MONTANA
BUSINESS QUARTERLY

RECREATING THE AMERICAN PRAIRIE

DEVELOPING TOURISM
IN NORTHEAST MONTANA

FALL 2017

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BUREAU OF BUSINESS AND ECONOMIC RESEARCH
UNIVERSITY OF MONTANA

The Bureau of Business and Economic Research has been providing information about Montana's state and local economies for nearly 70 years. Housed on the Missoula campus of the University of Montana, the bureau is the research and public service branch of the School of Business Administration. On an ongoing basis the bureau analyzes local, state and national economies; provides annual income, employment and population forecasts; conducts extensive research on forest products, manufacturing, health care and Montana KIDS COUNT; designs and conducts comprehensive survey research at its on-site call center; presents annual economic outlook seminars in cities throughout Montana; and publishes the award-winning Montana Business Quarterly.

COVER
A bison herd grazes on the High Plains. (PriceM)

INSIDE COVER
Visitors camp on the American Prairie Reserve where Chief Joseph and the Nez Perce crossed the Missouri River in 1877. (Gib Myers, American Prairie Reserve)

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MESSAGE FROM THE INTERIM PROVOST FOR THE UNIVERSITY OF MONTANA

We kicked off the 2017-18 academic year at UM with the wonderful news that the University of Montana passed its latest accreditation review with flying colors! The Northwest Commission on Colleges and Universities gave UM high marks during our latest seven-year review by renewing our accreditation with no recommendations.

In addition to this excellent news, I am pleased to share with you a number of new initiatives we are launching in support of UM students this year:

- The grand opening of our new Missoula College building is in full swing! If you have the opportunity to visit these state-of-the-art facilities, please feel free to stop by. There is a public café area on the ground floor in addition to a gorgeous view of the Clark Fork River.
- Project Reconnect is geared toward all Montanans who completed some courses at the University of Montana, but never graduated. The goal is to reconnect them with UM and offer several pathways, including online courses, for degree completion. It's never too late to earn your UM degree and open new doors.
- Effective advising leads to degree completion within four years for undergraduate students. I convened the first UM Advising Council this fall to promote a common and productive advising experience for all UM students. As you know, great advising practices are directly linked to student retention, persistence and completion.

As we work hard to enroll new students and provide new pathways for their retention and successful completion of their college degrees, I know you will agree the effects of these efforts are far-reaching. They not only impact the UM budget, they buoy the Missoula economy and our state.

The University of Montana will be celebrating the 125th anniversary of its chartering by the Montana Legislature in February 2018. For a century and one quarter, our university has been an integral part of Missoula and the great state of Montana. Our strategic vision recognizes the important relationship between our people and this special place.

I invite you to read more about the different challenges and opportunities related to business in Montana in this issue of the Montana Business Quarterly. Here's hoping that you and your businesses thrive this fall!

Beverly Edmond
Interim Provost & Vice President for Academic Affairs
University of Montana

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WORLD ECONOMIC OUTLOOK

BETTER THAN LAST YEAR, BUT INCREASING UNCERTAINTY

BY PAUL E. POLZIN

There are a number of reasons why worldwide economic conditions are important to us in Montana. First of all, a large part of the Montana economy is dependent on commodities – and the recent collapse of commodity prices was mostly due to changes in world demand. Secondly, some of our largest manufacturing firms rely on the world market, in particular Applied Materials in Kalispell and REC Silicon in Butte. Finally, our wheat farmers sell much of their crop on the world market. Led by the U.S., most regions of the world are now growing. Before we look at the world view, let's quickly summarize national and state economic trends.

Russian President Vladimir Putin and U.S. President Donald Trump shake hands during their bilateral meeting on the sidelines at the G20 Summit in July 2017 in Hamburg, Germany. (Kremlin Pool)

United States and Montana

There was an explosion of optimism after the presidential election in November 2016. We saw surges in indices of sentiment in consumer and business surveys, such as the University of Michigan's Survey of Consumer Confidence, and a renewed bull market in stocks with the S&P 500 Index up about 10 percent right after the election. The actual economic data reports more modest increases with overall growth continuing in the 2 percent range.

Since then, the U.S. economy has returned to full employment with the current unemployment rate hovering a little less than 5 percent. This suggests that there is not a large pool of unemployed workers who could fill jobs if demand increases, although the labor force participation rate could rebound and provide some manpower relief. Therefore, the U.S. Federal Reserve will probably continue raising interest rates to keep inflation minimal.

U.S. manufacturing has been a bright spot during the recovery from the trough of the Great Recession. Lower oil prices and an abundance of cheap natural gas have kept costs low and provided opportunities for new products and production facilities. A recovering housing market, particularly in multi-family facilities, is stimulating the demand for building materials, furniture and appliances. But there are uncertainties with manufacturing exports due to the rising value of the dollar, slow worldwide growth and the potential for trade-dampening policies in several countries.

THE OVERALL WORLD OUTLOOK IS MORE POSITIVE THAN LAST YEAR. GLOBAL ECONOMIC GROWTH WILL BE ABOUT 2.6 PERCENT IN 2017.

In Montana, low oil prices continue to dampen the economy in the eastern part of the state and a drop in agricultural prices has impacted farms and ranches statewide. Consequently Montana's overall growth rate in 2016 was less than 2015. The energy and agricultural sectors are not projected to improve markedly in the near future and economic growth may be only slightly above that of 2016.

Gallatin County stands out as the fastest growing community in the state, with Flathead County a bit behind. Lewis and Clark and Cascade counties have posted modest growth. Even Missoula and Ravalli counties in the western part of the state have started to turn upward. New and expanded manufacturing establishments are a major factor in the improved conditions in Cascade and Missoula counties.

Europe and the Eurozone

Despite the uncertainty, due to the upcoming election in Germany and Britain's exit from the EU, overall indicators are stronger this year than last. Almost all areas are posting positive growth, as compared to declines last year in some debt-ridden countries.

Germany remains the growth leader and France lags a bit behind. Countries such as Italy and Spain are growing, but still face tight credit conditions. Unemployment remains high in certain countries, but has begun to decline. Unemployment rates are still near 20 percent in places such as Greece and Spain, but down from the 25 to 28 percent reported four or five years ago.

The U.K. remains a big unknown. A new recession and rising unemployment that some predicted would immediately follow Brexit has not occurred, but the pound sterling remains weak, giving some assist to exports and deterring imports. A disintegration of the U.K. is possible if there is a Scottish independence vote. Future trade negotiations with the EU may get testy.

Hanging over the entire region is the potential for an energy crises. The unresolved situation between Russia and Ukraine could result in a sharp drop in energy supplies to Western Europe and a corresponding rise in prices.

South America

The South American economy should show slight growth and Moody's Analytics projects an acceleration in 2018. Commodity prices have strengthened a bit and the Brazilian economy will enter positive territory after two years of declines. Venezuela's economy remains a basket case.

Brazil, the largest economy in South America, declined in 2015 and 2016. It has implemented expansionary fiscal and monetary policies, but the effectiveness has been limited by high inflation, a lack of trust in the private sector and a growing political crisis. Argentina is expected to grow after economic reforms take hold and private investment and government spending rebounds. Venezuela continues to be plagued by low oil prices, rampant inflation and political instability.

Mexico

The Mexican economy decelerated because new reforms did not stimulate investment as much as expected. Low oil prices remain a concern and U.S. policies under the new administration may negatively impact future investments from the North.

India

A long-awaited nationwide tax reform (a GST-goods and services tax) went into effect in July. Theoretically, this will replace a bewildering array of state taxes and improve the efficiency of the Indian economy. But the proposed GST is itself complex and its implementation may be fraught with difficulties.

Demonstrators march against Brexit during the March for Europe rally in London in 2016. (Michael Puche)

China

Reliable economic data for the Chinese economy remains problematic, but the news is not good. Official statistics show only a moderate deceleration to 7 to 8 percent annual growth rate. Private non-government sources paint a much darker picture, with these estimates showing annual increases in the 2 to 3 percent range. There is some concern that an unstable housing and construction cycle may be underway and a policy mistake may have major repercussions.

Japan

Japanese consumers are feeling more buoyant as improved employment conditions and a rising stock market boost sentiment. A pickup in global demand and a weak yen continue to support the economy. Exports are expanding at a double-digit rate for the first time in over two years, pushing the trade surplus to levels last seen in 2010. Weaknesses that plagued recent growth have also carried over to this year despite the continuous fall in unemployment.

Canada

The pessimism resulting from the oil price drop is over and there was solid growth in late 2016 and early 2017. The labor market continues strong and a competitive exchange rate have helped exports. Low inflation and the need for a competitive exchange rate will keep monetary policy accommodative.

The overall world outlook is more positive than last year. Global economic growth will be about 2.6 percent in 2017 and Moody's Analytics projects it will accelerate to 2.9 percent in 2018. The prominent risks on the downside are:

- The impacts of Brexit are still unknown.
- The refugee crisis is far from over.
- The perennial instability in the Middle East is just short of explosive.
- Economic growth in emerging markets is very uneven. ■

Paul E. Polzin is director emeritus at the Bureau of Business and Economic Research at the University of Montana.

RECREATING THE AMERICAN PRAIRIE

DEVELOPING CONSERVATION, TOURISM AND ECONOMIC OPPORTUNITIES IN NORTHEAST MONTANA

BY JEREMY SAGE

For many, the first image of Montana is a vast mountainous landscape with pristine forests and rivers, replete with charismatic wildlife. This is the image many business owners hope will attract visitors from around the world. However, there is more to the landscapes of Montana that often go unnoticed. But not for much longer if some advocates of the prairie have a say.

In 2016, nonresident visitors to Montana spent nearly $3.5 billion dollars in the state, directly supporting $4.8 billion in economic activity and more than 52,000 jobs. Visitors flock to Montana for a multitude of reasons – high among them is outdoor recreation. When asked why they come to Montana, an overwhelming number of visitors indicate their desire to visit Yellowstone or Glacier National Park. Given such a response, it is easy to assume that a majority of visitor expenditures, and thus contribution to economic vitality, occur in the regions of the state in closest proximity to the two parks. In fact, year in and year out this is exactly what is observed (Figure 1), with Glacier and Yellowstone Country travel regions accounting for 60 percent of the economic output and 65 percent of the jobs generated by nonresident visitor spending statewide.

Natural amenity rich destinations like Yellowstone and Glacier are not just a draw for tourists and outdoor enthusiasts on vacation. In fact, much of the population growth of the rural western U.S. since at least the 1990s can be viewed in connection with the proximity to such amenity-rich landscapes. This population growth runs counter to that experienced in many rural, mostly agricultural regions throughout the nation, including much of northeast Montana. Population trajectories since 1970 in Missouri River Country compared with Yellowstone and Glacier Countries are emblematic of these observations (Figure 2). Counties like those in Missouri River Country find themselves in the midst of not only a decadeslong decline in population, but also struggling employment opportunities that keep younger generations in the community. As each community evaluates its path forward, they seek opportunities to engage in an evolving marketplace. Often that marketplace has been found in identifying and taking full advantage of amenity-based recreation and an amenity-based economy.

IN 2016, NONRESIDENT VISITORS TO MONTANA SPENT NEARLY $3.5 BILLION DOLLARS IN THE STATE, DIRECTLY SUPPORTING $4.8 BILLION IN ECONOMIC ACTIVITY AND MORE THAN 52,000 JOBS.

As Yellowstone and Glacier national parks experience continued record breaking numbers of visitors from across the country and internationally, regions like the Missouri River Country go largely unknown and underexplored. For many locals this may be just as well, as it allows them to go on without the hassle of tourists and other visitors. However, for others, the region is an opportunity waiting.

A large expanse of public and private land nestled between Montana's Charles M. Russell National Wildlife Refuge and the Fort Peck Reservoir to the south, and the Fort Belknap Indian Reservation and Upper Missouri River Banks National Monument to the west is currently the focus of one of North America's most ambitious large-landscape conservation initiatives (Figure 3).

The nonprofit American Prairie Reserve (APR) has steadily sought to establish a multimillion-acre grassland reserve as an intact prairie ecosystem and home for abundant native wildlife. Their aim, and that of proponents of the endeavor, is to provide an array of public recreation, research, tourism and other positive economic impact generating opportunities. To date, the American Prairie Reserve encompasses more than 86,500 acres of purchased private lands and 266,000 acres of leased federal and state public lands. A key element in fulfilling this vision is restoring a herd of several thousand head of bison to the landscape. The reserve first introduced bison to the range in 2005. Since that time, the herd has grown to more than 600 animals.

Proponents of the reserve restoration initiative expect significant increases in outdoor recreation and tourism-based expenditures in the region, making it the third corner of a tourism triangle in Montana, with

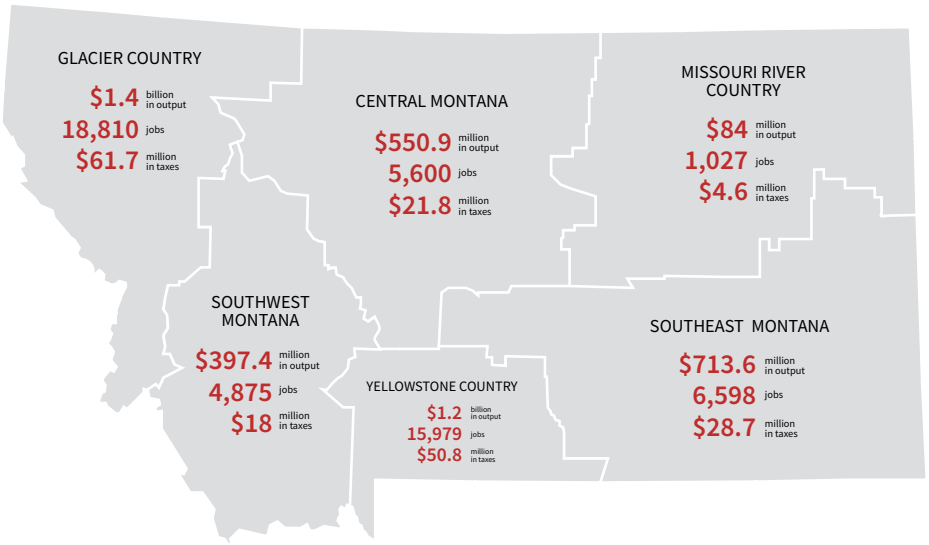


Figure 1. Nonresident visitor expenditure based economic impacts by travel region. Source: Grau, K. (2016). 2015 Economic Contribution of Nonresident Travel Spending in Montana Travel Regions and Counties.

Visitors hike the American Prairie Reserve during the 2016 Transect, which covered nearly 200 miles of the reserve's future hut-to-hut route. (Gib Myers, American Prairie Reserve)

Yellowstone and Glacier at the other two corners. These expectations are based on the perceived attractiveness of the prairie and bison as a natural amenity. Such visitor expenditure increases, if brought to fruition, may serve to support the struggling economy of northeastern Montana. However, the expected magnitude of future new spending is uncertain. Additional uncertainty may be found in any negative economic impacts generated if active range lands, a primary economic driver of the region, are removed from production or reduced in their productivity.

The economic and social uncertainties of northeast Montana and an interest the role tourism may play in its future, generated the push for a study by the Institute for Tourism and Recreation Research (ITRR) at the University of Montana. The study, funded by a grant from the National Wildlife Federation and ITRR funds directed from Montana's Lodging Facility Use Tax, created a first look at the social and economic impacts of the natural amenity enhancement.

Whether it is Montanans traveling for a weekend away or out-of-state visitors spending a longer vacation in the region, the opportunity to attract visitors – and thus spend money – is largely dependent upon the perceptions these potential visitors have of the region, and their willingness to go explore it.

In a survey of more than 600 nonresidents, researchers at ITRR found that many nonresidents who have not been to northeast Montana do not know much about the region. In fact, roughly three-quarters of these

respondents indicated that they did not know enough about the region to form an opinion about some of its most emblematic attributes – the cultural history, wildlife viewing, hunting and fishing, native culture, dinosaur sites, and unique geologic and water features. The lack of a quality image of the region readily speaks to the low visitor spending numbers. Much of the region is far from anything else. Without a major known draw, a lot of visitors to Montana simply do not make it to the northeast stretches.

Adding to the concern of this lack of knowledge are the number of visitors who have a lower perception of the area than those who have not been there at all. Visitors to the area reported a significantly lower perception of quality and intrigue in the region's native culture and wildlife viewing opportunities.

This is perhaps where the efforts by the APR may drum up interest in visitors to the region and enhance their experience once there. A quarter of nonresidents surveyed by ITRR indicated plans to travel to the region in the next year and spend an average of 2.6 nights. However, only 13 percent of them had ever heard of the American Prairie Reserve – and these are largely people who have been to Montana before or previously expressed interest in coming. Montanans outside of the northeast region also had a rather low familiarity with the APR, with only 32 percent knowing about the effort.

Once respondents were provided with more information about the current efforts of the APR and the conditions on the ground, those who had already planned to travel to and stay in the region expressed a greater interest in staying longer in the area – 26 percent more expressed a desire to visit. Additionally, once the respondents were provided with a broader look at the ultimate goals of the APR, visitation interest jumped even more.

The broader vision of the APR includes 3.5 million acres of connected public and private lands – roughly the size of Connecticut – with enhanced bird and riparian habitats, reintroduction or expansion of native wildlife species like the swift fox, prairie dogs and black-footed ferrets, 10,000 bison, hut-to-hut overland trekking and paddling opportunities on the Missouri River.

The economic impact resulting from the stated increased interest in visiting the American Prairie Reserve and northeast Montana is significant. In 2015, nonresident visitors spent $113 million in the region. Under conditions of a full build-out, this spending could be increased by as much as 67 percent, yielding $56 million in additional economic output and nearly 700 additional jobs.

While the vision of the American Prairie Reserve is still years in the making, the opportunity to increase awareness of the natural amenities that currently exist

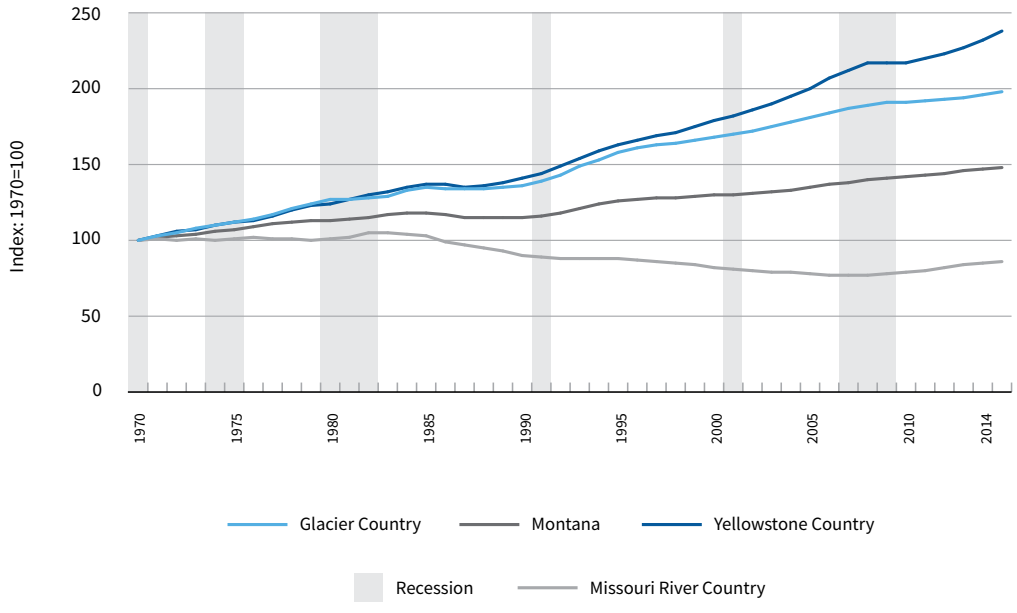


Figure 2. Regional population changes since 1970. Source: Graphic produced using Headwaters Economics' Economic Profile System. Data Sources: U.S. Department of Commerce, Census Bureau, Decennial Census Reports 1950-2010; U.S. Department of Commerce, Census Bureau, American Community Survey Office, Washington, D.C., 2016.

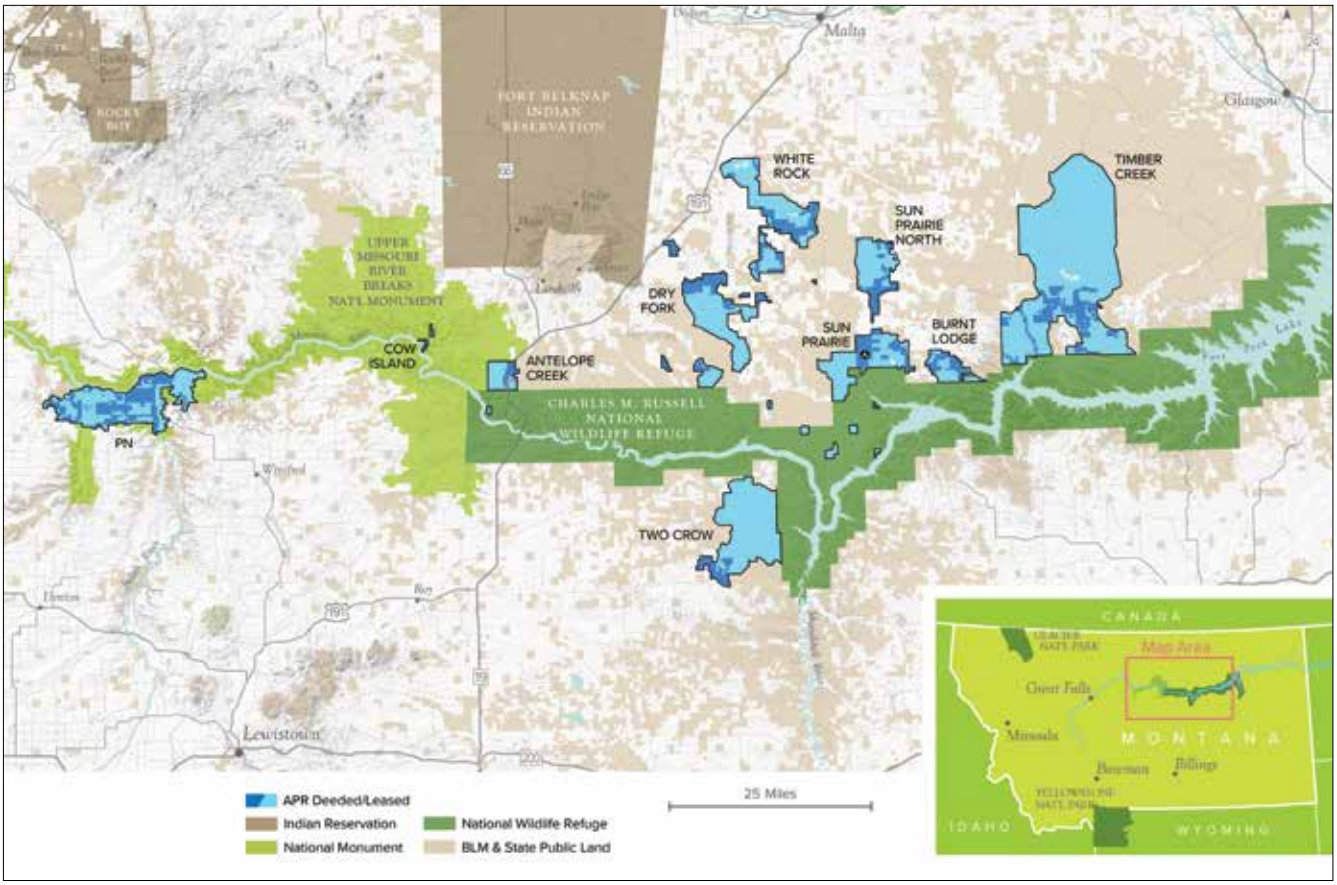


Figure 3. American Prairie Reserve current extent. Source: American Prairie Reserve.

in northeast Montana is happening now. Obviously, if the goals of the APR come to fruition and visitor response follows, improvements in infrastructure are greatly needed. A desire for improved and expanded dining and lodging opportunities, and roadways were frequently cited by respondents to ITRR's survey.

Time will tell if northeast Montana is able to transform itself into that third corner of an outdoor recreation triangle in Montana. It certainly has several dedicated tourism and conservation groups that believe it has the merits to stack up. Success may come down to the capacity of the region to maintain its cultural heritage and engage in an amenity economy.

Agriculture has been and will continue to be a major contributor to the way of life in the region. As such, the potential negative effects generated by any removal of lands from productive use must be considered in concert with the gains to recreation and tourism. The two objectives – agricultural production and recreation and habitat enhancement – are not necessarily at odds. Proponents of the APR have sought market-based mechanisms to align their objectives with that of the agricultural communities. Such market-based activities include the continuation of grazing opportunities where potential conflict is limited, as well as the promotion of products produced by local ranchers working in concert with conservation efforts. The goal of such activities is the ability to increase the overall welfare for the communities, not just those directly benefiting from conservation efforts and increased recreation. ■

Jeremy Sage is an economist and associate director for the Institute for Tourism and Recreation Research at the University of Montana.

DON'T TIE ME DOWN

PUBLIC OPINION ABOUT SEAT BELT REGULATION IN MONTANA

BY JOHN BALDRIDGE

The way Montanans regulate seat belt use can be confusing. It is illegal in Montana for an adult to ride in a car or truck without wearing a seat belt. But a law enforcement officer cannot stop a vehicle just because they see someone not wearing a seat belt – they can only stop a vehicle for another reason, such as a broken tail light. At that point, they can write a ticket for the occupant failing to wear a seat belt.

This head-scratcher of a regulation really matters. Many of our friends and neighbors die in accidents on Montana's roads and highways each year. In 2015, Montana ranked third out 50 states in the most traffic fatalities per 100,000 people at 21.7.

Montana also ranked second in the most traffic fatalities per 100 million vehicle miles traveled at 1.81 deaths per 100 million vehicle miles traveled (National Center for Statistics and Analysis). And 54 of the 124 people (44 percent) who've died so far on Montana's highways in 2017 were improperly restrained, according to the Montana Department of Transportation (MDT).

Clear scientific evidence demonstrates that wearing seat belts saves lives by reducing the risk of death in an accident by 45 percent and the risk of serious injury by 50 percent (National Highway Traffic Safety Administration). But the type of seat belt regulation a state chooses significantly impacts seat belt use in that state.

In 2016, 90 percent of people who lived in states that allowed law enforcement officers to stop a vehicle if an occupant wasn't wearing a seat belt (enforcing a primary seat belt law) wore seat belts. Only 81 percent of people who live in states without a primary seat belt law wore their seat belts. Sadly, just 76 percent of Montanans wore seat belts in 2016.

Over the past 10 years, the Bureau of Business and Economic Research has polled Montana residents to

IN 2015, MONTANA RANKED THIRD OUT 50 STATES IN THE MOST TRAFFIC FATALITIES PER 100,000 PEOPLE.

find out what they think about seat belt regulations in the state. The results exposed some perplexing views.

First, a majority of adult Montanans (54.5 percent) supported a primary seat belt law for Montana in 2017, while 45.5 percent of Montanans opposed such a law. The proportions of support and opposition were nearly identical to those in 2014 (Figure 1).

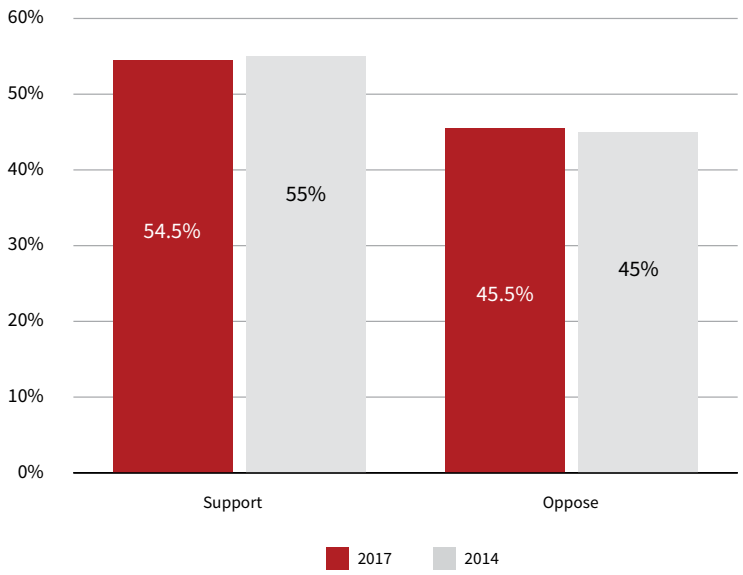
Second, most Montanans who opposed a primary seat belt law in 2017 (24.1 percent) cited their individual rights or protecting their right to choose whether or not to wear a seat belt as the reason they opposed a primary seat belt law. Figure 2 lists the reasons cited by opponents for their opposition of a primary seat belt law.

In general, opposition to a primary seat belt law reflects some Montanans' values for individual freedoms, a distaste for frivolous laws, suspicion of giving the state too many reasons to arrest citizens and concern about wise use of scarce state resources.

Third, the opposition to a primary seat belt law for adults does not transfer to an opposition for a primary seat belt law for children who occupy vehicles. Almost all adult residents in 2017 (93.7 percent), favored a primary seat belt law for children in vehicles (Figure 3). Only 6.3 percent opposed such a law. This nearly universal support for a primary seat belt law aimed at protecting children in vehicles is an interesting contrast to the bare majority support for a primary seat belt law for adults.

Fourth, Montanans' nuanced views on seat belt regulation extend not only to making a distinction between adults and children, but to whether or not a primary seat belt law would save lives.

Figure 1. Montanans' support for or opposition to a primary seat belt law. Source: Bureau of Business and Economic Research, University of Montana.



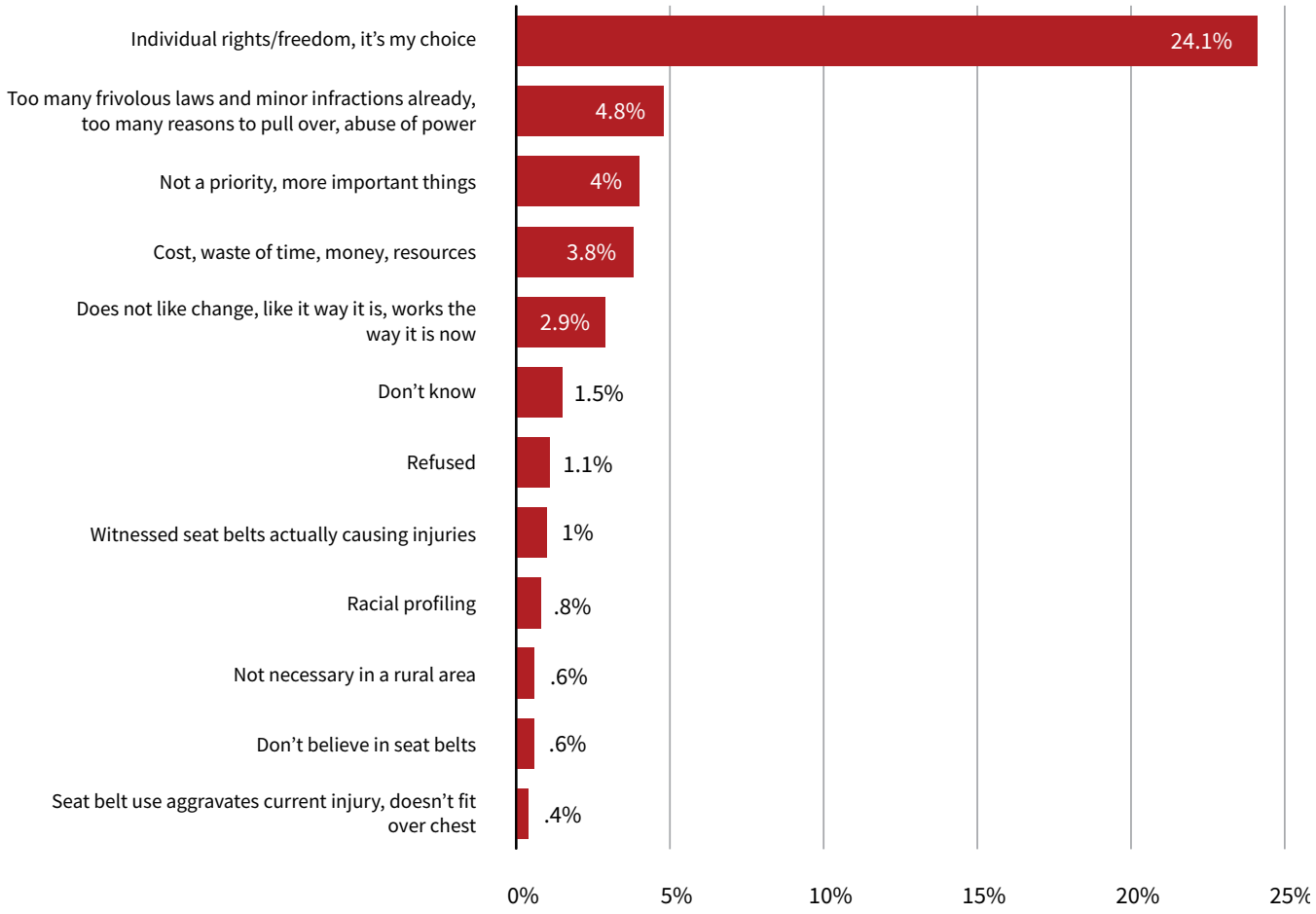


Figure 2. Reasons for opposing a primary seat belt law. Source: Bureau of Business and Economic Research, University of Montana.

The Bureau of Business and Economic Research asked 1,400 adult Montanans whether a primary seat belt law would save lives. Two-thirds (66.9 percent) said that a primary seat belt law would save lives, while one-third (33.1 percent) said that the law would not save lives (Figure 4).

Since 66.9 percent of Montanans say that a primary seat belt law would save lives, but only 54.5 percent support a primary seat belt law, how does one explain the views of the other 12.4 percent who oppose the law, but think it would save lives? Our polling only allows us to speculate, but one intriguing possibility is that some Montanans place a higher value on protecting their personal freedoms than saving lives.

MONTANA ALSO RANKED SECOND IN THE MOST TRAFFIC FATALITIES PER 100 MILLION VEHICLE MILES TRAVELED.

Figure 3. Montanans' support or opposition for a primary seat belt law for child restraint. Source: Bureau of Business and Economic Research, University of Montana.

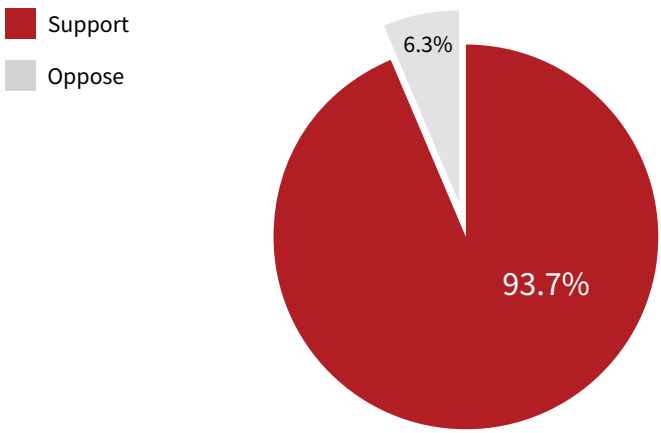
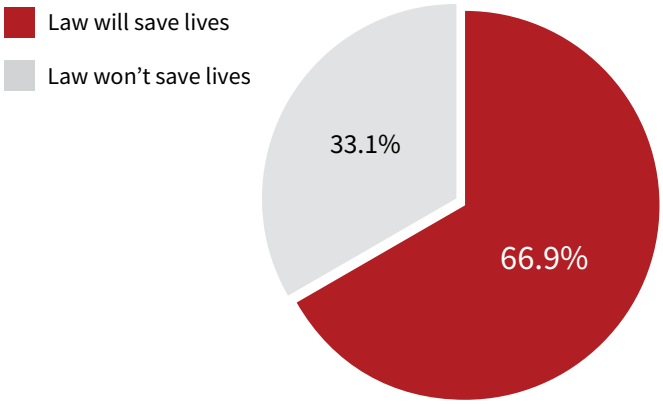


Figure 4. Montanans' opinion on whether or not a primary seat belt law would save lives. Source: Bureau of Business and Economic Research, University of Montana.



A second interesting and unresolved question is raised by the observation that two-thirds of Montanans said a primary seat belt law would save lives. The statements of one-third of adult Montanans in 2017 that the law would not save lives, are directly contradicted by readily available and well-known scientific evidence. That contradiction really is a head-scratcher.

In summary, a majority of adult Montanans favor adopting a primary seat belt law. Almost all Montanans favor protecting children with a primary law for child restraints in vehicles. And two-thirds of all adult residents say that adopting a primary seat belt law would save lives. These three facts strongly support the adoption of a primary seat belt law in Montana.

Montana's last attempt to pass a law providing for primary enforcement of seat belt laws, Montana Senate Bill 9, died in committee this past April. Perhaps Montana legislators will look at public opinion and reconsider the proposal in 2019. ■

John Baldridge is a survey researcher and project manager at the Bureau of Business and Economic Research at the University of Montana.

WILDFIRE EMISSIONS IN MONTANA

EXPLORING WILDFIRE MANAGEMENT IN CO2 EMISSION REDUCTION

BY PATRICK M. BARKEY AND TODD A. MORGAN

Depression era bank robber Willie Sutton's reasoning for why he robbed banks was summed up in a famous quote, "Because that's where the money is." The same logic helps explain why the Obama administration's now suspended Clean Power Plan targeted coal-fired electric generating facilities. Of the roughly 5.7 billion metric tons of carbon dioxide (CO2) emitted in the U.S. in 2009 to produce energy, more than a third came from the burning of coal (Energy Information Administration, 2011).

Yet while advancing the retirement of coal-fired generators nationwide can pencil out as a means of reducing carbon emissions, the contributions of those still functioning power plants to both electric grids and to local economies would be lost as well. In Montana, a coal-producing state which has exported electricity to other states for four decades, those benefits are substantial (Barkey, 2015).

Consideration of those trade-offs leads to the question: Could meaningful reductions in carbon emissions in Montana be accomplished in ways that are less costly in terms of jobs, incomes and economic production?

An option that is rarely included in carbon policy discussions is wildfire management. Like other western states, Montana has experienced years of significant wildfire activity in recent decades. Since 2003, an average

SINCE 2003, AN AVERAGE OF ALMOST 300,000 ACRES PER YEAR HAVE BURNED STATEWIDE IN BOTH WILDFIRES AND PRESCRIBED FIRES. THOSE FIRES RESULTED IN SUPPRESSION COSTS – NATIONALLY RUNNING AT ABOUT $2 BILLION PER YEAR.

of almost 300,000 acres per year have burned statewide in both wildfires and prescribed fires. Those fires resulted in suppression costs – nationally running at about $2 billion per year (NIFC, 2017). And case studies suggest that suppression represents as little as 5 percent of true wildfire costs, when rehabilitation, health impacts and other indirect costs are taken into account (Western Forestry Leadership Coalition, 2010).

Those fires also emit significant quantities of CO2. Model-based estimates of CO2 emissions from wildfires in Montana for the past 13 years vary between a high of 16,849 thousand tons in 2003 and a low of 259 thousand tons in 2014. Those emissions, not surprisingly, resemble the pattern of acres burned in fire over the fire seasons of differing intensity over the recent past, as shown in Table 1. The variation in the intensity and fuel for the

Table 1. Estimated annual wildfire burned area and pyrogenic carbon emissions of CO2 for Montana, 2003-2015. Source: Based on Urbanski, et.al. (2011), personal communication Urbanski (2016).

Year	Area Burned (acres)	CO2 Emitted (thous. tons)	Biomass Consumed (kg per square meter)
2003	681,885	16,848.9	3.43
2004	21,088	272.5	1.80
2005	95,517	2,058.9	3.00
2006	683,370	9,445.9	1.92
2007	580,383	16,172.1	3.87
2008	133,175	1,101.0	1.15
2009	48,899	1,068.7	3.04
2010	61,808	738.1	1.66
2011	173,178	3,310.6	2.66
2012	954,347	12,747.8	1.86
2013	89,962	2,533.3	3.91
2014	24,772	258.8	1.45
2015	337,715	8,698.4	3.58
2003-15 average	298,931	5,788.8	2.56

The smoke column from the Cabin Gulch Fire on the Helena National Forest in 2015. (Thom Bridge, Independent Record)

individual fires, however, makes this correlation far from perfect. The high year for acreage burned (2012) produced more than 20 percent less CO2 emissions than estimated for 2007, a year when significantly more biomass was consumed per square meter of fire.

There are many questions that would need to be addressed before wildfire management could be put forward as a realistic alternative – or addition to – other proposals and policies aimed at achieving reductions in CO2 emissions. A better understanding of the relative contributions of wildfires to total emissions is a good place to start.

Wildfire and Coal CO2 Emissions in Montana

The measurement of CO2 emissions from wildfires in Montana presents a more challenging problem than measuring emissions from the small number of coal-fired electric generators in the state. Not only is the fuel for wildfires and their thermal intensity highly variable, they are also spread across a wide geography that cannot be predicted in advance. Available estimates are based on models which take into account estimates of the areas burned, the types and quantity of fuels present, the proportion of fuel consumed and the completeness of combustion.

Of the two model-based estimates of wildfire CO2 emissions for Montana, the more comprehensive data used in the U.S. Forest Service (USFS) estimates presented in Table 1 make them preferable to those published by the Environmental Protection Agency (EPA). The latter are significantly higher than the USFS CO2 emission estimates for the select years, for which both are available. The availability of the USFS estimates for all of the years 2003-15, moreover, give a better depiction of the interyear variability in emissions stemming from the varying severity of fire seasons.

The EPA has published a comprehensive inventory of greenhouse gas emission sources for the U.S. annually since 1990. These include both energy-related emissions from the use of fossil fuels, as well as emissions from manufacturing, agriculture, and forestry and land use. For CO2 emissions at the state level, however, only energy-related emissions are reported.

Over the 1998-2013 period, the use of coal in Montana has emitted an average of 19.2 million tons of CO2 each year. Of that total, 17.2 million tons are accounted for by the operations of units 1-4 of the Colstrip Steam Electric Station in Rosebud County. Since the Corette generation station in Billings was closed in 2011, the operations of Colstrip SES account for an even larger share of emissions. Overall, coal accounts for roughly half of energy-related CO2 emissions in Montana.

A comparison of these emissions to the USFS estimates of wildfire emissions shown in Table 1 reveals that only in two years since 2003 – 2003 and 2007 – did CO2 emissions from wildfires approach the same magnitude as those from coal use. The average emissions of wildfires of 5.8 million tons of CO2 is about 30 percent as large as the average emissions from coal.

Nonetheless, given that coal is the single largest emitter of CO2 in the state and that coal emissions are spread over all 12 months of the calendar year, the data clearly show that wildfire emissions are significant enough to merit attention for policies aimed at CO2 reduction. And a reduction in wildfires would generate additional health benefits.

Other Emissions

Direct measurements of emissions from individual wildfires, such as those conducted from aerial measurements, show that wildfires in the U.S. and elsewhere emit significant amounts of pollutants that degrade air quality. In particular, wildfires emit significantly more pollutants – particularly small particulate matter – than prescribed burns conducted as part of forest management.

The EPA maintains an extensive state level database of emissions of air pollutants known to be associated with public health degradation. Some of the most important of these are carbon monoxide (CO),

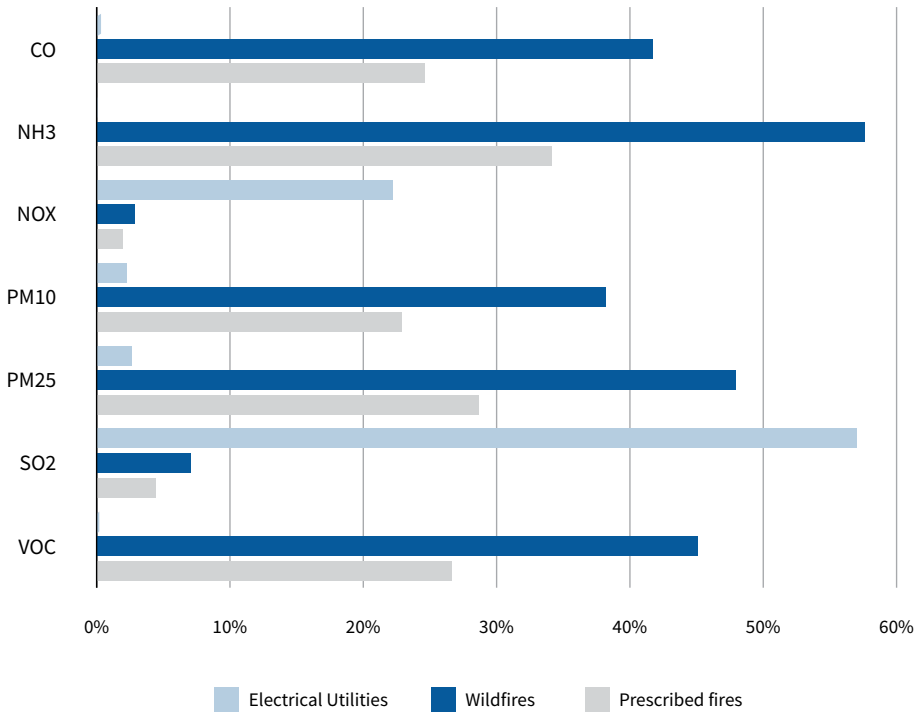


Figure 1. Percent contribution of electric utilities and wildfires to total pollutant emissions, Montana, average 2003-2014. Source: U.S. Environmental Protection Agency.

ammonia (NH3), nitrogen oxides (NOX), micron-sized particulate matter (PM10 and PM25), sulfur dioxide (SO2) and volatile organic compounds (VOC). The reduction of these emissions is not the primary goal of greenhouse gas reduction policy. But different policies to carry out CO2 reduction can have widely varying impacts on other emissions.

With the important exceptions of NOX and SO2 emissions, for which coal is a significant source, the emissions from this list of pollutants that occur because of wildfires and prescribed burns in Montana are several orders of magnitude higher than those from coal, as shown in Figure 1. The presence of particulate matter measuring 2.5 micrometers or less (PM25) in the atmosphere is the leading cause of global pollution-related mortality (Koplitz, et. al., 2016). The combustion of organic material in wildfires produces, on average, almost half of all of PM25 emissions statewide.

The variability, concentration and geographic aspects of wildfire smoke heighten the concern over their hazardous emissions. In heavy fire seasons, when the amount of biomass that is burned is higher, emissions can be two to three times the average. Those emissions also take place in a relatively short portion of the calendar year, so that annual emissions understate their presence in the air during fire events.

The geographic pattern of wildfire activity in relation to population density – particularly in comparison to coal – also can play a role in the relative health impacts of emissions. The predominance of fire activity in the western part of the state, as shown in Figure 2, not only puts their emissions in close proximity to Montana population centers, but it also means that prevailing wind currents carry those emissions across the state. The Colstrip electric generating stations, in contrast, are located east of the seven largest cities in Montana, upwind of the more sparsely populated areas of the state.

Implications for CO2 Reduction Policies

The emission data clearly show that emissions from wildfires – both CO2 emissions as well as those of other pollutants – are significant in Montana. We have compared those emissions to coal because so

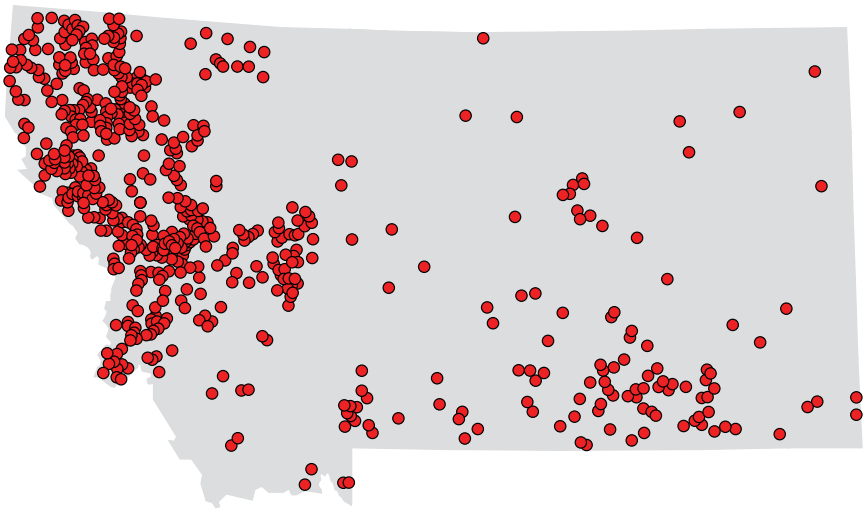


Figure 2. Incidence of wildfires in Montana, 2014. Source: U.S. Environmental Protection Agency.

much policy attention has been paid to the latter as a means of achieving desired reductions in emissions of greenhouse gases that contribute to climate change. Expanding policy options to include actions aimed at curbing wildfire emissions might bring about CO2 emission reductions at a lower cost to the economy and at the same time make improvements to public health. ■

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References

Barkey, Patrick (2015), "The Economic Implications of Implementing the EPA Clean Power Plan in Montana," produced by the Bureau of Business and Economic Research, University of Montana for NorthWestern Energy, November 2015.

Urbanski, S.P., W. M. Hao and B. Nordgren (2011), "The Wildland Fire Emission Inventory: Western United States Emission Estimates and an Evaluation of Uncertainty," Atmospheric Chemistry and Physics, 11, 12973-13000, 2011.

Koplitz, S.N. et. al. (2016), Public Health Impacts of the Severe Haze in Equatorial Asia in September-October 2015, Environmental Research Letters, 11, 2016.

National Interagency Fire Center, Federal Firefighting Costs (Suppression Only), www.nifc.gov.

Energy Information Administration, "Emissions of Greenhouse Gases in the U.S.," www.eia.gov.

Western Forestry Leadership Coalition (2010), The True Cost of Wildfire in the Western U.S., www.thewflc.org.

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