WHITEFISH CLIMATE ACTION PLAN

DRAFT FOR PUBLIC REVIEW

This draft Climate Action Plan is available for public review and comment through Monday, March 19, 2018. Please send comments with references to relevant page numbers to Mariah Gladstone at the City of Whitefish, mgladstone@cityofwhitefish.org.

This review draft does not include the Executive Summary or the Implementation Plan, which will be completed after the public review period. Both of these sections will draw from information and recommendations included in this draft plan, subject to final revision after the comment period. Some details still need to be added to this draft, such as photo captions, map corrections, and end notes.

The Climate Action Plan Committee seeks your input especially on substantive issues, goals, strategies and actions in the draft plan. While we welcome editorial suggestions on grammar, format, wording, and design, the committee will also be conducting a close final review to identify and address those issues.

Final revisions to this draft plan will be completed by March 28, and it will be submitted to the Whitefish City Council for a work session and a public hearing on Monday, April 2.

Letter from the Mayor

JOHN MUHLFELD
City Mayor

An introductory letter from the Mayor will be included in the final plan.

Letter from the Superintendent

HEATHER DAVIS SCHMIDT
Superintendent

An introductory letter from the School Superintendent will be included in the final plan.

Committee Members

Executive Summary

Will be completed after final revisions to plan.

Road Map

Introduction

Surrounded by crisp mountain vistas and an abundance of cold, clear water, Whitefish is a great place to live and visit. Our community has grown and changed, but we have maintained our friendly small-town character by building partnerships to enhance cultural, recreational, and economic opportunities.

Climate change threatens the very qualities that enrich Whitefish. Air will be smokier and wildfires more extreme as summers are projected to be hotter and drier. Snow will be less certain and clean water more precious. We will experience impacts to our economy, infrastructure, recreation, and health. Whitefish has joined hundreds of American communities to step up to the challenge.

The Whitefish Climate Action Plan is a joint effort by the City of Whitefish and the Whitefish School District, working with the non-profit Climate Smart Glacier Country, to provide local leadership, minimize risk, and create new opportunities.

WHAT IS A CLIMATE ACTION PLAN?

A local climate action plan establishes a foundation for a community to make the transition to a clean energy economy and improve local resilience to future climate change impacts. It also sparks community conversation about a serious issue that is becoming ever more urgent. The two fundamental goals of the plan include:

> **Understand and prepare:** This plan identifies the key trends and scientific projections for what a warming, more-volatile climate means for Whitefish. It presents a pathway for solutions, such as becoming a fire-adapted community and protecting our water. It presents strategies to safeguard public health, property, and economic vitality in an increasingly uncertain world.
>
> **Reduce emissions:** The City of Whitefish, alongside nearly 400 U.S. cities and 195 nations, has committed to keep global average temperatures from rising more than 3.6 degrees Fahrenheit. This plan emphasizes energy efficiency, local production of clean energy, and conservation of carbon-rich forests and soil.

HOW DID WE GET HERE?

In December 2016, the Whitefish City Council authorized a Climate Action Plan Committee and instructed Mayor John Muhlfeld to appoint a citizen committee. The 10-member committee was selected in January 2017 and charged to work with city staff and the non-profit Climate Smart Glacier Country to:

> *"... evaluate the City's energy use and propose specific projects, benchmarks and other recommendations to conserve energy in the City. The Committee may also propose actions to enhance community resilience and prepare for the effects of climate change."*

Under the leadership of Deputy Mayor Richard Hildner, committee members have provided a wide range of community perspectives and expertise, including renewable energy and civil engineering, forestry and water protection, local food systems, education, and document editing and design. Climate Smart chairman Steve Thompson assisted with project management. AmeriCorps members Rachel Sussman and Mariah Gladstone provided additional research and analysis.

In June 2017, Mayor Muhlfeld joined nearly 400 other U.S. mayors in committing Whitefish to do our part in upholding the Paris Climate Agreement. At the Paris summit in 2015, the United States committed to reducing its greenhouse gas emissions by 26 to 28% from 2005 levels by 2025, with the understanding that the U.S. and all nations would need to make additional cuts to keep global temperatures from rising more than 2 degrees Celsius. The 26% reduction target for 2025 has been adopted by the

City as its initial goal.

All CAP meetings were open to the public and the committee conducted extensive public outreach. (See Appendix B.)

A community survey received 145 responses, indicating strong community support for energy conservation projects that reduce costs and partnerships with schools and businesses. Preparing for projected change and building community resilience also was a priority.

The committee also consulted with climate scientists and researchers at Montana State University, University of Montana, Colorado State University, and Oregon State University. Committee members participated in the Montana Climate Science Day seminar at Flathead Valley Community College on October 16, 2017. Committee members, city staff and officials at Glacier National Park participated in a "resilience dialogue" with climate experts around

Public Participation By the Numbers

10 meetings to consult with city staff and committees, including two City Council work sessions

2 public forums at City Hall

1 public survey via postcard form and SurveyMonkey

5 presentations to community groups

1 public hearing by City Council

2- week public review period prior to City Council public hearing

22 media stories in newspapers, radio and television

1. The City should prioritize greenhouse gas reductions.

2. The City should choose strategies based on their financial feasibility and subsequent saving.

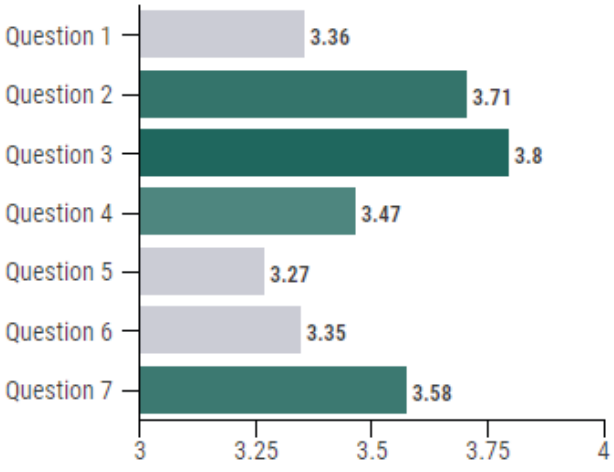
3. The City should coordinate and partner with the Whitefish School District, local businesses, and other organizations.

4. The City should incorporate climate strategies into other citywide plans and initiatives where appropriate.

5. The City should increase its climate-related public outreach and engagement efforts.

6. The City should be a leader in addressing climate change in the community.

7. The City should strive to prepare for projected change and build resilience.



Average Response per Question

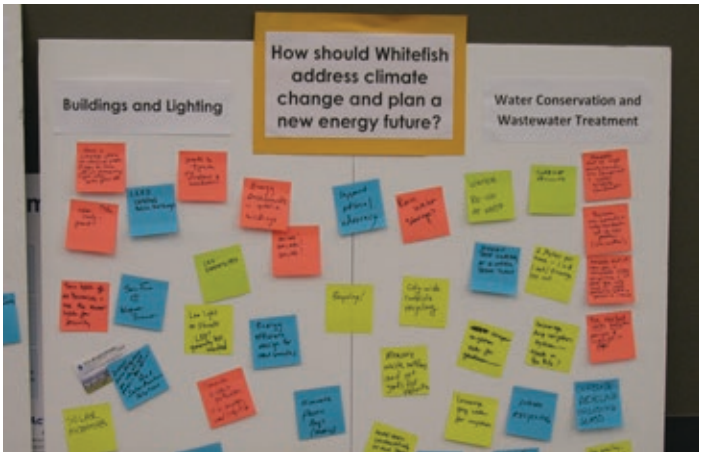
Survey responses varied from
1 - Disagree with Principle to 5 - Top Priority

FIGURE 1. COMMUNITY SURVEY RESULTS.

the country organized by the American Geophysical Union and the U.S. Global Change Research Program.

The committee also consulted with local experts in forestry, agriculture, winter recreation, and public health. And committee members interviewed long-term residents about changes they have observed. Many of these conversations are featured in relevant chapters of this plan.

Steve Thompson, project manager for the Climate Action Plan, introduces panelists at a public forum on local climate solutions (l-r), Glacier National Park Deputy Superintendent Eric Smith, Whitefish Mayor John Muhlfeld, and Whitefish School District Curriculum Director Ryder Delaloye.



Whitefish residents posted ideas at a community forum.
PHOTO: Karin Hilding

Glacier National Park Superintendent Jeff Mow speaks at the October, 2017, Montana Climate Science Day.
PHOTO: Nancy Woodruff

Whitefish residents discuss climate solutions.
PHOTO: Karin Hilding

Whitefish Fire Marshall Travis Tveidt discusses fire-adapted communities at a community forum.
PHOTO: Karin Hilding

What is the City's Carbon Footprint?

As part of developing this Climate Action Plan, the City of Whitefish conducted a greenhouse gas inventory in 2016 to serve as a baseline to measure future reductions against. The greenhouse gas inventory, otherwise known as the City's carbon footprint, is an accounting of all the emissions of greenhouse gases caused by City operations for one year.

The City's inventory does not include emissions from the community as a whole, such as emissions from residential or commercial energy use.
This section summarizes information from the City's greenhouse gas inventory. For more information, see Appendix C - City of Whitefish 2016 Local Government Operations Greenhouse Gas Emissions Inventory.

METHODS
In 2016 the City of Whitefish hired an Energy Corps coordinator, shared with the Whitefish School District, to assist with the development of this Climate Action Plan and in particular to compile a greenhouse gas inventory for City operations.

The City became a member of ICLEI Local Governments for Sustainability, a nonprofit organization dedicated to helping local governments take action on climate change. Whitefish's Energy Corps coordinator used protocols and tools provided by ICLEI to complete its greenhouse gas inventory.

The City used ICLEI's Local Government Operations Protocol (LGOP), which serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The LGOP provides the principles, approach, methodology, and procedures to develop a local government operations greenhouse gas inventory.
According to the LGOP, a city can use two approaches to define the scope of its operations: 1) facilities and activities that the city controls operations for; and 2) facilities and activities that the city controls financially. For Whitefish the main difference here was whether to include all facilities that the City owns or only those that it operates. The City leases a number of buildings, such as The Wave, the ice rink, the O'Shaughnessy performing arts center, and Smith athletic fields, to nonprofit organizations to operate. Because the City does not have direct control over the operation of these facilities, it chose to estimate Whitefish's emissions based on the first method, facilities and activities for which the City maintains operational control.

The City must also choose a baseline year for its greenhouse gas inventory. After considering the amount and types of data available for each of several recent years, Whitefish's greenhouse gas inventory uses 2016 as its baseline year.

In addition to using the ICLEI protocol for the greenhouse gas inventory, the City used ICLEI's Clean Air and Climate Protection 2009 (CACP 2009) software to calculate emissions. This software determines emissions by combining activity data, such as energy consumption, with verified emission factors.

RESULTS
The City of Whitefish's operations were responsible for emitting 1,760 metric tons of carbon dioxide

Definitions

WHAT IS CARBON DIOXIDE EQUIVALENCY?

There are six main greenhouse gases that contribute to climate change, and each one has a different level of impact based upon its molecular structure. For example, the emission of 1 ton of methane has a global warming potential 21 times larger than that of 1 ton of carbon dioxide. To avoid confusion between emissions of the different types of gases, all emissions are converted into the common unit of CO_2e (or carbon dioxide equivalent).

MT = metric tons

$MTCO_2e$ = the amount of any greenhouse gas translated to an equivalent number of metric tons of CO_2

equivalent in 2016.

The largest source of greenhouse gases were the water treatment and wastewater treatment facilities, which accounted for 747 MTCO2e, or 42% of City emissions. These facilities employ energy-intensive filtration and treatment processes and are large consumers of electricity. The City is in the planning stages for a new wastewater treatment plant, which is scheduled to go on line in 2021. At full capacity, projected to be in 2038, the new plant will use about three times as much energy as the existing plant.

Emissions for other sectors, expressed in MTCO2e, were buildings with 413, the City vehicle fleet with 374, the employee commute with 124, and streetlights with 102.

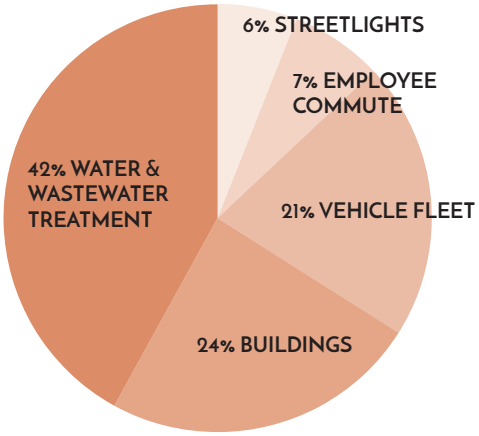


FIGURE 2. 2016 City of Whitefish Emissions by Sector. The largest operational source of greenhouse gas emissions in 2016 was water and wastewater treatment.

Source: City of Whitefish 2016 Local Government Operations Greenhouse Gas Emissions Inventory

How Much is 1,760 Metric Tons of CO2e?

190 homes' energy use for one year

198,042 gallons of gasoline consumed

1,925,602 pounds of coal burned

Source: US EPA Greenhouse Gas Equivalencies Calculator

HOW DO WE COMPARE?

With a population of about 7,279 in 2016, emissions from City of Whitefish operations translate to 0.242 metric tons of CO2e per person. This is more than the per capita City operations emissions for Missoula, at 0.167, and Bozeman, at 0.215, but less than Helena at 0.360.

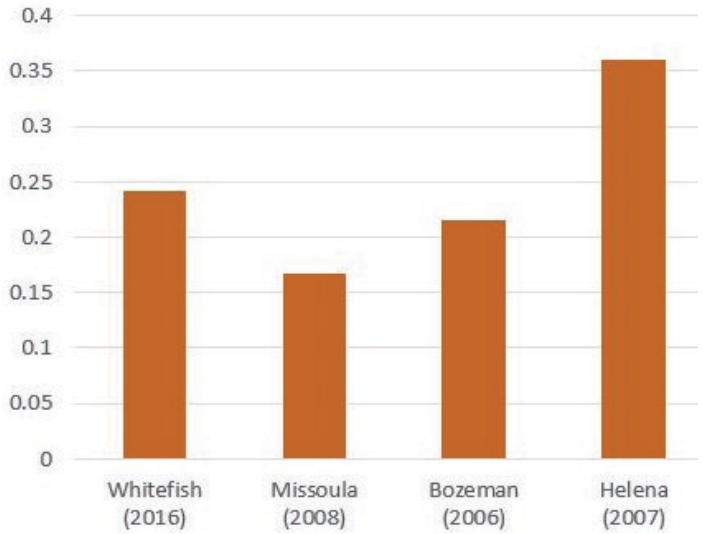


FIGURE 3. Per Capita MTCO2e Emissions From City Operations. Whitefish City operations per capita emissions are higher than those in Missoula and Bozeman, but less than Helena.

Source: Climate Action Plans for the Cities of Whitefish, Missoula, Bozeman, and Helena

TARGETS, GOALS AND OVERARCHING STRATEGIES
The committee focused on two predominant goals – preparing for change (adaptation) and reducing emissions (mitigation) – while recognizing that strategies to achieve those two goals often overlap.

EMISSION REDUCTION TARGETS

2025 - 26% reduction compared to 2016 levels

2030 – 43% reduction

2040 – 71% reduction

2050 – Whitefish becomes carbon neutral

The committee considered establishing 2005 as the baseline year to match the U.S. government pledge in the Paris agreement. We examined two methods to estimate 2005 emissions. One method suggests that emissions have increased since 2005 and the other method indicates that emissions have decreased. The committee adopted 2016 as the baseline because that is the only year for which a solid inventory has been conducted.

Four clean energy strategies must be pursued to reduce emissions.

- Produce local renewable energy
- Prioritize energy efficiency in buildings and facilities
- Decarbonize transportation with more efficient vehicles, use of biofuels, better bike and pedestrian infrastructure, and transition to electric vehicles
- Utilization of carbon offsets through forest conservation and land management

The plan provides a pathway for the City of Whitefish to steadily reduce greenhouse gas emissions through 2025. The road to carbon neutrality in Whitefish and beyond is less certain, but the plan provides a set of principles and specific strategies that will help meet this aspirational goal.

Whitefish Carbon Offset Fund

Climate Action Plans in other communities provide for the purchase of carbon offset credits through established markets to help meet emission reduction goals. These purchased credits can be used, for example, to support reforestation of tropical rainforests or distribute solar-powered cookers in Africa. While these are legitimate ways to reduce emissions, this plan prioritizes investment in local carbon offsets.

The amount of carbon stored in Haskill Basin's forest is estimated to be the equivalent of almost ten years of emissions from the City of Whitefish municipal operations.
PHOTO: Gravity Shots

With the city's $7.7 million investment in the conservation of our municipal watershed in Haskill Basin in 2015, the city already has established a bank of carbon credits. An analysis by researchers at Colorado State University (Appendix D) provides a preliminary estimate of carbon stored in that forested watershed: 16,900 metric tons of CO_2 equivalent. That's equivalent to 92 train cars of coal, or nearly 10 years of emissions from City of Whitefish municipal operations

OVERARCHING STRATEGIES THAT CUT ACROSS MULTIPLE CHAPTERS IN THIS PLAN INCLUDE:

- Shift to clean energy
- Support climate-friendly land use and management
- Maximize cost saving by conserving water and energy
- Support community businesses and increase local production of food
- Reduce consumption of carbon-intensive goods and services
- Plan ahead to minimize risk to community

infrastructure and public health

- Lead by example and create partnerships with residents, schools, businesses, nonprofits, and other governments

This plan is the beginning of an ongoing process that will require a long-term, dedicated effort by the Whitefish community. To provide continuity and demonstrate commitment, the Climate Action Plan Committee calls on City leaders to establish a standing Committee on Sustainability and Resiliency and create a staff position focused on energy efficiency and risk management. The final chapter of this document is an implementation plan that recommends specific actions to achieve specific goals by 2025.

The Whitefish Climate Action Plan serves as a foundation for the City of Whitefish to support the community's transition to clean energy and to build community resilience to future climate impacts.

CLIMATE TRENDS, PROJECTIONS, AND IMPACTS

PHOTO: Sierra McCartney

Climate Trends, Projections, and Impacts

The world's climate is warming, a trend that is expected to accelerate with increasing concentration of the greenhouse gases that trap heat in the atmosphere. Each community will experience the impacts differently depending upon location and geography, economic circumstances, and local preparedness.

Trends

The 2017 Montana Climate Assessment analyzes trends in temperature and precipitation for seven regions of Montana. Scientists at the University of Montana and Montana State University examined data beginning in 1950, which is when climate records became widespread and reliable. That period also coincides with the observed trend of temperature increase in Montana and a rising rate of global carbon dioxide emissions.[1]

Longer fire seasons are the result of current climate trends.

PHOTO: Courtesy of Ed Lieser

Northwest Montana Climate Trends 1950 – 2015 By the Numbers

2.5°F increase in annual average **temperature**

- Spring heated up 3.3°F
- 12 more frost-free days per year

3.77 inches decrease in annual **precipitation**

- Winter average decline was 3.76 inches – likely due to more frequent El Nino events, which tend to cause warmer, drier winters in Whitefish
- No significant trend for other 3 seasons

Observed impacts since 1950:

- Longer fire season
- Extended growing season
- Lower summer stream flows
- Earlier snow melt – roughly 2 weeks earlier

DOUG FOLLETT
Glacier National Park Ranger and Whitefish Resident
PHOTO: Chris Peterson/Hungry Horse News

"We haven't always been able to talk about climate change in Glacier National Park. Now it's unavoidable. The plants and the animals are suffering."

- Doug Follett, age 91, has been a Glacier National Park ranger since 1959. He completed his 56th season in the park in 2017 and plans to return in 2018.

Melting Snowpack

When examining long-term trends in snowpack, scientists typically use snow measurements on April 1 to represent peak snowpack for the winter. Warmer spring temperatures are the primary reason that April 1 snowpack levels have declined. High-elevation snowpack has been less affected than snowpack at lower elevations.

Across western Montana since the 1930s, April 1 snowpack declined by an average 23 percent below 6,000 feet and 12 percent above 6,000 feet.[2] Figure 1 shows April 1 snowpack trends since 1955 at five snow course stations in northern Flathead County.[3]

STATION NAME	ELEVATION (FEET)	% CHANGE TREND
Mineral Creek	4,000	- 40.4%
Logan Creek	4,300	-29.9%
Emery Creek	4,350	-28.3%
Desert Mountain	5,600	-26%
Hell Roaring Divide	5,770	-24.1%

FIGURE 1. TRENDS IN APRIL 1 SNOWPACK, NORTHERN FLATHEAD VALLEY, 1955-2016. Spring snowpack is melting roughly two weeks earlier, more so in mid elevations than high elevations.

FIGURE 2. LOCATION OF FIVE LONG-TERM SNOW COURSE SITES IN NORTHERN FLATHEAD COUNTY.
SOURCE: Natural Resources Conservation Service via EPA Climate Indicators[4]

Witnesses to Change

Whitefish High School student Luca Welle discusses Whitefish Lake's past and future with Dewey Hartman, Charlie Abell, and Sandra Hartman.

PHOTO: Karin Hilding

As a child in the 1940s, Charlie Abell spent many hours at his grandmother's cabin on Whitefish Lake. Together they would keep track of the weather and record their observations. "She kept good records," Abell recalls. "I remember looking at the thermometer once and it was 51 degrees below zero. We don't see that anymore."

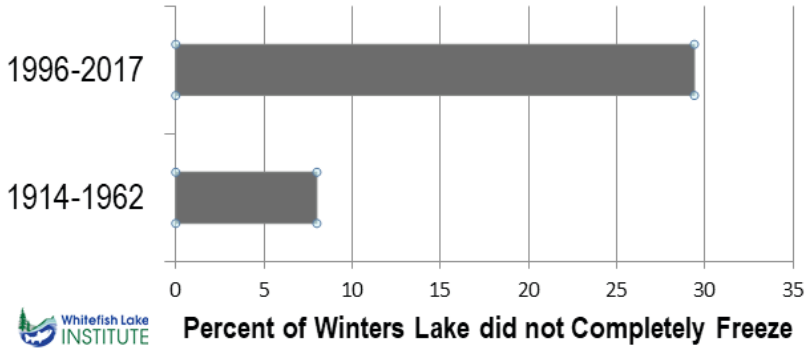
On a warm September afternoon, Abell sat on the deck of his longtime neighbors, Dewey and Sandra Hartman, to reflect on decades of living on Whitefish Lake. Asking the questions was Luca Welle, a Whitefish High School student, who has been an advocate for clean energy and emission reductions. "What changes have you observed since you were young?" Welle asked.

Dewey Hartman recalls colder winters. "The ice on the lake always got very thick. That's been a big change. We get a lot more years now when the whole lake doesn't even freeze over." The summers are different, too, Sandra Hartman says. "We used to get two or three hot days every summer, in the upper 80s or even into the 90s. But mostly the temps were in the 70s. We get a lot more hot days now. I don't remember many wildfires until about 20 years ago, and now we seem to get a lot more fire and smoke."

Less summer rain, too, according to Abell. The month of June used to be wet and cool, but not so much anymore, he said. "My grandma and I kept track of rainy days in June when I was a kid. Over the three or four years that we did this together, it averaged 28 days of rain during the month of June."

Changing weather conditions over so many years tell us the climate is shifting, Abell said. "We need to encourage the science and technology. Maybe tax incentives for energy-efficient buildings and renewable energy projects."

Reflecting on the afternoon of stories, Welle said it was an eye-opener. "They provided a lot of insight into how things have changed locally. The science tells us that these changes are only going to accelerate if we don't act quickly to make it right. For me personally, I want to make a difference so we don't degrade our way of life and our ecosystems, both local and global."



*No data exists from 1963-1995. Multiple factors are involved for the lake to freeze.

FIGURE 3. WHITEFISH LAKE ICE SUMMARY, TREND TOWARD ICE FREE CONDITIONS. The number of winters that Whitefish Lake freezes over has declined since the early part of the last century.

SOURCE: Whitefish Lake Institute

Projections

Projections for temperature and precipitation changes depend primarily upon future greenhouse gas emissions. The future climate outlook in this chapter is based upon the 2017 Montana Climate Assessment, which used an ensemble of 20 global computer models. The Montana Climate Assessment considers two emission scenarios in projecting future change:

- **Stabilization Scenario:** Assumes that greenhouse gas emissions peak around 2040, then gradually decline. This scenario, known as RCP 4.5, comes closest to meeting the international goal of limiting global temperature increases to 2°C (3.6°F).[4]
- **Business-as-Usual Scenario:** Global emissions continue to rise steadily at the current trajectory. This scenario, known as RCP 8.5, models what will happen if we fail to curb our emissions.

These projections for Northwest Montana represent the median point within a range of values produced by the 20 climate models. Scientists have a high degree of confidence in the general magnitude of future temperature increases. The climate models have a greater level of disagreement about future precipitation, so scientists are less confident about these projections.

Wild Card: Weirder Weather

Climate modelers have high confidence in future temperature projections. They are less confident in predicting severe weather. However, researchers have documented a recent increase in extreme weather events.

Some scientists expect a future Montana with more windstorms, blizzards, and hail.[5] Factors include:

- The Arctic is warming much faster than the temperate regions of North America, which appears to make the jet stream wavier and pulls cold Arctic air farther south.[6]
- Warming ocean temperatures and melting ice sheets may disrupt ocean currents.[7]
- Warmer air holds more water vapor and warm oceans evaporate more quickly, both fueling bigger storms.[8]

Temperature and Precipitation Projections By the Numbers

Projected **Temperature** increases relative to a historical (1970 – 1999) 30-year average:

STABILIZATION SCENARIO

4.5°F by mid-century (2040 – 2069)

5.6°F by end of century (2070-2099)

BUSINESS-AS-USUAL SCENARIO

6°F by mid-century (2040 – 2069)

9.8°F by end of century (2070-2099)

Projected **Precipitation** increases relative to a historical (1970 – 1999) 30-year average:

STABILIZATION SCENARIO

1.3 inches by mid-century (2040 – 2069)

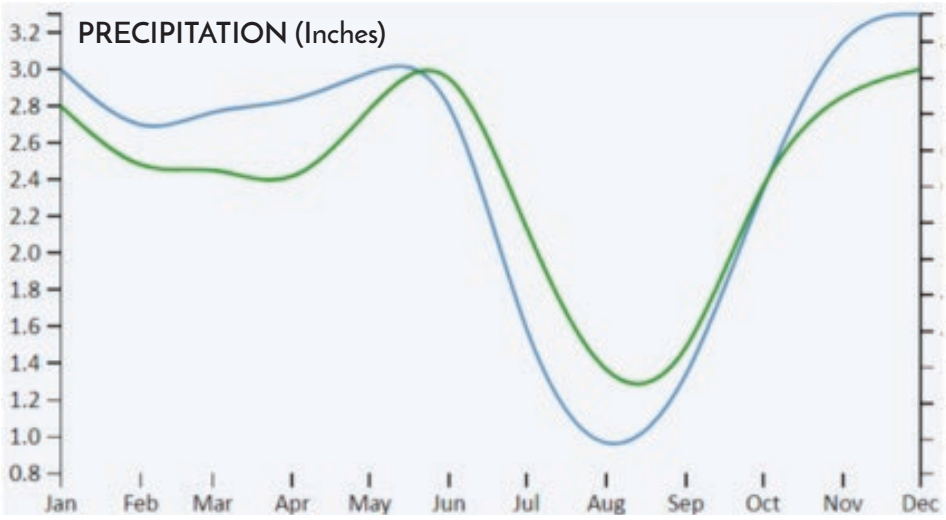
2.3 inches by end of century (2070-2099)

BUSINESS-AS-USUAL SCENARIO

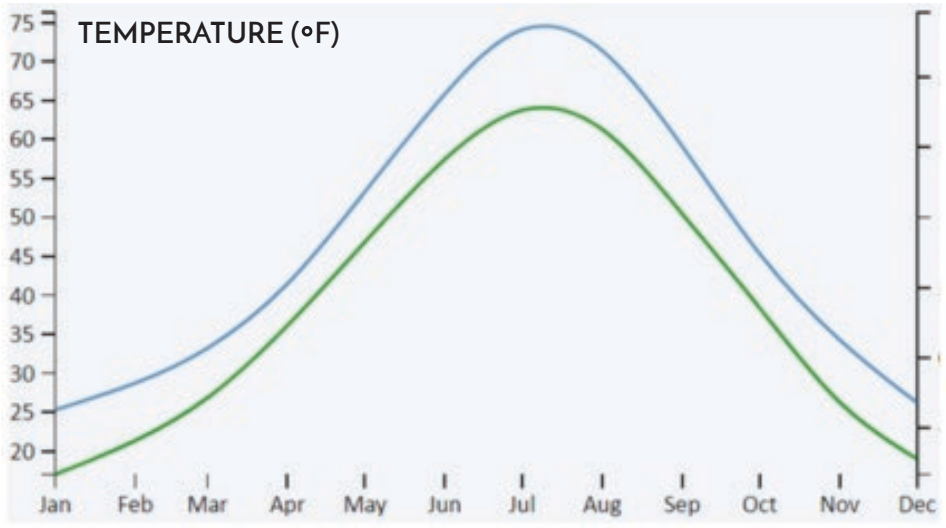
1.6 inches by mid-century (2040 – 2069)

2.5 inches by end of century (2070-2099)

Projections for Whitefish



BLUE: 2071-2090 PROJECTED GREEN: 1986-2005 HISTORICAL



BLUE: 2071-2090 PROJECTED GREEN: 1986-2005 HISTORICAL

FIGURE 4. SEASONAL PROJECTIONS – WHITEFISH 2071-2090.

SOURCE: National Center for Atmospheric Research - https://gisclimatechange.ucar.edu/inspector

"Montana's rapid shift in 2017 from a wet spring to a very hot dry summer is precisely what we expect to see from climate change."

- Montana State University Professor Cathy Whitlock, lead author of Montana Climate Assessment

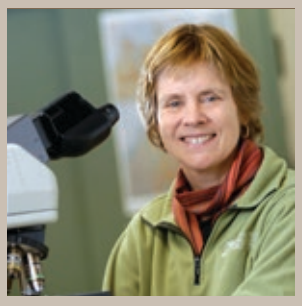


PHOTO: Courtesy of Cathy Whitlock

Seasonal Precipitation

The timing of precipitation during the year is perhaps more important than annual average precipitation levels. The Montana Climate Assessment projects a shift in seasonal patterns.

Winter

- Warmer and wetter
- More rain-on-snow
- Less low-elevation snowpack by mid-century and less overall snow by 2100

Spring

- Warmer and wetter
- Earlier snowmelt and earlier peak stream flow

Summer

- Hotter and drier
- More frequent flash droughts
- Bigger fires, more smoke

Fall

- Warmer with more rain

The Future of Skiing

Future winter precipitation and rain-snow elevation levels are difficult to predict. But two recent reports examine a more reliable predictor of future snow conditions: Winter temperatures above freezing. The freezing point is important for ski areas because it determines whether precipitation falls as rain or snow, and sub-freezing temperatures are required for artificial snowmaking.

A 2018 report published by the Climate Impact Lab projects the future number of days below freezing in Flathead County compared to the 1981-2010 period based on the Stabilization and the Business-as-Usual scenarios. The average number of sub-freezing days is determined by average temperatures at Hungry Horse Dam, so the actual number of days below freezing at Whitefish Mountain Resort will be greater.[9]

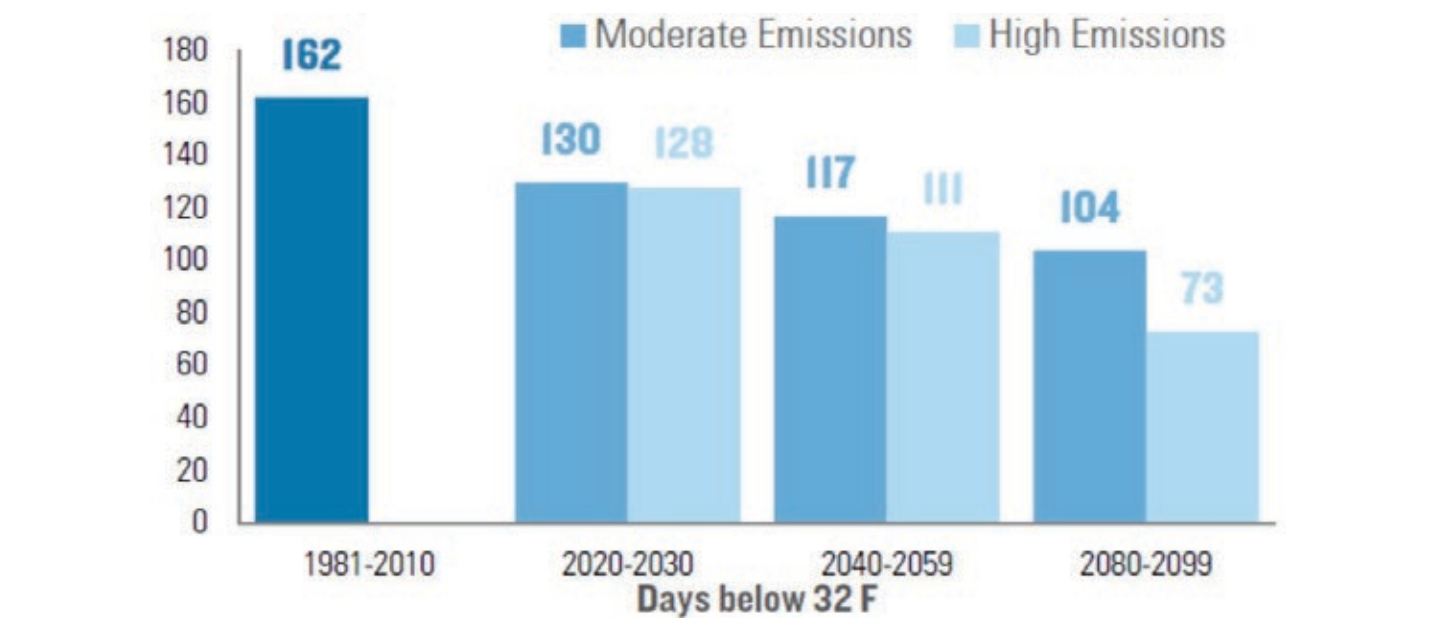


FIGURE 5. CURRENT AND FUTURE DAYS PER YEAR BELOW FREEZING.

SOURCE: Climate Impact Lab, America's Shrinking Ski Season

A preliminary report by Professor Anne Nolin, Director of the Oregon State University Mountain Hydroclimatology Research Group, takes a seasonal approach to predict the future frequency of warm winters. Her research uses the Access1.0 global climate model for these calculations. "Frequency of a Warm Winter" is calculated as the percentage of winters out of 30 winters during which the mean monthly temperature exceeds 32°F during any of the core winter months (December-February).[10]

Possible impacts of climate change for winter recreation:

- Ski and snowmobile season begins later and ends earlier.
- More rain-on-snow and freeze-thaw conditions.
- Whitefish Mountain Resort may have a competitive advantage compared to lower-elevation or lower-latitude ski areas that may face greater negative climate impacts.
- Less reliable low- and mid-elevation snow for Nordic skiing.
- Fewer opportunities for wild ice skating and ice fishing.

WHITEFISH MOUNTAIN LOCATION	1970-1999 HISTORICAL	2040-2069		2070-2099	
		STABILIZATION SCENARIO	BUSINESS AS USUAL	STABILIZATION SCENARIO	BUSINESS AS USUAL
BASE	0	30	33	47	93
MID-MOUNTAIN	0	23-27	23-30	23-40	70-83
SUMMIT	0	3	3	17	60

FIGURE 6. FREQUENCY OF WARM WINTERS FOR WHITEFISH MOUNTAIN. Future winter months are more likely to be warm compared to the historical period.

SOURCE: Anne Nolin, Oregon State University. [Note: Unpublished data - Do not cite without permission.]

Public Health and Safety

Climate change has several implications for public health, safety, and welfare. These include:

- More days of unhealthy air quality due to forest fires.
- Greater incidence of insect-borne diseases.
- More frequent severe weather events such as heat waves, flooding, and forest fires.[11]

Resilient communities understand and prepare for these risks and take measures to protect vulnerable populations (such as the elderly and children) who may be at risk.

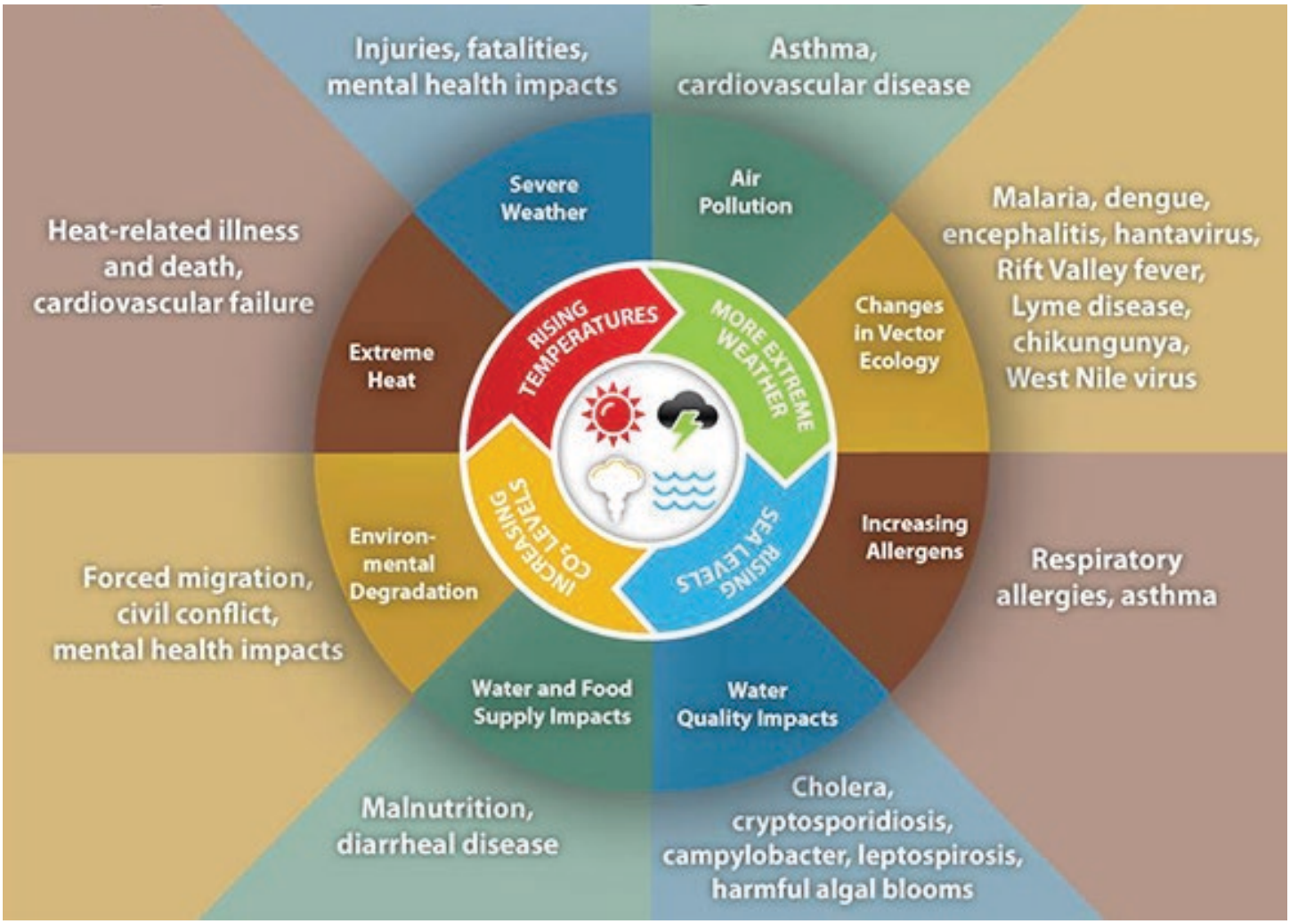


FIGURE 7. IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH Climate change will impact human health in a number of ways.

SOURCE: https://www.cdc.gov/climateandhealth/effects/default.htm

What Can Whitefish Do to Protect Public Health?

Partner with public health agencies and health care providers to keep the public informed.

As extreme weather events increase, the City can coordinate with the Flathead County Health Department and the Montana Department of Environmental Quality (DEQ) to update residents about public health concerns.

- The Flathead County Health Department issues public alerts as necessary related to flooding, fires, heat waves, or disease outbreaks: http://flatheadhealth.org/health-alerts-2/.
- The DEQ regularly monitors air quality during forest fire season and issues public alerts when the air quality becomes too poor for healthy outdoor activity. Go to http://svc.mt.gov/deq/todaysair/ and click on the dot representing Flathead County.
- The Centers for Disease Control has a Climate and Health Program to help state and local governments model potential health impacts, identify vulnerable populations, and develop strategies to address potential health impacts of climate change.

Develop strategies to mitigate health impacts on vulnerable populations.

Vulnerable populations include children and the elderly.

- Encourage community networks to assist elderly and other vulnerable populations during periods of extreme heat, poor air quality, or other severe weather events.
- Plan for temporary shelters and transportation for elderly and other residents who do not have access to safe places.
- Identify and coordinate access to public spaces

Where There's Fire, There's Smoke

In recent years the Flathead Valley has experienced an increasing frequency of regional wildfire smoke. Wildfires throughout the western US and Canada send plumes of smoke toward the northern Rockies, and the smoke can be trapped in these intermountain valleys for days or weeks.

The growing incidence of megafires in the West and longer fire seasons means more waves of smoke will settle in the Flathead Valley. A recent analysis of wildfire projections and summer air currents by researchers at Harvard and Yale suggests that the length of the Flathead smoke season will double by 2050. The concentration of particulate levels during each smoky day is also expected to worsen.[12]

Wildfire smoke contains a complex mixture of gases and fine particles, the most dangerous of which are fine particles. Particulate matter that is 2.5 micrometers in diameter or smaller (PM 2.5) is the biggest public health concern because it can easily enter the lungs and blood.

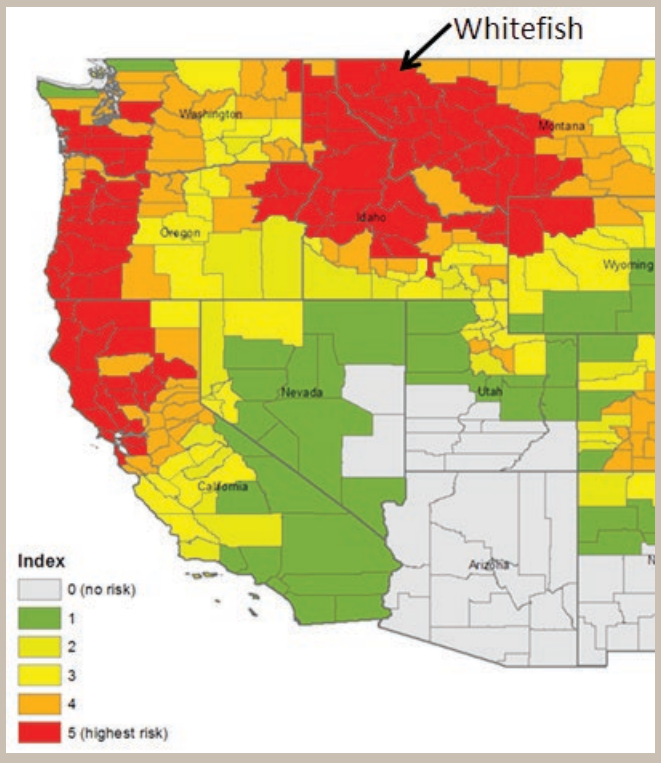


FIGURE 8. MAP OF WILDFIRE SMOKE RISK.
By mid-century, periods of wildfire smoke are likely to be longer, more intense, and more frequent under climate change. Western Montana is considered a high-risk area.

SOURCE: Particulate air pollution from wildfires in the Western US under climate change, Climatic Change, 2016, https://www.ncbi.nlm.nih.gov/pubmed/28642628

where residents can stay cool and breathe clean air, such as the library, the mall, and the Wave.
- Partner with businesses and non-profit organizations to provide HEPA home air filters for the low-income and shut-in populations.

Work with local and state environmental health officials to minimize insect outbreaks.

The City can coordinate with local health officials to disseminate information about mosquito-borne diseases and identify possible hot spots for insect outbreaks. The Flathead County Health Department has a mosquito control program and a Mosquito Control Board. The Health Department also keeps data on potential cases of West Nile Virus and Zika Virus. Information about these diseases can be found on the Health Department website.

Missoula Clears the Air

Amy Cilimburg, the director of Climate Smart Missoula, helped Seeley Lake residents Joy and Don Dunagan get a HEPA air filter through a partnership with the Missoula City-County Health Department.

PHOTO: Nora Saks, Montana Public Radio

The smoke was bad in Whitefish in 2017, but it was even worse in Missoula County. Especially vulnerable to the choking air were elderly residents and young children unable to flee.

To the rescue came a coalition of community groups. Climate Smart Missoula teamed up with the Missoula City-County Health Department, Missoula Aging Services, local hospitals, and others to provide free portable air purifiers for senior citizens and classrooms in Seeley Lake and Lolo. They identified the best quality air filters for residents who wanted to buy their own. A leading manufacturer of air purifiers even provided a special discount for county residents.

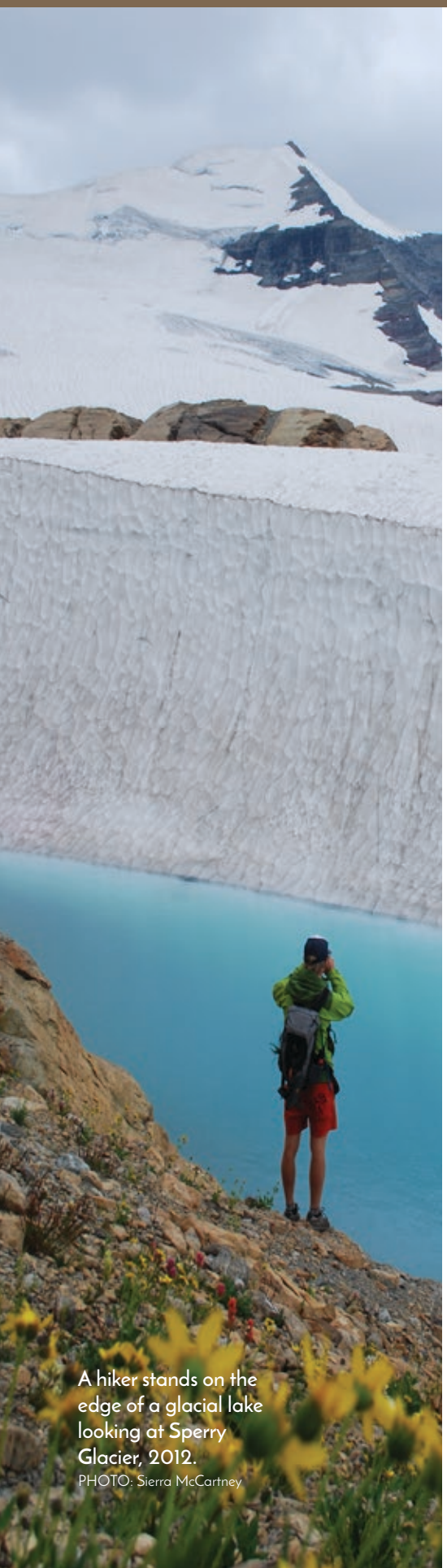
"There's a difference between telling folks they need to create a clean air space during wildfire season and actually helping them make it happen. I am beyond grateful for the opportunity to provide real relief to some of our most vulnerable residents during this incredibly challenging smoke season," said Sarah Coefield, air quality specialist with the Missoula City-County Health Department.

Air purifiers that are effective for wildfire smoke must be HEPA filters (High Efficiency Particulate Arrestance). Key considerations for selecting a HEPA air filter include:

- **PM Size:** Make sure the air filtration unit you choose filters the smallest particulate matter (PM) possible. The best units for smoke filter down to 0.3 microns.
- **Room Size:** Buy the right air filtration unit to fit the room where you will use it most frequently. Most units list the size room they can filter effectively.
- **Filter Maintenance:** Some HEPA filters must be replaced from time to time. Others can be cleaned with occasional washing or vacuuming.
- **Noise Level:** Some units are noisier than others. If this is a concern, check user comments and feedback online.
- **Energy Star Rating:** To save energy and money on your electricity bill, choose units with the US Department of Energy's Energy Star rating.

"It's amazing what can be accomplished with such a collaborative effort, from generous funders to social service providers," said Amy Cilimburg, Executive Director of Climate Smart Missoula. "We witnessed relief and many appreciative smiles as we plugged in these new filters. We wish we could have helped everyone. We'll be living with wildfire for years to come, and with such a generous community, we'll look to expand this program."

Climate Smart Missoula provides a list of recommended HEPA filters here: https://www.missoulaclimate.org/hepa-air-filtration.html.



A hiker stands on the edge of a glacial lake looking at Sperry Glacier, 2012.
PHOTO: Sierra McCartney

Resources

To learn more about the topics discussed in this chapter, explore these helpful links:

- Recommendations for Outdoor Activities Based on Air Quality for Schools and Child Care Facilities, Flathead County Health Department (http://bit.ly/2BzRWQT)
- Montana Climate Assessment 2017 (http://montanaclimate.org/)
- Today's Air, Montana Department of Environmental Quality (http://svc.mt.gov/deq/todaysair/)
- Climate and Health Assessment, U.S. Global Change Research Program, 2016 (https://health2016.globalchange.gov/)

End Notes

[1] Whitlock C, Cross W, Maxwell B, Silverman N, Wade AA, 2017. 2017 Montana Climate Assessment, Bozeman and Missoula MT, Montana State University and University of Montana, Montana Institute on Ecosystems. 318 p doi: 10-15788/m2ww8w, accessed February 1, 2018, http://montanaclimate.org/

[2] Montana Climate Assessment, p. 95, http://montanaclimate.org/

[3] Trends in April Snowpack in the Western United States, 1955–2016, Environmental Protection Agency Climate Indicators, Data source: Mote, P.W., and D. Sharp. 2016 update to data originally published in: Mote, P.W., A.F. Hamlet, M.P. Clark, and D.P. Lettenmaier. 2005. Declining mountain snowpack in Western North America. B. Am. Meteorol. Soc. 86(1):39–49. Accessed February 13, 2018 at http://arcg.is/2f8qfVN

[4] https://phys.org/news/2017-01-umd-optimistic-vision-paris-climate.html and Montana Climate Assessment, p. 43, http://montanaclimate.org/

[5] Montana Climate Assessment, New Modeling of Hail Threats in Response to Climate Change. http://montanaclimate.org/article/New-Modeling-of-Hail-Threats-in-Response-to-Climate-Change

[6] Scientific American, January 5, 2017, "The Arctic Is Getting Crazy: Feedback loops between record Arctic temperatures and the jet stream may be altering our weather." https://www.scientificamerican.com/article/the-arctic-is-getting-crazy/

[7] Nature Communications Journal, January 2016, "Melting Greenland ice sheet may affect global ocean circulation, future climate." https://phys.org/news/2016-01-greenland-ice-sheet-affect-global.html

[8] National Aeronautics and Space Administration Earth Observatory, March 5, 2013. "In a Warming World, Storms May Be Fewer but Stronger." https://earthobservatory.nasa.gov/Features/ClimateStorms/page1.php

[9] Climate Impact Lab, America's Shrinking Ski Season, http://www.impactlab.org/news-insights/americas-shrinking-ski-season/

[10] Personal communication between Steve Thompson and Anne Nolin, Director of the Oregon State University Mountain Hydroclimatology Research Group. Preliminary data will be submitted in 2018 for peer review and future publication.

[11] U.S. Global Change Research Program, Climate and Health Assessment, 2016. https://health2016.globalchange.gov/

[12] Liu, J.C., Mickley, L.J., Sulprizio, M.P., et al. "Particulate air pollution from wildfires in the Western US under climate change." Climatic Change (2016). https://www.ncbi.nlm.nih.gov/pubmed/28642628

BUILDINGS AND ENERGY

PHOTO: Ryan Richardson

Buildings and Energy

OVERVIEW

When most of us think of reducing our carbon footprint, we picture driving a hybrid or electric vehicle or recycling our trash. But buildings account for a surprising amount of greenhouse gas emissions.

Buildings are where we live and work, and where a lot of our energy consumption occurs. In the United States, buildings account for 39% of total energy use and 38% of nationwide carbon dioxide emissions, according to the Environmental Protection Agency (EPA).[1]

Two main strategies for reducing emissions for buildings are improving energy efficiency and developing renewable energy sources.

The City can also support these goals in the community by leading by example, providing information about existing efficiency programs and funding sources, and by facilitating new programs.

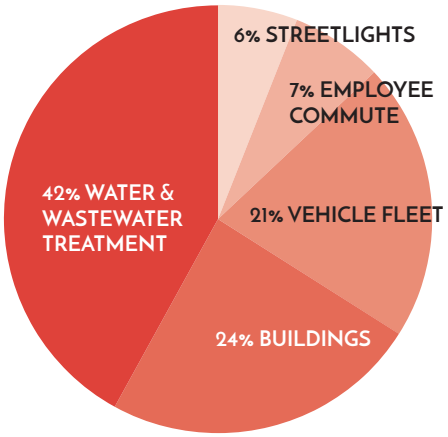


FIGURE 1. 2016 City of Whitefish Emissions by Sector.

CITY OF WHITEFISH BUILDINGS

In 2016 the City of Whitefish operated five main buildings, which accounted for 24% of the City's greenhouse gas emissions.

Of these buildings, by far the largest consumer of electricity and natural gas in 2016 was the 32,000-square-foot Emergency Services Center. This building accounted for 14% of the City's electricity consumption and 31% of its natural gas consumption.

The Emergency Services Center consumes more energy than any other City building.

The City's building portfolio changed significantly in 2017 with the completion of the new, 26,000-square-foot City Hall. In 2016 the City leased a temporary location for City Hall, and the Parks and Planning departments were located in a separate building in Depot Park. With the completion of the City Hall in May, 2017, the temporary City Hall and the Depot Park building were vacated.

The City's Water Treatment Plant and Wastewater Treatment Plant are not included in the emissions inventory for City buildings because much of the energy expenditure at those plants has to do with the treatment processes rather than the buildings themselves. Emissions for these plants are examined in the Water and Wastewater chapter.

The new City Hall building was completed in 2017. The building's energy efficiency is yet to be determined.

PHOTO: Nancy Woodruff

By the Numbers: FEC Energy Efficiency

$8.8 million Flathead Electric Coop (FEC) investments in energy efficiency programs, 2012-2016

$10.9 million Total power and transmissions savings, 2012-2016

0.6% Reduction in average annual cost of power

$40 million Minimum projected savings by 2027

$31.2 million Minimum projected net savings from FY 12-16 energy efficiency investments

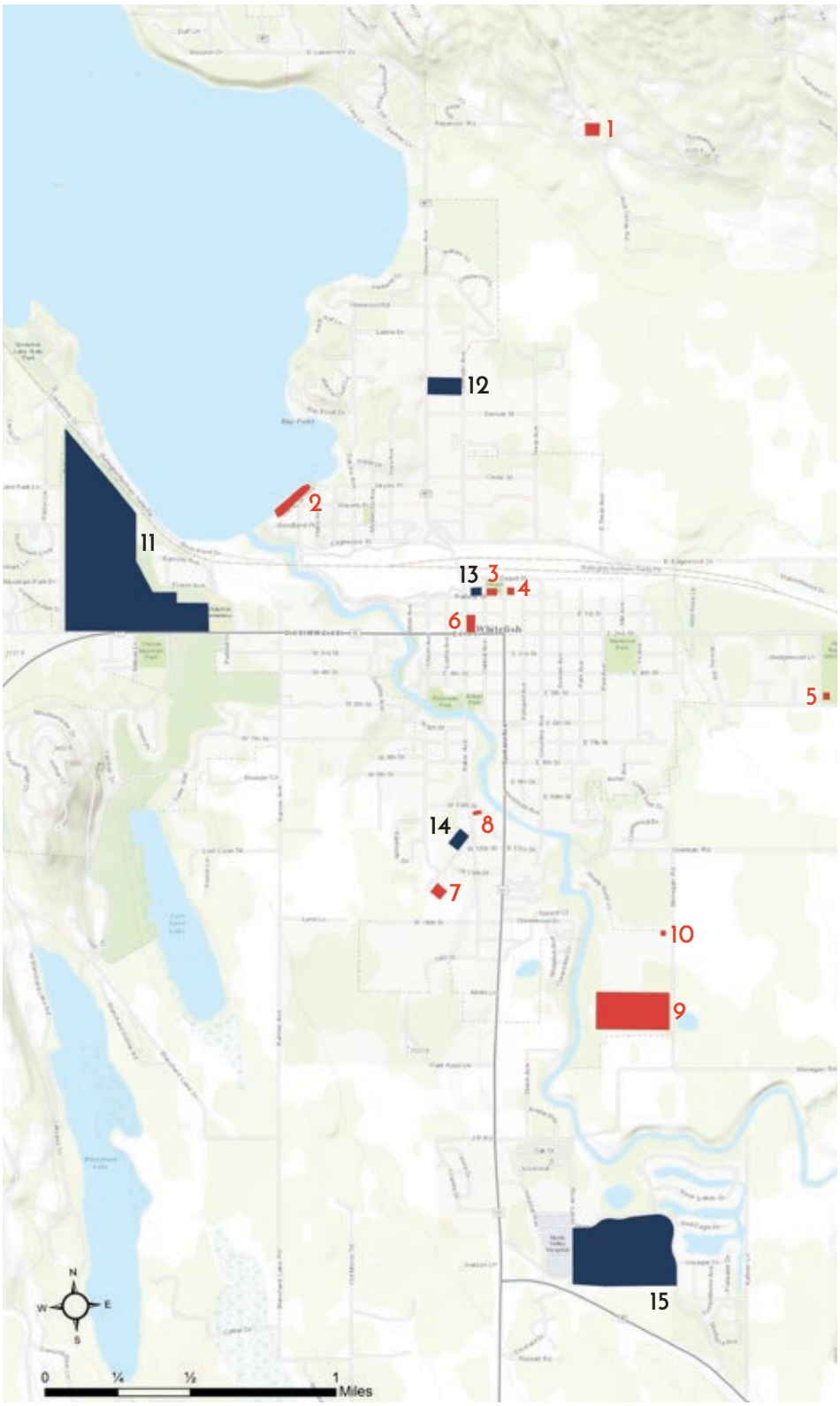
SOURCE: EES Consulting, Energy Efficiency Analysis, Prepared for FEC, Sept. 2017

LEASED BUILDINGS

In addition to the buildings operated by the City, the City owns the ice rink, The Wave fitness center, the golf course, the O'Shaughnessy performing arts center, and Smith Fields athletic fields. These facilities are operated by non-profit organizations under long-term leases. Because the City does not have control over daily operations, these buildings are not included in the City's greenhouse gas emissions inventory.

Although the City does not operate these facilities, it can work cooperatively with the operating organizations to find opportunities to reduce energy consumption and save money.

Of particular interest is the ice rink, which is a large consumer of electricity. The ice rink was operated by the City until 2015. In 2014, the rink used 52% of the electricity used in City buildings and accounted for 38% of all emissions by City facilities (not including the water and wastewater treatment plants).



CITY OPERATED BUILDINGS

1 Water Treatment Plant

2 City Beach

3 Planning-Building & Parks-Rec Department

4 Library

5 Armory Building

6 City Hall and Parking Garage

7 Emergency Services Center

8 Temporary City Hall

9 Wastewater Treatment Plant

10 Parks Maintenance Building

CITY LEASED BUILDINGS

11 Whitefish Lake Golf Club & Nordic Center

12 Stumptown Ice Den

13 O'Shaughnessy Center

14 Wave Aquatic & Fitness Center

15 Smith Sports Complex

FIGURE 2. MAP OF 2016 CITY OPERATED AND LEASED BUILDINGS. Buildings shown in red are operated by the City of Whitefish, while buildings in blue are owned by the City but leased to nonprofits to operate. Two buildings, #3 and #8, are no longer occupied by the City, but were included in the 2016 greenhouse gas inventory.

Progress to Date

- **RENEWABLE ENERGY:** The City refurbished a small hydro plant that had fallen into disrepair and brought it back on line in 2012. The plant produces $62,000 worth of electricity annually. The City also installed six solar thermal collectors on the roof of the Emergency Services Center to provide some of the hot water for the facility.
- **ENERGY EFFICIENCY:** The new City Hall includes energy-efficient features such as LED lighting, a high-efficiency heating and cooling system, and automated lights. The City has also performed extensive energy-efficiency retrofits at the water treatment plant and wastewater treatment plant.
- **LED LIGHTING:** In the Spring of 2018 the City is in the process of converting 187 streetlights to LED bulbs. The City plans to eventually convert all of its 982 streetlights to LED bulbs, reducing greenhouse gas emissions and saving hundreds of thousands of dollars. Eighteen streetlights north of the library have already been converted from high pressure sodium bulbs to LED. The interior library lighting has also been converted to LED.
- **ENERGY AUDIT:** At the request of the City, the National Center for Appropriate Technology conducted an energy audit of the Emergency Services Center, resulting in recommendations that will reduce energy usage, save money, and improve the comfort of employees in the building.
- **SOLSMART PROGRAM:** The City has applied for designation as a SolSmart community, which will allow the City to receive free technical assistance from solar experts.

A portion of the City's electricity is produced by a small hydro plant.
PHOTO: Nancy Woodruff

The Emergency Services Building uses solar thermal collectors to heat some of its hot water.
PHOTO: Nancy Woodruff

Goals & Indicators

Goals

- Reduce energy use in City buildings.
- Use renewable energy sources.
- Help the community reduce its reliance on fossil fuels.

Potential Indicators

- Energy use and associated emissions.
- City renewable energy production.
- Energy and water use per unit building area.

Strategies and Actions

Strategy BE-1 Maximize energy efficiency of City facilities and operations.	
BE-1.1	Implement recommendations from the energy audit of the Emergency Services Center.
BE-1.2	Retrocommission City-operated buildings on a regular schedule (every 3-5 years).
BE-1.3	Implement recommendations from the commissioning of City Hall.
BE-1.4	Hire an energy efficiency and sustainability coordinator.
BE-1.5	Work with lessees of City-owned facilities to optimize energy-efficient operations and sustainability standards.
BE-1.6	Use LED bulbs and occupancy sensors for all building lighting.
BE-1.7	Convert decorative streetlights to LED bulbs.
Strategy BE-2 Develop and encourage use of renewable energy sources.	
BE-2.1	Construct a solar array to power the new wastewater treatment plant.
BE-2.2	Explore the development of community solar projects on City-owned land.
BE-2.3	Obtain and maintain SolSmart designation.
BE-2.4	Advocate for solar-friendly policies.
Strategy BE-3 Encourage building energy efficiency and conservation in the community.	
BE-3.1	Integrate sustainability and energy-efficiency standards in the City's workforce housing strategies.
BE-3.2	Train building inspectors and builders on the state energy code.

Strategy BE-1 Maximize energy efficiency of City facilities and operations.

The average commercial (non-residential) building in the US wastes 30% of the energy it consumes, according to the EPA.[2] That means that for most buildings there is ample opportunity to reduce energy use. In 2016, the City of Whitefish spent $113,798 on energy for City buildings. At that rate, a 30% reduction would save the City $34,000 annually, as well reduce the City's greenhouse gas emissions.

BE-1.1 Implement recommendations from the energy audit of the Emergency Services Center.

A free energy audit of the Emergency Services Center was recently performed by the National

RECOMMENDATION	COST	REBATE	NET COST	EMISSION REDUCTION ($mtCO_2e/yr$)	$ SAVINGS PER YEAR	PAYBACK IN YEARS
Replace light bulbs with LEDs	$36,360	$17,137	$19,223	33	$6,879	2.8 years
Modify heating boiler activation and hot water reset schedule	$1,200	$0	$1,200	2.3	$308	3.9 years
Perform regular maintenance of system via DDC controls service	Varies	N/A	Varies	42.4	$3,075	N/A
Conduct building retrocommissioning	$5,000-$7,000	N/A	$5,000-$7,000	37.6	$3,356	2
Modify courtroom HVAC system	$12,700	$0	$12,700	6.4	$647	19.6 years

FIGURE 3. MAJOR RECOMMENDATIONS FROM THE EMERGENCY SERVICES CENTER ENERGY AUDIT.

Center for Appropriate Technology's Energy Services department. The audit identified recommendations to improve building operations and reduce energy use. The recommendations would cost the City $38,125 to implement and would save the City about $11,000 per year in energy costs, making for a payback period of 3.5 years.

The recommendations would also save the equivalent of 121 metric tons of CO2 per year, and would address issues with certain areas of the building being always too hot or too cold.

Figure 4. summarizes the major recommendations from the audit.

BE-1.2 Retrocommission City-operated buildings on a regular schedule (every 3-5 years).

A building's systems are designed to operate as efficiently and safely as possible. Over time, or if the building was not originally commissioned, the systems need to be monitored, analyzed, and adjusted to ensure optimal performance. This process is called retrocommissioning. Retrocommissioning can improve indoor air quality and occupant comfort, ensure ongoing training of operation and maintenance staff, allow for easier operation, prevent equipment failures, and save money on energy costs.

The cost of retrocommissioning depends on which systems are being analyzed and the complexity of those systems. Big-ticket items like HVAC components tend to be much more expensive, but also yield the highest savings.

A 2009 study of 643 commissioned and retrocommissioned buildings by the Lawrence Berkeley National Laboratory reported that median cost per square foot of retrocommissioning is $0.30 and the median whole-building energy savings are 16% with a median payback of 1.1 years.[3] The greenhouse gas reductions are significant.

Definitions

WHAT IS COMMISSIONING AND RETROCOMISSIONING?

Commissioning of a new building is the process of verifying that the building's systems and equipment have been designed, installed, and tested to perform in accordance with the owner's, architect's and engineer's intent. Building systems to be reviewed and tested include HVAC, plumbing, electrical, building envelope, fire/life safety, lighting, water conservation equipment, building controls, and security systems.

Ideally commissioning begins in the design phase and continues through the first year of occupancy.

Retrocomissioning is the methodical process of testing and adjusting the systems and equipment in existing buildings. Retrocommissioning focuses on operations and maintenance improvements and diagnostic testing, although needed capital improvements may be identified and recommended through the process. It includes a full investigation of building systems to identify equipment that is not operating correctly, systems that are not adjusted properly, and recommendations for system changes to improve operation.

Buildings that are properly commissioned or retrocommissioned typically are more energy-efficient, have lower operation and maintenance costs, and are more comfortable for occupants. According to the US General Services Administration, industry sources indicate that on average the operating costs of a commissioned building range from 8% to 20% below that of a non-commissioned building.[19]

Also, the documentation of the commissioning process provides the foundation for correctly benchmarking the baseline energy consumption of the building.

A recent energy audit of the Whitefish Emergency Services Center[4] (ESC) identified retrocommissioning as one of the top five recommendations to improve the building's performance. Retrocommissioning of the ESC would cost an estimated $5,000-7,000. Estimating energy savings conservatively at 10% would mean annual savings of $3,356 and a payback period of 2 years or less.

In addition to improving energy efficiency, retrocommissioning of the ESC can identify the causes of ongoing problems with the building, such as the overcooling of the courtroom area and overheating of the dormitory area, and the presence of hot water in the cold water faucets.

A systematic practice of commissioning new buildings and retrocommissioning all City-operated buildings on a regular schedule can reduce energy use, save money, and ensure building systems are operating properly.

BE-1.3 Implement recommendations from the commissioning of City Hall.

Commissioning of the new City Hall was completed in early 2018 by CTA, an architectural and engineering firm. The commissioning process included functional testing of the building's systems, most notably the HVAC system, and analysis to determine whether the building is performing according to the design intent.

The commissioning report identified a number of issues with the building, ranging from the radiant floor heating in the lobby not performing as designed to minor adjustments in system settings. The report details how to correct each issue. We recommend the City implement all improvements identified in the commissioning report in order to optimize energy-efficient operation of the building.

BE-1.4 Hire an energy efficiency and sustainability coordinator.

An energy efficiency and sustainability coordinator, as described in detail in the Implementation chapter, can improve the energy efficiency of City operations and oversee the City's sustainability and resiliency efforts. By improving energy efficiency and identifying cost-saving opportunities, this staff position has the potential to pay for itself, as well as reduce the City's greenhouse gas emissions.

A major focus for energy-efficiency improvements would be City facilities. An energy

Success Story

MARK HEIDER: DRIVING FOR EFFICIENCY

Mark Heider has a passion for saving energy. And the City of Whitefish is better off because of it.

City Electrician Mark Heider is always looking for ways to save money and boost energy efficiency.
PHOTO: Nancy Woodruff

Heider, the City's electrician, is always looking for a way to improve energy efficiency. And variable frequency drives (VFDs) are one of the key technologies the City can use to do so.

VFDs are motors that, instead of running at full speed all the time, vary their speed according to the need. By running more slowly when conditions allow, VFDs save energy.

At the City's water treatment plant, for example, retrofitting the heating and cooling system with VFDs has resulted in significant savings. The plant, which filters the City's drinking water, is one of the largest consumers of electricity among City facilities, using $42,663 of electricity in 2016.

One issue at the plant was high humidity in the filtration room. When the plant opened in 2007, a 500,000 BTU cooling system on the roof ran constantly to dry out the air in the filtration room. Now, VFD motors on the fans speed up or slow down depending on the volume of air that needs to be moved to reduce humidity.

Switching to VFDs also saved on natural gas use at the water plant. Since the filtration room was not as humid, it did not require as much heating. The first four months after the VFDs were installed in 2014, the City saved $16,800 in natural gas and electricity costs.

In addition to the energy savings, reducing the humidity in the filtration room will extend the life of expensive components of the system, such as actuators, valves, and piping.

The City also installed four turbo blowers in the ceiling ducts to move warm air at the top of the filtration room down to the floor. With all the retrofits, the original cooling system on the roof is hardly used anymore. Altogether, the changes save the City $20,000 to $23,000 in energy costs each year.

efficiency coordinator can oversee a building retrocommissioning program (see BE-1.2); ensure appropriate staff are trained in the optimal operation of City facilities, especially HVAC systems; conduct energy audits of City facilities on a regular basis and implement recommended actions; and monitor and report on energy usage at City facilities, among other duties.

An ongoing building retrocommissioning program has the potential to save an estimated 10-15% in energy costs.[5] Although the actual retrocommissioning is often contracted out, a successful program will require a staff person to manage it and to oversee implementation of actions recommended in retrocommissioning reports.

Investments in energy-efficiency projects could be included in the City's long term capital improvement plans. Because such projects typically result in cost-savings, there are a range of innovative funding possibilities. For example, with performance contracting a third party pays the upfront cost of the improvements and the City repays the debt with money saved by reducing energy costs.

"When we pay our monthly utility bills, that money is gone forever. But when we spend money on improving energy efficiency, that's an investment that pays itself off and then returns money to the City year after year."

PHOTO: Courtesy of Richard Hildner

- Richard Hildner, Whitefish City Councilor

BE-1.5 Work with lessees of City-owned facilities to optimize energy-efficient operations and sustainability standards.

The City leases out several facilities, including the golf course, the Wave athletic center, the O'Shaughnessy performing arts center, Smith athletic fields, and the Stumptown Ice Den. These facilities are not included in the City's greenhouse gas emissions inventory since the City does not have direct control over their operations.

Although these emissions are not included in the City's emissions inventory, the emissions still occur and it would be responsible of the City to address them to the extent possible.

The Stumptown Ice Den, for example, was operated by the City until 2015, and was the most energy-intensive building in the City's portfolio. In 2014 the ice rink's electricity use accounted for 38% of all emissions by City facilities (excluding the water and wastewater treatment plants). By FY2016, the City had leased out operation of the Ice Den, resulting in a 15% reduction in the City's total carbon emissions. The reduction, however, is only on paper and does not reflect changes in actual emissions at the rink.

The City can work with lessees on a voluntary basis to improve energy efficiency and implement sustainability measures. These efforts could save the lessees money or have other benefits. For example, the City can assist lessees in setting up energy audits, share information about energy efficiency funding programs, or encourage the use of non-petrochemical fertilizers at the golf course and athletic fields.

The City should first focus on the ice rink due to its intensive energy use. This should include an assessment of current energy use at the rink, such as an energy audit or commissioning report, and research on what other ice rinks have done to improve energy efficiency.

As the facility leases, which are for a term of 5 to 20

Strategies and Actions

years, come up for renewal, the City can consider including energy efficiency performance standards or other stipulations in future leases.

BE-1.6 Use LED bulbs and occupancy sensors for all building lighting.

Lighting is the single largest electricity user in commercial buildings. In 2012, lighting accounted for 17 percent of electric use in commercial buildings nationally.[6]

Switching to LED bulbs, which use far less electricity than other types of bulbs, can result in significant reductions in electricity use. As the cost of LED bulbs has decreased in the last few years, the payback period for purchase of the bulbs has become shorter.

The top recommendation in a recent energy audit of the Emergency Service Center[7], for example, is to switch all non-LED bulbs to LED. According to the audit, conducted by the Montana Resource Efficiency Program, the City can save $6,879 per year by switching to LED bulbs in this building. The initial cost of retrofitting existing light fixtures and purchasing the bulbs is $36,360. With a $17,000 rebate from Flathead Electric Cooperative, the payback period is 2.8 years.

It can be assumed that other City buildings with non-LED lights would see savings by converting to LED. Occupancy sensors, which turn lights off when an area is unoccupied, can also reduce electricity use.

BE-1.7 Convert decorative streetlights to LED bulbs.

In 2016, streetlights accounted for 6 percent of the City's greenhouse gas emissions. By converting its streetlights to LED bulbs, the City can reduce emissions and save hundreds of thousands of dollars.

The City has 982 decorative streetlights that use high pressure sodium (HPS) bulbs of varying wattage. HPS bulbs last an average of four years and use between $15 and $50 worth of electricity annually, depending on the wattage of the bulb. In comparison, LED lights cost slightly more but last more than 10 years and cost between $7 and $17 in electricity annually.

Over the 10-year life of the LED bulbs, the City would save an estimated $185,120 in energy costs.
In addition to the energy savings, the use of the LED bulbs will save money by needing replacement less often. Fewer bulbs need to be purchased and labor costs will be reduced. It costs an average of $75 in labor to replace each burned out bulb.

Over the 10-year life of the LED bulbs, the City would save an estimated $182,350 in bulb replacement costs. Combined with the energy savings, the total savings are $367,470 over 10 years.

Flathead Electric Cooperative offers rebates for converting to LED bulbs. Assuming the City takes advantage of the rebates, the total cost of converting the streetlights is estimated at $91,219. That means the net savings over 10 years is around $276,251.

In addition to saving money, converting to LED streetlight bulbs would reduce the City's emissions by 80 metric tons of CO2 annually.

Additional Actions

- Conduct energy audits on City buildings on a regular basis, or when monthly energy use in a building increases.
- Adopt the 2015 State of Montana high-performance building standards for all newly constructed City-owned buildings. The school district could also adopt these standards and apply them to the construction of the new Muldown Elementary School.
- Track monthly energy use in City buildings and issue reports that compare current use to historical data.
- Install real-time energy management

dashboards in major City facilities. Studies show that real-time energy monitors can reduce energy consumption by an average of 5-10%.[8]

Strategy BE-2 Develop and encourage use of renewable energy sources.

In addition to reducing the City's greenhouse gas emissions, renewable energy projects can save money, support the creation of new jobs, and increase the resiliency of the community. The two fastest growing occupations in the US for the next 10 years are expected to be solar PV installers and wind turbine technicians, according to the US Bureau of Labor Statistics.[9] In Montana, 4,000 new jobs in renewable energy could be created by 2030, according to a report by Synapse Energy Economics.[10] In addition to creating jobs, renewable energy projects decrease dependency on remote transmission networks that are susceptible to natural events such as storms and wildfire. Equipping the City's infrastructure, such as the wastewater treatment system, street lighting, and communication towers, with standalone solar PV systems (solar PV with storage batteries) can play a critical role in the community's ability to bounce back from extreme conditions. A number of cities around the country have used standalone solar PV to power emergency shelters, drinking water delivery, or cell phone charging centers during emergency situations.[11]

BE-2.1 Construct a solar array to power the new wastewater treatment plant.

The City of Whitefish is currently considering building a large-scale solar array at its new wastewater treatment plant. The new plant, to be built by 2021, is expected to use more than $250,000 of electricity per year at full capacity. A 1.7 megawatt solar project could greatly offset the cost of operating the plant while also generating renewable energy credits that can be used as a carbon offset for other City energy use.

The potential solar array is discussed in the chapter

Success Story

RENEWABLE ENERGY: THE HYDRO PLANT

The City's hydro plant, located just north of the water treatment plant, was built in 1984 but was struck by lightning in 1989. The lightning strike ruined the electronics associated with the plant, knocking it out of business. The plant sat idle and over the course of a couple decades generally fell into disrepair.

Mike Holecek of Aeon Renewable Energy and City electrician Mark Heider discuss the workings of the City's rebuilt hydro plant.
PHOTO: Jeff Arcel

Fortunately, local resident and renewable energy entrepreneur Jeff Arcel heard about the plant and contacted then Public Works director John Wilson to find out more. As the two of them toured the plant and talked it over, they recognized its value. Although some of the components were not functional, there was enough basic infrastructure intact, including two miles of pipeline that brought water from Second and Third Creeks and the building that housed the facility, to make it feasible to refurbish the plant.

In 2009 Wilson secured funds for a feasibility study, and Arcel wrote a report for the City on what it would take to get the hydro plant back online. The City could either rebuild the original power plant or install a new hydro turbine. The City chose to install a new turbine, generator, and state-of-the-art electronic control systems, at a cost of about $400,000. Flathead Electric Cooperative partnered with the City, fronting the money to renovate the plant by pre-purchasing the electricity.

In August, 2012, the new hydro plant went online. The new plant is more efficient than the original one, producing up to 235kW of power, compared to a maximum output of 190 kW by the original plant.

The power is fed into the electrical grid, and the City is credited for the electricity by Flathead Electric Cooperative. The cost of refurbishing the plant is expected to be paid off in January of 2019. After that, the output of the hydro plant, about $62,000 worth of electricity annually, will offset the energy costs at the City's wastewater treatment plant.

The hydro plant is expected to run for at least 40 years. Thanks to the efforts of Arcel and Wilson, the City will save millions of dollars in electricity costs through the local production of clean, renewable energy.

Can Solar Energy Work in Whitefish?

The term renewable energy typically includes photovoltaic solar (PV Solar) for producing electricity, solar thermal that produces hot water and heat, hydropower, wind power, and biomass energy production. Solar power, both PV solar and solar thermal, have the most potential for use in Whitefish.

Our gray weather and short days during winter, however, prompt many people to wonder whether solar power is economically feasible in Whitefish.

Although sun is limited in the winter, the annual amount of sun in Montana makes solar power a practical alternative. According to the National Renewable Energy Laboratories' (NREL) 2012 study of renewable potential by state, Montana receives an amount of sunshine similar to Germany, the world's leader in solar power.[15]

Another study, the Montana Solar Market Assessment prepared for the Montana Department of Environmental Quality (DEQ), looked at solar productivity for six Montana cities. Solar productivity is dependent upon two primary factors: available solar radiation and ambient temperature (solar modules operate less efficiently in warmer ambient temperatures).

While no cities in the Flathead Valley were included in the study, Whitefish has a similar number of sunny days as Missoula. As shown in the figure below, Missoula has a productive solar output similar to other cities in the state and in the U.S.

To demonstrate that solar works in our area, Flathead Electric Cooperative (FEC) has had a small residential-size solar array at its headquarters since 2009.

The NREL study also finds that Montana has the potential to develop over 4,000 gigawatts of rural-utility-scale solar, thanks to its large land area, low population density, and the amount of annual solar irradiation. This means that large-scale projects, such as community solar, may be viable in our area.

As many people are aware, the cost of solar panels has declined rapidly, 90% over the last 20 years and 50% in just the last five years. Although the economic feasibility of each project must be evaluated on a case-by-case basis, generally the answer is yes, solar can and does work in Whitefish.

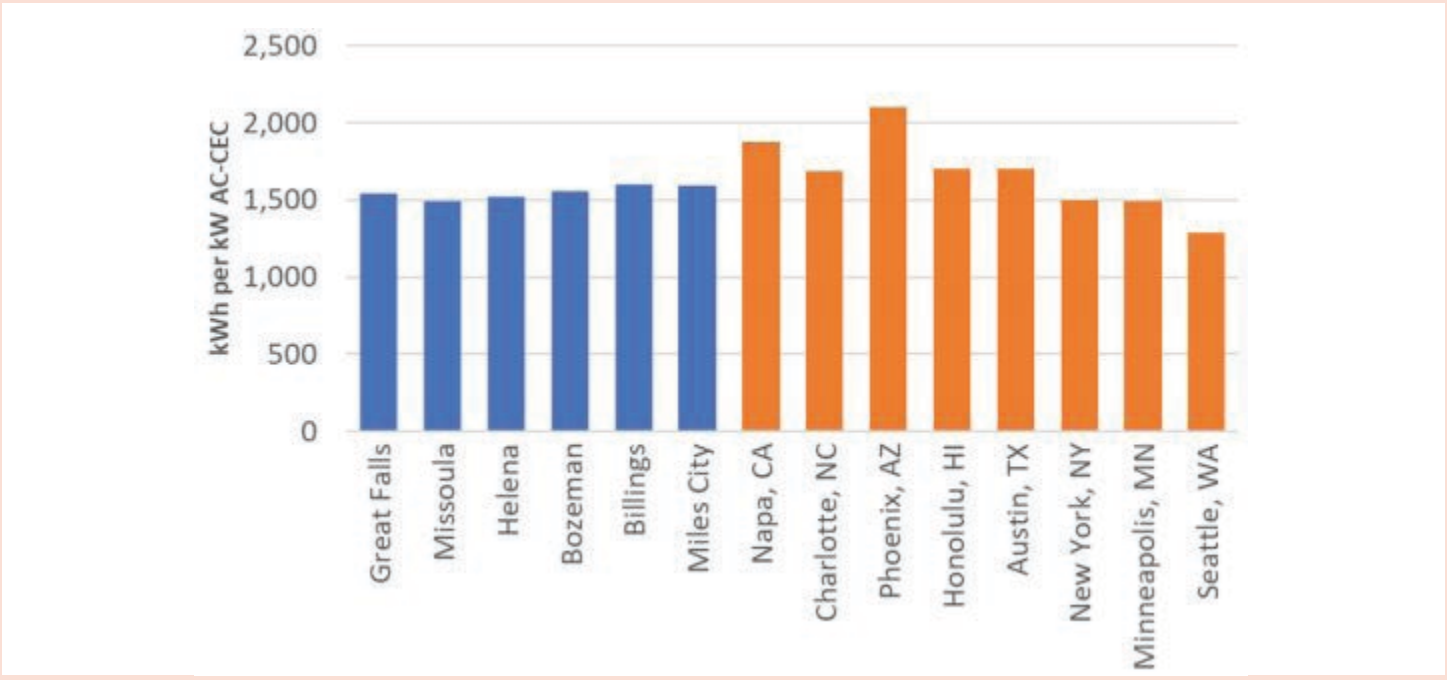


FIGURE 4. TEN-YEAR AVERAGE SOLAR PRODUCTION IN SELECTED US CITIES. The chart shows the average amount of energy that can be produced monthly by a 5 kW system in Whitefish.[17] Year-to-year variations in solar radiation mean that some years a system will produce more or less energy than the typical year. For example, a 5kW system in Whitefish will produce 6,331 to 6,958 kWh per year.

Strategies and Actions

on Water and Wastewater. However, because it would be a major renewable energy project by the City, we wanted to acknowledge it here.

BE-2.2 Explore the development of community solar projects on City-owned land.

Community solar is a solar power plant whose electricity is shared by more than one household. It can refer to both community-owned projects and third party-owned projects whose electricity is shared by a group. Community solar allows people to obtain solar power without installing it on their property. This expands access to solar power to renters, residential and business property owners with shaded roofs, and those who do not want to install a solar system at their property for financial or other reasons.

One of the main requirements for a community solar project is the land where the solar arrays are installed. As an owner of public land, the City can explore the feasibility of providing land for community solar projects, possibly as part of a public-private partnership.

BE-2.3 Obtain and maintain SolSmart designation.

The SolSmart program is part of the U.S. Department of Energy's SunShot Initiative, and is designed to help communities streamline the process of going solar by addressing permitting, zoning, planning, and other "soft costs" associated with solar installations. Communities work to complete milestones and can achieve a SolSmart Designation (Bronze, Silver, or Gold) that comes with national recognition.

In the summer of 2017 Whitefish committed to working toward SolSmart designation. Partnering with the Montana Renewable Energy Association (MREA), the National Renewable Energy Laboratory

MONTH	SOLAR RADIATION (kWh/m²/day)	AC ENERGY (kWh)	ENERGY VALUE ($)
JANUARY	2.03	294	$26
FEBRUARY	2.82	361	$33
MARCH	3.97	553	$50
APRIL	4.75	625	$56
MAY	5.53	740	$67
JUNE	5.91	745	$67
JULY	6.38	813	$73
AUGUST	6.27	806	$73
SEPTEMBER	5.24	657	$59
OCTOBER	4.05	547	$49
NOVEMBER	2.11	286	$26
DECEMBER	1.41	202	$18
ANNUAL	**4.21**	**6,629**	**$597**

FIGURE 5. AVERAGE MONTHLY ENERGY PRODUCTION BY A 5kW SOLAR PV SYSTEM IN WHITEFISH. The chart shows the average amount of energy that can be produced monthly by a 5 kW system in Whitefish. Year-to-year variations in solar radiation mean that some years a system will produce more or less energy than the typical year. For example, a 5kW system in Whitefish will produce 6,331 to 6,958 kWh per year.

Strategies and Actions

(NREL), and The Solar Foundation (TSF), Whitefish staff began the process of documenting and improving permitting and zoning processes for solar in the community. To date, the Whitefish area has not experienced significant solar deployment, which leaves open the opportunity to ensure streamlined permitting, zoning, and planning practices that can foster increased development as the market grows.

Whitefish has almost completed enough milestones to achieve Bronze SolSmart designation. City staff are working with MREA to complete a few more prerequisites, such as creating a Going Solar Checklist that will guide interested local residents through the process of going solar, including all the necessary paperwork. Adoption of this Climate Action Plan is also a key component for the City to acquire SolSmart designation.

In addition, City staff are working with NREL and TSF to obtain free technical assistance on the solar PV feasibility study for the wastewater treatment plant. NREL and TSF are valuable resources with expertise in a wide range of renewable energy topics, including technical and policy analysis.

BE-2.4 Advocate for solar-friendly policies.

Currently Montana does not have official policies that directly promote community solar. In other states with aggressive solar development commitments, local electric utilities have led the way by adopting policies that encourage and support the development of community-scale solar projects. Whitefish can support the adoption of new policies that would encourage both residential and community solar development. An example of a solar-friendly policy is shared net metering, which allows occupants of multi-unit buildings or a group of neighbors to apply a single renewable energy source to multiple meters.

Additional Actions

- Promote the integration of renewable energy sources in all City buildings.
- Explore the potential for installing solar streetlights and other new solar powered technologies, such as the solar roadway panels recently installed in the town square of Sandpoint, ID.[12]
- Hold workshops for local business owners and residents on renewable energy benefits and programs.

Strategy BE-3 Encourage building energy efficiency and conservation in the community.

The City can have an impact beyond its own operations by promoting energy efficiency in the community. In addition to leading by example, the City can actively pursue this goal by initiating programs, modifying relevant City regulations, and disseminating information in the community.

BE-3.1 Integrate sustainability and energy-efficiency standards in the City's workforce housing strategies.

The City of Whitefish recently adopted the 2017 Whitefish Strategic Housing Plan. The plan identifies a number of strategies to increase the amount of workforce housing in Whitefish.

Sustainability and energy-efficiency goals dovetail well with workforce housing projects. Making housing energy efficient, for example, keeps utility bills low for the occupants. Considering factors such as the walkability of the housing location reduces commuting expenses and helps build a connected community.

As the City moves forward with its housing strategies, there will be an opportunity to advance sustainability and energy-efficiency goals at the same time. To achieve this, the City can build sustainability and energy efficiency standards into its housing

Strategies and Actions

programs.

The Strategic Housing Plan details core components of a successful housing plan. One of these components, guidelines for workforce housing (p. 48), could be expanded to include standards for energy efficiency and sustainability. Members of the City's Sustainability and Resilience Committee, recommended by this Climate Action Plan to be established, could assist in formulating these standards. These standards can then be included in City projects and regulations.

For example, zoning regulations, such as inclusionary zoning or zoning for affordability, can include energy efficiency and sustainability standards as part of the definition of workforce housing. The City can also specify such standards when participating in public-private partnerships to build workforce housing or when evaluating developer proposals.

Many housing agencies, including the Montana nonprofit Homeword, make sustainable construction and energy efficiency a key part of their mission. The City could invite Homeword Missoula to conduct a workshop on making workforce housing sustainable.

BE-3.2 Train building inspectors and builders on the state energy code.

The City can organize training for building inspectors and local builders on the new state energy code and energy-efficient building practices. Possible training resources include the state Department of Environmental Quality and the National Center for Appropriate Technology.

Additional Actions

- Provide information for residents on local energy efficiency programs, tax incentives, and rebates from local utility companies and state government.
- Promote wood stove efficiency and facilitate replacement of inefficient wood stoves with high-performance stoves by partnering with the Flathead County Health Department and the Montana Energy Office, and by providing information about existing tax incentives for replacement.

Co-Benefits

Economic

Saves money on energy costs

Creates local jobs

Social

Increasing energy efficiency in buildings supports public health by improving indoor air quality, increasing occupant comfort, and reducing mold

Renewable energy increases community resiliency by decreasing dependence on remote transmission networks that are susceptible to natural events such as storms and wildfire

Environmental

Reduces the City's carbon emissions

Reduces air pollution from fossil fuels

Conserves water

By the Numbers: How Much Does Solar Cost in Whitefish?

$10,500 Average net cost:

$15,000 Average installed cost

$4,500 Federal tax credit (30%)

5 kW Size of grid-tied solar PV system for this example

$6,630 kWh Average electricity produced annually by a 5 kW system in Whitefish

50-60% Average home's power produced annually

$597 Average amount of electricity produced annually

17.5 Years to pay back investment

30-40 Years of projected life of solar modules

SOURCE: National Renewable Energy Laboratory and Jeff Arcel

How Can I Make a Difference?

- Use LED bulbs – compared to a 60 watt incandescent bulb, an LED bulb uses 20% of the electricity and lasts 25 times longer.[13]
- Take advantage of free energy audits and rebates from utility companies. For example, if you have an electric hot water heater, sign up for Flathead Electric Cooperative's Peak Time Rebate Program to save $48 per year.
- Purchase EnergyStar appliances.
- Consider installing rooftop solar or buying a panel in the next SUN community solar array offered by Flathead Electric Cooperative.[14]

Resources

To learn more about the topics discussed in this chapter, explore these helpful links:

- Montana DEQ Energy Office (http://deq.mt.gov/Energy)
- Northwest Energy Efficiency Alliance (http://neea.org/home)
- US EPA Energy Star guide to saving energy in commercial buildings (http://bit.ly/29JCsgv)
- ICLEI High Performance Building Program (http://bit.ly/2Fpn3yh
- US Department of Energy Better Buildings program (http://bit.ly/2pX4GJ6)
- US Green Building Council (https://new.usgbc.org)
- US EPA WaterSense (https://www.epa.gov/watersense)
- Montana Solar Market Assessment (http://bit.ly/2AIAMg6)
- Montana Renewable Energy Association (http://montanarenewables.org)
- Montana Solar Community Project (http://mtsolarcommunity.com/)
- Montana Green Power (https://www.ncat.org/montana-green-power/)
- Montana DEQ – Renewable Energy (http://deq.mt.gov/Energy/EnergizeMT/Renewable)
- Alternative Energy Finance and Incentives presentation slides (http://bit.ly/2mk6ZoA)
- National Center for Appropriate Technology (https://www.ncat.org/)
- National Renewable Energy Lab (http://www.nrel.gov/)
- National Renewable Energy Lab's Guide to Community Shared Solar

A pole top mount 5.1 kW grid-tied solar array system was installed at a Whitefish resident's home in 2017. The system is projected to produce 80% of the homeowner's annual power needs.
PHOTO: Sierra McCartney

End Notes

[1] http://www.homeselfe.com/how-energy-efficient-homes-impact-the-environment/.

[2] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy.

[3] Evan Mills, Ph.D., Lawrence Berkeley National Laboratory, Building Commissioning, A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions (California Energy Commission Public Interest Energy Research, July 21, 2009), http://cx.lbl.gov/documents/2009-assessment/LBNL-Cx-Cost-Benefit.pdf.

[4] Laura Howe, National Center for Appropriate Technology, Energy Evaluation Report, City of Whitefish Emergency Services Center, (Montana Resource Efficiency Program, 2017).

[5] Laura Howe, National Center for Appropriate Technology, email message to Karin Hilding, November 13, 2017;
and Evan Mills, Ph.D., Lawrence Berkeley National Laboratory, Building Commissioning, A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions (California Energy Commission Public Interest Energy Research, July 21, 2009), http://cx.lbl.gov/documents/2009-assessment/LBNL-Cx-Cost-Benefit.pdf.

[6] https://www.eia.gov/energyexplained/?page=us_energy_commercial#tab2.

[7] Laura Howe, Energy Efficiency Evaluation Report, City of Whitefish Emergency Services Center (Montana Resource Efficiency Program, 2017), 21.

[8] Missoula Conservation and Climate Action Plan, p. 35: http://www.ci.missoula.mt.us/DocumentCenter/View/25578.

[9] https://www.bls.gov/ooh/fastest-growing.htm.

[10] http://meic.org/wp-content/uploads/2014/06/Synapse-Montana-Jobs-Final-6-5-145.pdf.

[11] http://icleiusa.org/wp-content/uploads/2016/02/Solar-and-Resiliency-Fact-Sheet.pdf.

[12] http://www.cityofsandpoint.com/visiting-sandpoint/solar-roadways#ad-image-0.

[13] https://energy.gov/energysaver/how-energy-efficient-light-bulbs-compare-traditional-incandescents

[14] https://www.flatheadelectric.com/community/sun-community-solar-program/.

[15] https://www.nrel.gov/docs/fy12osti/51946.pdf.

[16] http://mtsolarcommunity.mt.gov/Portals/185/Documents/MT_Solar_Market_Assessment.pdf?ver=2017-10-26-113746-333.

[17] NREL PV Watts Solar Calculation Tool, available at http://pvwatts.nrel.gov/.

[18] https://www.flatheadelectric.com/community/sun-community-solar-program/.

[19] US General Services Administration, https://www.gsa.gov/real-estate/design-construction/commissioning/commissioning-program/building-commissioning-philosophy.

TRANSPORTATION AND LAND USE

PHOTO: Sierra McCartney

Transportation and Land Use

In 2014, transportation accounted for 27% of the United States' greenhouse gas emissions and was the second largest emission sector after the electric power industry.[1] The majority of transportation-related greenhouse gas emissions are in the form of carbon dioxide (CO_2) that results from use of petroleum in internal combustion engines.

Buying vehicles with higher fuel economy standards, as well as increasing fuel efficiency through better driving practices and vehicle maintenance, reduces greenhouse gas emissions and also saves money. Promoting alternative modes of transportation such as walking, bicycling, and public transportation can reduce the number of vehicle miles traveled.

Traffic congestion causes vehicles to idle in traffic and emit greenhouse gases. According to the Whitefish Transportation Plan, many intersections along US 93 and Wisconsin Avenue will experience significant delays and congestion by the year 2030. A combination of improvements to the road network, new technologies, and a reduction in transportation demand are necessary to address this issue. Smart transportation technologies include sensors, vehicle-to-vehicle communication, autonomous vehicles, and software that can optimize traffic lights and route planning.

In addition to greenhouse gas emissions, other pollutants related to transportation can diminish air quality and cause a variety of health issues. According to standards established in the Clean Air Act, Whitefish is a non-attainment area for the pollutant PM-10. PM stands for particulate matter and is the term for a mixture of solid particles and liquid droplets found in the air. Unpaved driveways, alleys, and streets and road dirt from erosion are sources of transportation-related PM-10. Reducing the number of miles driven will help improve air quality by reducing airborne dust and reducing emissions from vehicle exhaust.

Land use policies are intricately connected to transportation patterns as they affect where people live, work, and shop. Development that promotes complementary land uses and street network connectivity improves options for walking to work or commercial areas and increases access to alternative transportation. Land use patterns should locate commercial services near residential areas and provide for workforce housing near employment centers to shorten commutes. Such development patterns reduce vehicle miles traveled, resulting in reduced emissions from automobiles and less reliance on fossil fuels.

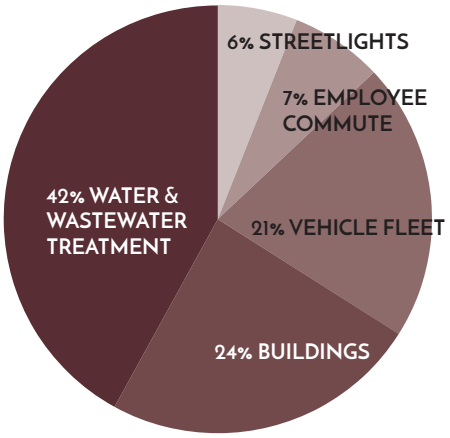


FIGURE 1. 2016 City of Whitefish Emissions by Sector.

Intersections along US 93 and Wisconsin Avenue are projected to have significant congestion by the year 2030.

PHOTO: Ryan Richardson

Development with strong street network connectivity increases the use of alternative transportation.

DAVID KACK
Montana State University

"Public transportation allows a cost-effective, environmentally friendly way to provide mobility for locals and visitors in areas such as the Kalispell, Columbia Falls, and Whitefish region. Transit allows access to jobs, educational opportunities, and recreation sites without people having to get into their car. It is a much more environmentally friendly mode than the single occupancy vehicle."

- David Kack, Director of the Small Urban, Rural and Tribal Center on Mobility (SURTCOM) at the Western Transportation Institute of Montana State University

A warming climate in the northwestern US is projected to increase the severity of extreme rain and snowfall events, heat waves, and summer drought conditions. Land use policies and management of public spaces can mitigate these impacts by encouraging green infrastructure that captures and filters stormwater, promotes drought-adapted landscaping, and enhances an urban forest that cools neighborhoods.

REDUCING TRANSPORTATION-RELATED EMISSIONS

In municipalities, city vehicle fleets tend to be the second or third largest source of greenhouse gases. Vehicles play a significant role in carrying out city functions, such as snow plowing, police patrols, emergency response, and other crucial jobs. Because they cannot run without vehicles, municipalities must find ways to green their fleets.

In Whitefish, the municipal fleet is a major source of the City's greenhouse gas emissions. In FY 2016, municipal vehicles accounted for 21% of the City's greenhouse gas emissions, and the City spent $87,767 on fuel.

The following strategies can play a role in reducing the City's greenhouse gas emissions related to transportation:

- Increasing the fuel efficiency of the City vehicle fleet.
- Promoting the use of public transportation.
- Improving the City's bike and pedestrian infrastructure.
- Providing electric vehicle charging stations.
- Decreasing traffic congestion and idling at intersections.
- Encouraging employees to use alternative transportation for their commutes.
- Adopting land use policies to reduce vehicle miles traveled.
- Increasing the amount of workforce housing in the City to reduce local commutes.

LAND USE BEST PRACTICES

The built environment has significant impacts on the natural environment and on human health. Land use policies, site design, and new construction can all integrate best practices to reduce greenhouse gas emissions and prepare for projected impacts, such as more intense rain and snow storms.
Best practices related to the built environment include:

- **Smart Growth** - The term "smart growth" has been used for more than 20 years to describe how growth and development can promote quality of life and sustainability in a community. Smart growth practices minimize traffic congestion, use land efficiently, extend infrastructure in a cost-effective manner, save money on energy and transportation, and result in healthier communities.

Forest Benefits By the Numbers

The portion of the urban forest maintained by the City of Whitefish is comprised of street trees and trees in city parks. Just this portion of the urban forest is responsible for thousands of dollars of benefits annually.

The Montana Department of Natural Resources and Conservation estimates the following benefits from the City's investment in street and park trees.

$32,747 in energy savings

246 pounds intercepted pollutants

$292,352 increased property values

45,324 pounds of CO_2 avoided

1.3 million gallons reduced Stormwater runoff

- **Low-Impact Development** - One way to reduce impervious surfaces and increase green infrastructure is through low-impact development. Low-impact development strives to mimic natural processes, such as infiltration and evapotranspiration, for managing stormwater on the site. The Montana Department of Environmental Quality recommends that communities incorporate low-impact development designs as part of their stormwater management plans. According to the Low-Impact Development Center, case studies and pilot programs show at least a 25-30% reduction in costs associated with site development, stormwater fees, and maintenance for residential developments that use low-impact development techniques.[2] Examples include porous pavement, rain gardens, and bioswales with natural grasses to filter stormwater.
- **Native Plants and Urban Forestry** - The use of native plants in landscaping treatments has multiple benefits. Native plant species are adapted to the local soil and environment and as such they require little to no irrigation. Native plants have natural defenses against insects and diseases and provide wildlife habitat for food, shelter, breeding, and nesting. A healthy urban forest is a highly effective way to conserve energy and water, provide natural cooling in neighborhoods, and increase the livability of communities.[3]
- **Green Infrastructure** - At the city or county scale, green infrastructure is the collection of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, stormwater management systems mimic nature to soak up, filter, and store stormwater. Large expanses of impervious surface create a heat island effect requiring more energy and higher costs for cooling. Additionally, impervious surfaces increase stormwater runoff, resulting in non-point pollution and additional cost and energy to treat water. Finally, the asphalt used to pave impervious surfaces such as parking lots and driveways is comprised of fossil fuels. Green infrastructure reduces the heat island effect, filters stormwater, provides habitat, reduces reliance on fossil fuels, and creates opportunities for carbon sequestration.

Progress to Date

- **BIKE AND PEDESTRIAN INFRASTRUCTURE:** The City of Whitefish has constructed 13.6 miles of bike/pedestrian paths, two miles of bike lanes on City streets, and three bike/pedestrian bridges. The City has a Bicycle and Pedestrian Advisory Committee that provides recommendations on bike and pedestrian improvements. In its Downtown Master Plan the City designed downtown streets and sidewalks to prioritize walkability.
- **CONNECT WHITEFISH:** The City's Connect Whitefish Bicycle and Pedestrian Master Plan was completed in 2017. The plan identified the need for an advocacy group to support the education, awareness, and promotion of biking and walking in Whitefish. In 2017 a volunteer group, also named Connect Whitefish, was formed to be the voice for walking and biking. Connect Whitefish annually coordinates numerous events including Bike to Work Week, Connect Whitefish Week, bike to school days, and more.
- **SAFE ROUTES TO SCHOOL:** Whitefish Schools have participated in the national Safe Routes to School program by holding Walk to School and Bike to School Days to encourage students and staff to give walking and biking a try. For several years the City has helped coordinate and provide funding for the Walk and Bike to School events. The City also applied for and received Safe Routes to School grant funding for sidewalk and crosswalk improvements near the schools. In addition, the City hired Alta Planning to prepare a Safe Routes to School Plan in 2011.
- **PUBLIC TRANSIT:** The SNOW bus provides free transportation from downtown to Whitefish Mountain Resort in the winter. The Glacier

Three bike/pedestrian bridges have been built connecting trails along the Whitefish River.

Whitefish Schools participate in the Safe Routes to School Program and organize Bike and Walk to School Days.

PHOTO: Whitefish School District

Goals & Indicators

Goals

- Reduce carbon emissions from the City's fleet.
- Reduce community and City employee vehicle miles traveled.
- Facilitate and encourage alternative transportation for community members.
- Support sustainable and smart growth in the built environment.

Potential Indicators

- Fuel efficiency of vehicles in the City's fleet.
- Percentage of workforce that commutes to town.
- Public transit ridership.
- Miles per capita of pedestrian facilities and bike trails.
- Percentage of landscaped areas and native plants in new development.

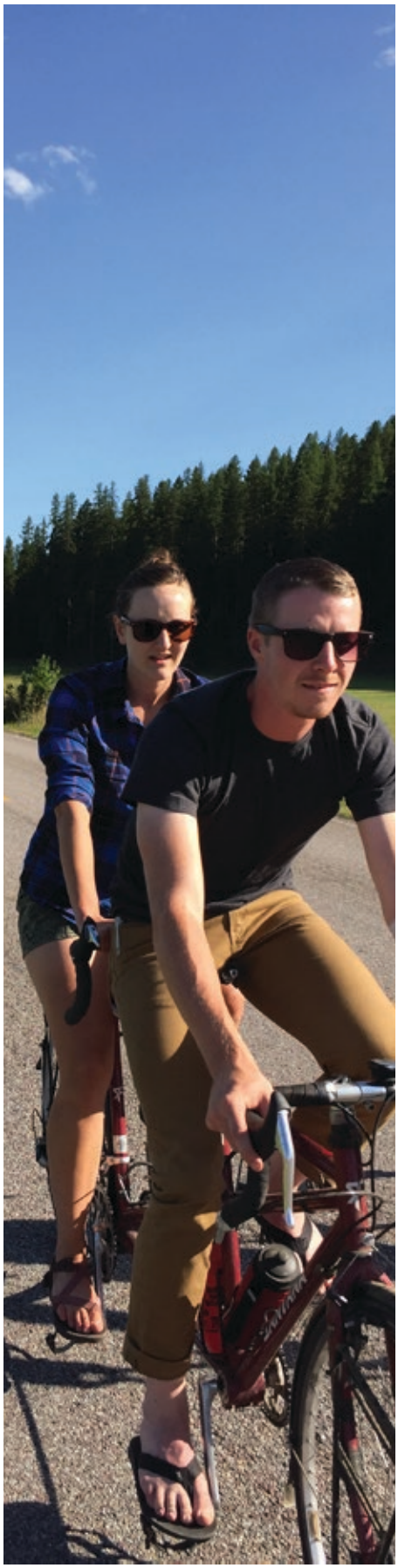
Progress to Date

Park Express bus provides transportation to Glacier National Park (for a fee) and Whitefish Mountain Resort (free) in the summer. The Big Mountain Commercial Association raises funds, primarily from local businesses, to support both buses. Eagle Transit, operated by Flathead County, operates routes within Whitefish and between Whitefish and Kalispell.

- **LAND USE POLICIES:** In response to community input, the City prioritized infill development in its 2007 Whitefish Growth Policy. Infill development creates a more dense land use pattern where residents live closer to the businesses and services they use.
- **WORKFORCE HOUSING PLAN:** In 2017 the City adopted the Whitefish Strategic Housing Plan to address the lack of affordable housing in the town. One goal of the plan is to reduce the number of employees who commute from neighboring areas because they cannot afford to live in Whitefish.
- **URBAN FORESTRY:** The City of Whitefish has a Tree Advisory Committee that provides recommendations on management of the City's urban forest. The City has achieved certification as a Tree City by the Arbor Day foundation for 22 years.

The SNOW bus provides free public transportation from downtown to Whitefish Mountain Resort.
PHOTO:

The City has achieved certification as a Tree City by the Arbor Day foundation for 22 years.
PHOTO:



Strategies and Actions

Strategy WW-1 Increase the efficiency of City fleet vehicles and increase employee commuting.	
TL-1.1	Train City staff to use EcoDriving Practices while operating City vehicles.
TL-1.2	Encourage City employees to limit idling of parked City vehicles to no more than 10 seconds.
TL-1.3	Increase the average fuel efficiency of the City fleet to 30 MPG (for light duty vehicles) by implementing purchasing guidelines.
TL-1.4	Purchase an electric vehicle as the next Public Works replacement car.
TL-1.5	Implement a vehicle trip reduction and out-of-town travel policy.
TL-1.6	Encourage employees to carpool or use alternative transportation to reduce employee commute miles.
TL-1.7	Promote a no idling campaign in coordination with the schools and railroad.
Strategy WW-2 Support better public transit.	
TL-2.1	Develop a transit center near Depot Park.
TL-2.2	Improve public transit through partnership with public agencies and private organizations.
TL-2.3	Promote transit use by making information on stops and routes more visible.
Strategy WW-3 Make Whitefish more bike and pedestrian friendly.	
TL-3.1	Promote Implement actions in the City's bike and pedestrian master plan.
TL-3.2	Partner with local groups and businesses to educate residents on bike safety.
TL-3.3	Implement a regular crosswalk and bike lane striping schedule.
TL-3.4	Publicize and enforce sidewalk snow clearing ordinance.
TL-3.5	Create a City sidewalk repair and replacement program.
Strategy WW-4 Support more-efficient vehicles.	
TL-4.1	Install electric charging stations and encourage them for new development.
TL-4.2	Provide free EV charging.
Strategy WW-5 Adopt land use and transportation policies to reduce vehicle miles traveled.	
TL-5.1	Plan for walkable communities through compact development and investment in pedestrian and bike facilities.
TL-5.2	Encourage mixed use developments.
TL-5.3	Develop design standards to accommodate transit, car-sharing, and non-motorized travel.
TL-5.4	Increase the inventory of workforce housing to reduce local commutes.
TL-5.5	Promote infill development and redevelopment of brownfield sites.
Strategy WW-6 Reduce impervious surfaces and increase green infrastructure.	
TL-6.1	Consider reducing the minimum parking requirements for new developments.
TL-6.2	Map green infrastructure assets and integrate with stormwater planning.
TL-6.3	Promote green infrastructure and alternative designs to reduce impervious surfaces.
TL-6.4	Encourage the use of native and drought-resistant plants in landscaped areas.
Strategy WW-7 Integrate climate adaptation and mitigation measures into urban forest and City parks management.	
TL-7.1	Maximize shade canopy and green spaces to reduce urban heat island effect.
TL-7.2	Prioritize the selection of drought- and heat-resistant tree species in City landscaping.

Strategies and Actions

Strategy TL-1 Increase the efficiency of City fleet vehicles and increase employee commuting.

TL-1.1 Train City staff to use EcoDriving Practices while operating City vehicles.

Changes in driving style and vehicle upkeep are often the easiest and most cost-effective methods of reducing fuel use. The difference between the most and least fuel-efficient drivers is up to 33%. For most drivers, practicing EcoDriving can reduce fuel usage by 10-15%. A poorly maintained and untuned vehicle can emit up to 50% more greenhouse gases and guzzle up noticeably more fuel.
The City can provide an EcoDriver's Manual in each vehicle in its fleet, and can train all City staff on the techniques outlined in the handbook. Cars can be checked regularly to ensure tires are properly inflated and other maintenance is performed.

TL-1.2 Encourage City employees to limit idling of parked City vehicles to no more than 10 seconds.

Many drivers, especially in Montana, idle their cars when they are temporarily parked. A persistent myth claims that cars need to idle to warm up the engine. However, modern engines do not need to idle and warm up much faster by driving than by idling. Idling wastes gas and money, up to $70-650 per year depending on idling habits, fuel costs, and the vehicle. The US Department of Energy estimates that idling in the US wastes more than 6 billion gallons of fuel per year, costing $20 billion. Idling also releases pollutants that can trigger asthma attacks, cause respiratory and cardiovascular damage, contribute to haze, and damage crops.

City employees often idle while leaving their cars to perform job-related tasks. By implementing a no-idle policy, the City can save significantly on fuel and vehicle maintenance costs. An Idle-Free City policy would complement the Idle-Free Schools campaign already in place at the Whitefish School District.

TL-1.3 Increase the average fuel efficiency of the City fleet to 30 MPG (for light duty vehicles) by implementing purchasing guidelines.

Advances in vehicle fuel efficiency, as well as the increasing financial viability of hybrid and electric vehicles, make the purchase of high-efficiency vehicles an opportunity for cost and emissions reductions for the City. Currently the City does not have a fuel efficiency policy for purchasing new vehicles, and consequently there are no hybrid or electric vehicles in the fleet. The cost of fuel over the lifetime of a vehicle is rarely considered when pricing vehicle options. However, fuel costs can make an otherwise affordable car a poor investment in the long term. The following recommendations will help ensure that these costs are considered:

- Perform a lifetime cost analysis to determine the cost of purchasing, operating, and maintaining the vehicle over the first 100,000 miles of operation.
- If a department specifically requests a less fuel-efficient model, require a written justification for the decision.
- Size vehicles appropriately for their anticipated functions.

These purchasing guidelines will help the City choose vehicles that not only reduce emissions, but save considerable taxpayer dollars on fuel and maintenance costs.

TL-1.4 Purchase an electric vehicle as the next Public Works replacement car.

The City's Public Works Department manages a vehicle for driving in town and for driving to out-of-town meetings and conferences. This vehicle is replaced approximately every 10 years. For the next replacement cycle (2019), we recommend that the

Strategies and Actions

City consider purchasing a plug-in hybrid. This will reduce greenhouse gas emissions and save the City money.

While gas vehicles tend to have a lower purchase price than electric and hybrid vehicles, the cost of gas is expected to rise while electricity is relatively inexpensive and produces far fewer harmful emissions. Additionally, electric vehicles cost 30% less to maintain as they do not have internal combustion engines or exhaust systems.[10]

However, electric cars can only travel for a limited number of miles before they need to be recharged. In Montana, charging stations are few and far between and often lack the supercharging capacity needed to charge quickly. A plug-in hybrid would allow the vehicle to run on electricity for trips around town and switch to gas for travel out of town.

If gas prices remain at $2.60 over the next 10 years and electric prices remain at $0.06 per kWh, a plug-in Prius Prime hybrid would cost the City less than a gas engine vehicle such as a Toyota Camry after 72,000 miles. That is about 10 years of use as the Public Works vehicle is driven an average of 7,000 miles per year. If gas prices continue to climb as expected, the number of miles where a plug-in hybrid is cheaper will be even lower.

TL-1.5 Implement a vehicle trip reduction and out-of-town travel policy.

Montana's far-flung communities makes trips to other cities fuel-intensive and costly. City employees frequently drive City vehicles to cities such as Helena for meetings. Many of these meetings could be held via telecommuting or teleconferencing. The City Hall buildings has TVs, HDMI cords, and screencasting set up in all conference rooms for such purposes. Opting for these methods would save fuel and money, increase productivity (less time traveling, more time working), and limit wear-and-tear on vehicles. If employees must travel, they should use the most fuel-efficient vehicle possible.

TL-1.6 Encourage employees to carpool or use alternative transportation to reduce employee commute miles.

The City of Whitefish conducted a commuter survey in 2017 to gain insight into employee commute habits. City employees commute a median of 10 miles roundtrip to work each day. Only a quarter of responders reported using alternative forms of transportation (walking, biking, buses) to get to work, and 50% of those still drove a passenger vehicle or light truck at least 90% of the year. In FY 2016, emissions from employee commutes accounted for 7% of City greenhouse gas emissions.
The City can encourage employees to reduce their

	2017 TOYOTA CAMRY	2017 FORD FOCUS ELECTRIC	2017 PRIUS PRIME PLUG-IN
PURCHASE PRICE	$23,495	$29,190	$27,100
FUEL EFFICIENCY	35 MPG	105 MPGe	54 MPG/ 133 MPGe
COST PER MILE (Fuel + Maintenance)	$0.13	$0.06	$0.08
LIFETIME COST (100,000 Miles)	$36,495	$35,190	$35,100
LIFETIME EMISSIONS (Tons of CO_2)	40	15.4	17

FIGURE 2. ELECTRIC VEHICLE COST, FUEL EFFICIENCY, AND EMISSION COMPARISON. Over the lifetime of the vehicle a plug-in hybrid is an economical choice.

Strategies and Actions

commutes by providing incentives, organizing bike or walk to work days, or providing bike parking or storage facilities at city buildings.

TL-1.7 Promote a no idling campaign in coordination with the schools and railroad.

In response to student initiative, in 2016 the Whitefish School District implemented no idling zones around the schools. Representatives of the City and interested citizens have met with Burlington Northern Santa Fe Railroad to discuss the impact of emissions from idling trains in the rail yard. The City can coordinate with these efforts to promote a no idling campaign in the community.

Strategy TL-2 Support better public transit.

Expansion and improvement of public transit service is critical as the number of tourists and commuters in the valley continues to increase. Improved service would reduce emissions, save on fuel costs, and provide transportation alternatives to those without personal vehicles.

Current public transit services include Eagle Transit, operated by Flathead County and providing service within Whitefish and between Whitefish and Kalispell. Eagle Transit includes fixed-route service and service by appointment for those with disabilities. The County is currently updating its five-year transit plan.

The Big Mountain Commercial Association is a non-profit association that raises funds to pay for the Snow Bus and the Glacier Park Express. The Snow Bus operates from December to April and provides free transit service from locations in Whitefish to Whitefish Mountain Resort. The Snow Bus transports approximately 20,000 riders annually. Passengers on the bus include resort employees, visitors, and school children. It is anticipated that ridership will increase along with increased visitation.

The Glacier Park Express operates in the summer months and provides transit service between Whitefish Mountain Resort, Whitefish, and Glacier National Park (Apgar Village). The summer buses are equipped with bike racks.

TL-2.1 Develop a transit center near Depot Park.

The Depot Park Master Plan recommends a multi-modal transit area north of the O'Shaughnessy Center to serve those using alternative modes of transportation such as bikes, the Snow Bus, intercity transit, and Amtrak. The transit center can include

Success Story

NO IDLING CAMPAIGN

Caroline Dye

PHOTO: Courtesy of Caroline Dye

Caroline Dye, a sophomore at Whitefish High School, led a successful campaign to implement no-idling zones outside all three Whitefish schools to keep kids safe from exhaust emissions.

"It can be a really big health issue for people with breathing issues," said Dye while explaining her research about the impact of airborne particulates on children.

In 2016, Caroline and other students from the Student Council found data from an air monitoring site at Whitefish High School that shows obvious spikes in carbon monoxide levels in the morning around the time school begins, when parents and buses are dropping off students. The no-idling campaign asks drivers to turn off car engines if they are waiting for more than 10 seconds.

Caroline is also working with the Climate Smart Glacier Country Transportation Group to find no-idling solutions for diesel locomotives in the railyard next to Whitefish Middle School.

Strategies and Actions

maps and an information kiosk, including a website for transit information (car sharing and public transit) and information on bike maps and bike and pedestrian resources.

TL-2.2 Improve public transit through partnership with public agencies and private organizations.

There is a dearth of public transportation in the Flathead Valley, which can make travel between Whitefish, Kalispell, Columbia Falls, and Glacier National Park fuel-intensive and expensive for residents and tourists alike. While the City of Whitefish alone cannot improve these services, it can promote existing routes and push for expanded services in the Valley.

This is especially important as the City grapples with affordable housing issues. Employees in Whitefish who cannot afford to live in town and are pushed into the surrounding cities need affordable and accessible commuting options. The City can encourage the development of these options with partners including the Western Transportation Institute, Eagle Transit, Flathead County Agency on Aging, Big Mountain Commercial Association (Snow Bus), and Glacier National Park.

TL-2.3 Promote transit use by making information on stops and routes more visible.

Although there is some public transit in the Flathead Valley, there is very little information on bus stop locations, routes, or schedules. Making this information available to employees, especially the 45% who live outside of Whitefish City limits, can promote the use of public transportation as part of their commute.

For example, as part of their 5-year plan Eagle Transit, with assistance from the Western Transportation Institute, will be investigating options for providing real-time bus information through use

The Future

ELECTRIC SNOW BUS OR SCHOOL BUS?

Electric transit buses are most likely the way of the future. Here in Whitefish, that means we could see electric school buses or SNOW buses. Electric buses provide several advantages over traditional diesel buses. They emit no greenhouse gases or other pollutants and have lower operating and maintenance costs. They also provide a smoother, quieter ride.

David Bopp

PHOTO: Flathead Electric Cooperative

David Bopp, an energy services representative with Flathead Electric Cooperative, is working on a graduate dissertation on transitioning to electric school buses. His research will analyze the costs and benefits of electric buses compared to diesel buses in Flathead County. Whitefish, Columbia Falls, Kalispell, and Bigfork Public Schools have agreed to participate in his study.

In addition to the advantages listed above, using electric school buses can reduce children's exposure to diesel pollutants, which are linked to negative health effects. Operating and maintenance costs of electric buses are lower as well, but the upfront costs are high at this time.

Other communities in Montana have begun to transition to electric buses. The Associated Students of the University of Montana purchased two zero-emission, battery-electric buses for its UDASH fleet in 2016. According to the Montana Department of Environmental Quality (DEQ), the Proterra buses improve air quality by reducing emissions by 1,392 tons during their 12-year lifespan. DEQ estimates that nearly 123,500 gallons of diesel fuel will not be burned as a result of the transition. These buses also eliminate 10 tons of nitrogen oxide and 250 pounds of diesel particulate matter. Proterra claims that operating a diesel bus costs $1.03 per mile, while its electric buses cost just $0.19 per mile.

The Missoula Urban Transportation District is in the process of replacing two of its Mountain Line diesel buses with electric buses. The Mountain Line buses will be in operation in 2018 or 2019. Park City, Utah, acquired six Proterra buses in 2016 with the assistance of Federal Transit Administration funding. Park City Transit recently received additional federal funding for another seven electric buses. It will be helpful to evaluate the performance of the Park City electric buses that operate in a mountain resort community similar to Whitefish.

Strategies and Actions

of a mobile app. The City can support this effort and help disseminate information about the app when it is available.

Strategy TL-3 Make Whitefish more bike and pedestrian friendly.

By making Whitefish more bike and pedestrian friendly the City reduces the need for people to drive. This reduces emissions while also providing health benefits to residents and visitors.

TL-3.1 Promote Implement actions in the City's bike and pedestrian master plan.

According to the 2017 Connect Whitefish Bike and Pedestrian Master Plan, the City has 41 miles of sidewalks, 13.6 miles of shared use paths, and 2 miles of bike lanes on City streets. The plan notes that key issues include connectivity of these bike and pedestrian facilities, safety, and wayfinding. The plan recommends both short-term and long-term improvements to the system. Upgrades to the system will result in increased use and a reduction in the number of vehicle trips.

TL-3.2 Partner with local groups and businesses to educate residents on bike safety.

Lack of knowledge on bike, pedestrian, and bus safety can make employees reluctant to use these commute methods. This is especially true in winter months, when inclement weather and cold temperatures can be intimidating and dangerous. The City can partner with local transportation groups and businesses to host workshops on these topics for City employees and residents. This would help individuals feel more comfortable using alternative transportation.

Success Story

BIKE PATHS
City of Whitefish

The City of Whitefish began building bike and pedestrian paths in earnest in the 1990s. The paths quickly became part of the fabric of the community, and many residents would have trouble imagining the town without them.

A cyclist cruises alongside the Whitefish River on the BNSF Railway Loop.
PHOTO: Connect Whitefish

To date Whitefish has built 13.6 miles of shared use bike and pedestrian paths, and three bike/pedestrian bridges. In addition, there are two miles of bike lanes on City streets and 41 miles of sidewalks. Bike and pedestrian facilities contribute to a more livable community, attract tourists, and increase property values. Additionally, walkable and bikeable communities have a number of health benefits.

According to the Montana Department of Health and Human Services, "Poor access to active transportation and recreation opportunities is putting America's youngest generation at risk for living shorter and less healthy lifespans than their parents' generation. At the same time, demand is on the rise for safer and more accessible communities to better serve people with disabilities and the growing numbers of seniors." [17]

TL-3.3 Implement a regular crosswalk and bike lane striping schedule.

Currently, crosswalks and bike lanes are not striped on a regular basis. It is difficult for users to determine where, or even if, there are lanes or crosswalks. Not only does this discourage the use of alternative transportation, it creates a dangerous environment for pedestrians and bikers. Implementing a regular schedule for striping these lines would foster safer roads and encourage alternative transportation.

TL-3.4 Publicize and enforce sidewalk snow clearing ordinance.

The City has an ordinance requiring residents to

Strategies and Actions

clear snow off their sidewalks. However, a lack of awareness and enforcement frequently allows snow to accumulate on sidewalks, creating dangerous or difficult scenarios for pedestrians. Often, pedestrians are forced to walk in the street to avoid snow pile-ups and icy spots. The City can increase enforcement of the snow clearing ordinance to create a safer and more hospitable environment for pedestrians in the winter.

TL-3.5 Create a City sidewalk repair and replacement program.

Dilapidated sidewalks can make walking difficult and dangerous, but repairs can be prohibitively expensive for homeowners. A sidewalk repair and replacement program can share the burden of these costs, while maintaining a walkable community. The City of Kalispell has a 50/50 Sidewalk Replacement program, in which residents can apply for funds from the City to split the cost of repairs. The repairs are performed by a local contractor through a competitive bidding process, further decreasing costs for the homeowner. A program of this nature can help ensure that Whitefish remains a walkable community by making sidewalk maintenance more affordable.

Strategy TL-4 Support more-efficient vehicles.

The City can reduce emissions by providing education, incentives, and support for hybrid and electric vehicles.

TL-4.1 Install electric charging stations and encourage them for new development.

Bloomberg News forecasts that electric vehicles will account for more than half of all new light-duty vehicle sales globally by 2040.[11] To adapt to this changing mode of transportation, businesses around the valley, including Xanterra and The Lodge at Whitefish Lake, have already installed charging facilities. The City can install electric vehicle (EV) charging stations in City facilities and encourage developers to add EV charging stations for new commercial and multi-family construction. This helps ensure that the City's transition to an electric vehicle economy occurs smoothly.

Success Story

ELECTRIC CAR CHARGING STATIONS IN THE FLATHEAD

Flathead Electric Cooperative

PHOTO: Flathead Electric Cooperative

In 2015, Flathead Electric Cooperative (FEC) installed Montana's first Chargepoint Vehicle Charging Station in the front parking lot of its Kalispell headquarters. The charging station is available for anyone to pull in and power up their electric vehicle. FEC hopes to install charging stations throughout the Valley. In January, 2018, FEC issued a call for local businesses that might be interested in hosting a charging station. According to the interactive mapping application PlugShare, there are three charging stations at businesses in Whitefish.

TL-4.2 Provide free EV charging.

By offering fee-free EV charging in the City's parking garage, the City can promote the use of electric vehicles and encourage users to walk around Whitefish's iconic downtown businesses.

Strategy TL-5 Adopt land use and transportation policies to reduce vehicle miles traveled.

The City's land use policies can help shape development that better accommodates non-motorized travel and is more resilient to a changing climate.

Strategies and Actions

TL-5.1 Plan for walkable communities through compact development and investment in pedestrian and bike facilities.

In addition to the recently adopted Connect Whitefish Bike and Pedestrian Master Plan, the City subdivision standards require the installation of sidewalks on both sides of new streets. There is also a cash in lieu of sidewalk provision that could provide funds to improve connectivity. Street and sidewalk standards can be reviewed to make sure they are consistent with walkability standards. The policy on use of cash in lieu of sidewalks fund should be clarified so funds are used to implement the Bike and Pedestrian Master Plan.

TL-5.2 Encourage mixed use developments.

The current zoning regulations allow mixed-uses with a PUD or in the WB-3 District (General Commercial District). Accessory apartments are allowed as conditional uses in the WB-2 and WB-1 Districts. Allowing accessory residential units on upper levels without a conditional use permit in WB-2 and WB-1 Districts may encourage more of these types of developments.

TL-5.3 Develop design standards to accommodate transit, car-sharing, and non-motorized travel.

The City parking regulations and design standards can be reviewed to provide for bicycle parking and drop-off zones for alternative forms of transportation. Missoula, Great Falls, and other cities in Montana have requirements in their zoning regulations to provide bike racks in addition to parking spaces. To promote public transit, car-sharing, ride services, and eventually autonomous vehicles, large retail and residential complexes should have drop-off zones. Providing such facilities may allow for a reduction in overall parking spaces.

TL-5.4 Increase the inventory of workforce housing to reduce local commutes.

The City of Whitefish recently adopted the Whitefish Strategic Housing Plan to address the needs of affordable workforce housing. In January, 2018, the City appointed a Whitefish Strategic Housing Plan Steering Committee to provide ongoing direction in implementing the plan. Among priority recommendations in the plan are to adopt mandatory inclusionary zoning and development of affordable housing on the City's snow lot near downtown. Overall the plan recommends that affordable housing be developed near employment centers, schools, and transit.

Reducing commute times can have a significant impact on reducing emissions. According to an employer survey that was conducted as part of the Whitefish Housing Needs Assessment, an average of 3,245 employees (56%) commute into the Whitefish area for work throughout the year. If workforce housing in Whitefish were provided for just 10% of these employees (324 employees), it would result in a reduction of 1,541,835 pounds of CO2 emissions each year and around $252,000 dollars in savings on gasoline for these employees. This amounts to a cumulative annual savings of about $1 million in operating costs of these commuters' vehicles.

TL-5.5 Promote infill development and redevelopment of brownfield sites.

The 2007 Whitefish Growth Policy contains a policy to promote infill development. Under that policy, rural lands surrounding the City will not be rezoned for residential or commercial development until at least half of the previously entitled dwelling units are actually constructed. This threshold has been met and the Growth Policy is more than 10 years old. The Growth Policy should be updated and infill policies should be evaluated at that time.

Brownfields include properties where expansion,

Strategies and Actions

redevelopment, or reuse may be complicated by the presence a hazardous substance, pollutant, or contaminant. Common brownfield sites are gas stations with leaking underground tanks, former industrial sites, dry cleaners, and sites adjacent to railroads. Cleaning up and reinvesting in these properties both improves and protects the environment and promotes infill development. Policies regarding brownfield redevelopment should be included in the Growth Policy update.

Reducing the amount of impervious surfaces in the City has a number of benefits, such as reducing the urban heat island effect, allowing water to infiltrate and recharge aquifers, and reducing the amount of stormwater runoff. Increasing green infrastructure is one way to reduce impervious surfaces.

Strategy TL-6 Reduce impervious surfaces and increase green infrastructure.

TL-6.1 Consider reducing the minimum parking requirements for new developments.

The City parking ordinance establishes the minimum number of parking spaces per type of use. As noted by the American Planning Association (APA), many cities and counties across the US have reevaluated their approaches to requiring off-street parking for all new land uses and development. Often, this has led to reducing or eliminating minimum requirements or other policy-driven parking policy reforms, including parking reductions for transit proximity or shared parking facilities. According to the APA, some cities have even established a maximum number of parking spaces. The City of Bozeman has land use regulations that provide flexibility in the number of spaces that are required.

TL-6.2 Map green infrastructure assets and integrate with stormwater planning.

The Green Infrastructure Center recommends inventorying green assets to identify opportunities for connecting habitats and for protecting or restoring important assets. The City has mapped wetlands, conveyances, and streams. Green infrastructure also includes woodlands, wildlife habitats, greenways, parks, and farms.

Planning for green infrastructure facilitates partnerships and a coordinated strategy to expand green assets in the community. Mapping these assets also allows the City to integrate green assets into planning for its stormwater system.

TL-6.3 Promote green infrastructure and alternative designs to reduce impervious surfaces.

The City can develop design guidelines and incentives to promote green infrastructure and alternative designs to reduce the amount of impervious surface in roads, parking areas, and on rooftops.

The City's public works standards and City codes regarding water quality contain many of the principals of low-impact development.
The City can support pilot projects that exceed minimum standards that can be models for how to incorporate low-impact design elements in new developments. For example, the Northern Plains Resource Council in Billings uses a permeable system for the parking lot that consists of a plastic mat with recycled glass cullet as the top layer. This permeable system allows storm water to soak into the ground instead of going into City storm sewers.

TL-6.4 Encourage the use of native and drought-resistant plants in landscaped areas.

As part of the design review process, the City can provide educational materials to developers

Strategies and Actions

regarding the use of native plants and drought-resistant plants. Including such educational materials on the City's website is another way to disseminate information. The Center for Sustainability and Entrepreneurship at Whitefish High School plans a xeroscaping demonstration project using native and drought-resistant plants. The City can also seek funding to create demonstration projects with native landscapes at City facilities and parks, and can develop a program to re-landscape grass with drought-tolerant plants. Educational and outreach efforts could include sponsoring a walking tour of successful projects in Whitefish.

Local Source for Native Plants

CENTER FOR NATIVE PLANTS

Staff at the Center for Native Plants in Whitefish collect thousands of seeds by hand from nearby hiking and biking areas. They then germinate these seeds and grow them into the native wildflowers, grasses, and shrubs that fill the nursery. Since the plants are adapted to our area they generally require less maintenance and water to thrive.

Native plants are a good choice for landscaping since they require less water and maintenance.
PHOTO: Unknown

Strategy TL-7 Integrate climate adaptation and mitigation measures into urban forest and City parks management.

The way the City manages its street trees and other landscaping can have an impact on the City's greenhouse gas emissions by providing shade, and reducing water use.

TL-7.1 Maximize shade canopy and green spaces to reduce urban heat island effect.

The subdivision ordinance requires the planting of street trees, (Section 12-4-22) and the City has a tree committee that provides advice and recommendations to the Park Board and City staff on matters related to the City's urban forest. Section 11-4-9 of the City code requires a tree preservation plan for new multi-family or commercial developments. The City can develop a design manual for tree preservation to encourage owners of single-family homes to voluntarily protect this resource. The Montana Department of Natural Resources (DNRC) estimates a single tree provides a benefit of $98 per year in energy savings, increased property values, and other benefits.[14]

TL-7.2 Prioritize the selection of drought- and heat-resistant tree species in City landscaping.

The City can use drought- and heat-resistant trees for streets and parks. These trees need less water and are better adapted to survive a hotter, drier climate. The Whitefish Tree Advisory Committee's list of suitable street trees should be reviewed to highlight drought- and heat-resistant trees and should include a diversity of species to reduce the risk of disease or insect damage. Also, the Montana Department of Natural Resources and Conservation's Urban and Community Forestry program provides education, technical assistance, and grants. It also has nursery stock to provide trees adapted to local climates to cities and organizations for conservation efforts.

Related Actions

- **Water and Wastewater Action 4.2** -The action to establish a plant nursery at the wastewater treatment facility described in the Water and Wastewater chapter would also support this strategy's goals of reducing water use and promoting urban forestry. The plant nursery would be irrigated with treated effluent that would otherwise be discharged into the Whitefish River, thereby reducing water consumption for irrigation and providing the City with a "water smart" source of trees and native plants.

Co-Benefits

Economic

- Bikeable/walkable communities attract businesses
- Low-Impact Development saves 20-30% in costs associated with site development
- The City and residents spend less on fuel and water
- Increased workforce housing
- Smart growth saves money on water, sewer, and road infrastructure
- Planting trees cuts energy consumption

Social

- Less traffic congestion
- Healthy population (more walking and biking + more breathable air)
- Shorter commute times
- Urban green spaces provide mental health benefits
- Less urban heat island effect

Environmental

- Reduced emissions from the City fleet
- A more drought-resilient community
- Better air quality
- Preservation of open space and wildlife habitat
- Reduced stormwater runoff

Students take a field trip using City sidewalks.
PHOTO: Whitefish School District

How Can I Make a Difference?

- Buy smart: Purchase a fuel-efficient, low-greenhouse-gas vehicle.
- Improve your fuel economy with better driving practices:
  - Avoid hard accelerations
  - Reduce time spent idling
  - Unload unnecessary items to reduce weight
- Take off removable roof racks when not in use to improve your fuel economy.
- Get regular tune-ups, follow the manufacturer's maintenance schedule, check your tires, and use the recommended grade of motor oil.
- Get out of the car by walking, bicycling, using public transportation, or telecommuting. Carpool more often.
- Plant shade trees around your home.
- Minimize paved surfaces so water can infiltrate and recharge aquifers.
- Plant native species of trees and plants, and leave some areas unmowed to increase habitat and water infiltration.

Parents join in the fun, participating with their kids in an organized Bike to School Day event.
PHOTO: Whitefish School District

Resources

To learn more about the topics discussed in this chapter, explore these helpful links:

- Whitefish Water Utility Plan (2006). See especially Water Conservation Tips, pp 2-10 – 2-12
- Whitefish Extension of Services Plan (2009) (http://bit.ly/2snLCck)
- Whitefish Lake Institute (http://www.whitefishlake.org/)
- Montana Source Water Protection Program (http://bit.ly/2EjMy7i)
- Rain Gardens by the Natural Resources Conservation Service Montana (http://bit.ly/2nWyuFx)

End Notes

[1] https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

[2] http://www.mdt.mt.gov/pubinvolve/stormwater/docs/ms4_program.pdf and http://www.lid-stormwater.net/background.htm

[3] https://www.arborday.org/programs/treecityusa/benefits.cfm and http://dnrc.mt.gov/divisions/forestry/forestry-assistance/urban-and-community-forestry

[5] https://www.fs.fed.us/sustainableoperations/documents/TheEcoDriversManual.pdf

[6] http://www.ecodriver.org/pages/Fuel-EfficientDriving.php

[7] http://www.ecodriver.org/pages/Fuel-EfficientDriving.php

[8] https://www.edf.org/climate/reports/idling

[9] http://dec.vermont.gov/air-quality/mobile-sources/be-idle-free and https://www.epa.gov/smartgrowth/our-built-and-natural-environments

[10] https://www.forbes.com/sites/constancedouris/2017/10/24/the-bottom-line-on-electric-cars-theyre-cheaper-to-own/#65352bbf10b6

[11] https://www.bloomberg.com/news/articles/2017-11-21/global-electric-car-sales-jump-63-percent-as-china-demand-surges

[12] Calculations based on full-time, year-round employees who commute 25 miles roundtrip. The average passenger car emits 0.81 pounds of CO2 per mile driven. http://css.umich.edu/factsheets/carbon-footprint-factsheet.

[13] https://www.planning.org/knowledgebase/parkingrequirements/

[14] http://dnrc.mt.gov/divisions/forestry/docs/assistance/urban/docs-urban-fact-sheets/montana-fact-sheet-whitefish.pdf

[17] http://dphhs.mt.gov/publichealth/NAPA/BACI.aspx#152361461-why-do-we-need-active-communities

The Whitefish Middle School bike racks are filled on Bike to School Day. The event is organized by Connect Whitefish, a volunteer group.

PHOTO: Unknown

WATER AND WASTEWATER

PHOTO: Brett Svetlik

Water and Wastewater

OVERVIEW

The water and wastewater treatment plants consume more energy than any other City operation, accounting for 42% of the City's total energy use in 2016. They also provide vital City services and face significant capacity issues as the community grows. Providing core services could become more challenging in an era of a warming climate due to seasonal drought, higher water demand, and increased risk from wildfire or aquatic invasive species to disrupt our water supply.

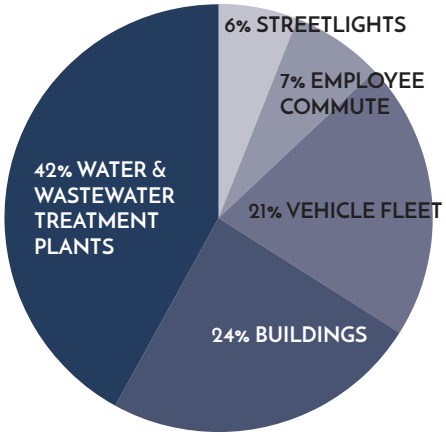


FIGURE 1. 2016 City of Whitefish Emissions by Sector.

WATER SYSTEM

The City of Whitefish relies entirely on surface water for its domestic supply, as do many residents around the shoreline of Whitefish Lake. The Public Works Department administers drinking water services known as the Public Water Supply. The Montana Source Water Protection Program (Montana Department of Environmental Quality, 1999) and the federal Safe Drinking Water Act (SDWA) require that municipalities conduct an assessment and provide a report to assist them in identifying potential contaminant sources and develop a plan to protect drinking water resources in the City of Whitefish. Because the City of Whitefish water supply comes from surface water, it is classified by the Montana Source Water Protection Program as highly sensitive to contamination.

In 2014, the City of Whitefish Public Water Supply served approximately 6,500 residents through more than 3,500 connections. The primary water source for the community is from perennial streams (Second Creek and Third Creek) within Haskill Basin north of the City of Whitefish. These streams supply between 1 and 3 million gallons per day, a rate that varies seasonally. Historically, the City used First Creek but that creek was abandoned in 1975 due to Escherichia coli (E. coli) contamination from sewage land application practices at Big Mountain Ski Resort. Channel alterations also led to bedload movement impacts to the intake device. With improved sanitary and land-use practices it may be possible to tap into First Creek again.

The Haskill Basin water source is augmented by Whitefish Lake water in summer during low flows and higher demand periods. Whitefish Lake water is sourced from an intake device located approximately 1,200 feet off Mountain Harbor in the southeastern part of the lake at a depth of 28-30 feet.

Second Creek and Third Creek supply about 90% of the total volume of water consumed by the City. Over the past 10 years, that number has

The City of Whitefish water supply comes from surface water, making it highly sensitive to contamination.

PHOTO: Steven Gnam, provided by The Trust for Public Land

Water is pumped out of Whitefish Lake in the summer when the Haskill Basin water source cannot meet peak demand.

PHOTO: Christopher Boyer, provided by The Trust for Public Land

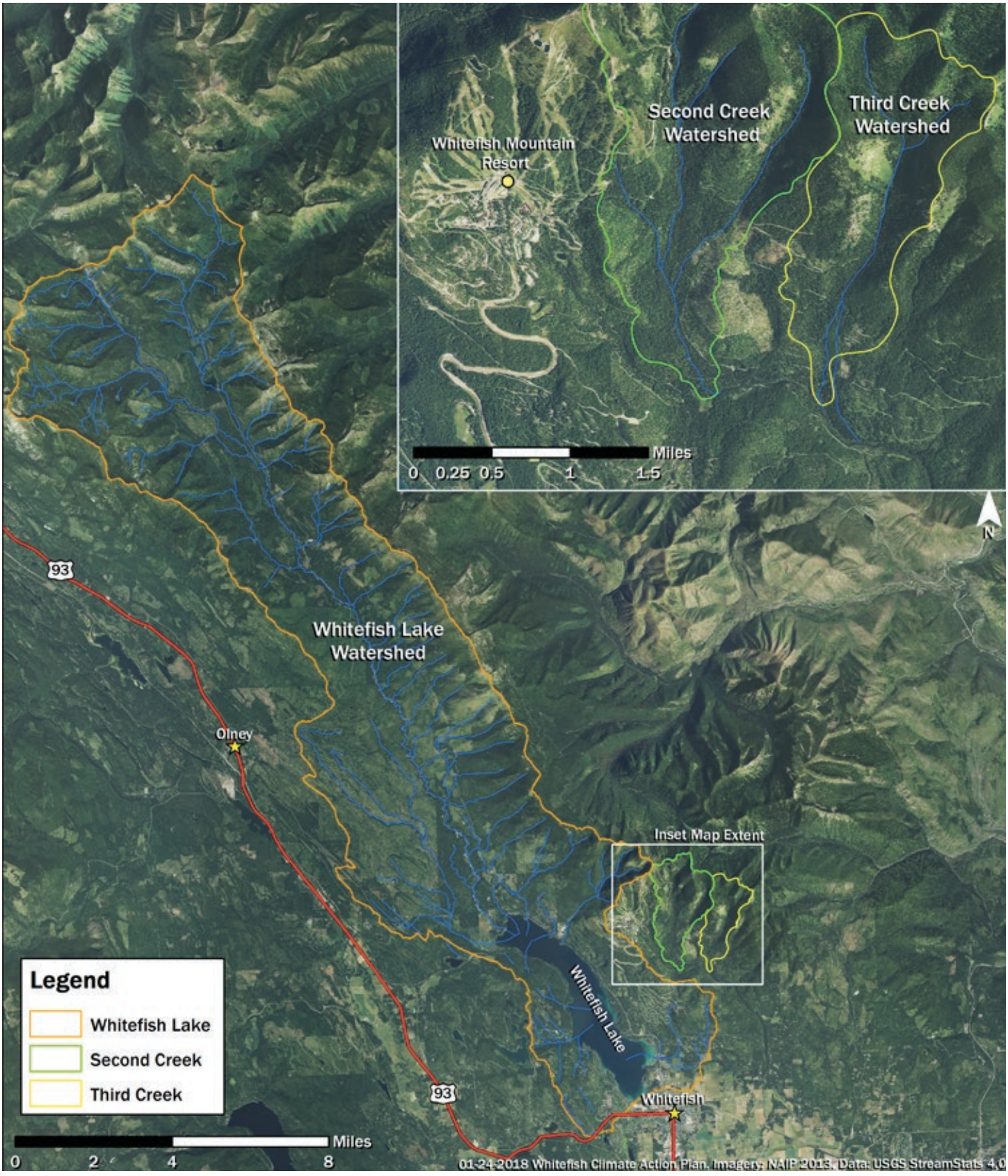


FIGURE 2. MAP OF WHITEFISH MUNICIPAL WATERSHEDS. Two tributaries to Haskill Creek provide most of the City's drinking water, supplemented by water pumped from Whitefish Lake during periods of low flow and peak demand.

Ice free conditions on Whitefish Lake have increased over time.
PHOTO: Gravity Shots

been as high as 97% and as low as 80% annually. In the summer months — June through August — the usage tends to be around 75%, which declines further in hot, dry years.

On the other side of the water supply equation, the system is losing a large volume of treated water before it gets to anyone's tap. In 2016 alone, 40% of water was lost, translating to 196,447,289 gallons of water wasted and a revenue loss of $770,073 (at the current rate of $3.92/1,000 gallons). This does not include the energy cost of treating and transporting the water. The source of the loss has not yet been discovered, although leaky underground pipes are likely a significant factor. It is possible that some of this lost water is delivered to unmetered users. As of Spring, 2018, an engineering consultant has been hired to determine the source and extent of leakage in the water distribution system. The consultant also is evaluating the optimal size and location for a new water storage tank on the south end of Whitefish to stabilize pressures in the system and provide additional storage during peak flow periods.

As described in the Forests and Watersheds chapter, a changing climate may adversely affect the City's water supplies through increased risk of catastrophic wildfire, summer "flash droughts," and flooding-induced soil erosion tied to extreme downpours and rain-on-snow weather events. The potential impact of these events on a secure water supply is greatest in Haskill Basin and to a lesser degree in Whitefish Lake. Warmer lake temperatures also create conditions favorable for aquatic invasive species (AIS), including dreissenid (zebra or quagga) mussels, to harm water quality, clog water intake pipes, or damage the water treatment plant.

To ensure the long-term resiliency of the Whitefish water supply, the community needs to prioritize a more-efficient water treatment and distribution system while encouraging stronger water conservation by users. Such strategies also will reduce costs to City residents and ratepayers and decrease energy use and greenhouse gas emissions. The City also should develop a rapid response plan should the two existing water sources become compromised, given the risk of wildfire and AIS to disrupt water service. The City should also investigate a tertiary source of drinking water.

WASTEWATER TREATMENT SYSTEM

The City's existing wastewater treatment plan does not meet current or anticipated future water quality standards for the discharge of treated effluent into the Whitefish River. Therefore, a new treatment plant is in the design phase and scheduled to go on line in 2021. The new

WATCHDOGS FOR WATER

Whitefish Lake Institute Staff, 2018: Mike Koopal, Lori Curtis, and Cynthia Ingelfinger

Founded in 2005, the Whitefish Lake Institute (WLI) gives Whitefish Lake a voice. Through the years, WLI, along with project partners, has amassed a solid baseline understanding of the water quality and ecology of Whitefish Lake and local streams. Through WLI's long-term trend analysis and reporting, resource management agencies, including the City of Whitefish, can make informed decisions to protect our aquatic resources. WLI also provides public education about the resource and about stewardship initiatives aimed at its protection.

Climate change will significantly alter the long-term physical, chemical, and biological conditions of watersheds. For lakes, we can expect climate change to influence the amount and duration of ice cover, cause an increased heat budget leading to amplified thermal stratification, increase evaporative rates that decrease lake elevation, and create conditions favorable to aquatic invasive species. As a result there will be a shift in the food web and water quality will suffer.

Beyond long-term monitoring and scientific research, WLI has spearheaded, facilitated, or advised many other projects that create water quality resilience aimed at protecting public health and the local economy. In the era of climate change, our community will need creative solutions and partnerships to protect our iconic backyard lake.

mechanical treatment plant, generally described as a sequencing batch reactor (SBR), will meet effluent discharge requirements, provide for future community growth, and reduce potential for odor generation.

At full design capacity, projected to be in 2038, the new plant is expected to use about three times as much energy as the existing plant, which used about 912,040 kWh during FY2016. The new SBR plant is expected to use about 2,519,544 kWh per year by 2038, at an estimated power cost of about $251,955. When the plant is initially put into operation it will require substantially less power.

All opportunities for conserving power in the new plant are being evaluated during the design phase, and energy conservation equipment and processes will be preferred during the contractor selection process. The proposed SBR facility will use a biological nutrient removal process for nitrogen and phosphorus, which eliminates the need for most chemicals. Energy requirements for the production and delivery of chemicals will be significantly reduced with the new plant.

To mitigate the climate impacts of a more energy-intensive treatment plant, the City is investigating the feasibility of installing a large solar photo-voltaic system on site at the wastewater treatment plant. Potential also exists to generate hydropower by capturing the flow energy of raw wastewater from the Big Mountain sewer district, although engineering and cost issues will need to be addressed.

The footprint of the new plant will be reduced from that of the existing facility. Almost 10 acres of land currently used for treatment lagoons will be available for other uses. In addition to a solar array, other potential uses include a City composting system for leaves and food waste and a tree and native plant nursery. The nursery could be irrigated with treated effluent, thus reducing the overall daily nutrient loads discharged into the river. The new treatment plant design will also provide a site and some infrastructure for a future biosolids composting operation.

Whitefish Lake as viewed from Lion Mountain.

PHOTO: Gravity Shots

Progress to Date

- **HASKILL CONSERVATION EASEMENT:** As described in the Forests and Watersheds chapter, in 2015 a comprehensive conservation easement in Haskill Basin was secured by the City and other partners from F.H. Stoltze Land and Lumber Company. The agreement included the purchase of discounted development rights from Stoltze to protect the forested watershed that supplies City water, and it guarantees City use and access to drinking water infrastructure in the basin.
- **UPDATED WATER RIGHTS:** In 2015, the City of Whitefish received updated water rights allowances that will allow its municipal water system to serve approximately double its current population.
- **PROPOSALS FOR NEW WASTEWATER TREATMENT PLANT:** The City is designing a new wastewater treatment plant that includes provisions to maximize energy efficiency, develop a solar array to mitigate energy use, and provide space for composting operations and a future plant nursery that would use treated effluent for irrigation.[2]
- **WATER TREATMENT PLANT ENERGY SAVINGS:** In 2015, the City retrofitted the heating and cooling systems at the water treatment plant by installing variable frequency fan drives, reducing energy requirements and emissions, and saving tens of thousands of dollars in reduced electricity and natural gas consumption.
- **UPDATED IRRIGATION WATER RATES:** The City modified water rates for irrigation meters in 2016 to encourage greater conservation.
- **REPAIRS TO SEWER LINES AND MANHOLES:** Infiltration and inflow of clear water into the system has been reduced.
- **REPLACEMENT OF WATER MAINS:** Ongoing work has begun to reduce the substantial loss of treated water through underground leaks before it is delivered to homes and businesses.[3]

Goals & Indicators

Goals

- A clean, healthy, and secure drinking water supply.
- Energy- and cost-efficient water and wastewater treatment plants, including collection and distribution systems.

Potential Indicators

- Water chemistry that meets drinking water standards.
- Wastewater discharge that complies with state and federal pollution standards.
- Energy use and expenditures at the water and wastewater treatment plants.
- Water loss rates as indicated by gallons treated minus gallons delivered to metered systems.

Strategies and Actions

Strategy WW-1 Increase resilience and optimization of the Whitefish drinking water supply.	
WW-1.1	Update the 2006 Whitefish Water Utility Plan.
WW-1.2	Incorporate climate action plan objectives and strategies into an update of the 2009 Extension of Services Plan.
Strategy WW-2 Expand water conservation practices by the City and the community.	
WW-2.1	Expand Smart Metering in municipal infrastructure.
WW-2.2	Optimize irrigation practices in City operations.
WW-2.3	Support community initiatives to collect rain water, develop rain gardens, and use gray water for landscaping.
WW-2.4	Provide education and outreach on water conservation.
Strategy WW-3 Minimize energy use at the wastewater treatment plant.	
WW-3.1	Use energy-efficient technologies at the new wastewater treatment plant.
WW-3.2	Minimize groundwater inflow from residential sump pumps tied into the sanitary sewer system.
WW-3.3	Continue to implement measures to reduce groundwater infiltration and inflow to the sanitary wastewater system.
Strategy WW-4 Offset wastewater treatment plant energy use and emissions.	
WW-4.1	Install a 1.7 MW solar PV system on site at the wastewater treatment plant.
WW-4.2	Investigate establishing a plant nursery or tree plantation at the wastewater plant in partnership with a local business or non-profit organization.
WW-4.3	Consider a geothermal heat pump system using the heat from effluent to heat the administrative building.

Strategy WW-1 Increase resilience and optimization of the Whitefish drinking water supply.

Community growth and increasing frequency of summer drought conditions will place new stresses on the municipal water system. There are a number of engineered solutions at the water treatment plant that can minimize potential water shortages, meet future consumption needs, and protect other beneficial uses, such as native fish in Haskill Creek. These measures should be evaluated as part of a revision of the 2006 Water Utilities Plan. Municipal use of surface water depends on maintaining a healthy watershed. Natural events that can jeopardize water supplies from Haskill Basin and Whitefish Lake are more likely to occur as the climate warms and weather becomes more volatile. The Forests and Watersheds chapter includes strategies to reduce these vulnerabilities in municipal watersheds. However, given the risk of wildfire and aquatic invasive species to disrupt a vital City service, the City also should investigate a tertiary source of drinking water.

WW-1.1 Update the 2006 Whitefish Water Utility Plan.

Develop and implement strategies to address climate-related risks, ensure adequate water supplies for a growing population, optimize efficient use of water, energy and money, and protect beneficial uses and water quality in Haskill Creek, Viking Creek, and Whitefish Lake. These strategies should be considered and deployed as appropriate:

- Expand water storage capacity on the south side of Whitefish or at the treatment plant.
- Install radio telemetry to control headgates at the Haskill Basin diversion structures.
- Manage inflow and outflow from the reservoir at the treatment plant to optimize usable volumes and reduce water spilled into Viking Creek.
- Reduce evaporation from the reservoir at the treatment plant by using evaporative control measures such as shade balls or floating covers.

Strategies and Actions

- Determine whether moving the water intake pipe to a deeper portion of the lake would provide better water-quality parameters that could reduce the cost of treating the lake water.
- Install variable frequency drive technology on the secondary large pump at Whitefish Lake to reduce energy costs and reduce reservoir overflows, thus reducing the amount of water that must be pumped from Whitefish Lake.
- Develop and implement measures to expand system capacity, prioritizing actions to meet water storage needs and reduce water loss in the distribution system.
- Evaluate costs, benefits, and potential environmental impacts of bringing First Creek back on line to mitigate potential events such as wildfire, drought, earthquakes, landslides, and pollution.
- Conduct a feasibility study regarding costs, benefits, and energy requirements for a groundwater well located above the water treatment plant as a tertiary source of drinking water.
- Design a settlement pond above the current pre-treatment reservoir that would help reduce turbidity if Haskill Basin is impacted by a wildfire or other soil-mobilizing event.
- Develop a rapid response plan to potential introduction of dreissenid (zebra or quagga) mussels to Whitefish Lake.
- Determine current water quality conditions seasonally in the drinking water reservoir using vertical profile sampling to inform water management decisions.

WW-1.2 Incorporate climate action plan objectives and strategies into an update of the 2009 Extension of Services Plan.

Address future water storage and fire flow capacity needs that are projected to increase with warmer, drier summers.

As water supplies are stressed by population growth and climate change, particularly during hot and dry summers, water conservation needs to become a community priority. Practices that reduce water consumption minimize costs to City residents and ratepayers, reduce energy use and emissions, and keep water in our lake and streams for aquatic ecosystems.

Strategy WW-2 Expand water conservation practices by the City and the community.

WW-2.1 Expand Smart Metering in municipal infrastructure.

Consider upgrading to a fixed-base, remote meter reading system to reduce operating expenses, increase profitability, and create a more sustainable utility network. A fixed-base system will provide hourly metering data with detailed consumption information, capitalizing on the water meter upgrades that have taken place over the past decade. These upgrades have been successful in converting about 90% of the city to smart meters, or meters capable of automatic meter reading. The next step is to truly automate this data collection with a fixed-base system. Doing so will further support conservation efforts, help staff to address high water bill complaints, and provide leak, tamper, and reverse flow data.

WW-2.2 Optimize irrigation practices in City operations.

Incorporate drip systems and automatic timers on City-managed lands, parks, and rights of way. Investigate the feasibility of using treated effluent from the Whitefish Wastewater Treatment Plant at strategic locations like Highway 93 South or along the bike and pedestrian trail on the Whitefish River.

Conserving Water to Save Money and Energy

The forecast for the Flathead's climate future calls for an increasing likelihood of hot and dry summers compared to the historical average. That has big implications for Whitefish water users, who have long taken for granted our abundant supply of clean drinking water. Those impacts are likely to include increased cost to ratepayers, a higher energy footprint to deliver drinking water, and possible water production shortages in late summer months.

In a relatively wet year, the City of Whitefish gets up to 90 percent of its annual water supply from Second and Third Creeks in Haskill Basin. Hotter, drier summers means increasing water demand from irrigators even as the creeks in Haskill Basin flow lower than normal. To supplement its water supply, Whitefish pumps additional water as needed from Whitefish Lake.

The process of pumping from Whitefish Lake is energy-intensive and increases the cost of producing treated water by 130%. The year 2016 was a fairly typical summer by historical measures of precipitation, and the percentage of water pumped out of the lake in August and September was relatively low, around 12% percent. However, in dry years such as 2015 and 2017, which appear to represent the new climate trend, the City pumped as much as 40% from Whitefish Lake during late summer.

The electricity cost for pumping water from Whitefish Lake during a typical summer (June-September 2016) totaled $23,688, compared to nearly triple that, $65,737, during a drier summer (2015).

Water conservation practices by the City of Whitefish and its residents will save money and reduce energy emissions, especially in dry years. They may also forestall the need to impose water use restrictions when the treatment plant is at full capacity and demand is high.

To reduce the prospect of water rationing, the Public Works Department is in the process of adding a water storage tank on the south end of the City. The additional storage will help maintain pressure and provide increased capacity to supplement the system during peak use hours and for fire emergencies.

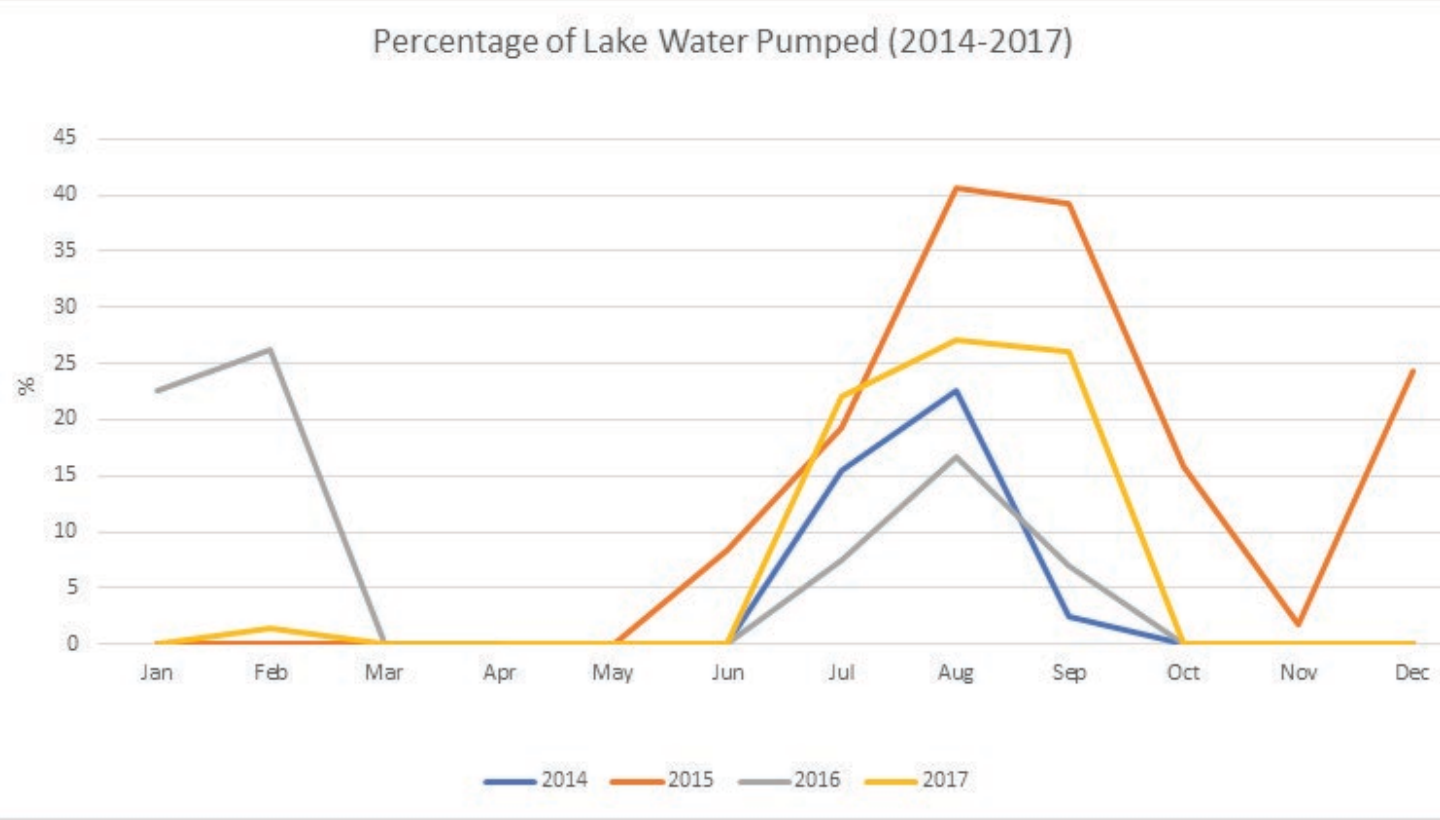


FIGURE 3. MUNICIPAL CONSUMPTIVE USE OF WHITEFISH LAKE. The City must pump more water out of Whitefish Lake during hot, dry summers, such as 2015 and 2017, due to lower flows in Haskill Basin and higher demand from water users.

Strategies and Actions

WW-2.3 Support community initiatives to collect rain water, develop rain gardens, and use gray water for landscaping.

Review City planning and zoning regulations and building codes to identify and remove any obstacles to water conservation and reutilization.

WW-2.4 Provide education and outreach on water conservation.

Develop a public outreach campaign about the rationale and benefits of water conservation. Provide robust user data to residential ratepayers in water utility bills to show comparative use data by month, year, and in neighborhoods.

Related Actions

- **Transportation and Land Use Action 6.4** - Encouraging the use of native and drought-resistant plants in landscaped areas also supports this strategy's goal of conserving water.

Strategy WW-3 Minimize energy use at the wastewater treatment plant.

Update the Wastewater Utility Plan for the new treatment plant to prioritize energy-efficient technologies and reduce treatment of stormwater and groundwater.

WW-3.1 Use energy-efficient technologies at the new wastewater treatment plant.

Work with Bonneville Power Administration (BPA) and the City's consultants to select energy-efficient technology, such as blowers and variable frequency drives. Use BPA's Energy Smart Industrial program resources. Apply for the BPA Incentive Energy Savings program to help fund more-efficient technology. Train employees on optimum operation of the new facility and energy conservation.

Priority Action

FIND LEAKS AND REPLACE OLD PIPES
City of Whitefish

PHOTO: City of Whitefish

The City's 2006 Water Utility Plan calls for boosting leak detection and repairs of its aging underground network of water mains and distribution lines. At the time, an estimated 16.5 percent of treated water was lost through underground leaks. Ten years later, loss rates soared to an estimated 40 percent.

In 2017 the City replaced a significant portion of old cast-iron water mains, a program that will continue for several years. Initial results indicate that water loss has begun to decline.

"Our water loss rate is still much higher than we would like, but this is a step in the right direction," said Neil DeZort, Utility Operations Supervisor. "Replacing these old mains is a high priority."

The Public Works Department plans to recommend expanded leak-detection efforts and additional cast iron water main replacement in the FY 2019 Budget.

WW-3.2 Minimize groundwater inflow from residential sump pumps tied into the sanitary sewer system.

Help homeowners develop alternatives for pumping wet basements. Educate homeowners about the legal prohibition against tying sump pumps into the sewer system and consider stronger enforcement measures.

Strategies and Actions

WW-3.3 Continue to implement measures to reduce groundwater infiltration and inflow to the sanitary wastewater system.

Since 2011 the City has invested in repair work to fix leaking pipes and manholes to reduce infiltration and inflow of clear water into the sewer system. It should be a priority to continue finding and fixing these leaks in the aging pipe network. Overall plant operation will function more efficiently without excess clear water in the waste stream.

Strategy WW-4 Offset wastewater treatment plant energy use and emissions.

The new wastewater treatment plant will require more energy to operate than the current system. These energy demands can be offset with renewable energy produced by the City or through carbon sequestration projects.

WW-4.1 Install a 1.7 MW solar PV system on site at the wastewater treatment plant.

Determine feasibility, funding, and an implementation schedule in consultation with Flathead Electric Cooperative, Bonneville Power Administration, and the National Renewable Energy Laboratory. An initial feasibility study conducted for this plan indicates the solar array would pay for itself by 2041.

WW-4.2 Investigate establishing a plant nursery or tree plantation at the wastewater plant in partnership with a local business or non-profit organization.

A tree plantation would provide tertiary treatment of wastewater and offset carbon emissions by sequestering carbon in biomass. The City could provide a business low-cost or no-cost use of land adjacent to the wastewater plant, as well as supply irrigation water from the plant's treated effluent. Nursery stock could then be used for City purposes, such as urban forestry or riparian restoration. This could include managing an urban composting and leaf utilization system to enrich soils on site and to produce soil supplements for off-site uses or sale.

WW-4.3 Consider a geothermal heat pump system using the heat from effluent to heat the administrative building.

The temperature of treated effluent is warmer than river temperatures when it is discharged into the Whitefish River. A geothermal heat pump system would capture some of that energy for productive uses while improving the river's thermal quality.

Related Actions

- **Consumption, Food, and Waste Action 3.4** – Establishing a City composting system or leaf repository at the new wastewater treatment plant supports this chapter's Action 4.2 to establish a plant nursery at the facility by improving site drainage, water infiltration, and the quality of the clay soils.

Solar Farm for the Whitefish Wastewater Treatment Plant

To meet Montana's water quality laws and accommodate a growing population, the City of Whitefish is designing a new wastewater treatment plant, scheduled to go on line in 2021. Unfortunately for the City's budget and energy footprint, the sequencing batch reactor system being designed for the new plant will require three times as much energy as the present system.

The solution: Offset energy use with a solar farm on the 85-acre grounds of the wastewater treatment plant.

Electrical consumption for the plant at full flow is projected to average 2,520,000 kWh per year, which would cost $252,000 annually. To fully offset that energy use with an on-site solar farm, the City is exploring construction of a 1.76 Megawatt (MW) solar farm that would deliver 2,170,000 kWh annually. This would require more than 5,000 340-watt solar panels and could be located on 7 to 9 acres at the north end of the treatment plant site.

The proposed solar farm would be integrated into the local and regional power grid operated by Flathead Electric Cooperative and Bonneville Power Administration. A preliminary cost analysis estimates it would cost up to $5 million to build and operate, an expense that would be paid off through energy savings in approximately 20 years.

With a projected operational life of 30-40 years, the solar farm would essentially provide free, clean, and locally produced power beginning in 2041.

FIGURE 4. PRELIMINARY SITE DESIGN OF NEW WHITEFISH WASTEWATER TREATMENT PLANT. Showing proposed 1.7 MW solar farm (blue). Courtesy Anderson-Montgomery Consulting Engineers and Aeon Renewable Energy.

Co-Benefits

Economic

Water conservation saves on energy used to pump water out of Whitefish Lake

Reducing sump pump connections to the sewer system reduces capacity requirements for the new wastewater plant and reduces energy costs for treatment

A tree nursery at the wastewater plant would use available land, support a local business, and reduce City costs for nursery stock

Social

Clean water is essential for public health

Water conservation helps maintain Whitefish Lake levels for boat-dock owners and other users

Environmental

The new wastewater plant will reduce nutrient discharges into the Whitefish River, improving water quality

A tree nursery at the wastewater plant would provide tertiary treatment of wastewater and sequester carbon in biomass

Water conservation keeps water in creeks and lakes for fish and other species

Winter Monitoring of Whitefish Lake.
PHOTO: Whitefish Lake Institute

How Can I Make a Difference?

- Do not drain sump pumps into the sanitary sewer system.
- Fix all plumbing leaks.
- Turn off household faucets when not directly in use, such as while brushing teeth.
- Landscape with materials that don't require water, and choose grass, shrubs, and trees that need the least amount of watering.
- Water your lawn in early morning or overnight to reduce evaporative loss.
- Use irrigation systems that don't directly water onto streets, sidewalks, and driveways.
- Water lawns no more than three times a week to encourage deep root growth and improve drought tolerance.

Resources

To learn more about the topics discussed in this chapter, explore these helpful links:

- Whitefish Water Utility Plan (2006). See especially Water Conservation Tips, pp 2-10 – 2-12
- Whitefish Extension of Services Plan (2009) (http://bit.ly/2snLCck)
- Whitefish Lake Institute (http://www.whitefishlake.org/)
- Montana Source Water Protection Program (http://bit.ly/2EjMy7i)
- Rain Gardens by the Natural Resources Conservation Service Montana (http://bit.ly/2nWyuFx)

End Notes

[1] Whitlock C, Cross W, Maxwell B, Silverman N, Wade AA, 2017. 2017 Montana Climate Assessment, Bozeman and Missoula MT, Montana State University and University of Montana, Montana Institute on Ecosystems. 318 p doi: 10-15788/m2ww8w, accessed February 1, 2018, http://montanaclimate.org/

[2] Anderson-Montgomery Consulting Engineers, 2016 Wastewater System Improvement Project Preliminary Engineering Report

[3] Progress-to-date information provided by City of Whitefish Public Works Department staff, personal communications.

[4] Whitlock, C, Jencso, K, and Silverman, N, Sept. 15, 2017. Guest column in the Helena Independent-Record, "Wildfires, the smoking gun of western climate change?" http://helenair.com/opinion/columnists/wildfires-the-smoking-gun-of-western-climate-change/article_9317a04e-a37c-58e7-8a9a-ab97878807e9.html

[5] Preliminary cost analysis, January 2018, Prepared by Aeon Renewable Energy

FORESTS AND WATERSHEDS

PHOTO: Gravity Shots

Forests and Watersheds

OVERVIEW

The forested hills surrounding Whitefish are integral to our town's identity as a mountain community and recreation wonderland. They also may harbor the greatest threat that climate change poses to our community: wildfire. Fire is a natural and necessary part of our ecosystem, but wise stewardship is critical to reduce risk to human communities and to offset local emissions that contribute to global climate change. We can strengthen our ability to become a fire-adapted community by maintaining well-managed natural forests across mixed ownerships and avoiding increased residential development in the forested wildland-urban interface.

Forests are key features in our watersheds, areas of land that capture, store, and release water downstream. Climate projections for northwest Montana indicate changes are coming to our watersheds. According to the Montana Climate Assessment (2017)[1], the Whitefish basins will experience additional days with temperatures above freezing. These warmer temperatures will increase the frequency of rain-on-snow events, creating the potential for more-frequent large floods. Since a larger percentage of water will leave high elevations during the winter and early spring through melt or rain events, less water will be available to support streamflows during summer and early fall. Meanwhile, recent trends and future projections of hotter, drier summers indicate increased frequency of "flash droughts," which produce parched soil and fire-fuel conditions even during years of normal winter and spring precipitation. The net effect will reduce late-summer streamflows in Haskill Basin, which provides most of the Whitefish water supply.

The potential for short-term drought in late summer also corresponds with the greatest evaporative loss and highest consumptive water demand on Whitefish Lake. This leads to lower water elevations for Whitefish Lake. Lower lake elevations will expose more shoreline, increase the potential for nutrient suspension, decrease aquatic habitat, affect native species, and pose problems to recreationalists and landowners attempting to access boat slips in shallow water. The tributaries to the lake and Whitefish River will also see changes that could affect native fisheries. Lower flows lead to higher lake temperatures that allow aquatic invasive species to gain a foothold. Lower flows and higher temperatures can block the migration of fish through a watershed.

This chapter provides strategies to protect water quality and forest ecosystems in a changing climate.

With hotter and drier summers, more fire is in our future.

PHOTO: USDA Photo by Lance Cheung

Late-summer streamflows in Haskill Basin are projected to decrease with changes in our climate.

PHOTO: Steven Gnam

Flash droughts in summer lower Whitefish Lake water elevations.

PHOTO: Gravity Shots

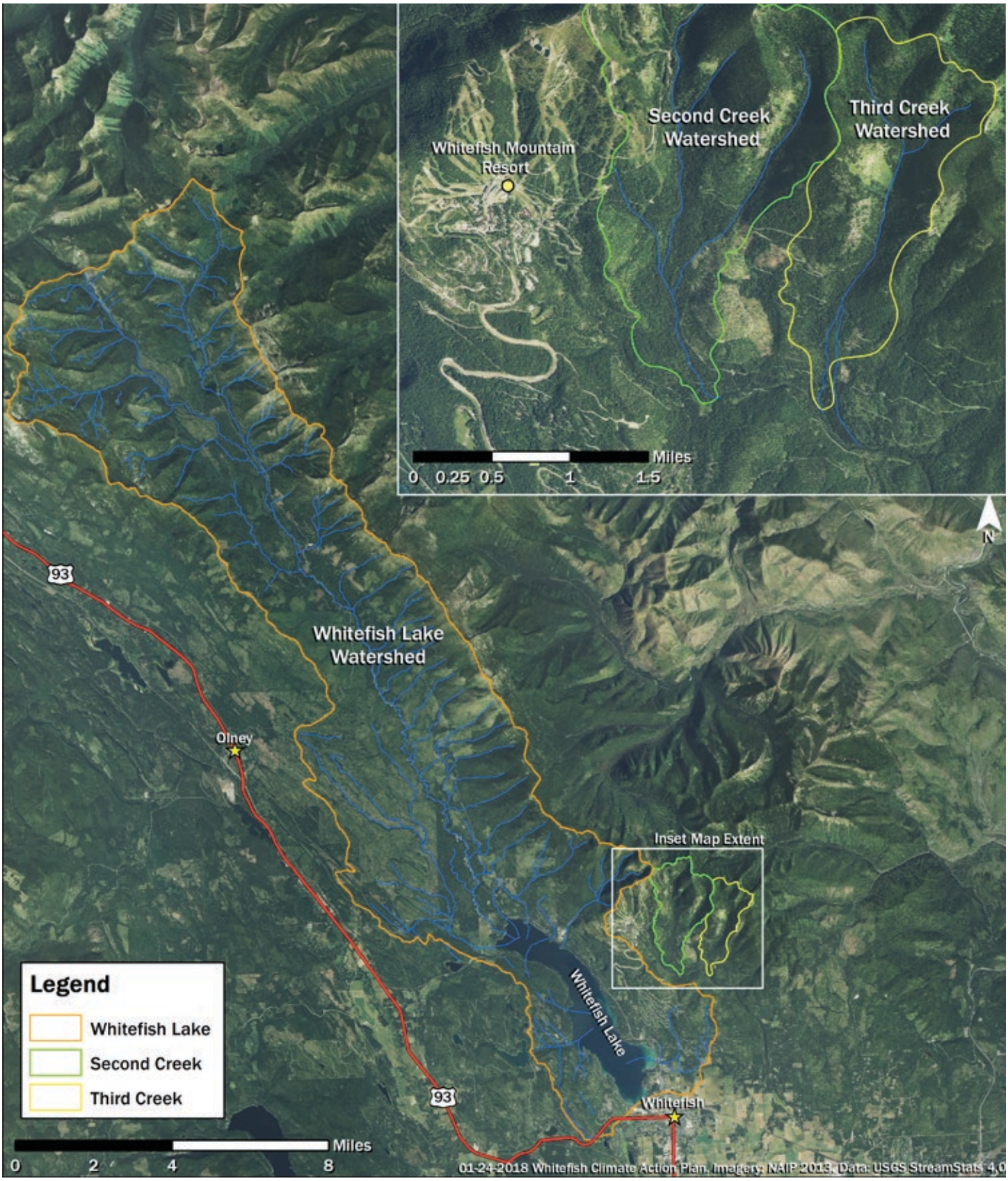


FIGURE 1. MAP OF WHITEFISH MUNICIPAL WATERSHEDS. Climate change is projected to increase wildfire risk, reduce late-summer streamflows, and lower lake levels in watersheds that supply Whitefish drinking water.

Progress to Date

- **AQUATIC INVASIVE SPECIES PREVENTION:** The City of Whitefish, the Whitefish Lake Institute, and other partners have implemented strong measures to prevent the introduction of aquatic invasive species into Whitefish Lake.
- **HASKILL CONSERVATION EASEMENT:** In cooperation with state and federal governments, F.H. Stoltze Land and Lumber Company, and private conservation organizations, especially The Trust for Public Land, Whitefish voters approved a $7.7 million resort tax increase to permanently conserve more than 3,000 acres of sustainably-managed forests in Haskill Basin owned by Stoltze.
- **WHITEFISH LAKE HEADWATERS CONSERVATION EASEMENT:** The Trust for Public Land, in partnership with the Montana Department of Natural Resources and Conservation and Montana Fish, Wildlife, and Parks, and with the support of the City of Whitefish, has completed a large conservation acquisition with Weyerhaeuser to permanently conserve more than 10,000 acres of private forest land in the headwaters of Whitefish Lake. The Trust for Public Land and partners continue to work to conserve an additional 3,000 acres in the watershed.
- **FIREWISE CERTIFICATION:** Whitefish-area landowners, including six neighborhoods, have developed and implemented strategies to reduce the risk of catastrophic wildfire through certification in the Firewise program of the National Fire Protection Association. Those neighborhoods are Grouse Mountain, Suncrest, Lion Mountain, Wolftail Pines, Elkhorn, and Big Mountain Fire District.
- **WHITEFISH AREA FIRE SAFE COUNCIL:** Private landowners, with the support of the Whitefish Fire Department and state and federal forest management agencies, established the Whitefish Area Fire Safe Council to educate other landowners about ways to reduce wildfire risk in rural neighborhoods.

Goals & Indicators

Goals

- Become a fire-adapted community.
- Protect municipal watersheds that provide the Whitefish water supply.
- Sequester carbon through land management and soil conservation strategies.

Potential Indicators

- Structures lost to wildfire.
- Expenditures for fire-adaptation compared to wildfire suppression measures.
- Avoided loss of stored carbon in forested watersheds measured in tons of carbon and acres of natural forest conserved.
- Whitefish Lake water quality parameters.
- Stream miles and acres of wetland and watershed restored to healthy condition.

Climate Solutions Abound in Haskill Basin

Whitefish Mayor John Muhlfeld, left, and the late Alex Diekmann were the masterminds of the Haskill Basin Conservation Project

PHOTO: Courtesy of John Muhlfeld

It was an old neighborly accommodation that worked. But Whitefish leaders had long known that they should formalize the City's legal right to divert water on private land and run it through a network of pipes to supply the growing community's demand for water. The complications were many and the price tag considerable, so it remained on the to-do list for years.

That changed in 2013 when two factors made it a front-burner priority. First, the real estate market was rebounding from the economic downturn and the Stoltze family was seriously considering selling high-amenity lands for development. More importantly, however, Whitefish Mayor John Muhlfeld formed a brotherly bond with Alex Diekmann, a Bozeman-based project manager for The Trust for Public Land.

Together, Muhlfeld and Diekmann combined their talent, passion, and ingenuity to craft a highly ambitious strategy to protect Haskill Basin forever. And in that they found a ready partner in Chuck Roady, general manager for the F.H. Stoltze Land and Lumber Company.

"You really could build homes everywhere up here, and we don't want to do that," Roady told a reporter in 2013. "We want to grow trees."[9] The three men came up with a plan to retire the development rights, guarantee permanent public access, maintain timber jobs, and validate the City's right to convey clean water from basin to town.

"There were a lot of bumps and complications along the way," Muhlfeld said recently. "But what made it work was Alex Diekmann. Chuck trusted Alex all the way and so did I. Each time, Alex found a solution to keep the deal on track."

And it was a complicated deal. In addition to the Stoltze family, which discounted the appraised value by $4 million, the project received millions of federal conservation dollars for forest and wildlife protection. The clincher, however, was passage of a $7.7 million bond, overwhelmingly supported by 84 percent of Whitefish voters, that increased local taxes to protect the municipal watershed.

On February 1, 2016, the City Council passed the final resolution to close the deal. But it was a bittersweet moment. That same day Alex Diekmann died after battling cancer for more than a year, even while shepherding the project through the final stages. With a catch in his throat, the mayor announced Diekmann's death before the final vote. "Please keep Alex forever in your thoughts when your footsteps carry you through the lands he helped us protect," Muhlfeld said.

Conserving Haskill Basin is a particularly important achievement in an era of warming temperatures and climate disruptions. This legacy will help buffer the impacts of climate change while reducing local emissions of the greenhouse gases that are heating the planet like a down blanket.

Tony Vorster, a forest researcher at Colorado State University, has studied the forest carbon implications of protecting 3,020 acres in Haskill Basin. A well-managed natural forest retains large amounts of carbon in trees and soil. Much of that carbon is removed when forests are scraped for rural home sites and roads. Vorster utilized historic and recent aerial photos, satellite imagery, and GIS analysis to estimate the avoided loss of above-ground forest carbon from protecting Haskill Basin.

By comparing the Stoltze forest to surrounding subdivisions, Vorster calculated the amount of forest carbon currently on the landscape compared to the most likely development scenario. "The difference in above-ground forest carbon that remains on the landscape is roughly 10,000 metric tons," Vorster said. That's equivalent to 36,677 tons of carbon dioxide, or 92 train cars of coal, or nearly 10 years of emissions from City of Whitefish municipal operations.

Mayor Muhlfeld, a hydrologist by profession, ticks off several other climate benefits of the Haskill Basin conservation deal:

- **MANAGING WILDFIRE RISK:** Building upon their successful working relationship, the City, Stoltze, and other partners have collaborated with the US Forest Service on a fuels management project in the basin to reduce the risk of catastrophic wildfire in an era of hotter, drier summers.
- **WINTER RECREATION:** Even at its lower reaches, Haskill Basin attracts and retains deep snowpack while other low-elevation areas experience sketchy snow years. A ridge on the southern edge of the basin protects a reliable snow basket in a lush cedar forest. That's good for the throngs of Nordic skiers who currently access many miles of groomed trails in the basin.
- **RELIABLE WATER SUPPLY:** Much of the western US is projected to experience more drought conditions even as demand for clean water increases. The same is true for Whitefish. Maintaining a natural, healthy forest in Haskill Basin, the source of 75 percent of the City's drinking water, will yield the gift that keeps on giving.

"This is a legacy project that will give back to the Whitefish community for generations to come," Muhlfeld said.

Plausible Scenarios for Whitefish Water

WHAT HAPPENS IF YOUR WATERSHED BURNS AND INVASIVE SPECIES CLOG YOUR PIPES?

A wildfire in Haskill Basin could threaten the City's drinking water supply.

PHOTO: U.S. Department of the Interior

Zebra mussel infestation results in blockage or reduced flow in pipes and water intake systems, leading to adverse long-term economic impacts.

PHOTO: Environmental Science & Engineering Magazine (2016)

Fire in Haskill Basin

In 2003, wildfire broke out in the Myrtle Creek watershed outside of Bonners Ferry, Idaho. The blaze grew quickly to engulf 3,600 acres of forest in the steep valley. Downstream, the water supply for more than 2,500 people was at risk. Myrtle Creek is the primary water source for the City of Bonners Ferry, which was forced in the immediate days after the fire to switch to a backup water source.

Here in Whitefish, our water comes from Second and Third Creeks in Haskill Basin, along with water from Whitefish Lake in the summer months. Wildfire risk continues to increase in both watersheds due to the hotter and drier summers the Flathead has seen in recent years. Climate scientists project that trend to worsen as the planet warms, even with wetter spring months.

Luckily for Bonners Ferry, the 3,600 acres burned accounted for only 15% of the total watershed, allowing clean water to flow within days of the fire being put out. If a fire spread through Second and Third Creeks in Haskill Basin, which are much smaller than Myrtle Creek, the burned hillslopes could lead to landslides and debris flows that would threaten the Whitefish water supply. The slurry of ash and soil would likely make the water untreatable and could permanently damage intake structures.

Depending on the severity of the burn, these hillslope failures could continue to occur for several years after a fire, gradually decreasing in frequency and intensity.

Zebra Mussels in Whitefish Lake

In early 2017, City engineers in Lawrence, Kansas, made an unwelcome discovery: Invasive zebra mussels were found in the City's water transmission lines, encrusting the inside of pipes and choking water pumps. City commissioners approved an emergency expense to begin controlling the mussels at the intake from Clinton Reservoir, where they were first identified in 2013. But City officials expect an ongoing expense. Once established, invasive mussels are impossible to eradicate.

In areas of the US, where zebra and quagga mussels have established a foothold, the cost of dealing with the invasion has been in the billions of dollars. Now the problem has come to Montana, where mussels were discovered east of the Continental Divide in 2016. The Columbia River Basin, on the west side of the Continental Divide, is the only major river basin in the US free of invasive mussels. And Whitefish lies at the headwaters, where prevention has become a top priority.

Unfortunately, warmer waters associated with climate change create more hospitable conditions for mussel reproduction. A zebra mussel infestation of Whitefish Lake could have disastrous consequences: they could plug the drinking water intake pipe in the lake. And if zebra mussel larvae are pumped to the Whitefish Water Treatment Plant, they could clog infrastructure and compromise the City's ability to provide drinking water.

In response to the threat, the Whitefish Lake Institute and City of Whitefish are collaborating with the State of Montana to prevent the spread of zebra mussels to Whitefish Lake. This effort includes watercraft inspection stations and a preventive hot water flush station for high-risk watercraft.

While not likely to occur at the same time, both of these scenarios are more likely in an era of climate change. The City should continue to prioritize preventive measures to protect Haskill Basin and Whitefish Lake. Meanwhile, it is prudent to consider a tertiary water supply, such as a groundwater well, in the event that the two worst case scenarios occur together.

Strategies and Actions

Strategy FW-1 Minimize wildfire risk to community residents, infrastructure, and amenities.	
FW-1.1	Adopt and enforce best practice building codes for homes in the wildland-urban interface (WUI).
FW-1.2	Coordinate fire adaptation strategies with landowner groups, firefighting agencies, and public land managers.
FW-1.3	Improve fire flow capacity of the water system at Suncrest.
FW-1.4	Identify and mitigate risks from wildfire, flooding, landslides, and other hazards.
Strategy FW-2 Protect municipal watersheds and Whitefish Lake water quality.	
FW-2.1	Maintain healthy and resilient forests through conservation agreements and partnerships.
FW-2.2	Promote land management practices that minimize negative impacts to water sources.
FW-2.3	Continue to protect against aquatic invasive species and develop a rapid response plan.
FW-2.4	Maintain a strong water-quality monitoring program.
Strategy FW-3 Promote land conservation and management to sequester carbon and mitigate greenhouse gas emissions.	
FW-3.1	Quantify forest carbon storage successes.
FW-3.2	Develop partnerships to maximize land-based carbon sequestration.

Strategy FW-1 Minimize wildfire risk to community residents, infrastructure, and amenities.

Whitefish is located within a landscape historically defined by wildfire. Elimination of wildfire is neither a realistic option nor a wise objective. A fire-adapted community is defined by the US Forest Service and other agencies as "a human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire."[2]

FW-1.1 Adopt and enforce best practice building codes for homes in the wildland-urban interface (WUI).

Whitefish adopted Montana's WUI Code[2] in 2017. Provide for effective enforcement and consider possible revisions to the WUI code to include defensible-space landscaping and ongoing maintenance within the City and in the Whitefish Fire Service Area. Encourage owners of existing homes to adopt best practices. Under the City's contract with the rural Whitefish Fire Service Area Board for

We All Live in the Wildland-Urban Interface

FIRE CHIEF'S MESSAGE

Joe Page
PHOTO: Courtesy of Joe Page

"I was extremely concerned about what could have happened in the summer of 2017. We had a wet spring, but that quickly changed with hot weather and no rain. I guess they call that a flash drought. The fire danger was so high, and if we had experienced lightning or another source of ignition at the wrong time, it could have been very bad. Frankly, we were lucky to get out of the fire season with no major fire in the Whitefish area. We all live in the wildland-urban interface, the WUI. We all live within range of an ember shower. As a community and as individual homeowners, there are a lot of simple things we can do over time that will have huge benefits for reducing our vulnerability to wildfire."

Joe Page, Whitefish Fire Chief

Strategies and Actions

the Whitefish Fire Department to provide structural fire protection, establish incentives for homes and neighborhoods to adopt the WUI building code, implement defensible-space landscaping practices, and become Firewise neighborhoods using standards adopted by the National Fire Protection Association.

FW-1.2 Coordinate fire adaptation strategies with landowner groups, firefighting agencies, and public land managers.

Develop maps and an implementation plan that depicts existing and proposed shaded fuel breaks in the Whitefish area. Participate in public outreach to educate private landowners about wildfire risk and to implement adaptation strategies in the WUI. Support collaborative projects to reduce wildfire risk on public and private lands, especially in Haskill Basin and the Whitefish Lake watershed, such as through the Whitefish Range Partnership and the Whitefish Area Fire Safe Council. Participate in updates and help implement the Whitefish Community Wildfire Protection Plan and the Flathead County Pre-Disaster Mitigation Plan.

FIGURE 2. MAP OF WHITEFISH FIRE SERVICE AREA. The Whitefish Fire Department protects homes and businesses in the 86-square-mile Whitefish Rural Fire Service Area in addition to the 6-square-mile City jurisdiction.

Becoming a Fire Adapted Community

THOUGHTS FROM A FIRE BEHAVIOR ANALYST AND CONSULTING FORESTER

Ed Lieser
PHOTO: Courtesy of Ed Lieser

"The Whitefish Fire Department provides fire protection for most of the rural residences in the 59937 zip code. That's under a five-year contract negotiated with the County and the Whitefish Fire Service Area Board of Directors. There are six rural subdivisions in the Whitefish area that have organized themselves as Firewise communities, which means they make progress every year toward goals they established themselves to reduce the risk of wildfire using guidelines from the National Fire Protection Association.

Those six subdivisions are Grouse Mountain, Suncrest, Lion Mountain, Wolftail Pines, Elkhorn, and Big Mountain Fire District. I'd like to see all the neighborhoods in the Fire Service Area meet the highest standards for reducing wildfire risk. It should be a big priority for all of us, whether we live in town or out in the forested wildland-urban interface. That's how we establish Whitefish as a fire-adapted community.

Fire is going to become a more critical issue as time goes on. It's pretty clear now that environmental conditions are changing, and we can expect more extreme fire seasons in terms of heat, wind, storms and summertime drought. Our forests are vulnerable to change. Now insert humans and homes that are right in the thick of it. That's a recipe for serious problems."

FW-1.3 Improve fire flow capacity of the water system at Suncrest.

Improving the fire flow capacity at Suncrest will protect this subdivision as well as adjacent residential areas and the Haskill Basin watershed. Options may include onsite water storage, new pipes and pumps, or emergency interconnection with Iron Horse.

Strategies and Actions

FW-1.4 Identify and mitigate risks from wildfire, flooding, landslides, and other hazards.

Identify areas in the City that are vulnerable to these hazards. Develop emergency response plans for high-risk events in vulnerable areas. Discourage new development in identified high-risk areas.

Strategy FW-2 Protect municipal watersheds and Whitefish Lake water quality.

FW2.1 Maintain healthy and resilient forests through conservation agreements and partnerships.

To supplement the 2015 conservation agreement with F.H. Stoltze Land and Lumber Company, pursue other opportunities to ensure clean water flows from Haskill Basin, including rehabilitation of First Creek lands owned by Whitefish Mountain Resort for possible reintegration into the City's Haskill Creek water supply. Collaborate with public land agencies, Weyerhaeuser, other landowners, and conservation organizations to protect upland forests in the Whitefish Lake watershed from residential conversion, wildfire, erosive floods, and pollution. Prioritize conservation of Weyerhaeuser lands in the Lazy Creek and Swift Creek tributaries to Whitefish Lake.

FW2.2 Promote land management practices that minimize negative impacts to water sources.

Maintain and monitor implementation of the Whitefish Water Quality Protection Plan and Lakeshore Protection Regulations aimed at limiting the impact of residential and commercial development. Participate in review of the Habitat Conservation Plan (HCP) for lands managed by the Montana Department of Natural Resources and Conservation, and support implementation and possible expansion to protect sensitive aquatic and terrestrial species. Promote strategies to limit nutrient and pollutant loads to local waterbodies through Best Management Practices and a Nutrient Trading Plan. Nutrient trading is a market-based approach providing economic incentives for voluntary pollutant reductions from point and nonpoint sources of pollution to improve and preserve water quality.

FW2.3 Continue to protect against aquatic invasive species and develop a rapid response plan.

Aquatic invasive species (AIS) are non-native plants and animals that negatively affect water bodies. They can have profound effects on the aquatic food web, decrease recreational experiences, affect property values and the local tax base, impair infrastructure, and impact local businesses. In Whitefish, it is projected that increased water temperatures will benefit dreissenid (zebra or quagga) mussel colonization and create conditions favorable to other invasive aquatic animals, plants, and pathogens. The City of Whitefish should continue to partner locally with the Whitefish Lake Institute and regionally with the Flathead Basin Commission, Upper Columbia Conservation Commission, and the Montana Invasive Species Council. The City can also support the development of a rapid response plan with project partners to analyze scenarios should dreissenid mussels or other AIS be found in Whitefish Lake.

FW2.4 Maintain a strong water-quality monitoring program.

Long-term conservation requires a baseline of scientific, cultural, and historical knowledge of an area; an understanding of its physical, biological, and chemical dynamics; and a program to monitor changes from the baseline. With these elements in place, adaptive management plans and education programs can be developed and implemented. Although cursory water-quality monitoring dates back to the 1970s, a consistent program began only in 2007 through the Whitefish Lake Institute. The City

Strategies and Actions

should continue to support and partner with WLI and other agencies, researchers, and funders to expand understanding and protection of local water bodies.

Strategy FW-3 Promote Land Conservation and Management to Sequester Carbon and Mitigate Greenhouse Gas Emissions.

Well-managed forests, healthy watersheds, and organic soils serve as a natural sink for carbon that otherwise would be released into the atmosphere as greenhouse gases. Carbon-rich ecosystems provide a wealth of ecosystem services, such as conserving moisture, filtering and cleaning water, and cooling landscapes. Long-term carbon storage strategies can reduce risk from extreme disruptions such as wildfire and floods.

FW-3.1 Quantify forest carbon storage successes.

Conversion of forests and other open lands for residential and other development significantly reduces land-based carbon sequestration. Forest conservation in municipal watersheds, such as in Haskill Basin, the Beaver Lake area, and Swift and Lazy Creeks, should be documented for the carbon storage benefits. By comparing long-term carbon storage to likely carbon loss from plausible land-use conversion scenarios, the City may count avoided loss of carbon against its emission-reduction objectives. This would work essentially like a carbon offset, and the City can deduct a portion of avoided emissions in proportion to its share in the conservation effort. For example, if the City provides half the funds for the purchase of a conservation easement, the City can deduct half the avoided emissions.

FW-3.2 Develop partnerships to maximize land-based carbon sequestration.

Partner with other public agencies, non-governmental organizations, and private landowners

Success Story

COMBATING THE INVADERS
Whitefish Lake Institute

In 2011, the Montana Department of Natural Resources and Conservation discovered Eurasian watermilfoil (EWM) in Beaver Lake, a quarter-mile upstream of Whitefish Lake. EWM is highly invasive and quickly clogs waterways. The Whitefish Lake Institute (WLI) joined an interagency committee to rapidly respond to the infestation by installing bottom barriers to prevent sunlight from reaching the plants.

Eurasian Watermilfoil (EWM) clogs a boat propeller.

PHOTO: Kate Wilson, Montana Department of Natural Resources and Conservation

Although bottom barriers were a success, plants had begun to colonize other areas of the shoreline near the boat ramp. WLI and the City of Whitefish partnered in an annual suction dredging operation to seek and destroy any plants found during survey efforts. The suction dredging was carefully done so that no plant fragments were released. It takes only a postage-stamp-sized EWM fragment to drift off and start a new plant.

The suction dredging has proven effective. In 2012, 23.5 pounds of EWM were removed from the lake. By 2017, only two plants were found under a submerged log.

EWM thrives in shallow, warm, nutrient-rich waters, a scenario likely to become more common with climate change. Eradication is difficult if not impossible. Fortunately, the Beaver Lake EWM infestation was caught early and aggressive action was taken. Suction dredging will continue until project partners are confident that EWM has been eradicated.

The threat of aquatic invasion by other species is expected to increase in the Whitefish Lake watershed. Although the EWM story is not yet complete, the initial early success points to the ongoing importance of early detection monitoring, rapid response planning, and preventive measures to protect the lake and the human, ecological, and economic health of Whitefish.

Strategies and Actions

on cooperative agreements to conserve forests, farmland, and other open lands that provide carbon storage in soils and vegetation. Include carbon sequestration as one of the values achieved through forest conservation. Seek funding partners through market-based or voluntary carbon offset funds.

Conserving Forests and Water in Haskill Basin

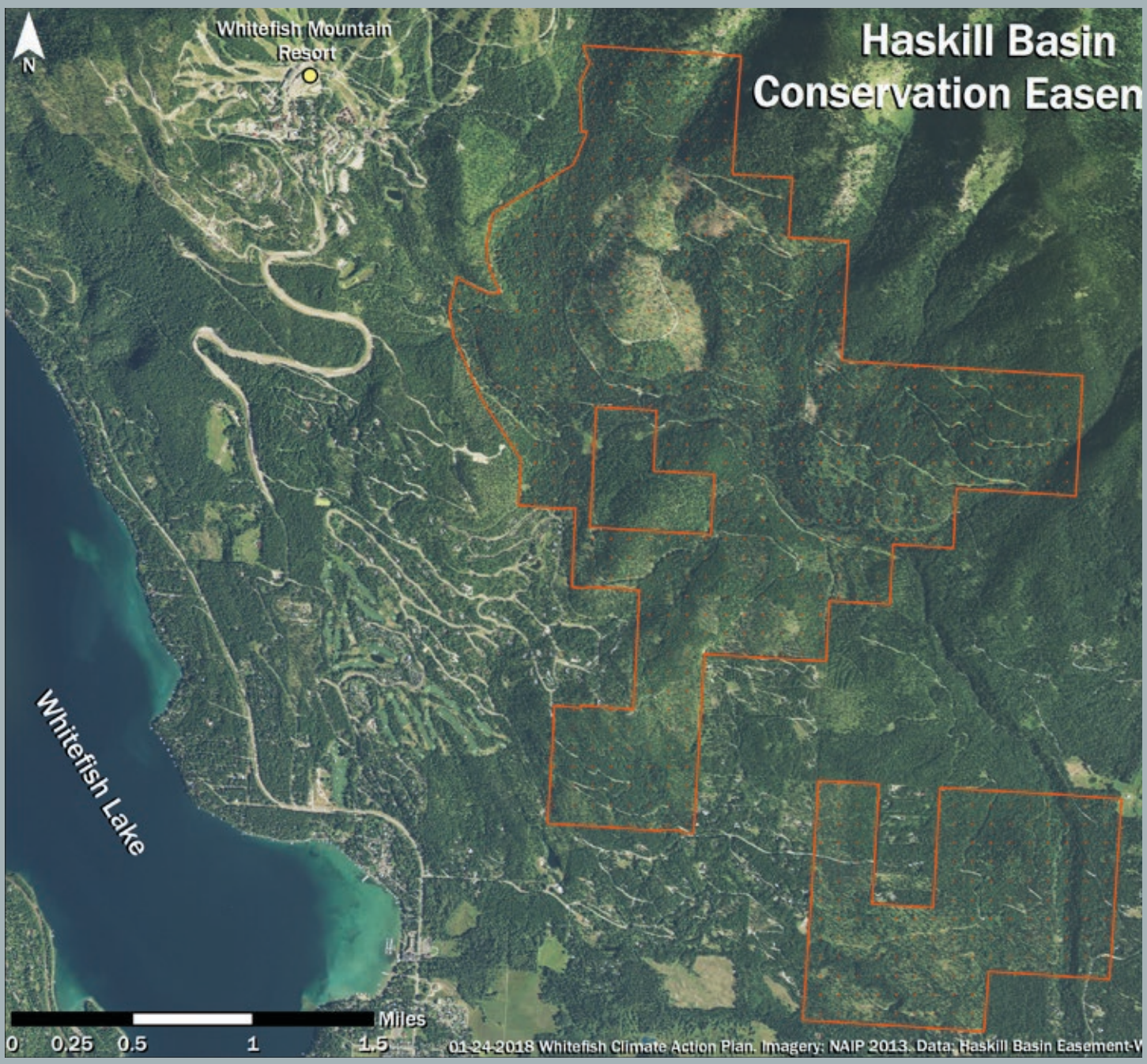


FIGURE 3. MAP OF HASKILL BASIN CONSERVATION AREA By conserving 3,020 acres in Haskill Basin, the City and its partners permanently sequestered large amounts of carbon that otherwise would have been released to the atmosphere as greenhouse gases.

Co-Benefits

Economic	Social	Environmental
Maintaining natural forestlands and minimizing their conversion to real estate development supports the local timber, recreation, and tourism industries	Conservation of forested lands provides permanent public recreation access	Forest conservation and sustainable management sequesters carbon in trees and soil. That carbon would be lost to the atmosphere as greenhouse gas emissions if the land were converted to real estate development
Reducing new development in fire-prone forest areas reduces the cost to taxpayers of fighting fires and providing basic services to residents	Firewise practices in the wildland-urban interface, such as ensuring defensible space around homes, improves firefighter and resident safety	Well-managed forests and healthy watersheds provide habitat for sensitive, threatened, and endangered fish and wildlife
Voluntary conservation agreements provide revenue to private landowners in lieu of land sales for development	Public recreation access on conserved lands and the development of recreational trails expand opportunities for physical exercise that improves public health and personal fitness	Minimizing conversion of forest lands for real estate development improves opportunities to manage wildfire risk and protect air quality, clean water, and wildlife habitat
Conservation of open lands and water quality helps maintain property values		
Reducing the risk of wildfire and aquatic invasive species in lakes and creeks avoids costly disruptions to water treatment systems	Preventing the spread of aquatic invasive species helps maintain community quality of life	

Recreationists paddle the Stillwater River.
PHOTO: Sierra McCartney

How Can I Make a Difference?

- Support collaborative forest-conservation and fuel-management efforts with public agencies, landowners, and non-profit organizations, such as the Whitefish Range Partnership, Whitefish Lake Watershed Conservation Project, and Whitefish Area Fire Safe Council.
- Clean, drain, and dry your watercraft to prevent introduction of aquatic invasive species in local waters. Support the AIS program through the Whitefish Lake Institute.[4]

HOMEOWNERS

- Avoid buying or building a home in rural, forested areas prone to wildfire.
- Organize your forested neighborhood to become a Firewise community.
- Design new homes with ignition-resistant materials[5], including roof, siding, and decks. Close in eves and screen over vents.
- Display your street address and provide adequate access and turnaround for fire trucks.
- Maintain defensible space: clean gutters, remove flammables adjacent to buildings, remove lower limbs of trees, and clean needles and leaves on roof and yard.[6]
- Learn about cost-share opportunities to reduce hazardous fuels on private land.[7]

REAL ESTATE DEVELOPERS AND HOMEBUILDERS

- Design two ways in and out of communities.
- Provide a water supply (hydrant system or 30,000-gallon cistern).
- Sign roads and residences properly.
- Construct access roads with adequate width and turnarounds for emergency equipment.
- Thin trees and vegetation along roadways.
- Build in accordance with the International Wildland-Urban Interface Code, adopted by Montana in 2016.[8]

Resources

To learn more about the topics discussed in this chapter, explore these helpful links:

- Whitefish Area Fire Safe Council (http://wafsc.com/)
- Whitefish Community Wildfire Protection Plan by the Whitefish Area Fire Safe Council (http://bit.ly/2EBljEj)
- Flathead County Pre-Disaster Mitigation Plan (http://bit.ly/2G6AIda)

PHOTO: Steven Gnam, provided by The Trust for Public Land

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- Flathead County Pre-Disaster Mitigation Plan (http://bit.ly/2G6AIda)
- Firewise USA, by the National Fire Protection Association (http://bit.ly/2F1OeOu)
- Ignition Resistant Construction Guide by FireSafe Montana (http://bit.ly/2Ent6Xd)
- Living with Fire: Homeowners' FireSafe Guide for Montana by FireSafe Montana (http://bit.ly/2BqlQae)
- Landowners Guide by the Whitefish Area Fire Safe Council (http://bit.ly/2ss3brK)
- Montana Code for Wildland Urban Interface (http://bit.ly/2BWW3Yt)
- Whitefish Area Water Resources Report: A Status of the Whitefish Lake Watershed and Surrounding Area by the Whitefish Lake Institute (http://bit.ly/2Eo13aa)
- Inspection and Decontamination Program by Whitefish Lake Institute (http://bit.ly/2nVb9EZ)
- 2017 Montana Climate Assessment by Montana State University and the University of Montana, Montana Institute on Ecosystems (http://montanaclimate.org/)

End Notes

[1] Whitlock C, Cross W. Maxwell B, Silverman N, Wade AA, 2017. 2017 Montana Climate Assessment, Bozeman and Missoula MT, Montana State University and University of Montana, Montana Institute on Ecosystems. 318 p doi: 10-15788/m2ww8w, accessed February 1, 2018, http://montanaclimate.org/

[2] Fire Adapted Communities Learning Network, accessed February 15, 2018, https://fireadaptednetwork.org/about/frequently-asked-questions/

[3] Montana Code for Wildland Urban Interface, accessed February 1, 2018, http://www.mtrules.org/gateway/ruleno.asp?RN=24%2E301%2E181

[4] Whitefish Lake Institute, Inspection and Decontamination Program, accessed February 1, 2018, http://www.whitefishlake.org/download_docs/AIS_Flier_Rev2s.pdf

[5] FireSafe Montana, Ignition Resistant Construction Guide, accessed February 1, 2018, http://firesafemt.org/img/Ignition-Resistant-Construction-Guide-FINAL.pdf

[6] FireSafe Montana, Living with Fire: Homeowners' FireSafe Guide for Montana, accessed February 1, 2018, http://wafsc.com/docs/LivingwFireFSM2009.pdf

[7] Whitefish Area Fire Safe Council, Landowners Guide, accessed February 1, 2018, http://wafsc.com/landowners-guide.html

[8] Montana Code for Wildland Urban Interface, accessed February 1, 2018, http://www.mtrules.org/gateway/ruleno.asp?RN=24%2E301%2E181

[9] Flathead Beacon, June 26, 2013, http://flatheadbeacon.com/2013/06/kkff26/leaving-a-legacy-on-haskill-basin/

[10] Personal communication between Steve Thompson, Chapter Author, and Tony Vorster, Colorado State University, January 11, 2018

[11] Environmental Protection Agency, Greenhouse Gas Equivalencies Calculator, accessed February 6, 2018, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

CONSUMPTION, FOOD, AND WASTE

PHOTO: Whitefish Downtown Farmers Market

Consumption Food & Waste

OVERVIEW

The life cycle of goods and materials accounts for a significant percentage of a municipality's greenhouse gas emissions. Because Whitefish's industrial sector is small and the town has limited agriculture to feed both residents and tourists, the community relies year round almost entirely on imported goods, food, and energy products to meet its needs. Encouraging greater production and use of local foods and of goods that are made sustainably would have significant emissions reduction benefits, while also improving food quality for Whitefish residents.

In addition, climate change may disrupt global supply chains and thereby affect the cost and availability of household goods, food, and services on which local residents and businesses rely. Encouraging local food production enhances the community's food security and availability. While Whitefish cannot directly control how goods are produced outside its jurisdiction and thereby impact upstream emissions, it can directly impact downstream emissions by changing consumption and waste disposal practices. Two ways Whitefish can positively affect its long-term sustainability goals are:

- Reducing the use and purchase of targeted carbon-intensive goods and services.
- Maximizing waste diversion opportunities throughout the community.

Implementing effective policies and practices in these areas also models a commitment to climate resiliency that encourages residents, businesses, and visitors to do the same.

Local food production increases food security in our community.
PHOTO: Wicked Good Farm

Buying locally grown food reduces the need to buy carbon intensive goods.
PHOTO: Whitefish Downtown Farmers Market

Composting organic material diverts waste from the landfill and creates soil, a rich resource.
PHOTO: Dirt Rich

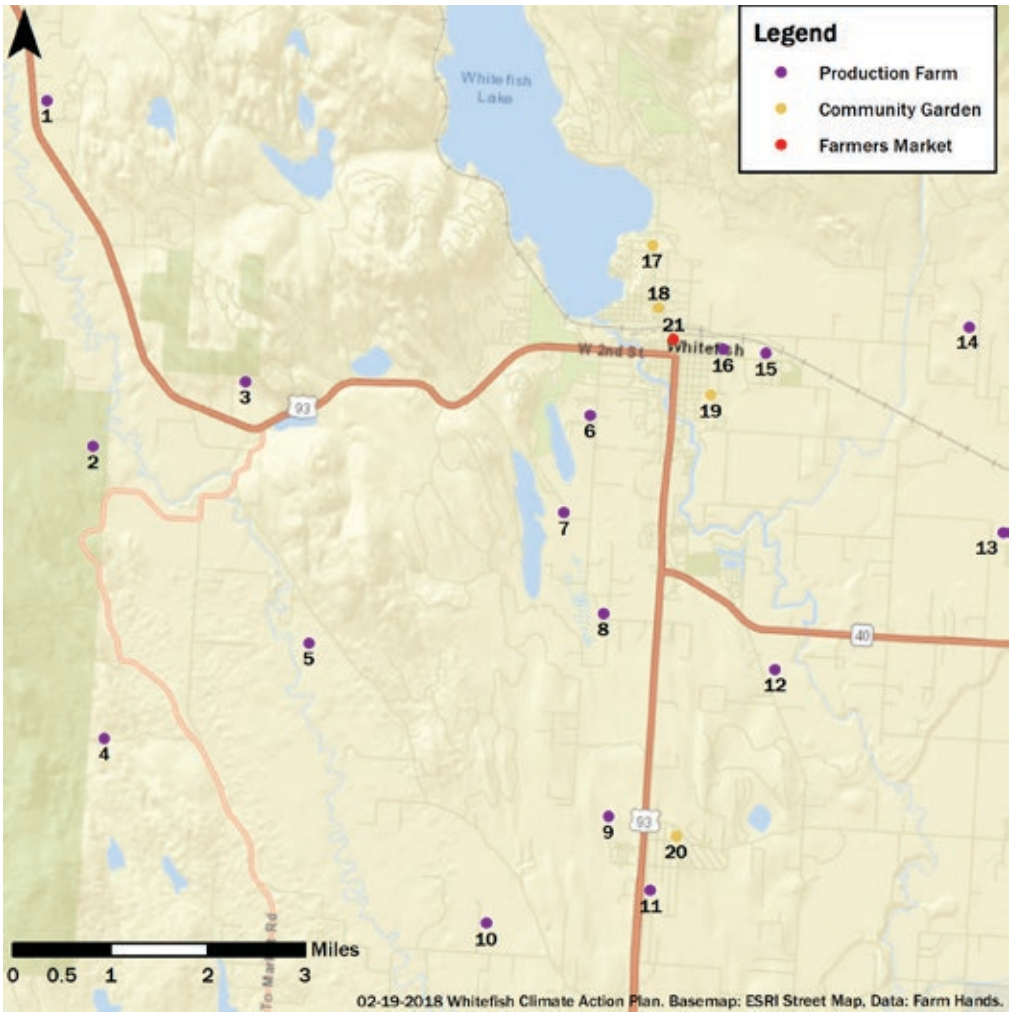

FIGURE 1. MAP OF WHITEFISH LOCAL FOOD SOURCES

PRODUCTION FARMS

1 Walking Bear Farm

2 Terrapin Farm

3 Round Prairie Farm

4 Steitzhof Merinos

5 Two Bear Farm

6 Rocking Heart Ranch

7 Purple Frog Gardens

8 Buggy Road Farm

9 Spirit Works Farm

10 Mountain Prairie Farm

11 Squash Blossom Farm

12 Beach Farm

13 Gray's Homegrown

14 EarthStar Farm

15 Foolish Blooms

16 Wicked Good Farm

COMMUNITY GARDENS

17 Whitefish Community Garden

18 St. Peter Lutheran Community Garden

19 Whitefish Nazarene Community Garden

20 Snow Country Gardens

FARMERS MARKET

21 Whitefish Downtown Farmers Market at Depot Park

FIGURE 2. MAP OF RECYCLING LOCATIONS. Materials for recycling can be dropped off at these locations.

RECYCLING LOCATIONS

1 City Beach

2 Depot Park

3 City of Whitefish Central Recycling Site

4 Riverside Park

SOURCE: https://www.pca.state.mn.us/sites/default/files/glasstoolkit.pdf
and Interview with Teri Schneider, owner New World Recycling, January 30, 2018

Glass Facts

WHY IT PAYS TO RECLAIM AND REUSE GLASS LOCALLY

- One of the most chemically inert, non-toxic, durable man-made materials - can take up to 1 million years to decompose.
- Indefinitely recyclable into new glass containers without loss of strength.
- A glass pulverizer (we have one in the Valley!) crushes and tumbles the glass to remove sharp edges (think sea glass), converting a 32-gallon container of bottles into a quart of crushed colored material.
- Pretty enough for landscaping, pulverized glass can be stronger than rock, making it an excellent aggregate building material, great for sidewalk and road construction and wherever concrete is used.
- While pulverized glass is heavy (2,500 pounds/cubic yard), making it expensive for long-distance transport, it is a valuable resource for local reuse.
- With global trade issues affecting plastic and steel and tin can recycling, an increase in glass containers for packaging may result.

Progress to Date

- **COMMUNITY GARDENS AND FARMERS MARKETS:** Despite a short growing season, Whitefish enjoys an active food-growing community and a vibrant culture of community service committed to providing all residents access to locally grown produce, meats, fruits, and fiber to the extent possible. Local food resources include several community gardens, an active Downtown Farmers Market, and more than a dozen small urban and rural producers, many of whom offer Community Sponsored Agriculture (CSA) options. Community gardens and local growers also grow produce for the local food bank, and the Downtown Farmers Market accepts both SNAP dollars and Senior Coupons, as well as elementary student Market Coins. The City actively promotes the community gardens by providing them a water-use credit.
- **SCHOOL GARDENS:** The City's Parks and Recreation Summer Day Camp program collaborates with the Lions Club and the Whitefish School District in the School-to-Cafeteria Garden project. Camp kids learn about growing food and help tend and harvest the garden in the summer. The garden, envisioned by the Lions Club in 2011, now grows thousands of pounds of fresh produce that goes directly into school lunches.
- **RESIDENTIAL AND COMMERCIAL RECYCLING:** Currently the City offers one centralized site (at Columbia Avenue and Railway Street) for residential and commercial recycling of flattened cardboard and paperboard, plastic (#1, #2), aluminum/tin/steel cans, and newspaper, magazines, office paper, catalogs, and junk mail. A proposal for a mandatory single-stream residential curbside recycling program has been developed by the City's Public Works Department and is under review by the City Council.
- **COMMUNITY AND VISITOR RECYCLING:** The City provides bins for paper, plastic, and aluminum cans at the Downtown Farmers Market, and in collaboration with Whitefish High School provides recycling containers at City Beach. The Baker Street Park also has some recycling capacity.
- **CITY OPERATIONS:** The City has made strides in reducing its operational paper consumption. In 2012 it began offering paperless billing for residents, and today City Council packets, which can be more than 200 pages each, are provided to council members in electronic form only. That saves the printing of at least 360,000 pages annually, at a cost savings of about $12,680 per year. Internally, the City has recycling containers for paper, plastic, and aluminum cans in some of its buildings.

Goals & Indicators

Goals

- Reduce consumption of carbon-intensive foods, products, and services.
- Increase waste diversion and reduction through waste prevention, purchasing and repair policies, recycling, composting, and education.
- Support the production and purchase of local products.

Potential Indicators

- Quality and quantity of waste diverted from the landfill to recycling and composting from City operations, construction, and the community.
- Consumption-related emissions.
- Number of community garden beds and edible landscapes.
- Availability of locally produced food and goods.

Strategies and Actions

Strategy CFW-1 Improve the sustainability of City operations and purchases.	
CFW-1.1	Develop an environmentally preferable purchasing (EPP) program for City procurements.
CFW-1.2	Implement a paper-reduction policy.
CFW-1.3	Improve and expand waste-diverting opportunities and practices.
Strategy CFW-2 Mitigate the emission consequences of City construction practices.	
CFW-2.1	Develop information about deconstruction material salvage and recycling for local builders and contractors.
CFW-2.2	Develop a waste-reduction plan for City construction and demolition projects.
Strategy CFW-3 Expand community recycling and composting.	
CFW-3.1	Implement single-stream residential curbside recycling.
CFW-3.2	Improve public space recycling programs.
CFW-3.3	Develop opportunities for recycling of goods and food waste by local businesses.
CFW-3.4	Purchase a leaf vacuum and explore developing a leaf collection/composting repository with community partners.
Strategy CFW-4 Expand City support of local food production and availability.	
CFW-4.1	Expand community gardening and urban agriculture opportunities.
CFW-4.2	Incentivize new construction to include green space, gardens, and food growing spaces.
CFW-4.3	Explore partnering with the Center for Sustainability and Entrepreneurship for community collaborative growing.
CFW-4.4	Offer unused or underutilized City property at low-cost leases to local growers.

Strategy CFW-1 Improve the sustainability of City operations and purchases.

While City operations may account for a smaller portion of Whitefish's emissions, they are a relatively easy target for sustainability improvements because the City has direct control over them. Moreover, they provide a valuable opportunity to support the community in reaching its sustainability goals and leading by example.

CFW-1.1 Develop an environmentally preferable purchasing (EPP) program for City procurements.

The City of Whitefish currently has some adopted purchasing practices, but has no formal policies or clear guidelines. Many cities have demonstrated clear benefits from investing in the development and implementation of procurement policies and guidelines that reduce their ecological footprint. Recycled and remanufactured products, energy- and water-conserving equipment, and low-toxicity cleaning and maintenance supplies often pay for themselves, either initially or over a reasonably short time.[1] They also have other benefits, including improved indoor air quality and local jobs creation. A successful program can include:

- Partnering with other agencies (such as the Whitefish School District) for enhanced purchasing power.
- Setting minimum recycled-content requirements.
- Purchasing food, products, and services from local sources whenever possible.
- Eliminating the purchase of carbon-intensive products such as plastic water bottles, polystyrene foam containers, and toxic cleaning supplies.
- Creating benchmarks for program implementation.
- Providing oversight and education through a sustainability or environmental purchasing manager.

Strategies and Actions

CFW-1.2 Implement a paper-reduction policy.

Implementing an aggressive paper-reduction policy across all municipal operations is an inexpensive way for Whitefish to reduce both costs and waste. The following steps can have a dramatic and positive effect on the City's budget and carbon footprint:

- Expanding online services across agencies (such as permitting, bill payment, and development packet submissions).
- Setting all printers to default to duplex printing.
- Reducing color copies and eliminating hard-copy report requirements wherever possible.

CFW-1.3 Improve and expand waste-diverting opportunities and practices.

Currently, office materials recycling by City staff is hampered by inconsistent access within City buildings (number and size of bins) and processing (rate of retrieval not keeping pace with bin usage). Successfully diverting more waste from the landfill is a low-cost opportunity for the City to both reduce the environmental impact of City operations and to lead by example in promoting recycling participation in the community.

A successful City operations recycling program includes: assessing current practices; developing a program for easy recycling across all City facilities that includes staff education, benchmarks and oversight; and providing appropriate containers, signage, and collection process plans.

Whitefish's Energy Corps member, possibly in collaboration with Whitefish High School students, is uniquely positioned to undertake the assessment at low cost to the City. The assessment can include planning development steps and making recommendations for improving recycling in all City buildings.

In the Parks and Recreation department, eliminating the use of potentially toxic herbicides could allow grass clippings and other landscape waste to be composted for future use, reducing the cost of soil and fertilizer purchases by the City.

Strategy CFW-2 Mitigate the emission consequences of City construction practices.

Due in large part to the sheer quantity of material involved, building construction, demolition, and remodeling has an outsized impact on Whitefish's materials and waste management strategy. Demolition of a modest three-bedroom family home can generate more than 200,000 pounds of landfill material. Targeting buildings for reuse and salvage not only reduces the quantity of material sent to the landfill by up to 90%, it also creates a local market of recovered building materials that can be used again in new construction projects, remodels, and landscaping. We recommend that the City explores ways to increase diversion of construction waste from the landfill and ways to reduce material consumption for all projects requiring a building permit from the City.

CFW-2.1 Develop information about deconstruction material salvage and recycling for local builders and contractors.

Creating a Deconstruction and Demolition Resource Guide for local builders and contractors is a low-cost, high-impact opportunity for the City to support the diversion of building materials from the landfill. The guide can help inform contractors about the value of successful deconstruction and about area resources for recycling building and demolition materials. Missoula and other cities have implemented guides that can serve as models.

CFW-2.2 Develop a waste-reduction plan for City construction and demolition projects.

The City worked successfully with Flathead Recon to deconstruct the Parkside Credit Union drive-through

Strategies and Actions

building in Depot Park. About 90% of the building's materials were salvaged, including the building's wood shingles, and landfill disposal fees totaled less than $200[2]. The City can use this knowledge in developing and implementing a waste-reduction and diversion plan for future City-managed construction and demolition projects. By leading by example, the City can help shift the local construction industry culture toward recycling and reuse.

Additional Actions

- The City can seek grant funds or develop business partner relationships to purchase an industrial multi-material waste grinder for processing and recycling construction waste. In new construction, two of the largest waste items are asphalt roof shingles and drywall[3], both of which have economic value as recycled products. Asphalt shingle waste can make up to 15% of a road base and has been used successfully by local road construction companies such as Knife River. Drywall, about 12% of new construction project waste, is composed of paper and gypsum, both useful soil amendment materials. Wood waste also can be ground into landscape mulch and compost for municipal, commercial, or residential landscaping.
- The City can consider additional incentives for waste reduction and diversion for all construction projects within City limits. Guidelines can be developed to increase diversion and reuse of home demolition and remodeling waste, including mandates for a greater percentage of deconstruction over time and promoting reuse of deconstruction materials in new construction projects.

Success Story

DECONSTRUCTING DEPOT PARK BUILDING
Flathead Recon

PHOTO: Flathead Reconstruction

In 2011 Dave Fischlowitz and Flathead Recon won a competitive bid from the City to deconstruct the Parkside Credit Union drive-through building in Depot Park. Rather than demolish the building as others had bid, Dave and his team salvaged almost all the building's materials, taking only the roofing paper, drywall, carpeting, and fiberglass insulation to the landfill. Land fill disposal fee: about $175.

Materials salvaged for re-use and re-sale include:

- Cedar Shingles
- Plywood Sheathing
- Trusses
- Steel Columns
- Brick Facade
- Wood Framing
- Steel Safe (45,000 lbs)
- Interior Trim, Cabinets, Doors, Fixtures
- Wiring, Outlets, Plumbing

Strategy CFW-3 Expand community recycling and composting.

Diverting more waste from the landfill is one of the most direct strategies Whitefish can pursue to reduce the environmental impacts of the City's consumption. While the City cannot control upstream production methods at factories and farms beyond City limits, minimizing downstream waste has a clear and measurable positive impact that will help Whitefish move toward its sustainability goals. Making recycling a convenient and straightforward process for City residents and visitors is crucial to helping the community reduce waste disposal and increase diversion from the landfill. It also supports Whitefish as a tourism leader in climate resiliency.

CFW-3.1 Implement single-stream residential curbside recycling.

Strategies and Actions

The current residential program of a single, multi-stream, centralized site for recycling (at Columbia Avenue and Railway Street) suffers from overuse, with excess cardboard routinely stacked by containers. Materials contamination, especially among the plastics, is an ongoing issue. Implementing a committed single-stream curbside recycling program, with performance benchmarks and citizen education and outreach, can have a substantial positive impact on community waste diversion, reduce contamination issues associated with multi-stream recycling, and support community participation. The City has developed a plan for mandatory single-stream curbside recycling that is under review by the City Council.

CFW-3.2 Improve public space recycling programs.

Currently, successful recycling within Whitefish public areas is hampered by inconsistent access, poor signage, and substantial contamination. A successful public space waste diversion program includes: clear waste diversion and reduction benchmarks, enhanced education and outreach, better signage, more bins in public areas, and a committed waste collection and diversion plan.

CFW-3.3 Develop opportunities for recycling of goods and food waste by local businesses.

Whitefish's tourism industry places an additional burden on the City's waste disposal and community waste diversion efforts. We recommend that the City and local businesses work together to identify opportunities and incentives for enhanced waste diversion by local businesses (including restaurants, bars, hotels, and multi-family building owners), and their customers and tenants. One possible incentive could be a discount on resort taxes for participating businesses.

Success Story

DIVERTING FOOD WASTE

Whitefish Lake Restaurant

Owner Doug Reed is an early adopter of Dirt Rich composting business's food scrap pick-up service, signing the Whitefish Lake Restaurant up when Dirt Rich first began offering commercial service in 2015. He's been a satisfied customer ever since. "It's a big morale booster for the staff; they love knowing the food scraps are being composted and not going to the landfill. Everyone was surprised at how easy it was to incorporate into our food prep system." The biggest surprise? "It's a money saver. Our property taxes are determined in part by how many trash containers the City picks up from the restaurant. Recycling food scraps eliminates one whole container. So we save on taxes."

Dirt Rich

PHOTO: Dirt Rich

Dirt Rich's owner, Alissa La Chance, says it's all about building soil fertility. "The key to healthy food and healthy bodies is healthy soil. Our food waste is a valuable resource for building nutrient-rich soil. Composting food scraps is the most energy-efficient form of recycling and provides local jobs and soil remediation product. The process is entirely local and more sustainable than any recycling options currently on the market."

CFW-3.4 Purchase a leaf vacuum and explore developing a leaf collection/composting repository with community partners.

Currently, the City collects bagged leaves from residents and delivers these to Purple Frog Gardens, a farm on Blanchard Lake Drive. The farm empties the bags and disposes of them, then composts the leaves. Purchasing a leaf vacuum would eliminate the use of carbon-intensive plastic leaf bags. It is also cost-effective, requiring only one driver instead of a

Strategies and Actions

crew of four to collect the leaves.[4]

In collaboration with Purple Frog Gardens, the school district, and other community partners, the City could also develop a community leaf composting site at the new wastewater treatment plant. This could complement the proposed plant nursery, as described in Action 4.2 in the Water and Wastewater chapter. A leaf collection and composting program could improve site drainage, water infiltration, and soil quality. The wastewater treatment plant is located on heavy clay soils, which may cause drainage problems for a tree nursery or plantation. Local farmers have successfully increased organic carbons and water infiltration capacity of clay soil types by incorporating leaves and compost. The composting center could also produce soil supplements for off-site uses or sale.

The City could also explore composting leaves for municipal landscaping use, either at the wastewater plant or in collaboration with the Whitefish School District Center for Sustainability and Entrepreneurship.

Additional Actions

- Conduct education and outreach programs on backyard composting and reduce/reuse best practices.
- Install additional water bottle filling stations in City buildings, parks, and public spaces.
- Join other cities in banning the sale of single-use plastic bottles at public events and the use of polystyrene foam food packaging by local restaurants, retail food vendors, and nonprofit food providers.
- Join other cities in adopting an ordinance to substantially reduce consumption of single-use plastic carryout bags.
- Seek grants or other funds to identify and implement a successful glass recycling or reclamation program.
- Seek grant funds to launch a food waste reduction campaign for residents, such as the US Environmental Protection Agency's "Food: Too Good to Waste" program.
- Invite the Whitefish School District Center for Sustainability and Entrepreneurship to participate in developing enhanced business waste diversion opportunities.
- Explore opportunities for making diverted food scraps available for local residents' livestock.

Success Story

BUILDING SOIL FROM LEAVES
Purple Frog Gardens

PHOTO: Purple Frog Gardens

It all started with a garden of clay rock. Some 20 years ago Pam Gerwe and Mike Jopek, owners of Purple Frog Gardens on Blanchard Lake Drive, were searching for biomass materials to help build their top soil layer. The organic farmers reached out to the City for access to autumn leaves. Ever since then, rather than burn the leaves, the City has delivered the collected bags of residential leaves to Purple Frog, where volunteers and staff open the bags and compost and use the leaves for mulch. "We've literally opened thousands of leaf bags each year," said Pam. "They are a huge resource for our soil fertility and part of why our garden is so successful today. We appreciate this reciprocal relationship with the City and being able to show others how to turn a byproduct that some consider waste into a valued resource." The only downside, of course, are the empty plastic leaf bags. Pam's still looking for an alternative solution for these that doesn't involve the landfill.

Strategy CFW-4 Expand City support of local food production and availability.

Supporting environmentally responsible production of goods and food locally - in or around Whitefish - is beneficial because it reduces emissions associated with shipping goods into the community, provides for

Strategies and Actions

greater local food security, supports local jobs, and retains money in the community.

CFW-4.1 Expand community gardening and urban agriculture opportunities.

Promoting and increasing the land and resources available for local agriculture can help satisfy a portion of the City's demand for food, reducing the quantity of food that must be imported from outside the region. Low-cost, easy-target options for the City include:

- Providing access to unused City land, rooftops, and building spaces for food growing or seed variety trials.
- Increasing water credits to community growing spaces.
- Providing compost from City-supported waste diversion projects to community growing spaces.
- Participating in partnerships with schools, churches, senior centers, and the food bank to help growers expand local food programs, including community-supported agriculture (CSA) programs.

CFW-4.2 Incentivize new construction to include green space, gardens, and food growing spaces.

"Greening" public spaces can have numerous benefits, including offsetting the urban heat island effect, preventing water runoff from paved surfaces, and providing garden space to those who do not have yards. As Whitefish moves into a period of greater growth and development, incentivizing new construction to create environmentally sustainable growing spaces supports conscientious design and climate smart development.

CFW-4.3 Explore partnering with the Center for Sustainability and Entrepreneurship for community collaborative growing.

The Whitefish High School's Center for Sustainability and Entrepreneurship provides an excellent collaborative partner for the City in expanding urban agriculture opportunities. The Center's urban farm and greenhouse could grow seedlings for municipal greenscapes, including dedicated edible landscapes, and the Public Works and Parks and Recreation Departments could collaborate with the Center on composting City green waste for use in City greenscapes. The Center and the Parks and Recreation Department could collaborate on food growing workshops offered through the Parks and Recreation Summer Camp, and the Center could be a resource for workshops on food growing and processing for adults.

CFW-4.4 Offer unused or underutilized City property at low-cost leases to local growers.

Cities in the US and elsewhere have experienced benefits from providing underutilized city property to food growers. Activities in other cities include

Success Story

FARMING IN THE HEART OF WHITEFISH
Wicked Good Farm

PHOTO: Wicked Good Farm

Located in the heart of Whitefish on Fir Avenue, this small urban farm demonstrates you don't need a lot of space to grow an abundance of high-quality food. On less than one city lot, the farm grows fresh greens, herbs, produce, and strawberries for the Farmers' Market, local restaurants, and avid Community Supported Agriculture (CSA) members. When outside working, owners Brooke Bohannon and Sean Hard visit and exchange stories with neighbors, hoping that this over-the-fence interaction inspires others to grow their own food.

Strategies and Actions

pasturing goats in vacant lots to keep weeds down, offering rooftops for planting (which insulates the building from temperature fluctuations), or offering a building's grounds to growers in exchange for some of the produce for building employees. Some cities offer land at nominal lease rates of $1 per year, knowing that conscientious cultivation can improve the land.

The land surrounding the City's wastewater treatment plant is a great opportunity for developing such a partnership. For example, a private business could grow native plant species, providing the City with native plants for riparian restoration. Another partnership could include a dual use collaboration between one or more local growers and a solar installation at the site. Solar installations in the northeast are being designed to keep the land under them productive in agriculture.[5]

Success Story

FOOD ACCESS FOR ALL
Whitefish Community Garden

PHOTO: Good Seed Company

Located next to the Whitefish United Methodist Church, the Whitefish Community Garden makes growing healthy food easy and fun for all. More than 60 garden plots are available for yearly rental, and everyone can harvest from the fruit trees, berry bushes, and perennial flower and herb beds. Incorporated as a nonprofit in 2010, the endeavor has blossomed with the help of dedicated volunteers and local organizations such as Soroptimist International of Whitefish, the Whitefish Community Foundation, and Flathead Electric Cooperative. The City provides a valuable water-use credit, which keeps bed rental fees low. About eight beds are dedicated to growing for the North Valley Food Bank, and everyone helps tend and harvest these beds. In 2018 the garden delivered over 900 pounds of fresh produce to the food bank.

Success Story

ENVISIONING HEALTHY FOOD FOR STUDENTS
Lions Club Farm-to-School Project


PHOTO: Whitefish School District

The Whitefish Lions Club launched an organic farm-to-school garden project in 2010, with the vision of supporting the school district with healthy food and teaching students about growing food. Now located at the high school, the garden engages students from both the middle and high schools, and harvests about 3,000 pounds of produce that the school district processes for student lunches. The garden's success helped spark the idea to build a greenhouse, which led to the district's new Center for Sustainability and Entrepreneurship.

Co-Benefits

Economic	Social	Environmental
Environmentally preferable purchasing (EPP) programs reduce procurement costs up to 25%	Diverting materials from the landfill salvages valuable material and reduces the amount of land required for the landfill	Purchasing low-toxicity cleaning supplies improves indoor air quality for City employees
Diverting City operations waste from the landfill reduces landfill fees	Using recycled and salvaged materials reduces the demand for new materials and provides a local source of affordable building materials	Building soil from composted food and green waste increases the nutrient value of the food grown in that soil
Diverting food scraps from the landfill can reduce the number of refuse containers a city business uses, which can reduce that business's property taxes	Engaging residents in sustainability activities increases awareness and participation and builds community	Locally and sustainably grown food can improve our community's health
Promoting waste diversion creates demand for new local businesses dedicated to repurposing salvaged materials and keeps money in the community	Expanding local food production enhances our community's food security	Fully using resources contributes to clean air, clean water, and fewer toxins
The value of donated deconstruction materials is tax-deductible	Food growing and preserving programs build community and resiliency	

Decomposition By the Numbers

The following numbers list how long it takes for various materials to decompose in a properly managed landfill, with a liner bottom and a system for exposing material to moisture and releasing decomposition gases.

1 Million Years Glass Bottles

600 Years Monofilament Fishing Line

500 Years to Forever Styrofoam Cups

500 Years to Forever Plastic Shopping Bag

450 Years Plastic Bottles

450 Years Disposable Diapers

80-200 Years Aluminum Cans

50 Years Tin Can

30-40 Years Nylon Fabric

1-5 Years Cigarette Filter

1-3 Years Plywood

3 Months Wax Milk Carton

6 Weeks Newspaper

SOURCE: https://recyclemontana.org/how-long-until-its-gone/

How Can I Make a Difference?

- Recycle all your paper and cardboard. Here's why:
  1. Paper and cardboard make up the largest percent of residential waste (28%).
  2. Paper and cardboard can be recycled seven times before losing their value.[6]
  3. It's easy to recycle, and there is a stable market for properly recycled material.
- Take responsibility for your waste by making the effort to recycle properly. Follow the instructions on the collection bins. Bin contamination, such as including plastics other than #1 or #2 in the plastics bin, can mean the difference between the bin's contents being recycled or sent to the landfill. Rinse plastic and glass containers as food remnants can damage recycling equipment.
- Instead of raking up your leaves in the fall, run your lawn mower over them and leave the shredded material to break down on your yard. The microbes in your soil will thank you by converting the material into plant food.
- Learn to compost your food scraps, or pass them on to someone who does.
- Eat locally grown food. Buy your food from local growers at the Farmer's Market, join a CSA, or grow some of your own food in a community garden plot or a container on your porch.
- Stop buying plastic water bottles.
- Stop using plastic bags. Get reusable grocery bags and train yourself to carry them when you shop.
- Urge the restaurants you frequent to stop using Styrofoam takeout containers.
- Ask your favorite restaurants if they divert their food scraps. If they do not, encourage them to start. If they don't want to compost the scraps themselves, there are businesses, such as Dirt Rich, that will pick up the scraps and do the composting.

EPA Biodegradation Definition

"A process by which microbial organisms transform or alter (through metabolic or enzymatic action) the structure of chemicals introduced into the environment." So far, this doesn't happen with plastic bags. At best, when exposed to sunlight, the bags break down to smaller and smaller bits. UV radiation causes the bag's polyethylene's polymer chains to become brittle and crack, eventually turning what was a plastic bag into microscopic synthetic granules that we may ingest or inhale.

SOURCE: https://search.epa.gov/epasearch/

Resources

- Whitefish Lions Club Farm-To-School Project Video (http://bit.ly/2HfiYh6)
- Deconstruction and Demolition Waste Diversion:
  1. Deconstruction Resource Guide by the City of Missoula (http://bit.ly/2EGQZZc)
  2. Demolition Alternatives Policy by the Missoula Redevelopment Agency (http://bit.ly/2o4AFa6)
  3. Construction and Demolition Debris Generation in the United States, 2014 by the US EPA (http://bit.ly/2EFrg3m)
- Where to Recycle in the Flathead:
  1. The Waste Not Project (http://www.wastenotproject.org/)
  2. The Waste Not Project brochure (http://bit.ly/2nWsUUy)
  3. Recycle Montana (https://recyclemontana.org/)
  4. Flathead County Solid Waste Department (https://flathead.mt.gov/waste/)
  5. New World Recycling (http://www.newworldrecyclingmt.com/index.html)
  6. GreenMontana Recycling (http://www.valleygreenmachines.com/)

End Notes

[1] Alicia Culver, Buying Smart - Experiences of Municipal Green Purchasing Pioneers (Green Purchasing Institute 2008), http://www.chej.org/ppc/archives/purchasing/file003.pdf

[2] Interview with Dave Fischlowitz, Owner, Flathead Recon, January 26, 2018

[3] https://www.epa.gov/sites/production/files/2016-12/documents/construction_and_demolition_debris_generation_2014_11302016_508.pdf

[4] Interview with Craig Workman, Public Works Director/City Engineer, January 10, 2018

[5] http://www.recorder.com/UMass-farm-raises-veggies-and-power-12470559

[6] Interview with David Prunty, Public Works Director, Flathead County Solid Waste District January 26, 2018

The Whitefish Downtown Farmers Market is bustling with activity on Tuesday evenings in the summer. The market starts in late May and runs through September.
PHOTO: Whitefish Downtown Farmers Market

SCHOOL DISTRICT

HEATHER DAVIS SCHMIDT
Superintendent

"Through our partnership with the City of Whitefish we are working to create a more resilient and sustainable Whitefish so our children's children can enjoy the quality of life we experience every day."

Letter from the Superintendent

Sustainability education allows students to develop the competencies they need to be prepared for a rapidly changing world. Considering the balance of social, economic, and environmental systems enriches deeper learning skills in students. As the foundation of the community, Whitefish Schools are working to provide the knowledge, skills, and behaviors needed to achieve a more sustainable future.

Through our Center for Sustainability and Entrepreneurship (CSE) we are working to prepare our students for careers in emerging fields. As resources become more scarce and consumption and waste increase, it is important we take steps at Whitefish Schools to cultivate real-world learning opportunities in the areas of sustainable energy, sustainable agriculture, sustainable forestry, and natural resource management. We believe these fields will define our shared future.

Our sustainability education programming compels us to use resources efficiently, minimize waste, and analyze our related data on a consistent basis. Measuring improvements in our sustainability and efficiency will translate to cost savings. Responsible practices grounded in the principles of sustainability enable us to be good stewards of valuable community resources.

I am grateful for the continued support we receive from the community for our sustainability education programming. The kindness and generosity of our citizens has empowered us to prioritize sustainability as a pathway forward. Through our partnership with the City of Whitefish we are working to create a more resilient and sustainable Whitefish so our children's children can enjoy the quality of life we experience every day.

Heather Davis Schmidt

School District

We have a passion for sustainability and an absolute belief that it is essential for the future prosperity of our students and community. Living at the base of the Whitefish Range and in the shadow of Glacier National Park reminds us every day why sustainability is important. In recognizing the recreational benefits we receive from the landscape surrounding us, we are keenly aware of our responsibility to promote good stewardship of nature. Our goal is to create future generations of sustainably-minded Whitefish citizens.

We are collaborating with the City of Whitefish to construct a holistic Climate Action Plan. The plan serves to redefine how communities foster resilience and ensure a sustainable future. At Whitefish School District we are teaching students about entrepreneurship, financial literacy, natural resource management, conservation practices, and stewardship through the lenses of sustainability. Our work in sustainability education relies on a vast array of partnerships on local, regional, and national levels with a focus on our shared values of conservation, compassion, open-mindedness, acceptance, and kindness.

Sustainability education programming in Whitefish School District builds deeper learning competencies. We are working to nurture citizens who can tackle complex problems in a manner that considers others and the environment. Addressing the complexity of challenges requires citizens who can think critically, communicate effectively, collaborate with others, direct and monitor their own learning, master academic content, and cultivate a growth mindset. Solving complex and multifaceted sustainability challenges requires all of these competencies be developed.

Areas of Sustainability

We have identified these keys areas of sustainability:

- Buildings and Energy Use: Reducing energy consumption in the District's 370,000 square feet of facilities.
- Water and Landscaping: Conserving water in the irrigation of the District's 18 acres of irrigated land.
- Transportation: Improving efficiency and reducing emissions related to school transportation.
- Consumption and Waste: Identifying the waste produced by the District and implementing waste reduction strategies.
- Education and Outreach: Creating awareness and change in our schools and in the community for sustainable action.

Success Story

ANGIE FINBERG
Eighth Grade English Teacher

Angie Finberg, an 8th grade English teacher at Whitefish Middle School, prides herself on running a 100% paperless classroom. By converting to Google Classroom and utilizing the school's Chromebooks, she has been able to avoid printing assignments while the students are able to digitally submit their work. She estimates that going paperless has saved 10,000 sheets of paper annually. Beyond saving money and reducing waste, Ms. Finberg highlights how this change has increased organization.

"Google Classroom and access to classroom Chromebooks has been beneficial to our students in both academic growth and engagement while also being environmentally friendly. Students can complete homework from anywhere and never worry about losing their work."

School District Summary of Highlights

GREEN RIBBON

Whitefish School District is the first school district in Montana to receive the US Department of Education's Green Ribbon Schools award. The award recognizes individual schools or entire districts for reducing environmental impact and costs, improving health and wellness, and offering effective environmental education. A variety of student and teacher-led initiatives contributed to receiving this recognition, including research conducted by middle school students on the topic of vehicle idling. Student-based citizen science research led to the adoption of no idling zones around the schools. District-level coordination allowed for comprehensive energy auditing to provide meaningful data on energy consumption.

CENTER FOR SUSTAINABILITY AND ENTREPRENEURSHIP

The Center for Sustainability and Entrepreneurship (CSE) is an innovative educational facility. It provides hands-on learning experiences for pre-kindergarten through 12th grade students and adult learners in sustainable energy, sustainable agriculture, sustainable forestry, natural resources management, and entrepreneurship. The CSE provides opportunities to develop the skills, knowledge, and behaviors citizens need to foster sustainability in their own lives and in their community.

ENERGY AND RESOURCE CONSERVATION

Through our energy and waste audits we have gathered baseline data of our ecological footprint. Our ongoing review of energy consumption and waste production allow us to minimize the impacts we have on the environment and on our community. By promoting behavioral initiatives we are working to ensure a healthy environment and improve our efficiency regarding resources consumption and financial expenditures. Strategies taken by students, faculty, and staff, such as turning off the lights and recycling are allowing us improve our sustainability.

OUTREACH AND EDUCATION

Sharing our message of sustainability education and developing collaborative partners is a priority for the Whitefish School District. On a local level we are working with numerous organizations playing a critical role in building capacity for sustainability education in our schools and community. With the help of local partners students engage in real world settings to apply their knowledge in meaningful ways. For example, all of our 6th grade students engage in nature and conduct citizen science by learning snow science in the field with the non-profit trail organization, Whitefish Legacy Partners .

LUCA WELLE
Ninth Grade Student

Luca Welle, a freshman at Whitefish High School, has always made an effort to embrace sustainability. Beginning in middle school, he was on the student council where he advocated for an idle-free Whitefish. Through this campaign, he has lobbied city council to address the issue of locomotive and APU idling.

In high school, he joined project Freeflow and partnered with Climate Smart Glacier Country to interview elders about the effects of climate change in their lifetimes.

"Climate change impacts everything around us. Locally, we have Glacier National Park, Big Mountain, and countless rivers and lakes, all of which will be affected. Factor in the effect that a shifting climate will have on our agricultural systems, and I felt the need to get involved."

Demographics

706 MULDOWN + **563** MIDDLE SCHOOL + **484** HIGH SCHOOL & INDEPENDENT HIGH SCHOOL = **1,753** STUDENTS

26.4%
STUDENTS USING FREE OR REDUCED MEAL PROGRAM

12%
INDIVIDUALIZED LEARNING PLAN & SPECIAL EDUCATION SERVICES

88.5%
GRADUATION RATE

538
ENROLLMENTS IN CAREER, TECHNICAL EDUCATION AT WHS

728
ENROLLMENTS IN ACTIVITIES/ATHLETICS IN HIGH SCHOOL

196
ENROLLMENTS IN ACTIVITIES/ATHLETICS IN MIDDLE SCHOOL

Muldown Elementary School

Whitefish Middle School

Whitefish High School

Buildings and Energy

Goals & Indicators

Goals

- Reduce energy use from operation of buildings and appliances.
- Use renewable energy.
- Develop behavioral strategies to minimize energy consumption.

Potential Indicators

- Reduction in electric and heating bills.
- A more comfortable and well-lit learning environment.

Progress to Date

The Whitefish School District has taken steps to reduce energy consumption in its facilities:

- Upgraded lights in 2015 with more efficient bulbs, including fluorescent lights indoors and LED lights outdoors.
- Installed occupancy monitors in classrooms to ensure that lights are turned off when the rooms are vacant.
- Identified areas of heat loss and need for improved insulation. For example, by insulating around key parts of the ceiling in Whitefish Middle School, the District saved thousands of dollars in heating costs and made the front desk a more comfortable work space.
- Conducted an energy and plug load audit in 2017. This provided information about energy use in each building, including lighting and appliances.

Actions

SD-1.1 Upgrade Lighting.

Lighting is a significant source of energy consumption in the District. The District will retrofit lights on a replacement schedule with LEDs or other advanced technology options.

SD-1.2 Use Smart Power Strips.

The District will incorporate the use of smart power strips to minimize energy use. This enables more effective management of electronics and their electric draw.

SD-1.3 Act on Energy Audit.

During the initial energy audit, the District conducted a comprehensive plug-load inventory in all classrooms. The District identified areas of inefficiency and redundancy regarding energy use. Those areas will be addressed through targeted actions.

SD-1.4 Reduce the Plug-Load.

Based on the plug-load audit, the District will develop strategies to promote staff and student behavior aimed at reducing energy consumption at each school.

Water and Landscaping

Goals & Indicators

Goals

- Reduce water consumption throughout the school district for both irrigation and internal building use.

Potential Indicators

- An overall reduction in the quantity of water used.
- Installation of landscaping featuring native plants.

Progress to Date

- Installed water bottle refill stations at the high school and middle school.
- Planned a native plant garden at the CSE. The native plant garden will require far less water than non-native species.
- Planned a rainwater catchment system at the CSE that will use harvested rainwater for irrigation.

Actions

SD-2.1 Install Rain Sensors to Reduce Irrigation Waste.

A rain sensor determines when enough rainfall has occurred to skip an irrigation cycle. Rain sensors save water, and therefore saves money. Additionally, using the sprinkler system less frequently extends the life of the system. Rain sensors have the added benefit of reducing excess runoff carrying fertilizers and pest control chemicals into nearby bodies of water.

SD-2.2 Convert Lawns to Native Plants.

Because native plants need less water and are more drought resistant, the District can reduce its water use by converting grass lawns to native plants where possible. These areas can also be used as teaching spaces for sustainability.

Transportation and Land Use

Goals & Indicators

Goals

- Reduce emissions from school transportation.
- Improve efficiency of routes through ongoing analysis.
- Examine feasibility of alternative buses technology.

Potential Indicators

- Increased carpooling and bus use.
- Lower levels of unhealthy emissions at pick-up/drop-off zones.
- Increased number of students biking and walking to school.

Progress to Date

- Encouraged biking by making bike racks accessible, hosting a Bike-to-School day, and teaching bike safety classes.
- In 2016, one in-town bus route was added to the routes required for students who live outside of the 3-mile radius. This has reduced emissions from students previously relying on parents' vehicles.
- Created no-idling zones around school buildings. As part of a Student Council project, students launched the "Turn the key, be idle free" campaign to educate commuters at all Whitefish schools about the health risks and costs associated with idling vehicles.
- Students constructed GIS transportation map and provided recommendations for efficiency improvements.
- Studied the cost and benefits of using electric buses. This research, conducted in partnership with Flathead Electric Coop will help the District shape its approach to electric transportation and provide analysis of bus routes.

Actions

SD3.1 Encourage Biking and Walking to School.

Nearly every student in the Whitefish School District is driven or drives themselves to school every day. If a student lives a half mile away from school, that equals over 163 pounds of carbon dioxide per school year from that student alone. Students who walk or cycle to school performed better on tasks requiring concentration than those who were driven to school. These alternate morning commute actions also provide an increase in student concentration lasting for about four hours into the school day. By expanding curriculum that teaches bike safety and incentivizes biking and walking to school, the school district can reduce emissions in addition to improving concentration in the classroom.

SD-3.2 Analyze and Review Bussing Data to Identify Efficiency Gains on a Regular Basis.

SD-3.3 Continue GIS Student-Based Mapping of Transportation Routes and Provide Recommendations Related to Efficiency.

SD-3.4 Utilize Data Analysis Conducted through Flathead Electric Coop to Determine Feasibility of Electric Buses and Improve Efficiency of Routes.

Consumption and Waste

Goals & Indicators

Goals

- Reduce paper use.
- Increase waste diversion.
- Purchase environmentally friendly products.

Potential Indicators

- Reduction in total waste generated.
- Reduction in proportion of waste transported to the landfill.
- Decrease in costs for paper, toner, and other disposables.

Progress to Date

- WSD recycles 375 gallons of material weekly.
- Reduced paper use through teachers' use of Google Classroom and online technology.
- Source food locally and grow approximately 2000 lbs of potatoes and squashes at the CSE. The District sources apples and cherries from Flathead Lake, and local beef is purchased through Lower Valley Processing, while Terrapin Farm and Mountainview Growers provide local produce for the past six years.
- Composts more than 1,000 pounds of materials from the three schools monthly, in coordination with Dirt Rich.
- Eliminated plastic utensils in the cafeterias, purchased metal silverware, and is transitioning away from the use of Styrofoam. At the middle school, the Student Council purchased a set of 30 plates and metal silverware for each grade-level kitchen for use during grade-level celebrations.

Actions

SD-4.1 Reduce Paper Use.

By implementing strategies and software that support reducing the amount of paper and toner the District uses, we can decrease energy use, reduce waste, and save money.

SD-4.2 Use Generated Compost On Site.

The District can use the compost it generates at school facilities for the greenhouse, outdoor gardens and landscaping organic fertilizer, instead of transporting it elsewhere.

SD-4.3 Use Local and Seasonal Foods in Teaching and Cooking.

Purchase locally sourced meat, dairy, grains, vegetables, and fruits from Montana-based farms through the Schools-to-Farms program. Develop a Farm-to-School Coordinator to increase awareness and education associated with local sourcing, as well as expanding local sourcing whenever possible.

SD-4.4 Gradually Reduce the Use of Styrofoam.

Promote alternative food serving and storage containers. Implement plan to phase-out Styrofoam completely.

District Spending By the Numbers

$16,118 on paper

$19,238 on toner

87,245 kWh of energy on paper production
= powering 9 homes for a year

159,167 gallons of water on paper production
= 1.2 million water bottles

182 trees

Education and Outreach

Goals & Indicators

Goals

- Coordinate with educational providers to construct a program of learning.
- Identify sustainability-related educational programming scope and sequence.
- Review and refine sustainability-related education programming.
- Strengthen and build partnerships to support learning about sustainability.

Potential Indicators

- List of local, regional, and national sustainability education partners.
- Scope and sequence of sustainability education programming.
- A review and evaluation of sustainability education programming.
- Public relations plan focused on sustainability education programming.

Progress to Date

DISTRICT

- Hosted Earth Day Celebration. The event featured a wide variety of booths hosted by local conservation groups and businesses. Each booth provided a hands-on activity.
- Conducted education programming with numerous Flathead Valley nonprofit organizations. For example, the District's work with Whitefish Legacy Partners, the US Forest Service, and the Flathead Avalanche Center play a key role in sustainability programming.
- Furthered knowledge about sustainability education through strategic partnerships with state and national-level organizations. For example, the District has partnered with the Sustainable Forestry Initiative and the US Green Building Council. We work to support other school districts through mentoring and guidance in sustainability education.

STUDENTS

- Installed four recycling containers at City Beach and on Baker Avenue.
- Launched the "Turn the key, be idle free" campaign to educate commuters at Whitefish schools about the health risks and costs associated with idling vehicles.
- Partnered with the Whitefish Lake Institute, Glacier National Park and Flathead Forest Service to gather, analyze, and evaluate data.
- GIS classes use Climate Change as a theme for research. They analyzed rooftop solar potential, emissions from idling, plug load, and the potential fire danger in the surrounding areas.

Actions

SD-5.1 Host the Annual Earth Day Celebration.

Whitefish School District is committed to hosting the annual Citizens for a Better Flathead Earth Day Celebration.

SD-5.2 Develop Educational Programming with Nonprofits.

The District will strengthen its partnerships in sustainability education to provide opportunities for students.

SD-5.3 Strengthen Partnerships.

The District encourages high school, middle school, and elementary students to engage in learning projects that contribute to enhancing sustainability.

SD-5.4 Support Student Projects.

The District encourages high school, middle school, and elementary students to construct personal learning projects that contribute to sustainability for their school and the community.

Center for Sustainability and Entrepreneurship

The Center for Sustainability and Entrepreneurship (CSE) was engineered to be the first net-zero energy building in Montana. The CSE will house two large classrooms, an attached four-season greenhouse, and the surrounding landscaping will incorporate xeriscaping with native plants and an experimental forest. The three acres facility will also provide an outdoor classroom, wetland, production garden, and food orchard. Each of these zones will serve as a vehicle for learning and student engagement. Through the use of the greenhouse, the CSE will be available year-round for food production, experimentation, and learning.

The CSE facility uses geothermal ground loop engineering to ensure a baseline temperature. Electricity is provided by solar PV cells. The primary electrical source is a 92-panel solar array that produces 31kW. The CSE also uses a Climate Battery, which incorporates annualized geo-solar principles by allowing air to be redistributed through ground source pumps. This system provides a 15 degree increase in the air temperature of the greenhouse. The CSE has wall insulation of R33 and roof insulation of R60. The windows are triple-paned to achieve the highest standard of insulation. Additional aspects of the facility that promote sustainability include the water system and air quality system. The greenhouse internal gutter collects rainwater and stores it to be used for irrigating the greenhouse. The construction of the CSE incorporated reclaimed materials and minimized construction waste whenever possible.

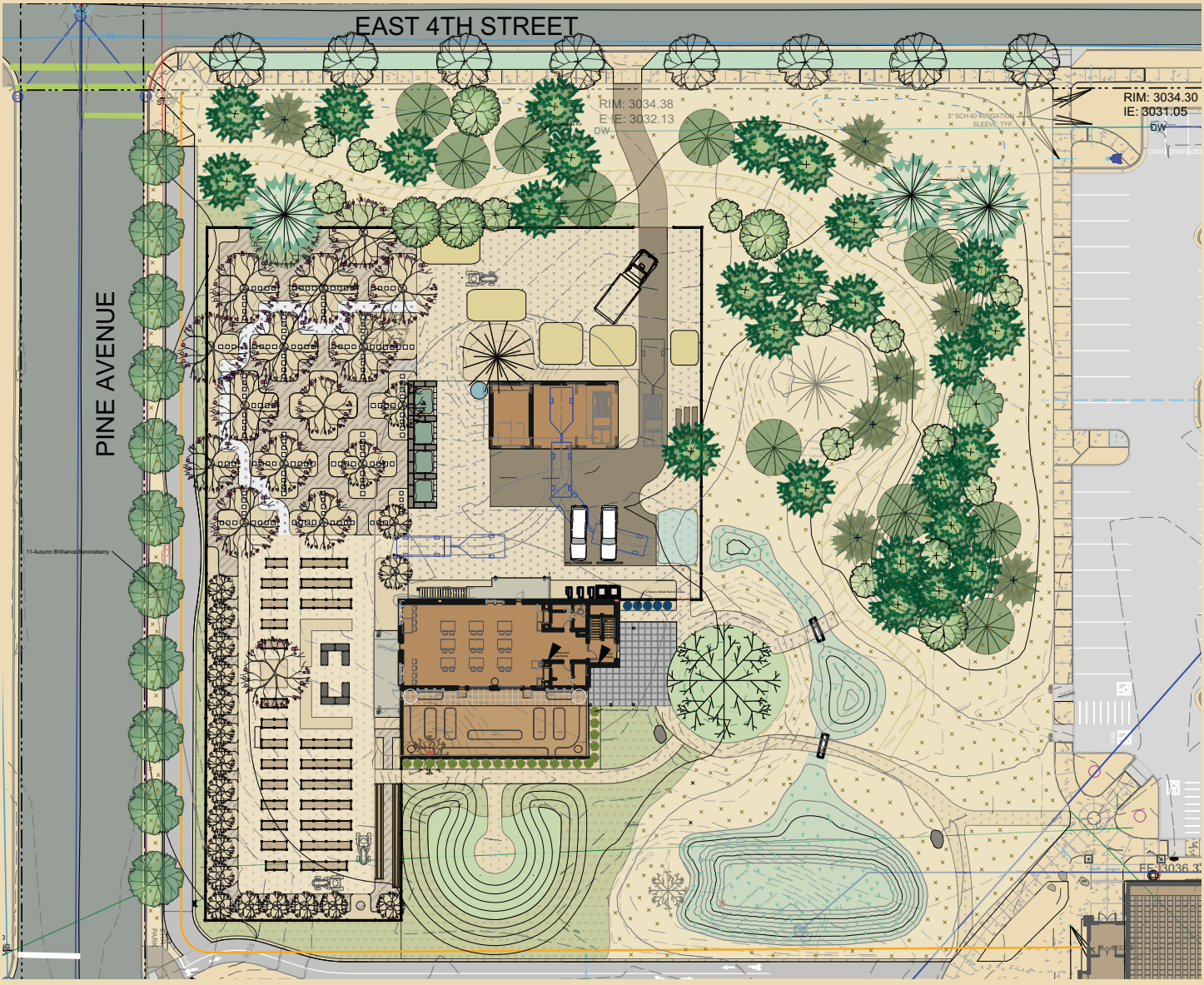

FIGURE 1. CENTER FOR SUSTAINABILITY AND ENTREPRENEURSHIP MASTER SITE PLAN

Vision for K-12 Programming

By working directly with local businesses and organizations, students will gain the knowledge and experience needed to foster personal and societal transformation. Real-world application will allow all students to experience learning that is supportive, individualized and meaningful.

ENERGY

Working directly with community, regional and national partners, students learn about energy consumption, energy modeling and technologies, green building practices, and strategies for reducing the community's carbon footprint. Students investigate the ways policy and engineering are shaping our energy needs and patterns of consumption.

AGRICULTURE

Through hands-on inquiry, students learn about healthy food systems, sustainable farming practices, strategies for scaled agriculture production, soil science and more. Students plant, cultivate and harvest food to be used in the District's cafeterias. Internship opportunities ensure that students gain first hand knowledge from local commercial agriculture production facilities, greenhouses and ranches. Students of all ages experience the reward of locally harvested food.

FORESTRY

In partnering with local forestry companies, the Forest Service, and the National Park Service, students learn about the growth, health, composition and quality of forests. Students explore the relationship between policy and forest management. Students use both experience in the field and digital tools such as GIS to research and apply forest management and water quality improvement techniques.

NATURAL RESOURCES

Students learn about land, water, soil, plants and animals, ecological systems, and focus on how the management of our natural resources affects the quality of life for present and future generations. Students track consumption and examine how waste is created and can be reduced. Working with local organizations and businesses, students develop strategies to use resources more effectively.

SUSTAINABLE WHITEFISH

Through the CSE, students have the opportunity to understand how sustainability is shaping their community and impacting them as citizens. Students learn about future career pathways and practices related to sustainability and entrepreneurship. Students form strong bonds with the community as they strengthen community connections through volunteerism and internships.

Outreach and Education

Outreach and education are important facets of Whitefish School District's sustainability programming, as the CSE will also be a conduit for sustainability education for the Whitefish community and greater Flathead Valley. The District is working to share the message and practice of sustainability education regionally and nationally, and through strategic partnerships the mission of creating a more sustainable Whitefish is being achieved. Coordinating with organizations such as the National Park Service, Whitefish Legacy Partners, Citizens for a Better Flathead and numerous others, allows students to engage in real world platforms, while connecting adult education program opportunities for students of all ages.

In addition to local partnerships, the District facilitated the Better Buildings, Better Schools education series in conjunction with the Montana Department of Environmental Quality, the Lt. Governor's Montana Smart Schools program, and the Montana chapter of the US Green Building Council (USGBC). This four-part series provided an overview of how sustainable practices through a whole-school approach can lead to healthy, safe, and successful students, while creating resource-efficient schools. In addition to presenting our message and approach at national conferences, such as the Green School Conference, the National Sustainability Teachers' Academy, and Greenbuild, Whitefish School District has also partnered with the USGBC to develop educational opportunities for teachers across the country. Outreach and education are paramount in the success of integrating our Climate Action Plan.