



# WATERSHED WISE

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## Magnetic Board Lesson Plan

This lesson plan and water management information package was created to accompany the Lesser Slave Watershed Council's - Watershed Wise magnetic teaching board.

# WATERSHED WISE – LESSON PLAN AND INFORMATION

A healthy watershed is vital to our wellbeing and the environment. The Lesser Slave Watershed includes the water from streams, creeks and rivers that run into Lesser Slave Lake and the Lesser Slave River. This includes the lake itself and its shoreline. The watershed is essential to plant, animal, fish and invertebrate survival. The health of the watershed is affected by many factors. The Watershed Wise resources will identify actions that you can do to help ensure we have a healthy watershed today and in the future.

## LESSON PLAN OUTLINE

- A. The Lesser Slave Watershed
- B. Watershed words
- C. Causes for an unhealthy watershed
- D. Watershed Wise magnetic board
- E. Appendix
  1. Magnet List and Management Messaging
  2. Conserving water at home
  3. The Water Cycle
  4. Water Related Acts and Regulations

## A. THE LESSER SLAVE WATERSHED



Lesser Slave Lake (LSL) is the third largest lake in the province, a popular tourist destination and a recognized biologically significant area for bird life. The lake is a source of water for agriculture, forestry, and recreation/tourism, domestic and municipal uses. It supports major sport, commercial and domestic fisheries.

There are several beaches, campsites, recreation areas, cottages and two large provincial parks around the lake. Communities located on the shores of the lake include the Town of Slave Lake, the village of Kinuso, the hamlets of Grouard, Jousard, Faust and Canyon Creek and the First Nation communities of Kapawe'no, Sucker Creek, Driftpile, Swan River, and Sawridge.

Lesser Slave Lake is approximately 110km long and 20 km wide at its widest point. It's watershed drains an area almost 11 times its size. Much of the inflow water enters the western end of the lake and all water from the lake flows out to the Lesser Slave River at the lake's east end. The Lesser Slave watershed has 5 major sub-basins, including:

- South Heart River
- East & West Prairie Rivers
- Driftpile River
- Lesser Slave River
- Swan River

## B. WATERSHED WORDS

### WHAT IS A RIPARIAN AREA?

Riparian areas are the strips of land located along shorelines. These areas are transition zones or the “vital edges” where land and water meet to create unique and highly productive ecosystems. In addition, riparian areas play a key role in maintaining the natural hydrologic cycle of a watershed by stabilizing stream channels, reducing erosion, filtering impurities and sediment, capturing and storing runoff water and precipitation and recharging aquifers that store groundwater. Over 80% of the species in Alberta spend at least some portion of their life cycle in a riparian area.

### WHAT IS EROSION?

Erosion is a natural process that causes a gradual wearing away of land surfaces by water, ice and wind. Erosion can cause slumping, surface runoff, silt deposits, and if left unchecked, major property and building damage. For shoreline property owners, alterations to your natural shoreline i.e. removal of rocks, trees, and other live and fallen vegetation, puts your buffer area at risk of becoming an “erosion zone”.

### RUNOFF, HOW DO WE MANAGE IT?

Runoff is the overland flow of water from snowmelt or rain events. Nature has created its own water capture and storage system through the water cycle. The dense vegetation along stream banks and shorelines help slow the speed of water as it travels overland and into the water system. By slowing the flow it can then be absorbed into the soil and end up as ground water. When the water flow is too fast and quantity too large erosion can occur and there is little capacity for it to be absorbed into the ground and plants. Ensuring that there is a healthy riparian area (native grasses, shrubs, trees, rocks and logs) between the water's edge and land on your property will assist in limiting erosion, flooding and increase ground water storage. To manage drainage, follow the 4 D's of runoff control:

- DECREASE the amount of runoff.
- DETAIN water to decrease the downstream velocity (speed).
- DIVERT the runoff to less erodible areas.
- DISSIPATE the runoff: spread it out, to encourage sheet runoff.

## WHAT ARE NATIVE PLANTS?

A native plant is generally defined as a plant that has been growing here before European settlement. Native plants and trees in this area include reeds, cattails, willow, hazelnut, aspen, poplar, spruce and pine. The use of native plants species around the shoreline and banks helps erosion control. Plant roots anchor the soil. They reduce the energy of waves, currents, and wind from causing erosion. Plants physically trap sediment and uptake the nutrients. In addition, these shoreline plants increase the soil's ability to absorb water, which reduces the negative impact of flooding. If the shoreline vegetation goes missing, nutrients suddenly become available for other vegetation forms to take advantage of, like algae. Vegetation can provide shade and channel wind. Foliage reduces the energy of rainfall and prevents excess runoff. Many types of animals, insects and even fish need native vegetation for their own survival and these plants rely on them equally as well for seed distribution and pollination.

## WHAT IS AN INVASIVE SPECIES?

An invasive species is an organism which has been introduced into areas where it is not native and competes with native species for foods, nutrients, and habitat. Invasive species often have no natural enemies and can grow out of control. Invasive plants can make your shoreline or streamside less attractive for fish and wildlife.

## WHY IS WATER QUALITY IMPORTANT?

Water quality is an issue that concerns all of us for our survival, but especially for those who live and play along the shoreline. It is crucial that we maintain the highest water quality for many reasons including our own health, the environment, for recreation, and simply for its natural beauty. We want to reduce the flow of water carrying pollutants like soil particles, fertilizers, chemicals and road runoff into lakes, streams, ponds, estuaries and coastal waters.

## C. CAUSES OF AN UNHEALTHY WATERSHED

The Watershed Wise lesson is about identifying factors in the watershed that may degrade the water and its adjacent environment. The concerns listed below are broad categories; additional factors may be relevant in your area. The accompanying lesson board helps illustrate these concerns.

- Agriculture
- Livestock
- Riparian Area Health
- Forest Harvesting
- Shoreline Property
- Docks
- Fish
- Stream Crossing
- Beaver Dams
- Human Sewage
- Invasive plants
- Algae /Fertilizers/ Pesticides
- Aquatic invasive species
- All-Terrain Vehicle (ATV) use

## D. WATERSHED WISE MAGNETIC BOARD

The magnetic board visually reinforces the concepts of personal responsibility for water quality and watershed health. The moveable pieces allow you create multiple scenarios to demonstrate best water management practices, less desirable practices and factors leading to water degradation.

This kit comes with two carrying bags, two magnetic boards, magnets and the lesson plan information.

The board is to be placed side by side (table, tailgate, floor) in view for the class or presentation. The unused magnets are spread out on a table for east access.

### SETUP 1: BE WATERSHED WISE

Create a scene that uses the least desirable management magnets. The class or public has to then make changes to the board to make it a healthier watershed. Discuss the merits of the changes.

### SETUP 2: RATE MY WATERSHED

Two different watersheds scenes are created. The class compares the two to see the pros and cons of the management practices and factors.

### SETUP 3: PROPERTY ASSESSMENT

Recreate a homeowner's property with the magnet choices. Review some options the homeowner can make to help support a healthier watershed.

## MAGNETS

The following is a list of magnets is included with the magnetic board. Please see the attached document for the magnet management messages.

- Agriculture
- Livestock
- Riparian Area Health
- Forest Harvesting
- Shoreline Property
- Docks
- Healthy Fish Populations
- Stream Crossing
- Magnet Topic
- Beaver Dams
- Human Sewage Waste
- Invasive plants
- Algae /Fertilizers/ Pesticides
- Aquatic invasive species
- ATV and OHV use
- Oil and Gas extraction

## INFORMATION RESOURCES:

- [www.livingbywater.ca](http://www.livingbywater.ca)
- [www.naturealberta.ca](http://www.naturealberta.ca)
- [www.cowsandfish.org](http://www.cowsandfish.org)
- [www.lesserslavewatershedcouncil.ca](http://www.lesserslavewatershedcouncil.ca)

## APPENDIX 1: WATERSHED WISE MAGNET MESSAGING

Magnet Topic	Main Management Message
1 Agriculture	Cropland location is the emphasis. Is there an adequate vegetative buffer between the agriculture crop and the riparian area for erosion control, water retention and flood control? When spraying ensure that proper protocols are followed. Never spray too close to a water body and ensure weather conditions are appropriate before application. High winds, or a rain after spraying can carry the chemicals into near by water bodies.
2 Livestock	Livestock should not be able to enter the riparian area. Unrestricted access leads to vegetation loss, soil compaction and erosion. This leads to sedimentation, nutrient loading in the water and the leaching of phosphorous and nitrogen from the livestock waste entering the water system. A fence should be used to control the livestock access to water bodies. An off stream watering system can effectively keep livestock from entering the riparian areas.
3 Riparian Area Health	A healthy riparian area has lush vegetation including a variety of native plants such as grasses, sedges, cattails, and layers of shrubs and trees. A stable, well-vegetated bank and/or shorelines with very little or no bare soil and few or no weeds is desirable.
4 Forest Harvesting	Forest harvesting that has a greater retention of trees and shrubs including watercourse regulated buffers assists in the storage of water and reduces sediment runoff. The fewer roads used to access a harvest area reduces the chance of sedimentation and erosion from occurring.
5 Shoreline Property	It is important for private home owners to use natural sediment and erosion controls along the shoreline by limiting the removal of vegetation and non natural features.
6 Docks	Emphasis on the use of removable docks which cause the least amount of disturbance to aquatic areas. The littoral zone (up to 2 meters deep) vegetation is important habitat for many species.
7 Healthy Fish Populations	Educate about the limiting factors for fish populations. The effects of increased levels of nitrogen and phosphorous from livestock and agriculture lands. A healthy fish population will have biodiversity of species and ages of fish. An unhealthy fish population will not have this type of diversity.
8 Stream Crossing	Discuss the effects of an improperly placed water crossings on sedimentation and obstructions to flow and fish. A hanging culvert does not allow for fish passage and fragments habitat. Bridges are more expensive to build but have less of an impact overall on water flow and habitat.
9 Beaver Dams	Beavers and their dams are beneficial to the environment because they keep water on the landscape. This creates diverse habitat, provides flood mitigation during high runoff events, can provide a water source during droughts and slows flow to allow absorption and ground water recharge. They can be a nuisance around roads and mitigations such as mesh or barriers can help alleviate this.

Magnet Topic	Main Management Message
10 Human Sewage	Proper sewage control is necessary so it does not leach through the soil into the lake. This can be managed by installing an outhouse with a containment tank, a composting toilet, a properly functioning septic field system (rules based on the proximity to water) or a sewage holding tank. Municipalities have rules and regulatiuon about the types of sewage systems allowed near a water body.
11 Invasive plants	The introduction of non-native or invasive plants damages the natural environment. They compete for food and habitat and often have no natural controls to manage them. Removal of these from your property or shoreline helps reduce their spread. Terrestrial invasive plant examples are scentless camomile, oxeve daisy and common baby`s breath.
12 Algae /Fertilizers/ Pesticides	Large blue-green algae blooms in the lake are a concern. They are formed when increased nutrients from sewage and septic fields , runoff from agricultural fields, manicured lawns and livestock operations enter the waterways. Blooms can be detrimental to fish, animal and human populations because they can be toxic and lower water oxygen levels.
13 Aquatic invasive species	An invasive aquatic species of concern in this area are the Zebra and Quagga muscles. They has devastated the health of many Canadian & US lakes. Invasive species thrive in the absence of their native predators and have the potential to drastically alter habitat, rendering it inhospitable for native species. The main cause for these species to enter your watershed is through shipping, recreational and commercial boating, the use of live bait, the aquarium/water garden trade, live food fish, unauthorized introductions and transfers, and canals and water diversions. Proper drying, cleaning and draining of your boat when taking if from one waterbody to another is key to stopping the spread. Invasive aquatic plant examples are hydrilla, purple loosestrife, yellow flag iris and common reed grass.
14 ATV and OHV use	All-Terrain Vehicle's can have a negative impact on the environment when used irresponsibly. ATV users should use bridges or marked crossings only to avoid disturbing spawning beds and frylking. Sediment from driving in the water increases sedimentation and can cover the eggs and causing death. Avoid driving in wetlands or muskeg, this destroys habitat and cripples the ability of a wetland to filter and clean water.
15 Oil and Gas extraction	Road building, land clearing for development, and transportation of crude products (road, rail and pipeline) all pose a risk to watershed health. Companies must follow regulation and guidelines set out by the Alberta Energy Regulator. Berming oil extraction sites can contain spills. Access management and reducing the overall footprint is desirable for the environment.

## APPENDIX 2: WATER CONSERVATION AT HOME

### HOW CAN I REDUCE MY WATER USAGE?

Conserving water doesn't mean doing without; it's about reducing what we waste. Through REDUCING, REPAIRING, and RETROFITTING, you can reduce the water you waste, save money, and protect investments like septic systems.

Suggestions to conserve water at home:

- Run the dishwasher and clothes washing machine only when full.
- Turn the tap off when brushing your teeth.
- Collect rain water from down spouts to use for watering your plants.
- Install a low-flush toilet; this can reduce your water usage by 40 – 50%. Retrofitting your existing toilet with a water-saving device can reduce your water usage by up to 20% (45,000 litres of water/ year for a family of four)!
- Do a simple dye test on your toilet to check that it is not running all the time; place a couple of drops of food coloring in the tank and monitor whether it seeps into the bowl. If it does, you will need to replace the tank flapper.
- If you have a septic system: stagger your washing over several days. This prevents overloading the system with large volumes of water at once.
- Lawn maintenance:
  - Use a mulching mower and leave grass clippings on your lawn. Clippings can increase your soil's fertility by up to 50 percent. They will be gone in about two to three days as they turn into food for your turf's roots. Mow when the grass is dry to prevent clumping.
  - Keep clippings well back from water and drainage ditches. Never push them over the edge of a bank into a ravine, river or lake.
  - Increase the mowing height of your lawn to approximately 8 cm (2.5 cm). Taller grass provides shade for better root growth, which helps with absorption.
  - Before you consider fertilizing your lawn, aerate it and see if that improves its health.
  - Choose a fertilizer high in Water Insoluble Nitrogen (WIN). WIN is released slowly and helps prevent "lawn bum" and groundwater contamination.
  - Remove dandelions and other unwanted plants from your lawn using long-handled tools. If you feel you must use a pesticide, do not apply it to the whole lawn. Instead, use an applicator which allows you to direct a small spray towards each unwanted plant.
  - Don't water at the first sign of spring. Holding water back at first will encourage root growth and make for sturdier, more drought tolerant plants.
  - Encourage deep rooting by watering infrequently yet thoroughly. Soak grass with 2 to 3 cm of water, every 5 to 7 days (this will produce stronger, healthier grass). Water in the early morning, and don't overwater.
  - In hot dry weather, allow lawn grasses to go into a state of dormancy so that they require less water and nutrient intake for survival. Water  $\frac{1}{4}$  to  $\frac{1}{2}$  inch (about  $\frac{2}{3}$  to 1  $\frac{1}{4}$  cm) every two or three weeks to keep crowns from dehydrating beyond the point of recovery.
  - Use a water sprinkler that delivers large flat drops and has an adjustable range; this style reduces waste and unnecessary evaporation.

## APPENDIX 3: THE WATER CYCLE

The water cycle describes how water evaporates from the surface of the earth, rises into the atmosphere, cools and condenses into rain or snow in clouds, and falls again to the surface as precipitation. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the oceans, where it will once more evaporate. The cycling of water in and out of the atmosphere is a significant aspect of the weather patterns on Earth.

Information source: <http://pmm.nasa.gov/education/water-cycle>

### EVAPORATION, CONDENSATION, AND PRECIPITATION

The water cycle consists of three major processes: evaporation, condensation, and precipitation.

#### EVAPORATION

In the water cycle, liquid water (in the ocean, lakes, or rivers) evaporates and becomes water vapor (a gas).

Water vapor surrounds us, as an important part of the air we breathe. Water vapor is also an important greenhouse gas. Greenhouse gases such as water vapor and carbon dioxide insulate the Earth and keep the planet warm enough to maintain life as we know it.

The water cycle's evaporation process is driven by the sun. As the sun interacts with liquid water on the surface of the ocean, the water becomes an invisible gas (water vapor). Evaporation is also influenced by wind, temperature, and the density of the body of water.

#### CONDENSATION

Condensation is the process of a gas changing to a liquid. In the water cycle, water vapor in the atmosphere condenses and becomes liquid. Condensation can happen high in the atmosphere or at ground level. Clouds form as water vapor condenses, or becomes more concentrated (dense). Clouds at ground level are called fog or mist.

Like evaporation, condensation is also influenced by the sun. As water vapor cools, it reaches its saturation limit, or dew point. Air pressure is also an important influence on the dew point of an area.

#### PRECIPITATION

Unlike evaporation and condensation, precipitation is not a process. Precipitation describes any liquid or solid water that falls to Earth as a result of condensation in the atmosphere. Precipitation includes rain, snow, and hail.

Precipitation is one of many ways water is cycled from the atmosphere to the Earth or ocean.

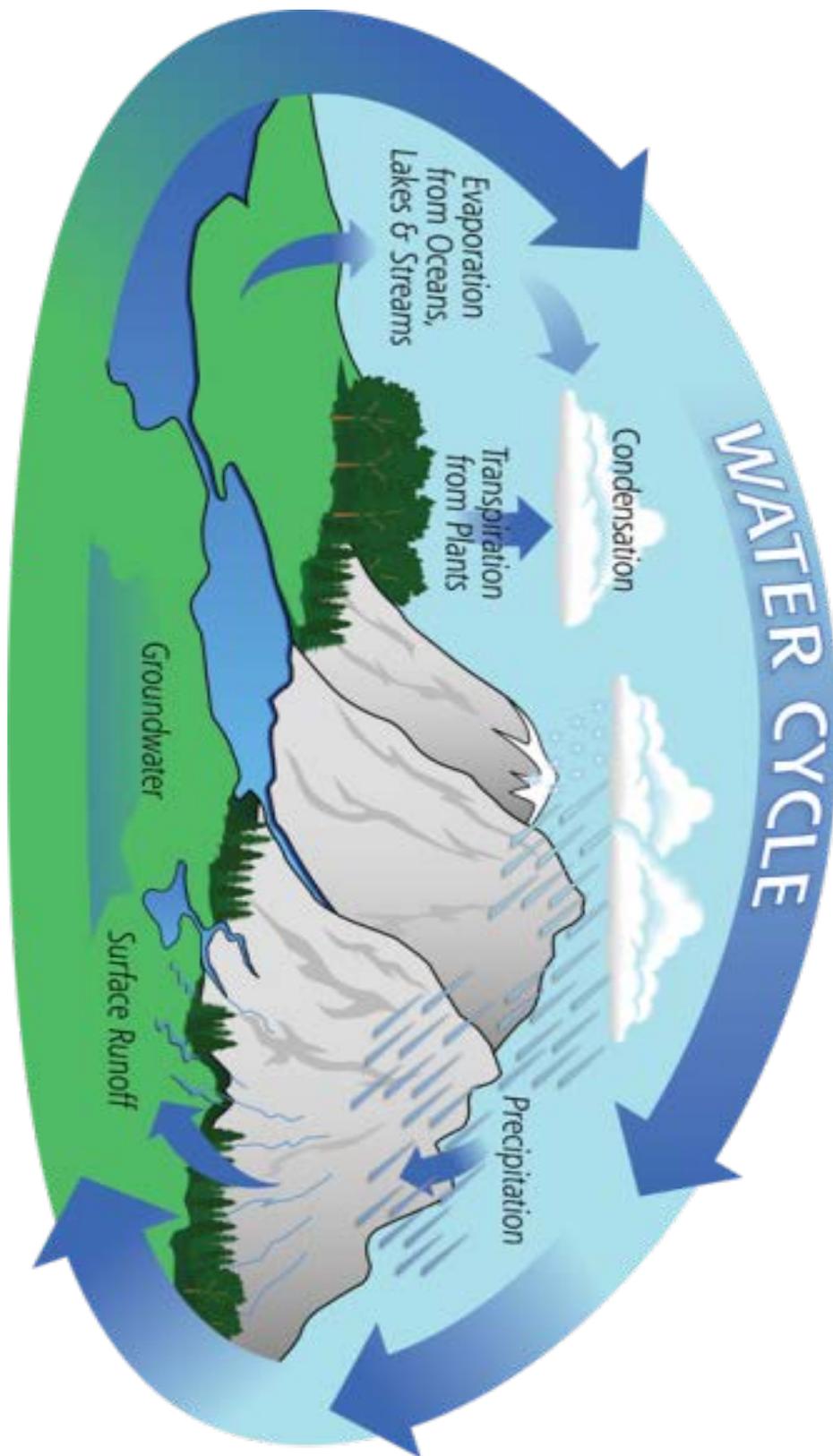
Fog and mist are a part of the water cycle called suspensions: They are liquid water suspended in the atmosphere.

#### OTHER PROCESSES

Runoff describes a variety of ways liquid water moves across land. Snowmelt, for example, is an important type of runoff produced as snow or glaciers melt and form streams or pools.

Transpiration is another important part of the water cycle. Transpiration is the process of water vapor being released from plants and soil.

Information source: [http://education.nationalgeographic.com/education/encyclopedia/water-cycle/?ar\\_a=1](http://education.nationalgeographic.com/education/encyclopedia/water-cycle/?ar_a=1)



## APPENDIX 4: WATER RELATED ACTS & REGULATIONS

- Fisheries Act
- Navigable Waters Protection Act
- Species at Risk Act
- Migratory Bird Convention Act
- Alberta Land Stewardship Act
- Alberta Environmental Protection and Enhancement Act
- Municipal Government Act
- Regional Health Authorities Act
- Private Sewage Disposal Systems Regulation
- Public Lands Act
- Safety Codes Act
- Water Act
- Soil Conservation Act
- Subdivision and Development Regulation, Municipal Government Act
- Surveys Act
- Wildlife Act

There are additional provincial policies and programs that also regulate activity in riparian areas.