Lessons 12, 13, 14, 15

<table>
<tr><th colspan="2">Stage 1 – Desired Results</th></tr>
<tr><td colspan="2">Established Goals:
8-4-08 Describe how erosion and deposition are influenced by the flow rate of a stream or river, and contrast the related characteristics of young and mature streams. Examples: meanders, oxbows, alluvial deposits, sandbars, flood plains, deltas… GLO: C8, D5, E3
8-4-9 Describe how wave action and ice movement in large bodies of water cause erosion and deposition. GLO: D5, E3
8-4-10 Explain how tides are caused and describe their effects on shorelines. GLO: D5, D6
8-4-11 Explain examples of human interventions to prevent riverbank or coastal erosion. Examples: vegetation, reinforcement (concrete, boulders) piers, breakwaters… GLO: B2, B5, D5
8-4-12 Identify factors that can cause flooding either individually or in combination. Examples: heavy snow pack, quick thaw, rain in sprint, lack of vegetation to remove water, water through transpiration, frozen ground preventing absorption, agricultural drainage systems, dams, diversions… GLO: C8, D5
8-4-13 Provide examples of the way in which technology is used to contain or prevent damage due to flooding, and discuss related positive and negative impacts. Examples: floodway, diversion, dike, levee… GLO: A5, B1, D5</td></tr>
<tr><td>Understandings:
Students will understand that…
Water causing erosion and deposition can create land features.
Some floods have the potential to be controlled.
Different types of soil have different capacities for retaining rainwater.
If the soil in an area will not hold enough rainwater, flooding problems will ensue.
Soil can be tested for its water-retaining capacity
Tides affect shorelines.</td><td>Essential Question:
How does water affect the land and how do humans attempt to alter its path?</td></tr>
<tr><td>Students will know…
How the slope, flow of water and land features affect erosion and deposition.
Which type of soil is best at preventing flooding and which contributes the greatest to flooding.</td><td>Students will be able to…
Communicate the steps and results from an investigation in written reports.</td></tr>
<tr><th colspan="2">Stage 2- Assessment Evidence</th></tr>
<tr><td>Performance Tasks:
Use a model to investigate the movement of water and how it shapes land.
Describe land features formed by water erosion and deposit of sediment.
Label a Winnipeg map of the different landforms (i.e. meanders, oxbow, etc.).
Recreate tide movement and describe the effects it has on shorelines.
Complete assigned activity data sheets, landforms sheet and final group engineer assignment.</td><td>Other Evidence
Activity 2
Assessment
You can evaluate your students on their lab reports using the following three-point rating scale:
Three: accurate and complete description of each soil test; clear explanation of how tests would be used; careful and error-free writing
Two: satisfactory description of each soil test; explanation of how tests would be used lacking in clarity; some writing errors
One: weak description; unclear or no explanation; numerous spelling and grammatical errors
You can ask your students to contribute to the assessment rubric by determining what information should be included in the description of each soil test.</td></tr>
<tr><th colspan="2">Materials Required</th></tr>
<tr><td colspan="2"></td></tr>
</table>

1 stream table per group (dishpan or rectangular aluminium baking pan with drainage holes drilled)	Modeling clay
sand & clay (For each stream table, 2 parts sand to 1 part clay– approx. 6 lbs needed total)	1 cup per group
Watering can per group	Buckets with water
Drainage basin per group	Textbooks/encyclopaedia/online access with info about land/river formations
Laminated Winnipeg map per group	1 stream table per group (dishpan or rectangular aluminium baking pan without drainage holes drilled)
Closed spatula for each group	Gravel/small rocks
Three soil samples: sand, agricultural soil (potting soil), and clay	Foliage (leaves, branches etc.)
Funnel per group	Filter paper per group
Three graduated cylinders per group	Blocks or books

Stage 3 – Learning Plan

Activity 1:

For additional student support, see BLM 9 to provide student groups with stream table scenarios *(courtesy of Kirsten Morris).*

Prior Knowledge

Students should be aware that

- erosion is the process by which weathered rock and soil, or sediment, are transported
- models simulate the real world but are not exactly like it
- models help us to understand natural processes
- landforms change over time

Materials Set-up

1. Mix sand and clay in drainage basin. Dampen mixture with some water.
2. In the stream table, pour out the sand and clay mixture. Pack the sand and clay mixture evenly into the upper half of the stream table (do not cover the end with the drainage hole).
3. Set the ruler over the top part of the stream table. Balance the water source cup on the edge of the stream table and the ruler.
4. Set the stream table on a flat surface such as a table. Place the wooden block under the upper end of the stream table to increase the slope.
5. Place the drainage basin directly below the drainage hole of the stream table to catch water and sediment exiting the stream table.
6. Fill bucket with water.

Procedures

Teacher asks students how they think the local landforms were created. What caused the hills/mountains to be shaped the way they are? Why are there flat areas? What forces shaped the land? How did water play a part in the process? Introduce the river model and its purpose. Teacher explains to students: You will create a river model to help you understand a river system and the land features created by water moving downhill. Remember that models are used in science to help us understand natural processes. For the river model, imagine you are the size of a small ant. The sand represents the earth and the watering can represents the precipitation, such as rain or snow. Observe what happens to the land as the water flows down the stream table.

Students observe their river model and complete the accompanying data sheet. Teacher leads discussion of land features created by the river model and lists student responses on poster paper to create a list of land features that will be covered in this lesson.

Teacher questions might include: If you could not see the water source, how would you know which way the water is flowing? What seems to influence the course that the river takes? What features did you observe in the stream tables that remind you of real land features you have seen before? What happens to the earth that is pushed out of the way when the water cuts a river into your model? What happens to the sediment carried by your model rivers? What would happen to all the mountains and hills in the world if

weathering, erosion, and deposition were the only forces shaping the land? Why does this not happen? Why is the Earth not flat?
Teacher scaffolds discussion with new vocabulary (meanders, oxbows, alluvial deposits, sandbars, flood plains, deltas), using transparencies (see BLM #5, 6, 7) to show visuals of each part of the river system, highlighting the land features.
Students read about the land features identified in the stream table model in the textbook, encyclopedia, or additional teacher provided resources. Students complete the Land Feature chart (OH 12.2).
The slope of the first river model was not very steep. How might a steeper slope cause the river to flow differently and create different land features? Students create an investigation to study the effect of slope on water flow. To increase the slope of the river model add more wooden blocks. Discuss with students how to conduct a controlled experiment which fairly tests the effects of slope on river model. Students observe the difference in water flow and land features and collect and analyze data for a brief lab report.

Activity 2 Lessons 13 & 14
Materials Set-up
1. Use the modeling clay to build levees along the river's banks and to form a canal leading from the river to a reservoir.
2. Set the stream table on a flat surface such as a table. Place the wooden block or textbook under the upper end of the stream table to increase the slope.
3. Place the drainage basin directly below the drainage hole of the stream table to catch water and sediment exiting the stream table.
4. Fill bucket with water.
Procedures
Students have previously investigated the effects of an increase of slope on the riverbed. Ask students what might happen if water flow, instead of slope, increases on a gently sloping riverbed. Have students make a prediction and share with the class.
Students run the flood stream table and observe how material is eroded and deposited.

- Present the following scenario to your students. The class is a team of "consulting engineers" for a new housing development to be built in the next county. Many of the county's citizens are protesting the development. They are saying that the soil in that area will not hold the rain and there will be flooding problems for all dwellings in that area. But others believe this is just an excuse to delay and block the development.
- Tell students that their challenge is to aid in the decision-making process by testing different samples of soil to see how much water the soil will absorb.
- Divide your class into small groups, distributing materials to each group.
- Students should first test each type of soil in its dry state by measuring the same amount of each soil, in turn, into a funnel lined with filter paper, and then pouring a measured amount of water through it. They should use the same amount of water for each type of soil. The water that drains through each type of soil should be collected in another graduated cylinder and the amount recorded.
- Have students repeat the test using the same types of soil in their saturated states.
- Discuss with the class which soil held the most water when dry and which saturated soil held the most water. Which type of soil would be most likely to cause flooding problems?
- Perform the same experiment again, but this time mix in different foliage such as branches and leaves to represent trees, roots and other plants.
- Have each student record on a separate paper answers to the overhead (BLM #1) describing the soil tests, and a final discussion of how communities and developers would use such tests.

Students complete the accompanying data sheet - Activity 2 – Data Sheet and Flood Lab (BLM#4).
Teacher leads discussion of student observations of the flood model. A connection is made between the Red and Assiniboine River and the flood model. Questions include: Where is the eroded material being deposited? Where are the largest sediment particles being deposited? The smallest sediment particles? Is a delta forming? Where? Why is it forming there?
Students observe the "controlled flood" river model and apply their knowledge of river systems and their study of how the human have modified their environment to deal with floods. Students complete the accompanying data sheet.
Students to make predictions as to what would happen in regards to erosion and deposition in large bodies

of water related to wave action and ice movements.
Performance Task Assessment:
Students look at a Winnipeg map. In groups, label the rivers with the new vocabulary. Then the students take the role of engineers and attempt to create an intervention for erosion and flooding. They are to determine where is needed the most along the two rivers and give reasons (see BLM#8). Then also need to discuss the positive and negative impacts of flooding and erosion related to the three aspects of Sustainable Development?
Activity 3 Lesson 15
Discuss with students how tides are caused. Get students to predict what they think happens to the shoreline due to tides.
Have students create a shoreline of the sand/clay mixture in the stream table without holes drilled in it. Gradually add water and using a closed spatula move the water to the shore. Gradually get students to record what happens to the shoreline. Allow students to be creative and put a variety of things on the shoreline, such as rocks (gravel) or paper or "Monopoly" style houses.

Lesson 15
Go through written assignments and discuss answers.

Teacher Background Knowledge

Activity 2
A diversion is a channel constructed across the slope to divert excess concentrated and sheet surface water, and possibly subsurface water, from areas under construction or development, to sites where it can be used or disposed of. This practice applies to sites where:
· A diversion is required to control erosion and runoff on construction sites.
· Concentrated runoff from higher lying areas is potentially damaging to a developing area.
· Overland (sheet) surface flow and shallow subsurface flow caused by seepage is potentially damaging to areas under construction.
· Runoff is in excess and a diversion is required as part of a pollution abatement system.
· Diversions shall not be substituted for terracing or land grading where such practices are more appropriate for erosion control.
Levee **–** is an embankment for preventing flooding or a continuous dike or ridge (of earth) for confining the irrigation areas of land to be flooded *http://www.m-w.com/cgi-bin/dictionar*

1997 Flood Facts
99.9 % of Winnipeggers are protected by the four major flood control works (Shellmouth Dam & Reservoir, Assiniboine River Diversion, Red River Floodway and Primary Diking System).
At the flood crest, the flow in the Red River approaching Winnipeg was 138,000 cubic feet per second, enough water to fill Winnipeg's Pan Am Olympic Pool once every second. Approximately half that flow was diverted around Winnipeg by the Red River Floodway.
More than 3,000 City staff were involved in the flood effort for a 2 1/2 week period starting April 21st.
800 properties were protected by secondary dikes: 750 by sandbags and 50 by earth fill.
Approximately 8.1 million sandbags were filled and delivered in the City. If you placed the sandbags end to end in a straight line, they would run roughly from Winnipeg to Vancouver. The City's four sandbag machines produced 4.4 million sandbags and volunteers hand filled 3.7 million sandbags.
Sandbag removal was essentially complete by the end of June, 1997.
Over 800,000 cubic yards (600,000 cubic meters) of clay was excavated for earth dike construction. This was approximately 45,000 truck loads. This earth would fill the Winnipeg Football Stadium to a height of 200 feet or a 20 storey building.
The primary diking system was raised with earth fill in 25 locations an average of three feet.
50 temporary earth dikes were modified to become permanent structures. Of these, 10 were primary dikes and 40 were secondary dikes.
All the City's 34 flood pumping stations were operated and a total of 131 flap and positive gates were checked and/or operated in the sewer systems.
The Flood Hotline handled 126,000 calls (peak day was 12,600 calls on April 30th). At the peak there were 60 operators and a 24 hour operation.
The City's Flood Information page on the Internet was accessed over 143,000 times with a maximum of

14,800 hits on May 1st.
There were 74 printed news releases and 24 live daily news conferences.
For 16 consecutive days and nights, Videon and Shaw Cable TV covered the flood, including the daily news conferences. It is estimated that 77% of Winnipeggers watched the cable channels.
City council members and staff conducted more than 2,000 media interviews.
City staff placed more than 70,000 volunteers.
It is estimated that sandbag diking required over 200,000 volunteer days, where one day is an eight hour shift.
Almost 1,000 citizens attended the City's sandbag dike building demonstrations.
Over 600 media personnel were covering the flood, including 150 national and international media from as far away as Germany, Holland and Japan.
Over 9,000 city residents representing 3,000 homes, were evacuated during the flood, primarily in the south end of the City. By mid-May, 97% were returned home.
More than 23,000 individuals received social services including shelter, food, clothing and personal services.
The original scenario of the potential Z-dike failure meant the potential evacuation of 125,000 City residents.
http://www.winnipeg.ca/Services/CityLife/HistoryOfWinnipeg/flood/flood_facts_1997.stm used with permission.

Activity 3

What causes the tides?

It is the gravitational attraction of the sun and moon that cause waters of the ocean to raise and lower at different parts of the earth. Tides occur in oceans, and to a much smaller extent, tides also occur in large lakes, in the atmosphere, and within the solid crust of the earth. There are also non-astronomical factors, such as the configuration of the coastline, the local depth of the water, the ocean-floor topography, and other hydrographic and meteorological influences that play an important role in altering the range and interval between high and low water.

Why tides are important to humans?

The knowledge of the times, heights, and the extent of inflow and outflow of tidal waters is of importance in a wide range of practical applications for humans such as the following:

A. Commercial and recreational Navigation through coastal waterways, and within estuaries, bays, and harbours.
B. The establishment of chart datums for Hydrography, which are then used for demarcation of a base line or "coastline" for fixing offshore territorial limits, both on the sea surface and on the submerged lands of the Continental Shelf.
C. For the furnishing of data useful to fishing, recreational boating, surfing, and a considerable variety of related water sport activities and tourism activities.
D. Work on harbour engineering projects, such as the construction of bridges, docks, breakwaters.
E. For the provision of information necessary for underwater military engineering uses.

Where are the largest tides in the world? What causes them to occur there?

The largest tidal ranges in the world occur in the Bay of Fundy (more exactly Minas Basin) and in Ungava Bay (more exactly Leaf Basin) on the East Coast of Canada, where you can observe a 16 metre (53 foot) tide range. Tidal range varies during the month according to phase of the moon. They are largest at the new and full moons, and smallest at the quarter phases. Tidal ranges in the Bay of Fundy and Ungava Bay are the highest in the world because of an unusual combination of resonance (or seiche) and the shape of the bay. The Bay of Fundy and Ungava Bay are "V" shaped, so that water entering at their wide mouth at the open ocean end is funneled into less and less space as it moves into the head of the bays and the water can only pile up and form a large tide. The water in the Bay of Fundy and Ungava Bay also has a natural rocking motion called a seiche. You could compare this to the movement of water in a bathtub. Although the water in a bathtub sloshes from one end to the other and back again in a few seconds, it takes about 13 hours for the water in the bays to rock from the mouth of the bays to the head of the bays and back again. The Atlantic ocean tide rising and flooding into the bay every 12 hours and 25 minutes reinforces the rocking motion. The seiche in the Bay of Fundy and Ungava Bay are therefore sustained by a pulse from the ocean tides.

Activity 3 background information is reproduced with the permission of the Canadian Hydrographic Service.

Homework Activities

Completion of flooding questions if not finished in class.
Finish 50% water use reduction chart.

Activity 1: Observing a River Model
Data Sheet (OH 12.1)

You will make 3 observations: before, during, and after the water flow.

For each observation do the following on your stream table diagram:

- draw and label any changes you observe
- draw and label the land features you observe

Include the following on your stream table diagram:

- draw and label any changes you observe
- draw and label the land features you observe

Describe what you observe about the stream table.

Première activité : Observer une feuille d’information sur un modèle de rivière (OH 12.1)

Vous ferez 3 observations : avant, pendant et après la coulée de l’eau.

À chaque observation, faites ce qui suit sur votre schéma de coulée d’eau :

- Dessinez et étiquetez tout changement que vous observez
- Dessinez et étiquetez les aspects physiques du terrain que vous observez
- Décrivez ce que vous observez au sujet de la coulée d’eau.

Land Features Chart (OH 12.2)

Land/River Feature	Written description	Diagram
Meanders		
Oxbows		
Sandbars		
Flood plains		
Deltas		

Tableau des aspects physiques du terrain (OH 12.2)

Trait de terre/rivière	Description écrite	Diagramme
Méandres		
Virages en U		
Bancs de sable		
Basse-terres inondables		
Deltas		

Activity 2: Flood
Data Sheet (OH 12.3)

You have observed river models that vary in the steepness of slope. Now you will see what happens when the flow of water changes from normal to a flood.

Run 3 cupfuls of water through the water source cup.

For the observation do the following on your stream table diagram:

- draw and label any changes you observe
- draw and label the land features you observe

Describe where the eroded material is being deposited.

How is this model the same/different from the previous model you have observed?

Activity 2: Flood
Feuille de données (OH 12.3)

Vous avez observé des modèles de rivières qui varient dans le degré de la pente. Maintenant vous verrez ce qui arrive quand l’écoulement d’eau change de la normale à l’inondation.

Faites passer 3 tasses d’eau à travers la tasse d’eau source.

Pour l’observation, faites ce qui suit sur votre schéma de coulée d’eau :

- dessinez et étiquetez tout changement que vous observez
- dessinez et étiquetez les traits du terrain que vous observez

Décrivez où se dépose la matière érodée.

Comment ce modèle est-il semblable/différent du modèle précédent que vous avez observé?

Name : _____________

Flooding lab (OH 12.4)

	Amount of water added		Amount drained out	
	1st attempt	2nd attempt	1st attempt	2nd attempt
Soil				
Sand				
Clay				
Adding of foliage				
Soil				
Sand				
Clay				

Answer the following questions on a separate piece of paper. If any questions are not completed in class it will be for homework.

1. Explain why a river can flood even if there was no recent rain in that section of the river valley?
2. Why are sediments found in rivers? Discuss how rivers carry sediments and explain how this impacts the land during a flood.
3. What characteristics determine how much water soil can hold?
4. Debate the merits of building dams upstream to prevent flooding that can make former floodplains available for development.
5. Discuss why hydrologists (scientists who study the water cycle) track snow accumulation as a part of long-term flood forecasting. What other data would help them make more accurate flood predictions?
6. What happens to the water capacity of each soil when foliage is added?
7. How does growing trees and other plants with significant root systems affect flooding?
8. Discuss with your group whether or not people should be allowed to rebuild homes in an area prone to serious flooding.
9. As the soil engineer, would you recommend the development if the soil in the area was mainly sand? If it were mainly regular soil? If it were mainly clay?
10. What are the positive and negative impacts flooding has on all three aspects of sustainable development?

Nom : ____________

Laboratoire d'inondation (OH 12.4)

	Montant d'eau ajoutée	Montant d'eau drainée
Sol		
Sable		
Glaise		
Addition de feuillage		
Sol		
Sable		
Glaise		

Répondez aux questions suivantes sur une feuille de papier séparée. Toute question non complétée en classe deviendra un devoir.

1. Expliquez pourquoi une rivière peut inonder même s'il n'y a pas eu de pluie récente dans cette section de la vallée de la rivière.
2.Pourquoi trouve-t-on des sédiments dans les rivières? Discutez comment les rivières transportent les sédiments et expliquez l'effet que cela a sur la terre durant une inondation.
3.Quelles caractéristiques déterminent combien d'eau la terre peut contenir?
4. Débattez les mérites de la construction de barrages en amont pour empêcher les inondations, ce qui permet le développement de terres anciennement inondables.
5. Discutez pourquoi les hydrologues (scientifiques qui étudient le cycle de l'eau) tiennent compte des accumulations de neige pour pouvoir prédire de loin les inondations. Quelles autres données pourraient les aider à prédire plus précisément les inondations?
6. Qu'arrive-t-il à la capacité d'eau de chaque sol quand on y ajoute du feuillage?
7. Quel effet cela a-t-il sur les inondations quand on fait pousser des arbres et d'autres plants aux systèmes de racines importants?

8. Discutez avec votre groupe si oui ou non on devrait permettre la reconstruction de maisons dans une région portée à de sévères inondations.
9. Comme ingénieur de terrain, recommanderiez-vous le développement si le sol dans la région était surtout du sable? Surtout un sol régulier? Surtout de la glaise?
10. Quels sont les effets positifs et négatifs de l’inondation sur les trois aspects du développement soutenable?

Group Members

____________ ______________

_____________ _____________

Winnipeg Rivers 12.8

Where are the top three areas as an engineer you would protect Winnipeg from either flooding or erosion? Please include which river and cross streets of importance.

1. ____

2. ____

3. ____

What methods might you use to protect those areas from flooding or erosion?

____

____

____

How does flooding/erosion affect (think of potentially both positive and negative):

The local economics: ________________________________

____

The local environment: ______________________________

____

Human health and well being? __________________________

____

Rivières de Winnipeg 12.8

En tant qu'ingénieur, quelles trois régions de Winnipeg protégeriez-vous contre l'inondation ou l'érosion? Veuillez indiquer quelle rivière et quel carrefour important.

1. ____

2. ____

3. ____

Quelles méthodes utiliseriez-vous pour protéger ces régions contre l'inondation ou l'érosion?

____

____

____

Quel effet l'inondation/l'érosion a-t-elle (pensez aux possibilités positives et négatives) sur :

L'économie locale : ____________________________________

____

L'environnement local :

____

____

La santé et le bien-être des humains?

____

____

Stream table scenarios

These are assigned to groups after they have done the first stream table activity. This can be part of lessons 12, 13, 14, 15.
OPTIONAL . Clay for rocks and boulders, trees (Christmas decorations or foam stickers), people (foam decorations or whatever works), houses (*Monopoly* houses .. or small banks of staples work too) and anything else you can think of to represent a human and nature presence.

Scenario #1 Start with a “fresh” stream table.

Using your observations and the information you gathered in your first stream table, spray or carefully pour water to recreate the Red River around Scotia Street.
In your design, include people, houses, trees… etc

Scenario #2 Start with a “fresh” stream table.

Increase the slope of your stream table. B spraying or pouring water form as many of these as you can: delta, sandbars, watershed, oxbow, floodplain…. etc
In your design, include people, houses, trees… etc

Scenario #3 Start with a “fresh” stream table.

Use clay to build banks that would best protect the people, houses, work places, vegetation etc. Then, by pouring water very quickly, create a flash flood.
What happened? Did the banks give the needed protection?
In your design, include people, houses, trees… etc

Scenario #4   Start with a “fresh” stream table.

Using your observations and the information you gathered in your first stream table, spray or carefully pour water to recreate the Red River around Kingston Crescent.
In your design, include people, houses, trees… etc

Scenario #5   Start with a “fresh” stream table.

Create a very wet spring. Slowly and gently spray water along the entire top of the stream table. This represents many days of rain. Observe the changes in rivers, tributaries water sheds, etc.
In your design, include people, houses, trees… etc

Scénarios de tables d'écoulement MLN 12,9

Ceux-ci sont assignés à des groupes après qu'ils ont fini leur première activité de table d'écoulement. Ceci peut faire partie des leçons 12, 13, 14, 15.

FACULTATIF : De la glaise pour les roches et les grosses pierres, les arbres (des décorations de Noël ou des collants en mousse), les gens (décorations en mousse), les maisons (des maisons de Monopoly … ou des petits paquets d'agrafes peuvent servir aussi) et n'importe quoi d'autre qui vous vient à l'esprit pour représenter une présence humaine et naturelle.

Scénario No. 1 Commencez avec une table d'écoulement «vierge».

Selon vos observations et les informations garnies dans votre première table d'écoulement, vaporisez ou versez doucement de l'eau pour recréer la rivière Rouge autour de la rue Scotia. Dans votre maquette, incluez gens, maisons, arbres … etc.

Scénario No. 2 Commencez avec une table d'écoulement «vierge».

Augmentez la pente de votre table d'écoulement. En vaporisant ou en versant de l'eau, formez autant des choses suivantes que possible : un delta, des bancs de sable, un bassin hydrographique, un virage en U, une plaine d'inondation … etc. Dans votre maquette, incluez gens, maisons, arbres … etc.

Scénario No. 3 Commencez avec une table d'écoulement «vierge».

Avec de la glaise, construisez des rives qui offriront la meilleure protection aux gens, aux maisons, aux lieux de travail, à la végétation, etc. Puis, en versant de l'eau très rapidement, créez une inondation éclair.
Qu'est-ce qui est arrivé? Est-ce que les rives ont offert la protection nécessaire?
Dans votre maquette, incluez gens, maisons, arbres … etc.

Scénario No. 4   Commencez avec une table d'écoulement «vierge».

Selon vos observations et les informations garnies dans votre première table d'écoulement, vaporisez ou versez doucement de l'eau pour recréer la rivière Rouge autour du croissant Kingston. Dans votre maquette, incluez gens, maisons, arbres … etc.

Scénario No. 5   Commencez avec une table d'écoulement «vierge».

Créez un printemps très pluvieux. Vaporisez lentement et gentiment de l'eau tout le long du haut de votre table d'écoulement. Ceci représente plusieurs jours de pluie. Observez les changements dans les rivières, les affluents, les bassins hydrographiques, etc. Dans votre maquette, incluez gens, maisons, arbres … etc.