

Changing climate, Changing future

**What's at
stake in
the last
best place?**



A guide to climate change in Montana and smart ways we all can act NOW to preserve our state for tomorrow's generation



Changing climate, Changing future

Montana in an era of climate change

What's inside...

Introduction

Why is climate change happening in Montana?.....	3
How can we stop it?.....	3
How to use this guide.....	3
Who produces greenhouse gases in Montana?.....	4

Section I:

Under our roofs

Existing homes.....	5
New construction.....	6
Rental units.....	7
Commercial buildings.....	8
School buildings.....	9
Recommendations.....	10

Section II:

Forests, farms and ranches

Forests.....	11
Farms and ranches.....	12
A new way to refuel.....	13
Biodiesel primer.....	14
Recommendations.....	15

Section III:

A driving force

Personal vehicles.....	16
Freight.....	17
Recommendations.....	18

Section IV:

Powering Montana

Alternative energy.....	19
Wind power.....	20
Recommendations.....	21

Preserve our state

Communities taking action.....	22
What YOU can do.....	23

In 2005, Governor Brian Schweitzer responded to growing debate and confusion about climate change in Montana by asking a group of 18 people to study the science and facts.

By that point, Montanans had already seen troubling evidence of climate change under our big sky.

In 2000, the state suffered one of the worst wildfire seasons in recorded history.

Ski resorts had shut down due in part to a lack of snow.

Blue-ribbon trout fisheries closed during parts of the summer because our rivers and streams didn't have enough water to support fish.

Several of the glaciers that give Glacier National Park its name had melted.

Gov. Schweitzer's group, called the Climate Change Advisory Committee, included Montanans from all backgrounds and professions, including a teacher, an organic farmer, a county commissioner, a petroleum business owner and a union leader.

Focusing on the evidence of climate change and its consequences for Montana, the Climate Change Advisory Committee started work to answer these questions: *Why is climate change happening in Montana?* and *How can we stop it?*

This publication is a guide to the committee's answers.

Montana Climate Change Advisory Committee

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Cascade County Commissioner

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Why is climate change happening in Montana?

The Climate Change Advisory Committee identified carbon dioxide as the main culprit of climate change in our state.

Carbon dioxide is a greenhouse gas that naturally cycles between the atmosphere and living things on Earth. But human activities create excess carbon, which remains in the atmosphere as carbon dioxide, or CO₂. According to most climate scientists, we have overwhelmed the Earth's ability to naturally cycle the atmospheric carbons we emit. This makes the Earth warmer.

In Montana, our forests, farms and rangelands store carbon. But we also generate carbon through agriculture and energy production. We mine and burn coal for electricity. We drill for oil, till soil for crops and harvest trees. We use fossil fuels to drive cars and trucks and heat homes. Those activities and more add carbon to the atmosphere.

Until recent years, Montana stored more carbon than the state produced through human activities. But in 2000, we reached our carbon tipping point. For the first time, we emitted more carbon than we stored.

How can we stop it?

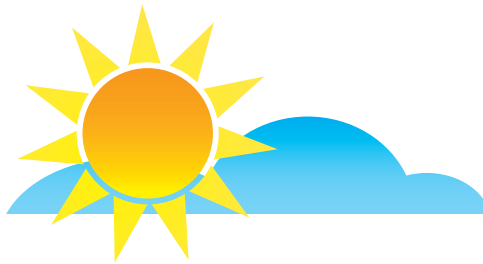
After 18 months, the Climate Change Advisory Committee produced a 450-page final report that named 54 ways to cut carbon and other greenhouse gas emissions in our state.

The goal of these recommendations is to reduce our greenhouse gas emissions to 1990 levels by the year 2020.

Many of the committee's recommendations encourage us to conserve and use energy more efficiently. If we use less coal, natural gas and oil to heat and operate our homes and offices, we reduce our greenhouse gas emissions. These efforts also make sense in today's economy.

Other recommendations focus on developing Montana's excellent wind, solar and geothermal resources, as well as exploring a full array of biofuels from Montana-grown crops. The committee also recommends ways to store more carbon in our forests, farmland and rangeland.

The carbon cycle



CO₂ in the atmosphere lets in radiation from the sun and traps heat to warm the surface of the Earth. This effect is called the greenhouse effect because the CO₂ keeps the Earth warm, like a greenhouse.



CO₂ is a product of fuel use by humans. The fuels burned are fossil fuels as well as surface fuels like wood.



Plants turn CO₂ into solid plant materials like leaves, wood and roots. Plants keep the CO₂ out of the atmosphere as long as the plants are not eaten by animals or burned. This is called sequestration.



How to use this guide

The Climate Change Advisory Committee studied four main categories:

- 1) Housing and commercial buildings
- 2) Agriculture and forestry
- 3) Transportation
- 4) Energy supply and renewable energy

This guide is organized into the same four sections. Each section highlights what the committee learned about each category's carbon emissions, including where carbon comes from and how much is produced.

All of the committee's recommendations wouldn't fit in this guide, so we included the most relevant and easy to follow. We also provide resources to help you save money by

reducing your energy use.

From installing efficient light bulbs to getting the best gas mileage from your car, this guide will arm you with simple things you can do to reduce your own greenhouse gas emissions.

Each section also features success stories of Montanans across the state already putting the Climate Change Advisory Committee recommendations to good use. From a grocery store on the Hi-Line with a state-of-the-art high-efficiency refrigeration system that saves thousands of dollars a year to a rancher in Belgrade that uses solar hot water to mill wool, these examples introduce you to Montanans just like you already reducing their greenhouse gas emissions.

Who produces greenhouse gases in Montana?

One of the Climate Change Advisory Committee's first tasks was to find out where greenhouse gases in Montana come from.

Our buildings, including homes, businesses, schools and industrial parks, are the biggest producers, according to the committee.

These buildings use most of the electricity and natural gas in our state and account for

about 43 percent of our greenhouse gas emissions.

Montanans log millions of miles on the road each year, so it makes sense that transportation generates about 20 percent of the state's greenhouse gas emissions. Gasoline-powered vehicles accounted for 54 percent of transportation emissions in 2005, diesel fuel consumption for 39 percent and air travel for about 6 percent.

The committee projects transportation to be the largest contributor of future emissions

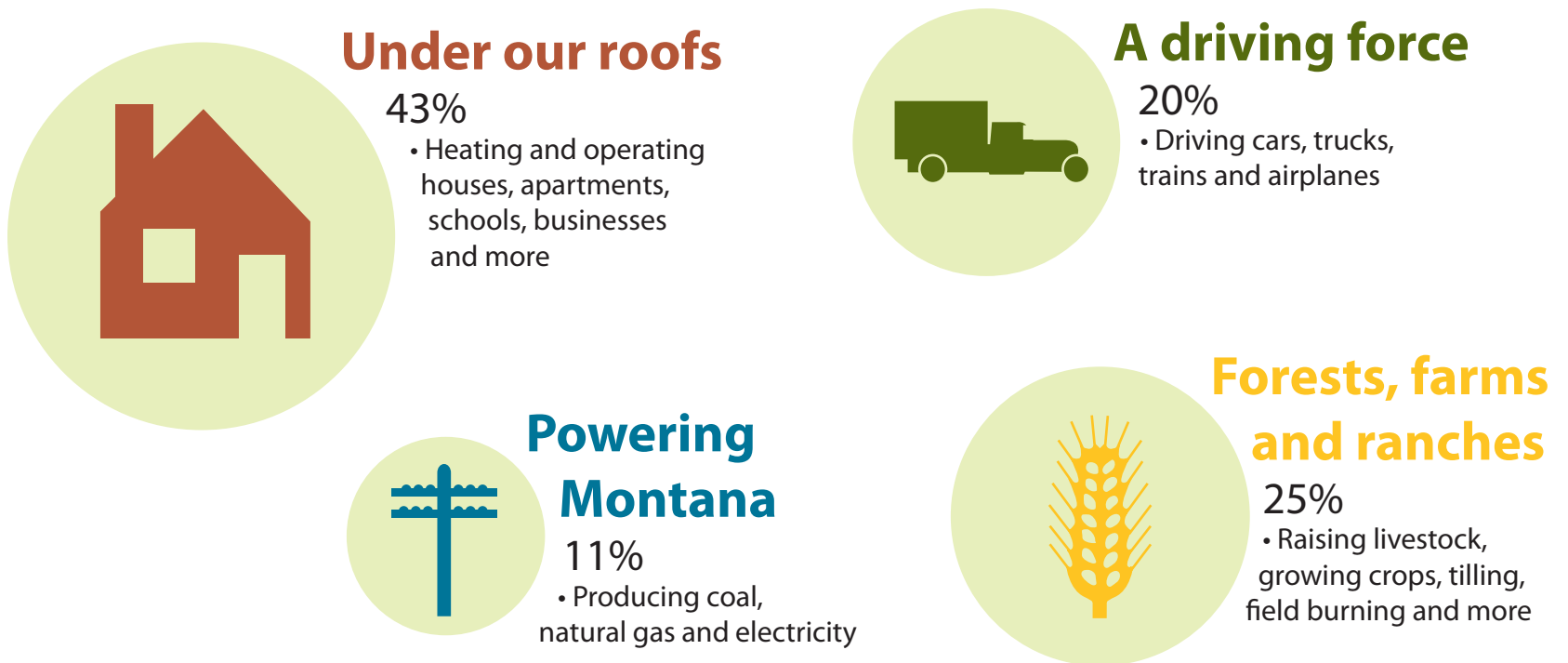
growth in Montana, so figuring out ways to make transportation more efficient is critical.

Agriculture activities, the base of Montana's economy, account for about 25 percent of the state's emissions. Livestock, manure, field burning, fertilizers, tilling land and more all produce greenhouse gases.

Approximately 11 percent of Montana's greenhouse gases come from electric generation and oil, natural gas and coal production.

A breakdown of greenhouse gas emissions in Montana

This graph shows where greenhouse gases in Montana come from. The size of each circle represents the sector's overall greenhouse gas emissions.



The production-versus-consumption approach

As a major energy producer, Montana exports raw coal, refined and unrefined oil and natural gas products. These fossil fuels are actually burned in other states or

countries and those emissions will presumably be measured in those places.

Some coal is used in Montana to generate electricity that we export over transmission lines to other states.

The Climate Change Advisory Committee's recommendations to reduce greenhouse gas

emissions are based on the amount of energy used within Montana. These are recommendations that Montana citizens can take and policies we can support.

The committee's recommendations and the ones presented here do not address emissions from electricity exported to other states.

Section I: Under our roofs

Efficiency starts at our front doors

In this section:

This guide starts with the Climate Change Advisory Committee's report on buildings across the state: our houses and apartments, office buildings, schools and warehouses.

It begins with buildings because the committee found that these structures produce a considerable amount of Montana's greenhouse gases — about 43 percent. About a third of that is from burning fossil fuels. The rest is from electricity use.

Existing homes:

Updating our dwellings

Montana has roughly 415,000 houses, apartments and other buildings we call home. The Climate Change Advisory Committee found that many of these structures can produce less greenhouse gases if they use energy more efficiently.

About half of Montana homes are old, with 45 percent built before 1980. The committee found that these homes often are not well insulated and have outdated, inefficient appliances. That means these homes use more natural gas, other fossil fuels and electricity to supply their occupants with heat and power to run older appliances.

The committee found that if we increase efficiency in our homes, we can use less of these fuels and save money. The story on this page about the Missoula Green Blocks program is just one example of Montanans taking the first step toward smarter energy use.

Neighbors working together

Utility, residents partner to make homes more efficient

MISSOULA — NorthWestern Energy and the city of Missoula are out to make the city more efficient, one block at a time.

In the summer of 2008, the city of Missoula selected residences for a pilot program designed in part to see how homeowners and utilities can team up to help conserve natural gas and electricity.

The Green Blocks program selected four two-block areas in Missoula and seven groups of residences.

NorthWestern performed an energy audit, which is an inspection to determine how a home uses energy and find ways to increase efficiency.

During these audits, NorthWestern installed weather-stripping, door sweeps, low-flow showerheads, hot water tank insulation, programmable thermostats, new light bulbs and more.

NorthWestern will monitor energy use

for the next year to track benefits and changes in energy consumption.

Allied Waste and Mountain Water Company are also participating in the program and will provide audits and offer help to recycle waste and save water.

Green Blocks also provides participants educational programs in recycling, energy conservation and building materials reuse.

Green Blocks is a project of the Missoula Mayor's Advisory Group on Climate Change and Sustainability, which selected participants from a pool of applicants.

Green Blocks is based on NorthWestern Energy's existing residential energy efficiency programs that include home energy audits and rebates for lighting, programmable thermostats, insulation and more.

For more information, visit www.ci.missoula.mt.us/greenblocks.htm



Tips for a GREENER house

You don't need to be a part of the Green Blocks program to save energy in your own home. Implement some of the program's measure today:

- **Get an E+ Energy Audit from NorthWestern Energy.** You're eligible for a free audit if you heat your home or water with fuel from NorthWestern Energy, haven't had an audit in the past and your home is at least five years old. Other qualifications may apply. **Sign up by calling 1-800-823-5995.**
- **Find a place to recycle your waste.** There are more than 100 recycling collection points in Montana and 90 percent of citizens live in areas that offer recycling. **Visit www.recyclemontana.org or call (406) 461-9106 to get recycling information for your area.**



— UNDER OUR ROOFS —

A sign marks the entrance to Josephine Crossing.



A drawing of a home model at the subdivision.



Houses facing a park in the planned community.



Drawing from <http://mccalldevelopment.com>

New construction:

Building a more efficient future

The Climate Change Advisory Committee projects Montanans will build 100,000 new homes by 2025. New construction offers distinct advantages to build in energy efficiency from the ground up, and the committee encourages this.

The easiest way to incorporate efficiency measures is in the design and construction phases of a new building. The story at the right about Josephine Crossing, a Billings subdivision, highlights one Montana developer who designs and builds efficient houses.

As it gets more expensive to heat our homes, builders, buyers and banks want better energy performance. If you're building a new home, investing a bit more money for better insulation and more efficient appliances means lower energy bills in the future.

Green from the ground up

Billings development emphasizes efficient homes

BILLINGS — A new development near Billings' Yellowstone riverfront bucks the trend of developers consuming open lands with semirural and suburban sprawl.

Josephine Crossing is a planned community of 300-plus energy-efficient homes. McCall Development of Billings designed and is building the neighborhood.

The streets at Josephine Crossing balance bicycle and pedestrian use with closely controlled motorized traffic. The urban infill means improved transportation choices for residents. But that's not all.

Josephine Crossing is the only Billings subdivision with exclusively Energy Star-certified homes. This means homes exceed energy-efficiency ratings of standard new homes from 30 to 50 percent. Appliances, heaters and more are the most efficient on the market. The homes are

also modestly sized, about 1,000 to 3,000 square feet, with porches facing the street and garages accessed from alleyways.

Pocket parks and a larger community park, meant to encourage neighbor interaction, are under development. A portion of Josephine Crossing is also set aside as an addition to the adjacent Riverfront Park along the Yellowstone River.

McCall Development co-owner Greg McCall said it costs up to \$6,000 more to build an Energy Star-certified home, but as prices for home energy continue to escalate that investment becomes even more valuable. Prices at Josephine Crossing range from about \$190,000 for a two-bedroom, two-bath unit to \$295,000 for a three-bedroom, three-bath craftsman.

For more information about Josephine Crossing, visit <http://mccalldevelopment.com>

Efficient from the start

Building a new house? Check out these resources to help you make it energy efficient:

- **The Montana Building Industry Association** can help homeowners and businesses build more efficiently. Home builders follow a checklist of recommended best practices and two on-site inspections from a third-party certifier are required. The final scoring is sent to national Green Home certifiers who rank and certify the completed project. **For more information, visit www.montanabia.com/green.html or call (406) 442-4479.**

- The Yellowstone Business Partnership offers assistance for its own certification. This new green rating system, called the Greater Yellowstone Framework for Sustainable Development, awards points for energy-efficient designs and materials and incorporates buildings into local cultural elements such as recreation, community history and wildlife corridors. **For more information, visit www.yellowstonebusiness.org or call (406) 522-7809.**

— UNDER OUR ROOFS—

Rental units:

An efficient place to call home

About 14 percent of apartments and rental units in Montana are either unsound or in need of improvement, according to a recent study commissioned by the state.

Most of these deteriorating homes have inefficient appliances, furnaces, boilers and in-

sulation. The Climate Change Advisory Committee found that people who live in these homes heavily use utility subsidy programs to help pay high energy bills. Residents also rely on weatherization programs to make efficiency improvements they can't afford.

But sometimes these programs aren't enough. According to the Public Service Commission, almost 2,400 Montanans lost service

at the end of the 2007 heating season when the state's largest utility shut off their supply due to nonpayment. That's more than double the number of shutoffs in 2005.

We can lower this number if we follow committee recommendations to make apartments more efficient. HomeWORD, a Montana nonprofit, is doing just that. Read about it in the story below.

HomeWORD raises the standard

Nonprofit builds efficient low-income housing

BILLINGS — The Acme Hotel is a century-old fixture in downtown Billings. Unfortunately, for more than decade of that time it was a vacant eyesore.

Today the three-story brick building offers 19 refurbished apartment units for low-income tenants. The remodel is the product of a year-long, \$3.4 million renovation completed in 2004 by homeWORD, a nonprofit organization based in Missoula and Billings.

HomeWORD's mission is to use innovative, sustainable and replicable methods to develop affordable housing for those most in need. The Acme historic restoration project used recycled material and incorporated conservation and renewable applications wherever possible. At the time of completion, the Acme rooftop boasted the state's largest array of solar electric panels.

Several blocks south of the Acme Hotel, homeWORD took on an even larger project at the Southern Lights, a multi-family apartment complex. This project filled a long-vacant lot near Billings' South Park. The Southern Lights complex has a rooftop garden and high-efficiency windows and insulation. The units offer from one to four bedrooms and house families.

HomeWORD also has major projects in the Missoula area. The 35-unit Orchard Gardens in Missoula County features both community orchards and gardens and the state's most progressive energy-efficient design.

For more information about homeWORD, visit www.homeword.org or call (406) 532-HOME in Missoula, (406) 255-0298 in Billings.



Public art is part of the entrance at Southern Lights in Billings. HomeWORD's 1% for the Art program dedicates a small portion of each project's budget to incorporate art in its housing developments.

HomeWORD projects across the state

Gold Dust

- 18 units in Missoula's historic Northside
- Solar electric system meets up to half of residents' power needs
- Serves people earning 50% of the area median income

Lenox Flats

- 10 one-bedroom apartments in a 1905 building in downtown Missoula
- High-efficiency wood-clad windows
- Serves residents earning between 25% and 50% of the area median income

High Sierra

- 8 affordable three-bedroom single-family homes in The Heights neighborhood in Billings
- Stress skin panel construction
- Prices start at \$98,000

Fireweed Court

- 12 townhouses in the historic Southside neighborhood in Missoula
- Infill development, strawbale walls
- Serves households earning less than 50% of the area median income

Strawbale Homes

- Two 1,170 square-foot, two-bedroom demonstration homes in Missoula's Northside
- 18-inch thick strawbale walls
- Sold to single-parent families earning less than 60% of the area median income.

Emma Court

- Four rent-to-own Missoula townhomes
- \$25,000 no-interest loan for purchase

Commercial buildings:

Doing energy-wise business

Our state's commercial buildings range from Main Street businesses, professional offices and health care facilities to wholesale and retail outlets and restaurants. Public buildings, schools and institutions are also in this category.

The Climate Change Advisory Committee discovered that energy inefficiencies in these buildings are often passed on to customers. If a restaurant pays too much to heat its building, it charges more for a meal. If it costs more to heat a school, taxes go up.

In general, commercial buildings heavily use electric motors, refrigeration, boilers, air conditioning and specialty appliances. According to the committee, using more efficient versions of necessary equipment can mean great savings for businesses like Rex's Food Farm, as described in the story on the right.

A blast of cold air at Rex's

Energy savings in store for a Hi-Line grocer

CHOTEAU — In an earlier era, an ice-cold beverage on a summer day was a rare luxury along Montana's front range.

We've come a long way from the days when an ice-box contained a block of ice.

Today, you can get a cold soda just about anywhere and frozen goods are commonplace. But refrigeration comes with an energy and greenhouse gas price tag.

At Rex's Food Farm, owners recently replaced 36 feet

of old multi-deck freezer cases with three new energy-efficient modular units.

The \$31,000 project was assisted by a NorthWestern Energy incentive of about \$17,700.

According to NorthWestern, Rex's will save \$6,000 per year in refrigeration costs and pay back the owner's project costs through energy savings in just over two years.

Refrigeration is a major source of energy use for

many commercial businesses. But a partnership between the federal government, refrigeration manufacturers and interest groups resulted in major product improvements in the past decade. Modern equipment offers impressive energy savings over older models.

Rex's also recently completed a major lighting overhaul. NorthWestern contributed about \$1,600 toward the \$23,000 lighting project.

The second year's a charm

Rex's Food Farm pays back the cost of new energy-efficient freezers in two years



School buildings: *Learning about energy*

More than half of Montana's primary and secondary schools were built before 1970. Although most are well maintained, almost 30 percent have inefficient single-pane windows and about 75 percent have outdated lighting.

In 2007 alone, Montana school districts

spent \$27 million purchasing fuel to run buildings. This figure could be lower if buildings were more efficient.

Districts across the state are already making lighting and energy-use improvements. The story below about schools in Red Lodge and Basin highlights how schools across the state can be more efficient.

The state colleges and universities are also

trying to contain carbon emissions. Some student groups and administrators have designated sustainability positions and green teams to collect energy data, monitor purchases and coordinate recycling programs. Research and training at the state's campuses may further influence the course of renewable technologies and carbon sequestration in Montana. 🏠

An education in efficiency

Schools build and remodel with an eye toward the future

BASIN — As energy costs soar, school districts across Montana face tough decisions.

Aging buildings, like the two-story Basin Elementary School, are particularly problematic. The school is an iconic example of a frontier school. Built in the 1890s, its bell tower and stone foundation define building craftsmanship of the period.

But the century-old building was incredibly energy inefficient. The ship-board siding and lath-and-plaster walls contained no insulation and neither did the attic. Double-hung windows on the first floor were single pane.

In 2008, a major energy renovation started at the Basin School. Area contractors stripped siding and blew insulation into the wall cavities and attic. Crews sheathed and re-sided exterior walls and installed energy-efficient replacement windows. These and other planned conservation measures mean officials can afford to keep the school open for the 15-or-so students enrolled in Basin.

Halfway across the state in another old mining town, a school board took a decidedly different approach to dealing with high energy costs.

In February 2009, Red Lodge high school students will receive a big valentine from local residents — a brand new, energy-efficient building.

The new high school will be a working example of green design, reduced energy consumption and innovative use of raw and recycled materials.

The site of the new school is on the north edge of town on old coal tailings. Reclaiming land was important to the project leaders and is a main concept behind the project's rigorous certification system.

"The new school will be a really cheery, pleasant place to be," said Jeff Kanning of Collaborative Design Architects, the project architect.

Classrooms are positioned to receive maximum sunlight and equipped with banks of lights that respond to changes in weather and time of day. Windows will be fitted with solar shades. The abundance of natural light and fresh air — the green aspects of the building — is healthy for students and faculty.

Builders used local products whenever possible. The building will feature recycled carpet and low- or no-VOC (volatile organic compounds) paint.

"A healthier interior will lead to healthier students, and hopefully better grades and attitudes as well," Kanning said.

The school will keep all of its storm-water on site and use it to recharge the local water table. The building features low-flow plumbing and automatic shut-off lights.

The \$9 million price tag for the school is comparable to a conventional building of the same size.

"The new school is an active building, and the students will be active participants in that process," Kanning said. "They will learn how to control their environment and not just be passive occupants."



Work on the Basin School includes re-siding walls and adding energy-efficient windows to the 100-year-old structure. About 15 students attend the school.

Recommendations:

The Climate Change Advisory Committee recommendations for our homes, offices and other buildings focus on reducing carbon emissions by reducing energy use.

Increase access to energy efficiency

Expand programs that offer free energy audits for homes and businesses. Also expand programs that offer tax rebates, incentives and energy-efficiency measures for low-income residences.

Provide energy audit and weatherization services in areas that don't currently offer these services and coordinate with utilities where services are offered.

Expand low-income and rental housing and energy efficiency programs.

Build more energy-efficient buildings

Develop a more stringent statewide energy standard for new construction. Substantial rehabilitation of older structures is also proposed.

Offer consumer education programs.

Expand tax credits to increase residential investment in conservation and efficiency measures, including energy-efficient appliances.

What you can do

- Many Montana utility companies already offer energy audits:
 - NorthWestern Energy provides home energy audits for their customers. Visit www.northwesternenergy.com/display.aspx?Page=Home_Audit_MT or call 1-800-823-5995 to sign up.
 - If you get energy from a rural cooperative, visit www.mtco-ops.com/Member_Coops/index.html or call (406) 761-8333 to find out what programs your utility offers.
- Lighting is an easy place to start conserving. Try switching from incandescent bulbs to energy-efficient compact fluorescent bulbs, which use two-thirds less energy and last 10 times longer than traditional bulbs. Check out Energy-Star's Web site at www.energystar.gov/index.cfm?c=cfls.pr_cfls to learn about CFLs and use their guide to select the right bulbs for your house.
- NorthWestern Energy offers an Efficiency Rebate Program for customers who install insulation, high-efficiency gas furnaces, programmable thermostats, compact fluorescent bulbs and water efficiency measures. Visit www.northwesternenergy.com/display.aspx?Page=Rebates_Home_MT&Item=102 or call 1-800-823-5995 for information.
- The Low Income Energy Assistance Program (LIEAP) is a state-, federal- and utility-funded program available to persons who may not otherwise be able to afford to heat or weatherize their homes or apartments during the winter. For more information, visit www.dphhs.mt.gov/programsservices/energyassistance/index.shtml or call 1-800-332-2272.

What you can do

- The Montana Department of Environmental Quality offers a summary of residential and commercial building codes and energy standards. Look for information about building beyond existing energy codes to save money on energy costs in your building. Learn more at www.deq.state.mt.us/energy/conservation/homes/newhomes/Building%20Codes.asp.
- Energy-Star also offers information on how to build an Energy-Star-certified home or building and upgrade existing structures at www.energystar.gov.
- The Montana Energy Savers Guidebook offers information on how to reduce greenhouse gas emissions and is available from the Department of Environmental Quality. It can be accessed online at www.deq.state.mt.us/Energy/index.asp.
- Visit the Montana State University Extension Service's Home Insulation Choices Web site at www.weatherization.org/homeinsulationchoices.htm for information about choosing the right type of insulation for your home.
- Contact your elected officials and let them know you support expansion of tax credits for conservation and efficiency measures.

Section II: Forests, farms and ranches

Planting the seeds for change

In this section:

This section deals with what defines Montana's landscape — our farms, ranches and forests.

Rural Montana has a lot to lose to climate change. About 64 percent of our state's roughly 93 million acres is classified as farmland and rangeland. These landscapes will drastically change as the climate changes.

The Climate Change Advisory Committee focused on agriculture because if Montana becomes drier, farmers will grow less and livestock will lose major food sources.

Forests:

Where Montana stores carbon

About 23 million acres of our state are forested. The trees and shrubs of Montana's forests are an important part of the carbon cycle. Trees remove carbon dioxide from the air through photosynthesis. The carbon dioxide gas is converted into carbon and some of it is stored as fiber in tree trunks, branches, foliage and roots.

Growing forests are important in the carbon cycle because they store carbon. We don't fully understand how recent droughts, insect damage and forest fires that have plagued our state's forests are changing this cycle.

Pine bark beetle infestations across Montana forests have killed millions of trees.

This creates an opportunity to harvest trees for building materials, wood products, energy production and more, as long as tree removal improves the health and sustainability of the remaining forests. Healthy forests provide greater carbon sequestration and resistance to further infestation.

We know from the committee's work that Montana forests and a large portion of our agricultural lands can capture and store far more carbon than we produce from all agriculture- and forestry-related activities. Farmland and rangeland will help reduce the impact of the greenhouse gases we produce across the state from buildings, vehicles and more.

Trees killed by pine bark beetles line the East Ridge in Butte.



*Inset:
Pine bark beetles are not much larger than a grain of rice.*

Farms and ranches: *A sustainable harvest*

Agriculture is at the heart of Montana's identity and economy. It is also a key contributor of greenhouse gases. Growing food and raising livestock contributes about 25 percent of our state's current greenhouse gas emissions.

Sources of emissions from agriculture include CO₂ that is released when we till land and methane and nitrous oxide from livestock, manure management and fertilizer application. The Climate Change Advisory Committee tallied the gas and diesel we use to produce and ship crops and livestock as transportation emissions.

The committee learned that agricultural activities contribute significant emissions. But it also found that Montana's extensive rangelands, hayfields and some crops store a substantial amount of carbon.

Sustainable farming methods, such as organic farming, extensive conservation tillage and community-supported agriculture, are becoming more popular. The story below highlights a successful community-supported agriculture farm in Boulder.

Sustainable methods reduce emissions by storing more carbon in soils. In fact, the committee discovered that greenhouse gas emissions from agriculture actually decreased since 1990.

What's your carbon footprint?

A carbon footprint is a measure of the amount of greenhouse gases produced in our lives through burning fossil fuels for electricity, heating, transportation and more.

The **People's Climate Project** offers tools to determine the size of your carbon footprint. Use calculators on the site to learn how many tons of carbon you produce each year. The site also offers links to donate to help low-income Montanans weatherize their homes and reduce their natural gas and electric bills, and also lower their carbon footprints. Learn more at:

www.peoplesclimateproject.org

Community-supported ag is growing in Montana Local farm promotes partnership between consumer, producer

BOULDER — At first glance, Tom and Jackie Fischer's place south of here seems an unlikely place for a farm.

Perched on the flanks of the Elkhorn Mountains, the landscape is dry, windy and very rocky. Sagebrush seems at home here, but eggplant?

It actually thrives, along with snap peas, corn, beets, carrots, cabbage, cauliflower and many other vegetables and herbs.

"People are always amazed at the variety of vegetables that we can grow here in Montana," laughs Jackie Fischer. "They can't believe it."

The Fischers own and operate Perpetual Harvest Farms and sell produce through food shares, rather than at more traditional farmers markets.

It works like this: Members purchase a share in the early spring. Their share of the harvest throughout the 16-week growing season is delivered weekly, usually to a central pickup place. One share is generally sufficient for two people on a vegetarian diet, or a small family on a mixed diet.

This concept — called community-supported agriculture, or CSA — allows farmers to plan ahead based on the number of shares purchased. Since the produce has a waiting consumer, farmers are free from the pressures of marketing and sales.

The CSA model also creates a partnership between farmers and consumers. Members can depend on locally produced fruits and vegetables, and farmers can depend on a ready market and fair price for the food they produce.

This form of local agriculture is still fairly new for many parts of Montana, but has been successful throughout the country in recent years.

Before the 1940s, Montana grew and processed about 70 percent of the food consumed by its citizens and the state was a net exporter of processed fruits and vegetables.

In the past few decades, the amount of food Montana produces for its own residents fell below 10 percent and Montana now imports most of the food consumed here.

Many food products are shipped 1,500 miles from their place of origin to a table in



Photo from Perpetual Harvest Farms
Perpetual Harvest Farms in Boulder grows tomatoes, squash and beets.

Montana, and handled more than 30 times. Carbon contributions from these practices can be significant.

But recent trends may mark a slow turnaround as more Montanans seek out locally produced food products. Microbreweries and farmers markets are high-profile indicators of the trend, but other activities like CSAs are also at work.

A new way to refuel with Montana crops

Golden Triangle farmers produce commercial biodiesel

CHESTER — Logan Fisher and Brett Earl are fourth-generation farmers in northcentral Montana's Golden Triangle region. They are also Montana's first commercial biodiesel refiners.

Originally from the Chester area, Fisher and Earl went off to college before returning to family farms in the region. Earl briefly worked in petroleum refineries.

Each man approached biofuels as a possible hedge against petroleum input costs in their farming operations.

"We wanted to lower costs for our own farms," Fisher said. "Farming is our primary occupation."

A commercial enterprise

Earl Fisher Biofuels sold its first biodiesel in April 2008. The plant is currently capable of producing about 400 gallons per day of certified biodiesel for off-highway use.

When the partners began production, Fisher and Earl experimented with a variety of vegetable oils, including safflower, mustard and canola.

"We started with safflower," Fisher said. "It loves heat and you can harvest it late."

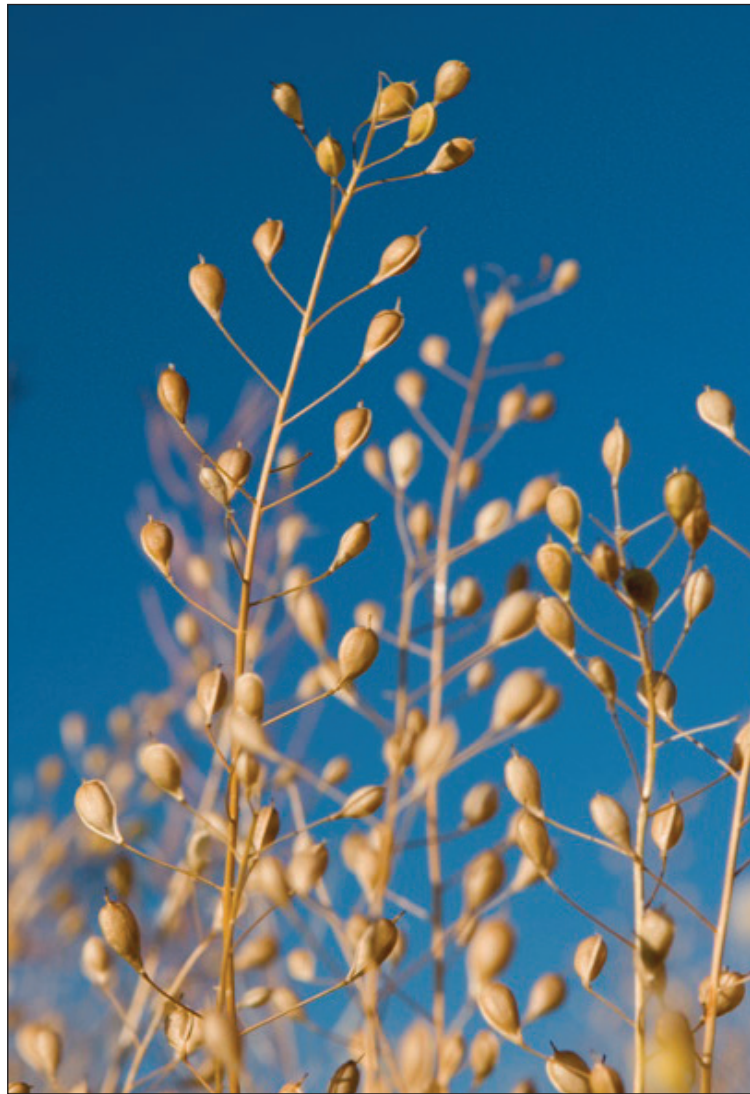
Research with safflower eventually led the men to camelina, an oilseed well suited to the region's growing conditions.

Camelina is an environmentally friendly crop that requires no fertilizers or pesticides. It holds potential as a rotational crop in dryland settings.

Both Earl and Fisher plant it on their farms, but most area farmers currently devote their acreage to a more lucrative crop — wheat.

How it works

The process at Earl Fisher starts with a vegetable oil. The company uses two oil presses capable



Camelina grows in a field at Earl Fisher Biofuels.

of processing about two tons of oilseed per day. Camelina seed at the plant yields about two gallons of oil per bushel. The refinery augments this supply with liquid oil purchased from presses out of Culbertson and other regional sources.

Filtered oil is pumped into a tank, heated and blended with methanol and sodium hydroxide. A chemical reaction breaks down the fat molecules in the oil, creating ester and a glycerin co-product. In a settling tank, the ester, or biodiesel fuel, rises and the glycerin is drained out. After a

washing, the final product — more than 99 percent biodiesel — is filtered, tested and put in a sale tank.

The product can also be blended with petroleum diesel for use on area farms. Montana State University-Northern's Bio-Energy Innovation and Testing Center gives Earl Fisher biodiesel high ratings and is testing it with various blends of petroleum diesel and other biofuels.

What it means for Montana

The partners said they can envision producing 1 million gallons of biodiesel a year from of their current pilot operation. They also think Montana's grain-growing regions could support eight or more plants that produce 1 million gallons per year.

But, for the time being Earl and Fisher will continue to farm by day and make biofuels at night and during the winter.

The business plan and development of the plant was assisted through about \$350,000 in funding from a local development organization and the U.S. Department of Agriculture. Central to the operation was \$234,500 from the Workforce Innovation in Regional Economic Development grant administered through the Montana Department of Commerce.

Why biodiesel?

Biodiesel is an important renewable energy source for transportation purposes. It is efficient when burned and environmentally safe in the event of spillage.

Burning biodiesel offsets petroleum-based diesel and decreases greenhouse gas and other toxic air emissions. The product also holds a high potential to improve Montana's rural economies by providing jobs and an alternative crop to wheat and barley.

Biodiesel primer

What is B20 biodiesel?

B20 is an alternative fuel created by mixing regular petroleum diesel with biodiesel produced from agricultural products such as soy beans, canola, camelina, mustard seeds, waste cooking oils and other organic products. The B number indicates the percentage of biodiesel. That means B20 biodiesel is a blend of 20 percent biodiesel and 80 percent petroleum diesel. The B20 mixture is considered a typical blend for normal use in conventional diesel engines.

Is biodiesel safe to put in my diesel engine?

Yes. Using biodiesel requires no engine modification, but achieves significant performance and emissions benefits. Biodiesel has been tested by governmental agencies, universities, transit authorities and private industry. Biodiesel is also recognized as an alternative fuel by the U.S. Department of Energy and the Environmental Protection Agency.

Does B20 act and burn the same as petroleum in my engine?

Yes. In most cases you would be unable to tell the difference between the two fuels. B20 can be used in the existing engines and fuel injection equipment with little impact to the operating performance. In more than 30 million miles of in-field demonstrations, B20 has produced similar fuel consumption, horsepower, torque and haulage rates as conventional diesel fuel. Biodiesel also has a superior lubricity, which helps prevent engine wear.

Can I still use B20 biodiesel during Montana's cold winter months?

Yes. B20 biodiesel has essentially the same cold-weather properties as regular petroleum diesel. B20 is used extensively in Yellowstone National Park, in ski areas and other locations with no problems.

What does biodiesel mean to Montana?

In addition to reduced air pollution, biodiesel has the potential for significant economic opportunities for rural communities. Biodiesel creates markets for crops used to produce biodiesel. Earl Fisher Biofuels is investigating the construction of biodiesel production plants in other locations across Montana.

—Adapted from
www.earlfisherbiofuels.com



Top: A tour at Earl Fisher Biofuels learns how to seed camelina.

Middle: Vials of biodiesel blends sit in the lab at Montana State University-Northern's lab.

Right: Brett Earl demonstrates how to test blends of biodiesel for maximum efficiency.



Recommendations:

The Climate Change Advisory Committee's recommendations for our forests, farms and ranches focus on developing more lands that can store carbon. The recommendations also encourage using less energy to produce our food. Some of these recommendations are for farmers and ranchers, but many apply to all Montanans.

Develop more lands that store carbon

Develop programs to promote local foods and fiber.

Expand agricultural land that stores carbon. This includes rangeland preservation, sustainable soil management and improved opportunities for organic and local food production and distribution.

Expand forest activities that sequester carbon, including reforestation, restoration, afforestation and improved management of existing stands.

What you can do

- Support local and sustainable food in your region. Shop at farmers markets or from community-supported agriculture organizations. To find a farmers market in Montana, visit <http://agr.mt.gov/farmersmarkets/default.asp>. To find local food, including community-supported agriculture, visit www.localharvest.org.
- Consider conservation tillage, organic and no-till management strategies on your farm. These approaches better preserve topsoil structure and conserve soil carbon. Conservation tillage has already demonstrated measurable reductions in carbon emissions within the Montana agriculture sector over the past decade. Tillage is a main fuel use for many operations. Tillage calculators are available at <http://ecat.sc.egov.usda.gov>.

Explore and produce biofuels

Explore and produce biofuels like ethanol and biodiesel from select crops, crop residues and forestry wastes.

Expand the use of forest biomass to produce energy and create local, durable wood products.

Preserve open space and working agricultural and forest lands.

What you can do

- Biodiesel.org lists biodiesel retail sights in each state. Learn more at www.biodiesel.org/buyingBioDiesel/retailfuelingsites.
- Buy products made from Montana wood. Find handcrafted Montana wood products at <http://madeinmontanausa.com>.
- If you're a farmer, growing oilseeds for biodiesel can save or even make you money. To learn more, check out the Oilseeds for Fuel, Feed and the Future workshop in Billings Jan. 28-29, 2009. The workshop will cover oilseed crushing and biofuel production. For more information, visit www.ncat.org or call 1-800-ASK-NCAT.
- To obtain free publications on biodiesel, visit the National Center for Appropriate Technology at www.attra.ncat.org/farm-energy/biodiesel.html or call 1-800-ASK-NCAT.
- Support local and state efforts for conservation easements, public land acquisitions, new community parks and open space initiatives.

Other ways to conserve energy on your farm or ranch

- Saving energy in agricultural settings begins with an inventory of energy use. Check out the ATTRA National Sustainable Agriculture Information Service at www.attra.ncat.org/energy_calculators.html. Each calculator has a specific focus, such as irrigation and pumps, electrical use and fertilizer application.
- Order an energy audit of your main facilities. Most utilities offer energy audits tailored for commercial and agricultural customers. Visit the following sites for more information: NorthWestern Energy, www.northwesternenergy.com/display.aspx?Page=Energy_Efficiency_Business_MT;

Montana Dakota Utilities, www.mduenergycenter.com; and Montana Rural Electric Cooperatives, www.mtco-ops.com/Member_Coops/index.html.

- Change lighting strategies. Switch incandescent fixtures to T-8 fluorescent lighting in barns, calving sheds and outbuildings. Consider changing out yard lamps with directed fixtures that save energy. Outdoor motion detectors work well for many agricultural applications.
- Irrigate efficiently. This usually means a combination of mechanical and management upgrades

to your system. Lowering pressures on pivot lines can save considerable energy. Use pressure gauges and examine sprinkler nozzles regularly. Studies in Western states indicate that about 25 percent of electrical energy used in irrigation is wasted due to poor pump and motor efficiency.

- Manage stored fuel. A 300-gallon unsheltered, above-ground tank can lose up to 10 gallons of fuel per month through evaporation during warm weather, particularly when painted a dark color. Silver-coat tanks and put up a rudimentary shelter. Pressure-relief caps also help reduce evaporation losses.

Section III: A driving force

Steering down a more efficient road

In this section:

It doesn't take a study by the Climate Change Advisory Committee to determine what we already know: Montanans drive a lot. In a rural state like ours, transportation is an essential economic activity and a personal necessity.

What the committee did learn is that cars, trucks, trains and planes are all major contributors of greenhouse gases.

With about 11 billion total vehicle miles traveled in Montana each year, this category kicks out about 20 percent of Montana's gross emissions. Gasoline-powered vehicles make up more than half of the emissions, with diesel fuel contributing about 40 percent. Air transportation accounts for about 6 percent.

Personal vehicles: *Ditching the regular commute*

Our state has a very high ratio of licensed drivers. We register almost a million vehicles, about a third are trucks, and drive about 12,000 miles each year per registered vehicle. Since 1990, gasoline use increased about 1 percent annually.

The Climate Change Advisory Committee focused on finding basic ways to make transportation more efficient. From taking

the bus to getting the most miles out of a gallon of gas, anyone can reduce their own vehicle's carbon emissions.

The story below highlights Montanans already reducing their emissions by using public transportation in Missoula and Bozeman.

Google Maps offers a comprehensive trip planning tool for bus trips in Missoula. It is available at www.mountainline.com/trip_planner.htm

Montanans on the move for a cleaner future

A shift to public transportation saves carbon

Bozeman — In a state as well known for its big sky as its big trucks, more and more Montanans are using and enjoying alternative transportation like Bozeman's Streamline bus system.

"Streamline has enlarged my circle and expanded my horizon," said Suzanne Winchester of Bozeman.

Winchester, who has not owned a car in 16 years, is one of 800 people who ride Streamline's buses each day. That's almost three times initial projections from when service started in 2001.

Bus popularity is clearly booming. In June 2008, Streamline saw a nearly two-fold increase in riders over the same month in 2007. Bus officials estimate that people who rode the bus saved 395,000 pounds of carbon dioxide by not driving.

By ditching the traditional commute, Missoula's Way to Go! Club members saved more than 6 million pounds of carbon dioxide during the last six years and traveled almost 8 million miles using alternative transportation.

The Way to Go! Club, a program of Missoula in Motion, is designed to help local businesses, institutions and individuals address transportation issues within the Missoula community.

Mountain Line, Missoula's bus system, provides 730,000 rides a year. Ridership increased 22 percent over the past three years, and the system now serves 20 fixed routes.

Mountain Line also recently replaced five of its oldest buses with new units. The buses have efficient diesel engines that run on B20 biodiesel.

The Gallatin Valley's Streamline bus system is free. The bus is run by the nonprofit Human Resource Development Council and is supported by many groups, including the city of Bozeman, Associated Students of Montana State University, the Montana Department of Transportation, the United Way and others.

Jackie Kostelnik of Belgrade, who uses Big Sky's Skyline bus service to connect to Stream-



Photo from www.streamlinebus.com

Streamline Bus in Bozeman runs Monday through Friday with Saturday service on two lines.

line, was virtually homebound for 15 years and now uses the bus to get to her physical therapy appointments and grocery stores, visit friends and to attend community events.

"One of the things that I enjoy about riding Streamline is the wide diversity of people I see every day," she said.

Freight:

Efficiency down the track

Trains are a popular way to move freight through Montana, and the amount of goods we ship over the rails is growing. Diesel fuel use in Montana increased 4 percent every year since 1990, and the Climate Change Advisory Committee attributes this jump largely to increased freight transport.

Much of Montana's trucked and rail freight bridges the state, or passes through with only fuel and service stops. Most of the freight tonnage through Montana is handled by rail, but trucks contribute more emissions.

The committee predicts transportation to be the largest contributor to future emissions growth. That's why it's important that we take action now to increase efficiency from our cars, truck, trains and planes.

The story on the right about efficient locomotives is a prime example of railroads already taking steps to reduce greenhouse gas emissions. ■



A diesel locomotive chugs along Montana's rails.

Locomotives pull their own weight

Trains get wise about greenhouse gas emissions

MISSOULA — It used to take eight Montana Rail Link locomotives to haul a typical freight train over Mullan Pass west of Helena.

But a new generation of technology introduced in the big sky state gets the job done with just four efficient diesel locomotives. And the trip is accomplished with less nitrous oxide, carbon and particulates pumped into the air.

These engines — the fuel-efficient 16-cylinder Electro-Motive Diesel and General Electric Co.-manufactured 12-cylinder Evolution series locomotives — are changing the way Montana railroads haul freight.

Railroads play a huge role in the state's economy, carrying more than half of all its freight tonnage. About 1.2 million carloads also pass through Montana, stopping only to sort cars, refuel and maintain locomotives.

Burlington Northern Santa Fe Railway, one of the nation's largest railroads, and Montana Rail Link, a midsized regional railroad, handle most of the freight that moves through Montana. Together, the railroads cover 3,200 miles of track in the state.

About two years ago both railroads started operating new locomotives that pollute less and run more efficiently than older models. The move was in response to regulations developed by the Environmental Protection Agency.

The Missoula-based MRL runs 16 Electro-Motive diesel locomotives over about 900 miles of track, including Mullan Pass. BNSF uses the same engines for service along Montana's northern routes and to haul coal



New Montana Rail Link locomotives sit in a yard in Helena.

out of the Powder River Basin. BNSF also runs Evolution locomotives along its other rails.

MRL's chief mechanical officer Claude Van Winkle said the railroad picked the new locomotives because of increased efficiency while maintaining power.

The new locomotives also decrease idling emissions in railroad yards by automatically shutting down when stopped and restarting only to charge batteries and maintain water temperature in cold weather.

MRL also installs auxiliary power units on older engines to significantly reduce idling. The retrofits reduce consumption during an hour-long idle from about four gallons of diesel fuel to about a half gallon, Van Winkle said.

Fuel efficiency is always a big consideration for BNSF, since a high-horsepower mainline locomotive can burn up to 400,000 gallons of fuel per year. BNSF expects to have 750 of the new units in service by the end of 2008, with about 70 or more running through Montana. Each locomotive costs from \$1.8 to \$2 million.

Recommendations:

The Climate Change Advisory Committee recommendations for transportation focus on improving vehicle efficiency and expanding public transportation options.

Make transportation more efficient

Expand public transportation and require higher vehicle fuel efficiency.

Develop better markets for fuel-efficient tires.

Distribute better consumer information about miles-per-gallon monitoring systems that track fuel usage.

Create financial incentives to encourage the purchase of low-emission vehicles.

What you can do

- Thirty-four Montana communities offer public transportation. Find out what options are available in your area at www.mdt.mt.gov/travinfo/public_trans.shtml. This site also has information for train and bus transportation.
- Proper tire selection and tire pressure are important to maximize mileage. Screw-on indicator caps are available from most auto parts stores. A green indicator means tire pressure is OK, yellow is a warning and red signals a problem. Battery-operated LED models are also available.
- Still carrying around winter tire chains and a bag of sand in your trunk? Weight matters, particularly in lighter cars, and less is better. Remove roof-top cargo containers when not in active use. Expect savings in the 1- to 2-percent range for smaller cars.
- Do you sometimes choose a washboard shortcut over a paved stretch of highway? Pavement can save up to 30 percent in fuel use over rough roads.
- A properly timed and tuned vehicle is absolutely essential to fuel efficiency. Your owner's manual provides important information to keep your vehicle running smoothly. Ask for an appropriate energy-conserving motor oil during your next service. These steps can improve efficiency up to 14 percent.
- Personal driving habits are a huge variable in fuel use. Most vehicles deliver optimal mileage at highway speeds less than 75 miles per hour. Slowing down is a simple and significant measure that saves fuel. Savings vary from 7 percent to 23 percent, depending on your type of car.
- Check out new federal tax credits for purchasing plug-in electric vehicles. The credit ranges from \$2,500 to \$15,000 depending on the vehicle's battery and weight. Visit the Internal Revenue Service at www.irs.gov or call 1-800-829-1040.

Reduce carbon emissions

Reduce idling of all diesel engines.

Develop incentives to use railroads to transport more freight in Montana.

What you can do

- Avoid high-traffic time periods. City traffic lights are timed to speed limits and are best negotiated during off-peak intervals.
- Electronic ignitions start up efficiently. That means most engine idling is a waste of gas. Even winter warm ups shouldn't last longer than a minute for newer cars. Remember, at idle you're getting zero miles per gallon.

Section IV: Powering Montana

Homegrown energy under the big sky

In this section:

Producing energy in Montana contributes significantly to our state's greenhouse gas emissions. We drill for oil and gas, mine and crush coal and more. These activities contribute about 11 percent of greenhouse gas emissions in our state.

Alternative energy: *Power from the sun*

We can use solar hot water panels, solar electricity, geothermal and other forms of renewable resources to produce energy. The Climate Change Advisory Committee recommends using all these technologies to reduce carbon emissions in Montana.

If we follow committee recommendations to use less energy, we don't have to make as much. If we produce energy from renewable sources, we can cut emissions even more.

The story below about 13 Mile Lamb and Wool Company in Belgrade is an example of a Montana business doing just that.

Sheep and solar power in southwestern Montana

Sustainable Belgrade farm uses power from the sun to mill wool

BELGRADE — There always seems to be a load in the wash at Thirteen Mile Lamb and Wool Company here.

Becky Weed and Dave Tyler, owners of the ranch and natural fiber mill, process fibers almost daily in a giant 275-gallon wash tank.

Weed and Tyler run about 300 head of sheep on their ranch, but the business also washes, picks and spins bison, alpaca, llama and goat fibers for outside customers.

Weed and Tyler spent more than 20 years cultivating their vision of a sustainable ranch in harmony with the local landscape at Thirteen Mile, on the 1860s-era John Reese homestead at the base of the Bridger Mountains.

Weed, a former geologist, and Tyler, a former engineer, raise certified-organic sheep and use non-lethal methods to protect against predators. For the first two decades, Thirteen Mile operated only as a lamb ranch.

But in 2003, Weed and Tyler decided to expand the farm and build a fiber processing mill. The mill enables them to add value to wool, a Montana agricultural product normally sent out of the state for processing.

Stabilizing, insulating and re-roofing an old white dairy barn to house the mill was simple enough. But Weed and Tyler needed hot water to make their operation run, and they needed a lot of it.

The process of turning raw fiber into usable

wool, felt and fleece starts with wool scouring, or washing the fiber in a 275-gallon tank full of 180-degree water.

Heating hundreds of gallons of water would create an energy burden for the small ranch, especially since propane is the only readily available fuel. And using large amounts of a fossil fuel didn't fit with the farm's sustainable goals.

So Weed and Tyler got creative. The barn's east-west orientation and steep roof angle made the site a perfect candidate for a solar water heating array, so they decided to set up a sun-powered system.

It was expensive. Weed and Tyler spent about \$50,000 for collectors, storage and cleansing tanks, a boiler and related equipment. A \$25,000 grant from NorthWestern Energy's E+ Renewable Energy Program helped defray some of the costs for the collector system.

Radiant Engineering in Bozeman designed the system, which runs off eight 4-foot by 8-foot solar collectors. During the day, heated water from the collectors circulates through a copper heat exchanger in an insulated 700-gallon hot water storage tank. When needed, water is pumped into the wash tank.



Solar hot water panels line the roof of the barn at 13 Mile Lamb and Wool company in Belgrade.

The wash tank features compressed air piped through the bottom of the load and provides a gentle veil of bubbles, an essential strategy to clean wool and delicate fibers. A high-efficiency propane boiler provides hot water to top off temperatures as required.

Weed and Tyler said the solar energy system supplies most of the hot water needed to run the wool wash tank. Radiant Energy estimates the system saved 12,000 gallons of propane during its first four years of use.

Wind power: *A change in the breeze*

The Judith Gap wind project at 135 megawatts is the largest wind facility in Montana today. An installation partially online at Cut Bank is at 110 megawatts and will add about 210 megawatts of wind power in late 2009. One megawatt can provide electrical power to 300 homes or more.

Montana's quality geothermal resources are also attracting attention. A number of

hot spring sites are candidates for development and dry wells from oil exploration access deep, warm waters that may be valuable for a variety of applications.

The Spa Hot Springs Motel in White Sulphur Springs is already using an array of alternative energy, including wind power. Read about it in the story below.

The Climate Change Advisory Committee recommends using all these resources to reduce Montana's greenhouse gas emissions. †

Make your business more efficient

You can sign up for a commercial energy appraisal, get more information on the E+ Energy Renewable Energy program and more. Visit http://www.northwesternenergy.com/display.aspx?Page=Energy_Efficiency_Business_MT.

Alternative energy on display at hot springs

Central Montana business owner uses several renewable energy options

WHITE SULPHUR SPRINGS — As much as he can, Gene Gudmundson takes advantage of solar, wind and geothermal energy at Spa Hot Springs Motel in White Sulphur Springs.

"We utilize all alternative energy sources available to us," Gudmundson said. "We strive to be a model of clean energy consumption and better business for the future."

That philosophy led Gudmundson to install a wind turbine and solar electric panels to meet some of his electricity needs.

A Whisper 175 wind turbine quietly turns White Sulphur Springs breezes into electricity at Spa Hot Springs. The 3,000-watt rated turbine sits atop a 44-foot tower and delivers in excess of 500 kilowatt hours per month in an average 12-mph wind.

A Southwest Windpower machine at the spa has a 14-foot rotor diameter and features a handmade fiberglass and foam core blade

for smooth, high-efficiency operation and low-wind start-up. It also incorporates a patented angle governor design for quiet operation in high winds. It has a peak power rating of 3,200 watts at 27 mph.

The tower and turbine stand 100 feet or so from the spa and motel.

"You can hear it sometimes at night, but it's not an unpleasant sound," said Gudmundson. "The only comments we've had from motel guests have all been positive."

Gudmundson's 16-panel solar electric system includes two 120-watt solar modules that produce 7.1 amps at 16.9 volts. Both arrays are mounted on racks that track the sun.

"It is kind of neat to watch the thing move and follow the sun," Gudmundson said.

The wind and solar systems are net metered, which allows them to feed excess electricity back into the utility grid. The two systems provide about a quarter of the spa's electric power needs.

"We've got a very large electric load,"

Gudmundson said. The load includes lighting and appliances for a 21-room motel, pools and dressing rooms and Gudmundson's Hot Springs Natural Health Clinic and chiropractic office, which serves clients from across the state.

To help finance the system, Gudmundson received a grant from the universal system benefits fund administered by the former Montana Power Company and paid for by all the utility's customers. The grant covered about a quarter of the total project cost of \$40,000.

Despite a few glitches and delays in getting the system running, Gudmundson said he is pleased with the results.

"The pool ties in with the clinic, which ties in with the alternative energy stuff," he said. "It's all natural, healthy and non-polluting. They all tie in. They all complement one another."



Wind and other forms of renewable energy power Spa Hot Springs Motel in White Sulphur Springs.



Batteries at the motel provide backup power.

Recommendations:

The Climate Change Advisory Committee's recommendations to reduce our greenhouse gas emissions from producing energy focus on increasing renewable energy generation in Montana.

Require utilities to obtain supply from renewable sources

Require utilities to obtain 20 percent of their supply from renewable sources by 2020 and 25 percent by 2025.

Identify and address barriers to the integration of renewable sources and encourage investment in renewable energy sources.

Create tax incentives for community wind projects.

Develop a planning process to evaluate potential wind sites and associated transmission infrastructure.

What you can do

- Contact your elected officials and let them know you support increasing Montana's renewable energy supply.
 - NorthWestern Energy offers several alternative ways to power your home or business. Learn more at www.northwesternenergy.com/display.aspx?Page=Green_Power_Intro&Item=91.
 - The National Center for Appropriate Technology has numerous resources to help Montanans retrofit homes with renewable energy sources and information to help builders incorporate renewable energy in their construction. Learn more at www.ncat.org.
 - MontanaGreenPower.org is our state's source for information on green energy. Explore the site to learn what's happening in solar, wind and other renewable energy technologies in Montana. You'll find the latest renewable energy news, information on planning and designing your own solar, wind and micro-hydro systems, activities for the classroom, updates on utility restructuring and links to other useful sites.
 - The Montana Department of Environmental Quality offers a loan program for homeowners, businesses and nonprofits that install renewable energy systems for their own use. Download an application at www.deq.state.mt.us/Energy/Renewable/altenergyloan.asp.
 - Montana also offers state tax credits for installing renewable energy systems. To find out more, go to www.deq.state.mt.us/Energy/Renewable/TaxIncentRenew.asp.
- For homeowners:
- Access Montana Solar House: A Guide to Adding Solar to Your Home, at www.montanagreenpower.com/solar/pdfs/MontanaSolarhouse.pdf or call 1-800-ASK-NCAT for a copy.
 - Learn about building a more efficient home with NCAT's Energy Star Solar Homes publication, available at www.montanagreenpower.com/solar/HomeownerBrochure.pdf or call 1-800-ASK-NCAT.
- For builders:
- Get NCAT's Montana Guide to Building Energy Star Homes at www.montanagreenpower.com/solar/BuilderBrochure.pdf.

Preserve our state for tomorrow's generation

Communities take action

Community efforts to conserve energy are powerful forces. That's why the Climate Change Advisory Committee's recommendations all apply to and can be implemented by small towns and big cities alike.

Montana communities are at the forefront of efforts to contain carbon and greenhouse emissions. Neighborhoods, local governments, school districts and colleges are working to reduce energy use and make more efficient neighborhoods.

One of the benefits of living in a state like Montana is the ability citizens have to contact their leaders. We all have easy access to decision makers — from school principals and city officials on up to our governor, U.S. senators and congressman.

Take advantage of this and contact leaders in your community. Let them know what you think about climate change and greenhouse gas emissions.

The story at the right is an example of state government already acting to reduce greenhouse gas emissions.

Can this level of citizen involvement and success help us meet the Climate Change Advisory Committee's goal to reduce our greenhouse gas emissions in Montana to 1990 levels by 2020?

The committee thinks it can.

Montana is blazing the path

State government works to reduce greenhouse gas emissions

Montana is already leading the way as an example of how states can act to reduce their carbon emissions.

In 2007, Gov. Brian Schweitzer announced the 20 X 10 Initiative. This initiative directs state agencies to reduce their energy consumption 20 percent by the year 2010. Conservation efforts started in January 2008 and will be measured against energy use from 2007.

"Climate change is serious and we should lead by example," Schweitzer said. "By setting a goal and working toward it, we can become leaders in addressing climate change."

The 20 X 10 Initiative seeks to reduce electricity, natural gas, propane and fuel oil use. It applies to all of the 30-plus state agencies.

The initiative starts by focusing on maintenance work that can make buildings more efficient. If state-owned buildings are more efficient,

agencies can reduce spending on energy fuels.

The initiative also directs agencies to start conserving by purchasing energy-efficient equipment, such as Energy Star-rated appliances.

Agency employees can also save energy. The initiative encourages using timing devices to make sure lights are only on when employees need them.

It also recommends setting thermostats a little lower and turning off computers at the end of the day.

In addition to building improvements, the 20 X 10 Initiative also lays out a requirement to only purchase state vehicles that average 30 mpg.

"Every agency will get to the goal in its own way," Schweitzer said. "This is not only the right thing to do but it also has huge cost-saving potential for the taxpayers.

This makes government more efficient."

In addition to benefits for taxpayers, Schweitzer encouraged schools, universities, businesses and communities to join the effort.

"Montana will lead by example and Montana will make a difference," he said.



What YOU can do

So now what?

Our climate in Montana is changing, but how does it affect you?

Your heating bill this winter might be a little higher than last year, but what's the point of insulating your attic if you can still pay what's due each month?

Your favorite fishing hole was closed for a portion of last summer because the river didn't have enough water, but with dozens of blue-ribbon trout streams in the state you can find another spot.

Your grocery bill might be higher because your supermarket's refrigeration costs are increasing, but you can still afford to feed your family.

So why is it important to deal with climate change in Montana? What's really at stake in the last best place?

The answer is simple: Climate change will have a profound effect on our economy, our environment and the quality of life for future generations.

The Climate Change Advisory Committee emphasizes the need to act now, while we have the luxury of time and simplicity.

Right now, Montanans can easily cut their carbon emissions. We can use inexpensive and energy-efficient light bulbs. We can carpool to work. We can develop community-level task forces to reduce energy use and greenhouse gas emissions, like Missoula, Billings, Helena and Red Lodge have already done.

By taking a few simple steps, we can reduce our emissions to 1990 levels and meet the Climate Change Advisory Committee's goal. But in a few decades it might not be so easy.

We know how to solve our problem. Everyone can do something. You can act now to preserve our state for tomorrow's generation.

Additional resources on climate change issues in Montana

www.montanaclimatechange.org

This Web site, hosted by the National Center for Appropriate Technology, provides current information on climate change activities in the state, technical reports, tips for reducing energy use and links to other resources.

www.aeromt.org/blueprint.php

This site offers viewers a blueprint for home-grown energy self reliance, as well as contacts for local foods and farmers markets in Montana.

www.deq.mt.gov/climatechange/

The Montana Department of Environmental

Quality Web site provides links to the full Montana Climate Change Action Plan and Montana Greenhouse Gas Inventory and Forecast.

www.clarkfork.org/publications/lowflows.html

A new report by the Clark Fork Coalition explores what the future holds for the Clark Fork basin in a world of changing climate.

www.mtaudubon.org/issues/global/index.html

This site provides information on the effects

global warming has on birds and other wildlife.

www.mtvotersedfund.org/system/files/PressPoll20081015.pdf

This 2008 poll on how Montana voters feel about energy issues show a clear preference for the development of renewable energy resources.

www.montanafarmersunion.com

Information on how agriculture producers can earn income by storing carbon in their soils through no-till crop production, tree plantings, conversion of cropland to grass and more is covered on this site.



Contact your local and state representatives and tell them to take action on climate change in Montana:

The 2009 Montana Legislature convenes at noon on Jan. 5. Legislative committees will work on new bills that focus on carbon-neutral buildings, offsetting carbon dioxide pollution from natural gas, monitoring and reporting greenhouse gas emissions and new tax credits for energy-efficient measures. Weigh in on important issues by contacting your elected officials:

To contact Gov. Brian Schweitzer:

By mail:

Gov. Brian Schweitzer
State Capitol
PO Box 200801
Helena, MT 59620-0801

By phone:

(406) 444-3111

By e-mail:

governor@mt.gov

To contact your Montana Legislature representative:

By mail:

(Name of representative)
Montana House of Representatives
State Capitol
PO Box 200400
Helena, MT 59620-0400

(Name of Senator)

Montana Senate
State Capitol
PO Box 200500
Helena, MT 59620-0500

By phone:

For legislative information: (406) 444-4800
To leave a message for your legislator (both representatives and senators): (406) 444-4800

By fax:

House of Representatives: (406) 444-4825
Senate: (406) 444-4875

Helpful information:

Official Web site for the Montana Legislature:
<http://leg.mt.gov/css/Default.asp>

To find your representative and senator for the Montana Legislature:
<http://leg.mt.gov/css/find%20a%20legislator.asp>



National Center
for Appropriate
Technology

NCAT

NCAT is a 501(c)(3) nonprofit organization that aims to improve the lives of economically disadvantaged people by helping individuals and communities adopt technologies that save energy and resources. Since 1976, NCAT, with its headquarters in Butte, Mont., has provided training, publications, Web sites, personalized technical assistance and telephone help lines to address issues ranging from housing and economics to environmental quality.

www.ncat.org

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