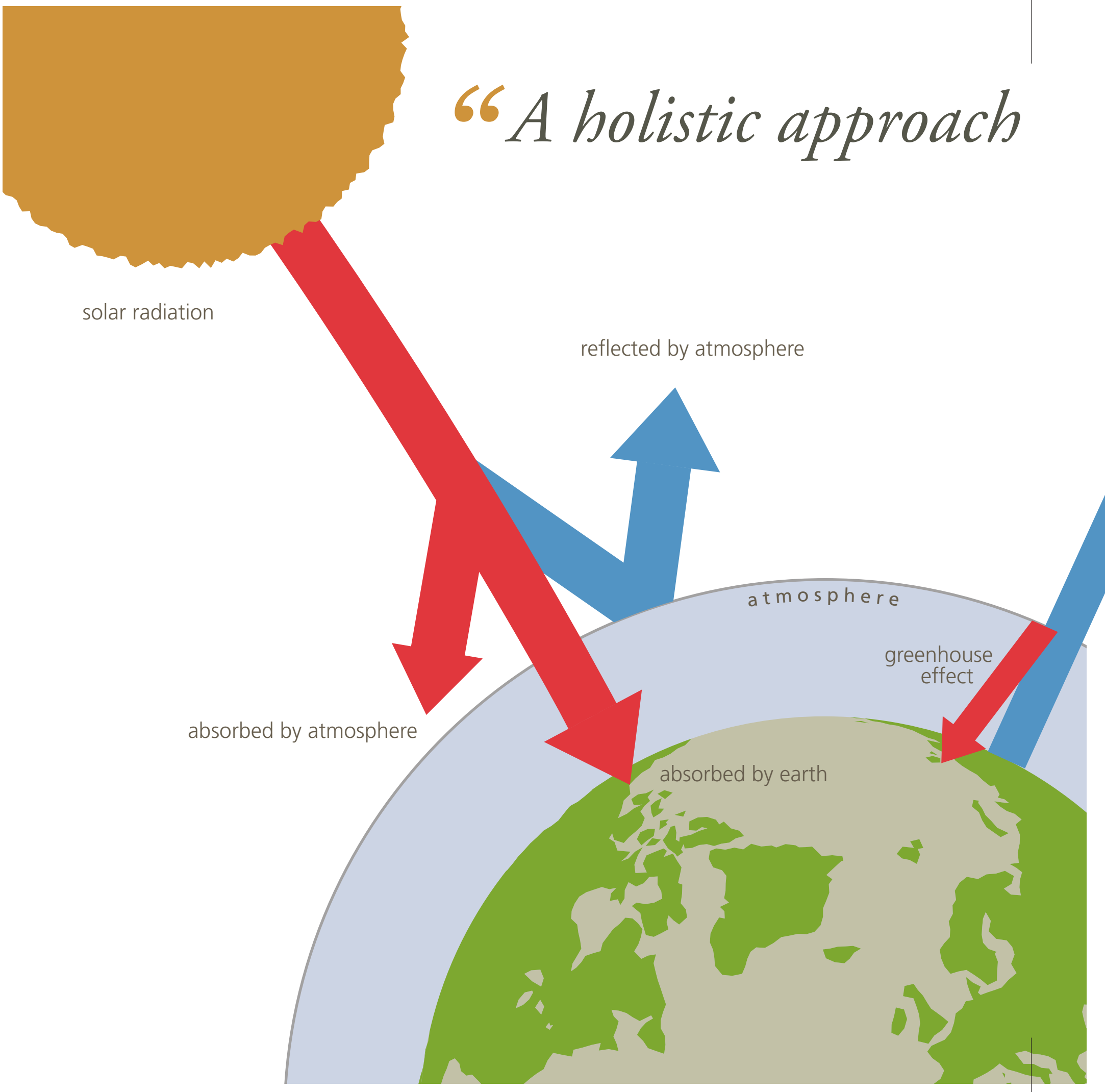
ecological climatology

natural resource applications of remote sensing and GIS

Dr. Harrington came to KSU in 1994 after serving on the faculty at the University of Oklahoma, the University of Nebraska, New Mexico State University, and Indiana State University. Since coming to Kansas, he has been an active contributor to the Natural Resources and Environmental Sciences Secondary Major at K-State, served as department head in geography for 6 years, and served for 3.5 years as the Chair of the All-University GIScience Steering Committee. Dr. Harrington has contributed to a number of multi-university research projects, including GCLP [Global Change in Local Places], HERO [Human Environment Regional Observatory], Ecoforecasting, and the Climate Change Education Partnership.

align from this edge »
needs to match up with other graphic panel!

“A holistic approach



to energy capture and conservation”

Ken is researching better ways to get hydrogen fuel from water using solar power. In the past, efforts to use solar energy to split water into hydrogen and oxygen produced only very low yields of hydrogen. Ken’s team is experimenting with nanoscale chemistry techniques to gain more active sites per unit. More sites would increase the energy output. His team is also working to use visible as well as ultra-violet light energy of the solar system.

A Kansas EPSCoR goal is to apply this nanotechnology research to real-world energy challenges. The Klabunde Group foresees a time when small, localized hydrogen generators will provide heat and electricity for homes and businesses. On-site energy production will utilize renewable solar power and eliminate the need to transport large volumes of fuel.

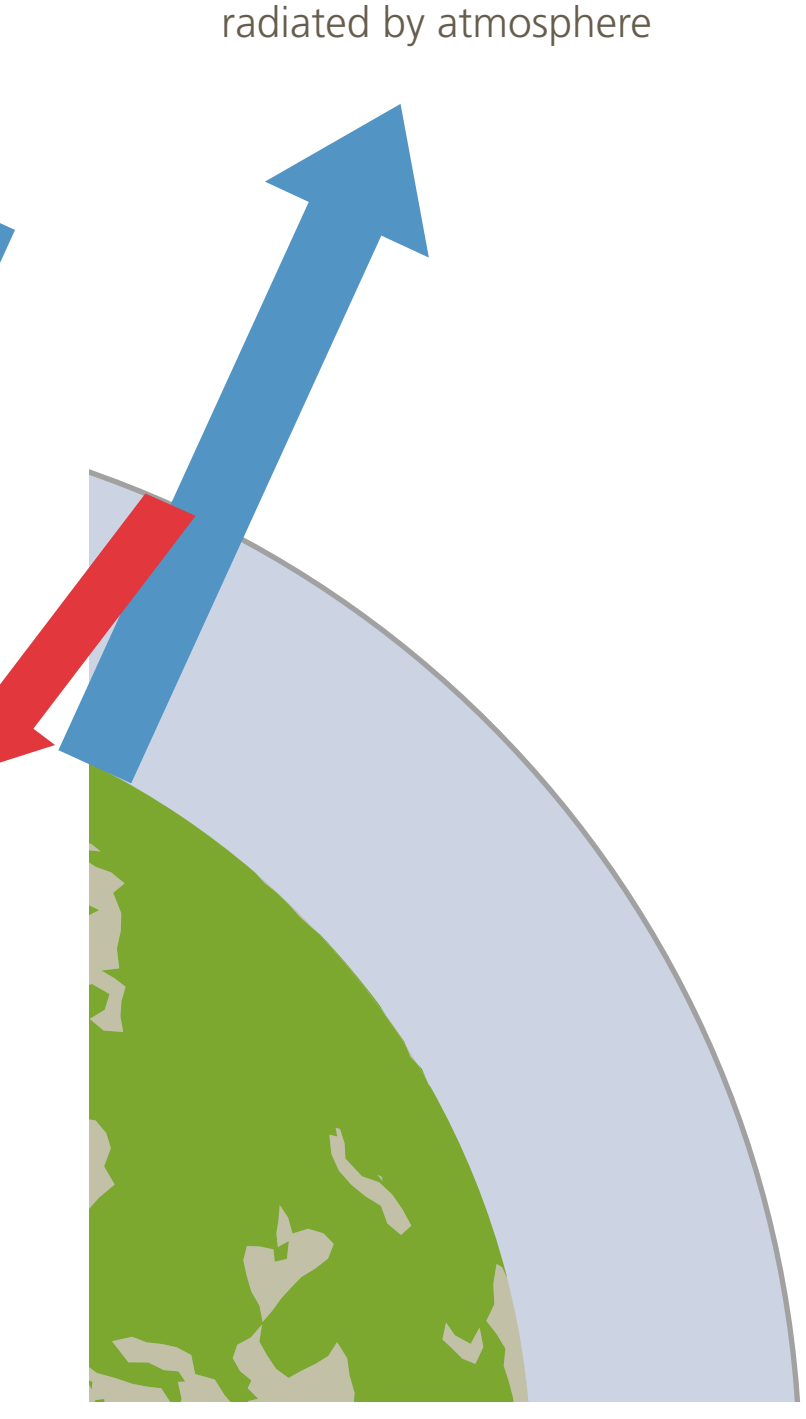


Photo from K-State Divison of Communications and Marketing

name **Dr. Kenneth J. Klabunde**

University Distinguished Professor of chemistry, Kansas State University

education Ph.D., chemistry, University of Iowa (1969)
B.A., chemistry, Augustana College (1965)

bio In 1995 Dr. Ken Klabunde founded the NanoScale Corporation in Manhattan, Kansas, as an independent, commercial, research and development organization. NanoScale manufactures filter materials for water and air purification, odor control, control of bacteria and viruses, and detoxification of dangerous chemical spills.

research interests

material science and nanoscale particles

organometallic chemistry

The National Science Foundation recognized Klabunde for developing a nanomaterial air filter that breaks down harmful, polluting chemicals in drywall. Homeowners appreciate the environmentally safe process of using earth materials to destroy or neutralize pollutants.

Klabunde is currently working with Kansas EPSCoR as a member of the Nanotechnology for Renewable Energy project.

> *"We are working to find the best ways to capture and use solar energy in ways that are socially, economically, and scientifically possible."*
>
> - Ken Klabunde

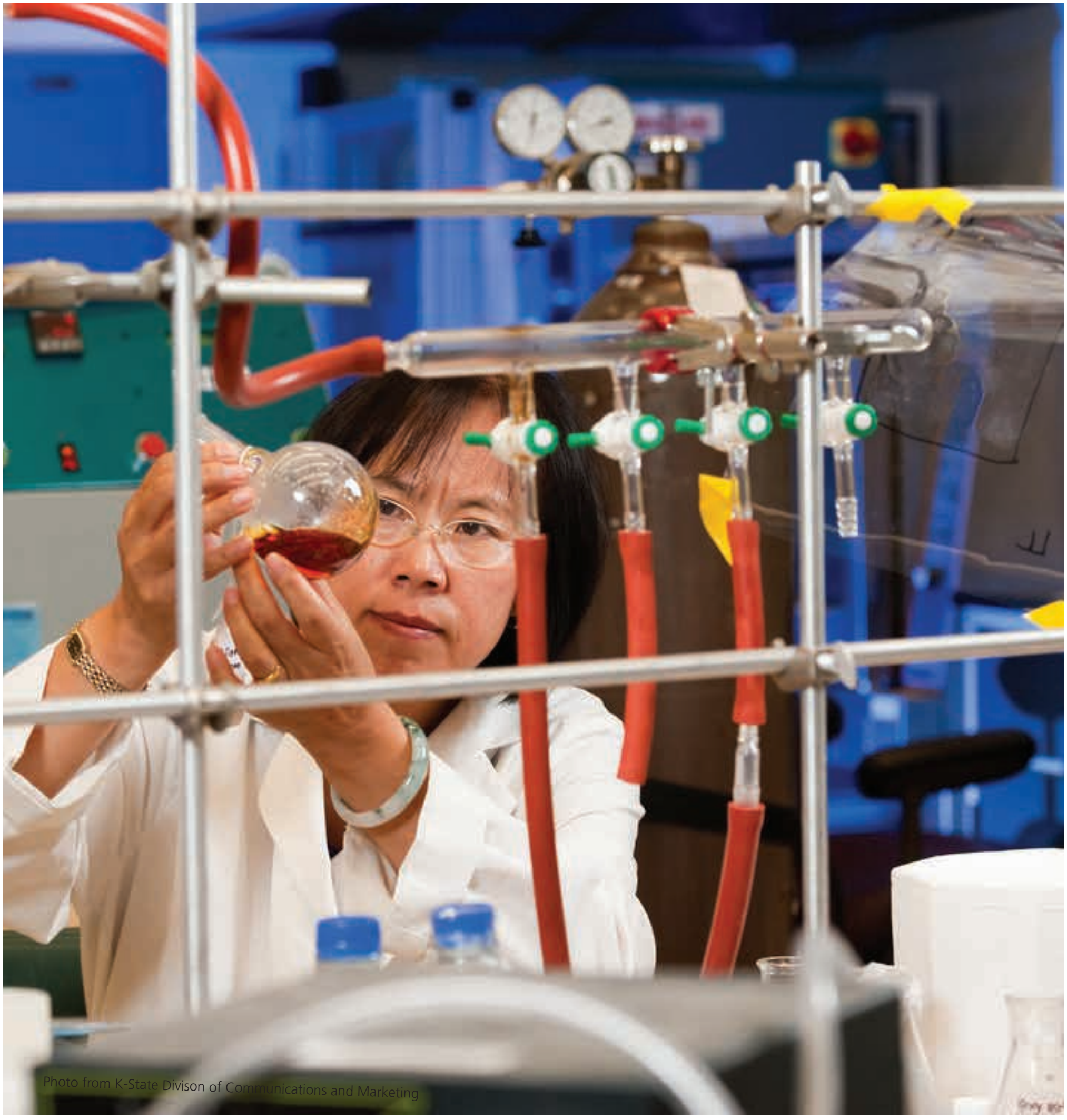


Photo from K-State Divison of Communications and Marketing

name **Xiuzhui “Susan” Sun**

University Distinguished Professor of grain science and industry, Kansas State University

education Ph.D., agricultural and biological engineering, University of Illinois, Champaign-Urbana (1993)
M.S., agricultural engineering, Northeast Agricultural University, China (1986)
B.S., agricultural engineering, Northeast Agricultural University, China (1982)

bio Dr. Sun is a team leader for the Kansas EPSCoR scientists working on biomass utilization by materials design. She founded and continues to lead the Bio-Materials & Technology Laboratory at K-State and is also co-director of the Center for Biobased Polymers by Design.

Sun’s research focuses on how plant and grain molecules can be used to create materials that are safer, more durable, and environmentally friendly. Her work has resulted in eight patents, with more pending. She’s also helped create a soy-based, formaldehyde-free adhesive that’s water resistant, and a biodegradable container that’s used to hold nutritional supplements for cattle.

research interests

biobased materials process engineering

rheology and phase transition of biopolymers

biobased adhesives

biodegradable plastics

structure and functional properties of biomacromolecules

biomaterials at nanoscale

“I have always felt so rewarded that any of the technologies developed from my laboratory have commercial values that improve our environment and make the world a better place.”

- Susan Sun

Dan is working with a Kansas EPSCoR team on **research to better understand the impact of climate changes on indigenous farmlands**. These studies will provide the basis for climate model predictions and the development of strategic responses.

American Indian farmers often combine traditional and commodity crop agriculture and livestock production. Others pursue subsistence fishing and hunting on native lands. Yet there has been little systematic research on the impacts of climate changes on reservations. Kansas EPSCoR is addressing this gap to provide information to indigenous communities as they to respond to climate-related events.

Dan contributes a deep understanding of American Indian culture to Kansas EPSCoR research. As scientists study climate data from tribal communities, Dan challenges the scientists to consider "**indigenous realism**" which is based on the interconnectedness and unity of the earth system. He notes that each tribe can contribute "truths that emerged out of their long histories and interactions with particular landscapes and seascapes on this planet."

“We have a responsibility to live respectfully for our children seven generations into the future.”

- Dan Wildcat, *Red Alert*

name **Dr. Daniel Wildcat**

Professor of American Indian Studies, Haskell Indian Nations University

education Ph.D., interdisciplinary studies, University of Missouri at Kansas City (2006)
M.A., sociology, University of Kansas (1986)
B.A., sociology, University of Kansas (1978)

bio Dr. Wildcat is a Yuchi member of the Muscogee Nation of Oklahoma. In addition to teaching, he serves as co-director of the Haskell Environmental Research Studies Center, which he founded with colleagues from the Center for Hazardous Substance Research at Kansas State University.

research interests

Indigenous knowledge

technology, environment, and education

Known for his commitment to environmental defense and cultural diversity, Wildcat has been honored by the Kansas City organization "The Future Is Now" with the Heart Peace Award. His book, *Red Alert! Saving the Planet with Indigenous Knowledge*, was published in 2009.

> *"American Indian and Alaska Native wisdom is a cooperative construction built on generations of attentive interaction between humans and the diversity of life found in the unique ecosystems and environments we call home."*
>
> - Dan Wildcat, *Red Alert*