



HEALTHY LANDSCAPES, HEALTHY PEOPLE

A Guidebook for Montana Communities
Preparing for a Changing Climate

Khumalo • Stonecipher

THE CENTER FOR
LARGE LANDSCAPE
CONSERVATION

HEALTHY LANDSCAPES, HEALTHY PEOPLE

A Guidebook for Montana Communities Preparing for a Changing
Climate

October 2018



The Center for Large Landscape Conservation

Bozeman, MT

largelandscapes.org

Libby Khumalo, PhD

and

Grace Stonecipher

Formatting and layout by Kendra Hoff

Acknowledgements

We would like to thank Susan Higgins, Dr. Robert Byron, Dr. Lori Byron, and the Montana Faith and Environment Coalition. Financial support for this project has been generously provided by The Arthur Vining Davis Foundations.

Cover Photo

Two Medicine Lake in Glacier National Park during the August 2018 fire season

Table of Contents

	Executive Summary	2
1	Introduction	3
2	Understanding Landscapes	6
3	Major Impacts of Climate Change to Landscapes and Human Health: Air and Water	9
4	How We Can Protect Landscapes to Protect Human Health	12
5	Ways to Build a Promising Future: Things Your Community Can Do to Take Action	16
6	Smart Communication Promotes Preparedness	22
7	Tools for Planning and Acting Now to Protect Our Future	28
	Additional Resources	29
	Works Cited	30

Executive Summary

This guidebook was prepared for the *Faith, Science, and Climate Action* conference, which took place in Bozeman, Montana in October 2018. It is intended to serve as a guide for people who are concerned about human health and climate change, with a specific focus on faith communities. We begin with a discussion of landscapes: what they are, why they're important, and how they relate to human health. We then provide examples of how climate change threatens human health, and how, by protecting landscapes, we can better protect ourselves. We follow with a set of recommended actions to help communities and individuals respond to and prepare for climate change, and then we offer seven strategies for communicating about climate change. At the end of the guidebook we provide two additional tools: a discussion guide and a list of additional resources. We believe climate change poses a daunting challenge. We also believe that we can act now, together, to create a better future.

Background on the Montana Faith and Environment Coalition, by Susan Higgins

People who love and care for the land often do so for intensely spiritual reasons. We are vested in landscapes for survival, livelihoods, water, and clean air. We are also vested in them as sacred places that encompass traditions, celebrations, and stories illustrating our beliefs and culture. This guidebook is the culmination of first steps made by the Center for Large Landscape Conservation (CLLC) and other groups to explore the impacts of climate change on our landscapes and communities. In a major large landscape collaborative, the US-Canada *Roundtable on Crown of the Continent*, we began to notice that lessons from faith-based thought leaders and communities in this 18-million acre landscape were missing from the conversation.

After a series of focus groups in 2016, CLLC convened a transformational landscape-based pilot project joining interfaith leaders and scientists on the shores of Montana's Flathead Lake. Participants identified opportunities to support interfaith engagement to build enduring social capital for landscape conservation. Faith leaders also explored the human health implications of climate change. Going forward, they asked for contemporary activities that assure interfaith response through science-based webinars, workshops, theological primers, sermons, conferences, blogs, and discussions on faith and the environment – all to effectively engage their faith communities. After the Flathead workshop a vibrant working group in Montana continued to share ideas under their new group title: Montana Faith and Environment Coalition.

The Coalition designed the *Faith, Science, and Climate Action* conference in which this guide was released, and asked CLLC to present recommendations around how we all can take part in ways to protect our landscapes and our health at the same time, for they are inextricably connected. We have Arthur Vining Davis Foundations to thank for its support of conversations and collaborative outcomes. We hope these lessons can be applied to other regional and global dialogues to assure a significant role for faith traditions in shaping the future of critical landscapes.

About the Center for Large Landscape Conservation

The Center for Large Landscape Conservation (CLLC) is a nonprofit organization established in 2007 by Dr. Gary Tabor, and located in Bozeman, Montana. Guided by science, CLLC strives to repair and protect large landscape integrity. Our science-driven approaches to policy and community decision-making processes have made us a lead organization in North America, and now, internationally, in ecological connectivity.

1. Introduction

“What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another...”

Chris Maser, Forest Primeval

We are in an era of extremely rapid social and environmental change, much of which is driven by the impacts of climate change on the people and places we love. There is an urgent need to respond thoughtfully and collectively to climate change to protect each other and the natural world of which we are a part. In the following chapters, we show how landscape health and human health are inextricably linked and offer a set of recommendations for how individuals and communities can take climate action. We also discuss strategies for climate change communication, both within our own communities and beyond. We provide a particular focus on faith communities in Montana, though we believe that this guidebook can be of use to many place-based communities interested in preparing for climate change.

To illustrate the relationship between landscape health and human health, we begin with a case study:

Water, Landscapes, and Our Health: Flint vs. New York City

When we think about landscapes and human health, water often comes to mind. Where does the water flowing from your faucet come from, and how do you know that it's safe for your family to drink? Health concerns propelled Lee Anne Walters, of Flint, Michigan, to test her family's drinking water in February 2015. Results showed their tap water contained lead levels of 104 parts per billion (ppb), seven times higher than the federal limit.¹ Lead is a neurotoxin that can cause permanent learning disabilities and behavioral problems. Concerned about the test results and her children's water-derived health problems, she contacted Mark Edwards of Virginia Tech for help with water sampling across the city. The Virginia Tech team found “serious” levels of lead throughout Flint's water sources, with some results showing lead levels as high as 13,200 ppb (water is considered hazardous waste at 5,000 ppb).² Lee Anne Walters ultimately blew the whistle on Flint's water crisis, the systematic failure that exposed nearly 9,000 children aged six and under to dangerous levels of lead.³



Michigan National Guard members deliver water, filters, replacement cartridges and water test kits to residents of Flint, Michigan on January 19, 2016.
Photo: The National Guard Michigan National Guard⁴

What does Flint's contaminated water have to do with landscapes?

The crisis unfolded when Flint switched its water source from Lake Huron to the highly polluted Flint River. Because of the high bacteria levels in the river water, water treatment managers had to add high quantities of chlorine, which made the water acidic enough to corrode the city's lead pipes, releasing lead into the drinking water.⁵ Water managers could have prevented the crisis by adding anti-corrosion agents to the treated water, a common water treatment technique.⁶ While the Flint health crisis stemmed from a series of poor decisions, especially the choice to not use anti-corrosion treatment, equally at fault was the highly impacted landscape that has polluted the Flint River for decades. Pollution in the Flint River comes from agricultural fields, parking lots, roads and bridges, construction sites, and leaking septic systems which contaminate the river with nutrients, bacteria, sediments, and chemicals in the 1,358 square mile watershed.⁷ Bacteria levels are so high in many places that people have to limit their recreational use of the river. Massive landscape changes in the last century have not only increased the amount of pollutants released but have curtailed the watershed's ability to filter them out and slow their spread. **In a landscape that used to be 75% forest and 13% wetland (ecosystems that act as natural water filters), we now see an area where agriculture, industry, and urban development have limited forests to only 16% of the landscape and wetlands to 3%.⁸** How might the story of Flint have unfolded differently if society had prioritized the region's watershed health over the last century?



Photo: Edward Kimmel from Takoma Park, MD
Climate March 1085⁹



Ashokan Reservoir in the Catskill Watershed

Photo: New York City Department of Environmental Protection¹⁰

The story of Flint contrasts markedly with New York City's experience with drinking water

While we typically think of New York as a highly developed metropolis, the city sources 97% of its water from the nearby Catskill/Delaware Watershed, a highly protected landscape of 1,597 square miles that includes the forested Catskill Mountains and provides water to more than 8.5 million people every day.¹¹ The cleanliness of its water supply makes New York one of only five major cities that do not have to filter surface water (note that the City does treat its water with chlorine, UV light, fluoride, and anti-corrosion agents).¹² New York's Department of Environmental Protection carefully protects the Catskill/Delaware Watersheds by preserving parks and forests (nearly 40% of the watershed is preserved as open space), completing farm pollution-prevention plans to minimize runoff, upgrading wastewater treatment plants, repairing septic systems, carefully managing streams and forests, and reviewing proposals for new development in the watershed.¹³ Not only does the watershed filter and clean the water, it also provides wildlife habitat, clean air, and a refuge for people vacationing from the city to reconnect with their landscape.

When we compare these two cases, we can see clearly the impact that the landscape can have on human health. As climate change threatens our landscapes, we must take actions to protect our health by protecting landscapes.

2. Understanding Landscapes

What is a landscape?

A landscape is a large area of land, typically thousands of square miles, and all of its features both natural and man-made. These features include people, lakes, rivers, farms, rangelands, cities, mountains, culture, wildlife, air, fire, insects, fish, birds, bacteria, local economies, soil, weeds, water cycles, buildings, nutrient cycles, cars, fences, roads, and much more. Landscapes are not static and so are not easily defined. As all features interact with one another, landscapes are ever-changing and reshaping in new ways. A landscape protection approach to conservation is a way of working in a rapidly changing world by thinking and acting at multiple scales to conserve life in its many forms. To understand and build healthy connections within a landscape, we must understand what occurs at the local, regional, national, and international levels and how actions in the past and present impact future conditions. It is a way of viewing the world as complex and recognizing that actions in one place can impact people thousands of miles away, with effects lasting decades or more into the future. Landscape conservation also recognizes that protected areas with fixed boundaries like Glacier and Yellowstone National Parks are not enough by themselves to protect species; they need to be connected to each other and to other protected areas to allow for wildlife and plant communities to move and adapt in response to rapid change. **In short, a landscape approach helps us to see the bigger picture so that we can set priorities for protecting life in its myriad forms in a very complex world, now and into the future.**

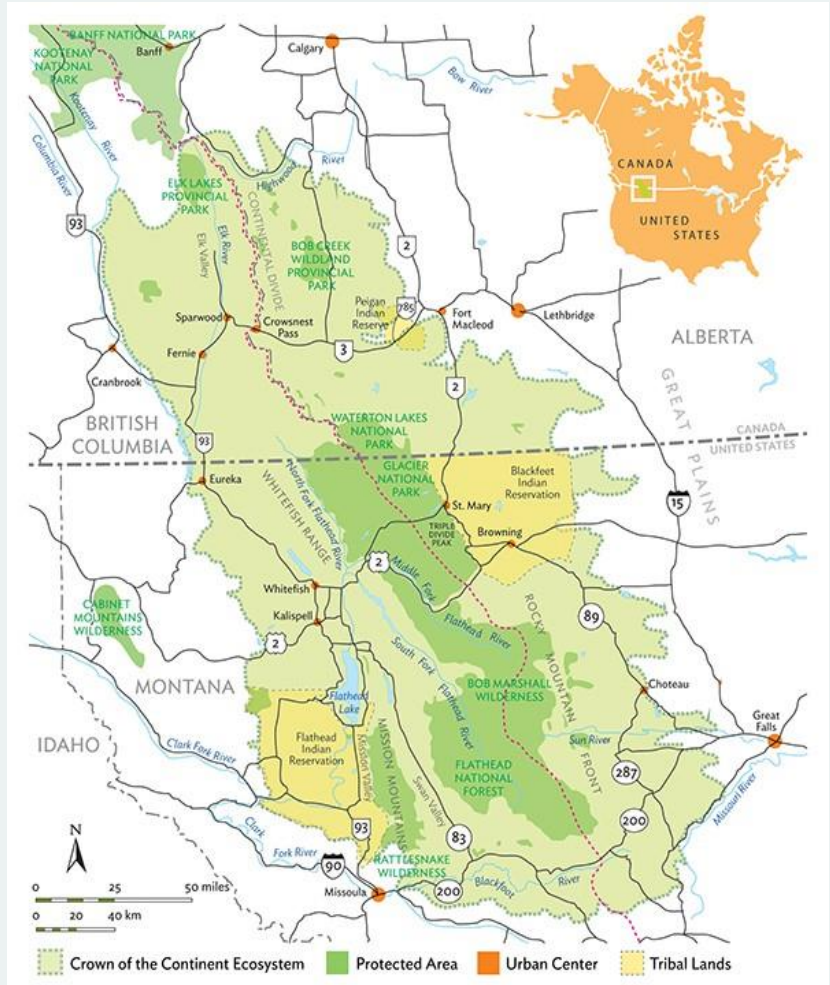
Why should we use a landscape approach?

In the past, we've taken a piecemeal approach to caring for our lands, with different groups working without sharing sufficient information on specific areas. But let's think of a National Park like Yellowstone or Glacier as our heart or our lungs. While the functions of these organs are highly important, our overall health requires the entire system to work together, which means looking at the body as a whole. The same is true of a landscape. Whether divided by fences, roads, dams, sprawling development, or even political and legal boundaries, fragmented landscapes do not sustain the same function and quality as highly connected landscapes.¹⁴ This means that they cannot easily maintain natural functions such as water cycles, pollination, gene flow, migration, fire, or other processes that protect life in its many forms, including human health. A fragmented landscape is like a fraying tapestry; using a landscape approach allows us to understand the pattern so that we can weave it back together.

Working at the landscape scale also helps us to reach across the lines of ownership or jurisdiction because it requires collaboration. A landscape is simply too big for one person or group to care for alone. Furthermore, a landscape approach necessarily means including those who live within a landscape; working at this scale can help break down the artificial boundary between people and nature. It can give plants and animals wider spaces to move in response to rapid changes in climate. The landscapes we live in provide the backdrop for our lives and if they aren't healthy, neither are we.

BOX 1: The Crown of the Continent Landscape

The 18-million-acre Crown of the Continent landscape stretches from western Montana through the Northern Rocky Mountains into Canada, and includes Waterton-Glacier International Peace Park and the Bob Marshall Wilderness. Its sparkling waters flow into the Pacific Ocean, the Gulf of Mexico, and the Arctic, sustaining the livelihoods of millions of rural and urban communities located thousands of miles along the way. The Crown of the Continent Landscape is home to almost 200,000 people who find meaning and a sense of place in their stunningly beautiful surroundings, many of whom link their livelihoods directly to the Crown's mountains, forests, lakes, rivers, and grasslands.¹⁵ Ancestors of the Kainaiwa, Ktunaxa, Salish, Kootenai, and Blackfoot peoples cared for this land for millennia. Today, the Crown is one of the last places in the world that still has its full set of native habitat and native predators, including grizzly and black bears, wolves, cougar, coyote, wolverine, fox, bobcat, and lynx as well as large populations of elk, pronghorn, deer, moose, and bighorn sheep.¹⁶ To protect the place and people and life in the Crown, more than 21 federal, Tribal, First Nations, state, and provincial agencies manage the landscape cooperatively.¹⁷ While these groups have diverse interests, backgrounds and beliefs, they're united by their shared value of the landscape.



Landscapes protect human health

We are our landscapes. Made of air and water, our physical and mental health depends on the health of our environment. Wetlands filter and clean water, storing it to protect our homes and roads from flooding. Healthy forests provide food, fuel, shelter, income, and oxygen. Wetlands, forests, and other natural spaces provide fish and wildlife with places to live, which in turn provide sources of food and recreation. These spaces also hold an intrinsic worth, giving meaning to our lives through the myriad of ways we may engage with them. Whether through our livelihoods or recreation, open spaces provide us with a sense of wellbeing. Well-managed agricultural areas also provide us with food, subsistence, and soils that store carbon. Urban areas are part of our landscapes, too. They provide us with places to live, work, and entertain ourselves. While urban development often causes air and water pollution and wildlife habitat loss, exemplary urban management can improve linkages between urban areas and their broader landscapes, protecting human health, plants, and animals.

Our landscapes provide clean air and water and healthy outdoor recreation. They buffer us from floods and fire, mitigate climate change, improve public health, and safeguard cultural heritage, wildlife and ecological systems. Our landscapes provide food, fiber, jobs, and community vitality. And they provide the special sense of place that defines a community and region and—if not diminished—is passed down through the generations.

Network for Landscape Conservation¹⁸

BOX 2: Are cities wild?

So often we tend to think of cities as distinct from the natural world. Yet as the examples of Flint, Michigan and New York City show, cities do not exist in isolation from their landscapes. The more we recognize cities as



an integral part of landscapes, the more we can foster urban-wildland connections that protect biodiversity and our health. Urban trees, for example, make our streets beautiful, provide a place for children to play, reduce energy costs, store carbon, and improve air and water quality.¹⁹ Incredibly, one acre of tree cover in a park can remove 80 to 200 pounds of air pollution each year.²⁰ Urban trees also invite people to walk and enjoy beauty outside, and are associated with decreased risk of obesity, diabetes, heart disease, and stroke.²¹ They also make our cities cooler and help absorb water as climate change increases severe weather events.²² Planting and protecting trees in cities connects us to a broader network of

plants and animals.²³ A maple tree can nurture a family of robins, provide refreshing shade on a hot summer's day, and give a child a place to practice climbing and swinging. Private and public gardens provide habitat that might not be found elsewhere in a city,²⁴ and urban trees and gardens support birds as they migrate each year. Not surprisingly, research shows biodiversity in cities benefits people by improving our health and wellbeing through connection to nature.²⁵

3. Major Impacts of Climate Change to Landscapes and Human Health: Air and Water

A changing climate poses many challenges to human health, and we are already seeing impacts in Montana. Climate change will likely reduce air quality, increase cancer rates, increase extreme weather events, reduce food security, increase heat-related illnesses, pose risks to human development and mental health, and increase rates of neurological diseases, vector-borne diseases, and water-related illnesses.²⁶ This is a long and discouraging list of dangers, but they may not all occur in Montana, or in any single region. We can act now to reduce these risks and protect our health.

This section concentrates on only two of categories of climate impacts to human health: changes in air and water. It is not a comprehensive review of all climate-related health impacts, but rather highlights some of the major relationships among climate, human health, and landscapes. What we breathe, eat, and drink, and what makes its way into us uninvited all come through our landscapes. By taking action now to care for our landscapes and the air and water they provide, we can protect our health. For specific actions we can take to protect landscape and human health, see Chapter 5.

Air

Our health depends on clean air. Long-term exposure to polluted air is linked to reduced cognitive function, asthma, cardiovascular disease, and other health problems.²⁷ Air pollution is associated with heart attacks, stroke, preterm birth, stillbirth, dementia, and learning disabilities.²⁸ Ironically, not only is air pollution the primary cause of climate change, but climate change itself further increases air pollution by increasing wildfire smoke, airborne dust, pollen, and mold spores. Contaminants and allergens like these irritate our lungs, aggravating pre-existing health conditions like asthma and exacerbating chronic obstructive pulmonary diseases. Wildfire smoke and dust contain particulate matter (chemically and biologically active fine particles in the air) that are harmful to breathe. Pollen and mold spores are allergens that can trigger an overreaction by the body's immune system.

Fire

Climate change is increasing temperatures and causing earlier spring snowmelt, drying forests in the western United States and contributing to more wildfires.²⁹ Since the 1970s, large forest wildfires in the Rocky Mountains have increased in frequency and total area burned.³⁰ Wildfire season length has increased as well.³¹ Wildfires emit fine particulate matter and other pollutants, meaning that as wildfires increase, so does our exposure to air pollution.³² Wildfire smoke exposure exacerbates respiratory problems like asthma, chronic obstructive pulmonary disease, bronchitis, and pneumonia, and it can increase the risk of



Photo: Chris Denning – Helena, MT

hospital visits and premature death.³³ Older adults, children, pregnant women, unborn babies, and people who already have health issues are most sensitive to wildfire smoke.³⁴

Dust

As climate change elevates drought conditions in Montana, airborne dust may increase. When airborne dust particulates are small enough, they can travel deep into the lungs, causing scarring and lung and heart disease due to inability to absorb oxygen at a healthy level. Older adults, young children and people with cardiopulmonary diseases are most sensitive to airborne dust.³⁵

Pollen

Allergy season is getting longer and more severe. Climate change is increasing our exposure to pollen as rising temperatures extend growing seasons and prolong exposure.³⁶ Additionally, greater concentrations of carbon dioxide (a major contributor to climate change) are increasing plant growth rates and the amount and potency of pollen.³⁷ Climate change is also changing where plants grow and pollen distribution, meaning places that may not have had much pollen in the past may see an increase in allergies.³⁸

Mold

In some parts of Montana, climate change is projected to increase precipitation in the late winter and early spring.³⁹ Homes that are in poor condition or located in flood-prone areas are at increased risk of indoor dampness. This promotes mold growth, dust mites, and bacteria levels, and releases volatile organic compounds, all of which negatively impact human health.⁴⁰ Dampness and mold are linked to worsening asthma and bronchitis, and children, people with pre-existing conditions, and people with homes in disrepair are especially susceptible.⁴¹

Water

Water is the basis of life. Drinking, bathing, playing, and growing crops in clean water promotes good health. Climate change threatens both water quantity and quality in Montana, particularly as temperatures increase and precipitation patterns change. Water pollutants include heavy metals like lead and mercury, fertilizers and pesticides from agricultural runoff, waste from sewage and food processing, industrial chemical waste, and contaminants from hazardous waste sites.

Drought reduces water quality and availability

Climate change will likely intensify drought in Montana.⁴² Prolonged periods of hot temperature and low rainfall produce water shortages that compromise the quality and quantity of drinking water.⁴³ Drought can impact surface water by reducing stream flows and concentrating pollutant levels.⁴⁴ By increasing wildfire risk, drought can also introduce sediment, ash, and other debris into surface water.⁴⁵ Drought can slow groundwater recharge and impact well water levels.⁴⁶ Drought reduces crop yields, impacting food prices, and ultimately, consumer health and producers' livelihoods,⁴⁷ which in turn can impact mental health (see Box 3).

Box 3: Climate change impacts our mental health

Climate change poses many risks to mental health. Changes to the landscapes we cherish can cause psychological distress, so much so that this sense of loss has its own name: *solastalgia* - “the homesickness we have when we are still at home”.⁴⁸ Natural disasters induced by climate change, like floods, wildfires, or extreme snows, can cause immediate trauma or shock.⁴⁹ In the long-term, such events can compound stress or lead to post-traumatic stress disorder.⁵⁰ Slower changes brought by climate change, like drought, impact livelihoods, often causing financial-related stress, which can lead to depression, anxiety, and other mental and behavioral health challenges.⁵¹ In the 1980s, farmers in Montana, North Dakota, South Dakota, Minnesota, and Wisconsin committed suicide at nearly double the national rate in a time when record drought, declining land values, indebtedness, and unstable prices caused thousands of foreclosures and bankruptcies.⁵² Montana has the highest suicide rate in the nation, and climate change impacts are striking a state where many people are already highly vulnerable to mental health challenges.⁵³

Water-borne diseases

In parts of Montana, climate change is expected to increase precipitation and snowmelt in late winter and early spring, increasing runoff and flood risk.⁵⁴ Outbreaks of waterborne diseases are associated with increased precipitation, heavy rainfall, and flooding. Exposure to pathogens like *Salmonella*, *E. coli*, *Cryptosporidium*, *Giardia*, norovirus, rotovirus, and adenovirus are expected to increase.⁵⁵ Storm runoff can move heavy metals, herbicides, and pesticides into freshwater systems used for drinking and recreation, exposing more people to contaminants.⁵⁶ Flooding can contaminate water and food supplies, especially when storms pound aging water and sewage treatment facilities.⁵⁷

Harmful algal blooms

By warming water temperatures and changing precipitation patterns, climate change will likely increase harmful algal blooms.⁵⁸ Last year, the State of Montana verified 41 citizen reports of harmful algal blooms in places like Canyon Ferry Reservoir, Holter and Hauser Lakes, Clark Canyon Reservoir, Beaver Creek Reservoir near Havre, and Big Horn Reservoir.⁵⁹ Blue-green algae, called cyanobacteria, can produce neurotoxins, which are poisonous to people and animals. Swallowing toxins in water may cause nausea, vomiting, diarrhea, and headache, or cause damage to the liver or kidneys.⁶⁰ Direct contact may cause skin, eye, nose or throat irritation and may induce respiratory symptoms.⁶¹ Harmful algal blooms can occur in standing bodies of water that are exposed to the sun, including reservoirs, lakes, ditches, and stockponds.



Harmful algae bloom at Clark Canyon Reservoir south of Dillon, one of 41 confirmed reports in Montana in 2018.⁶²

Photo: Montana Department of Environmental Quality

4. How We Can Protect Landscapes to Protect Human Health

Climate change and its threats to our health can feel like a looming and intangible obstacle over which we have little control. However, the health impacts we experience from a changing climate are mediated by our landscapes. We can join growing efforts to protect landscape integrity and reduce climate change impacts. This section explores several ways we can protect landscape health to safeguard clean air and water.

Improve forest health

Forests clean our air and water, but they are threatened by the impacts of climate change like severe fires and drought. Healthy forests are more resilient to climate change, and better able to protect human health. Wildfires and other disturbances are a natural part of landscape function in the Northern Rockies, though the way we manage forests can increase or decrease the extent and severity of wildfires to some degree.⁶³ Over much of the last century, forest managers suppressed wildfires and altered forest structure, increasing forest susceptibility to disease and intense wildfires.⁶⁴ Ecological restoration and fuels management *may* help address wildfire risk to some extent,⁶⁵ provided it follows best scientific practices. There are many approaches to logging, some of which can improve forest function and some that undermine forest integrity. If logging operations remove larger trees and leave small ones, create a more uniform forest structure, or leave slash on the ground, logging can actually *increase* wildfire.⁶⁶ When used well, prescribed fire and disease management may, in some situations, reduce risk of severe wildfires by limiting the build-up of fuel load.⁶⁷ Fire and insect disturbances are a natural part of Rocky Mountain forests and are needed to protect biodiversity and forest health.⁶⁸

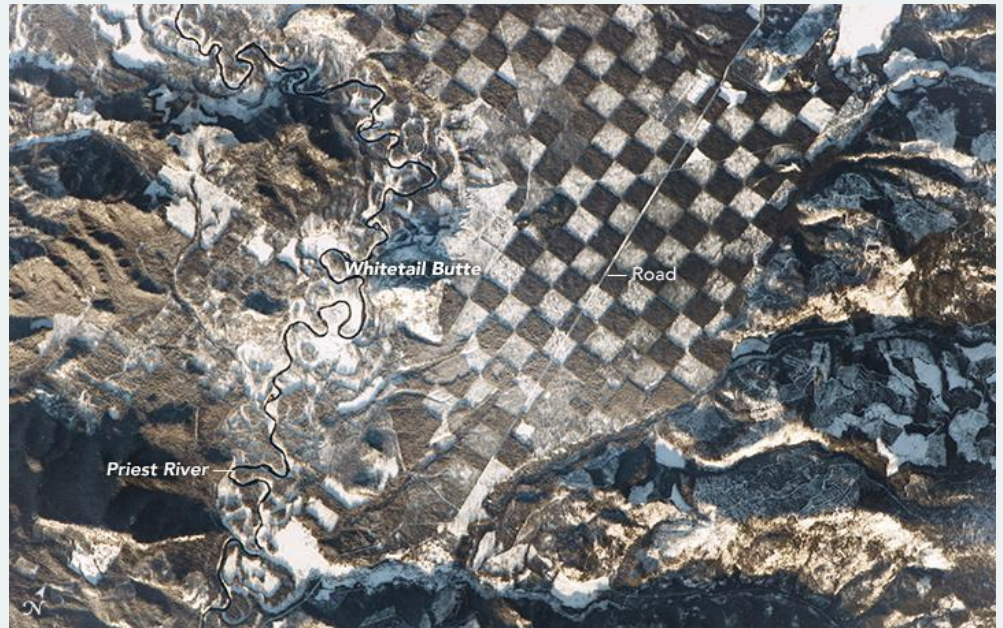
Increasing and protecting forest genetic diversity is vital for helping forests adapt to a changing climate.⁶⁹ In addition, retaining canopy cover increases shading and improves water availability in forests, leading to healthier soils.⁷⁰ Healthy soils retain moisture, cycle nutrients, and nourish forests, so managing soil health by limiting compaction and erosion, and retaining woody debris, can reduce wildfire risk.⁷¹ Using best practices when building forest roads for fire and fuel management also helps reduce erosion and stream sedimentation.⁷² Reducing checkerboard land ownership patterns can help to reduce the costs of managing forests and improve outcomes (see Box 4). Ultimately, no single solution will fit all challenges, and a mix of approaches should be used to improve forest health now and in the future.⁷³

Box 4: Case Study: Checkerboard landscapes

The Problem: Divided Use, Divided Landscapes

This photo of Idaho's Priest River shows two types of physical fragmentation in a landscape: roads and checkerboards. Roads, like railroad tracks, fences, and sprawling development, often impair wildlife movement across landscapes. Roads can also spread weeds.⁷⁴ Checkerboards, the alternating forested and logged patches of land, can increase forest edges. This alters landscape function, impacting some species positively and others negatively.⁷⁵

Similar checkerboard patterns are found throughout the West, though many stem from the late 1800s when the federal government awarded every other square of land to railroad companies.⁷⁶ Over the years, railroad company land often came under the control of timber companies that clear-cut or otherwise heavily managed some of their forestlands.⁷⁷ Checkerboard ownership makes it hard to manage landscapes in an integrated way, with one property owner managing for timber production or real estate, for example, while another manages for multiple use.



2017 NASA Photo of Priest River in Idaho⁷⁸

The Solution: Mending checkerboard fragmentation

In recent years, timber companies have placed many of their lands on the real estate market, increasing threats of development and risking further fragmentation. In response, people from many communities and organizations have come together to purchase and consolidate checkerboard lands. For example, in 2007, Swan Valley community members, located in the Southwest Crown of the Continent, worked with the Trust for Public Lands and The Nature Conservancy to form an agreement to purchase all remaining Plum Creek lands in Montana's Swan Valley, lands crucial both for outdoor recreation and for wildlife like grizzly bears, lynx, and bull trout.⁷⁹ These lands, now transferred to public agencies, connect Swan Valley habitat to central Idaho's Salmon-Selway wildlands.⁸⁰ Protecting the integrity of this vast landscape helps ensure continued recreation opportunities for communities. It also helps sensitive species adapt to climate change because it enables them to move across longer distances to find suitable habitat as conditions change. Today, groups like Swan Valley Connections, Roundtable on the Crown of the Continent, Blackfoot Challenge, and others work hard to foster collaboration among multiple interests like local communities, tribes, ranchers, land management agencies, environmental groups, and timber industries in the Crown of the Continent landscape. Collaboration not only helps to mend many of the artificial divisions and fragmentations that formed in the last century, but also helps build connected landscapes, both socially and on the ground.

Sustainably manage agricultural lands

Farmlands make up 64% of Montana's land cover (28% cropland, 4% woodland, 66% pastureland, 2% other).⁸¹ Covering almost two-thirds of the state, farmland management has a big impact on air, water, and human health. Improving agricultural practices to enhance soil health is one key strategy with a vast array of benefits, including water retention and improved carbon storage.⁸² Healthy soils also protect air and water quality by reducing erosion. Any time soil is disturbed, whether through construction, mining, or farming activities, it has greater potential to be washed into nearby streams by precipitation (stream sedimentation) or to be picked up by wind (airborne dust). Since dirty air and water can have both negative health and environmental impacts, soil conservation practices are necessary. These practices reduce or eliminate soil disturbance using no-till agriculture, conservation agriculture, and sustainable land management.⁸³ Similarly, rangelands can be managed to protect soil integrity and combat erosion by preventing overgrazing and keeping livestock away from streams.⁸⁴ Planting cover crops and no-till agriculture (which leaves crop residue behind) are also useful practices for preventing nutrient and pesticide runoff, as they slow the movement of water across the landscape.⁸⁵ Conserving water on the landscape is also beneficial to both the environment and to farmers, as it can increase soil resiliency, especially during drought years.⁸⁶

Green urban areas

As more people in the U.S. move into urban areas, it is vitally important to promote green practices in cities. Green cities decrease air pollution by regulating vehicle emissions and wood stove emissions or by discouraging car use by providing good public transportation, bike lanes, and sidewalks.⁸⁷ Upholding vehicle emissions standards and incentivizing car maintenance lowers air and water pollution from cars. Green cities can be literally green – they often contain many trees as well as open spaces, which make air and water cleaner and serve both as recreation areas or even corridors for wildlife as they move through the city. Cities with more vegetation and green roofs help mitigate the urban heat island effect, a phenomenon where cities are notably warmer than surrounding rural areas, which can lead to increased pollen and air pollution levels.⁸⁸ Trees provide a natural source of shade, and vegetation absorbs far less heat than man-made materials such as concrete.⁸⁹ Trees and open spaces in green cities also provide ways to appreciate and connect with nature for people who may not have the time or resources to get out of the city on a regular basis.

Green urban areas also protect water. In areas prone to drought, cities incentivize against overwatering, while those prone to flooding can update city zoning plans to keep new housing out of flood zones. Updated stormwater management plans are necessary in some areas, especially since stormwater can contain pollutants, and can't simply be moved and deposited elsewhere. Green cities reduce the negative impacts of stormwater by installing green roofs or protecting wetlands and riparian areas, which can both retain excess water and help filter pollutants.⁹⁰ As populations increase and more pressure is put on urban areas, cities need new approaches to wastewater treatment to ensure both human and environmental health. One solution is to view wastewater as a resource from which we can extract nutrients, water, and energy that can be returned to the watershed for reuse.⁹¹ While we often think of cities as a detriment to the natural world, certain efforts can make our cities less impactful and even beneficial to our health. Green cities can reduce their environmental footprint by promoting renewable energy and sustainable building practices, setting up city-wide recycling and composting programs, and adding recharging stations to make it easier for people to transition to electric vehicles.

Protect water

Protecting water quality and water availability is vital for human health. Water availability is driven by climate, and how we manage our forests, cities, wetlands, and agricultural areas (see sections above). Wetlands include marshes, swamps, fens, riverbanks, floodplains and any other parts of a landscape defined by the presence of water.⁹² Wetlands are like sponges that soak up, store, and slowly release water. They offer flood protection and replenish streams and also filter sediment and pollutants.⁹³ Wetlands recharge groundwater, which is essential for people who live in rural Montana where groundwater supplies 94% of domestic supply and 39% of the public water supply.⁹⁴ Wetlands also provide habitat for countless birds, fish, and wildlife, and they nurture plants that need wetter soils to grow.

Wetlands are under great pressure from development, road building, grazing, agriculture, mining, dumping, draining, vegetation removal, and other impacts.⁹⁵ Carefully planning county and city development and avoiding floodplain development as much as possible will help protect water. Mine reclamation can help remove toxic pollutants from areas of direct threat to human health. Grazing management, whether using fencing, alternative water sources, filter or buffer strips, stable stream crossings, rotational grazing, or other techniques, can help maintain wetland integrity.⁹⁶ Preventing, as much as possible, dumping, draining, and vegetation removal will also protect our water.

Beavers are nature's wetlands engineers. They build dams to store water, acting like rotational farmers by continually creating, modifying and abandoning wetland patches to create a mosaic of wetlands.⁹⁷ The habitat heterogeneity they create increases plant and animal diversity and enhances resilience to disturbances like flooding and drought.⁹⁸ In fact, beaver create and maintain wetlands even during extreme drought.⁹⁹ Wherever possible, wetlands should be restored to protect water quality and offer sustenance to life in its many forms.



Collaborate to protect landscape integrity

All of these efforts - improving forest health, sustainably managing agricultural lands, greening urban areas, and protecting our water - require collaboration by many groups and individuals from diverse backgrounds and interests. Collaborations help nature function better by bridging political and jurisdictional boundaries. For example, the Roundtable on the Crown of the Continent brings together tribes, First Nations, government agencies, ranchers, conservation organizations, educators, and other community members to cooperatively protect the landscape's integrity (visit the Roundtable at www.crownroundtable.net).

5. Ways to Build a Promising Future: Things Your Community Can Do to Take Action

Protecting landscapes and our health can be fun and affordable, and have immediate benefits. In this section, we describe actions that communities can take to protect landscapes and safeguard human health in a changing climate. First, we focus on actions people can take to slow climate change and then discuss actions to prepare for the changes that are already underway. We focus particular attention on faith communities because across faith traditions, people are called to care both for each other and for all of creation, and this commitment readily translates into tangible change. The actions that we suggest can be taken by individuals and households, or scaled up to community, regional, or even national levels. Climate change is a collective challenge in which all of our actions matter. When we work alongside our family, friends, and even strangers, we can change the world.

Slow climate change

The most impactful thing we can do to protect our landscapes is to slow climate change. We can do this by reducing human-released greenhouse gas emissions and storing carbon, a process known as climate change **mitigation**. This section provides key opportunities for communities and individuals to mitigate climate change.

BOX 5: What are greenhouse gases?

Greenhouse gases trap heat in the atmosphere and include carbon dioxide, methane, nitrous oxide, and fluorinated gases. People release greenhouse gases by burning fossil fuels to produce energy and by using fossil fuels for transportation. People also release greenhouse gases in industrial processes like refrigeration, deforestation, livestock production and other agricultural practices, decay of organic waste in landfills, and other means.¹⁰⁰ We can work together to reduce our greenhouse gas emissions.

Project Drawdown is an initiative that has ranked 80 effective techniques for drawing down greenhouse gases on a global scale.¹⁰¹ Their rankings consider both economic viability and total greenhouse gas reductions. The top ten techniques and technologies Project Drawdown lists are refrigerant management, onshore wind turbines, reduced food waste, plant-rich diets, tropical forests, educating girls, family planning, farms, silvopasture, and rooftop solar (see the entire list of 80 strategies with descriptions at www.drawdown.org).

Drawing on this work, we propose the following techniques can be used by communities on a local scale to mitigate climate change:



Make your buildings more efficient (and save money). Ask your utility provider for a free energy audit and make suggested changes. Simple changes include using LED lighting, installing water-saving devices like low-flow faucets and low-flush toilets, and ensuring you have effective insulation. Consider adding rooftop solar panels and a solar-heated water system. Design new buildings to prioritize energy efficiency as well as function and aesthetics.



Protect the forests you manage. Many communities of faith manage forested retreat centers or church camps. Well-managed forests, both public and private, play a key role in the fight against climate change by storing carbon. Montana State University Forestry Extension is one of many resources for people managing privately-owned forests.



Promote diets rich in fruits, vegetables, and legumes. Plant-rich diets can boost human health and reduce greenhouse gas emissions. Not knowing how to cook delicious and filling plant-based meals can make it hard to shift from a meat-centered to a plant-rich diet. One way to encourage the transition could be to hold a plant-focused potluck by encouraging people to prepare plant-based dishes and share their recipes. This can be especially fun to do during the growing season when fresh fruits and vegetables are abundant.



Hosting a community garden encourages people to add more fresh fruits and vegetables to their plates.¹⁰² Community gardens also promote a sense of community and wellbeing and can help supply local food banks, giving people with lower incomes access to fresh and healthier food.¹⁰³ Getting children involved in gardening is a great way to get them excited about vegetables. Youth groups within your community could conduct activities related to gardening, or take field trips to local farms to volunteer. Supporting local farmers' markets protects food security and can reduce the fossil fuel used to produce food. Currently, Montana has over 70 farmers' markets.¹⁰⁴

Another great way for small communities to increase access to vegetables is through hosting a FoodCorps member. FoodCorps is part of the AmeriCorps service network and members are dedicated to protecting healthy food in schools. Farm to School Coordinators are an excellent resource as well.



Encourage alternative forms of transportation. Walking, biking, mass transit, electric vehicles, and carpooling all reduce greenhouse gas emissions when compared to travelling solo by car. Carpooling is also a great way to connect with others in your community. Installing a bike rack at your gathering place and hosting an annual car-free gathering day can encourage people to explore alternative transportation. Working with your town or city to support Safe Streets policies can improve street design, for example, by adding bike lanes to provide safer and greener commuting opportunities.¹⁰⁵ And, virtual meetings are, in a sense, a form of alternative transportation, as video conferencing technologies carry us across thousands of miles without leaving our own room. Cutting down on air travel also significantly reduces emissions.

Box 6: Community gardens promote climate change preparedness



This photo shows Saint Mary's Jubilee Garden in 2018, during Helena Community Gardens' Secret Garden Tour. The Memorial Garden and Healing Garden are visible, as are household vegetable plots. Faith communities host three of Helena, Montana's nine community gardens. St. Paul's United Methodist Church, Saint Mary Catholic Community (Saint Mary's), and Plymouth Congregational Church provide garden space for over 60 gardeners and

their families. Their gardens, along with the other 6 in the city provide over 300 pounds of fresh produce to Helena Food Share each year.¹⁰⁶ They also inspire many gardeners with a sense of community and wellbeing.¹⁰⁷



A harvest from Jubilee Garden in Helena, Montana.

Photo: Helen Beausoleil



Make sharing, re-using, and recycling simple and fun. Producing material goods releases greenhouse gases, so encouraging broader sharing and re-use of things helps mitigate climate change, as does recycling. Used book sales, rummage sales, and second-hand clothing exchanges are ways many faith communities already encourage re-use. *Libraries of Things*, like community tool libraries or recreational equipment libraries, broaden item use from household to community level while saving people money.¹⁰⁸



Encourage engagement with life over possessions. Perhaps one of the greatest impacts faith communities can have is to encourage people to engage spiritually with each other and with nature. Showing people ways to live, in which meaning comes not from material possessions but from caring for others, may encourage more climate-friendly lifestyles and may combat loneliness.



Support climate-friendly policies. Local, state, and national legislation can create effective ways to expand the scope of climate change mitigation techniques. Faith communities may want to engage in advocacy to support healthy people and healthy landscapes, by, for instance, supporting clean energy bills in the Montana State Legislature and engaging in community planning to protect forests, public lands, and open spaces. Encourage participation in all elections to influence policies that protect landscapes and human health in a changing climate. Speak with friends and family about climate change impacts to human health and landscapes and encourage them to take action. Research shows that friends and family members are the most trusted messengers for communicating the climate change story (see Chapter 6 for climate change communications strategies).

Prepare for climate change

While taking action to slow climate change is crucial (mitigation), we know that it is already impacting our landscapes and our health. Preparing for such impacts and building resilience is known as **adaptation**. Many mitigation actions, like those described above, are also adaptive, meaning they help individuals and communities adjust to climate change impacts. For example, shifting to a plant-rich diet not only reduces the level of greenhouse gases released but it can also improve overall health.¹⁰⁹ Similarly, improving building efficiency prepares faith communities and individuals to better manage increasing extreme temperature fluctuations.

Box 7: Blackfeet Country and Climate Change

In 2018, the Blackfeet Nation created a website dedicated to climate change adaptation in Blackfeet Country. The website details specific impacts of climate change on health, with descriptions tailored for people who live in the region. It also weaves traditional ecological knowledge and other forms of science together to provide specific opportunities for action. Visit their website at blackfeetclimatechange.com.

There are countless ways to prepare for climate change impacts, many of which are covered in Chapter 4 on protecting landscape health. This section gives a few examples of how we can adapt to protect human health.



Connect with family, friends, and neighbors. A recent survey of 20,000 adults found that: nearly half of Americans report sometimes or always feeling alone or left out; one in four Americans rarely or never feel as though there are people who really understand them; and young adults (ages 18-22) are the loneliest.¹¹⁰ One of the many wonderful aspects of living in community is it can bring a shared sense of purpose and provide healthy connections and a deeper meaning for our lives. Faith communities connect people with a higher power and provide hope in the midst of difficult challenges. They also often reach out through scheduled events which can include potlucks or picnics, hosting family fun days, hosting book clubs for young adults, or through committing to longer term efforts like hosting a community garden (see Box 6).

Building connection and community is particularly important now as climate change is increasing the risks of mental health challenges in a state with the highest suicide rate in the nation.¹¹¹ We can work together to save lives by identifying people who may be at risk for suicide and then reaching out and connecting them with mental health care. The Suicide Prevention Resource Center provides a host of resources for preventing suicide in our communities. Visit their website at www.sprc.org. For immediate help for someone in crisis, call the National Suicide Prevention Lifeline at 1(800) 273-TALK (8255).



Provide and protect access to nature. Support unstructured play in open spaces and build connections with nature to promote mental health and physical health.¹¹² Host a camping outing and provide people with equipment who may not otherwise be able to afford it. Provide opportunities for youth and adults to attend summer camps and weekend retreats in natural settings. Days at camp can be among the most powerful and motivating moments in a young person's life. Host service projects that bring people into the outdoors, such as a tree planting event or trail maintenance on public lands. Gathering in forests or other natural spaces to have fun together can also remind us of the value of these spaces and can encourage people to actively protect them.



Create an inviting space to talk about health-related impacts of climate change.

While many people have heard of climate change, few people yet understand how it impacts human health. It is important to communicate the potential impacts, while also providing solutions and recommendations. Provide space and time for people to discuss any fears, questions, or solutions surrounding climate change and its impacts, whether through educational talks or informal discussions. Create resources which people can use to learn on their own, such as educational handouts or lists of books and websites with more information. Make sure that there are resources that are accessible to different ages and backgrounds. (See Chapter 6 for specific ways to talk about climate change).



Look out for people who are most vulnerable. Some people may need more help than others to adapt to climate change. It is important to identify more vulnerable individuals, and to help them adapt, whether through information, shelter, or community support. Often, children, older adults, those with pre-existing medical conditions, pregnant women, people with fewer economic resources, and people living in isolation are more vulnerable to health-related impacts of climate change and may need extra assistance.

Faith communities are uniquely positioned to provide a place for people to gather during a severe weather event. Buildings owned by faith communities can serve as cooling or warming shelters when people lose power or are unable to get to their homes. Having extra food, water, and clothing on hand can be especially helpful.



Plant trees. Trees provide a natural source of shade, which can reduce energy costs for air conditioning in hot weather. Trees also help to reduce particulate matter, ozone, and other pollutants and improve wellbeing.



Build healthy habits. Serve and eat nutritious foods, commit to a fun (yes, fun!) exercise plan, and get plenty of rest. Participate in mindset training to prepare for adversity and adaption in a rapidly changing world.¹¹³ Building belief in one's own resilience, fostering optimism, and cultivating active coping and self-regulation can strengthen your mental health and overall resilience.¹¹⁴



Practice proactive building maintenance. Maintain structures to withstand wildfire and adverse weather. If possible, buy or build in places that have little or no flood or fire risk. Make simple changes to protect your facilities and home, especially if you live in a forested area. For example, remove dead plant matter and prune back trees and bushes.¹¹⁵ The National Fire Protection Association provides an excellent resource for protecting homes and buildings from wildfire.¹¹⁶ Protect indoor air quality as well. Consider getting a high efficiency particulate air (HEPA) filter for use during the fire season and when using a wood stove. Keep your facilities in good repair to prevent mold growth.



Prepare for emergencies. Make an emergency plan and practice it, and encourage friends and family to make household emergency plans. Stock up on emergency supplies. For suggestions on how to prepare your community and your family for emergencies visit the American Red Cross website.¹¹⁷



Northview Bible Church members protect outdoor recreation opportunities by clearing downed trees from a national forest camping area.

Photo: Gary Nelson

6. Smart Communication Promotes Preparedness

Are we opening a window when we talk about climate change, or are we unintentionally building barriers? Creating healthy conversation about climate change is crucial to building shared understanding. Social science and psychology show us we can talk about climate change in ways that encourage openness to new ideas and motivate action. This section provides seven, science-informed strategies for effectively communicating about climate change, whether with people who are worried about it, people who are undecided, or people who think human-induced climate change is not a reality.

Box 8: Talking about climate

One summer, I (Libby) was invited to chat with some of my relatives' friends on a patio overlooking a beautiful lake. Prior to knowing anything about my career path, the group made several statements suggesting they believed climate change threats are exaggerated or altogether unreal. Then the group of friends asked me what I did for work, and upon learning I was a climate resilience planner, a discussion began. A man in the group asked me why I thought climate change was a real issue. In response, I described growing up in Spokane, Washington where I witnessed housing and business developments overcome forests and open fields where children had played. I explained that it was not a far leap for me to think about how similar changes I've seen in other parts of the world can collectively alter global ecology and climate. While it was a little daunting talking about the subject with a group of people who had very different viewpoints, I appreciated the sincerity with which people asked questions and the willingness to listen. The whole conversation, though, got me thinking more about how we might improve how we talk about climate change. It also provided impetus to write this guidebook, as I know that human health is an area of concern that can make it easier to talk about climate change.

1. *Build mutual understanding*

Who are you talking with? We all have different values and views of the world, as well as different ideas, concerns, and knowledge about climate change. Telling someone who feels unsure about global warming that they need to support new carbon tax policies is a tough place to start a conversation because it leaves little room to find middle ground. At the same time, sharing fact after fact about possible climate change impacts without providing adaptation strategies could overwhelm someone who is already feeling nervous and could build a trap of inaction. So, how should we approach these conversations?

To start, we need to understand that society is not simply made up of “believers” or “deniers”. Instead, researchers find that people in America can be grouped into six categories based on their levels of belief in global warming, their concern, and their motivation to act on the issue. The work by Yale and George Mason University researchers, called the “Six Americas”, finds people are alarmed, concerned, cautious, disengaged, doubtful, or dismissive. To effectively communicate about climate change, we must learn more about each of these groups.

People who are *alarmed* or *concerned* are already convinced of the reality and danger of climate change but may not understand how to adapt. This may lead to feelings of helplessness, with people often thinking their actions won't make any difference. To increase a sense of efficacy, we can use logical and sound arguments to show ways people can take effective action and to convince people that their individual and group efforts do make a difference (see Chapter 5 for examples).¹¹⁸ We can also encourage people who are alarmed to discuss climate change more frequently with friends and family and to model climate-friendly behaviors, since face-to-face communication with people we know and respect is highly effective.¹¹⁹

“The challenge now is to convert the felt concern into prioritizing the climate issue relative to other issues. Roughly one or two in ten need to shift into giving greater priority to ambitious climate policies”.

Espen Stoknes

What We Think about When We Try Not to Think about Global Warming¹²⁰

People who are *cautious* or *disengaged* have weak beliefs about global warming or have given it little thought, and have low involvement in the issue by choice. In this case, it is especially important to make the issue of climate change approachable. Scientists suggest making climate change messages easy to process and understand by using visual imagery, humor, and attractive and highly credible sources.¹²¹ Show rather than tell what is happening.¹²² Personalize the threat of climate change by showing impacts on places that are physically or emotionally close, like national parks.¹²³ Use stories – fiction or non-fiction – to illustrate climate change impacts and preparedness.¹²⁴ Show that admirable people are preparing for climate change.¹²⁵ People tend to do what people they respect are actually doing, so try to avoid focusing on negative behaviors. Finally, people who are *doubtful* have little acceptance of key beliefs about global warming and low involvement. People who are *dismissive* are certain climate change is not happening and are highly confident in their views. Many people in the *dismissive* group perceive climate change as a threat to their underlying values of individualism and respect for the established order.¹²⁶ Adopting less confrontational and more indirect approaches can help with these groups, as can communicating personal experiences of climate change, framing the discussion in terms of human health, and carefully choosing language to reflect their values.¹²⁷ Simply providing factual information is not an effective communication strategy because the problem is not information. Instead, there is a need to break the link between identity and factual beliefs.¹²⁸ Framing climate change action as a way to help society – by improving the economy, advancing technology, or increasing social cohesion – can be more effective with these groups than speaking of avoiding risks of climate change.¹²⁹

2. Select a trusted messenger

We are more apt to believe messages from people we trust. The most trusted sources for climate-related health information are family and friends and primary care doctors, when the information is delivered face-to-face.¹³⁰ Faith leaders can also be a trusted source for people who are doubtful or dismissive about climate change.¹³¹ People with moral authority might reach people who are less inclined to believe in the science of climate change, especially when people fear their religious beliefs conflict with science.¹³² Proclamations about climate change as a moral and ethical issue from leaders like Pope Francis may increase social engagement with climate change. For example, Pope Francis issued an encyclical in 2015, stating:

The climate is a common good, belonging to all and meant for all. At the global level, it is a complex system linked to many of the essential conditions for human life. A very solid scientific consensus indicates that we are presently witnessing a disturbing warming of the climatic system. Climate change is a global problem with grave implications: environmental, social, economic, political and for the distribution of goods. It represents one of the principal challenges facing humanity in our day. Its worst impact will probably be felt by developing countries in coming decades. Many of the poor live in areas particularly affected by phenomena related to warming, and their means of subsistence are largely dependent on natural reserves and ecosystemic services such as agriculture, fishing and forestry. Our lack of response to these tragedies involving our brothers and sisters points to the loss of that sense of responsibility for our fellow men and women upon which all civil society is founded.¹³³

Role models like Bible study leaders or committee leaders in faith communities can show people how to link religious and political views and how to respond to climate science.¹³⁴ Promoting climate change communication means finding and investing time in people who are already recognized leaders in a community and who support climate change preparedness.

3. Convey consensus

Messages about uncertainty can derail climate change communications. While it is important to acknowledge that there is inherently uncertainty in predictions we make about the future, it is more effective to emphasize the scientific consensus among experts that climate change is real and human-caused.¹³⁵ **At least 97% of scientists agree climate change is happening and that it is human-caused.**¹³⁶ What's more, speaking in terms of higher probabilities is more effective than referring to lower uncertainties.¹³⁷ For example, saying something like "we predict a severe wildfire in the next six years, but there is a 25% chance that we are wrong" would be less effective than saying "we predict a 75% chance of a severe wildfire in the next six years". Certain groups and individuals, motivated by personal interest, often attempt to spread misinformation about climate change, and researchers suggest that warning people about these attempts can help people stay focused on the reality of climate change.¹³⁸

**Americans who think global warming is happening
outnumber those who don't by 5 to 1.**¹³⁹

It may also be helpful to point out that the majority of Americans have concerns about climate change and support policies that could mitigate it. **Most American registered voters are worried about climate change and know it is mainly human-caused.**¹⁴⁰ What's more, **large majorities of American registered voters across the political spectrum support policies that promote clean energy and reduce carbon pollution and fossil fuel dependence.**¹⁴¹ Promote positive social norms by showing that climate change adaptation is popular and expected of admirable people.¹⁴² Focusing on prevalent negative behaviors can backfire. People tend to imitate other people, so understanding that many people are concerned and support measures that would, in effect, mitigate climate change may encourage action.¹⁴³

4. *Frame messages carefully*

The way messages are framed impacts how they are received. Framing is how information is packaged and presented. Framing effects have significant impact among groups of people without strong political affiliations, though they can be important across the political spectrum as well.¹⁴⁴ Researchers have uncovered a range of ways that framing can enhance climate change communications, summarized below:

- Make your message supportive.¹⁴⁵ Invite people to participate in creating a positive future, a future with open and climate-friendly societies in which people prosper. How many stories do we hear of a future with happy people living on healthy land? Instead, we typically see dystopian, apocalyptic renditions of humanity's future. Creating visions of doom to threaten people into giving up a presently comfortable lifestyle are ineffective.¹⁴⁶ Instead, let's emphasize steps like adding trees, walking trails, and cycling lanes in our cities to give us cleaner air and more contact with friends and family, all while reducing our carbon footprint.
- Speaking of climate change as a public health issue makes it more personally relevant. Focusing on human health may elicit more hopeful responses about mitigation and adaptation than other frames.¹⁴⁷
- Highlight local impacts of climate change. Research suggests people respond more to messages about local impacts (for example, discussing sea level rise in a coastal community, or increased fire severity in a forested community) than focusing only on global impacts.¹⁴⁸ Make it feel "near, human, personal, and urgent".¹⁴⁹ Experience of extreme weather events like flooding can increase concern about and support for action towards climate change, making it helpful to tie local extreme weather events to discussions of climate change.¹⁵⁰
- Highlight that we can avoid losses, and experience gains, in acting now to mitigate climate change.¹⁵¹ Framing something as a gain means focusing on a positive outcome, while framing something as a loss happens when we focus on costs or damages. For example, a gain-frame is more effective, saying something like, "We can prevent suicides by acting now to mitigate climate change". A less effective way to communicate would be to say, "Suicide rates will increase if we do not mitigate climate change".¹⁵²
- When speaking with people who are politically conservative, make environmental or climate change comparisons to the past rather than comparisons with future conditions.¹⁵³ Research suggests that some people are more oriented to using the past as a guide for where we are now.
- Use the term "climate change" rather than "global warming" when speaking with people who are more moderate in their views or disengaged from climate change. Researchers have found that the term "global warming" has become more emotive and polarizing.¹⁵⁴
- Keep the message simple by avoiding long words and using metaphors. Use images along with messages that have clear and meaningful captions.¹⁵⁵

- Messages framed as climate change “preparedness”, with concrete steps people can take, are more effective than speaking about “adaptation”.¹⁵⁶ “Prevention” is a powerful message with women, Democrats, and young voters.¹⁵⁷
- Tell a story. Present information within a narrative structure to capture people’s imaginations and motivate action.¹⁵⁸ Both fiction and non-fiction stories can be effective.¹⁵⁹

5. *Avoid triggering defensiveness*

Talk about climate change tends to trigger defense barriers, preventing messages from leading to meaningful action. Poor messaging can lead to denial or a sense of helplessness. Denial about the psychologically-difficult reality of climate change stems from self-defense, not ignorance or lack of intelligence, so much so that Per Espen Stoknes prefers to call it “resistance” instead of denial.¹⁶⁰ **We can help reduce resistance by avoiding messages that trigger fear, guilt, and self-protection. We can promote a sense of self-efficacy over helplessness by offering opportunities to act instead of focusing on fear-inducing visions of a doomed planet.** Research suggests that avoiding the following can help get climate messages across:

- Avoid shaming and blaming people. Telling people that they are to blame and that the only answers to climate change require personal sacrifice can backfire.¹⁶¹
- Avoid communicating visions of doom. Bombarding people purely with facts about climate change impacts and negative human behavior can leave people with a sense of hopelessness and helplessness, especially when the facts are unaccompanied by opportunities to act with others to adapt.¹⁶²
- Avoid politicized rhetoric.¹⁶³ Shaming supporters of a certain political party or political persuasion alienates people. Trying to persuade people to adopt different value sets tends to fail as well. For example, emphasizing the need for more government control over natural resources to combat climate change might not need to be a focal point with political conservatives when we can talk about how clean energy technologies can provide personal and community independence in a free market.

The new psychology of climate is less about what each of us can do to solve the problem and more about liberating us from some of the most debilitating side effects of the global climate messages. Messages telling me that I am to blame. That I must give up on all shopping and flying and otherwise reduce my sinful consumption before I can speak out about it. That the only answers involve sacrifice. That it is too late. And, finally, and devastatingly, that anything I can do doesn't matter.

*Espen Stoknes*¹⁶⁴

What We Think about When We Try Not to Think about Global Warming

6. *Provide opportunities for action*

We can support people to shift from resistance or despair to self-efficacy and action by showing that climate-friendly actions can be easy, convenient, and even fun.¹⁶⁵ Chapter 5 describes a variety of actions communities and individuals can take to prepare for climate change.

Box 9: Beaver mimicry in Blackfeet Country

In 2018 the Blackfeet Community College Native Science Field Center focused their two-week summer program on beaver and climate change preparedness¹⁶⁶. Beaver engineer water storage by building dams, protecting against drought. Beaver are also an important part of Blackfeet way of life. During the field program, high school and college students built a series of small structures to mimic beaver in order to slow and naturally store water, a process called beaver mimicry. Conversations about climate change impacts and preparedness took on new life as students took immediate action to address decreasing summer streamflow.



Blackfeet Community College Native Science Fellows with a mimic dam they built to naturally store water in a drying climate. So-called “beaver mimicry” is a fun way to learn about climate change impacts while creating a better future.

Photo: Libby Khumalo

7. *Signal success*

How do we know when our actions are making a difference? We can signal successful climate change preparedness by selecting and then measuring indicators of progress rather than focusing on global problems.¹⁶⁷ Communications expert Per Espen Stoknes recommends measuring happiness and wellbeing to broaden our focus beyond Gross Domestic Product (GDP) as our society’s main measure of success. He also recommends focusing on measures of healthy ecosystems, like Norway’s Nature Index that shows levels of intact biodiversity. We can find and create many types of indicators to measure success.

7. Tools for Planning and Acting Now to Protect Our Future

Acting Now to Protect Our Future - A Discussion Guide

This guide offers a set of questions for talking about where your community is now in regard to climate change, what steps you would like to take together, and how you would like to talk about the actions you are taking. We suggest you refer to Chapter 5 for some climate change preparedness tips.

1. **Where are we now?** What things are we already doing as a community to reduce our greenhouse gas emissions (our current mitigation actions)? What are we already doing to prepare our community to better handle climate change impacts (our current adaptation actions that build resilience)? What actions are we not taking that we could?
2. **Where do we want to go?** Where do we see our faith community a year from now in regards to climate change preparedness (both mitigation and adaptation)? Five years from now? Do we want to change mindsets about climate change? Do we want to spur people to act who are already concerned about climate change?
3. **How do we want to get there?** What mitigation and adaptation actions would we like to continue? What activities would we like to start doing, and when? Who will help us? How will we measure our progress to make sure we are reaching our goals? Do we want people to take action within the context of your faith community or within their personal lives or both? What do we see as our community's main barriers to taking climate action? How might we move past them? What physical resources does our community have, and how might we make small changes in management to mitigate and adapt to climate change?
4. **How might we improve communications about climate change in our community?**
 - **How can we build mutual understanding?** Are we trying to reach everyone in our community, or do we prefer to focus on people who are already convinced about the reality and danger of climate change and want to find ways to take action? (Who we reach out to depends on what we are trying to accomplish.)
 - **What messages do we want to get across?** How might we weave simple messages about human health and local impacts while inviting our community to participate in creating a positive future? What stories might we tell to invite people to build a more just world and climate-friendly society?
 - **Selecting a trusted messenger...** Who would be the best messenger or coordinator for reaching out to our faith community about climate change preparedness?
 - **How might we avoid triggering defensiveness?** What words, phrases, or ways of describing the future might best be left out of the conversation?
 - **What opportunities for action will we provide when speaking with people about climate change?**
 - **What will we do to signal that our faith community is having success in addressing climate change?** For example, do we want to show how many people have pledged to help prepare for climate change? Do we want to talk about progress on a particular project? Do we want to measure ways our community has reduced energy consumption? How will we measure and communicate the positive changes our community is making?

Additional Resources

The Blackfeet Country and Climate Change website shows the Blackfeet Nation’s climate change plan and how it is being put into action in Montana: blackfeetclimatechange.com.

The **Center for Large Landscape Conservation** works to protect the integrity of large landscapes by promoting connectivity science, policy, and community partnerships: largelandscapes.org.

The **Children Nature Network** provides resources for connecting children with nature: childrenandnature.org.

Climate Smart Missoula fosters partnerships and actions to address climate change with an eye towards equity and a zero carbon footprint: missoulaclimate.org.

ecoAmerica provides research results and recommendations for climate change action: ecoamerica.org.

Faith and Climate Action Montana educates individuals in faith communities about climate change and creates space for spiritual reflection on social and environmental issues:
faithandclimateactionmontana.weebly.com

Interfaith Power and Light promotes of energy conservation, energy efficiency, and renewable energy:
interfaithpowerandlight.org

Moms Clean Air Force seeks to protect children’s health by reducing air pollution: momscleanairforce.org

The **Montana Climate Assessment** shows past and future climate trends that affect the state, with particular attention to agriculture, forests, and water: montanaioe.org/mca

Montana Department of Environmental Quality provides daily air quality updates Montana:
svc.mt.gov/deq/todaysair/smokereport/mostrecentupdate.aspx.

Montana Department of Public Health and Human Services provides public health recommendations:
dphhs.mt.gov.

Montana State University Extension Forestry provides forest management resources for private landowners:
msuextension.org/forestry/index.html.

Project Drawdown calls itself “the most comprehensive plan ever to reduce global warming”: drawdown.org.

The **U.S. Global Change Research Program’s 2016 Climate Health Assessment** provides a broad synthesis of many ways climate change may impact human health: health2016.globalchange.gov.

Yale Forum on Religion and Ecology broadens the understanding of the nature of complex environmental issues: fore.yale.edu

Yale Program on Climate Change Communication provides research-driven climate change communications insights: climatecommunication.yale.edu.

Works Cited

- ¹ Kennedy Merrit, "Lead-Laced Water In Flint: A Step-By-Step Look At The Makings Of A Crisis," NPR.org, accessed October 1, 2018, <https://www.npr.org/sections/thetwo-way/2016/04/20/465545378/lead-laced-water-in-flint-a-step-by-step-look-at-the-makings-of-a-crisis>.
- ² Merrit.
- ³ "LeeAnne Walters," Goldman Environmental Foundation, accessed October 1, 2018, <https://www.goldmanprize.org/recipient/leeanne-walters/>.
- ⁴ [CC BY 2.0 (<https://creativecommons.org/licenses/by/2.0/>)], via Wikimedia Commons
- ⁵ Merrit, "Lead-Laced Water In Flint"; Tim Carmody, "How the Flint River Got so Toxic," The Verge, February 26, 2016, <https://www.theverge.com/2016/2/26/11117022/flint-michigan-water-crisis-lead-pollution-history>.
- ⁶ Tafline Laylin, "How Michigan's Flint River Came to Poison a City," *The Guardian*, January 18, 2016, sec. Environment, <https://www.theguardian.com/environment/2016/jan/18/michigan-flint-river-epa-lead-contamination-mdeq-pollutants-water-safety-health>.
- ⁷ Joseph M. Leonardi and William J. Gruhn, "Flint River Assessment," in *Michigan Department of Natural Resources, Fisheries Division, Special Report 27, Ann Arbor*, 2000.; "What Is a Watershed Anyway? « The Flint River Watershed Coalition," accessed October 5, 2018, <http://flintriver.org/blog/watershed/>.
- ⁸ Leonardi and Gruhn, "Flint River Assessment."
- ⁹ [CC BY-SA 2.0 (<https://creativecommons.org/licenses/by-sa/2.0/>)], via Wikimedia Commons
- ¹⁰ "About Watershed Protection," accessed October 1, 2018, http://www.nyc.gov/html/dep/html/watershed_protection/about.shtml.
- ¹¹ "Croton & Catskill/Delaware Watersheds," *NYC Watershed* (blog), accessed October 1, 2018, <https://www.nycwatershed.org/about-us/overview/croton-catskilldelaware-watersheds/>.
- ¹² Bill de Blasio and Vincent Sapienza, "New York City 2017 Drinking Water Supply and Quality Report," n.d., 24.
- ¹³ de Blasio and Sapienza.
- ¹⁴ Network for Landscape Conservation, "Pathways Forward: Progress and Priorities and Landscape Conservation," 2018.
- ¹⁵ Sarah Bates et al., "Remarkable Beyond Borders: People and Landscapes in the Crown of the Continent" (The Sonoran Institute, September 2010).
- ¹⁶ Bates et al.
- ¹⁷ Bates et al.
- ¹⁸ Network for Landscape Conservation, "Pathways Forward: Progress and Priorities and Landscape Conservation."
- ¹⁹ Maria Dolan, "Making City Trees Eligible for Carbon Offsets," CityLab, August 28, 2018, <https://www.citylab.com/environment/2018/08/carbon-offsets-for-urban-trees-are-on-the-horizon/568378/>.
- ²⁰ David J. Nowak, Daniel E Crane, and Jack C. Stevens, "Air Pollution Removal by Urban Trees and Shubs in the United States," *Urban Forestry & Urban Greening*, no. 4 (2006): 115–23, <https://doi.org/10.1016/j.ufug.2006.01.007>. cited in David J Nowak and Gordon M Heisler, "Air Quality Effects of Urban Trees and Parks" (National Recreation and Park Association, 2010), https://www.nrpa.org/uploadedFiles/nrpa.org/Publications_and_Research/Research/Papers/Nowak-Heisler-Summary.pdf.
- ²¹ Omid Kardan et al., "Neighborhood Greenspace and Health in a Large Urban Center," *Scientific Reports* 5 (July 9, 2015): 11610, <https://doi.org/10.1038/srep11610>.; T. Takano, K. Nakamura, and M. Watanabe, "Urban Residential Environments and Senior Citizens' Longevity in Megacity Areas: The Importance of Walkable Green Spaces," *Journal of Epidemiology and Community Health* 56, no. 12 (December 2002): 913–18.
- ²² "20160825_PHA_Report_Final.Pdf," accessed October 5, 2018, https://thought-leadership-production.s3.amazonaws.com/2016/11/07/14/13/22/685dccba-cc70-43a8-a6a7-e3133c07f095/20160825_PHA_Report_Final.pdf.
- ²³ Kardan et al., "Neighborhood Greenspace and Health in a Large Urban Center."
- ²⁴ Z. G. Davies et al., "A National Scale Inventory of Resource Provision for Biodiversity within Domestic Gardens.," *Biological Conservation*, no. 142 (2009): 761–71.; M. A. Schlaepfer, D. F. Sax, and J. D. Olden, "The Potential Conservation Value of Non-Native Species.," *Conservation Biology*, no. 25 (2011): 428–37.; Linda Chalker-Scott, "Nonnative, Noninvasive Woody Species Can Enhance Urban Landscape Biodiversity.," *Arboriculture and Urban Forestry*, no. 41 (2015): 173–86.; cited in Kylie Soanes et al., "Correcting Common Misconceptions to Inspire Conservation Action in Urban Environments," *Conservation Biology* 0, no. ja, accessed October 6, 2018, <https://doi.org/10.1111/cobi.13193>.
- ²⁵ R.A. Fuller et al., "Psychological Benefits of Greenspace Increase with Biodiversity.," *Biology Letters*, no. 3 (2007): 390–94.; D. F. Shanahan et al., "Toward Improved Public Health Outcomes from Urban Nature.," *Amerian Journal of Public Health*, no. 105 (2015): 470–77.; cited in Soanes et al., "Correcting Common Misconceptions to Inspire Conservation Action in Urban Environments."
- ²⁶ USGCRP, "The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment," Eds., A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska (Washington, DC: U.S. Global Change Research Program, 2016).; CJ Portier et al., "A Human Health Perspective On Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change." (Research Triangle Park, NC: Environmental Health Perspectives/National Institute of Environmental Health Sciences, 2010).
- ²⁷ Xin Zhang, Xi Chen, and Xiaobo Zhang, "The Impact of Exposure to Air Pollution on Cognitive Performance," *Proceedings of the National Academy of Sciences* 115, no. 37 (September 11, 2018): 9193–97, <https://doi.org/10.1073/pnas.1809474115>; Ulrike Gehring et al., "Exposure to Air Pollution and Development of Asthma and Rhinoconjunctivitis throughout Childhood and Adolescence: A Population-Based Birth Cohort Study," *The Lancet Respiratory Medicine* 3, no. 12 (December 1, 2015): 933–42, [https://doi.org/10.1016/S2213-2600\(15\)00426-9](https://doi.org/10.1016/S2213-2600(15)00426-9); Joel D. Kaufman et al., "Association between Air Pollution and Coronary Artery Calcification within Six Metropolitan Areas in the USA (the Multi-Ethnic Study of Atherosclerosis and Air Pollution): A Longitudinal Cohort Study," *The Lancet* 388, no. 10045 (August 13, 2016): 696–704, [https://doi.org/10.1016/S0140-6736\(16\)00378-0](https://doi.org/10.1016/S0140-6736(16)00378-0).
- ²⁸ "Particulate Matter Air Pollution and Cardiovascular Disease | Circulation," accessed October 5, 2018, <https://www.ahajournals.org/doi/abs/10.1161/cir.0b013e3181d8e111>; Yun-Chul Hong et al., "Air Pollution," *Stroke*, September 1, 2002, <https://www.ahajournals.org/doi/abs/10.1161/01.str.0000026865.52610.5b>; Lyndsey A. Darrow et al., "AMBIENT AIR POLLUTION AND PRETERM

BIRTH: A TIME-SERIES ANALYSIS," *Epidemiology (Cambridge, Mass.)* 20, no. 5 (September 2009): 689–98, <https://doi.org/10.1097/EDE.0b013e3181a7128f>; Ambarina S. Faiz et al., "Does Ambient Air Pollution Trigger Stillbirth?," *Epidemiology* 24, no. 4 (July 2013): 538, <https://doi.org/10.1097/EDE.0b013e3182949ce5>; Oudin Anna et al., "Traffic-Related Air Pollution and Dementia Incidence in Northern Sweden: A Longitudinal Study," *Environmental Health Perspectives* 124, no. 3 (March 1, 2016): 306–12, <https://doi.org/10.1289/ehp.1408322>; Guxens Mònica et al., "Prenatal Exposure to Residential Air Pollution and Infant Mental Development: Modulation by Antioxidants and Detoxification Factors," *Environmental Health Perspectives* 120, no. 1 (January 1, 2012): 144–49, <https://doi.org/10.1289/ehp.1103469>.

²⁹ John T. Abatzoglou and A. Park Williams, "Impact of Anthropogenic Climate Change on Wildfire across Western US Forests," *Proceedings of the National Academy of Sciences* 113, no. 42 (October 18, 2016): 11770–75, <https://doi.org/10.1073/pnas.1607171113>; Anthony LeRoy Westerling, "Increasing Western US Forest Wildfire Activity: Sensitivity to Changes in the Timing of Spring," *Phil. Trans. R. Soc. B* 371, no. 1696 (June 5, 2016): 20150178, <https://doi.org/10.1098/rstb.2015.0178>.

³⁰ Westerling, "Increasing Western US Forest Wildfire Activity."

³¹ Westerling.

³² Crystal D. McClure and Daniel A. Jaffe, "US Particulate Matter Air Quality Improves except in Wildfire-Prone Areas," *Proceedings of the National Academy of Sciences*, July 11, 2018, 201804353, <https://doi.org/10.1073/pnas.1804353115>.

³³ USGCRP, "The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment."

³⁴ A. L. Westerling et al., "Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity," *Science* 313, no. 5789 (August 18, 2006): 940–43, <https://doi.org/10.1126/science.1128834>.

³⁵ Michael D. Schweitzer et al., "Lung Health in Era of Climate Change and Dust Storms," *Environmental Research* 163 (May 2018): 36–42, <https://doi.org/10.1016/j.envres.2018.02.001>.

³⁶ "A Changing Climate Worsens Allergy Symptoms," Union of Concerned Scientists, accessed October 1, 2018, https://www.ucsusa.org/global_warming/science_and_impacts/impacts/climate-and-allergies.html.

³⁷ "A Changing Climate Worsens Allergy Symptoms."

³⁸ P. J. Beggs, "Impacts of Climate Change on Aeroallergens: Past and Future," *Clinical & Experimental Allergy* 34, no. 10 (October 1, 2004): 1507–13, <https://doi.org/10.1111/j.1365-2222.2004.02061.x>.

³⁹ C Whitlock et al., "2017 Montana Climate Assessment" (Bozeman and Missoula, MT: Montana State University and University of Montana, Montana Institute on Ecosystems, 2017), doi:10.15788/m2ww8w.

⁴⁰ USGCRP, "The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment."

⁴¹ USGCRP.

⁴² Whitlock et al., "2017 Montana Climate Assessment."

⁴³ Centers for Disease Control and Prevention et al., "When Every Drop Counts: Protecting Public Health During Drought Conditions—A Guide for Public Health Professionals" (Atlanta: U.S. Department of Health and Human Services, 2010).

⁴⁴ Centers for Disease Control and Prevention et al.

⁴⁵ Centers for Disease Control and Prevention et al.

⁴⁶ Centers for Disease Control and Prevention et al.

⁴⁷ Centers for Disease Control and Prevention et al.

⁴⁸ David Eisenman et al., "An Ecosystems and Vulnerable Populations Perspective on Solastalgia and Psychological Distress After a Wildfire," *EcoHealth* 12, no. 4 (December 1, 2015): 602–10, <https://doi.org/10.1007/s10393-015-1052-1>; Glenn Albrecht, "The Age of Solastalgia," *The Conversation*, August 7, 2012, <http://theconversation.com/the-age-of-solastalgia-8337>; Glenn Albrecht et al., "Solastalgia: The Distress Caused by Environmental Change," *Australasian Psychiatry* 15, no. 1_suppl (February 1, 2007): S95–98, <https://doi.org/10.1080/10398560701701288>.

⁴⁹ S. Clayton et al., "Mental Health and Our Changing Climate: Impacts, Implications, and Guidance." (Washington, DC: American Psychological Association and ecoAmerica, 2017).

⁵⁰ Clayton et al.

⁵¹ Centers for Disease Control and Prevention et al., "When Every Drop Counts: Protecting Public Health During Drought Conditions—A Guide for Public Health Professionals."

⁵² Centers for Disease Control and Prevention et al.

⁵³ "Montana Tops National Trend of Increasing Suicide Rates, Report Shows | Montana News | Billingsgazette.Com," accessed October 1, 2018, https://billingsgazette.com/news/state-and-regional/montana/montana-tops-national-trend-of-increasing-suicide-rates-report-shows/article_55a72dc1-700a-52ab-bf94-ce1122541f32.html.

⁵⁴ Whitlock et al., "2017 Montana Climate Assessment."

⁵⁵ USGCRP, "The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment."

⁵⁶ USGCRP.

⁵⁷ USGCRP.

⁵⁸ USGCRP.

⁵⁹ "State Agencies Ask the Public to Report Harmful Algal Blooms - News.Mt.Gov," accessed October 1, 2018, <https://news.mt.gov/state-agencies-ask-the-public-to-report-harmful-algal-blooms>.

⁶⁰ "State Agencies Ask the Public to Report Harmful Algal Blooms - News.Mt.Gov."

⁶¹ "State Agencies Ask the Public to Report Harmful Algal Blooms - News.Mt.Gov."

⁶² "Montana Waters Tainted by Toxic Algae Blooms, State Calls for Public Awareness," Great Falls Tribune, accessed October 1, 2018, <https://www.greatfallstribune.com/story/news/2018/07/30/algae-can-make-people-ill-and-kill-pets-taints-montana-waters/828946002/>.

⁶³ "Fire and Forest Management," accessed October 1, 2018, https://www.biologicaldiversity.org/programs/public_lands/forests/ecosystem_restoration/fire_and_forest_management.html.

- ⁶⁴ “U.S. Forest Service Fire Suppression,” *Forest History Society* (blog), accessed October 1, 2018, <https://foresthistory.org/research-explore/us-forest-service-history/policy-and-law/fire-u-s-forest-service/u-s-forest-service-fire-suppression/>.
- ⁶⁵ Westerling et al., “Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity.”
- ⁶⁶ Oregon State University, “Logging May Hinder Forest Regeneration, Increase Fire Risk,” *ScienceDaily*, January 7, 2006, <https://www.sciencedaily.com/releases/2006/01/060106131506.htm>; Carter Stone, Andrew Hudak, and Penelope Morgan, “Forest Harvest Can Increase Subsequent Forest Fire Severity” (USDA Forest Service, 2004), <https://doi.org/10.2737/PSW-GTR-208>.
- ⁶⁷ Paulo M. Fernandes and Herminio S. Botelho, “A Review of Prescribed Burning Effectiveness in Fire Hazard Reduction,” *International Journal of Wildland Fire*, no. 12 (2003): 117–28; Michael J. Jenkins et al., “Bark Beetles, Fuels, Fires and Implications for Forest Management in the Intermountain West,” *Forest Ecology and Management* 254, no. 1 (January 15, 2008): 16–34, <https://doi.org/10.1016/j.foreco.2007.09.045>.
- ⁶⁸ John H. Bassman et al., “Rocky Mountain Ecosystems: Diversity, Complexity and Interactions,” *Tree Physiology* 23, no. 16 (November 1, 2003): 1081–89, <https://doi.org/10.1093/treephys/23.16.1081>.
- ⁶⁹ Whitlock et al., “2017 Montana Climate Assessment.”
- ⁷⁰ Whitlock et al.
- ⁷¹ Whitlock et al.
- ⁷² Washington Department of Natural Resources, “Forest Roads,” in *Forest Practices Illustrated* (Washington State Department of Natural Resources, 2017), 164.
- ⁷³ Constance I. Millar, Nathan L. Stephenson, and Scott L. Stephens, “Climate Change and Forests of the Future: Managing in the Face of Uncertainty,” *Ecological Applications* 17, no. 8 (December 1, 2007): 2145–51, <https://doi.org/10.1890/06-1715.1>.
- ⁷⁴ Jennifer L. Birdsall, Ward McCaughey, and Justin B. Runyon, “Roads Impact the Distribution of Noxious Weeds More Than Restoration Treatments in a Lodgepole Pine Forest in Montana, U.S.A.,” *Restoration Ecology* 20, no. 4 (July 2012): 517–23, <https://doi.org/10.1111/j.1526-100X.2011.00781.x>.
- ⁷⁵ M Pfeifer et al., “Creation of Forest Edges Has a Global Impact on Forest Vertebrates,” *Nature* 551, no. 7679 (November 9, 2017): 187–91, <https://doi.org/10.1038/nature24457>; Julien Terraube et al., “Forest Edges Have High Conservation Value for Bird Communities in Mosaic Landscapes,” *Ecology and Evolution* 6, no. 15 (June 28, 2016): 5178–89, <https://doi.org/10.1002/ece3.2273>.
- ⁷⁶ George Draffan, “A History of Railroad Land Grant Reform,” n.d., 41.
- ⁷⁷ Draffan.
- ⁷⁸ NASA, *Checkerboarding in Northern Idaho*, January 4, 2017, Photograph, January 4, 2017, <https://eol.jsc.nasa.gov/SearchPhotos/photo.pl?mission=ISS050&roll=E&frame=28519>.
- ⁷⁹ “Montana Legacy Project,” Swan Valley Connections, accessed October 1, 2018, <https://www.swanvalleyconnections.org/montana-legacy-project/>.
- ⁸⁰ “Conservationists Go Big in Montana –Land&People,” The Trust for Public Land, accessed October 1, 2018, <https://www.tpl.org/magazine/conservationists-go-big-montana-%E2%80%93landpeople>; “Montana Legacy Project.”
- ⁸¹ “State Data,” accessed October 1, 2018, <https://data.ers.usda.gov/reports.aspx?ID=17854>.
- ⁸² “Soil Health | NRCS Soils,” accessed October 2, 2018, <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>.
- ⁸³ J. Dumanski and R. Peiretti, “Modern Concepts of Soil Conservation,” *International Soil and Water Conservation Research* 1, no. 1 (June 1, 2013): 19–23, [https://doi.org/10.1016/S2095-6339\(15\)30046-0](https://doi.org/10.1016/S2095-6339(15)30046-0).
- ⁸⁴ Michigan State University Extension, “Acceptable Practices for Managing Livestock Along Lakes, Streams and Wetlands,” n.d., [http://www.canr.msu.edu/uploads/resources/pdfs/acceptable_practices_for_managing_livestock_along_lakes_and_streams_\(e3066\).pdf](http://www.canr.msu.edu/uploads/resources/pdfs/acceptable_practices_for_managing_livestock_along_lakes_and_streams_(e3066).pdf).
- ⁸⁵ “The Problem of Runoff – Pesticide Environmental Stewardship,” accessed October 2, 2018, <https://pesticidestewardship.org/water/runoff/>.
- ⁸⁶ “Conservation Agriculture Knowledge Portal,” accessed October 2, 2018, <http://conservationagriculture.mannlib.cornell.edu/pages/aboutca/advantages.html>.
- ⁸⁷ “What Are Cities Doing to Go ‘Green?’,” *Scientific American*, accessed October 2, 2018, <https://www.scientificamerican.com/article/how-do-cities-go-green/>.
- ⁸⁸ Charles S. Barnes et al., “Climate Change and Our Environment: The Effect on Respiratory and Allergic Disease,” *The Journal of Allergy and Clinical Immunology in Practice* 1, no. 2 (March 2013): 137–41, <https://doi.org/10.1016/j.jaip.2012.07.002>.
- ⁸⁹ US EPA, “Reduce Urban Heat Island Effect,” US EPA, October 1, 2015, <https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect>.
- ⁹⁰ “A Green Solution to Stormwater Management,” Penn State Extension, accessed October 2, 2018, <https://extension.psu.edu/a-green-solution-to-stormwater-management>.
- ⁹¹ C A Howe and K Vairavamoorthy, “In the City of the Future,” n.d., 94.
- ⁹² “What Is A Wetland?,” The Wetlands Initiative, accessed October 2, 2018, <http://www.wetlands-initiative.org/what-is-a-wetland/>.
- ⁹³ “Why Are Wetlands So Important to Preserve?,” *Scientific American*, accessed October 2, 2018, <https://www.scientificamerican.com/article/why-are-wetlands-so-important-to-preserve/>; “Wetlands | Mille Lacs SWCD,” accessed October 2, 2018, <https://www.millelacsswcd.org/wetlands/>.
- ⁹⁴ Montana State Library, “Water Information System: Groundwater,” Montana.gov, n.d., http://geoinfo.msl.mt.gov/geography/water_information_system/groundwater.aspx.
- ⁹⁵ “Threats to Wetlands,” accessed October 2, 2018, <http://cas.umn.edu/watershedclinic/links/clarkfork/wetlands/threatstowetlands.htm>.
- ⁹⁶ Michigan State University Extension, “Acceptable Practices for Managing Livestock Along Lakes, Streams and Wetlands.”
- ⁹⁷ M.M. Pollock et al., eds., *The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains*, 1st ed. (Portland, Oregon: United States Fish and Wildlife Service, 2015), <http://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Beaver.asp>; Joe Wheaton, “What Can Beaver Teach Us about Adapting to Climate Change & Building More Resilient Systems?” (Webinar, February 11, 2015).

- ⁹⁸ Glynnis A. Hood and Suzanne E. Bayley, "Beaver (*Castor Canadensis*) Mitigate the Effects of Climate on the Area of Open Water in Boreal Wetlands in Western Canada," *Biological Conservation* 141, no. 2 (2008): 556–67.; Robert J. Naiman, Carol A. Johnston, and James C. Kelley, "Alteration of North American Streams by Beaver: The Structure and Dynamics of Streams Are Changing as Beaver Recolonize Their Historic Habitat.," *BioScience* 38, no. 11 (1998): 753–62.
- ⁹⁹ Hood and Bayley, "Beaver (*Castor Canadensis*) Mitigate the Effects of Climate on the Area of Open Water in Boreal Wetlands in Western Canada."
- ¹⁰⁰ US EPA, "Overview of Greenhouse Gases," US EPA, December 23, 2015, <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>.
- ¹⁰¹ "Drawdown," Drawdown.org, n.d., <https://www.drawdown.org/>.
- ¹⁰² Jill S. Litt, Mah-J. Soobader, Mark S. Turbin, James W. Hale, Michael Buchenau, and Julie A. Marshall. The Influence of Social Involvement, Neighborhood Aesthetics, and Community Garden Participation on Fruit and Vegetable Consumption. *American Journal of Public Health*, August 2011, Vol. 101, No. 8: pp. 1466-1473
- ¹⁰³ Helena Community Gardens Impact Assessment: Final Report Libby Khumalo, Pat Christian, and Asha Consultants September 2016
- ¹⁰⁴ Angie Nelson, "Farmer's Markets," Montana.gov, n.d., <https://agr.mt.gov/Farmers-Markets>.
- ¹⁰⁵ "National Complete Streets Coalition," Smart Growth America, n.d., <https://smartgrowthamerica.org/program/national-complete-streets-coalition/>.
- ¹⁰⁶ L. Khumalo, P. Christian, and Asha Consultants, "Helena Community Gardens Impact Assessment: Final Report.," 2016.
- ¹⁰⁷ Khumalo, Christian, and Asha Consultants.
- ¹⁰⁸ Librarianship, "A Brief Survey of America's Libraries of Things," *EBSCOpost* (blog), September 26, 2017, <https://www.ebsco.com/blog/article/a-brief-survey-of-americas-libraries-of-things>.
- ¹⁰⁹ Philip J Tuso et al., "Nutritional Update for Physicians: Plant-Based Diets," *The Permanente Journal* 17, no. 2 (2013): 61–66, <https://doi.org/10.7812/TPP/12-085>.
- ¹¹⁰ MultiVu-PR Newswire, "New Cigna Study Reveals Loneliness at Epidemic Levels in America," Multivu, accessed October 2, 2018, <https://www.multivu.com/players/English/8294451-cigna-us-loneliness-survey/>.
- ¹¹¹ Clayton et al., "Mental Health and Our Changing Climate: Impacts, Implications, and Guidance.,"; Marshall Burke et al., "Higher Temperatures Increase Suicide Rates in the United States and Mexico," *Nature Climate Change* 8, no. 8 (August 2018): 723–29, <https://doi.org/10.1038/s41558-018-0222-x>; "Out of Control': Why Montana Has the Highest Suicide Rate in the Country," NBC News, accessed October 2, 2018, <https://www.nbcnews.com/news/us-news/montana-had-highest-suicide-rate-country-then-budget-cuts-hit-n904246>.
- ¹¹² Hillary L. Burdette and Robert C. Whitaker, "Resurrecting Free Play in Young Children: Looking Beyond Fitness and Fatness to Attention, Affiliation, and Affect," *Archives of Pediatrics & Adolescent Medicine* 159, no. 1 (January 1, 2005): 46–50, <https://doi.org/10.1001/archpedi.159.1.46>; Leyla E. McCurdy et al., "Using Nature and Outdoor Activity to Improve Children's Health," *Current Problems in Pediatric and Adolescent Health Care*, Using Nature and Outdoor Activity to Improve Children's Health, 40, no. 5 (May 1, 2010): 102–17, <https://doi.org/10.1016/j.cppeds.2010.02.003>; Eeva Karjalainen, Tytti Sarjala, and Hannu Raitio, "Promoting Human Health through Forests: Overview and Major Challenges," *Environmental Health and Preventive Medicine* 15, no. 1 (January 2010): 1, <https://doi.org/10.1007/s12199-008-0069-2>.
- ¹¹³ Clayton et al., "Mental Health and Our Changing Climate: Impacts, Implications, and Guidance."
- ¹¹⁴ Clayton et al.
- ¹¹⁵ "Wildfire Preparedness Tips," accessed October 2, 2018, <https://www.nfpa.org/Public-Education/By-topic/Wildfire/Wildfire-safety-tips>.
- ¹¹⁶ "Wildfire Preparedness Tips."
- ¹¹⁷ "Make a Plan," American Red Cross, n.d., <https://www.redcross.org/get-help/how-to-prepare-for-emergencies/make-a-plan.html>.
- ¹¹⁸ C. Roser-Renouf et al., "Engaging Diverse Audiences with Climate Change: Message Strategies for Global Warming's Six Americas.," in *Handbook of Environment and Communication*, by R. Cox and H. Anders, 2015.
- ¹¹⁹ Roser-Renouf et al.; C. Roser-Renouf et al., "Global Warming's Six Americas, October, 2014: Perception of the Health Consequences of Global Warming and Update on Key Beliefs." (New Haven, CT, Yale Program on Climate Change Communication: Yale University and George Mason University, 2014).
- ¹²⁰ Per Espen Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*. (White River Junction, VT: Chelsea Green Publishing, 2015).
- ¹²¹ Roser-Renouf et al., "Engaging Diverse Audiences with Climate Change: Message Strategies for Global Warming's Six Americas."
- ¹²² Roser-Renouf et al.
- ¹²³ Roser-Renouf et al.
- ¹²⁴ Roser-Renouf et al.
- ¹²⁵ Roser-Renouf et al.
- ¹²⁶ Roser-Renouf et al.
- ¹²⁷ Roser-Renouf et al.
- ¹²⁸ A. Barnosky et al., "Chapter 9. Establishing Common Ground: Finding Better Ways to Communicate About Climate Disruption," *Collabra* 2, no. 1 (2016): 23, <https://doi.org/10.1525/collabra.68>.
- ¹²⁹ P.G. Bain et al., "Promoting Pro-Environmental Action in Climate Change Deniers.," *National Climate Change*, no. 2 (2012): 600–603, <http://dx.doi.org/10.1038/nclimate1532>.
- ¹³⁰ Roser-Renouf et al., "Global Warming's Six Americas, October, 2014: Perception of the Health Consequences of Global Warming and Update on Key Beliefs."
- ¹³¹ Roser-Renouf et al.
- ¹³² C. Roser-Renouf et al., "Faith, Morality and the Environment: Portraits of Global Warming's Six Americas." (New Haven, CT, Yale Program on Climate Change Communication: Yale University and George Mason University, 2016).

- ¹³³ Pope Francis, “Encyclical Letter Laudato Si’ of the Holy Father Francis on Care for Our Common Home,” June 18, 2015, http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.
- ¹³⁴ L. Bean, *The Politics of Evangelical Identity: Local Churches and Partisan Divides in the United States and Canada*. (Princeton and Oxford: Princeton University Press, 2014), <http://dx.doi.org/10.1515/9781400852611>. cited in Barnosky et al., “Chapter 9. Establishing Common Ground: Finding Better Ways to Communicate About Climate Disruption.”
- ¹³⁵ Sander van der Linden et al., “Inoculating the Public against Misinformation about Climate Change,” *Global Challenges* 1, no. 2 (February 1, 2017): 1600008, <https://doi.org/10.1002/gch2.201600008>.
- ¹³⁶ John Cook et al., “Consensus on Consensus: A Synthesis of Consensus Estimates on Human-Caused Global Warming,” *Environmental Research Letters* 11, no. 4 (2016): 048002, <https://doi.org/10.1088/1748-9326/11/4/048002>.
- ¹³⁷ Garrett Ward Richards and Rebecca Carruthers Den Hoed, “Seven Strategies of Climate Change Science Communication for Policy Change: Combining Academic Theory with Practical Evidence from Science–Policy Partnerships in Canada,” in *Handbook of Climate Change Communication: Vol. 2: Practice of Climate Change Communication*, ed. Walter Leal Filho et al., Climate Change Management (Cham: Springer International Publishing, 2018), 147–60, https://doi.org/10.1007/978-3-319-70066-3_11.
- ¹³⁸ Linden et al., “Inoculating the Public against Misinformation about Climate Change.”
- ¹³⁹ A. Leiserowitz et al., “Climate Change in the American Mind: March 2018.” (New Haven, CT, Yale Program on Climate Change Communication: Yale University and George Mason University, 2018).
- ¹⁴⁰ Leiserowitz et al.
- ¹⁴¹ A. Leiserowitz et al., “Politics & Global Warming, March 2018” (New Haven, CT, Yale Program on Climate Change Communication: Yale University and George Mason University, 2018).
- ¹⁴² Roser-Renouf et al., “Engaging Diverse Audiences with Climate Change: Message Strategies for Global Warming’s Six Americas.”
- ¹⁴³ Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*.
- ¹⁴⁴ Daniel Benjamin, Han-Hui Por, and David Budescu, “Climate Change Versus Global Warming: Who Is Susceptible to the Framing of Climate Change?,” *Environment and Behavior* 49, no. 7 (August 1, 2017): 745–70, <https://doi.org/10.1177/0013916516664382>.
- ¹⁴⁵ Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*.
- ¹⁴⁶ Stoknes.
- ¹⁴⁷ Teresa A. Myers et al., “A Public Health Frame Arouses Hopeful Emotions about Climate Change,” *Climatic Change* 113, no. 3 (August 1, 2012): 1105–12, <https://doi.org/10.1007/s10584-012-0513-6>.
- ¹⁴⁸ Leila Scannell and Robert Gifford, “Personally Relevant Climate Change: The Role of Place Attachment and Local Versus Global Message Framing in Engagement,” *Environment and Behavior* 45, no. 1 (January 1, 2013): 60–85, <https://doi.org/10.1177/0013916511421196>.
- ¹⁴⁹ Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*. Pg. 90.
- ¹⁵⁰ Christina Demski et al., “Experience of Extreme Weather Affects Climate Change Mitigation and Adaptation Responses,” *Climatic Change* 140, no. 2 (January 1, 2017): 149–64, <https://doi.org/10.1007/s10584-016-1837-4>.
- ¹⁵¹ Alexa Spence and Nick Pidgeon, “Framing and Communicating Climate Change: The Effects of Distance and Outcome Frame Manipulations,” *Global Environmental Change*, 20th Anniversary Special Issue, 20, no. 4 (October 1, 2010): 656–67, <https://doi.org/10.1016/j.gloenvcha.2010.07.002>.
- ¹⁵² Suicide rates rise with higher average monthly temperatures, according to research: Burke et al., “Higher Temperatures Increase Suicide Rates in the United States and Mexico.”
- ¹⁵³ Matthew Baldwin and Joris Lammers, “Past-Focused Environmental Comparisons Promote Proenvironmental Outcomes for Conservatives,” *Proceedings of the National Academy of Sciences* 113, no. 52 (December 27, 2016): 14953–57, <https://doi.org/10.1073/pnas.1610834113>.
- ¹⁵⁴ Benjamin, Por, and Budescu, “Climate Change Versus Global Warming.”
- ¹⁵⁵ Barnosky et al., “Chapter 9. Establishing Common Ground: Finding Better Ways to Communicate About Climate Disruption.”
- ¹⁵⁶ ecoAmerica, “Climate Impacts: Take Care and Prepare” (ecoAmerica and Lake Research Partners, 2012).
- ¹⁵⁷ ecoAmerica.
- ¹⁵⁸ Barnosky et al., “Chapter 9. Establishing Common Ground: Finding Better Ways to Communicate About Climate Disruption.”
- ¹⁵⁹ Roser-Renouf et al., “Engaging Diverse Audiences with Climate Change: Message Strategies for Global Warming’s Six Americas.”
- ¹⁶⁰ Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*.
- ¹⁶¹ Stoknes.
- ¹⁶² Stoknes.
- ¹⁶³ Barnosky et al., “Chapter 9. Establishing Common Ground: Finding Better Ways to Communicate About Climate Disruption.”
- ¹⁶⁴ Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*.
- ¹⁶⁵ Stoknes.
- ¹⁶⁶ <https://bcapwebsite.files.wordpress.com/2018/09/final-2018-ksik-stakii-project-field-program-report.pdf>
- ¹⁶⁷ Stoknes, *What We Think About When We Try Not to Think about Global Warming: Toward a New Psychology of Climate Action*.