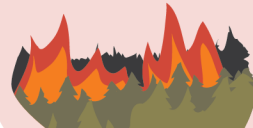
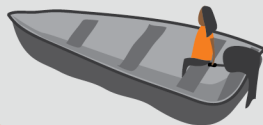


CLIMATE CHANGE ADAPTATION QUICK GUIDE

climate change adaptations for northern First Nation communities & individuals





PICCA Partnership for Indigenous Climate Change Adaptation



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Thanks to:

Sarah Cockerton and Kim Jorgenson (Matawa First Nations Management), Donald Meekis (Keewaytinook Okimakanak), Lucas King (Grand Council Treaty #3), Roger Rozon and predecessor Tara Ingram (Nokiiwin Tribal Council), and Laura Sayers (Shibogama First Nations Council)

We welcome the use of this document for education or adaptation planning and kindly request it be referenced as follows:

Up North on Climate. 2021. *Climate Change Adaptation Quick Guide*. Laurentian University, Ontario.

<https://www.upnorthonclimate.ca/impacts-and-adaptations>

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Developed with financial support from

Natural Resources Canada's Building Regional Adaptation Capacity and Expertise (BRACE) Program

as part of the co-lead project

Building Climate Change Adaptation Capacity of First Nations in Far Northern Ontario Through Knowledge-Exchange and Collaboration



Natural Resources
Canada

Ressources naturelles
Canada

Canada

INTRODUCTION

The weather in northern Ontario is changing. Human-caused greenhouse gas emissions are pushing the Earth’s climate toward a warmer world at a faster rate than ever before, with temperatures in the north rising at twice the rate of other regions. These changes, coupled with the close ties First Nation communities have with the land, make the need to prepare and adapt to the impacts of climate change increasingly important.

As part of a co-lead Building Regional Adaptation Capacity and Expertise (BRACE) project, Up North on Climate, along with partners from the Tribal Councils of Keewaytinook Okimakanak, Matawa, Mushkegowuk, Nokiiwin and Shibogama, as well as Grand Council Treaty #3, have co-developed resources that can be used by First Nations moving towards climate resilience.

The **Climate Change Adaptation Quick Guide** is a series of illustrations that present climate change impacts and possible adaptation options relevant to northern Ontario First Nation communities.

Climate change impacts are already being noticed and felt by people in communities throughout the north. Some of those impacts, as well as impacts that are expected as climate continues to change, are summarized in the “Climate Change Impacts” illustration (pictured to the right).

To illustrate climate change adaptation actions, impacts are divided into 8 themes:



DROUGHT



ECOSYSTEMS



FLOODING



FOOD SECURITY



HEALTH



INFRASTRUCTURE



TRANSPORTATION



WILDFIRE

Each of the 8 illustrations set adaptation options in a fictional First Nation community in a northern Ontario landscape and includes:

1. A banner to show how climate change has, will or can impact the land, people and community.
2. Bubbles on the front to present possible adaptation options.
3. A 'reverse side' that expands on each bubble to give additional detail about the adaptation option.

The Quick Guide does not aim to present every possible adaptation option for dealing with climate change impacts. Instead, the purpose is to help start conversations about climate change adaptation options in First Nation communities. Whether the illustrations are used as posters, handouts, or slides in a presentation, the aim of the Climate Change Adaptation Quick Guide is to spark ideas and get the ball rolling on discussions around adapting to climate change and creating climate resilient communities.

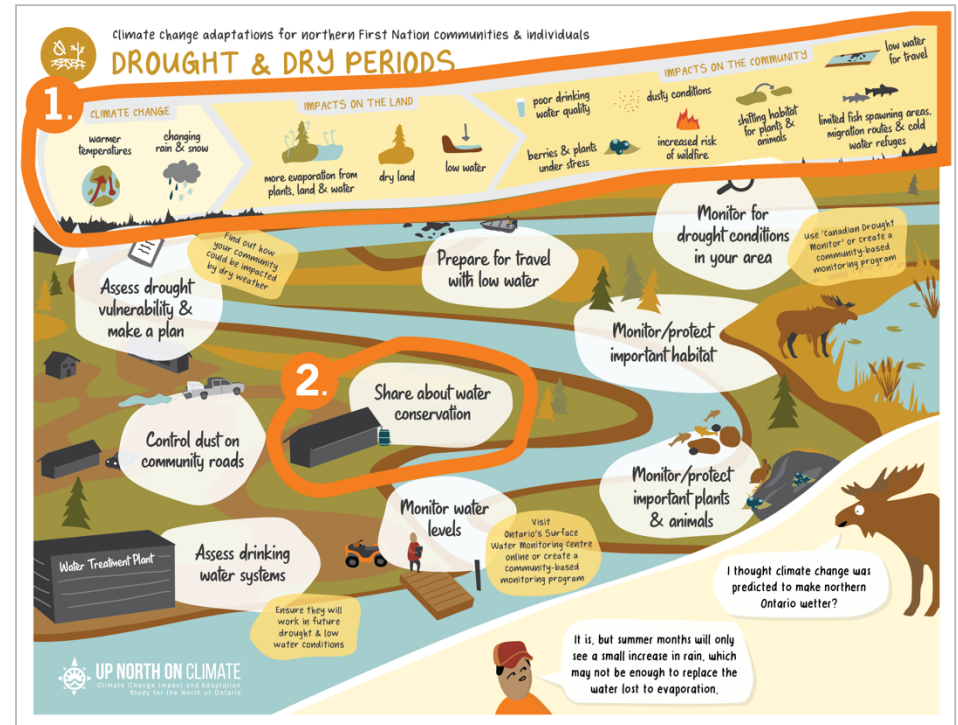
Want to learn more?

Check out the Up North on Climate Adaptation Framework, a 5-step guide designed to help First Nation communities move toward climate change adaptation projects. Find the Framework and other adaptation planning tools at:

<https://www.upnorthonclimate.ca/adaptation-planning>.

For more information about climate change impacts and adaptations, have a look at the Impact and Adaptation Infosheets or the Adapting to a Changing Climate report available at:

<https://www.upnorthonclimate.ca/impacts-and-adaptations>.



CLIMATE CHANGE IMPACTS

SHIFTING ECOSYSTEMS

invasive species in new places
change in temperature-driven events
permafrost thaw
berries, trees, plants & animals under stress
changing ecosystems
warmer lakes/ rivers
changes in vegetation
earlier spring
warmer winters
more wildfire

DROUGHT

berries & plants under stress
dry land
poor drinking water quality
dusty conditions
low water
more evaporation from plants, land & water

INFRASTRUCTURE

more heavy rains
wastewater lagoon leakage
road flooding & damage
contaminated drinking water source
severe storms
building damage
heavy wet snow loads
damage to energy infrastructure causing power outages

WILDFIRE

poor air quality
higher risk of accidental ignition
evacuations & stress
more lightning (fire ignition)
drier land (fire fuel)
longer fire season
more dead/fallen trees (fire fuel)
damage to the community

HEALTH

evacuations
mental stress
hot days
heat illness
more pollen
allergies
mold in homes & smoke in air
flooding & fires
respiratory issues
ticks & mosquitoes in new places
lyme disease
west nile virus

TRANSPORTATION

delay in winter road opening
change in ice quality
higher cost to fly in goods
social isolation
shorter winter road season
ice conditions less predictable
water routes obstructed
food & energy insecurity
severe storms make travel less safe

FOOD SECURITY

warmer temperatures
changing rain & snow
more storms / more severe storms
change in fish spawning
shifting ranges for plants & animals
changing migration patterns
plants & animals moving north
cold-water fish under stress

FLOODING

changes in river ice
more winter rain
more mid-winter thaws
faster spring melt
more heavy rain events
spring melt flooding
lakes/ rivers overflow banks
changes in ice jams
winter flooding from thaw or rain
flooding from heavy rain

CLIMATE CHANGE ADAPTATION OPTIONS

UP NORTH ON CLIMATE
Climate Change Impact and Adaptation
Study for the North of Ontario

SHIFTING ECOSYSTEMS

- Start a land monitoring program
- Prevent spread of invasive species
- Protect threatened or culturally important areas, plants & animals
- Protect permafrost
- Keep forests connected & rivers flowing
- Keep ecosystems healthy
- Be guided by Traditional Knowledge

DROUGHT

- Assess drinking water systems
- Share about water conservation
- Monitor for drought conditions in your area
- Assess drought vulnerability & make a plan
- Monitor/protect important plants, animals & habitat
- Control dust on community roads
- Monitor water levels
- Prepare for travel with low water

INFRASTRUCTURE

- Assess vulnerability & make a plan
- Monitor wastewater lagoons
- Produce renewable energy
- Build/retrofit for climate change
- Create a plan for power outages
- Maintain good community drainage
- Monitor drinking water quality
- Design roads to let water run off
- Plan for snow load

WILDFIRE

- Become a FireSmart community
- Create an emergency plan
- Keep people informed with community alerts
- Raise awareness about human-caused fires
- Monitor for smoke & air quality
- Manage trees & plants in and around the community
- Monitor for wildfire risk in your area
- Use fire resistant materials for homes & buildings

HEALTH

- Monitor air quality
- Monitor for ticks & mosquitoes and prevent bites
- Make a community plan for weather events
- Designate a refuge centre
- Protect yourself from sun & heat
- Recognize & prevent mold growth in homes
- 25°C 26°C 30°C
- Monitor for heat & heatwaves

TRANSPORTATION

- Know ice self-rescue & partner rescue
- Change equipment for changing conditions
- Install permanent bridge crossings
- Improve winter road flooding methods
- Reduce the need for fuel tankers & dependence on shipped goods
- Consider an all-season road feasibility study
- Plan your trip & be prepared
- Share ice conditions & winter road information in the community

FOOD SECURITY

- Share harvested food
- Protect/restore important habitat
- Monitor commonly harvested plants, animals & fish
- Adjust where, when & how you harvest
- Grow food in the community
- Assist plant migration
- Start a community food storage program

FLOODING

- Manage snow
- Keep wetlands & natural spaces in the community
- Maintain good community drainage
- Help river ice melt to avoid ice jams
- Create an emergency plan
- Create a community plan with flooding in mind
- Avoid building on flood plains
- Monitor & forecast flooding
- Drain water away from buildings
- Install water control structures



CLIMATE CHANGE IMPACTS EVERYONE

What changes have you seen on the land & in your community? What actions can be taken? Share your ideas in the white spaces below.

- DROUGHT
- ECOSYSTEMS
- FLOODING
- FOOD SECURITY
- HEALTH
- INFRASTRUCTURE
- TRANSPORTATION
- WILDFIRE



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-  **DROUGHT AND DRY PERIODS**
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-  **TRAVEL ON LAND, WATER & ICE**
-  **WINTER ROAD TRAVEL**
-  **WILDFIRE**



Climate change adaptations for northern First Nation communities & individuals

DROUGHT & DRY PERIODS

CLIMATE CHANGE

warmer temperatures



changing rain & snow



IMPACTS ON THE LAND

more evaporation from plants, land & water



dry land



poor drinking water quality



berries & plants under stress



dusty conditions



increased risk of wildfire



shifting habitat for plants & animals



limited fish spawning areas, migration routes & cold water refuges



low water for travel



Assess drought vulnerability & make a plan



Find out how your community could be impacted by dry weather

Prepare for travel with low water

Monitor for drought conditions in your area



Use 'Canadian Drought Monitor' or create a community-based monitoring program

Monitor/protect important habitat

Share about water conservation

Control dust on community roads

Monitor/protect important plants & animals

Monitor water levels

Visit Ontario's Surface Water Monitoring Centre online or create a community-based monitoring program

Assess drinking water systems

Ensure they will work in future drought & low water conditions

I thought climate change was predicted to make northern Ontario wetter?

It is, but summer months will only see a small increase in rain, which may not be enough to replace the water lost to evaporation.

DROUGHT & DRY PERIODS - ADAPTATION OPTIONS



Travel & low water



- Low water levels can make travel by boat more difficult. Consider changes like:
 - finding new water routes
 - creating a portage around low water areas
 - using motors made for shallow water
 - carrying lighter loads in boats
 - traveling over land instead
- Be mindful of hazards like: newly exposed rocks (sometimes called 'reefs') or logs, soft/muddy shorelines, etc.

Share about water conservation



- Inform the community of drought or low water conditions and encourage water conservation when needed.
- Raise awareness about water conservation and how it can be done in the community (fix leaky taps/toilets, collect rainwater for gardens, etc.).

Monitor water levels



- Set up a program to monitor water levels or use existing programs like the Low Water Conditions Map from Ontario's Surface Water Monitoring Centre.
- In some cases, low water could impact hydro-electric power generation. If this applies in your area, you may want to plan for power outages.

Drought impact assessment



- Find out what areas of the community might be impacted by drought conditions and how community members might be affected.
- Changing drinking water quality, dusty roads leading to breathing problems, lack of water for gardens or harvested foods, are all examples of drought impacts.
- Have a community plan to lessen the impact of drought on people and the community.

Monitor for drought conditions



- Monitor for drought conditions in your area and have a plan in place for dealing with drought conditions (called a drought response plan).
- Drought monitoring can be done with programs like Canadian Drought Monitor.
- Communities may want to create their own drought monitoring program.

Monitor/protect important habitat



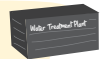
- Monitor and/or put measures in place to protect important habitats that can be impacted by dry conditions and low water.
- This could include wetlands, wild rice beds, fish spawning grounds, fish migration routes, shoreline areas, etc.

Control dust on roads



- Hot, dry weather can cause excessive dust on gravel roads, leading to breathing issues for some in the community.
- To limit dust on community roads: limit traffic, encourage lower speeds, change road building materials, water roads or apply eco-friendly dust suppression products.

Assess drinking water systems



- Low water levels can put drinking water quality at risk.
- Monitor drinking water sources for problems related to low water like algae growth, higher contaminate levels, issues with intake pipes, dry wells, etc.
- Determine if your drinking water system will work well in drought and low water conditions with a vulnerability assessment.
- Have a plan to supply emergency drinking water if needed.

Monitor/protect important plants & animals



- Monitor and/or put measures in place to protect important plant or animal species that could be impacted by drought and dry periods.



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*Adaptations vary in scale (small to large), focus (individual to community) & cost (low to high). Find what works for you and your community.



Climate change adaptations for northern First Nation communities & individuals

ECOSYSTEMS

CLIMATE CHANGE

warmer temperatures



changing rain & snow



more extreme weather



IMPACTS ON THE LAND

more wildfire

earlier spring

possibly more flooding

warmer winters

possibly more drought

warmer lakes/ rivers

permafrost thaw

changes in vegetation

IMPACTS ON ECOSYSTEMS

plants & animals moving north



change in temperature-driven events

invasive species in new places

berries, trees, plants & animals under stress

changing migration patterns

Start a land monitoring program

Assist plant migration

Protect permafrost

Keep forests connected & rivers flowing

Keep ecosystems healthy

(like lakes, rivers, forests & peatlands)

Be guided by Traditional Knowledge

Protect threatened or culturally important areas, plants & animals

Adjust harvesting

Prevent spread of invasive species

Restore damaged habitat



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Climate Change Impact and Adaptation Study for the North of Ontario

ECOSYSTEMS - ADAPTATION OPTIONS



Start a monitoring program



- Monitoring can help track changes happening in traditional areas and guide future actions.
- What a community monitors will depend on its needs/goals and could include:
 - Presence of new or invasive species
 - Timing of events like spawning or flowering
 - Migration times and patterns
 - Number and health of culturally significant plants & animals

Traditional Knowledge



- Traditional Ecological Knowledge (TEK) contains valuable information about the land and water and can guide decisions about protection. Intergenerational sharing of TEK is key to continued land and water protection.

Protect permafrost



- Permafrost loss can change the landscape and affect plants and animals (palsa collapse, thaw slumps, shoreline erosion, etc.).
- Protect permafrost by limiting disturbances and properly constructing roads and buildings.
- Limiting global warming by reducing greenhouse gas emissions is the best way to protect permafrost.

Restore damaged habitat



- Help bring damaged habitats back to their natural state by: replanting native vegetation, removing invasive species, cleaning up trash and pollution, etc.
- Restoring habitat supports biodiversity and could provide other benefits like natural flood control and carbon storage.

Keep ecosystems healthy



- Healthy land and water help support all species and may be better able to cope with the impacts of climate change like drought, wildfire, flooding, and invasive species. Healthy peatlands and forests also store carbon which can help limit further climate change.

Keep forests and rivers connected



- Climate change will mean some plants and animals will have to move to new places to survive. Keeping forests continuous or connected and not blocking the paths of rivers can help species that need to move to new areas.

Adjust harvesting



- Change harvesting time and location to match when/where animals and plants are now available. Consider harvesting species new to the area, like deer and bass.

Prevent invasive species



- Climate change could make it possible for invasive species to live in new places.
- Prevention is key. Encourage actions like:
 - Cleaning boats and fishing gear
 - Using local firewood
 - Avoiding invasive plants in gardens
- Monitor for new species and have a control plan for ones that could be damaging.

Protect important areas/plants/animals



- Protect important habitat or culturally significant places from destruction or damage.
- Protect important animals, plants, and medicines by looking after the habitat they need and prevent overharvesting.

Assist plant migration



- Programs where humans help plants move to new areas in response to climate change is called 'assisted migration'.
- This includes helping important plants continue to grow (through seed collection, local transplants, etc.).
- Bringing in new plants could lead to ecosystem disruptions. Weigh risks carefully.

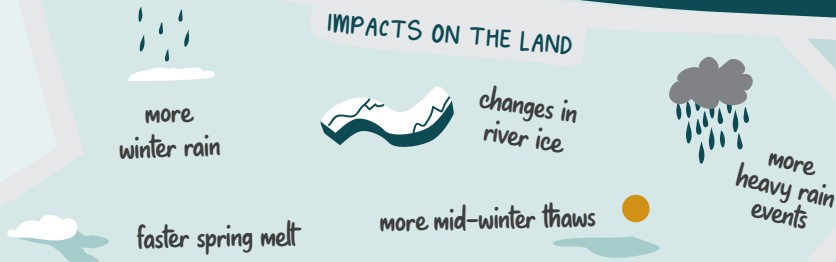
CLIMATE CHANGE



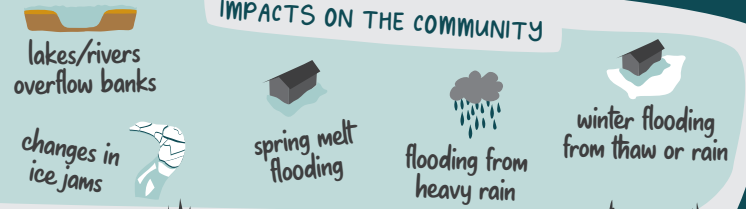
climate change adaptations for northern First Nation communities & individuals

FLOODING

IMPACTS ON THE LAND



IMPACTS ON THE COMMUNITY



Monitor & forecast flooding

Use Ontario's Flood Watch & Warning Program or create a community-based monitoring program

Create a community plan with flooding in mind

Community wide & in households

Create an emergency plan

Community Centre

Help river ice melt to avoid ice jams

Drain water away from buildings

Avoid building on flood plains

Manage snow

Avoid building in low areas

Maintain good community drainage

Keep wetlands & natural spaces in the community

Install water control structures



FLOODING - ADAPTATION OPTIONS



Flood monitoring & forecasting

- Monitor your area for conditions that could lead to flooding. This could be things like:
 - heavy rains
 - high water in lakes/river
 - rapid snow melt
 - ice jams
- Some flood watch and warning programs already exist (like Ontario's Flood Watch and Warning Program) or communities may want to create their own.
- Flood forecasting models (made specifically for a community or area) look at what conditions have led to flooding in the past to try to predict what conditions will likely cause flooding in the future.

Water control structures

- Structures like dams, dikes and berms are sometimes used for flood control in areas where floods have happened before.
- Structures like ice booms are sometimes used to prevent ice jams from forming.

Wetlands & natural space

- Wetlands and natural forest spaces can help absorb water from rain and spring melt and provide natural flood protection.

Avoid building on flood plains

- A flood plain is an area of low-lying ground next to a lake or river. These areas are more likely to have flooding issues.
- Traditional knowledge about past floods and high water levels can give valuable information about which areas may be at risk of flooding.

Drain water away from buildings

- Keep water from entering homes and buildings with:
 - eavestroughs, drain pipes, weeping tile
 - trenches to direct water away
 - sloping the ground away from foundations
- Consider the slope of the land and how water will drain when choosing where to build homes/buildings.

Community drainage

- A good community drainage system (ditches, culverts, water storage areas, etc.) can help prevent flooding from heavy rain or during spring melt.
- Regular maintenance (clearing blockages, replacing damaged culverts, etc.) can help keep drainage systems working well.

Community planning

- Consider flooding in community planning, like when deciding where to build homes/buildings, where/how roads should be constructed, plans for drainage, etc.

Help river ice melt

- In areas where ice jams are common, weakening the ice to melt it faster can help prevent a jam or make it less severe.

Emergency planning

- Emergency planning can help keep people safe.
- Community emergency plans could include: evacuation plans, refuge centres, plans to protect infrastructure, etc.
- Households can prepare by: having emergency supplies, knowing what to pack for evacuations, knowing the community emergency plan, etc.

Manage snow

- Pile snow in a places where melt water can drain away safely from buildings and other infrastructure.



Climate change adaptations for northern First Nation communities & individuals

FOOD SECURITY

CLIMATE CHANGE

warmer temperatures



changing rain & snow



IMPACTS ON THE LAND



changes in water levels



permafrost thaw



warmer lakes/ rivers



earlier spring



warmer winters



changes in vegetation

IMPACTS ON FOOD



changing migration patterns

↑ plants & animals moving north



shifting ranges for plants & animals



changes in fish spawning

cold-water fish under stress

Monitor commonly harvested plants, animals & fish

Assist plant migration

Adjust where, when & how you harvest

Protect/restore important habitat

Share harvested food

Grow food in the community

Start a community food storage program

Use community coolers/freezers or traditional food storage



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Community-based monitoring



- Monitoring activities can help us understand what's happening with plants and animals in our area.
- What a community chooses to monitor will depend on its needs and goals.
- The information gathered from monitoring can help guide future actions and decisions.
- Things to monitor could include:
 - population counts (how many?)
 - fish spawning times & locations
 - migration times & patterns
 - animal health & diseases
 - locations where important plants grow
 - when plants are ready for harvest
 - water levels & temperature

Protect/restore habitat



- Protect the habitat that is important to harvested plants and animals and/or restore habitat areas that have been damaged.
- Important habitat areas might include:
 - migration routes
 - spawning grounds
 - staging & nesting areas
 - cold water refuges
 - calving grounds
 - wild rice stands

Adjust how you harvest



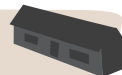
- Change when and where you harvest to match when/where animals and plants are now available.
- Change how/when you travel and wait until weather conditions are safe.
- Harvest species that are new to the area and shift away from harvesting vulnerable populations.

Community food storage



- Warmer fall weather can make it harder to keep harvested meat cool.
- Community coolers can provide a cool space for community members to hang and butcher their game. Community freezers can be used for long-term storage of food by members.
- Encourage traditional food storage methods, like smoking/salting meat, fish houses or storing food underground (if climate conditions still allow).

Food sharing



- Sharing harvested foods within the community can help ensure that everyone has access to healthy traditional foods.

Community food production



- Growing food in the community can help more people have access to healthy foods. Examples of local or community food production include:
 - household gardens
 - raising animals
 - community gardens
 - indoor growing methods
 - forest gardens
 - other methods of culturally appropriate food production
 - greenhouses

Assisted migration



- Programs where humans help species move to new areas in response to climate change is called 'assisted migration'.
- For food security this may mean planting berries or other plants that will grow well in future climate, or helping important plants in the area continue to grow.
- Moving plants and animals can lead to invasive species and disruptions of ecosystems. Weigh all risks carefully before using assisted migration.

Climate change adaptations for northern
First Nation communities & individuals

HEALTH

CLIMATE CHANGE

warmer temperatures
changing rain & snow

IMPACTS ON THE LAND

warming temperatures
shifting ranges
longer growing season
flooding & fires
hot days
ticks & mosquitoes in new places
more pollen
evacuations
mold in homes & smoke in air

IMPACTS ON PEOPLE

heat illness
lyme disease
west nile virus
allergies
mental stress
respiratory issues

Support cultural activities

Plan for hot weather if needed

Get support from health services

Monitor air quality

Designate a refuge centre

Such as cooling centres, evacuation centres & clean air spaces

Make a community plan for weather events

Identify vulnerable populations & include their needs

Protect yourself from sun & heat

Monitor for ticks & mosquitoes and prevent bites

Recognize & prevent mold growth in homes

25°C 26°C 30°C

Monitor for heat & heatwaves



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Study for the North of Ontario

HEALTH - ADAPTATION OPTIONS



Health support

- Make sure that health professionals serving the community know the health risks of climate change.
- Information about climate change and health should be shared with the community.
- Advocate for health services for climate change challenges (mental health support, medications for asthma, respiratory conditions, Lyme disease prevention, etc.).

Community plan for weather events

- Communities can make a plan/plans for events like heat, storms, flood, wildfire, etc.
- Consider things like community alerts, refuge centres, emergency supplies, planning for power outages, evacuation plans, etc.
- Identify vulnerable groups in the community (children, Elders, those with health issues, etc.) and include their needs.

Monitor air quality

- Air quality could be affected by wildfire smoke or increases in pollen/allergens.
- Monitor air quality in the community with existing programs (like firesmoke.ca) or with a community air-monitoring station.

Protection from sun & heat

- Avoid sunburns and heat illness by:
 - finding shade
 - covering skin with clothing or sunscreen
 - wearing hats & sunglasses
 - limiting activity in the hottest part of the day

Monitor for hot weather

- Create a monitoring program for heat events. Warn community members of hot weather days and share steps for avoiding heat illness.

Monitor & prevent bites from ticks and mosquitoes

- Climate change will allow species to live in areas where they couldn't live before, like blacklegged ticks that can carry Lyme disease or mosquitoes that can carry West Nile virus.
- Monitoring activities, like tick dragging and mosquito traps, can help alert communities to new species in their area.
- Help prevent infection by preventing bites. Take actions like covering skin, using 'bug spray' and checking for ticks after being outdoors.

Recognize & prevent mold growth in homes

- Mold can grow when there is extra moisture in your home from condensation, leaking pipes, flooded basements, etc.
- Share information about recognizing, preventing, and dealing with mold in community homes.

Cultural activities

- Cultural activities support community health and well-being.
- Consider weather and the changing climate when planning traditional or outdoor activities; provide shade, water and shelter to participants.

Refuge centres

- Refuge centres provide safe spaces for people during emergencies or extreme events.
- Cooling centres for hot weather, clean air spaces for poor air quality, and evacuation centres or emergency housing for people who have to leave their homes, are types of refuge centres.



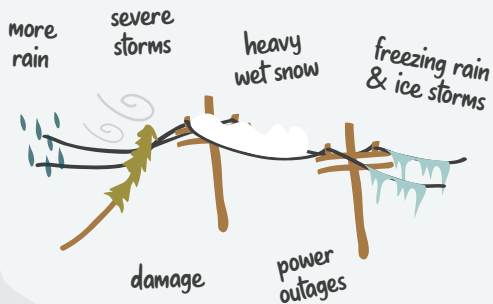
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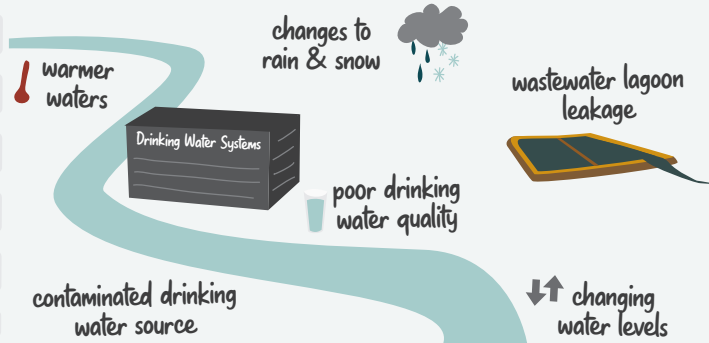


INFRASTRUCTURE

Climate change impacts on energy



Impacts on drinking water systems & wastewater lagoons



Impacts on homes & buildings



Impacts on roads



Assess vulnerability & make a plan

Make sure infrastructure is ready for climate change

Plan for snow load

Monitor wastewater lagoons

Create a plan for power outages

Produce renewable energy

Monitor drinking water quality

Build/retrofit for climate change

Maintain good community drainage

Design roads to let water run off

Drinking Water Treatment Plant

Have an emergency plan to supply water if needed

Homes, community buildings, energy infrastructure & treatment plants

Community-wide & in households

Rely less on diesel generators, provide back-up power

Include ditches & culverts and keep them maintained

INFRASTRUCTURE - ADAPTATION OPTIONS



Produce renewable energy



- Communities can use renewable sources, like wind, solar or micro hydro, to produce energy.
- Renewable energy can reduce dependence on diesel generators or the provincial grid.
- Renewable energy can also provide backup power if the larger electrical grid goes down.

Good community drainage



- Good drainage can help keep water from settling on roads and keep it out of basements and crawlspaces.
- Drainage systems should have:
 - an appropriate slope
 - water holding areas (like wetlands)
 - culverts that are the right size and not damaged
 - clear ditches

Snow load



- Snow load is the weight of snow and ice on the roof of a home or building.
- Know the warning signs of snow load problems for homes/buildings.
- Measure snow amounts and have a plan for snow removal.

Vulnerability assessment



- Climate change will bring many challenges to energy infrastructure, community roads, water systems, homes and buildings. A vulnerability assessment can help identify how these parts of the community are at risk.
- Make a plan to get vulnerable infrastructure ready for climate change.

Build or retrofit for climate change



- Keep climate change (extreme heat, severe storms, flooding, etc.) in mind when planning new projects or repairing/upgrading existing homes, buildings and services.
- Improve community homes with things like insulation, drainage, sump pumps, energy efficient windows, etc.
- Structural changes or improvements might also be needed.

Monitor drinking water quality



- Monitor drinking water sources for potential climate change impacts (lower water levels, water quality changes, problems with intake pipes, etc.).
- Have a community plan if tap water is not safe to drink.

Plan for power outages



- A community plan for power outages could include: an emergency centre (warming in winter, cooling in summer), support for community members, community alerts, etc.
- Having a source of emergency power will be an important part of community planning.
- Households can prepare by: having emergency supplies, knowing how to keep refrigerated foods from spoiling, knowing how to keep pipes from freezing, etc.

Building roads



- Shape roads to help water drain off (water on roads can create potholes & washouts).
- Include ditches and culverts and keep them maintained.
- Limit erosion on roadside slopes by keeping the grade gentle and letting plants grow.

Monitor wastewater lagoons



- Climate change could bring challenges like more heavy rain events. Monitor lagoons for signs of problems, like leakage, that can contaminate surrounding land.



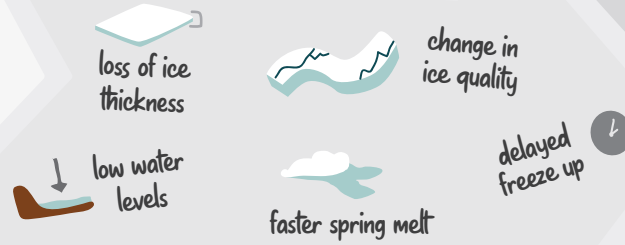
TRAVEL ON LAND, WATER & ICE



CLIMATE CHANGE



IMPACTS ON LAND, WATER & ICE



IMPACTS ON TRAVEL



Keep travel routes clear

Consider new travel routes

Know ice self-rescue & partner rescue

Change equipment for changing conditions

Consider bridges for traditional routes

Monitor ice conditions & share the information

Plan your trip & be prepared



TRAVEL ON LAND, WATER & ICE - ADAPTATION OPTIONS



Change equipment



- People in the north are already changing the way they travel on land, water & ice by doing things like:
 - using ATVs instead of snowmobiles
 - using boats and motors for shallow water
 - taking lighter loads in boats
 - using lighter equipment on thinner ice

Keep routes clear



- Making sure trails and routes stay accessible may mean putting more time and effort into keeping trails clear (removing fallen trees, keeping brush down, etc.).

New or different routes



- Taking a different route or creating a new trail might be needed if low water levels, thin ice, or changes to the land make traditional routes unsafe or obstructed.

Plan trip & prepare



- Trip planning and carrying emergency supplies can help keep people safe in the face of changing and unpredictable weather.
- Actions can include:
 - checking the weather forecast
 - sharing your travel plans with someone you trust
- Supplies can include:
 - food and water
 - first aid kit
 - extra medication
 - satellite phone or SPOT device

Bridge crossing



- Climate change is making the ice-on season shorter and affecting the thickness and quality of ice.
- Permanent bridge crossings over water on popular routes and trails could make crossing ice safer and extend the length of time people can travel.

Monitor ice conditions



- Monitor ice conditions in the area and share that information with the community.
- Ice thickness can be measured with an axe or auger, or with ice-monitoring sensors like ground penetrating radar, like the ones used in the SmartICE program.

Ice rescue



- Ice self-rescue is knowing how to get yourself out of the water. Partner-rescue is knowing how to help someone else out of the water.
- Consider arranging ice rescue training in the community.
- Having safety equipment (floater suits, ice picks, throw ropes, etc.) and knowing how to use it can make a difference.
- Communities may want to consider making safety equipment available for people to use.



Climate change adaptations for northern First Nation communities & individuals

WINTER ROAD TRAVEL



CLIMATE CHANGE

warmer temperatures
 especially winter, spring & fall

changing rain & snow
 more winter rain



IMPACTS ON LAND, ICE & WINTER ROAD

later freeze up

earlier break-up

shorter winter road season

permafrost thaw

more mid-winter thaws

weaker, thinner ice

unexpected road closures

delay in road opening

worse road conditions



IMPACTS ON THE COMMUNITY

energy insecurity

higher cost to fly in goods

food insecurity

unable to attend events/appointments

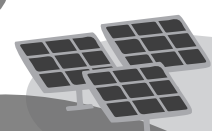
social isolation



Share daily road information in the community



Consider an all-season road feasibility study



Reduce dependence on shipped goods



Harvest from the land when you can

Reduce the need for fuel tankers

Produce energy in the community

Seek funding for equipment



Install permanent bridge crossings

Add bridges at increasingly risky water crossings



Improve winter road flooding methods



Gather winter road information



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Study for the North of Ontario

WINTER ROAD TRAVEL - ADAPTATION OPTIONS



Permanent bridge crossings



- Bridges over river and creek crossings can make winter roads less dependent on ice conditions allowing roads to open sooner and stay open longer.
- This option is likely to be expensive.

Realign the route



- Winter road builders, guided by local knowledge or their own experiences, may be able to make small-scale changes to the winter road routes like: avoiding steep slopes, limiting south-facing exposures, finding better creek-crossing locations, etc.
- Large-scale changes to the route involving big stretches of road (and likely more than one community) would be a big project involving consultants, engineers, government, etc.

Reduce need for fuel tankers



- Fuel for diesel generators is a big part of the goods shipped over winter roads.
- Energy from renewable sources, like wind or solar projects, reduce the need for diesel in communities.
- Wataynikaneyap Power is also connecting some remote communities to the provincial electricity grid.

Share information



- Climate change is making winter road conditions less predictable.
- Share daily winter road information in the community. Many communities and community members already do this using social media.
- Conditions can vary over different sections of winter roads. Information about road conditions over long distances, like the entire route from major centres in the south to communities in the north, could be very useful.

Better equipment



- Equipment upgrades could allow some road construction to start earlier. Graders, for example, could allow land sections to be built quickly without needing to wait for plentiful snow to create a smooth road bed.
- Seek funding for new equipment.

Reduce need for shipped goods



- It may be possible to harvest some goods, like logs or food, from the land.
- Consider foods that can be grown in your community with gardens, greenhouses, etc.
- Traditional ways of building may better incorporate materials from the land and strengthen cultural connection.

All-season road feasibility

- As the winter road season gets shorter, Tribal Councils, regions, etc. might explore the option of an all-season road.
- Communities may want to support an all-season road feasibility study for their region.
- Planning and building an all-season road is a long, multi-million dollar process that will require engineers/consultants, impact assessments, a coordinated plan, etc.

Winter road flooding



- It may be possible to change or improve road flooding methods to get better results.
- Newer water pumps, more water pumps, or other types of equipment could be helpful. Seek funding if equipment could be updated or improved.
- Ice-penetrating radar machines (like used in Smartice) could be helpful for determining safe ice thickness for flooding and travel.

Gather information



- Gathering information about the winter road (road condition, road usage, opening/closing dates, etc.) can be important for future decisions.



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*Adaptations vary in scale (small to large), focus (individual to community) & cost (low to high). Find what works for you and your community.



Climate change adaptations for northern First Nation communities & individuals

WILDFIRE

IMPACTS ON PEOPLE

IMPACTS ON WILDFIRE

IMPACTS ON THE LAND

CLIMATE CHANGE

warmer temperatures

changing rain & snow

more/intense storms & winds

more evaporation, drier land
summer

warmer = possible insect outbreaks
fall

later snow fall
winter

earlier melt
spring

longer fire season

more lightning (fire ignition)

more dead/fallen trees (fire fuel)

drier land (fire fuel)

higher risk of accidental ignition

poor air quality

evacuations & stress

damage to the community

Use fire resistant materials for homes & buildings

Monitor for smoke & air quality

Monitor for wildfire risk in your area

Use 'Ontario's Forest Fire Info Map' or create a community-based monitoring program

Monitor water quality after a fire in the area

Keep people informed with community alerts

Manage trees & plants in and around the community

Become a FireSmart community

Raise awareness about human-caused fires

Share info about fire hazard risk, smoke & air quality with the community

Create an emergency plan

community wide & in households

Community Centre



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WILDFIRE - ADAPTATION OPTIONS



Emergency planning



- Emergency planning can help keep people safe in the event of a wildfire.
- Community emergency plans could include: evacuation plans, the roles and responsibilities of community members, plans to protect infrastructure, etc.
- Households can prepare for emergencies by: having emergency supplies, knowing what to pack for evacuation, knowing the community emergency plan, etc.
- Communities can also inventory any fire equipment they have and keep it in working order.

Monitor water quality



- Wildfires can impact water when ash, sediment, or other debris is washed into lakes and rivers.
- When fires happen near or upstream of a community, drinking water could be affected.
- Monitor lakes/streams that supply drinking water after wildfire events and have a plan if water is not safe to drink.

Fire-resistant materials



- Some materials are more fire resistant than others. Use more fire-resistant materials when building new homes or updating existing ones.

Community alerts



- Share information about fire hazard risk, smoke and air quality with the community. Social media, community websites, local television and radio, and posted notices can all be good ways to do this.
- Communities may want to have a special alert or warning alarm to tell residents when there is a wildfire emergency.

FireSmart community



- FireSmart Canada offers programs and information to help households and communities be better prepared for wildfire.
- Managing trees and plants, priority zones around homes and communities, fire-resistant materials, community fireguards, and more, are all part of FireSmart.

Monitor wildfire risk



- Hot, dry conditions can make it easier for fires to start and spread.
- Communities can monitor the fire hazard risk in their area with online tools like Ontario's Forest Fire Info Map or the Canadian Wildland Fire Information System, or create their own program.

Monitor for smoke & air quality

- Knowing when smoke is predicted to reach your community (smoke forecasting) can allow time to put health actions in place.
- Track wildfire smoke with online tools like FireSmoke Canada or Canada's Wildfire Smoke Prediction System (FireWork).
- Identify those in the community most vulnerable to poor air quality (Elders, those with asthma, etc.).
- When air quality is poor or predicted to become poor, communities can: inform community members, set up clean air spaces, evacuate vulnerable people, etc.

Prevent human-caused fires



- Raise awareness of human-caused fires and how they can be prevented on the land and in the community.

Manage trees & plants



- Managing trees and plants can help keep wildfires out of your community. This could include: fireguards, thinning trees, encouraging growth of deciduous trees, clearing dead material and controlled burning.



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