



## *Instructions for*

### **The Watershed Game - Lake Model**

*A simulation exercise exploring the connection between land use and water quality and the impact of our choices.*

#### **About this version of the Watershed Game - Lake Model**

This version of the Watershed Game is focused on a lake and the contributing watershed and adjacent land uses around it. It includes a watershed boundary, an inlet and outlet stream, and four land uses: farmland, park and open space, city, and residential.

#### **Objectives**

Players will:

- Understand what a watershed is and recognize and encourage the need for watershed planning to solve larger water quality issues.
- Build their understanding about how land use and land management decisions affect water quality. Build knowledge about local development and municipal operations that affect water quality.
- Be able to identify major sources of sediment and/or phosphorus.
- Increase their knowledge about stormwater and land use best management practices (BMPs) and how those practices are used to reach pollutant load reductions. Learn how their choices can prevent or reduce impacts.
- Understand that water bodies have limits - they can only take so much before water quality, habitat, and designated uses are degraded. Understand water quality impairments, regulations, impaired water designations, and how local land use and management have a key role to play in reaching clean water goals.
- Understand the need for individual and community level solutions for protecting water quality and habitat.
- [Lake Version specific objectives ....](#)
- *And other local objectives as appropriate...*

#### **Goal of game**

Reduce nonpoint sources of sediment or phosphorus in the watershed to levels that meet water quality goals in the receiving water. The target sediment goal is 130 points; the target phosphorus goal is 130 points. Participants achieve this by implementing a variety of best management practices (BMPs) across a variety of land uses located around the lake.

#### **Materials**

- Game board
- BMPs for four land uses
- Watershed planning cards
- Chance cards
- 5 **Black** dry erase markers & wipe cloth

- Candy pieces to act as “money” (min. 35-40 pieces per game board)
- Large banquet style table (min of 6 feet)
- Weights or clamps to hold the game board on the table.

## **Background for Game Facilitators**

### **The Game Board - Lake Model**

- This is an example “lakeshed.” A “lakeshed” or lake watershed is the area of land that drains into a particular lake. A green dashed line on the game board represents the lakeshed boundary
- Land uses around the game board include farmland, parks and open space, residential areas, and cities (explain what makes up each of these land uses categories.) There is also an area of undeveloped land.
- Typical impacts you could expect from these land-uses are:
  - Farmland – no buffer between cropping and streams leading to the lake; wetlands drained for cropping; cows allowed uncontrolled access to the stream; and no conservation tilling.
  - Parks & Open Space – multiple trails that are prone to erosion and lead to sedimentation of the lake, destabilizing the shoreline, intensive management inputs on golf courses, recreation fields, parking lots that create vast amounts of impervious surfaces, and beaches that expose the shoreline.
  - Residential – Vegetation along the waters edge removed; extensive removal of vegetation and soil grading on new construction sites with no erosion control.
  - City – Wide streets; curb and gutter; removal of natural vegetation; loss of storage; and high percentage of impervious surface.
  - At any place along the lake or in the watershed of the lake there can be pollution contributions from such things as eroding banks that can be a function of the natural landscape, but increasing the amount and speed of runoff can increase these contributions.
  - Even undeveloped land contributes sediment & phosphorus to natural water bodies.

### **The Game Pieces**

A variety of BMPs can be used to prevent or mitigate pollution in the watershed. The ones represented in the game are not the only ones available, but represent a number of innovative and traditional stormwater management practices that have been used and shown to be effective in the appropriate situation. The costs represent a relative estimate of cost as compared to the other BMP's, but this will vary depending on circumstance and situation. Likewise, the effectiveness should be treated as relative, and depends on specific situations and appropriate implementation. In the future, additional BMP game pieces may be developed and shared with game users. If you wish to add or modify an existing game piece, feel free, but please inform Northland NEMO, to ensure that your contribution can be shared with others.

## **Ready, Set, Play !**

### **I. Setting the Stage Before play begins.**

*\* Note: This section should take you no more than 5 minutes. Previous experiences and feedback from participants indicate that the game facilitators should talk less! Therefore, although the facilitator must address the following sections (Setting the Stage, Background, Rules, and Explanations), it is important to allow for participants to talk freely and discuss amongst themselves, BMPs and the situations. Facilitators should promote inquiry based learning.*

- Introductions of presenters
- Game is a fictional landscape.
- Intent is not to point fingers at any one land use as the main culprit of sediment and other pollutants, but point out what all land uses can do to limit sediment and phosphorus pollution in the watershed.
- Describe land uses & typical impacts expected from each one:
  - Farmland
  - Parks and Open Space
  - City
  - Residential
- Describe game piece BMPs including the cost and point reductions on the front side and the description and outcome on the backside (hold on to all game pieces, candy, and markers until the game begins). Some BMPs cost more candy than others. Some are simple and easy, so they save you money. If you choose that BMP you get money from the bank. Each BMP has a label that describes what it does and how much it costs or saves.
- Describe **goal of game**, which is to reduce the pollution (sediment or phosphorus) load in the river to a set limit (*see above. Currently set at a TMDL sediment goal of 130 units or points; TMDP phosphorus goal of 100 units or points*). *State the objectives from above in your own words.*
- We have 3 years or rounds on which to meet this goal, in the case of the Game, implementing 1 BMP per year.
- Define key terms and their relevance: watershed, land use, sediment, Best Management Practice.
- Describe yourself as the facilitator and another assistant as the banker. *Experience has found that having an assistant who serves as the banker to collect the money (chocolate and add the points up during the rounds affords the facilitator to focus on leading the game, discussions, and learning objectives.*

### **Background narrative- example of narrative**

Runoff from developed landscapes carries pollutants in it. One of the most widespread is sediment and phosphorus. Sediment clogs fish gills, smothers eggs and aquatic organisms, decreases light penetration, carries nutrients and toxic compounds, and isn't fun to swim in or drink. High amounts of fast stormwater runoff cause erosion and carry sediment to the river. Another source of sediment in rivers comes from unstable, eroding river banks. A river can only take so much sediment before it starts to show poor water quality and habitat degradation. Phosphorus pollution is often associated with sediment because the nature of phosphorus binds itself to soil - and when

sediment pollutes waters it often carries with it excessive phosphorus to the receiving water. Excessive phosphorus pollution can lead to algae booms, excessive native & non-native plant growth, decrease light penetration, ...

This game uses a fictional landscape or watershed to introduce players to sediment & phosphorus pollution and Best Management Practices (BMPs) designed to reduce pollutant impact in the watershed. Four land uses are included on the game board (farmland, city, residential, and parks & open space). The intent is not to focus on one land use as the main source of pollution, but rather to point out what all land uses can do to limit pollution in the water resources of the community.

### **Setup:**

- Divide players among land uses (\* at least two players per land use)
- Give each land use a budget of five candies
- Assign points 50 pollutant points for each land use, 5 points from undeveloped land, and 50 points from upstream pollutant loading coming into the lake.
- 130 is the limit (for example our TMDL goal)

## **II. Play the Game !**

- Pass out the BMP cards to each group
- Pass out 5 candies to each group. This is “money” to buy BMPs
- Instruct each team to quickly review them, and lay them out in front of them. Allow the teams 2-4 minutes.
- **Rules: explain the rules**
  - Players can not swap BMPs between land use areas
  - Each team / player chooses one BMP per round
  - Pay banker/instructor for BMP selected
  - Each round, the BMP points are subtracted from the land use total

### **Pre-Round 1 - an opportunity to “buy” a Lake Management Plan**

- Players have a chance to buy a lake management plan” at start of the game for 1 candy. This is the only opportunity they have to do so.
  - *A plan may offer benefits in the future or it may be an expenditure of resources with little to no return. That is yet to be seen.*
  - *It may help guide their BMP selection the future,*
  - *it may cost a substantial investment of time and money,*
  - *it may lead to success.....*
  - *What we do know is that a Plan does not reduce their pollutant point total.*
- *Later, after round 1, those who purchased a “plan” may be rewarded by the instructor/banker giving them candies or money back) .*

### **Round 1**

- Give teams/players 2-3 minutes to choose a BMP to implement.
- Ask teams/players to discuss the BMPs they chose. Why? Cost or type? Have players explain what the BMP does.

- Collect the money (candies) from the each team.
  - Have each team subtract the points from their land use point box.
  - Add up total pollutant points remaining. Compare total pollutant points remaining to goal and encourage group to meet goal
- \*\* Experience has found that having an assistant to the facilitator really helps. The assistant can collect money (chocolate and add up points and recalculate totals so the facilitator can concentrate on discussions, concepts, and learning objectives rather than spending valuable time on math.*

**Planning Pays Off (sometimes)** give candies to those who bought a “plan.”

### Round 2

- Give players 2-3 minutes to choose a second BMP to implement.
- Ask teams/players to discuss the BMPs they chose why? Cost or type? Have players explain what the BMP does.
- Collect the money (candies) from the each team.
- Have each team subtract the points from their land use point box.
- Add up total pollutant points remaining. Compare total pollutant points remaining to goal and encourage group to meet goal
- Discuss that even though we have implemented all these BMPs (two rounds worth now) we still have not reached our goal.

### Chance Cards - unforeseen circumstances and events.

Purpose: The injection of “chance cards” into the Watershed Game provides additional learning opportunities beyond BMPs. It also provides some dilemmas and unforeseen circumstances. Chance cards may either benefit or cost a team money (candy) OR may also add/subtract from point totals. Chance cards were also developed to ensure that the simulation or learning experience does not end too quickly nor is it always so easy just to buy and implement BMPs to prevent or cleanup pollution. Chance Cards may be introduced at the facilitator’s discretion at random. The Chance Cards are orange and are meant to be held by the Game Facilitator. They are a guide, not a rule and you may have the need to create your own as appropriate. *The Chance Cards are included at the end of this document.*

**Examples of a chances include:** 12 inch rainfall in 24 hrs blows out construction site erosion controls and plugs storm sewers which floods city & homes: take 1-2 candies

**Planning Pays Off #2 (sometimes)** give candies to those who bought a “plan.”

### Round 3

- Give players 2-3 minutes to choose a third BMP to implement. This round however, they should realize (or the facilitator should acknowledge) that they may not be able to use the BMPs they have left because they do not have enough money or candies. OR even if they do, they can start to see that they cannot reach the overall watershed goal.

- *Revisit the Game Rules.* Encourage players to work together to reach their pollutant goal without actually saying “work together with other teams.”
  - *A suggested approach to this might be the following:* “We can see that we have implemented various BMPs, individual teams have reduced their contribution of pollution to the stream, and overall, together we have got closer to our target reduction. However, we still have not met our goal. We also see that we all have various BMPs remaining in our toolbox, but perhaps not enough candy or funding to implement them. Does anyone have any suggestions for how we might get closer to our target reduction?”
  - Hopefully participants discover and offer the suggestion of partnering or collaborating with adjacent land uses. Sharing/borrowing/giving candy or funds to adjacent, cooperating partners. Combining money/candy to buy the most effective BMPs for the overall watershed.
- Ask teams/players to discuss the BMPs they chose why? Cost or type? Have players explain what the BMP does.
- Collect the money (candies) from the each team.
- Have each team subtract the points from their land use point box.
- Add up total pollutant points remaining. Compare total pollutant points remaining to goal and encourage group to meet goal
- Summarize the wide mix of BMPs used

### **Wrap up**

Obviously this isn't a real-world situation. Different land-use contributes different pollutant loads and we don't all have the same bank account. Also, although we initially asked you approach this as an individual land use unit, many of these problems can't be solved alone. For instance, eroding bluffs aren't always caused by one landowner and things upstream can impact things downstream. This is where working together at a community or watershed level will be especially important. Communication is critical. Support and encourage your local officials. Working together you can find the most efficient and effective ways to control pollutants going to your streams so we can preserve or restore what we value about them for ourselves and for future generations. (Could mention...you might hear this type of limit on a stream called a TMDL)

- Possible questions for discussion:
- What did you learn?
- What would you do differently if you played again?
- How does this game apply to work you are doing/would like to do?
- There are other impairments of the watershed that are also being addressed through watershed management, planning, and the implementation of BMPs.
  - *Impairments include bacteria, chlorides, mercury, PCBs and nutrients.*
  - *Different impairments call for difference BMPs although some BMPs may provide a response to several different impairments.*
  - *External verses internal loading discussion*

**Storing the Game Board:** Make sure you erase the points and any writing on the Game Board as soon as play finishes! Otherwise the ink impregnates into the lamination and it won't come off.

Land Use	BMPs	Chance Cards
Farmland	Manage manure properly	Clean Water Grant
	Restore wetlands	Flood
	Practice conservation farming	Drought
	Establish filter strips	EAB
	Install stream fencing	Toxic Spill
	Test soil before applying fertilizer	
City	Implement Low Impact Development & redevelopment	Severe erosion or slump bank
	Control erosion at construction sites	Good Housekeeping Practices
	Apply salt and sand carefully	
	Design/redesign streets to reduce runoff	Coordination / Partnership
	Sweep streets regularly	Road salt/sand runoff pollution identified
	Maintain stormwater ponds	Upstream pollution load change
Residential	Organize a lake stewardship group	New regulation imposed
	Replace lawns with native plants	Clean Water Grant
	Reduce runoff from impervious surfaces	Flood
	Follow shoreland development standards	Drought
	Upgrade inadequate septic systems	EAB
	Manage yard and garden waste properly	Toxic Spill
Parks & Open Space	Capture roof runoff	Severe erosion or slump bank
	Use integrated turf and landscape management	Good Housekeeping Practices
	Plant native trees and vegetation	Coordination / Partnership
	Revegetate shorelines	Road salt/sand runoff pollution identified
	Designate protected natural areas	Upstream pollution load change
	Design trails & public access to protect shorelines	New Regulation Imposed
	Install rain gardens	Toxic Spill
		Severe erosion or slump bank

**Acknowledgement & Credits**

The game facilitator needs to verbally offer acknowledgment about the program, the development and origin of the Watershed Game tool.

***Here is the acknowledgment text block found on the Game Board:***

The Watershed Game helps individuals understand the connection between land use and water quality. Participants learn how a variety of land uses impact water and natural resources, increase their knowledge of best management practices (BMPs), and learn how their choices can prevent impacts. The Watershed Game was developed through Northland NEMO, a Minnesota-Wisconsin educational partnership. When using this tool, acknowledgment should be given to Northland NEMO, University of Minnesota Sea Grant, University of Minnesota Extension, University of Wisconsin Extension, Lake

Superior Research Institute, and the Minnehaha Creek Watershed District. To learn more, visit [www.northlandnemo.org](http://www.northlandnemo.org). 2009.

*Acknowledgement will also be in writing where suitable in the program materials.*

Version October 2009. These instructions were updated October 30, 2009. Bilotta et al. The Game Board and the Game Pieces or BMPs were updated October 30, 2009. Bilotta et al.

**Illustrations of the Watershed Game - Lake model**

Illustration of the Board Game Tool  
Actual size is approximately 2 1/2 x 5 feet.



**Vocabulary (page to be developed in the future)**

**Watershed**

**Receiving water**

**Impaired water**

**TMDL**

**Internal versus external loading**

**Facilitator Notes:**