

# Prairie Public's



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**Chuck Rice**

A Nobel Prize winner on ways carbon control may help agriculture.

Over the past 150 years we have seen nearly a 40% increase in carbon dioxide in the atmosphere, most of this is due to burning of fossil fuels. This is a concern for our global climate because carbon dioxide as well as methane and nitrous oxide are the three primary greenhouse gases that trap heat in the atmosphere. I had the opportunity to participate in the latest assessment report by the United Nations Intergovernmental Panel on Climate Change (IPCC). Scientific evidence clearly suggests our climate is changing and at least part of that change is a result of human activity. The expected change in our climate is not limited to temperature; precipitation patterns will change as well. There is a likelihood of greater frequency of extreme events (heat waves, tornadoes, floods). This change will impact humans, natural ecosystems and agriculture.

So what do we do? I think that there is sufficient evidence for action.

How? The IPCC and others have shown multiple paths for helping to solve the increase in greenhouse gases. In the long term, we will need to develop alternative and renewable energy sources, nuclear, wind, and biofuels, and to develop carbon capture and storage technologies for using coal.

However, there are existing actions and technologies that can be implemented now. Energy conservation can be adopted at the personal level. There are significant actions that could be taken to increase energy efficiency. These actions would reduce energy demand and thus reduce the output of greenhouse gases.

Agriculture can play a significant role in mitigation over the short term and certain practices to accomplish this can be implemented now. Agriculture can help mitigate greenhouse gas emissions by:

- 1) reducing energy use;
- 2) providing renewable energy, through wind and biofuels;
- 3) increasing Nitrogen fertilizer efficiency which reduces nitrous oxide emissions, another greenhouse gas; and
- 4) providing offsets through soil carbon sequestration.

Soil carbon sequestration also provides additional benefits, such as improvement in soil quality, water quality, wildlife habitat and in many cases improved profitability of the farm operation. US agriculture can offset annually 10-15% of the US greenhouse gas emissions not counting replacement of fossil fuels through biofuels. Thus agriculture has a major opportunity to not only maintain sustainability for food production, but at the same time provide environmental benefits and contribute to the energy security for the world

**Renee Gopal**

A founder of the Prairie Climate Stewardship Network comments on what it means to her.

The world we live in has gotten smaller, meaning our actions have far reaching consequences. What we do and don't do matter to people living far away and to future generations. What we buy, what we eat, the homes we live in, the way we use energy, how we care for the land - all matter. Now, more than ever before, we need to consider the impact of our choices and actions.

The evidence is before us: the rapid increase in carbon dioxide emissions from human activity is warming and transforming our world. For example, we are experiencing declining Arctic sea ice, shrinking and disappearing glaciers, prolonged and more intense droughts, and changing natural habitats. We know about the polar bears' plight. We pay less attention to how rising sea level has forced thousands of people to abandon the Sundarbans islands.

Existing environmental challenges caused by land and resource use are made worse by climate change. We need only look at Australia and the Tuvalu Islands in the Pacific. Australia's water demands to meet drinking, home, agriculture, and industry needs have resulted in water scarcity. Australia is now desalinizing seawater - removing salt from seawater - to grapple with years of grinding drought and water scarcity. Climate change will likely further increase the demand for water. On the Tuvalu Islands, excavation of beach sand for building material has resulted in coastal erosion. The islanders face life-changing challenges as rising sea levels worsen this coastal erosion and render already small patches of cropland unusable.

Here in the Great Plains, along with changes in precipitation, average temperature has increased between 2 to 5.5° Fahrenheit over the last century. These trends are expected to continue. My family and thousands of others in North Dakota face a future in farming and ranching with even more uncertainty than we cope with today. Hunters face the projected loss of historic breeding grounds for waterfowl as wetlands shrink and disappear. Imagine North Dakota without the Prairie Pothole Region.

Rather than feel overwhelmed by the challenge, I consciously choose to do what I can, starting at home and building from there. And I have found others who care. The Prairie Stewardship Network was born last year - as a way to engage us, North Dakotans, in climate stewardship, starting small and rippling out. Climate stewardship must become a way of life. We can no longer delay taking action. Prudence is the wisest choice for ourselves, our neighbors and for those yet to be born. It is the least we can do, in gratitude for our earthly home.

**Bruce MacDuffie**

An Episcopalian priest on his view of climate stewardship.

The high windows in the upper wall of my office look out at blue sky with the delicate leaves of a silver maple waving like so many prayer flags in the wind. The prayer flags give thanks for the gift of being part of God's body, related to all the sisters and brothers of this beautiful planet, plants, animals, rocks, creeks, trees, and humans. On this beautiful day, it might be possible to ignore the welfare of my sister and brother creatures, and to say, "Thank you God for this most perfect of little worlds, where all is right," hoping that by saying a prayer I will have lived up to my responsibility for the rest of creation, by turning its welfare over to an interventionist God whose job it is to set things right.

But then, one of those pesky conscience-stirring environmentalists emerges in my consciousness when I go shopping for some groceries. I love salmon in particular. I can still afford some of both. My sisters and brothers in the Native American community think of the salmon as a relative, a kind of thinking I'm only slowly coming to incorporate. They also think of the salmon as giving itself to them for food, sacrificing itself for them. All well and good . . . the salmon likes to sacrifice itself and I like to eat salmon. Climate stewardship? What does it have to do with my sense of entitlement to salmon?

Why couldn't those environmental scientists have left me content to enjoy! Who needs to think about grand children and future generations of creatures.

But no! Those scientists had the gall to compute how much carbon dioxide is created by the fishing vessels and fish processing plants, how much by transporting that delectable fish to me. The cost of eating that salmon is far greater than the money I spend for it. While my consumption may satisfy me, it also impacts families and communities in parts of the world where the warming is causing sea level rise, families and communities and nations whose output of CO<sub>2</sub> is a fraction of mine.

If I love the creatures and creation of which I am part, I have the opportunity to act on that love by changing my individual habits: to investigate the environmental costs of my habits of consumption; yes, to repent by turning in a new direction of increased care, where I live out my love for my sisters and brothers worldwide, repenting of living as though my own habits of consumption were all that matters. So these days, I'm driving more slowly and driving less, educating myself, and working to influence both my church community and my neighborhood, legislators and government officials, working to turn around some of the harm we have done.

I join hands with others in the circle of creation, and together we gather under that blue sky singing a hymn of grateful praise as we seek to know best how to love this old world, so that the blue skies (and salmon) are there for future generations.

**Andrea Baumgardner**

A chef who uses locally grown and produced ingredients.

Climate stewardship is an imposing couple of words. I think that the question “what is climate stewardship to you?” intimidated me a bit. What do I do that is taking care of our climate and world? What does it really mean?

Like most well-intentioned, sometimes informed citizens, I try to be a steward of our land or climate – I don’t really know if the efforts I make, some of them quite easy to adopt, make a difference, or if they just make me feel good and/or well-intentioned. I try but I don’t know how often that I take time to think about my impact or my business’ impact on the local climate. As a cook, my lens is through food and the production of raw ingredients.

When I was a kid in Fargo, North Dakota, my idea of cooking was to microwave big bags of frozen vegetables for snacks – my parents didn’t allow junk food, but I had no clue as to where any of my food came from. And I am just one generation away from farmers on both sides of my family. I continued to love food and eating throughout my childhood and college without really noticing anything about food production, even though I started to learn to cook.

While in cooking school in San Francisco, I experienced firsthand the exciting new world of using local, organic and artisanal products. It was a complete revolution for me and easy to cotton to since I could actually taste the difference between many sustainably-raised, small batch products (whether produce, meat or cheese) and what is conventionally raised and available. When I returned to work in North Dakota 8 years later, it was obvious that I had drunk the California cuisine Kool-aid and thought that I could transplant the idea to the project I was involved in here – Hotel Donaldson. Luckily for me, the owner was committed to sourcing small batch, small farm products from this area for the hotel. So began my education with local growers, ranchers and producers. This experience has made me understand a few things about the way food and the environment relate to each other in North Dakota.

1. Food production has an incredible impact on the environment and our society – the way that the land is readied for growing or ranching, how the products are grown or raised, how the economy is affected by a season’s production, and how it affects the people who are buying and eating the food. We don’t have to think very hard to come up with the recent tomato and salmonella scare, the use of sick cattle in the beef industry, the e-coli found in spinach in California’s central valley. Just read any of Michael Pollan’s books or “Fast Food Nation” for many convincing and well-researched arguments.

2. People who undertake the husbandry and care of plants and animals in a sustainable manner are great stewards of the land. Echo Lake Ranch, where we buy some of the beef and all of the lamb we use, first started lamb-ranching to take care of the indigenous prairie grasses on their land. Echo Lake Ranch’s owners also built a strawbale house and lived off the grid for 3 years. We buy their beef and lamb for its amazing and complex taste (the beef is 28-day aged grass-fed and the lamb is aged 14 days) – it makes us look good. However, it certainly works for us that this product is from animals that are being fed what is healthy for them to eat, who have comfortable lives in the middle of North Dakota, and are respectfully treated BEFORE AND AFTER slaughter. We have bought beautiful local vegetables and herbs each summer from local ORGANIC farmers who are committed to taking care of their soil and land.

3. It takes a lot more effort to do things the right way. I have enjoyed being on the easy side of this equation – I buy the products once they have already been grown or produced. I pay a little more than I would for commodity items, but the peace of mind and the superior quality is more than worth it.

4. Once we started finding local producers, we were drawn into a different community than the one we inhabit in Fargo. It is incredibly valuable to be connected to the region and the land in that way and it never hurts to know where and who your food comes from.

My best examples of climate stewardship are the individuals that I buy raw ingredients from. If I were to take their lead and apply it to my life outside the kitchen, I would ride my bike more often; I would vote in every election (and educate myself on all the issues, no matter how small); and I would not take the short and fast route with tasks. I have many things that I think need to be done quickly, but they might be done more effectively if I thought about their impact.

**Scott Handy**

President/CEO of Cass County Electric talks about energy conservation.

Cass County Electric Cooperative is in the business of providing reliable, affordable electricity to our members in North Dakota, which we've been doing for over 70 years. Electricity has dramatically improved the standard of living, health and productivity of the people of the Great Plains. Anyone who doubts this should read *Giants in the Earth* by Ole Rolvaag, or any other account of life here before electricity.

However, generating and providing electricity does have an impact on the environment and we need to acknowledge that. As someone who's made a life-long career in the electric industry, I also need to acknowledge that our ability to provide electricity in a more environmentally benign manner is increasing steadily. New technology, new practices, and yes, even new laws have helped our industry greatly reduce its environmental impact. On the whole, I think the benefits of having universally available and affordably-priced electricity far outweigh the environmental impacts, so far.

In recent years it's been suggested that the electric utility industry is having an impact not just on the environment, but on the earth's climate. Hence, the phrase "climate stewardship."

Stewardship is defined by Merriam Webster as "the conducting, supervising, or managing of something; especially : the careful and responsible management of something entrusted to one's care." This definition still applies when focused on our climate, but in my view it applies in a somewhat more limited manner. The directive to carefully and responsibly manage something implies that our actions can have a meaningful impact on the resource being managed. I don't know for sure if generating electricity with fossil fuels is a large enough force to cause climate change, and frankly I'm a little skeptical when claims that it is are made with such certainty. The earth's climate has undergone many cycles even in the past few centuries and these cycles may be attributable to many things besides the carbon dioxide emissions of power plants.

Having said that, let me conclude with something on which we can all agree: conserving all forms of energy, including electricity, is just plain smart. I want our members to conserve electricity because it's economically wise and because the next power plant is going to cost a whole lot more than the last one, with or without carbon management. We appreciate it when our members use our product, but no one benefits when it's wasted. Finding ways to do more with less is smart, it leads to greater productivity, and if it lessens our carbon footprint, that's good as well. Being energy wise is just the right thing to do.

**Svend Soeyland**

Norwegian representative of the environmental group Bellona speaks about climate change action.

Stewardship is an exotic term for a person from a non-English nation. I heard the term first time while assisting the predecessor conference to the Rio Summit. Action for a Common Future as it was called, took place in my hometown Bergen, Norway in 1990. Gro Harlem Brundtland, then Norwegian prime minister, now special envoy to the United Nations Secretary General delivered her famous Brundtland report. Days and nights of discussions followed, and as student-helpers we copied endless drafts. It was indeed an intriguing experience.

A stern-looking negotiator from the United Kingdom took everybody by surprise in the wee hours of the frustrating last night. She proposed Environmental Stewardship as a guiding principle for common action to achieve sustainable development. Only vain negotiators pretended to know the concept and people were feverishly looking up their dictionaries. Since then, the term has gained traction, largely due to its lack of clear meaning.

A dictionary tells us that the term originates from the 17<sup>th</sup> century and means to keep one's house in order.

Climate Stewardship would imply an understanding of our globe as a limited entity, and in need of our attention to keep in good shape. As all household chores, we are lazy and delay or hope someone else will take out the garbage, hover the floors or do the laundry. Likewise, we cling to our comfortable cars, big houses and air-conditioning, although we know that there is a big job to be done to reduce CO<sub>2</sub> emissions. So, who is going to take the lead?

As a Norwegian citizen I feel a particular responsibility for the CO<sub>2</sub> emissions caused by the oil and gas resources we export. These resources have made us an incredibly wealthy nation, but we have a moral responsibility to reduce the carbon footprint of our fossil exports. Our role as climate stewards is to develop and deploy carbon capture technology, especially to developing countries increasingly reliant on fossil fuels.

Environmental Stewardship is everybody's business and action is the only true sign that the concept is well understood. Action should happen at local, national and global scale. We need real leadership and actors willing to pave the way. Yes, I am looking at you: Presidential candidates, car manufacturer and power company executives and myself - an average consumer. We cannot wait for others to follow. We have to take the chance that leading by example will convince others to do the same. Countries like China and India are watching what happens in Washington DC for signs of true leadership.

With escalating fuel prices and a crashing economy this is not easy for politicians. Politicians could gain for a different kind of respect than that gained through giving in to popular demands. They could lead!

**Roger Johnson**

North Dakota Agriculture Commissioner talks about the state's alternative energy resources.

Stewardship is the soul of agriculture. People who make their living from the land know that their future and that of those who come after them depends on the conservation and care of our natural resources. This is especially true in North Dakota with our proud tradition of family farms and ranches handed down from one generation to the next.

Climate stewardship extends that concern for soil and water to the air we breathe and in a larger sense to the entire world around us. It is an understanding that dominion over the earth is not license to despoil it.

Our nation is gradually coming to understand and acknowledge that our past failure to be climate stewards carries a very substantial price. Global warming, brought about in part by man-made greenhouse gas emissions, threatens our future and our children's future.

Yet, it is one thing to promote and extol climate stewardship; it is quite another to do something about it. Embracing climate stewardship would appear to present us with a multitude of challenges, but in the case of agriculture, these challenges are in fact opportunities.

The emerging industry of carbon storage and credits presents a truly win-win-win situation for agricultural producers who can save on inputs through no-till farming, enhance the quality of their soil by restoring lost carbon, and earn income through storing carbon for others.

Our native grasses and wetlands have tremendous capacity for storing carbon. According to some experts, it's the best in the country. The grass takes carbon right out of the atmosphere and stores it in deep roots. That's a valuable resource for climate stewardship.

The next opportunity is biofuels, notably ethanol and biodiesel - fuels derived from plant materials. A greater reliance on biofuels, rather than those derived from petroleum and coal, means new markets for agricultural producers. It also means a cleaner environment and a positive contribution to climate stewardship.

North Dakota producers are responding to the demand for biofuels. Corn production in the state is growing at a phenomenal rate. We lead the nation in the production of canola - a major source for biodiesel. I believe North Dakota producers can meet the growing demand for fuel crops, while continuing to be the trusted provider of the finest quality foods in the world.

The real future of ethanol - cellulosic ethanol - should further spur the growing ethanol industry in our state. Switchgrass, the most highly touted source of cellulosic ethanol, is native to North Dakota, and that puts us in position to be a leader in ethanol production. Cellulosic ethanol production would silence erroneous criticism claiming that ethanol production has an adverse effect on food supplies and prices. It can lead to the development of lighter and stronger materials to replace fiberglass and plastics.

Finally, there is wind energy. North Dakota has been described as the "Saudi Arabia" of wind energy, but unlike that Middle Eastern kingdom, North Dakota has yet to fully utilize that potential. New wind farms are springing up around the state, and still more are being planned. We can and will be a national leader in wind energy.

In fact, we can do more to promote all facets of climate stewardship, whether it be conserving our precious resources or developing new and cleaner sources of energy. Agriculture has an important role to play, but climate stewardship is everyone's responsibility.

**Cody J. Schuler**

Methodist minister talks about the link between spirituality and climate stewardship.

Conversations about the environment do not often take place among people of faith. Issues like global warming may seem too political and the environment may appear to have little to do with religion.

As a pastor, headlines proclaiming ecological crises raise serious concerns and touch the very core of my religious beliefs and relationship with God.

I profess my faith through the ancient words of the Apostles' Creed, "I believe in God, the Father Almighty, creator of heaven and earth..." Believing in God as Creator, climate stewardship has little to do with believing in global warming or being an environmental activist. In understanding God as "creator of heaven and earth" climate stewardship becomes a part of how I live my faith.

In Genesis chapter two, God creates the first human out of the "dust of the ground" and places this new creature in a garden, itself growing up out of the same ground. The human's purpose is "working and keeping the earth."

We tend to the earth, and the earth sustains us with water and air, and nourishes us with food from the ground. I once heard a theologian describe our connection in relational terms by suggesting, "We are kin to the fertile soil."

This leads me to understand my relationship with God is vitally connected to my relationship with all of creation: soil, plant, animal, atmosphere and human. If indeed there is an environmental and ecological crisis at hand - then I am convinced it is a crisis in humanity's relationship with God.

My calling as a Christian - and as a pastor - is to play a role in God's work - repairing the broken relationship between God and humanity. Climate stewardship thus is more than fulfilling the human role to live upon the earth and care for it and it goes beyond any form of human political action.

Rather climate stewardship is part of our response to God's goodness and God's grace. Climate stewardship is about understanding that God is seeking to redeem humanity—and all of creation. When we are good stewards of creation we are seeking relationship with our Creator. Climate stewardship is but one part of the delicate reconciliation process going on between the Creator and all that has been created.

I tend to my relationship with God in many ways. Seeking to be a good steward of creation takes its place along with other spiritual practices such as prayer, study of Scripture, and serving and loving my neighbor.

I am not the first to suggest that stewardship of creation is a faith concern and I hope not to be the last. Our Creator wants to be in a relationship with us, and stewardship of the earth is stewardship of that relationship.

**Mark Lundberg**

Architect comments on how structures affect the climate.

Climate change means the world I grew up in and live in will be different than the one my children or grandchildren will occupy. This is something I don't want to happen.

Climate change means I must change the way I work and way I live.

I want to leave a world that is clean, healthy and prosperous for my children and grandchildren to live in.

In my profession as an architect, I have more power to reduce or eliminate the effects of climate change than most people, but this means I must reevaluate how I do my job.

Every aspect of how buildings are created, from how they are placed on a site to what materials and systems are used must be reconsidered. Buildings are now being built that are carbon neutral, this needs to be the future for all buildings.

The built environment has a profound impact on the climate. Buildings we have created annually account for more than 30% of the total energy, more than 60% of the electricity and 40% of CO2 emissions used in the U.S. A typical construction project in the U.S. produces 2.5 lbs of solid waste per square foot.

Reckless, uncontrolled, poorly planned development consumes massive amounts of land in the U.S. causing people to drive further and further to get to jobs and basic services. This type of development shifts land usage away from natural, biologically diverse habitats to paving and buildings that are impervious and devoid of biodiversity. The diversity needed to sustain the climate.

Climate change will force makers of buildings to adopt a holistic design approach to building. By using how nature works as a model for the design of buildings, there is no waste or pollution in natural systems, everything is reused, a "Cradle to Cradle" approach.

I feel I have a responsibility to use my knowledge to help make changes to the built environment. I can use my knowledge to educate my clients, the public and my colleagues to use construction practices and technology that stops buildings from emitting greenhouse gases, are healthy places to occupy and produce more energy than they use.

We are morally responsible to be stewards of the earth, we are at a tipping point and we need to use our knowledge to create a future for our children.

**Brad Crabtree**

A Program Director at the Great Plains Institute calls for a low carbon energy system in North Dakota.

Debate in North Dakota over global warming has begun in earnest. Now that federal legislation to reduce carbon dioxide and other greenhouse gases has been postponed until next year, it's time to step back and approach this issue rationally.

Let's start with three basic facts.

Fact number one. Global carbon dioxide emissions are skyrocketing. China alone builds a large conventional coal power plant *every week*, adding the equivalent of Great Britain every year to its electric grid. Just one year of China's coal plant construction cancels out the carbon benefits of *all* wind farms in the world today. Imagine two and a half billion Chinese and Indians aspiring to living standards like ours, and the climate challenge becomes crystal clear.

Fact number two. Because people around the world care what we do, not what we say, the problem won't be solved without real U.S. action. Some believe that we should *not* do our share, arguing that growth in China, India and other countries will swamp any U.S. reductions. This ignores the fact that we consume five times more energy per person than the average Chinese and 20 times the average Indian. To persuade poor countries to safeguard our future and prevent runaway CO2 emissions, we must lead by example.

Fact number three. North Dakota can lead America's shift to a low-carbon energy system. This energy transition will drive the greatest economic transformation of our century. Few places rival our potential to supply energy with low or zero carbon dioxide emissions.

We rank number one in wind energy potential. If North Dakota supplied just one-fifth of a Midwest goal recently endorsed by governors—that of 30 percent renewable electricity by 2030—that would mean over 16,000 wind turbines in our state.

We rank number one in perennial grass biomass potential. Imagine restoring prairie grasslands to our landscape and paying farmers and ranchers to harvest them renewably for energy.

We have vast reserves of lignite coal and the largest coal-based carbon dioxide capture and storage project in the world today. Dakota Gasification at Beulah captures nearly 3 million tons of carbon dioxide every year from lignite, pipes it to Saskatchewan and injects it deep underground into an oil field. This forces otherwise unrecoverable oil to the surface, resulting in a 70 percent lower carbon footprint than imported oil.

These are just a few of North Dakota's many low-carbon energy advantages.

Yet, one might conclude from the debate that we live in a very different place—that North Dakota is hopelessly without prospects. Public discussion is dominated by a focus on costs, unwarranted skepticism about new energy technologies, pessimism about our ability to innovate and, in the worst cases, dismissal of mainstream science.

Come on North Dakota. We can do better. Others will solve the global warming problem, with or without us. Let's embrace this challenge and find ways to help our energy and

agricultural sectors respond now—rather than waiting until we are forced to change. We'll be better off driving a trainload of opportunity than riding in the caboose.

**Jason Schaefer**

Climate educator and wind power advocate.

The more I began to study climate change over the years, the clearer it became that this was not hype. Scientists from all over the world were finding more alarming evidence that humans are changing the climate at a rate unseen in the history of civilization. What really struck me was how the science just kept piling up - especially since 2005. It seems like every month or two there is a study saying the situation is getting worse.

Another thing that really struck me as I became more familiar with climate change was the credibility gap between those who claimed climate change was a serious challenge and those who denied it. I found a petition online supposedly signed by over 19,000 scientists denying that humans were a significant cause of climate change. Up till then, I had been told that most scientists believed climate change was caused by humans. To test the validity of the petition, I made up an alias, Dr. J. M. Schaefenstein, and submitted my signature claiming to have a Ph.D. in Geology from UND - which a quick check would have revealed that, one, Dr. Schaefenstein does not exist, and two, he did not receive a Ph.D. in geology. Nevertheless, my signature was accepted and soon after I (or Dr. Schaefenstein) was receiving mail from the institute sponsoring the petition.

Last year, I observed three grad level atmospheric science classes at UND. I watched as the students addressed each argument made by climate change deniers. It turns out their claims, such as natural cycles or the sun causing climate change, have been disproved by peer-reviewed science.

The idea of innocent daily actions like turning on a light switch, possibly leading to a nightmarish future for our children and grandchildren, is a hard pill to swallow. Many ask, "How could humans have such a large impact on the climate?" Growing up in the Red River Valley, it is easy to understand considering that the native tallgrass prairie ecosystem has been altered so much that only about 1% of the native prairie remains in the valley.

I like to think of myself as conservative when it comes to climate change. I mean, if every major, credible scientific organization is saying humans are having an adverse and potentially catastrophic effect on the climate, then for us to dismiss those warnings is crazed and radical in the worst sense of the word. This is the great challenge of our generation. We have to do something.

**Larry Woiwode**

North Dakota poet laureate, internationally renowned writer, and organic farmer.

I feel the Christian Church has put too much emphasis on a single word in the book of Genesis. It occurs early, referring to Adam and Eve: "Then God blessed them, and God said to them, "Be fruitful and multiply: fill the earth and subdue it; have dominion over the fish of the sea, over the birds of the air, and over every living thing that moves on the earth."

I used to say as a joke when I swatted a fly, if I had an audience, "I'm asserting my dominion!" Dominion is the word that has had too much emphasis. Look: the verse also includes: be *fruitful*, *fill* the earth (before subduing it), and we later hear about nurture of the soil. I believe that human beings, creatures of intelligent language, are responsible to control cattle and large animals; that's why we build fences. Local and state governments enact animal-control laws, a form of dominion.

But when we of the Great Plains hear warnings of climate change, we should consider the soil. It's everywhere we look, our greatest natural resource, provider of the highest percentage of state income. We should hope to keep it fruitful. When we inject it with chemicals, defoliants, and pesticides, they take their toll, then seep into water sources and, when they evaporate, add to atmospheric pollution. The extra travel to fertilize and spray and inject anhydrous or other toxins adds CO2 to the air, and compacts the soil. We know the high cost of fuel for huge diesel equipment and trucks. Could the dollars be better spent on natural nutrients and soil conditioners?

With my family I have maintained a small organic farm for thirty years, and we know the difficulties and extra labor in that. But after a few years we saw a rousing return of wildlife, especially birds, a species sensitive to chemicals; that's why coal miners used to keep canaries underground. We have pheasant and Hungarian partridge and swallows, yellow warblers, goldfinches, red-tail hawks, kestrels, cowbirds, killdeer, plover, sand-hill cranes, godwits, shrikes, Western kingbirds; owls and golden eagles; mallards and pintails. Once a bittern nested in a far field, and last night a great blue heron flew low over our buildings. I want our land filled with this kind of life, on soil of high health, and I don't want to say, even as a joke, "I'm asserting my dominion."

**David Saggau**

CEO Great River Energy on a portfolio of approaches to reduce carbon output.

As Great River Energy faces the reality of climate change legislation and escalating costs to build power plants, it has become apparent that energy conservation, or using energy more wisely, is our least-cost resource. In fact, we consider conservation to be our "first fuel."

Increasing our energy efficiency and conservation efforts plays a significant role in our approach to addressing concerns about carbon. It provides an important first step in reducing our organization's carbon footprint.

However, it's important that we assemble a portfolio of approaches to reduce our carbon output. In addition to increasing our energy efficiency efforts, we are developing a carbon offsets program, exploring carbon capture and sequestration technology, developing power plant efficiencies and expanding our renewable energy resources.

Great River Energy supports a national cap-and-trade program for carbon emissions. We support a program that is phased in over a reasonable period with flexible, interim benchmarks to ensure the availability of carbon capture and sequestration technology.

It is essential that we have the necessary resources and time to conduct research, develop technological solutions, and deploy them at our existing power plants before such a program is in place.

One of those technological solutions is our innovative coal refining process. The lignite coal used at Coal Creek Station, our power plant near Washburn, has a high moisture content. By refining the coal - or using our patented process to remove some of the coal's moisture - Coal Creek Station will use 4 percent less coal to generate electricity with fewer emissions. In fact, using refined coal is expected to reduce the plant's carbon emissions by 400,000 tons each year.

Another Great River Energy effort underway in North Dakota is construction of Spiritwood Station, a combined heat and power plant located near Jamestown. In addition to generating electricity, this highly efficient plant will provide excess steam energy to power a nearby malting facility. Spiritwood Station will also use coal that has been refined at Coal Creek Station. Its carbon dioxide intensity will be 40% lower than conventional power plants - meaning there will be 40% fewer emissions for each unit of energy produced. The plant will also be 30 to 35% more efficient than most baseload power plants.

Looking to the future, there's no silver bullet answer for reducing carbon. Instead, Great River Energy is taking a "silver buckshot" approach by assembling a portfolio of approaches to address the issue and mitigate our carbon cost exposure.

