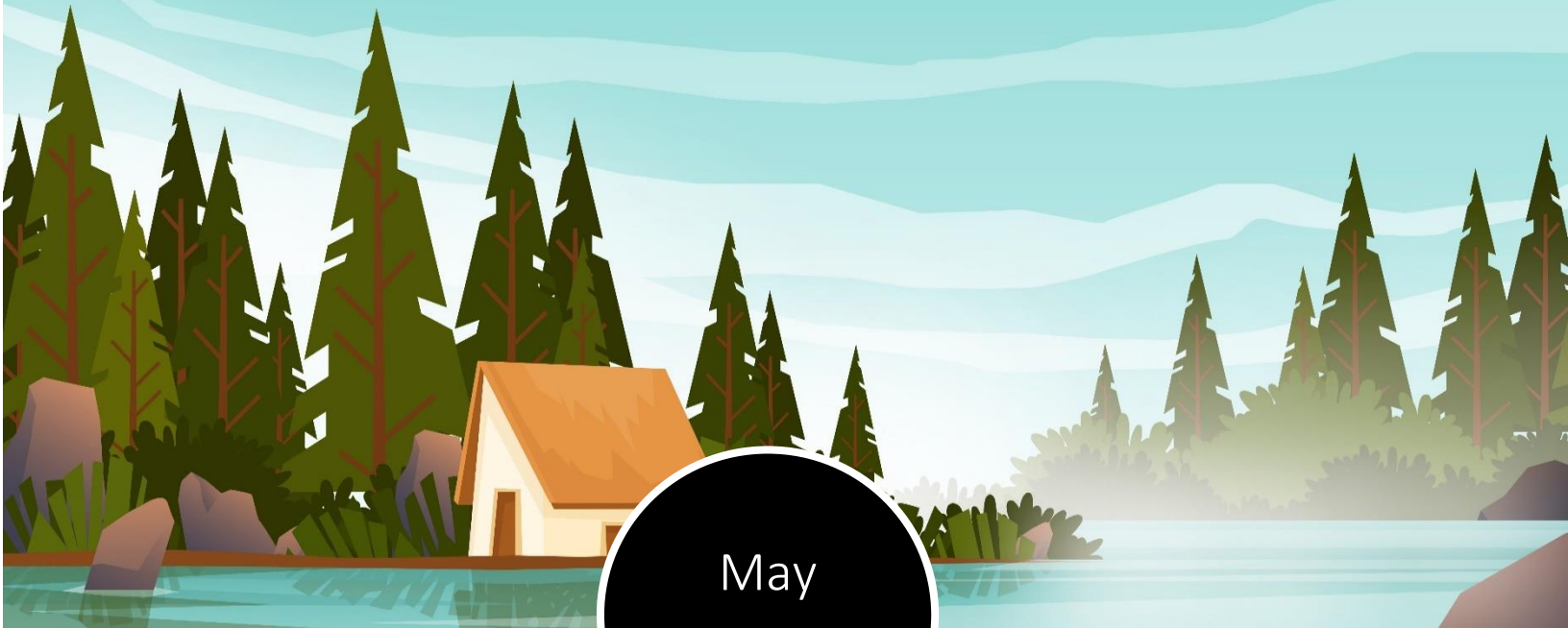


Summer Village of Bondiss

All One Sky
— FOUNDATION —



May
2023

CLIMATE ADAPTATION PLAN

Summer Village of Bondiss

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- Leah Iwaniuk, Councilor
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- Lawrence Habiak, Councilor
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1. Introduction

There is unequivocal evidence that climate change is occurring around the globe, and municipalities across Alberta are already feeling its effects. According to the Intergovernmental Panel on Climate Change (IPCC), our world is already 1.1°C warmer than pre-industrial times because of greenhouse gas emissions that are caused by human activities¹. Despite global mitigative efforts to curb emissions and slow the rate of change, current actions are insufficient to address the impacts of climate change on our food and water security, health, natural environment and economy. To ensure a livable and sustainable future for our people and planet, the IPCC has called for “a greater focus on adaptation” to create healthier and more resilient communities worldwide.

In partnership with All One Sky Foundation, the Summer Village of Bondiss (Bondiss) has developed this Climate Adaptation Plan for the community. This Plan serves as the overarching document that guides the Village in preparing for the impacts of climate change.





Importantly, the Bondiss community has engaged in community outreach to enhance the capacity of their residents to understand local climate changes and impacts, and the actions needed to adapt to these changes. A climate change impact assessment was performed as part of this process to help Council and the Chief Administrative Officer gain a clearer understanding of local vulnerability, as well as the risks and opportunities that may arise from climate change.

¹ Intergovernmental Panel on Climate Change. 2023. AR6 Synthesis Report - Climate Change 2023. Retrieved from <https://www.ipcc.ch/report/ar6/syr/>

2. Project Scope

Table 1 outlines the different scopes that apply to the context of this project. In short, the scope of this project includes all climate change related impacts that may affect the Summer Village of Bondiss.

Table 1: Bondiss Project Scope

Scope	What's included
 Geographic	<ul style="list-style-type: none"> Climate impacts occurring within the municipal boundaries of the Summer Village of Bondiss, and including impacts to Skeleton Lake
 Operational	<ul style="list-style-type: none"> Community-wide scope considering ALL potential climate change impacts on the 'community': assets, services, operations, economy, well-being of residents, natural environment, etc. Focus on impacts affecting Bondiss, and actions that can be implemented by/in Bondiss
 Temporal	<ul style="list-style-type: none"> The assessment is future –focused, considering impacts out to the 2060's; the 30-year average centered on 2065 (2051-2080)
 Emissions	<ul style="list-style-type: none"> A high greenhouse gas emissions scenario where global emissions continue at existing rates





The following aspects are specifically outside the scope of this work:

- Impacts that are not related to climate change such as provincial policy or legislative changes, broad economic impacts, and impacts related to demographic or population changes;
- impacts that do not occur within the municipal boundaries, or affect Skeleton Lake;
- impacts that are well outside municipal control; and
- impacts that are expected to improve as a result of climate change, such as extreme cold events and freeze-thaw cycles.

3. Climate Projections

Climate projections for Bondiss are based on a 2060s (2051-2080) future time-period, and relative to the 1976-2005 historical baseline period. These projections incorporate a high emissions scenario where greenhouse gas emissions continue to rise at existing rates until the end of the century. Data for these projections are derived from the Climate Atlas of Canada, for the 'Boyle' grid area. Table 2 summarizes the future climate changes for Bondiss that have been observed.

Table 2 Summary of future climate changes for Bondiss

Climate projections from the baseline time-period to the 2060s	Description
<p>Hotter Temperatures</p> 	<p>More frequent and intense heat waves and hot weather is expected. Hotter summers will lead to drier conditions overall which will increase wildfire risk and drought risk in Bondiss and may reduce surface water availability and lower water levels in lakes, ponds, and streams. Winter temperatures will also be milder with fewer cold days which may provide health benefits and improve quality of life, but negatively impact winter recreation opportunities such as ice skating and ice fishing.</p>
<p>More Extreme Weather</p> 	<p>Climate changes are projected to cause more convective storms, which means more frequent extreme weather events such as high winds, hailstorms, lightning, and tornadoes. This may include more heavy rainfall events and flooding.</p>
<p>Changing Seasons and Ecosystems</p> 	<p>Our seasons are changing, and we are projected to have a much longer frost-free season in the future, with fall coming later and spring arriving earlier. This means a longer summer season for food and crop growing and summer recreation but may negatively affect local wildlife and fish populations and ecosystems that are unable to adapt. New invasive species, pests, and diseases may also emerge, causing further strain on our ecosystems.</p>
<p>Climate Change Benefits</p> 	<p>Projected changes in climate may bring opportunities to the Village, such as an extended agricultural growing season to produce new crop types and varieties. Additionally, warmer winters will reduce extreme cold risks and reduce winter heating and fuel costs.</p>

Summer Village of Bondiss – Climate Adaptation Plan

Table 3 provides a summary of projected changes to several climate variables for Bondiss.

Table 3 Summary of Climate Projections for Bondiss

Variable	Historic	Future	Change
Mean Annual Temperature (°C)	1.7	6	+ 4.3
Mean Summer Temperature (°C)	15.1	19.3	+ 4.2
Mean Winter Temperature (°C)	-13.6	-8.5	+ 5.1
Number of Very Hot Days (+30 °C)	1.7	19	+ 17.3
Number of Heat Waves (#) ²	0.2	2.6	+ 2.4
Number of Very Cold Days (-30°C)	15.1	3.5	- 11.6
Mean Annual Precipitation (mm)	449	499	+ 50
Mean summer Precipitation (mm)	221	228	+ 7
Mean Winter Precipitation (mm)	65	75	+ 10
Max 1-Day Precipitation (mm)	29	33	4
Heavy Precipitation Days (#) ³	8.4	10.5	+ 2.1
Freeze Thaw Cycles (days) ⁴	86.3	71.3	- 15
Frost-Free Season (days) ⁵	117.9	154.3	+ 36.4

4. Community Survey

An online survey was released in November 2022 to provide Bondiss residents with the opportunity to provide their thoughts on how their community might be affected by climate change in the near future. The survey yielded 27 responses with 78% of questionnaires (21) being fully completed.

Table 4 is a summary of responses across all questions, showing the combined percentage of participants who rated impacts as either having a ‘moderate’ or ‘major’ effect. As a general rule, impacts with a combined “Moderate effect” and “Major effect” rating above 50% were considered further through the climate change impact assessment process. Detailed survey results are available in Appendix B.

² A heat wave is a period of at least 3 consecutive days where temperatures reach +30°C or higher.

³ A Heavy Precipitation Day is a day on which at least a total of 10 mm of rain or frozen precipitation falls.

⁴ A freeze-thaw cycle is a count of days when the air temperature fluctuates between freezing and non-freezing temperatures. Under these conditions, it is likely that some water at the surface was both liquid and ice at some point during the 24-hour period.

⁵ The Frost-Free Season is the approximate length of the growing season, during which there are no freezing temperatures to kill or damage plants.

Summer Village of Bondiss – Climate Adaptation Plan

Overall, increased lake temperatures impacting recreation was rated as the most concerning impact to survey participants. Increased wildfire smoke, reduced lake levels wildfires, droughts, power outages, and invasive weeds followed closely behind and were also rated as relatively significant impacts to the Bondiss community.

Table 4 Combined percentage of participants who rated impact as 'Moderate' or 'Major' effect⁶

Impact	Percentage of 'Moderate' or 'Major' responses
Increased lake temperatures impacting recreation	85%
Wildfire smoke impacts air quality and local health	78%
Reduced lake levels in Skeleton Lake	78%
Increased lake temperatures affecting water quality and wildlife	78%
Increased summer tourism and recreation season	68%
Wildfires damage buildings and property	65%
Negative impacts to aquatic wildlife and habitat and lake health	65%
Longer food growing season	64%
Increased invasive aquatic species degrading lake biodiversity	57%
Prolonged power outages	56%
Increased drought affecting local vegetation	54%
Increased invasive weed species damaging drainage systems	52%
Windstorms damaging homes and property	52%
Reduced winter heating costs and fuel use	50%
Increased runoff into Skeleton Lake affecting water quality	46%
Improved quality of life	41%
Negative impacts to terrestrial wildlife and habitat	39%
Flooding of homes and property from heavy rainfall	38%
Hailstorms damaging homes and property	38%
Increased invasive tree species and pests	35%
Local health impacts from extreme heat	32%
Loss of winter recreation	31%
Increased air conditioning costs	24%

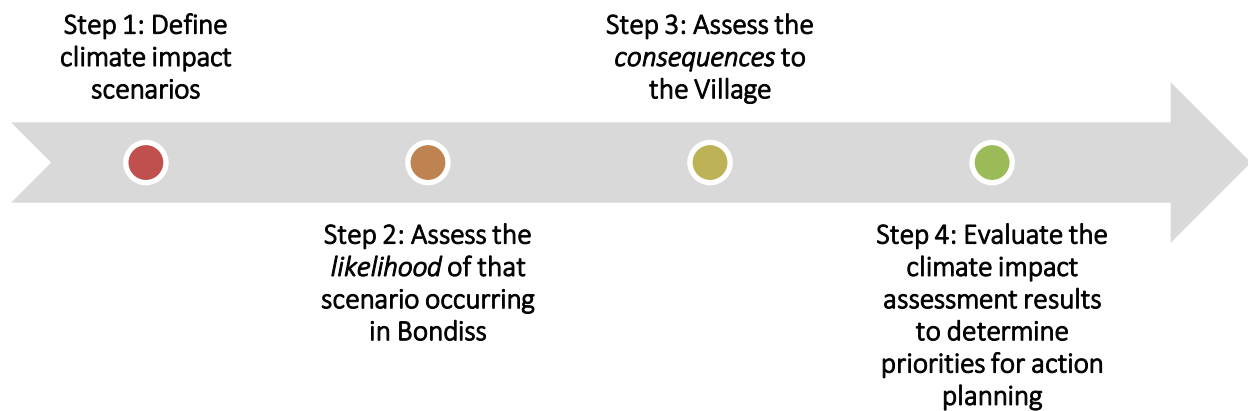
** Note: Impacts highlighted in blue represent benefits that may be realized as a result of climate change*

⁶ Impacts with potential positive benefits are highlighted in blue.

5. Climate Impact Assessment

The next step in the project is to utilize the survey results and climate projections data to conduct a formal climate change impact assessment to assess and prioritize potential impacts. The Climate Impact Assessment involves four key steps as illustrated in Figure 1 below. Each step in the climate impact assessment process is defined in detail throughout this section.

Figure 1 Climate Impact Assessment Methodology





Step 1: Defining Climate Impact Scenarios

Climate impact scenarios characterize the cause-and-effect relationship, or impact chain, between climate changes, impacts, and the potential consequences of those impacts on the Summer Village of Bondiss. Impact scenarios also account for local exposure to climate hazards, including consideration of the vulnerability (sensitivity and lack of coping capacity) of local services, infrastructure, populations, and the natural environment. Vulnerability to a given climate impact influences the magnitude or severity of impacts and consequences. It is therefore important to characterize key vulnerabilities as part of the climate impact scenarios.

Based on the results of the community survey and discussions with community members and staff, a total of nine (9) climate impact scenarios were identified and considered throughout the climate impact assessment process (

Table 5). Scenarios for climate impacts that may produce benefits for the village, such as a longer agricultural growing season and summer tourism/recreation season, were not considered in the impact assessment process. However, ideas on how to take advantage of climate benefits have been incorporated in the action planning process (Section 6). Appendix A defines each scenario below in detail.






Table 5 Overview of Climate Impact Scenarios

 Increased lake temperatures	 Wildfire smoke
 Reduced lake levels in Skeleton Lake	 Wildfire
 Changing Ecosystems Affect Aquatic Wildlife, Habitat and Lake Health	 Prolonged power outages
 Prolonged drought	 Windstorm
 Extreme rainfall and stormwater flooding	

Step 2: Assessing Likelihood

There are generally five (5) methods that can be used to assess the likelihood of a climate impact. Each method can be employed on its own or in tandem with others. Table 6 provides a description of each method.

Table 6 Methods to Assess the Likelihood of Climate Impacts

Strategy	Description
 Historic event occurrence	Use local reports, news articles or historic data to estimate likelihoods for events that have affected your community.
 Known return intervals	Use known return intervals: E.g.: a 1-in-100 rainfall event (1% annual likelihood), or 1-in-200-year river flow level (0.5% annual likelihood).
 Frequency distribution analysis	Download frequency distribution data from climate databases (e.g., the Climate Atlas of Canada) and approximate the likelihood of the defined threshold or intensity level occurring.
 External research	Existing assessments or research studies may contain relevant likelihood estimates, or data from which estimates can be generated or extrapolated.
 Professional judgment	When none of the other approaches are possible, the professional judgment of staff and stakeholders in your community can be used to estimate the likelihood of events occurring today and in the future.

After an initial assessment of likelihood has been completed, a likelihood score can be established for each scenario. Table 7 displays the scale that was used to score the likelihood of climate impacts.

Table 7 Climate Impact Likelihood Scale

Score	Descriptor	Recurring Event	Single Event
1	Rare	Impact scenario is expected to happen less than once every 100 years (Annual chance < 1% in 2050)	Almost certain not to occur (probability < 1%)
2	Unlikely	Impact scenario is expected to happen about once every 51-100 year (1% ≤ annual chance < 2% in 2050)	Not anticipated to occur (1% - 33% probability)
3	Possible	Impact scenario is expected to happen about once every 11-50 years (2% ≤ annual chance < 10% in 2050)	Just as likely as not to occur (33% - 66% probability)
4	Likely	Impact scenario is expected to happen about once every 3-10 years (10% ≤ annual chance < 50% in 2050)	Expected to occur (66% - 99% probability)
5	Almost Certain	Impact scenario is expected to happen once every two years or more frequently (Annual chance ≥ 50% in 2050)	Virtually certain to occur (probability >99%)

The detailed list of Climate Impact Scenarios in Appendix A includes a likelihood score, and a description of the method used to calculate the likelihood of each climate impact.

Step 3: Assessing Consequence

The consequence assessment involved assigning categorical and numerical (1 to 5) values to the potential consequences of each climate impact scenario. A tailored rating scale for assessing the consequences of climate change impacts on Bondiss was developed (Table 8), reflecting local conditions that are consistent with guidance and best practices for climate change risk assessment⁷. The consequence scale was viewed as a guideline only, to support the prioritization of climate change impacts facing the Village.

⁷ See for example: International Organization for Standardization (ISO) guideline 14092 – Climate adaptation planning for local governments and communities; All One Sky Foundation - Climate Resilience Express Community Climate Adaptation Planning Guide; and the Canadian Council of Ministers of the Environment (2021) Guidance on Good Practices in Climate Change Risk Assessment.

Summer Village of Bondiss – Climate Adaptation Plan

Table 8 Scale for Rating the Consequences of Risks⁸

Score	Descriptor	Description
(1)	Very low	<ul style="list-style-type: none"> • Negligible impact on health & safety or quality of life for residents • Very minimal impact on local economy • Financial loss equal to <1% tax impact • Insignificant environmental disruption or damage • Slight damage to property or infrastructure, very short-term interruption to water, power, and other services
(2)	Low	
(3)	Medium	<ul style="list-style-type: none"> • Some injuries or illnesses • Modest temporary impact on local culture and quality of life for some residents • Temporary impact on the local economy for some businesses/sectors • Financial loss of between 3% and 5% tax impact • Isolated but reversible damage to wildlife, habitat, and ecosystems, including Skeleton Lake • Damage to property and infrastructure, medium-term interruption to water, power, and other services
(4)	High	
(5)	Very high	<ul style="list-style-type: none"> • Many serious injuries, illnesses, or fatalities • Long-term impact on local culture and the quality of life of residents • Long-term impact on local economic sectors, major economic disruption • Financial loss equal to >7% tax impact • Widespread, irreversible, and long-term damage to wildlife, habitat, and local ecosystems, including Skeleton Lake • Widespread damage to local property & infrastructure, long-term interruption or impacts to water, power, and other services

⁸ Note: the descriptions for 2 (Low) and 4 (High) have been left blank intentionally.

Step 4: Climate Impact Evaluation

The end result of the climate impact assessment is a climate impact matrix, such as the one shown in Figure 2. The Matrix delineates between impacts that pose significant threats to the Bondiss community, and those that do not. The upper right corner of the matrix (in orange and red) represents larger impacts that would be priorities for action planning.

Following the climate impact assessment, the results are reviewed and verified by local community members and staff. The evaluation allows them to review the relative position of climate change impacts in the matrix and make well-reasoned arguments to adjust their location if they are judged—when viewed collectively—to have been either over or under-estimated in comparison to one another.

After the evaluation process is complete and all risk scores have been finalized, the next step is to determine which scenarios should be considered for action planning. Table 9 provides the decision framework that was used to prioritize scenarios based on where they fell in the matrix.

Table 9 Impact Decision Thresholds for Action Planning

Label	Decision
Very high priority	Adaptation actions should be developed in the near-term to reduce risks.
High priority	Adaptation actions should be developed in the near- medium-term, to reduce risks.
Medium Priority	Adaptation actions may be developed, particularly where low-cost options are available that provide other social, economic, or environmental benefits.
Low Priority	No action required at this time beyond monitoring and consideration as part of regular reviews.
Very low priority	No action required at this time beyond monitoring and consideration as part of regular reviews.

Climate Impact Assessment Results

A climate impact assessment workshop was held virtually (via Zoom) on March 22, 2023. The goal of the workshop was to assign consequence scores to the 9 scenarios of interest to prioritize the most significant climate-related impacts facing the Summer Village of Bondiss.

The final results of the climate impact assessment are provided in the climate impact matrix displayed in Figure 2. These results have been evaluated and verified by community members to determine if any impacts were over or underestimated in comparison to one another. A record of comments and suggestions that were made at the workshop for each impact can be found in Appendix C.

Figure 2 Climate Impact Matrix

CONSEQUENCE	Very high					Increased Lake Temperatures
	High			Reduced Lake Levels	Drought	Wildfire Smoke Flooding
	Medium			Wildfire	Changing Ecosystems	Windstorm
	Low			Power Outage		
	Very low					
		Rare	Unlikely	Possible	Likely	Almost certain
LIKELIHOOD						

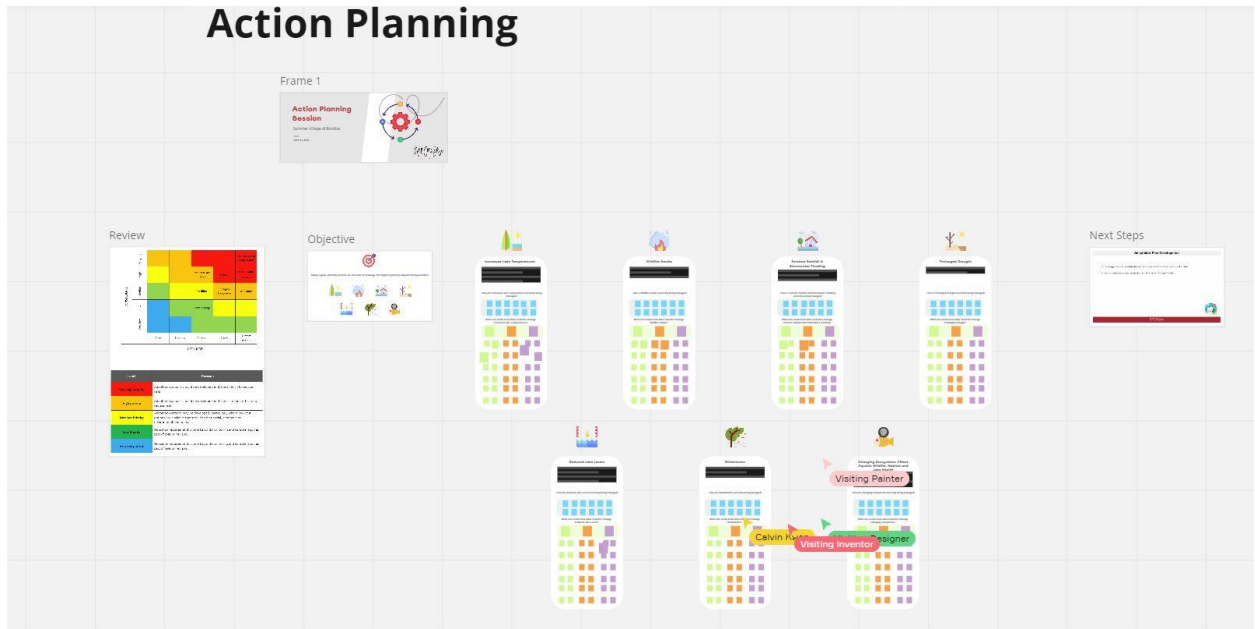
6. Climate Resilient Bondiss

This section presents the path towards a climate resilient future for Bondiss. The vision below is created to guide this Climate Adaptation Plan for success.

Vision: The Summer Village of Bondiss is resilient to the climate of the future

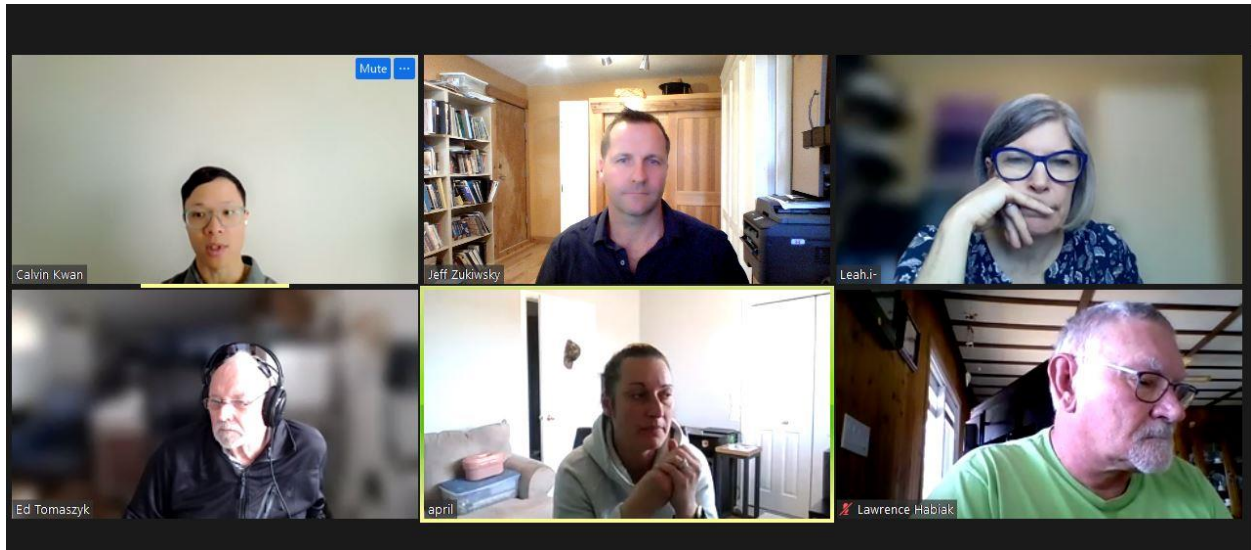
An action planning session was held virtually on April 13, 2023 to brainstorm actions that could be taken to build resilience to the highest priority climate impacts facing Bondiss. During the session, a total of 39 actions were developed and organized into what the Village could do to build resilience, including how Bondiss residents could support community resilience. Photos of the session are shown below in Figure 3 and Figure 4.

Figure 3 Virtual Action Planning Session Miro Board Photo



Summer Village of Bondiss – Climate Adaptation Plan




Figure 4 Virtual Action Planning Session Zoom Meeting Photo



Summer Village of Bondiss Climate Adaptation Actions





Following the session, actions were further refined and sorted into three action types as illustrated in Figure 5. A total of seven (7) actions are recommended for Bondiss and are outlined below under each type. Each action includes the following information:

- The estimated **cost** range for implementing the action:

Cost Ranges	
Low cost (<\$1,000)	
Medium cost (\$1,000 - \$10,000)	
High cost (>\$10,000)	

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- The recommended **timeframe** for implementation of the action

Time Frame	
Short-term (1-2 years)	
Medium-term (2-5 years)	
Long-term (5+ years)	
Ongoing (occurs on a continuous basis)	

- The **priority climate change impact(s)** addressed by the action








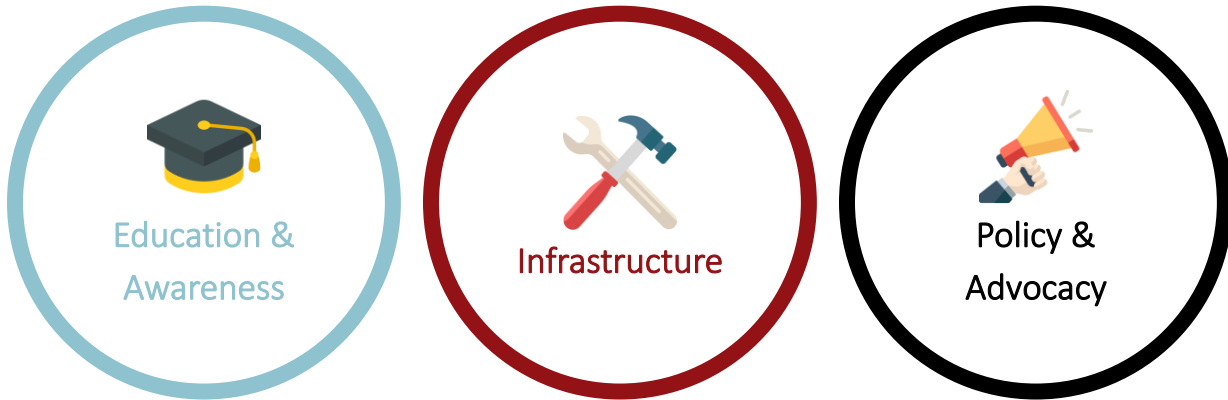
Priority Climate Impacts	
Increased Lake Temperatures	
Wildfire Smoke	
Reduced Lake Levels in Skeleton Lake	
Changing Ecosystems Affect Aquatic Wildlife, Habitat and Lake Health	
Prolonged Drought	
Windstorm	
Extreme Rainfall and Stormwater Flooding	

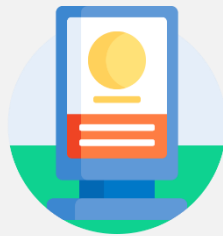
Figure 5 Climate Adaptation Action Types



EDUCATION & AWARENESS

Goal: Bondiss residents understand climate change impacts and their role in building local resilience

Education & Awareness Actions



Action 1: Install informational signage at the boat launch

Cost



Time Frame



Priority Impacts Addressed



Description

The sign(s) could include up to date information about climate-related impacts and issues such lake water quality (e.g., blue-green algae), campfire bans, air quality advisories, and/or weather warnings. In addition, the sign(s) should contain information about the important ecological features of Skeleton Lake and the role of residents in protecting the lake (E.g., do not litter, do not disturb the shoreline, etc.).

Education & Awareness Actions



Action 2: Create a dedicated climate adaptation webpage on the Bondiss website

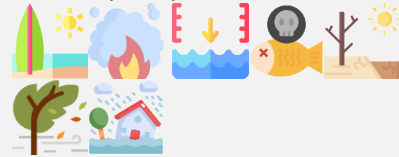
Cost



Time Frame



Priority Impacts Addressed



Description

A dedicated webpage on the Bondiss website could be used to inform residents about local climate related impacts and their role to support adaptation (Property Owners Supporting Climate Resilience in Bondiss). Topics to include on the website could include links to air quality webpages (purple air monitor and AQHI), fire hazard prevention, flood prevention, water quality and conservation, and fertilizer/herbicide/pesticide usage. In addition, these webpages could be turned into a printed 'Welcome Guide' for existing and new residents to Bondiss.



Infrastructure

Goal: Village infrastructure can withstand future weather and climate-related impacts

Infrastructure Actions



Action 3: Conduct an engineering assessment of the potential impacts of climate change on roads and stormwater infrastructure

Cost



Time Frame



Priority Impacts Addressed



Description

This assessment would likely follow the [PIEVC \(Public Infrastructure Engineering Vulnerability Committee\) Protocol](#) for assessing the severity and probability of future climate changes and impacts to the design, operation, and maintenance of infrastructure. The Village will need to acquire funding and hire a contractor to complete this work.



Policy & Advocacy

Goal: The Village continues to advocate for and maximize efforts towards climate resiliency

Policy & Advocacy Actions



Action 4: Develop a climate resilient Village procurement policy

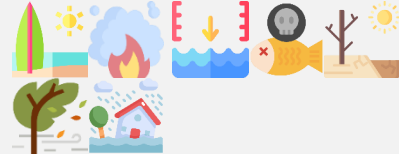
Cost



Time Frame



Priority Impacts Addressed



Description

Develop a Village procurement policy that requires all contractors to consider and plan for climate change impacts and adaptation in their work. This Policy will ensure that all future developments and asset improvements are resilient to the climate of the future.

Policy & Advocacy Actions



Action 5: Continue to advocate for watershed monitoring and stewardship

Cost



Time Frame



Priority Impacts Addressed



Description

Partner with local and regional non-profit organizations and continue to advocate for monitoring of lake and environmental conditions and watershed protection. This includes:

- Advocating for Alberta Health Services to increase the frequency of blue-green algae and other lake quality monitoring efforts;
- Support for the Alberta Lake Management Society's Lakewatch Program which gathers important water quality data and information at Skeleton Lake; and
- Advocating for increased enforcement of environmental offences around Skeleton Lake to prevent water quality degradation from human activities (e.g., littering, dumping, etc.).

Policy & Advocacy Actions



Action 6: Update the Skeleton Lake Watershed Management Plan

Cost



Time Frame



Priority Impacts Addressed



Description

The Skeleton Lake Watershed Managed Plan (SLWMP) provides a framework for the protection and sustainable management of aquatic resources and habitats in the Skeleton Lake watershed. The Plan was developed in 2009, does not take climate change into account, and is likely in need of updating. An updated SLWMP could identify:

- Water management options to improve and maintain long-term sustainable and stable water levels in Skeleton Lake;
- Priority areas for the restoration of impaired riparian zones and wetlands and the protection of existing wetlands;
- Options to manage effluent into Skeleton Lake that could affect water quality;
- Options to manage the impacts of increased water temperature of the Lake; and
- Strategies to maintain the health of Skeleton Lake aquatic and terrestrial ecosystems.

The Village will need to work in partnership with the Province of Alberta, nearby communities (County of Athabasca, Summer Village of Mewatha, Village of Boyle) and the Skeleton Lake Stewardship Society, and/or other local and regional watershed protection groups.

Policy & Advocacy Actions



Action 7: Implement the policies in the draft Municipal Development Plan (MDP) to support local climate adaptation and resilience

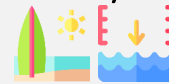
Cost



Time Frame



Priority Impacts Addressed



Description

The following draft MDP policies specifically support climate resilience:

General Development Policies

- Install erosion and sediment control measures
- Retain wetlands
- Incorporate FireSmart recommendations into the Land Use Bylaw
- Encourage small-scale agriculture activities

Watershed Stewardship Policies

- Restricts the types and situational usage of fertilizers
- Preserve vegetative cover surrounding Skeleton Lake
- Restore and re-establish natural vegetation cover
- Maintain and enhance wildlife connectivity around the lakeshore
- Conserve unique terrestrial habitats and significant treed areas

Future Land Use Policies

- New development on lakefront lots shall be setback from the property line as per the requirements of the Land Use Bylaw.
- Require all developments to provide onsite water and sanitary systems
- Avoid work that results in the harmful alteration, disruption, or destruction of fish
- Reserve lands shall remain in their natural state or be developed for low-impact recreational
- Utilized Low Impact Development (LID) stormwater management systems and design features
- New development and redevelopment should be designed to improve drainage patterns and reduce negative impacts.

Property Owners Supporting Climate Resilience in Bondiss

As a property owner in Bondiss, you can do your part to support climate resilience and protect your property from extreme weather events and climate change.

Stay informed

It is your responsibility to stay informed. Always adhere to notices, warnings and alerts issued by the Village and/or Province of Alberta. Here are some ways you can stay informed:

- ✓ Follow local weather forecasts and alerts to know when extreme weather (heat, rainfall, wind, smoke) may occur in the area
- ✓ Download the [Alberta Emergency Alert app](#) on your phone, tablet or computer to receive critical information about an immediate threat, where it is occurring, and what action you need to take
- ✓ Use the [Alberta Air Quality Health Index Map](#) to monitor local air quality conditions in your area
- ✓ Follow the [Village of Bondiss website](#) and [Facebook page](#) for local updates

Do your part to support the Village to monitor and report climate induced changes in the community. For example:

- ✓ If you see blue-green algae⁹, a downed tree, or an environmental infraction, call the Village office.
- ✓ If you see a wildfire in a forested area, call 310-FIRE

Be prepared

Personal preparedness is everyone's responsibility. Emergencies and disasters can occur anywhere, at any time. It is your responsibility to ensure you are prepared if an emergency or disaster occurs. Protect you and your family from extreme weather emergencies using these strategies¹⁰:

- ✓ Create a family emergency plan that you can print and store with your emergency supplies¹¹
- ✓ Be prepared to Shelter in Place if there is severe weather or hazardous air¹²
- ✓ Build a family emergency kit with necessary supplies for a minimum of 72 hours
<https://www.alberta.ca/build-an-emergency-kit.aspx>
- ✓ Learn more about how to be prepared for extreme weather conditions and climate-related impacts including power outages, extreme heat, storms, wildfires, and flooding by visiting:
<https://www.alberta.ca/hazard-preparedness.aspx>

Protect your home and property

There are many things you can do around your home and property to reduce the impact of extreme weather and climate change, for example:

- ✓ To protect your home from **heavy rainfall and flooding**,
 - Choose flood damage-resistant building materials for walls and siding, flooring, and doors

⁹ More information about blue-green algae here: <https://www.albertahealthservices.ca/news/bga.aspx>

¹⁰ See: <https://www.alberta.ca/emergency-preparedness.aspx> for more information

¹¹ A template from Public Safety Canada is available here: <https://www.getprepared.gc.ca/cnt/plns/mk-pln-en.aspx>

¹² More information about Shelter in Place is available here: <https://www.alberta.ca/shelter-in-place-advisories-severe-weather-hazardous-air.aspx>

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- Repair cracks in your basement foundation
- If your basement is subject to flooding, install a sump pump with a back-up power source
- Improve your lot grading so it slopes away from your house foundation.
- Install eavestroughs and downspouts if your home does not have them and ensure downspout extensions direct water at least 1.5 metres away from your house
- Clean your roof, eavestroughs, downspouts and drainage gutters clear of debris by removing needles, leaves, etc.
- ✓ To protect your home from **windstorms**, you can install impact resistant windows and doors and put a safety film on your windows. You can also install protective shutters (roll shutters or storm shutters) on the outside of your windows
- ✓ To protect your home from **wildfire smoke**, purchase a portable air purifier unit. An air purifier is a device that purifies the air of particulates or gases. Look for a HEPA (High Efficiency Particulate Air) filter, which provides the best protection from wildfire smoke. Use protective measures, such as wearing a mask, to reduce health-related impacts associated with poor air quality
- ✓ To protect your home from **wildfires**, follow the Alberta FireSmart guidelines which include using non-combustible and fire-rated materials for home construction and renovation, cleaning and clearing flammable debris (dry leaves, twigs, branches, etc.) from the areas around your home, and planting fire-resistant trees and pruning existing trees on your property¹³;
- ✓ To protect your home from dry conditions and **drought**,
 - Choose drought tolerant annuals, perennials and grasses, and hardy trees and shrubs when landscaping
 - Add a base of at least twenty centimeters (8 inches) of good quality soil for a healthy garden or lawn that retains more water and therefore requires less watering
 - Add mulch around trees and shrubs to retain moisture and keep an even soil temperature
 - Capture and use free rainwater collected in a rain barrel(s) as a source of water for your yard and/or garden
 - Direct runoff from downspouts and other hard areas into the landscaped areas of your property to avoid watering
 - If you have a manicured lawn, you can help conserve water by:
 - Watering early in the morning before the heat of the day
 - Using a soaker hose, drip irrigation or water by hand, rather than sprinkling
 - Refraining from mowing your lawn too short. Keep it 5 to 7 cm high to shade the soil

Protect the lake

Skeleton Lake is a natural water body that is one of the most valued natural resources to the Bondiss community. It is important that you do your part to help protect and care for the lake so that it can continue to thrive under a rapidly changing climate. Some effective actions you can take include:

- ✓ Reducing fertilizer, herbicide, and pesticide use on your property
- ✓ Protecting the sensitive lakeshore ecosystem around Skeleton Lake by preserving the natural landscape around your property and refraining from lakeshore modifications
- ✓ Maintaining healthy water quality by preserving important vegetative cover surrounding Skeleton Lake when planning new developments, to the greatest extent possible
- ✓ Avoid activities that may degrade or pollute the lake and surrounding area, such as littering

¹³ Download the Alberta FireSmart Homeowners Guide here: <https://www.firesmartalberta.ca/>



7. Implementation

The final and most important step of the climate adaptation planning process is implementation of the plan. An effective implementation plan and process is critical for success¹⁴.

An important aspect of implementation is ‘mainstreaming’ – integrating climate resilience, as a matter of routine, into community strategies, plans, projects, and administrative processes. This includes, for example: land use and development decisions; administrative processes; community development work; planning processes (e.g., the Bondiss Municipal Development Plan); and decisions related to the design, maintenance, and upgrading of infrastructure.

The Climate Adaptation Plan should be evaluated regularly—at least every 5-10 years—to ensure it remains effective and relevant. The evaluation should consider:

- Lessons learned from the implementation of actions, both in terms of whether actions have been implemented as intended and the effectiveness of implemented actions in achieving the intended results.
- New research and scientific information on climate projections and impacts, which may affect the understanding of risks and opportunities facing the community.
- Changes to community goals, or changes to social, economic, or environmental conditions, which likewise may affect the understanding of risks and opportunities facing the community.

Keeping this Plan relevant may involve a few minor adjustments, or it may require revisiting some of the steps in the planning process and preparing an updated Plan.

¹⁴ All One Sky Foundation. 2022. Climate Resilience Express - A Community Climate Adaptation Planning Guide.

Appendix A: Climate Impact Scenarios

Increased Lake Temperatures

Description	Increased temperatures in Skeleton Lake, causing algal blooms	
Climate driver(s)	Hotter temperatures	
Threshold: A blue-green algae health advisory is issued for Skeleton Lake by Alberta Health Services		
Likelihood Scores		
	Historic	Future
	4	5
Potential consequences	<ul style="list-style-type: none"> Health concerns, including skin irritation/rash, sore throat, red eyes, swelling of the lips, and hay-fever¹⁵ Reduced recreation opportunities (e.g., fishing) Health impacts to fish, vegetation, wildlife, and pets Water quality issues 	
Consequence score	5	
Risk level	Very high	
Notes		
Climate driver(s)	<ul style="list-style-type: none"> Climate projections indicate an increase in average summer temperatures, extreme heat, and heat waves 	
Threshold	<ul style="list-style-type: none"> Warm temperatures are a contributing factor to the growth of algal blooms¹⁶ 	
Historic likelihood	<ul style="list-style-type: none"> Between 2009 and 2022, there were 5 years with observed algal blooms on Skeleton Lake¹⁷ (= 38% annual probability) 	
Future likelihood	<ul style="list-style-type: none"> Every 1°C increase in air temperature will lead to a 0.6°C to 0.8°C (average = 0.7°C) increase in water temperature¹⁸, increasing the risk of algal blooms on Skeleton Lake 	

¹⁵ Environmental Public Health, Alberta Health Services. (2018). *Blue-Green Algae*. Government of Alberta. <https://myhealth.alberta.ca/alberta/pages/blue-green-algae.aspx>

¹⁶ US Environmental Protection Agency: <https://www.epa.gov/nutrientpollution/climate-change-and-harmful-algal-blooms>

¹⁷ Source: Alberta Government open data: Cyanobacterial blooms in Alberta recreational waters

¹⁸ Morrill, J. C., Bales, R. C., and Conklin, M. H. (2001). The Relationship Between Air Temperature and Stream Temperature. *American Geophysical Union*. <https://ui.adsabs.harvard.edu/abs/2001AGUSM...H42A09M/abstract>

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Wildfire Smoke

Description	Smoke from forest fires in the area reduces air quality causing local health effects
Climate driver(s)	Hotter temperatures
Threshold: The Air Quality Health Index (AQHI) reaches a value of 10 (very high) due to wildfire smoke	
Likelihood Scores	
Historic	Future
5	5
Potential consequences	<ul style="list-style-type: none"> Increased respiratory related health impacts, particularly in vulnerable populations Reduced visibility Reduced outdoor recreation activities Outdoor event cancellations
Consequence score	4
Risk level	Very high
Notes	
Climate driver(s)	<ul style="list-style-type: none"> Climate projections indicate an increase in average summer temperatures, extreme heat, and heat waves
Threshold	<ul style="list-style-type: none"> An AQHI index of 10+ (very high) is used as it occurs during a smoke event from forest fires and is linked to health effects¹⁹
Historic likelihood	<ul style="list-style-type: none"> There were 8 days where the AQHI index reached at least 10 between 2011-2020²⁰ (average = 1 high risk smoke event every 1.1 years = 89% annual probability)
Future likelihood	<ul style="list-style-type: none"> Increasing. Fire seasons are estimated to become more severe in the future as a result of climate change. The length of the fire season is expected to increase by more than 20 days per year in the Northern hemisphere by the end of the century²¹

¹⁹ Government of Alberta (2019, July). *Wildfire Smoke Impacts on Air Quality in Alberta*. Wildfire Smoke Fact Sheet. <https://open.alberta.ca/dataset/63f73779-e911-4651-80ac-cf078dacd578/resource/13f44ecb-0a49-4039-91ad-7f1c5d1f6829/download/aep-wildfire-smoke-impacts-on-air-quality-in-alberta-2019-07.pdf>

²⁰ Alberta Ministry of Environment and Parks (2023). Information based on Bruderheim as it is the closest location to Bondiss for which data is available.

²¹ Flannigan, M., Cantin, A. S., De Groot, W. J., Wotton, M., Newbery, A., & Gowman, L. M. (2013). Global wildland fire season severity in the 21st century. *Forest Ecology and Management*, 294, 54-61. <https://doi.org/10.1016/j.foreco.2012.10.022>

Reduced Lake Levels

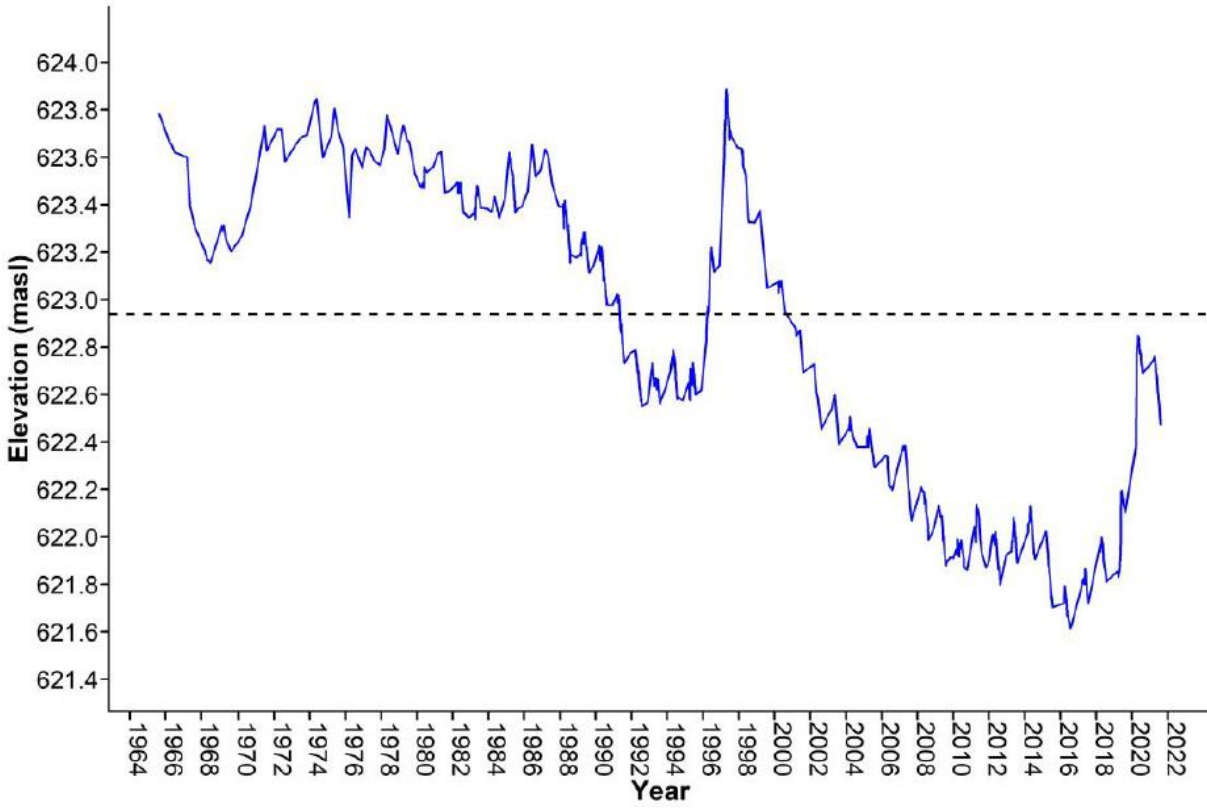
Description	Lake levels in Skeleton Lake experience a permanent decrease
Climate driver(s)	Hotter temperatures
Threshold: Skeleton Lake experiences a permanent and long-term reduction in lake levels	
Likelihood Scores	
Historic	Future
N/A	3
Potential consequences	<ul style="list-style-type: none"> • Health impacts to fish, vegetation, wildlife • Reduced opportunities for water-based recreation • Reduction in water availability / supply in wells • Reduced water quality • Increased risk of algal blooms
Consequence score	4
Risk level	High
Notes	
Climate driver(s)	<ul style="list-style-type: none"> • Climate projections indicate an increase in average summer temperatures, extreme heat, and heat waves
Threshold	<ul style="list-style-type: none"> • Water levels in Skeleton Lake have been consistently decreasing between 1964-2022 (Figure 6)²²
Historic likelihood	<ul style="list-style-type: none"> • N/A
Future likelihood	<ul style="list-style-type: none"> • Lakes and wetlands across Alberta are highly sensitive to climate change and variability. Projected declines in available moisture, and more frequent drought conditions is projected to lead to reductions in the depth and area of some wetlands and water bodies²³

²² Alberta Lake Management Society. (2022). Skeleton Lake Report. https://alms.ca/wp-content/uploads/2022/05/Skeleton_2021_20220506.pdf

²³ Sources: Liu, G., and F.W. Schwartz. 2012. Climate-driven variability in lake and wetland distribution across the Prairie Pothole Region: from modern observations to long-term reconstructions with space-for-time substitution. *Water Resources Research* 48: W08526; Ouyang, Z., R. Becker, W. Shaver, and J. Chen. 2014. Evaluating the sensitivity of wetlands to climate change using remote sensing techniques. *Hydrological Processes* 28:1703-1712; and Johnson, W.C., B. Werner, G.R. Guntenspergen, R.A. Voldseth, B. Millett, D.E. Naugle, M. Tulbure, R.W.H. Carroll, J. Tracy, and C. Olawsky. 2010. Prairie wetland complexes as landscape functional units in a changing climate. *BioScience* 60:128-140

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Figure 6 Water levels measured at Skeleton Lake South Basin in metres above sea level (1965-2021)



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Wildfire

Description	An uncontrolled wildfire enters Village boundaries and causes damage to buildings and property	
Climate driver(s)	Hotter temperatures	
Threshold: A wildfire occurs and damages homes and property in the Village		
Likelihood Scores		
Historic		Future
1		3
Potential consequences	<ul style="list-style-type: none"> Injuries/fatalities Displacement of residents Destruction of homes, property, and infrastructure 	
Consequence score	3	
Risk level	Medium	
Notes		
Climate driver(s)	<ul style="list-style-type: none"> Climate projections indicate an increase in average summer temperatures, extreme heat, and heat waves 	
Threshold	<ul style="list-style-type: none"> Conversations with Bondiss staff revealed that a wildfire damaging homes and property would be a significant event to the Village 	
Historic likelihood	<ul style="list-style-type: none"> Bondiss has not experienced a wildfire event in the past²⁴ The probability of experiencing a wildfire in Bondiss is highly unlikely (Figure 7)²⁵ 	
Future likelihood	<ul style="list-style-type: none"> Fire seasons are estimated to become more severe in the future as a result of climate change. The length of the fire season is expected to increase by more than 20 days per year in the Northern hemisphere by the end of the century²⁶ 	

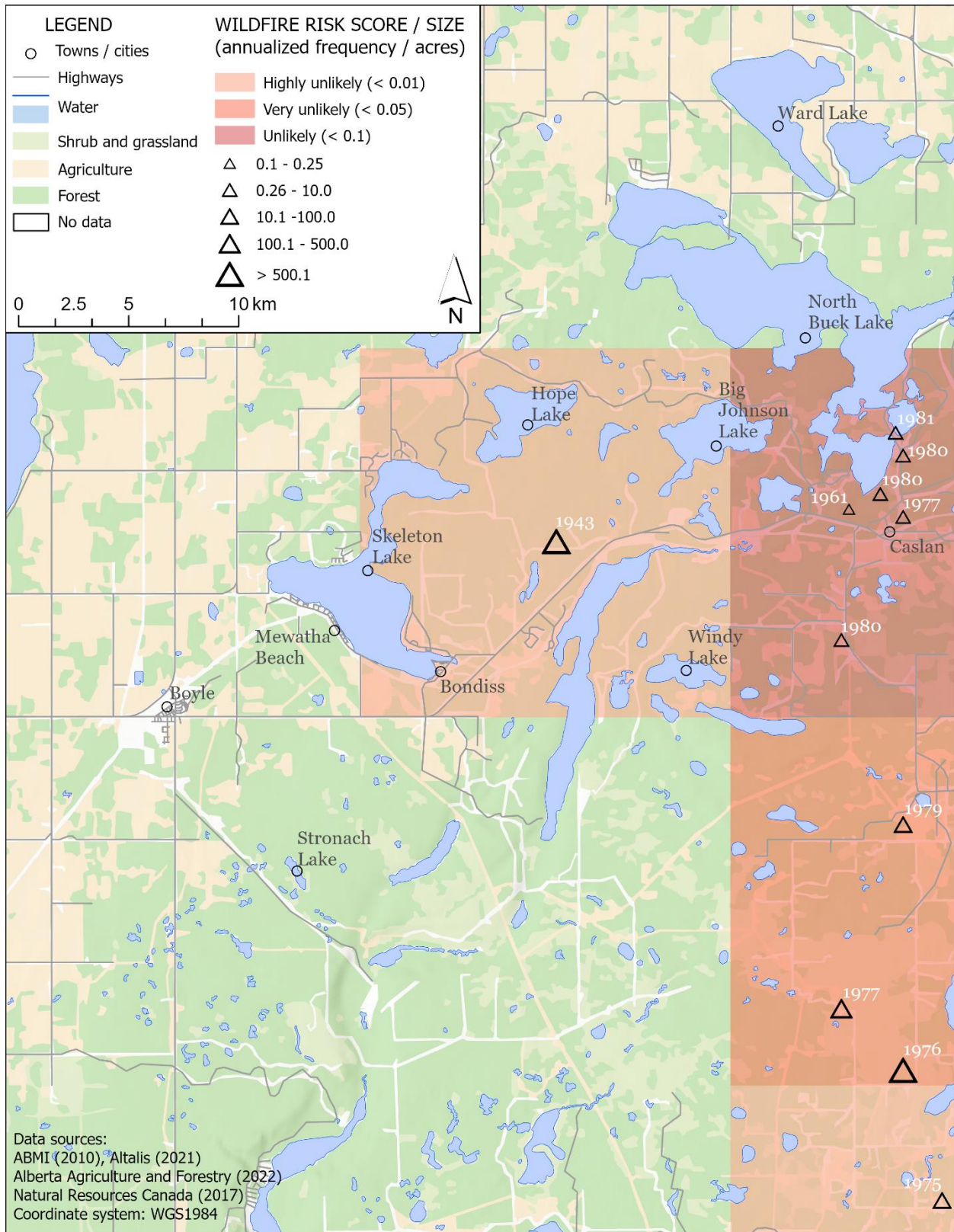
²⁴ Information from conversations with Bondiss staff

²⁵ Map retrieved from Alberta Agriculture and Forestry (2022).

²⁶ Flannigan, M., Cantin, A. S., De Groot, W. J., Wotton, M., Newbery, A., & Gowman, L. M. (2013). Global wildland fire season severity in the 21st century. *Forest Ecology and Management*, 294, 54-61. <https://doi.org/10.1016/j.foreco.2012.10.022>

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Figure 7 Historic occurrence of wildfires in the Bondiss area



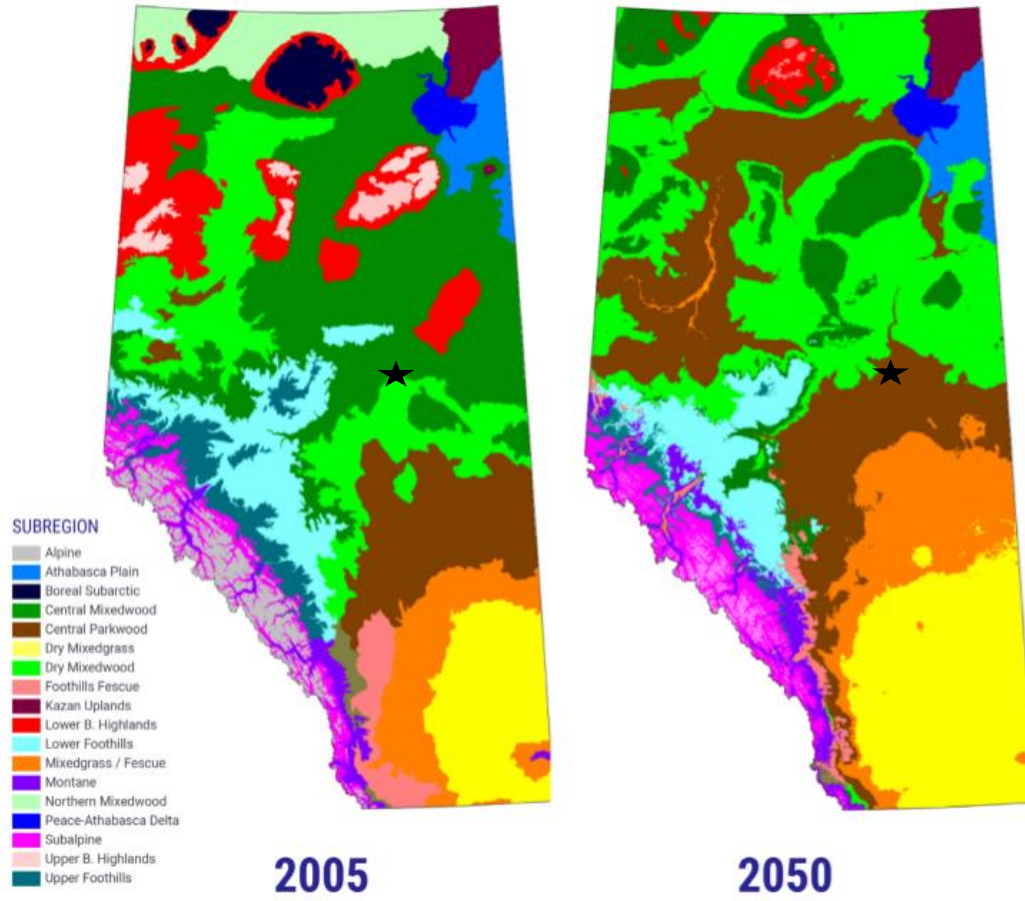
Changing Ecosystems Affect Aquatic Wildlife, Habitat and Lake Health

Description	Warmer summer seasons and changing ecosystems affect lake and habitat quality and aquatic wildlife populations
Climate driver(s)	Changing seasons and ecosystems
Threshold: The frost-free season is 154 days	
Likelihood Scores	
Historic	Future
1	4
Potential consequences	<ul style="list-style-type: none"> Impacts to fish, vegetation, and wildlife related to changes in migration patterns and plant/wildlife adaptability Increased survival of invasive aquatic species (e.g., mussels)
Consequence score	3
Risk level	High
Notes	
Climate driver(s)	<ul style="list-style-type: none"> Climate projections indicate longer frost-free and growing seasons. This climate will be more favourable for direr/grassland ecosystem types, and regional ecosystems are projected to shift northward and upslope across Alberta as the climate warms (Figure 8)²⁷
Threshold	<ul style="list-style-type: none"> The length and timing of the frost-free season is a determinant for the survivability of different plants, animals, pests, and diseases. A longer frost-free season indicates that plants and crops will have a longer time to grow and mature. Climate projections indicate a future value of 154 frost-free days for Boyle in the 2060s²⁸
Historic likelihood	<ul style="list-style-type: none"> Frequency distribution analysis results reveal a 0.4% historic annual probability that Boyle would experience 154 frost-free days between 1976-2005
Future likelihood	<ul style="list-style-type: none"> Frequency distribution analysis results reveal a 48% future annual probability that Boyle will experience 154 frost-free days between 2051-2080

²⁷ Schneider, R.R. 2013. Alberta’s Natural Subregions under a changing climate: past, present, and future. Alberta Biodiversity Monitoring Institute, Edmonton, AB

²⁸ Prairie Climate Centre. (2022). *Climate Atlas Version 2*. Climate Atlas of Canada. <https://climateatlas.ca>

Figure 8 Projected changes to Ecoregions in Alberta (2005 – 2050)



Prolonged Power Outage

Description	An increase in extreme weather events causes a prolonged power outage in Bondiss	
Climate driver(s)	Increased storm severity and extreme weather	
Threshold: A 48-hour power outage occurs		
Likelihood Scores		
	Historic	Future
	2	3
Potential consequences	<ul style="list-style-type: none"> • Health effects (if event occurs during hot/cold) • Disruption to local businesses/economy • Disruption of services (transportation, telecommunications, etc.) 	
Consequence score	2	
Risk level	Low	
Notes		
Climate driver(s)	<ul style="list-style-type: none"> • Climate projections indicate an increase in extreme heat events, mean annual precipitation, and mean annual temperatures 	
Threshold	<ul style="list-style-type: none"> • N/A 	
Historic likelihood	<ul style="list-style-type: none"> • No historic power outage records are available at this time²⁹ • No power outages of this scale have been experienced in Bondiss³⁰ 	
Future likelihood	<ul style="list-style-type: none"> • Increasing global temperatures are projected to increase the likelihood of severe thunderstorms which may increase the frequency of power outages³¹ 	

²⁹ FORTIS Alberta staff (2022)

³⁰ Information from conversations with Bondiss staff

³¹ Diffenbaugh, N. S., Scherer, M., & Trapp, R. J. (2013). Robust increases in severe thunderstorm environments in response to greenhouse forcing. *Proceedings of the National Academy of Sciences*, 110(41), 16361-16366. <https://doi.org/10.1073/pnas.1307758110>

Prolonged Drought

Description	A prolonged drought causes negative impacts to local trees and forests	
Climate driver(s)	Hotter temperatures	
Threshold: An extreme drought (“d3”/1:20 year) occurs		
Likelihood Scores		
	Historic	Future
	3	4
Potential consequences	<ul style="list-style-type: none"> • Impacts to local gardens and food supply • Ecological impacts, loss of local trees 	
Consequence score	4	
Risk level	Very high	
Notes		
Climate driver(s)	<ul style="list-style-type: none"> • Climate projections indicate an increase in average summer temperatures, extreme heat, and heat waves 	
Threshold	<ul style="list-style-type: none"> • A D3 drought is an extreme drought or a 1 in 20-year drought event³² 	
Historic likelihood	<ul style="list-style-type: none"> • A 1 in 20-year drought event = 5% annual probability of occurrence 	
Future likelihood	<ul style="list-style-type: none"> • Six years were recorded with a D3 drought between 2002-2022³³ (= 33% annual probability of occurrence) • Drought in the Canadian prairies is expected to become longer and more frequent in the 21st century³⁴ 	

³² Agriculture and Agri-Food Canada. (2022, January 12). *Canadian Drought Monitor*. Government of Canada. <https://agriculture.canada.ca/en/agriculture-and-environment/drought-watch-and-agroclimate/canadian-drought-monitor>

³³ Agriculture and Agri-Food Canada. (2022, January 12). *Canadian Drought Monitor*. Government of Canada. <https://agriculture.canada.ca/en/agriculture-and-environment/drought-watch-and-agroclimate/canadian-drought-monitor>

³⁴ Bonsal, B. R., Aider, R., Gachon, P., & Lapp, S. (2013). An assessment of Canadian prairie drought: past, present, and future. *Climate Dynamics*, 41(2), 501-516. <https://doi.org/10.1007/s00382-012-1422-0>

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Windstorm

Description	An event that meets Environment Canada’s alert parameters for issuing a Wind Warning (wind gusts to 90 km/hour or more)	
Climate driver(s)	More extreme weather	
Threshold: A windstorm with wind speeds reaching 90 km/hour occurs		
Likelihood Scores		
Historic		Future
5		5
Potential consequences	<ul style="list-style-type: none"> Injuries / fatalities Damage to homes, property, and infrastructure 	
Consequence score	3	
Risk level	High	
<u>Notes</u>		
Climate driver(s)	<ul style="list-style-type: none"> Climate projections indicate an increase in extreme heat events, mean annual precipitation, and mean annual temperatures 	
Threshold	<ul style="list-style-type: none"> Environment Canada wind warning criteria for Alberta is defined as “90 km/h or more sustained wind; and/or gusts to 110 km/h or more”³⁵ 	
Historic likelihood	<ul style="list-style-type: none"> No windstorms were recorded in the Bondiss area between 2017-2022 where wind gusts exceeded 90km/hour³⁶ Edmonton International Airport, the closest weather station with long term data, has recorded about 1 event per year with wind gusts exceeding 90km/hour³⁷ 	
Future likelihood	<ul style="list-style-type: none"> Warm temperatures are associated with an increased likelihood or wind gust events, and climate projections indicate a future increase in the frequency and intensity of wind gust events³⁸ 	

³⁵ Environment and Climate Change Canada (ECCC). (2020, October 29). *Criteria for public weather alerts*. Government of Canada. <https://www.canada.ca/en/environment-climate-change/services/types-weather-forecasts-use/public/criteria-alerts.html#snowFall>

³⁶ Data retrieved from the Athabasca weather station (ECCC, 2023)

³⁷ Data retrieved from the Edmonton International Airport weather station (ECCC, 2023)

³⁸ Cheng, C. S. (2014). Evidence from the historical record to support projection of future wind regimes: An application to Canada. *Atmosphere-Ocean*, 52(3), 232-241. <https://doi.org/10.1080/07055900.2014.902803>

Extreme Rainfall and Stormwater Flooding

Description	A heavy rainfall event causes flooding of homes and property in Bondiss	
Climate driver(s)	Increase in heavy precipitation events	
Threshold: 11 heavy precipitation days per year where 10mm falls within 24 hours		
Likelihood Scores		
	Historic	Future
	4	5
Potential consequences	<ul style="list-style-type: none"> • Damage to property (basement flooding) • Infrastructure repair costs (culverts, roads, etc.) • Impacts may be further exacerbated by invasive weeds that damage drainage systems and block culverts • Erosion 	
Consequence score	4	
Risk level	Very high	
<u>Notes</u>		
Climate driver(s)	<ul style="list-style-type: none"> • Climate projections indicate an increase in mean annual precipitation, and heavy precipitation events 	
Threshold	<ul style="list-style-type: none"> • Climate projections indicate a future value of 11 heavy precipitation days (10mm) for the Bondiss Region in the 2060s³⁹ 	
Historic likelihood	<ul style="list-style-type: none"> • Frequency distribution analysis results reveal a 30% historic annual probability that the Bondiss Region would experience 11 heavy precipitation days (10mm) between 1976-2005 	
Future likelihood	<ul style="list-style-type: none"> • Frequency distribution analysis results reveal a 50% future annual probability that Boyle will experience 11 heavy precipitation days (10mm) between 2051-2080 	

³⁹ Prairie Climate Centre. (2022). *Climate Atlas Version 2*. Climate Atlas of Canada. <https://climateatlas.ca>

Appendix B: Detailed Survey Results

This section contains the complete results and analysis of the Climate Impacts and Adaptation Survey that was released in November 2022. The survey mainly asked participants to identify the degree to which four key climate changes – Hotter Temperatures, More Extreme Weather, Changing Seasons and Ecosystems, and Climate Change Benefits – would impact the Bondiss community, what they thought the most significant climate change-related impacts were, and how the community could improve their adaptiveness to climate change.

Key Climate Changes

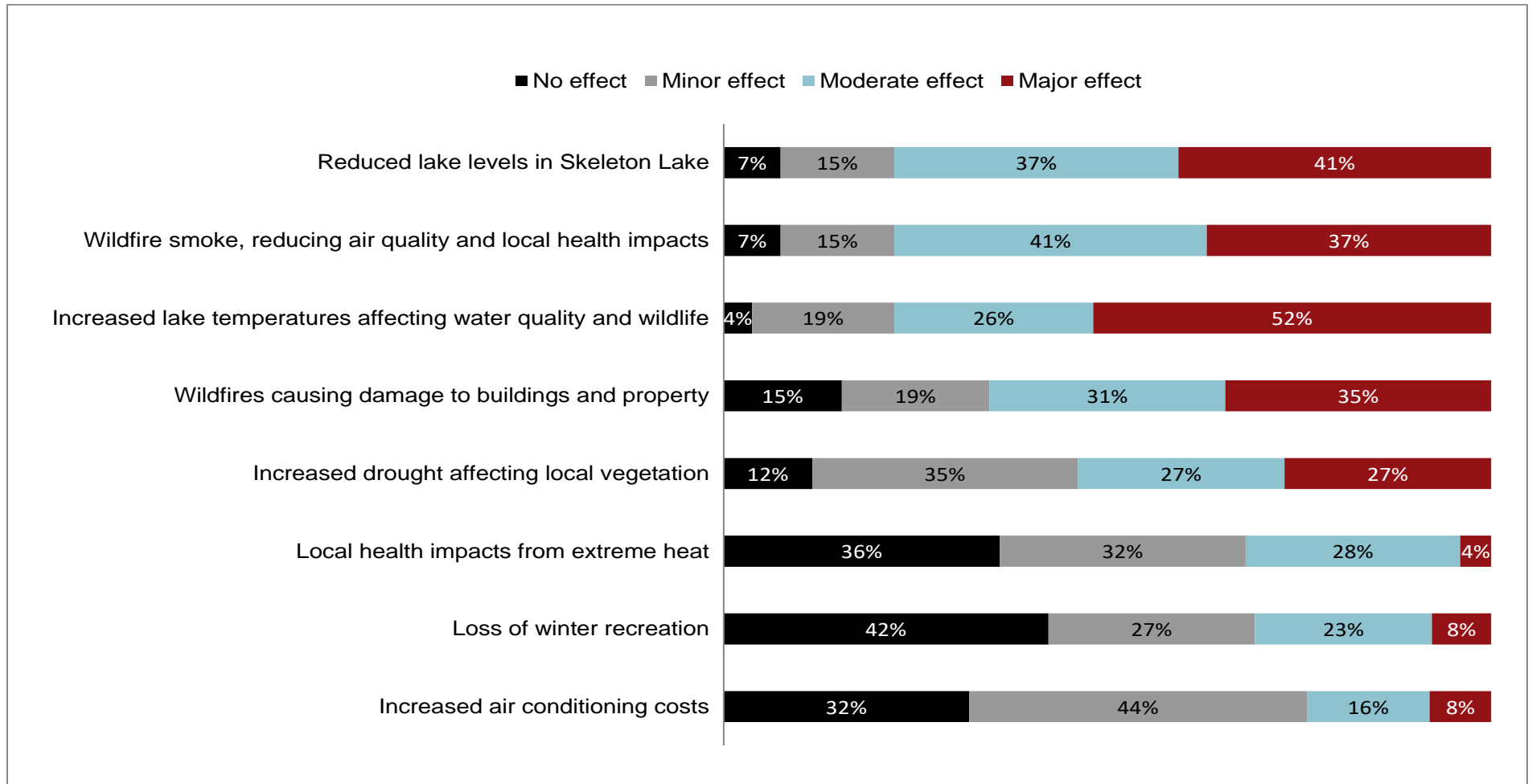
Hotter Temperatures

Figure 9 shows how survey respondents perceived the potential impacts of hotter temperatures on the Summer Village of Bondiss. For this question, respondents were asked to rate the degree to which each impact would affect the community, ranging from ‘no effect’, to ‘minor’, ‘moderate’, or ‘major’ effect. Increased lake temperature (and potential algal blooms) was the most concerning impact, with respondents concerned about potential consequences for local water quality and impacts to fish and wildlife (52% saw this as a major effect on Bondiss), as well as impacts to local recreation (50%). Respondents were also concerned about reduced lake levels in Skeleton Lake with over 40% seeing this as a potential major effect. Wildfire smoke affecting local health (37% major effect), and wildfires damaging local homes and buildings (35%) were also perceived to be significant impacts.

Increased air conditioning costs (only 8% perceived a major effect), loss of winter recreation (8%), and health impacts from extreme heat (4%) were the least concerning climate impacts, with over 60% of participants rating these to have a minor or no effect on the village.

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Figure 9 Community perceptions of the effects of hotter temperatures on Bondiss⁴⁰



⁴⁰ Note: Some of the response options have been shortened from what appeared in the survey

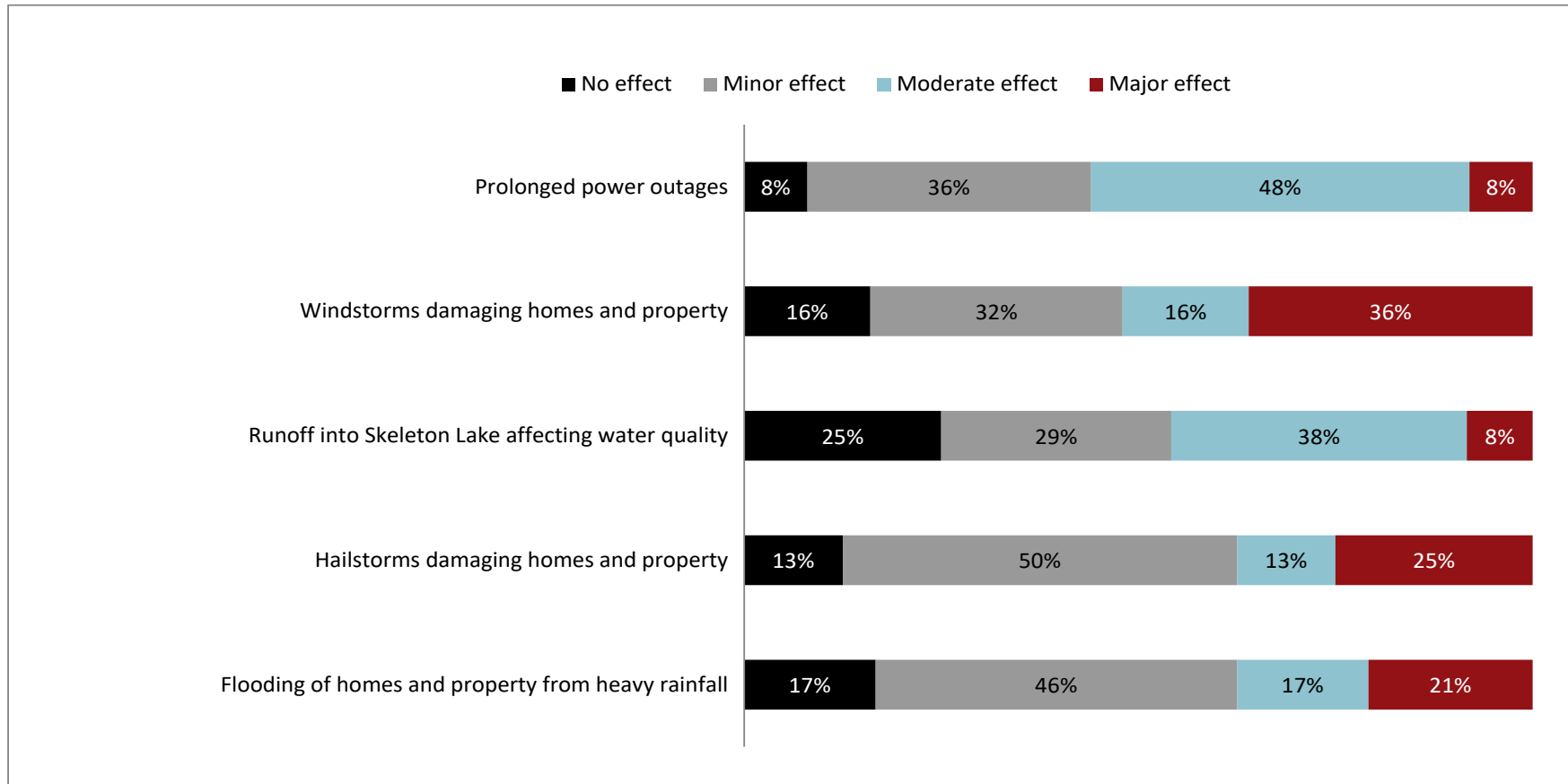
More Extreme Weather

Figure 10 shows community perceptions of the potential impacts of extreme weather on Bondiss. Participants were asked to rate the degree to which each impact would affect the community. Windstorms damaging homes and property, and prolonged power outages received the greatest concern with more than half of respondents rating them to have a moderate or major impact on the Village. Hailstorms and flooding were rated slightly lower, in terms of combined responses stating ‘moderate’ and ‘major’ effects, however many people perceived these impacts to have a major effect (25% and 21% respectively).

Participants were also asked to identify what they perceived to be the most significant impacts of extreme weather on the Village. In general, respondents seemed to be most concerned with wildfires with over 50% of comments (7 out of 14) on this question relating to wildfire and property damage. Flooding, lake levels, extreme heat, windstorms, and hail were also identified.

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Figure 10 Community perceptions of the effects of extreme weather on Bondiss

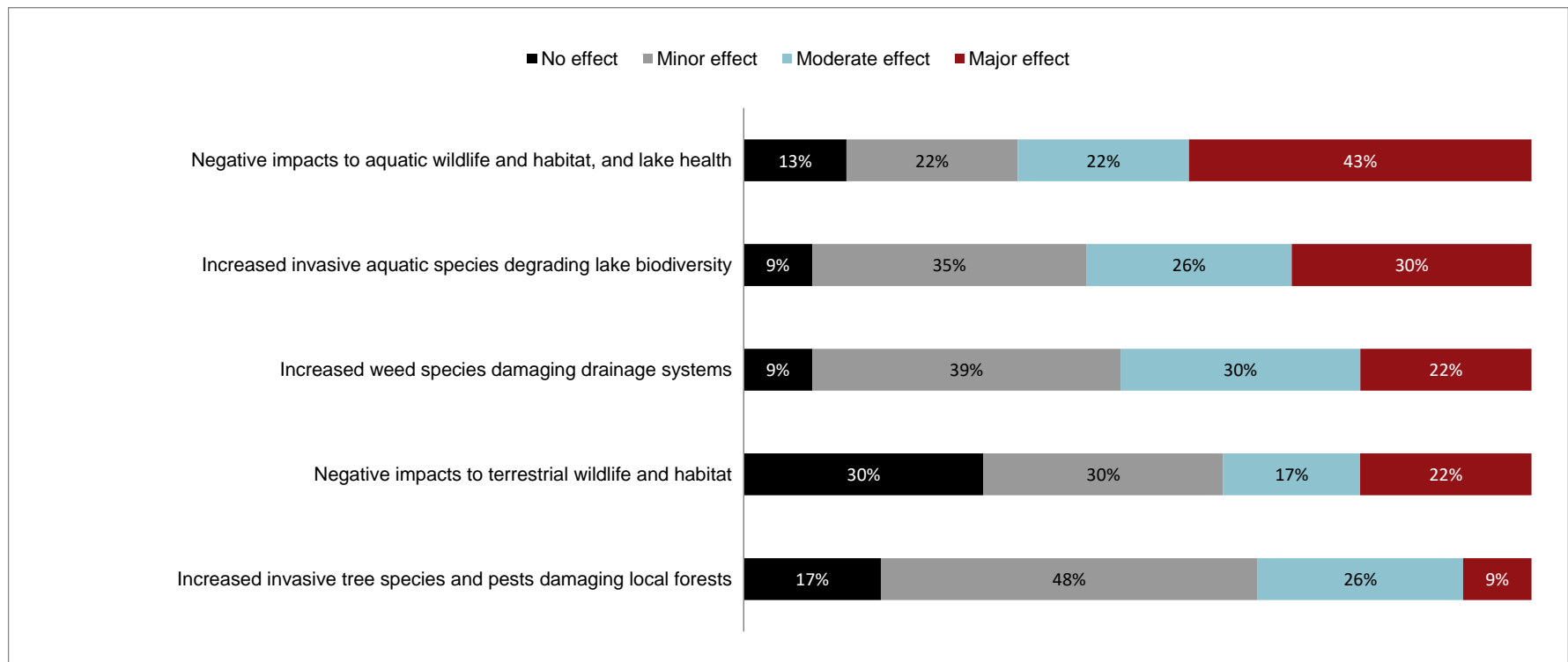


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Changing Seasons and Ecosystems

Figure 11 outlines community perceptions of the potential impacts from changing seasons and ecosystems on Bondiss. Again, participants were asked to rate the degree to which each impact would affect the community. Negative impacts to aquatic wildlife and habitat, and lake health was the most concerning impact with 43% of participants indicating a ‘major’ effect, and 22% indicating a ‘moderate’ effect on the Village. The potential for invasive aquatic to degrade lake biodiversity, and weeds blocking local drainage systems were also identified as important impacts with 57% and 52% identifying these as either a ‘moderate’ or ‘major’ effect respectively. The potential impacts of pests and invasive tree species on local forests was the least concerning impact to participants, with 65% rating this to have little to no effect on the Village.

Figure 11 Community perceptions of the effects of changing seasons and ecosystems on Bondiss

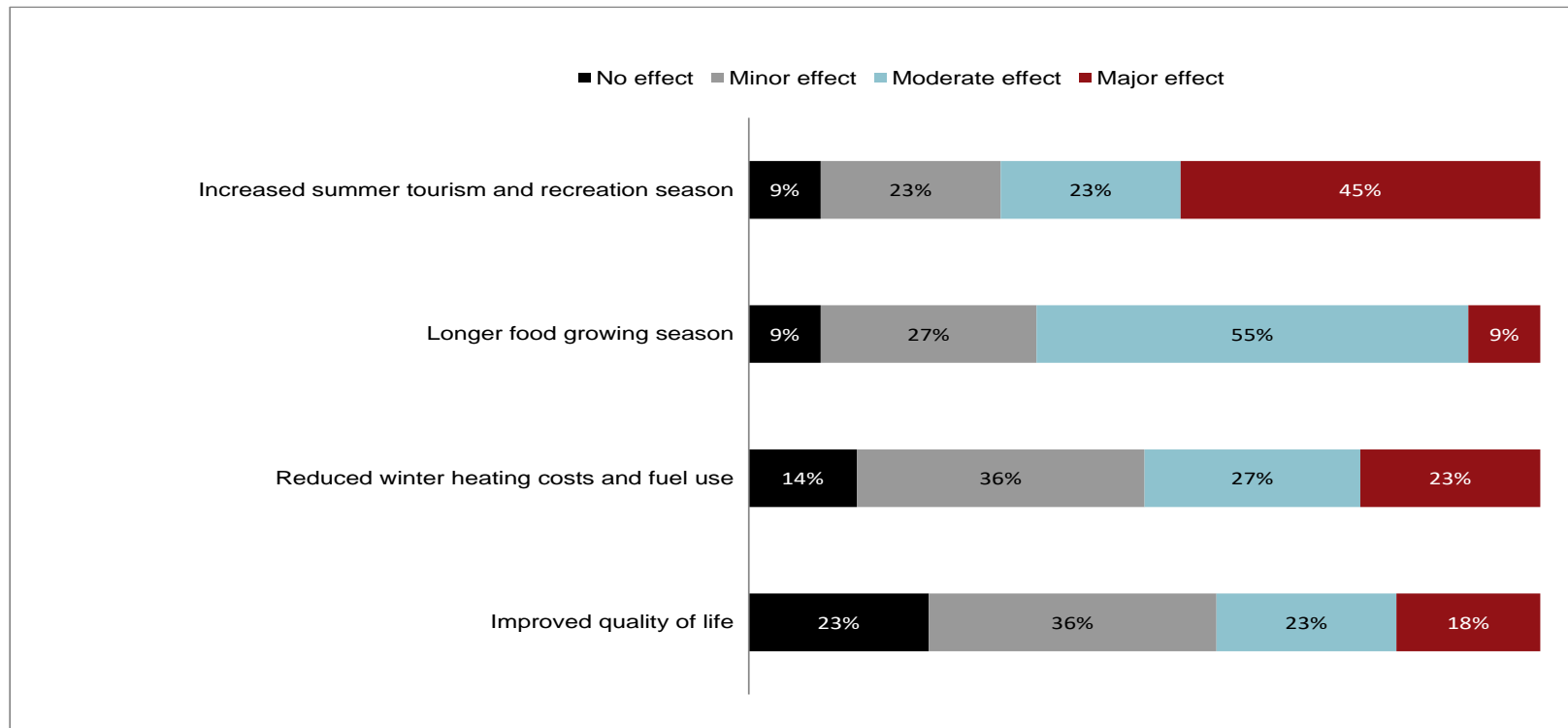


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Climate Change Benefits

Figure 12 outlines survey respondent perceptions of the potential benefits of climate change in Bondiss. Over 60% of participants indicated that increased summer tourism and recreation (68% said moderate or major benefit), and a longer food growing season (64% said moderate or major benefit) would provide the greatest opportunities to the village. Comments provided through the survey also show that some people are concerned that a longer summer season may bring many visitors to the lake and increase development pressures. This was seen as a potential negative impact given the additional stress on the lake caused by negative climate change impacts.

Figure 12 Community perceptions of the potential benefits of climate change



Climate Resilience Actions

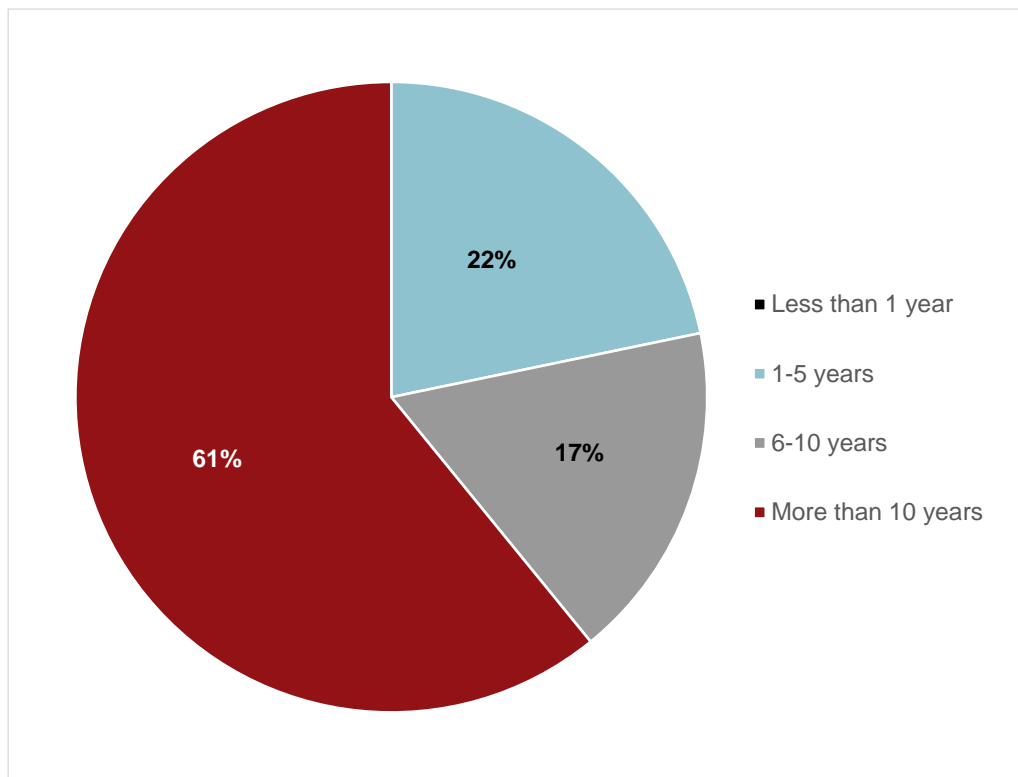
A total of 30 climate resilience actions were made in the survey to identify how the community could manage the impacts of climate change in Bondiss. The following is a summary of the main comments that were brought up by participants:

- Increase education and awareness about local climate impacts and resilience actions, particularly related to lake health and stewardship
- Continue and enhance Skeleton Lake stewardship activities to reduce runoff, improve lake water quality and manage development around the lake
- Protect green infrastructure around the lake to help manage flooding events and improve wildlife habitat
- Enhance tree management efforts to reduce blowdown and impacts to homes and utilities
- Support for home retrofits to such as grants for air conditioning or energy improvements
- Enhance fire prevention and mitigation in high-risk areas
- Enhance flood prevention and mitigation in high-risk areas
- Advocate for changes to fishing regulations to improve aquatic health of the lake

Survey Demographics

The vast majority of survey respondents (96%) owned a property in Bondiss. 70% of respondents reside seasonally, while 30% reported being permanent (year-round) residents. The majority of respondents (61%) were long-term residents having resided in the Village for over 10 years (Figure 13).





Figure 13 Length of property ownership of survey respondents








Appendix C: Climate Impact Assessment Workshop Feedback

This appendix provides a record of the feedback that was received at the Climate Impact Assessment Workshop (Table 10). Participants were asked to comment on each scenario as well as their rationale for voting the way they did. This feedback was ultimately used to update and finalize the scenarios in Appendix A.

Table 10 Summary of workshop feedback for climate impacts

Climate Impact	Scenario Comments	Voting Comments
 <p>Increased Lake Temperatures</p>	<ul style="list-style-type: none"> This scenario makes sense as algal blooms affect local air quality, contain unpleasant smells, and leave residue that washes up on shore. Additional consequences: Impacts on property values; Decreased access to the lake; Increased presence of noxious weeds especially in areas where the lake shore is adjacent to reserve lots; Increased maintenance costs for the municipality 	<ul style="list-style-type: none"> Skeleton Lake has been algae free, except for the last 4-5 years Property values will decrease and Bondiss won't be a good place to live Alberta Health Services doesn't test the lake regularly so it may be too late before Bondiss gets an advisory Notices go up, but not everywhere and people don't take it seriously Children swimming in the lake will be affected health wise Noxious smells and health impacts to dogs and fish in the lake There will be increased maintenance costs
 <p>Wildfire Smoke</p>	<ul style="list-style-type: none"> Respiratory health impacts are the biggest concern Question about whether increased precipitation would offset this [no] 	<ul style="list-style-type: none"> Smoke is thick and travels everywhere which prevents people from being able to go outside Health consequences are not as severe, and there are no other impacts (rated medium)
 <p>Reduced Lake Levels</p>	<ul style="list-style-type: none"> Consequences are similar to algal blooms (increased financial impacts for property owners and the municipality) We don't have enough data of what the new lake level will be and if climate change will affect us 	<ul style="list-style-type: none"> There are direct relationships between water levels and algal blooms This scenario might not happen (rated medium)
 <p>Wildfire</p>	<ul style="list-style-type: none"> Questioning whether the increased number of Athabasca properties using Bondiss roads will impact the safety of Bondiss 	<ul style="list-style-type: none"> Vegetation to the east of Bondiss is mostly poplar and there are not a lot of coniferous trees which reduces fire risk

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	<p>residents to evacuate if a wildfire occurs</p> <ul style="list-style-type: none"> • The scenario makes sense 	<ul style="list-style-type: none"> • There are many water bodies surrounding the Bondiss area which creates fire breaks (rated low) • Consequences are less severe than loss of life but there is still a long recovery process after a fire (rated high)
 <p>Changing Ecosystems Affect Aquatic Wildlife, Habitat, and Lake Health</p>	<ul style="list-style-type: none"> • Question regarding whether invasive species in the lake creates health problems (e.g., Swimmer’s Itch) 	<ul style="list-style-type: none"> • There is a lack of understanding about impacts to fish populations (rated medium) • Different growing seasons affect all wildlife (skunks, foxes, bears, etc.) and their ability to obtain food • There will be changes in human-wildlife interactions (e.g., more fences going up, people recreating less because of dangerous wildlife)
 <p>Prolonged Power Outage</p>	<ul style="list-style-type: none"> • This scenario rarely occurs • Effects would be worse in winter (e.g., water lines freezing) than in the summer (e.g., minor discomfort) 	<ul style="list-style-type: none"> • N/A
 <p>Prolonged Drought</p>	<ul style="list-style-type: none"> • Concerns about the effect of prolonged drought on lake levels 	<ul style="list-style-type: none"> • Droughts that impact fish habitats and lake health will also impact property values, tax revenue and municipal costs.
 <p>Windstorm</p>	<ul style="list-style-type: none"> • There will be costs to the Village to remove fallen trees 	<ul style="list-style-type: none"> • There will be damage to homes and costs to the Village from fallen trees and trees that have only partially fallen (creates uncertainty about when they will fall) • It is an inconvenience, but effects are insurable, short-term, and easy to recover from (rated low)
 <p>Extreme Rainfall and Stormwater Flooding</p>	<ul style="list-style-type: none"> • Additional consequences: Increased erosion; Slope instability 	<ul style="list-style-type: none"> • There is only one more day projected in the future and council has adapted to this impact fairly well (rated medium) • Previous historic development has been too close to the lake and there will be groundwater and flooding issues if this continues (rated high)



ALL ONE SKY FOUNDATION is a not-for-profit, charitable organization established to help vulnerable populations at the crossroads of energy and climate change. We do this through education, research and community-led programs, focusing our efforts on adaptation to climate change and energy poverty. Our vision is a society in which ALL people can afford the energy they require to live in warm, comfortable homes, in communities that are resilient and adaptive to a changing climate.

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