



The Problem with Stan

Role Playing Scenarios

English Edition

Taking a Role in Water System Management

Environmental role-playing exercises that support

**Alberta Learning Grade 8 Science Unit:
Freshwater and Saltwater Systems**

**Saskatchewan Education Grade 8 Science Unit:
Water Systems on Earth**

**Manitoba Education Grade 8 Science Cluster 4:
Water Systems**

Challenge your students to examine the complexities of water system issues from the various viewpoints of the stakeholders. Can they find common ground and work together to resolve problems?

Transform information into experience by engaging students in four role-playing scenarios that represent real-life issues in the Prairie Provinces.

**Damming Sturgeon Falls
Something Smells Fishy at Perch Lake
Pike City's Riverside Mess
Fish out of Water**



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Taking a Role in Water System Management

Learning Outcomes

Students will:

- Identify the environmental, economic and societal consequences of human practises that affect water system functions and fish habitat.
- Analyze group processes involved in problem solving and decision making.

What Students Will Do

- Be participants in roleplay simulations of meetings that address water use issues

There are four roleplay scenarios from which to choose:

- Damming Sturgeon Falls
- Pike City's Riverside Mess
- Something Smells Fishy at Perch Lake
- Fish out of Water

Time: 1.5 periods

Materials

- For each roleplay scenario:
 - One background information card
 - Eight roleplay cards

Teacher's Notes

The purpose of the activity, *Taking a Role in Water System Management*, is to engage students in role-playing situations in which they portray a diverse group of people with conflicting needs, wants and responsibilities. They will hold meetings and try to reach consensus or a way forward on issues that affect water systems. Each of the eight roles in the four scenarios can be portrayed by a male or female student.

The locations and the people in these scenarios, *Damning Sturgeon Falls*, *Pike City's Riverside Mess* and *Something Smells Fishy at Perch Lake* are fictitious but concern water system issues that are real across the Prairie Provinces. Although the people and meeting portrayed in *Fish out of Water* are fictitious, the Prairie Provinces Water Board has been involved in water allocations and management since 1948. <http://www.ppwb.ca/>

The meetings should incorporate a variety of opportunities for students to practice communication, organizational and planning skills as they try to resolve water issue problems.



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Procedure

Period 1 (Half period): Prepare for the meeting

Introduce the meeting scenario(s) and the participants (background information and roleplay cards) to your class.

Divide the class into groups of eight. You may assign the roles by lottery. Place all the roleplay names in a container and having each member of a group draw one. Hand out the background information and roleplay cards to each group.

A chairperson is required for each group; this can be an individual role or may be played by a student who already has a roleplay card. Add additional students to groups as reporters or minute takers. Having a record of the meeting will aid discussion. Other students could be observers and contribute to the analysis of the meeting process.

Provide discussion time for the group to review the background information. Encourage students to adopt personas for their roles. Make it clear, however, that there are no heroes or villains in the roles—the students are portraying a cross section of society with a variety of perspectives on issues. Stay away from stereotypes.

Inform students that a meeting should be about 30 minutes long.

Instruct student groups to create an agenda to structure their meeting. They should determine:

- The purpose of the meeting
- The order in which items are discussed
- The order in which participants speak
- A time allocation for discussion
- A time allocation to develop an action plan

Make sure students understand the role of the chairperson who introduces participants, ensures orderly discussion that stays on topic and looks for common ground.

Period 2: Conduct the meeting and analyze the process

The chairperson should call the meeting to order and read the agenda.

During the meeting, students:

- Share information on the roleplay cards to create understanding (updates on status, expert knowledge and advice, personal experiences and opinions)
- Develop ideas to address the issues (brain-storming)
- Make decisions (evaluate options, rank problems and solutions in order of importance, create common purposes, reach consensus if possible or find some way of moving forward).
- Construct an action plan by assigning tasks that promote goals (more information needed, communication with community and/or governments and other agencies, activities).

After the meeting, students:

- Each group presents its action plan.
- Evaluate the process.

In real-life situations, action plans should be evaluated after they have been executed to measure their success. As these action plans will not be implemented, incorporate evaluation by examining the group processes involved in problem solving and decision making. Decide if the action plan would contribute to a solution.

- What type of information did the participants convey? (scientific, technical, economic, social, personal)
- Did certain types of information carry greater or lesser weight for decision-making? Why?
- What key points were most important for individuals or for the group as a whole to consider?
- Were concessions made by various stakeholders?
- How did the group come to a consensus?
- How do the decisions of one group compare to that of other groups? What caused differences and similarities?
- Compare the notes on the meeting process from different groups. What are similarities or differences among the observations?
- How did working in a larger group differ from working in the smaller groups used for model building? What was harder or easier?

1. Damming Sturgeon Shoals

Scenario Notes

Students are participants at a town hall meeting called by the local Chamber of Commerce to gauge support for building a reservoir on the local river. How would a reservoir affect the local economy or the environment? What should they do?

Shoals are depositions of sediments, like sandbars, that may or may not reach the surface of the water. A reeve is an elected representative for a municipality. Environmental services performed by ecosystems include producing clean air, clean water and fertile soil, and moderating the effects of weather.

Background Information on the Fish River System

The town of Sturgeon Shoals overlooks the Fish River rapids. The fast-moving water cover gravelly shoals that shift with the seasonal flows of water. Two kilometres downstream, the current slows and the Fish River meanders across a fertile and moist floodplain.

Upstream from the town, the river channel cuts deeply into an upland plateau, forming a wide valley that is seven kilometres long. This portion of the river valley is a remnant of a 10 000-year-old meltwater channel that once transported large volumes of water from the shrinking continental glacier. Present-day Fish River only occupies a small channel at the bottom of this steep-sided valley.

The upland plateau supports a mix of farmland and forest. The sandy soil does not hold a lot of water so sometimes the crops are stunted. The floodplains downstream from Sturgeon Shoals are almost all cropped. Most residents find work at resource-based jobs in agriculture, forestry and tourism or in related services such as farm implement dealerships. River fishing is important for subsistence for two First Nations Reserves and brings in revenue from tourists. There are two out-fitting companies who provide river-fishing excursions. The region isn't booming but neither is it impoverished.

Some members of the local Chamber of Commerce believe that building a dam across the narrowest part of the river valley, just upstream from Sturgeon Shoals, would create a reservoir with economic benefits for the town and surrounding rural municipalities.

The members formed a committee and hired a consultant to do a preliminary cost/benefit analysis. After reading the report, the committee decided to call a meeting of concerned stakeholders to gather more information and to gauge support for the dam project. They knew that some type of plan was needed for the future and a dam seemed to be the best way to generate more economic growth.

**Clare or Abe Lee
Consultant**

The cost of the dam would be about \$10 million and take four years to build. The dam construction will employ close to 100 people. The reservoir will take an additional two years to fill.

Money could be raised, in part, through government grants and contributions from various associations. It is difficult to get large private investments as the payback won't be for six years. Once the reservoir is filled, there should be a steady source of revenue through economic spinoffs.

Potential income from developing a recreational fishery could reach \$1 million annually if lodging and food are included. The town merchants could see a \$1 million increase in revenues beyond this. The increased land value for lakefront properties, irrigated cropland and intensive livestock operations will approach \$5.5 million.

An environmental impact assessment must be conducted to understand how the bed and banks of the Fish River will be affected in terms of aquatic habitat, shoreline stability and water flow changes. Permits to alter a waterway must be obtained. Water must be allocated for downstream users.

Costs associated with the loss of ecological services, like water filtration and sediment transfer, provided by riparian and littoral ecosystems and natural river flow have not been estimated as the dollar values for these services are not completely understood. Ecological services are very important to consider, however, in the overall cost/benefit analysis.

**Goldie or Richie Jobbs
Chamber of Commerce Representative**

I grew up in Sturgeon Shoals. I do a lot of volunteer work in the community to help make this a better place to live. I don't want to see our young people begin to move away because there isn't enough work. That's happened in lots of towns. A reservoir will bring prosperity and jobs.

Farmland along the river could be developed for cottage owners on what would become lakefront property. Think of how much that land would be worth! Rainbow trout could be introduced for sport-fishing which would increase tourism. A marina could be built.

Upstream from Sturgeon Shoals, farmers would have access to water for irrigation and livestock. The scrubby forested areas could be converted to valuable farmland. With irrigation, all kinds of crops could be grown if there was a dependable source of water. With farmers making and spending more money, businesses in Surgeon Shoals will benefit.

Oil and gas exploration is increasing in this area and that means they'll be looking for water as well. We need take advantage of our opportunities. We owe it to our kids.



**Shelly or Ray Fisher
First Nation Representative**

The shoals are an important spawning ground for lake sturgeon, as well as for walleye and lake white fish. Downstream, northern pike and yellow perch spawn on the floodplain in the spring. If a dam regulates the water then these spawning grounds will be lost and they cannot be replaced.

We have fished here for generations, providing food for our communities and reaffirming our cultural connections to the land. Each family receives about 75 kilograms of fish each year so the harvest provides us with a lot of high-quality protein.

Under Treaty, we have a guaranteed right to fish this water so the federal government has a legal duty to consult us if the river system is altered. The protection provisions in the federal Fisheries Act require that certain issues are discussed and solved before the decision to build a dam is made. The value of fish in Aboriginal and recreational fisheries must be calculated and the measures that would be used to avoid or offset serious harm to these fisheries if a dam is built must be determined.

Rainbow trout are very good to eat but they always need to be restocked as they can't spawn here. They could never replace the amount of fish that we need to keep our communities healthy.

**Prudence or Justin Townsel
Mayor of Sturgeon Shoals**

I have a lot of concerns. How will the dam be paid for? I would need a big commitment from both the federal and provincial governments, as well as from the surrounding rural municipalities before I can involve the town of Sturgeon Shoals. Taxes would certainly go up but then if the population increased there would be more tax revenue. More businesses would move to town which would also increase revenues. But that also means that new infrastructure like roads and sewers need to be provided.

How will the dam project affect our current water treatment facilities? We use a combination of groundwater and some river water for the town's tap water. Will the reservoir and resulting land use changes affect our water quality? More testing means more expense. Our water treatment facilities are relatively new, but weren't designed to service a sudden increase in population.

What happens if the population base doesn't grow? If all we get are seasonal cottage owners, there won't be a lot of extra money coming our way. On the other hand, reservoirs with trophy-sized fish can host huge ice-fishing derbies that could bring in some needed winter revenue.

**Cornelia or Wheaten Reaper
Farmer/Reeve**

As reeve for my municipality, I listen to landowners along the river valley complain that the lack of water keeps them from realizing the full economic potential of their land.

If the reservoir is constructed, there are several farmers who are interested in growing higher value crops with irrigation. Others would keep more livestock or start new livestock operations. They're only asking for water security. If climate change affects the rainfall patterns, then having a reservoir full of water is like having money in the bank.

There seems to be too many regulations and too many agencies that need to be consulted before anything can change. It is important to protect the environment but we also need to provide for our families. The primary use for farmland is to produce food for Canadians and the international market. Crop rotation and zero-tillage conserves soil resources and livestock waste management reduces water pollution—these make good environmental sense. Not providing a source of water to produce food for people doesn't make any sense at all.

**Willow or Hunter Greenberg
Science Teacher**

The old meltwater channel which would form the basin of the reservoir is my outdoor classroom. Some of my students have found fossils and First Nations artifacts in the valley slopes. This has given us the chance to work with the university and local Elders—great learning opportunities.

In the spring we do bird counts in the river valley. Countless small native warblers and sparrows use the deep valley as a bird highway during migration to escape the strong winds that sweep across the upland plateau. Building a reservoir will decrease the diversity of life as riparian areas and littoral zones will be destroyed

Basically there will be flat farmland surrounding a featureless large water body as the steep valleys sides would not provide the shallow shoreline habitats that are so ecologically rich. The sandy soils on the uplands are easily eroded by wind and water when they are uncovered. The forested areas help protect these fragile soils.

We have already lost up to 70 percent of wetlands in the settled parts of the country and less than 20 percent of native grasslands are left. We need to conserve our remaining natural areas. There must be other ways to enhance our economy.



Misty or Clifford Waters Provincial Water Agency

The provincial government shares responsibility for managing and protecting water and fish resources with the federal government. We ensure safe drinking water and reliable water supplies as well as conserve fish stocks and protect fish habitat.

It is important to look at how a dam will change the water system. If water from the river system is removed and used for irrigation or intensive livestock use, ground and surface water quality and quantity in the region may be affected.

Erosion is another factor. As sediments settle behind the dam, there will be fewer deposits downstream although the rate of erosion will remain about the same. The shoals will eventually disappear. Downstream, the floodplain will no longer be subject to a wide range of water levels as the flow from a dam is regulated. The channel will become deeper and narrower. This can lower the level of the water table, affecting the floodplain crops and reducing yields.

When more water is allocated for agriculture and industries like oil and gas, it can mean less water for those who live downstream, affecting their economic well-being. This is the reason that water allocations are regulated.

Fedora or Federico Govca Government of Canada

There are over 20 federal departments and agencies with unique responsibilities for fresh water. A challenge is to coordinate strategies among these groups so that various policies and regulations work together to address fresh water issues. Sometimes the objectives are at odds with each other. In addition there are other agencies with a stake in regional matters like economic development and First Nations.

The Fisheries Act provides legislation to manage and control fisheries, conserve fish stocks, protect fish habitat and prevent water pollution.

The purposes of the Species at Risk Act are to prevent loss of native species and to provide recovery for species at risk. Lake sturgeons are endangered in this part of the river system. We can establish a stewardship action plan to support groups who wish to be involved in protecting sturgeon. Loss or degradation of habitat is the main reason why species at risk become listed.

Boats used for transportation, recreation or commerce can navigate Fish River so this water body is subject to the Navigable Waters Protection Act which balances the right of the public to navigate and the need to build dams and bridges for economic development. No structures can be built without approval.

The Western Economic Diversification Act was legislated to support community economic development. Funding is available for projects involving water, waste water, recreation and culture in rural communities.



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2. Pike City's Riverside Mess

Scenario Notes

Students are stakeholders and city administrators at a public meeting called to discuss the future development of some riverside property. There's wide range of opposing ideas and concerns presented by the stakeholders. Can happiness be found in the mess that surrounds Pike City's riverside development?

A backwater is an area off a main channel of a river that is generally stagnant and may backflow when the river is high. Brownfields are underused or vacant commercial or industrial sites which may or may not be contaminated by past use (e.g. gas stations, rail yards, dry cleaners, factories). Due to the possibility of contamination and the cost of cleanup, developers may not find them attractive. Greenfields (natural areas like grasslands, forests or wetlands) are viewed as being contaminant-free and so have no hidden costs for developers.

Background Information on Pike City

The Fish River flows through the heart of Pike City. Riverside land has become very expensive as the city grew out from the banks and into the farmland. Most of the riverbank has been developed as residential or commercial properties. One of the few undeveloped greenfields remaining along the river is located just west of a large marshy area. The marsh, surrounding a backwater off the main channel of the river, is the outlet for some of the city storm sewers. Over the years, the marsh has become polluted from contaminants in the stormwater.

A corporation has put in a bid to buy the riverside property and the marsh as they want to develop a large condominium complex and marina. They propose to rechannel the storm sewer outflow downstream of the backwater to solve the pollution problem.

The city, which owns the riverside property and the marsh, is tempted by the tax money a condominium complex like this would generate. As well, the polluted marsh would no longer be an issue. On the other hand, Pike City has few green spaces left.

The city also owns a large brownfield in an old industrial area along the river. Developers have been reluctant to consider this property as the cost of cleaning up possible contaminants is unknown until the environmental assessment is done. Additional costs may be incurred when the cleanup work is underway as more problems may be uncovered. There is concern that if contaminants are present, they may leach into the Fish River.

When the proposed development plans of the greenfield were made public, lots of people voiced opinions. The proponents and opponents to this development have become very vocal and polarizing. The city's Planning and Development Commission decided to hold a public meeting to discuss the riverside development and to allow citizens to voice their concerns and ideas. Maybe concerns can be addressed and some consensus can be found.



**Everly or Max Planner
Pike City Planning and Development Commissioner**

We have to ensure that Pike City has the type of development that benefits our citizens. We also need to have tax revenue to repair aging infrastructure and provide services.

The proposed greenfield development will provide revenue from land that is idle and not providing many benefits to Pike City in its current state. The bush and non-native invasive weeds that currently vegetate the property do help stabilize the riverbank. Any riverside development, however, is mandated to incorporate bank stabilization plans in order to get building permits.

The only other area we have for riverside development is a large brownfield in the old industrial area. There may be contamination from heavy metals and hydrocarbons like oil and gasoline. Some soil may need to be treated or removed in a few locations. This would allow the property to be used for housing or recreation. Brownfield redevelopment can provide an attractive return on investment.

Pike City has an incentive program which can cover some of environmental assessment costs for brownfield redevelopment. As well, some of the cleanup costs may be covered but this is determined on a project specific basis so I can't make any guarantees. I know this uncertainty is difficult for developers but with land at a premium, we need to make maximum use of our assets.

**Storm or Wade Piper
Pike City Public Works Director**

The stormwater system is separate from the municipal wastewater system. Stormwater doesn't receive any treatment before it reaches the river.

Water from snowmelt or rainstorms travels through yards dissolving substances like lawn fertilizer and pesticides. It travels over the streets picking up residues from cars like gasoline, oil and heavy metals from tire dust. Some people use the storm sewers to dispose of used oil or other toxic substances. Eventually the contaminants reach the river. There's lots of information available to the public about stormwater pollution and how to minimize it. I guess a lot of people don't wish to change how they do things.

The flow from the storm sewers can be extremely variable. A heavy rainstorm can send a torrent of water through the system. If there is no precipitation, very little comes through the pipes. The Fish River experiences natural high water levels in the spring and in the early summer. The water flows into the backwater and floods the marsh.

Rerouting the storm sewer outlet downstream of the marsh would clean up the marsh but it also continues to send our problems on to those who live downstream.



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Bette or Chance A. Fortune
Land Developer

We are going to provide a complete lifestyle package for affluent urban dwellers-- a luxurious condominium complex complete with a marina at its doorstep! Additional features like tennis courts, a running track and a swimming pool will be included. We conducted a survey of a number of businesses in the downtown area and there was an overwhelmingly favorable response to our development plans.

Housing like this is an asset for Pike City. Not only will there be a lot of tax revenue, it would be a draw for professional people who are thinking about moving here. There is a real shortage of this type of upscale housing in Pike City.

I've had experience in all kinds of development. I know what I'm getting when I buy a greenfield property and so I can build a concrete business plan. The investors for this development need assurances that there are no hidden costs. If I start to develop a brownfield and find that I have to pay millions of dollars extra to clean up the site, then the investors will be out the door. I've always been a bit of a gambler but I don't know if I want to take a chance on a brownfield.

Saylor or Sailor Atwater
Marina Developer

The fluctuating water levels and massive ice floes at breakup has always prevented Pike City from having a marina on the Fish River. The backwater provides the ideal site for this marina as it is protected from ice floes. Our plan includes reinforcing the shoreline with concrete which will stabilize it and provide a solid structure to which we can attach our dock system. Dredging up the sediments will create a deep enough channel for boats to maneuver in the backwater. The problem with water surges from the storm sewers will not be a problem if the outlet is relocated downstream.

We will use a floating modular dock system with room for about fifty boats. Having a modular system allows us to reconfigure the dock so that we can accommodate a variety of sizes of boats. It can be stored on land before freeze up. A boat lift and a boat storage shed is also part of the marina development plans. Adding a restaurant and jet boat rentals will increase revenues from the property.

There's a lot of congestion at the city boat launch and I know people who would love to tie up their boats at a marina for the summer. It would make life so much easier for them. Why should people not be able to enjoy the river they have right in the city?



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**Hope or Hart Merritt
Social Activist**

There is a lack of both low-cost housing and recreational areas for Pike City's most vulnerable people in the downtown area. Too many children live under crowded conditions in old apartment buildings with poor heating and plumbing. The downtown area is mostly concrete and asphalt with parks that are too small for a game of soccer or softball. Inner city children rarely have a chance to play in green spaces.

A number of these old apartment buildings have been demolished to make way for expensive condominiums and apartments that are beyond the reach of low-income people. Where are they supposed to live?

I would like to see the greenfield property become an affordable housing complex surrounded by parks, playing fields and a community garden. With the cost of fresh produce rising the way it is, children from low income families don't get half the amount of fruit and vegetables that they need for healthy growth. To see how a carrot grows or to harvest a sun-ripened tomato is a wonderful experience for a child. To be able to run and play outside, breathing fresh air instead of car exhaust should be the right of every child.

Don't we owe it to children to give them the best start in life that we can?

**Constance or Homer Comfort
Local Homeowner**

My home is in in one of the older riverside residential districts of Pike City. The elm trees along the boulevards often meet over the streets forming a green canopy. People are always surprised that this lovely neighbourhood is so close to downtown. People know their neighbours here and we look out for each other.

I can see the marsh where the developers are planning to build a marina from my house. It hold many fond memories for me as I used to bring my students there for field trips. We would net invertebrates in the water and marvel over the diversity of life that we found. Students watched pelicans fishing near the outlet to the river. It was an amazing outdoor classroom. I'm retired now and the marsh has certainly changed as it became more polluted. It's a shame.

To think that it might be all gone soon is sad. Especially when I think about what may replace it. The sound of motorboats constantly coming and going all summer long will replace the sound of bird song. I don't think the pelicans will stay with all the activity.



**Flora or Newt Fairbanks
Pike City Naturalist Society**

Why do we call natural land “undeveloped” like there is something wrong with it? I know the proposed development area is weedy and looks unkempt but nature isn’t tidy. With some work, the invasive weeds can be managed and native plants introduced. Can you imagine classes of inner city school children having the opportunity to work on a restoration project so close to home?

The marsh, although polluted, is filled with bird life. Just yesterday I saw a great blue heron standing in the reeds. There are ducks and shorebirds feeding in the water and red-winged blackbirds nesting in the cattails.

A major problem with this habitat is the unpredictable flooding that occurs with heavy rain. Nests are destroyed when stormwater surges into the marsh. Sediments are stirred up, clouding the water and suffocating fish and aquatic invertebrates. The food chain is disrupted.

The seasonal high water levels experienced in the Fish River are beneficial to the marsh and wildlife. Northern pike come to spawn in the spring in the flooded marsh vegetation although I don’t know how many of the fry survive because of the pollution.

Wetlands and other wildlife habitat is rapidly being lost throughout the prairies because of development. The greenfield property and marsh should be restored as wildlife habitat and a place where people can go to be in nature.

**Condi or Urbane Keen
Interested Condominium Buyer**

I can’t imagine living anywhere else than downtown. The diversity of people and cultures you encounter every day enriches your life and increases your acceptance of different lifestyles. But do you know how difficult it is to find a nice place to live downtown? I like to live close to work as I bicycle to work whenever I can—I don’t even own a car! You see, living downtown lets me minimize my carbon footprint. If I drove in from the suburbs every day, I’d be putting much more carbon dioxide into the air. Also it takes less resources to live in a condo than on a suburban lot. I just hope the proposed condominium complex will use green building design.

When I heard that a new condominium may be built complete with a marina, I thought this is for me. Although I love city living it is stressful. The cars, noises and rubbing shoulders with so many strangers can be a little overwhelming at times. I’d love to be able to come home, sit on a balcony overlooking the river and unwind after work.

A healthy lifestyle is important to me. I’d like to start a rowing club at the marina. Imagine boats with rowers plying up and down the river. The current would provide quite a workout. No gas needed, just muscle power!



3. Something Smells Fishy at Perch Lake

Scenario Notes

Students become stakeholders and guest speakers at the inaugural meeting of the Perch Lake Watershed Group. How will the watershed stakeholders organize themselves and develop their first action plan? Will they be able to do anything to address fish declines and stinky water?

Watershed stewardship groups in the three Prairie Provinces play a vital role in assessing the health of watersheds, identifying issues and planning activities that address problems and promote awareness. Some groups are small and may focus on the water system of a single lake and others, like Partners FOR the Saskatchewan River Basin, deal with an entire river system from source to mouth. Most members are stakeholders who live and work in the watershed. They become the volunteers who form the backbone of these non-profit organizations.

Hydrology is the science of water systems on Earth. Hydrologists help solve water-related problems.

Background Information on Perch Lake

Perch Lake is a shallow, 1400-hectre prairie lake surrounded by agricultural land, except on the east side which is part of the Perch Lake First Nation. A cottage community has grown along the southern and western shores.

The lake receives groundwater inflow, as well as water from several creeks to the north. When the lake level is high, water spills through an outlet on the east side and flows down a creek to the Fish River. This usually happens in the spring. By midsummer, the lake level drops so there is no outflow.

There's a lot of activity on Perch Lake. Boating is very popular and the lake is busy with speedboats, party boats and recreational fishing boats crisscrossing the water. The boat launch is often crowded with visitors wanted to join the fun. The Perch First Nation has operated a small fishery for years, netting mostly walleye, to feed their community.

Perch Lake began to change a few years ago. The water level wasn't high enough in the spring to spill through the outlet. Boaters began to hit sandbars that never used to be a problem in the summer months. The boat launch is becoming too shallow for the bigger boats.

Now the shorelines are clogged with mats of green algae and lifeless fish, belly up. Nobody likes to go down to the beaches anymore because of the smell. Fishers are complaining that the catch is down. As people talked about stinky Perch Lake, other water issues in the community were raised. One of the cottage owners organized a public meeting to discuss the community water issues.

As a result, a Perch Lake stewardship group formed with stakeholders from the cottage owners association, Perch Lake First Nation and local farming community. They haven't elected any officials or made any plans yet as they felt that they needed more information before they could proceed.

They have invited two guest speakers to a meeting who will help them set up their watershed group and provide information about possible causes for their problems. The goal is to establish a board and develop a plan of action to bring back the health of Perch Lake.

**Sage or Reid Keeper
Perch Lake First Nation Elder**

We used to drink from the lake without worrying about getting sick but that was a long time ago when most of the land around Perch Lake wasn't broken. When I was younger I would watch small fish hiding in the dark green reeds that grew thick near the shore. They would rise to the surface, hunting insects that the wind had blown into the water. Now most of the reeds are gone and there are fewer places for small fish to feed and hide while they are growing up. Sandy beaches don't make good fish habitat.

Perch Lake has changed and so has the surrounding land. Agricultural land is being used more intensely—more crops and cattle are produced. That takes more water for irrigation and feedlots. Everybody seems to want more water all the time. Now the oil and gas companies are needing water, too. There's only so much water and a lot of time we don't look after it as we should.

The water smells bad. How can you teach young people the value of water when you don't even want to put your hand in it? When people see the dead fish in the water, they don't want to eat the fish that are netted. They think the fish will make them sick. This removes an important source of protein from our diets. An unhealthy lake is bad for our health.

**Spring or Jett Lafontaine
Perch Lake First Nation Councilor**

In the 1980s Perch River First Nation switched from lake water to groundwater as the source of water for our water treatment plant. After treatment, the water is either piped to homes in the newer areas or trucked to isolated houses and transferred to water cisterns.

We have had a boil-water advisory for 18 months now. The water table started falling in our aquifer. Then water testing found organic contaminants in the pipes and in the groundwater. We don't know the source of pollution. The water treatment plant is old and doesn't always work the way it should so contaminants are getting through. We are on a waiting list to have a new one built.

We can't use the water for cooking or washing a baby. Water now comes in large jugs from outside the reserve, which is expensive especially when they have to be delivered to every home. Families are having a hard time coping. So much of the day is used to manage living with a limited water supply.

Our sewage lagoon is reaching capacity as the population is increasing. Sometimes it overflows. Most of the older homes have a septic system; some have nothing. We started soil testing to identify possible sources of local contamination. This might account for some of the contamination in the water-delivery pipes but probably not the groundwater.



**June or Colton Grassi
Rancher**

I run a calf-cow operation which requires a lot of water. After all, it takes about 15,000 litres of water to raise a kilogram of beef. My cattle used to drink directly from the lake but then I fenced off the shore and now pump lake water into large troughs. The shoreline vegetation is making a comeback and erosion is less.

My problem is the lowering lake level makes it harder to pump water. I have to keep readjusting my intake pipe. Boaters don't make it any easier; some of the waves from the big boats stir up so much sediment that it clogs the intake. I also worry about using the water for my cattle. Cattle don't put on weight the way they should when they drink poor quality water.

My best summer pasture has high quality forage as a creek flowing through the pasture floods it in the spring providing good soil moisture. With lower spring runoff, the flooded area is decreased, limiting the number of cattle I can put on that pasture. By summertime, the creek is just a trickle but it is usually enough for the cattle so I rarely need to truck in water. That's a good thing as I really have to watch my bottom line in order to stay in business.

**Tilly or Bran Grainger
Grain Farmer**

I have several orphan wells in my cropland. The company that drilled the wells went bankrupt years ago so I can't go after them to clean up the land. Two of the wells have started leaking oil at the surface as there has been no maintenance. I am concerned the oil may get into the water.

Someone from the Environment department came to take a look at them. I was told that the petroleum industry has a fund to clean up orphan wells but there's hundreds of them across the land so there's a backlog in getting the work done. It takes two to three years and costs about \$50,000 to clean up each well site. I can't use land until it has been certified restored.

I use irrigation to provide water for some of my crops. I have a license to operate a small diversion on a creek to redirect spring runoff into a reservoir. The runoff has been a lot lower the past two years. The snowpack wasn't very thick especially after those January thaws we have been having. Usually the water in the reservoir gets me through July and into August when the crops need it most but now it's depleted by mid-July.

Sandi or Sandy Beechie
Cottage Owner, President of the Cottage Owners Association

I built one of the original cottages on Perch Lake. Life was simpler then. You brought in drinking water and used outhouses. Over time, people drilled wells and installed septic systems. We worked hard to clean up the shoreline and replace the mud with beaches. As a community, we can really pull together when we need to. We put in a public beach, boat launch and the community hall. This was a beautiful place until our problems began.

The boat launch is becoming too shallow for some of the larger boats so those boat owners are complaining. To extend it and dredge a channel out to where the water is deeper is very expensive. Now we've been told that the water table has lowered and the aquifer may be depleted in about ten years at the current rate of use. At this point, no one wants to go back to hauling water.

I've always worked hard, paid my taxes and supported my community. Now that I am retired, I want to spend more time at Perch Lake. I like nothing more than to sit on my dock and watch the grandchildren play on the beach. Of course they can't do that now as the water is so polluted.

Lucky or Rod Reeler
Cottage Owner

I've been fishing in Perch Lake since I was a kid. That's one of the reasons I bought a cottage here a few years ago. The cottage overlooked a wide lawn that sloped gently down to the beach. A dock provided more than enough room to tie up my fishing boat. What more could I want.

Unfortunately, the next year, heavy winds during spring break-up drove massive sheets of ice up on shore. Lots of cottage owners lost their beaches and docks, including me. Loads of sand for new beaches were trucked in as owners made repairs. It didn't make sense to me. What if it happened again next spring?

I read up on ways to protect shorelines. I learned that native plants growing along a shore form a buffer on two sides—preventing erosion of the shore from wave action and blocking pollutants from the land from entering the water. So I planted my shoreline with willows and grasses and installed a floating dock that can be pulled out of the water. Reeds started to grow offshore. We saw small fish in the water. The kids didn't miss the beach as they preferred the public beach where they could meet their friends.

Life was good again until the lake became so polluted I couldn't fish. My small effort in improving the health of Perch Lake was just a drop in the bucket.



Nettie or Abel Shepherd Fish River Watershed Planning and Advisory Council

Successful community-based watershed management involves people from different backgrounds working together to restore watershed functions while supporting and improving the local economy. Both environmental and social values need to be included in decision-making.

Finding consensus may be difficult. Opposing interests can create conflict, dragging on the process so nothing gets done. It is important to set goals. When everyone participates in the decision-making, actions are more likely. Develop measurable results so you can judge if you are making progress.

Look at the lake and the surrounding land to see if causes can be identified that might be contributing to the problems. Use the information to develop an action plan for investigating the causes and finding workable solutions. Inform the community about your activities and provide educational outreach. When people understand the issues, they may wish to be part of the solutions.

Networking is essential. Contact government departments for help and expertise. For example, technicians can teach you how to monitor water quality. Talk to members of other watershed groups. Utilize members of your community to provide services and support.

You need to elect a chairperson, a treasurer and a secretary to provide structure to your new organization. Create committees to deal with certain issues or provide services like education or fundraising. As a watershed stewardship group, you can apply for grants or funds from provincial or federal sources.

Flo or Eddy Rivers Hydrologist

The large algae bloom in Perch Lake is caused by too many nutrients in the water. Possible sources are fertilizers from crops and lawns, manure and leaking septic systems. Spring runoff generally causes the lake level to rise enough so that water flows through the outlet, flushing excess nutrients out of the lake. This hasn't happened in two years. Lower water levels also concentrate the nutrients, making the problem worse.

The surface water and the groundwater are connected. If the rate at which groundwater is being extracted is greater than the rate at which it is replenished, then the water table falls. This causes the lake level to fall as it is partially fed by groundwater.

Toxins may enter the water system in many ways. The oily sheen on the water is from leaking oil and gas from boats. Pesticides and herbicides can leach from lawns and croplands into the lake. These toxins kill aquatic life. Abandoned water wells that aren't capped properly may become a channel for surface pollution to reach the groundwater. Their locations are often unknown.

Annual precipitation has been low for two years, affecting both surface water and groundwater supplies. Water conservation is always important. There is a lot of information available for homeowners, farmers and ranchers on ways to improve the health of the watershed which will improve the health of Perch Lake.



4. Fish out of Water

Scenario Notes

Students become bureaucrats and climate change experts at a Prairie Provinces Water Board meeting. They will search for ways to reach, educate and prepare society for changes to the water resources brought on by climate change.

The climate change information in this scenario is based upon on a report, *From Impacts to Adaptation: Canada in a Changing Climate 2008*, produced by Natural Resources Canada. See it at <http://www.nrcan.gc.ca/environment/resources/publications/impacts-adaptation/reports/assessments/2008/10253> Chapter 7: *Prairies* assesses the impact of climate change on the Saskatchewan River Basin.

Background Information on the Prairie Provinces Water Board (PPWB)

The eastern Rocky Mountains are the source of water for the Saskatchewan River. As the water flows from Alberta, through Saskatchewan and on to Manitoba, its quality and quantity can be impacted by users along the river system.

In order to manage shared water resources and resolve water use issues, the PPWB was created in 1948. It is made up of representatives from the provincial and federal governments. The PPWB distributes water resources fairly among the provinces and allows each province to manage its own water supplies. Each province knows how much water it can use and how much must travel downstream to the next province.

The board members are concerned about the effect that climate change will have on water resources in the Saskatchewan River Basin. They would like to improve forecasting of extreme weather events like droughts and floods. These events cause much human suffering and are very costly for governments. As well, the PPWB would like to see a better flow of information to coordinate the efforts of governments, industries, businesses and individuals to conserve water resources and adapt to a changing climate. This would really help meet present and future challenges

But here's the problem. The PPWB members know that governments must answer to the people who elected them. Many people are thinking more about the economy and jobs than climate change and how it may affect them. Some people don't think that climate change is happening or if it is, there is nothing they can do about it. They may not care to support governments that are promoting changes to their lifestyles.

The board members know big changes are going to be required in order to meet the challenges of a shrinking water supply and extreme weather events that effect water flow. How can they get people onside?

The PPWB has invited some experts to a meeting to discuss plans for an advertising campaign. What messages should they include that will make people realize that water resources are at risk? How can they ensure that everyone is working together? As well, what type of legislation should they recommend to federal and provincial governments that would help people cope and adapt?



Alberta or Alberto Rosa
PPWB Member from Alberta Environment and Parks

Healthy forests and grasslands contribute to a healthy watershed. Not only do they slow the flow of water, they also store carbon in the plants and organic matter, keeping carbon dioxide out of the air.

The hotter summers and warmer winters in the mountains have encouraged the spread of mountain pine beetles. In just a few weeks they can destroy an entire mountain slope of lodgepole pine trees, especially if the trees are drought-stressed. The dead pine roots can't prevent soil erosion or soak up water. Without anything to stop it, water rushes down the slopes, contributing to flash floods.

Cities were not planned for flood prevention – many were built on floodplains. The cities' water storage and drainage capacities may not be adequate for severe flooding. In June 2013, southern Alberta was hit by flooding after an extreme rainfall event. Five people died and more than 100,000 people were displaced. Total damages were over five billion dollars.

We may get too much water suddenly at one time but overall there won't be enough water. Based on current water use patterns, Alberta Environment has estimated that demands for water in the South Saskatchewan River Basin, not including irrigation, will increase between 52% and 136% by 2046.

Saskia or Sasha Livingsky
PPWB Member from Saskatchewan Water Security Agency

Snowmelt runoff over frozen ground is the main source of additional water for rivers once they reach the prairies. Warmer winters will change some of the snowfall to rain. Some of this water will evaporate and some will soak into the ground. This reduces the runoff available to keep river levels up.

We cannot count on pumping up more groundwater to make up the difference. Increased use of groundwater that would normally help recharge a river could lead to even lower water levels and failing wells.

Low flow is highest in the summer which coincides with the greatest water demands. Water conservation and sound management practices help adaptation to a shrinking water supply. Urban and rural water conservation efforts are increasing but are not well coordinated.

Drought adaptations have been used for years: repairing canals, constructing new dugouts and wells, and moving or culling livestock when crops dry up. Communities are supplied with water if needed. Governments respond to a crisis and provide a safety net. Most of what we do is reactive--responding to a crisis already underway. This is very costly. How can we plan better for the future so we are ready when something happens?



Partners FOR the
Saskatchewan River Basin

Mission: To promote watershed sustainability through awareness, linkages, and stewardship

 **SaskPower**
Powering the future

**Mania or Manny Friendly
PPWB Member from Manitoba Conservation and Water Stewardship**

Manitoba is projected to have the smallest water deficit of the Prairie Provinces. We can shift to higher value crops that need more heat and a longer growing system. It could be good for our economy. But if the water level in the Saskatchewan River drops, it will impact our hydroelectric generation.

Lake Winnipeg is important for sport and commercial fisheries. It receives water from the Saskatchewan River and other rivers which contains nutrients from agriculture and communities. When nutrient-rich water gets warmer, water pollution increases. Pathogens and toxins become concentrated when water levels drop. This is detrimental to our fish stocks, as well as to us as it will be more costly to treat water for domestic use.

A severe impact on fish species throughout the Prairie Provinces is expected—some fish will no longer be able to live in their normal ranges. Small changes in temperature, oxygen concentration and turbidity will change fish habitat dramatically. Coldwater fish like cutthroat trout or lake whitefish will be replaced by cool and warm water fish. Invasive fish and aquatic plants that like warmer water will outcompete some of the native species.

The ecosystems as we know them will migrate north but they will also change.

**Terra or Terran Carbonneau
PPWB Member from Environment and Climate Change Canada**

A high carbon economy is based on burning fossil fuels for energy. This produces carbon dioxide, the main contributor to climate change.

We use enormous amounts of fossil fuels to support our Canadian lifestyles. We live in big warm houses and usually don't think about fuel emissions when we hop in our cars. There's a lot of ways we can use energy conservation and green technology to reduce our carbon emissions.

In a low carbon economy, there will still be climate change but it will be more gradual, giving us a little time to try and solve our problems. Fossil fuels are important for purposes other than transportation, heating and manufacturing. They are turned into agricultural chemicals, asphalt and plastics—we'll need them for a long time. The oil industry is very innovative and needs to develop methods of extracting and processing that use less energy and water.

From individuals to industry – everyone needs to do what they can. The goal is to have a zero carbon footprint with no farther increases in the carbon dioxide concentration of the atmosphere.



Clover or Angus Greenfield
PPWB Member from Agriculture and Agri-Food Canada

Irrigation is essential to southern Alberta which traditionally has a long growing season and lots of heat. More heat without more water will be a disaster. About 80% of the irrigated crops are livestock feed, cereals and oil seeds. Feedlots that receive tens of thousands of cattle in this region depend on irrigated feed. Major food processing plants, which provide many jobs, have been built to process speciality crops like potatoes, beans and sugar beets. Some locations have no new water allocations available for irrigation and if the water supply shrinks, many producers will encounter hardship.

Alberta has experienced a 26 day advance of spring in the past century. Heat and more carbon dioxide will increase the rate of growth for agricultural land, grasslands and forests. The problem will be the availability of water. Plants and livestock need more water when it is hot.

Grassland production may not be too affected as a longer growing season and the use of warm – season grasses that are more drought-tolerant may offset lower productivity due to less moisture. Stocking rates of cattle per hectare will probably be reduced.

Switching to crops more suited to a hot, dry climate and improving water loss from irrigation will help some, but not all producers.

Dr. Sunny or Sonny Dace
Climatologist, Prairie Adaptation Research Collaborative

The risks of climate change are not well understood—there is a lot of uncertainty and complexity. Climate change models can predict temperatures but can't predict when drought or other extreme weather events will happen or how long they will last.

The Prairies are expected to warm more quickly than the global average or other places in southern Canada. The number of hot days per year could be three times greater than this year's average. Drought has always been part of the prairie climate but it is expected to be more frequent.

The greatest climate change risk for the Saskatchewan River Basin is water scarcity. The Rocky Mountain glaciers at the source are retreating rapidly. As well, snow accumulation in the mountains is less with the higher winter temperatures. Snowmelt will come earlier so the timing of the peak floods will be earlier which means less water is available in the summer when we need it the most.

Many regions can expect wetter winters and springs but drier summers. Surface water and soil water are likely to decrease. Summer river flows are predicted to be lower.

The problem is we can't predict exactly what will happen. To lessen our risks we need to plan for an increase in extreme weather events and a more variable climate.



**Prospera or Savin Addington
Economist, Natural Resources Canada**

The response to climate change must include adaptation. Adaptive actions happens when we understand the risks, reduce damage AND take advantage of new opportunities that may occur.

Some adaptive action takes place spontaneously, such as when farmers plant crops that are more drought-tolerant. An individual may decide to conserve water because of a belief in a sustainable lifestyle.

Planned adaptation tends to be lower cost and more effective. For such a plan to work, people need to be educated and provided with reasons or incentives that make change less difficult. Government policies and regulations can provide direction. For example a policy that requires resistant infrastructure design to be used for roads, power grids and buildings would reduce damage.

Some of the greatest cost to Canadians and governments are associated with extreme weather events like intense rainfall, drought, flooding and heatwaves. Increased heatwaves lead to an increased demand for electricity for air conditioning. If river levels are low, hydroelectric power generation could be lower. The generation of electricity at the Gardiner Dam depends on water levels in Lake Diefenbaker. Brownouts or blackouts are more common when there is high demand and a low supply.

**Dr. Harmony or Linc Peeples
Environmental Sociologist, University of Alberta**

The relationship between society and the environment is critical to the health of both. Understanding the relationship is key to solving our environmental problems. How and why do people become interested in environmental issues? How do people understand that they can add to the problems or contribute to solutions? Why should people care?

There is not enough awareness of the risks and opportunities that come with climate change. This limits the capacity of people to deal with these new challenges. First Nations and others who depend on resources are at economic risk. Fishing, hunting, agriculture, forestry and recreation in the Saskatchewan River Basin are very affected by a changing climate. Some of these people will have limited opportunities to find other jobs.

Those with low adaptive capacity will probably do less well. The poor and elderly in cities are particularly vulnerable to extreme weather events. Rural areas have less resources than cities to deal with emergencies. Infrastructure maintenance and emergency readiness will save lives.

Governments can share knowledge and provide tools that help communities, businesses and industry include climate change in their future planning and development. Communication is vital. Social media and the Internet are increasingly valuable as ways of connecting to people.

