Section I: Creating a Local Context for Water

The Polaris Institute is an Ottawa-based non-governmental organization that has been in existence since 1997. Our main goal is to enable citizen movements to develop new methods, strategies and tools in order to bring about democratic social change. As a result, most of our past educational work has focused on helping students to develop the critical thinking and leadership skills necessary to bring about on-the-ground action.

Full resource accessible online at: www.polarisinstitute.org/education

Other water education resources available at this site:
- Water Use & Availability *(Gr.9 Issues in Canadian Geography)*
- Water Perspectives: Conflict and Action *(Gr.10 Civics and Citizenship)*

Section I of II: Investigating Local Water

Gr.9 Science: *Biology—Sustainable Ecosystems* (2008), *SNC1D/ SNC1P

Description: *Section I* is meant to highlight the concept of exploring water in your local community. It puts forward a series of optional introductory activities which help to provide a richer context for the water quality explorations in *Section II: Scientific Investigation of Local Water Quality*. This resource also has strong linkages to geography on account of the main activity, which is to create a Community Water Map. This section of the resource has two main goals:

1. Identify and examine ways that water is used in the community
2. Develop an understanding and appreciation for where local water comes from, where it goes & what affects the source(s)

In this section, students examine the following inquiry/critical thinking questions: Where does our water come from? What affects water sources? How do we treat water before and after it's used? Where does water go after we've used it?

IMPORTANT NOTE FOR TEACHERS: This section of the resource also has strong ties to geography (mapping). To enhance the science focus of the activity, plot water quality data on the Community Water Map (upon completion of *Section II*). The main activity is structured as a guideline for teachers in conducting community water mapping with students, as local realities will differ greatly throughout communities across Ontario. We've aimed to provide some starting points, ideas, and resources for gathering information. However, we ultimately hope that you and your students will take this opportunity to make the project your own. Good luck!

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Black Line Masters:

Pre-Activity

Option A: Field Trip

Description: An outing for students to get out of the classroom to see first-hand where water comes from in the community. This pre-activity is relevant because it provides a context for the *Community Water Map* activity (p.6), as well as an opportunity for students to ask questions and/or make observations of land use in the community which are relevant to explorations of water quality in *Section II*.

#1: Arrange a field trip to the local water treatment plant. If there is no water treatment plant (or it is not accessible to the public), consider *#2*.
#2*: Take students on a field trip to examine different water sources in the community.

**Teacher's note*: If you plan to conduct in-the-field water quality testing with your students (see *Section II: Scientific Investigation of Local Water Quality*), sample and data collection should be done <u>during</u> the field trip, unless the water source(s) where you will conduct your water quality testing are easily accessible from the school. *Section II* has further resources for planning field trips, including checklists.

Time required: 1-2 class periods (65-70 min)
- Class 1: Introduce the topic (see **Engagement Strategy**, p.4), discuss the trip with students & come up with a list of questions and/or places to visit during the field trip or guest speaker.
- Class 2 (optional): Discuss water quality testing with students (if you will be conducting this at the same time as the field trip). Refer to *Section II: Scientific Investigation of Local Water Quality*.

Materials & Preparation:
- IN ADVANCE: Follow the appropriate protocol(s) for gaining permission to take students off of school property.
- IF APPLICABLE: Prepare water quality testing materials (refer to *Section II: Scientific Investigation of Local Water Quality*).
- *Research some basic information about the local watershed and water/wastewater distribution systems in your community (refer to *(BLM 1.1/ 1.2)* Community Water Map: Individual Student Research**,** p.24-27, to help you).

**Teacher's note*: This step is only required if students will <u>not</u> be creating the *Community Water Map* (see p.6).

<u>**Option B: Guest Speaker**</u>

Description: Students invite an "expert" on water in their community to the classroom and prepare questions for discussion. This pre-activity is relevant because it provides an option for the teacher to help students gather the information they need to create the *Community Water Map* (p.6), without taking students off-site (as in Option A).

#1: Invite an expert from the local water or wastewater treatment plant to talk to the class about treating, testing and protecting local water sources; OR

#2: If private wells are the principal source of water in the community, invite a community expert* (*e.g.*, from a local watershed group or Public Health Unit) to discuss ways to protect and maintain groundwater quality and monitor well water.

*<u>*Teacher's note*</u>: For more information on how to locate water experts or resources in your community, refer to *(BLM 1.1/1.2)* Community Water Map: Individual Student Research (p.24-27).

Time required: 1 class period (65-70 min)
- Introduce the topic (see **Engagement Strategy**, below), and come up with a list of questions to ask the visiting expert.

Materials & Preparation:
- Arrange for a local water 'expert' to visit your class

Engagement Strategy (for *Option A & B*):
- Create a discussion by asking students where their water comes from. If there is a municipal water treatment facility in the community, some students may assume their water comes from there, as opposed to a private well.
- Asking these questions will give an idea of how much prior knowledge students have about water in the community.

Teacher's note: If students are not creating the *Community Water Map* (p.6), show students on a map (or as part of the field trip outing) where their water comes from—this can be as broad as the surface source from which the water is taken (*e.g.*, Lake Ontario), or as specific as the location of water intake pipe(s). If there is a municipal well, its location can be pointed out to students. If private wells are the main source of water in the community, try to determine where the school well is (and/or assign as homework to have students determine where the well is on their home property).

Teaching Strategy (for *Option A & B*):
- Have students prepare questions in advance of the presentation or trip (see **Sample Questions**, p.5). If you are going to have students complete the *Community Water Map* activity, you may want to introduce the project to them before the presentation/ trip. This will allow students to develop a list of questions to ask that will help them with their map research.

Sample Questions:

Water treatment plant:

- Where does the water come from? What is important to know about this source?
- How much water do we use from this source (daily/ monthly/ yearly)? Who in the community uses the most? Who else uses this water (*e.g.*, other communities)?
- How does the water get from the source to the treatment plant?
- What happens to the water once it enters the treatment plant? (*process*)
- What problems do we have with the water supply (if any)? *E.g.*, Recurring contaminants
- What water quality tests are carried out on the water supply, and how often?
- Where does your water go after it's used? How is it treated? What is it treated/ not treated for?
- Who ensures the safety of our water supply? What regulations are in place to protect water from contamination?
- Are there water contaminants of potential concern that are not consistently monitored (or for which there are not yet testing methods/ protocols)?

Municipal or private well:

- What do we call water that is found underground? (Answer: groundwater, aquifer)
- Does well depth matter? Why?
- How can water found underground become contaminated?
- How can we protect groundwater?
- Whose responsibility is it to test private wells? What are typical costs?
- How often should we check well water quality?
- What happens to a private well if it becomes contaminated?
- Are there special procedures to close wells and why would this be important?
- Can well water be treated? *E.g.*, For naturally occurring high levels of metals and minerals?

Activity: Community Water Map

Description: Mapping activity and research project to create a picture and understanding of water in the community*. This activity is relevant because it provides a context for the scientific water quality investigation in *Section II*. The main goal of the activity is to:
- To develop an appreciation for where local water comes from, what affects it, how it is distributed & treated, how it is used in the community, and where it goes.

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*Teacher's note: This activity requires some prior knowledge or scaffolding of basic map-reading & map-making skills. Students should be familiar & able to work with: scale, symbols, legend, landmarks, labels, *etc*.

The following web resources provide further information for teaching map-making skills:
- National Geographic Map-Making Guide (Gr.9-12):
  <http://www.nationalgeographic.com/xpeditions/lessons/09/g912/cartographyguidestudent.pdf>
- Google Maps Education: <http://maps.google.com/help/maps/education/resources.html>
- Creating Custom Maps in Google:
  <http://www.google.ca/earth/outreach/tutorials/custommaps.html>

Time required: Variable, depending on the extent of the activity chosen by the teacher or class
- **At minimum:** 1-2 class periods, 65-70 min (with majority of research/ prep for discussion completed by teacher)
- **At maximum:** 4-5 class periods, 65-70 min (over one month—extra time built in for independent student research)

Materials and Preparation:
- Select and prepare mapping options for students (see *Activity format* & *Options for mapping*)
- Book time in the computer lab for student research
- Additional materials may be required as the project evolves!

Activity format: Full class, small groups, or individuals
- The advantage of doing the activity collectively, as a class, is that the research can be divided up between students [see *(BLM 1.0)* Community Water Map: Class Division of Research Tasks, p.14-23].
- If done in small groups, compare and contrast the students' maps and discuss any differences. You can also encourage information sharing between groups.
- If done as individuals, the task will need to be scaled back. Refer to *(BLM 1.1/1.2)* for guidance.

Options for mapping:
- Size/Scale:
  - Choose a size for the map based on the activity format, above (*i.e.*, a map used by the entire class or small groups will need to be bigger than one used by an individual student)
  - Consider the level of detail students will want to include on the map (see **Teaching Strategy**, <u>Step 3</u>, Map-making)

- It may not be possible to include all students' homes on a map, particularly in rural areas. An alternative might be to have these students choose a location to research that *is* on the map (*e.g.*, a public library, or a family member or friend's house). You may also want students to draw a line on the map depicting the limits of municipal water distribution (assuming there is municipal water in your community). Anyone outside these limits would be presumed to be on well water.

Choosing the map format, size and scale may be the most challenging part of scaffolding this activity. There are essentially two options you can choose:

Print map: The advantage of a print map is that the hardest part is over once you have chosen the scale and format. A disadvantage is that it is difficult to fix errors on a print map. Format options include:

- **Hand-drawn map**
  - *Advantage*: You don't need to prepare anything in advance. Students are responsible for creating the map. Recommended if there are students in the class with strong map-making and/or spatial skills.
  - *Disadvantage*: It won't be perfectly to scale; it may also prove difficult to add in more details/ area once the initial map is drawn. Mistakes might also prove difficult to fix.
- **Road map**
  - *Advantage*: It is a pre-existing, to-scale map. All that remains is to find one that is big enough to meet your mapping needs, and that has good resolution (if printing from online).
  - *Disadvantage*: Road maps often provide too much detail, which could make reading the map and working with it more challenging for students.
- **Community map**
  - *Advantage*: Will probably have fewer irrelevant details than a road map. It is also possible that your municipal office could provide you with a map showing existing water distribution and/or treatment infrastructure, thus saving students time and research.
  - *Disadvantage*: May not exist in some communities, and you are at the mercy of others in order to gain access to the map. See **Teacher's note*, below.
- **Aerial photographs**
  - *Advantage*: These can provide a neat way of seeing changes to the community over time, if you obtain the most recent photo in addition to the preceding one. You can compare them and note changes in land-use or water body sizes. Land-use information can also prove useful when interpreting water quality results (*Section II*).
  - *Disadvantage*: Requires some expertise in order to interpret. Recommended that this option is chosen in conjunction with a guest speaker who is brought in and can help point out relevant water-related landmarks and information on the photographs.

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*Teacher's note:
- Contact your municipal office/ planning department; Chamber of Commerce; and/or utilities commission/ agency. They may be able to provide a map with some municipal infrastructure already on it, such as water treatment facilities. Just note in your conversation that you are looking for a resource that will be easy for students with limited mapping experience to work with.

Online map: The advantages of a digital map are that information can be added to it easily, scale can be adjusted as you go along (based on need), and errors are easily fixed. A disadvantage is that creating an online map will require learning how to use an online mapping tool, which can sometimes have a steep learning curve. Some tools available include*:

- **National Geographic Education**: MapMaker Interactive
- **Googlemaps & Google Earth**
    - Note: Students can make a map in google and export the KML file to be used/ layered in any other map
- **Crowdmap**
- **OpenStreetMap**
- **ESRI ArcGIS Online**
- **Great Lakes Commons map**

Teacher's note:
- YouTube tutorials often exist for the more popular online mapping tools, such as Google maps and Google Earth. Many are geared toward educational purposes (*i.e.*, student friendly).
- You can also refer to the following resources for Google: Google Maps Education; Creating Custom Maps in Google

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Engagement Strategy:
- Ask—who knows where the water from their taps comes from (at home, at school)? What about the local outdoor pool? Where do we get this water?
- Engage in a short discussion to help students realize how much (or little) they know about water in their community.

Teaching Strategy:

Step 1: As a class, brainstorm a list of items to identify on the map that will help create a picture of: (1) where water is located in the community; (2) how it moves; (3) what it is used for; (4) what impacts it; *etc.*
- Some examples include: school, students' homes, surface water sources, water & wastewater treatment facilities, large-scale water users (*e.g.*, golf courses, factories); potential sources of water pollution (*e.g.*, farms, factories).
- Together, choose the most important items to include on the map*.

Teacher's note: If students are completing the mapping exercise as individuals VS. small groups or as a class, you may want to limit the number of items to include on the map to keep the research manageable. Choose those that are the most relevant to students' learning of *water in the community*.

Step 2: Ask students—How easy will this information be to find/ gather? Where can we look, or whom can we contact, for information?
- Brainstorm as a class & have someone take notes
- Alternatively, you can use the pre-assigned research tasks in *(BLM 1.0)*, p.14-23 to perform an in-depth class project (read this over prior to the class discussion)

- If you would rather give students a broad overview of potential research questions and resources to refer to for more information, refer to *(BLM 1.1/ 1.2)* Community Water Map: Individual Student Research (p.24-27)

Step 3: Begin the research & map-making process

Example scenario: You have decided to complete this activity as a class, using a print map. You have brainstormed what you want to include on your map, now it is time to divide the research tasks.

Research
- Assign teams of 2-3 to each of the research questions in *(BLM 1.0)*, p.14-23, 10 total).
- Choose the questions most relevant to: (1) your community; and (2) the class' goals with respect to creating a *Community Water Map*.
- Using the guidelines provided, teams must research the questions presented under their assigned topic. If they cannot obtain the answer from this source, they must try another. Encourage students to share any relevant information between teams (*e.g.*, Team 1 finds information relevant to Team 2's research questions, so they share this information).
- If students are unable to find an answer to one or more of their questions, they must record the sources they tried and why they were unable to find the answer.
- Teams will then do a short presentation of their research findings for the class (5-7 min)

Map-making
- Each team will identify the relevant items and information they want to include on the map
- As a class, come up with standard symbols (and/or a colour code) for all of the different items to be represented on the map, such as:
  - School (be sure to indicate whether it uses municipal water or a private well)
  - Students' homes*
  - Surface water sources (*e.g.*, lake, river, reservoir). Perhaps include some detail on the map or in the legend about how much water is taken from the source, or how many people rely on it from the community (if this information is available). Also be sure to have students *name* the source.
  - Water treatment facilities**
    - Could also include: (1) Location of water intake pipe(s) and/ or well(s); (2) Site(s) used for monitoring water quality
  - Wastewater treatment facilities
    - Could also include: location of outflow pipes for wastewater
  - Large-scale water users (*e.g.*, industrial operations, institutions, commercial businesses, etc.)
  - Areas at risk for water pollution***

- *If you, or individual students, are uncomfortable with having classmates disclose/ know this information, students may place a sticker/ symbol *near* the correct area on the map. Also, consider using different symbols for homes on private wells & those on municipal water (if relevant).
- **If students in the class receive water from different municipal treatment facilities, you may also want to use distinct markers for each of these facilities
- ***(1) Areas at potential *risk* for water pollution can be added *after* the students complete the pre-activity; OR (2) If undertaking water quality testing with students, you may wish to leave this component until you are ready to interpret and discuss the results (*Section II: Scientific Investigation of Water Quality*).

- ***To avoid creating a finger-pointing activity, discuss with students potential measures that could be undertaken in the community (by water polluters) in order to mitigate impacts to local water sources. Emphasize that water resources need to be managed and protected for a variety of uses. This might be a good opportunity to discuss responsibilities & water management (see *Section II, Appendix C: Water Quality Protection: Whose Responsibility?*)

Multi-media Mapping

- One neat element that would support this activity is having students take **photos** or make **short videos** at the sites visited, which could then be added to the map (particularly if created in a digital media form).
  - *Note*: Some online mapping tools allow for multi-media files to be embedded directly into the software, making it an interactive map that many people can contribute to simultaneously. One example of a user-friendly mapping tool is "Googlemaps," which many students will already be familiar with. Pictures can be annotated on to these maps. Refer also to the list of online mapping tools listed earlier (p.8).
  - If you are a particularly tech-savvy teacher with a class full of Smartphones, there are also mobile apps for doing this in the field!
- Students might also choose to add written pieces (news articles, letters to the editor, poems, *etc*.) to the map, to further contribute to the visualization of water in the community. One project that does this is the ***Great Lakes Commons Map*** (see below).

Note: Clear guidelines should be provided to students if they're going to be taking photos or video in the community. For example, students should be cautioned about getting proper permissions for such things as: accessing private property; and taking photos of water around businesses or other industrial operations (particularly at outflows)

One solution would be to **provide students with a short write-up** explaining the purpose of the project and how the information will be used for educational purposes only. That way, if students run into difficulties, you, the teacher, can be listed as the point of contact for the project.

If students are being asked to perform these activities as homework, some school administrators might see this as a "do-it-yourself" field trip; therefore, similar procedures would need to be followed in order to get **permission for students to complete this as part of the class project**

Great Lakes Commons map (http://www.greatlakescommonsmap.org):
- This is a locally-spearheaded project
- It is an online map that encourages the public to contribute to a collaborative and growing body of knowledge and awareness around the Great Lakes.
- The map is for observations, curiosities, questioning, education/ awareness, storytelling, and much more!
- At the least, it may give students some ideas!
- If your community relies on the Great Lakes as a water source, you may consider making a contribution to this site an assignment for students (or extension activity for advanced students/ classes).

Assessment:
- **Research Process:** How well did students work together (In their team? With other teams?). Did they contribute in a meaningful way to their team's efforts?
- **Team Research Presentation:** How well is the learned information, communicated?
- **Final map:** How well have the students translated the research about distances, locations and facilities onto their map with appropriate use of scale and layout?
- **Journal Reflection:** Have students research and/or reflect on one or more of the <u>Discussion Questions</u> (below).
    - How well have students integrated the information about how water is connected within their community? (*i.e.*, where the water treatment plant is, what role it plays, *etc.*)

<u>Discussion Questions</u>:
- Did you learn anything that *surprised* you (about water in your community)?
- What concerns might we have around getting water from surface sources? Groundwater sources? (*Hint*: focus on issues of availability & contamination)
- How many people rely on the same source as you, for their water?
- Roughly how far is your home from where your water comes from?
    - <u>Surface water</u>: How far is your home from the plant where it is treated?
    - <u>Groundwater</u>: Where is the well you get your water from?
- What can you conclude about the relationships between different sources of water in the community? What observations have you made?

Differentiated Instruction:
- This will vary a lot depending on the process you choose with your students. There are many options for pairing students up and having them work together throughout the research and map-making.
- If you choose to use *(BLM 1.0)* to scaffold and guide the research process, assign tasks according to student skill level and interest. Some questions will prove more difficult to research than others.
- This activity is meant to be executed on whatever scale you desire. This resource is simply meant as a collection of ideas for exploring the topic of "community water" with students, and you may choose to focus in on specific aspects of study, or a particular section of the community mapping concept.

Extension: Storytelling—gathering & sharing stories

Aside from verifying the information gathered during the map-making process, taking students out into the community has the purpose of **forming personal connections to *place***. It is one thing to read about environmental issues in our communities, but quite another to witness them first-hand (especially in places we have formed strong bonds to, whether through memories or other personal connections). The purpose of this activity is to inspire students to share both the information they've learned and stories they've gathered, with others in the community.

Part I: Gathering Stories

Students will be beginning to form a picture of the current 'story' of the watershed. You may want to encourage students to investigate the historical perspective of their local water resources, in order to determine how things came to be in their present state. Learning about the history of an area can provide a

rich context for understanding the current situation (for example: recurring contamination problems in the watershed, or the establishment of community groups to deal with particular watershed issues).

The fastest, and most personal way to collect historical information of this nature is through interviewing members of the community. If you are interested in undertaking an interviewing project with your class, there are some great models that already exist.*

The following *Steps to Getting Started* are based off of a more detailed activity of this nature, found in a resource entitled "Ground Truth Studies: Teacher Handbook" 2nd Ed.* The activity is called "Your Watershed's Story," p.101 (Aspen Global Change Institute, 2003). Refer to this resource for a more detailed description of conducting an interview project with your students.

Steps to Getting Started:

Step 1: As a class, come up with a list of questions you have about the history of water resources in your area.

Step 2: As a class, identify and discuss people/ organizations in your community who may have answers to your questions about the history of the area. For example: seniors in the community; the person(s) responsible for town planning; a First Nations person living in your area; someone involved in a local environmental committee/ organization/ working group; members of a historical society, *etc*.

Step 3: In small groups, brainstorm a list of interview questions you might ask one of these people. Compile all of the ideas. As a whole class, narrow them down to a list of key questions.

Interview questions might include:

- How long have you lived in the area?
- What was the water in our community like when you were our age?
- What are the different *uses* of the water in the community that you have witnessed?
- How has the *land* in the watershed been used during the years that you have lived here?
- What do you think has caused changes in the watershed?
- How do you feel about the changes that you have witnessed?
- What do you think the local water situation will be like in the next ten to twenty years? In fifty years?

Step 4: Practice interview skills in small groups, including how to prompt interviewees for more specific answers.

Step 5: Discuss methods of identifying, contacting, and questioning the people/ organizations listed.

Step 6: Have students arrange to conduct interviews. Be sure to follow proper protocols and safety procedures. During the interview, students should know what to say about the project and answer any questions the interviewees may have.

Step 7: As a culmination of the research, students could be asked to prepare a written report of the interview findings in the form of a feature article for a newspaper, or a chapter in a biography. Students could also illustrate their report with pictures of the watershed as it appeared in the past, or with a cover map of the watershed in the past.

Part II: Sharing Stories

Students may be encouraged to take their learning of 'water in the community' and use it to educate/ inspire others. Students should choose information/ topics that resound with them personally, and may have the choice of several formats for expression. There are many different, creative ways for students to communicate their desired message to the public.

Some examples include:

(1) Becoming a "community reporter"

- *E.g.,* Students write newspaper/ newsletter articles, blog posts, and/or letters to the editor, outlining their learning/ thoughts around water in the community. Tech-savvy students could even be encouraged to create pod-casts or YouTube videos with the same purpose.
- Following up from the interviewing activity outlined above, students could perhaps video or audio record interviews and broadcast them on a YouTube channel or other online medium. Proper permissions would have to be obtained from interviewees, of course!

(2) Becoming a "community supporter"

- *E.g.,* Students engage in public outreach & engagement by volunteering with community groups who are working to improve the health of water in the community. In doing so, students may find that they have ideas for helping to spread the word about the organization's work and mandate. Students may consider fulfilling school-required volunteer hours through their work with local environmental organizations.
  - o As an idea for 'spreading the word,' students may want to create an audio or video public service announcement (PSA). It could concentrate on: promoting the work of the local environmental group; communicating a specific message regarding concerns in the local watershed; and/or what people can do to take positive action! The PSA might be directed at students in the school, or to people in the greater community.
- Students could be encouraged to present their findings about water in the community to the local municipal council. For example, students might prepare a 5-10 minute presentation on the major results of their on-the-ground investigation of the local watershed.
- Students could hold an 'open-house,' showcasing all of the monitoring and investigative work that the class completed to create a profile of water resources in the community. They might invite a number of people from the community, including city counselors and those from non-governmental or governmental groups they contacted for information during the course of their project.

(BLM 1.0) Community Water Map – Class Division of Research Tasks

Research Team #1: _____

Q: What watershed(s) is our community located in?	Research Strategies

• What is a watershed (define)?
• What is the main watershed in our community (name)?* How big is it (*e.g.*, km^2)?
    ○ Find a map showing the watershed & its borders (be sure to record where it came from!)
    ○ Name any sub-watersheds, if relevant
• <u>Who</u> is responsible for maintaining the health of our watershed?
 	
If simpler, choose the watershed in which our school is located.
	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!).
	
	2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information.
	
	3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?
- Is there an **Ontario Conservation Authority** in your region?
  - Search: "Ontario Conservation Authority map."
  - Based on where you are located, figure out who your local Conservation Authority is (if any).
- **Ontario Ministry of the Environment, Great Lakes Watershed Locator**
  - Search: "Ontario Ministry of Environment Great Lakes Watershed Locator"
  - Find out the name of the watershed you live in, as well as neighbouring watersheds
  - Variety of Canada-wide maps showing distribution (*e.g.*, watersheds, hydrogeological regions)
- Consult the **Community Water Profiles** (by County), compiled by the Polaris Institute (<www.polarisinstitute.org/education>)

Research Team #2: _____

Q: Are there historical problems with water in our area (surface and/or groundwater)?	Research Strategies
Surface water • Are there concerns for protecting surface water quality in our area? (*i.e., what can negatively affect it?*) • Can you place any of these "areas of concerns" on the map? ○ *E.g.,* Are there any areas prone to closures (such as beaches in the summertime)? **Groundwater** • Is there any concern related to *natural* contaminants in the groundwater (*e.g.*, arsenic or other metals) • Is there any concern for *unnatural* contamination of groundwater sources (*e.g.*, from farming, industry, *etc.*).	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!). 2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information. 3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?
- Try contacting a local environmental organization in your area for information/ data on historical sources of water pollution.
    - If you don't know of any, start with your Conservation Authority.
- Consult the **Community Water Profiles** (by County), compiled by the Polaris Institute (<www.polarisinstitute.org/education>)
- Is there an **Ontario Conservation Authority** in your region or **local not-for-profit environmental group**?
    - Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any). Your CA should also know of any not-for-profit groups in the area with expertise.
- **Provincial Groundwater Monitoring Network (ON)**
    - Search: "Ontario Provincial Groundwater Monitoring Network:" Interactive map where you can search and view groundwater levels and water chemistry (from monitoring wells across the province)
- **Groundwater Information Network (Canada)**
    - Search: "Canada Groundwater Information Network:" Shows water wells, monitoring sites and aquifers in Canada

Research Team #3: _____

Q: Where does our drinking water come from?	Research Strategies

• How many **sources** are there for drinking water in the community?
    ○ Where are they? (record for mapping purposes)
    ○ Are they surface or groundwater sources?
    ○ Name them (*e.g.,* Lake Ontario, Oak Ridges Moraine Aquifer)
 	
• How much water do we **use** from these sources?
    ○ Record any water use stats you can find—such as how much is used by industry VS. households
	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!).
	
	2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information.
	
	3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?

- Is there a local agency/ commission/ utility responsible for water/ wastewater management? Start here.
- Is there an **Ontario Conservation Authority** in your region or **local not-for-profit environmental group**?
  - Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any). Your CA should also know of any not-for-profit groups in the area with expertise.
- **Drinking Water Ontario**
  - Search: "Municipal Drinking Water Treatment Facilities in Ontario"
  - Access info about local municipal drinking water systems, including: water source; population served; listing of water treatments; water quality report; facility's contact information; *etc*.
- Consult the **Community Water Profiles** (by County), compiled by the Polaris Institute (<www.polarisinstitute.org/education>)

Research Team #4: _____

Q: Where & how is our drinking water treated?	Research Strategies
Water treatment plants • Are there any drinking water treatment plants? If so, how many? ○ Name them and record their location (address or coordinates) • Record any relevant, extra details you find about the water treatment plants (*e.g.*, type of treatment used, amount of water treated each year, location of intake pipes, *etc.*) **(or, for well water…)** • What can you find out about wells in your community? (*e.g., typical depth, common problems with well water, etc.*) • Who is responsible for monitoring and treating well water? How often should monitoring take place?	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!). 2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information. 3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?
• Is there a local agency/ commission/ utility responsible for water/ wastewater management? If yes, start here.
  ○ Work with team #5 to ask about existing maps that show water infrastructure; some utilities may be able to tailor-make a map for the class already showing the location of water treatment facilities and intake/ outflow pipes, for example
• **Drinking Water Ontario**
  ○ In an internet search engine, type in: "Municipal Drinking Water Treatment Facilities in Ontario"
  ○ Access info about local municipal drinking water systems, including: water source; population served; listing of water treatments; water quality report; facility's contact information; *etc*.
• Is there an **Ontario Conservation Authority** in your region or **local not-for-profit environmental group**?
  ○ Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any). Your CA should also know of any not-for-profit groups in the area with expertise.
• **Public Health Ontario**: Go to the heading "Water Testing"—it provides information for well owners related to testing water quality and well/ groundwater protection

Research Team #5: _____

Q: Where & how is our wastewater treated?	Research Strategies

Wastewater treatment plants
• Are there any wastewater treatment plants? If so, how many?
    o Name them and record their location (address or coordinates)
• Record any relevant, extra details you find about the wastewater treatment plants
    o *E.g.*, Type of treatment used: What is the purification process? What pollutants do they take out/ treat? Which are difficult (or impossible) to remove entirely?
    o *E.g.*, Amount of water treated each year, where water goes after it is treated, *etc*.
 	
(or, for other waste management systems…)
• What is the main type of waste management system in our community (*e.g.*, septic systems)
• Who is responsible for ensuring proper maintenance?
	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!).
	
	2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information.
	
	3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?
- Is there a local agency/ commission/ utility responsible for water/ wastewater management?
  - o Work with team #4 to ask about existing maps that show water infrastructure; some utilities may be able to tailor-make a map for the class already showing the location of water treatment facilities and intake/ outflow pipes, for example
- **Safe Drinking Water Foundation**
  - o Search: "Safe Drinking Water Foundation"
  - o Factsheets—on aquifers, groundwater, conventional water treatment, source water protection, treating rural water, wastewater treatment, water pollution, *etc*.
- Is there an **Ontario Conservation Authority** in your region or **local not-for-profit environmental group**?
  - o Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any). Your CA should also know of any not-for-profit groups in the area with expertise.

Research Team #6: _____

Q: How is drinking water quality monitored?	Research Strategies
• How is drinking water quality monitored? Describe the system in place for ensuring safety (*e.g.*, how often, what water quality parameters are tested, *etc.*). o Who is responsible? (Water treatment facilities? Well water?)	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!). 2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information. 3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?
- Is there a local agency/ commission/ utility responsible for water/ wastewater management? If yes, start here.
- Is there an **Ontario Conservation Authority** in your region or **local not-for-profit environmental group**?
  - o Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local ConservationAuthority is (if any). Your CA should also know of any not-for-profit groups in the area with expertise.
- Consult the **Community Water Profiles** (by County), compiled by the Polaris Institute (<www.polarisinstitute.org/education>)
- **Drinking Water Ontario**
  - o In an internet search engine, type in: "Municipal Drinking Water Treatment Facilities in Ontario"
  - o Access info about local municipal drinking water systems, including: water source; population served; listing of water treatments; water quality report; facility's contact information; *etc*.
- **Public Health Ontario**
  - o Go to the heading "Water Testing"—it provides information for well owners related to testing water quality and well/ groundwater protection
- **Safe Drinking Water Foundation**
  - o Factsheets—on aquifers, groundwater, conventional water treatment, source water protection, treating rural water, wastewater treatment, water pollution, *etc*.

Research Team #7: _____

Q: How is surface water quality monitored?	Research Strategies
- How is surface water quality monitored (*e.g.*, for fishing, swimming)? - Who is responsible? - Where does sampling take place? (record the address or coordinates if possible)	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!). 2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information. 3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?

- Is there an **Ontario Conservation Authority** in your region? Start here.
    - Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any)
    - You may find information under "source water protection" strategies/ plans/ maps
- If no Conservation Authority, contact your regional Ministry of <u>Environment & Climate Change</u> and/or <u>Natural Resources & Forestry</u> office (Government of Ontario)
- Consult the **Community Water Profiles** (by County), compiled by the Polaris Institute (<<u>www.polarisinstitute.org/education</u>>)
- **Provincial Water Quality Monitoring Network** (Ontario-wide stream monitoring database)
- **Safe Drinking Water Foundation**
    - <u>Factsheets</u>—on aquifers, groundwater, conventional water treatment, source water protection, treating rural water, wastewater treatment, water pollution, *etc*.

Research Team #8: _____

Q: How are drinking water sources protected?	Research Strategies
- What is "source water protection"? (define) - Who is responsible (in our community)? - What are the major focuses of source water protection plans in our region? - Find a map of the source water protection area for our drinking water source(s)	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!). 2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information. 3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?

- Is there an **Ontario Conservation Authority** in your region? Start here.
    - Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any)
    - You may find information under "source water protection" strategies/ plans/ maps
- If no Conservation Authority, contact your regional Ministry of Environment & Climate Change and/or Natural Resources & Forestry office (Government of Ontario)
- Consult the **Community Water Profiles** (by County), compiled by the Polaris Institute (<www.polarisinstitute.org/education>)
- **Safe Drinking Water Foundation**
    - Factsheets—on aquifers, groundwater, conventional water treatment, source water protection, treating rural water, wastewater treatment, water pollution, *etc*.

Research Team #9: _____

Q: How is storm water collected and where does it goes?	Research Strategies
- What is stormwater? (define) - Why does it cause pollution? - Who is responsible for managing storm water runoff in our community? (department or agency) - Where does the run-off go? Is it treated? - Are there any problems during high rainfall events or snowmelt in spring? If yes, how do water managers prepare for these issues? - What are some examples of how communities and individuals can prevent stormwater runoff? Briefly describe.	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!). 2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information. 3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?

- Contact your municipal town/ city office to see if they have a department that manages stormwater
- Is there a local agency/ commission/ utility responsible for water/ wastewater management? If yes, contact someone who works on sanitary sewers
- Is there an **Ontario Conservation Authority** in your region?
  - Search: "Ontario Conservation Authority map." Based on where you are located, figure out who your local Conservation Authority is (if any)
- RAIN program (Green Communities Canada): <http://greencommunitiescanada.org/programs/rain/>
  - Learn about strategies for preventing stormwater runoff

Research Team #10: _____

Q: Who uses the *most* water in our area & how might they impact water quality?	Research Strategies

• In our community, are there: golf courses, industrial/ manufacturing plants, large companies/ office buildings, agricultural operations (farms), mining/ quarry projects, and/or hydroelectric generating stations (dams)?
   o Do they have permits to withdraw water?
      ▪ If yes, how much water are they permitted to take?
   o Where are they located on the map?
• Which might also have an impact on water quality?
   o *E.g.*, How close are these to local waterways? What type(s) of pollution might be of concern?
	1. Consult the websites & record useful information. Be sure to note the page and/or URL where the info was found (you must be able to later cite your source!).
	
	2. For more detailed inquiries, contact the person responsible for education/ outreach/ communications (by phone or email). Introduce yourself and explain the project. Be sure to record the name of the person, their position/ place of work, the date of your communication, and their contact information.
	
	3. If you hit a "dead end," contact your municipal town/ city office to see where you can get the information you require.

Where to start?

- Try the Ontario Ministry of the Environment interactive map where you can search permits to take water in your local area.
- The Ontario Environmental Registry lists permits issued for taking 50,000 (or more) litres of water per day
  - <www.ebr.gov.on.ca/ERS-WEB-External/>
  - Enter site, then hit "search" (not "basic search"); in the section labeled "with all the words," type in *water permit*. Scroll down to "Geographic Location Filters" and under "Location name," enter your community (*e.g.* Kingston). Note: You don't need to add the province, as this database is Ontario-specific! *Be sure to click on the circle beside this label to activate the search parameter.*
- Consult the **Community Water Profiles**, compiled by the Polaris Institute (<www.polarisinstitute.org/education>)
  - Lists major water takers in the County; source of information for assessing contributors to water pollution
  - Lists local environmental groups* with an interest in water protection (*many of these groups are a wealth of knowledge)
- Type the name of the large water users into "Google." Find their address & plot accordingly on your map (if you are able).

(BLM 1.1) Community Water Map – Individual Student Research (p. 1 of 2)

Surface water

Where does your drinking water come from?	Where to start?
1. *Ask at home:* does our water come from a local treatment plant or a private well? ***If private well, go to** *(BLM 1.1)* **2.** If water treatment plant, find out where the water comes from (groundwater or surface water?) **3.** If surface water, what is the *name* of the source? (*e.g.*, Lake Ontario)	**For questions 2 & 3, try the following resources for information:** • Local utilities agency or commission • Ontario Conservation Authority (which one is responsible for your region?) • Drinking Water Ontario (*for information on municipal drinking water treatment facilities*) • Community Water Profiles (by County), compiled by the Polaris Institute
Where is your water treated?	**Where to start?**
4. Where is the facility where your drinking water is treated—at home? At school? **5.** How many water treatment plans are there in your town/ city? Where are they located?	• Local utilities agency or commission • Drinking Water Ontario (*for information on municipal drinking water treatment facilities*) • Ontario Conservation Authority (which one is responsible for your region?)
Where is surface water quality monitored?	**Where to start?**
6a. For drinking water ? **6b.** For fishing? **6c.** For swimming?	*For these more detailed questions, try:* • Local utilities agency or commission • Ontario Conservation Authority *One of these places should be able to point you in the right direction!
Where is your wastewater treated?	**Where to start?**
7. *Ask at home***:** do we have a septic system, or are we hooked up to the town/ city sewer? **If on the city sewer, continue with #8 & 9. If on a septic system, continue to #10.* **8.** Where is the facility where your wastewater is treated—at home? At school? **9.** How many wastewater treatment plants are there in your town/ city? Where are they located?	**For questions 8 & 9:** • Call or email your municipal town/ city office to see where you can get this information

Surface water

Who uses the *most* water in your area?	Where to start?
10a. Are there golf courses, industrial/ manufacturing plants, large companies or agricultural operations (farms), mining/ quarry projects, hydroelectric generating stations (dams), *etc.*? **10b.** Where are these located on the map? Can you assign an area to them, or do they take water from all over?	**For question 10a:** 1) Try the Ontario Ministry of the Environment interactive map (link) where you can search permits to take water in your local area. 2) The Ontario Environmental Registry* (link) lists permits issued for taking 50,000 (or more) litres of water per day ***Instructions:** Enter site, then hit "search" (not "basic search"); in the section labeled "with all the words," type in *water permit*. Scroll down to "Geographic Location Filters" and under "Location name," enter your community (*e.g.* Kingston). <u>Note</u>: You don't need to add the province, as this database is Ontario-specific! *Be sure to click on the circle beside this label to activate the search parameter.* **For question 10b:** Type in the name of the large water users into "Google." Find their address & plot accordingly on your map (if you are able).
Which areas of the community are at *higher risk* for water pollution?	**Where to start?**
11. Consider the large water users in your area. How is their wastewater dealt with? **12.** What are common causes of "non-point*" source water pollution in your community? ***Non-point source pollution:** Pollution is contributed to the water source from a wide variety of places in the watershed. This can happen when water running over non-permeable surfaces such as pavement and concrete picks up pollutants along the way (*e.g.* oil/gas, dog poop, litter, chemicals, *etc.*)	**For question 11:** The Polaris Institute's Community Water Profiles (www.polarisinstitute.org/education) provide a source of information for assessing contributors to water pollution. **For question 12:** Try contacting a local environmental organization in your area for information/ data on historical sources of water pollution. If you don't know of any of these organizations, start with your Conservation Authority.

Groundwater

Where does your drinking water come from?	Where to start?
1. *Ask at home***:** does our water come from a local treatment plant or a private well? ***If water treatment plant, go to** *(BLM 1.0)*	• If desired, you could try to find out more about your local aquifer. Start with your Conservation Authority or a local environmental group that works on watershed issues • Another resource is the <u>Groundwater Information Network</u> (link)
How is your water treated (if at all)?	**Where to start?**
2. *Ask at home***:** do we treat our tap water with anything before we drink it?	• Sometimes well-water is found to be 'hard' or 'soft,' and people will treat their water for this in different ways • Other filtration or bacterial protection measures may also be necessary • The <u>Provincial Groundwater Monitoring Network</u> (link) may be able to provide more information on groundwater quality in your area
How is your groundwater quality monitored? Who is responsible?	**Where to start?**
3. *Ask at home***:** how often do we test our well water quality?	• Consult <u>Public Health Ontario</u> (link) for information on testing your well water quality and groundwater protection
Where is your wastewater treated?	**Where to start?**
4. *Ask at home*: do we have a septic system, or are we hooked up to the town/ city sewer? **If on the city sewer, continue with #5 & 6. If on a septic system, continue to #7.* **5.** Where is the facility where your wastewater is treated—at home? At school? **6.** How many wastewater treatment plants are there in your town/ city? Where are they located?	**For questions 5 & 6:** • Call or email your municipal town/ city office to see where you can get this information

(BLM 1.2) Community Water Map – Individual Student Research p. 2 of 2

Groundwater

Who uses the *most* water in your area?	Where to start?
7a. Are there golf courses, industrial/ manufacturing plants, large companies or agricultural operations (farms), mining/ quarry projects, hydroelectric generating stations (dams), *etc.*? **7b.** Where are these located on the map? Can you assign an area to them, or do they take water from all over? Are they likely to rely on the same groundwater source you do?	**For question 7a:** 1) Try the <u>Ontario Ministry of the Environment interactive map</u> (link) where you can search permits to take water in your local area. 2) The <u>Ontario Environmental Registry</u>* (link) lists permits issues for taking 50,000 (or more) litres of water per day **<u>*Instructions:</u>** Enter site, then hit "search" (not "basic search"); in the section labeled "with all the words," type in *water permit*. Scroll down to "Geographic Location Filters" and under "Location name," enter your community (*e.g. Kingston*). <u>Note</u>: You don't need to add the province, as this database is Ontario-specific! *Be sure to click on the circle beside this label to activate the search parameter.* **For question 7b:** Type in the name of the large water users into "Google." Find their address & plot accordingly on your map (if you are able).
Which areas of the community are at *higher risk* for water pollution?	**Where to start?**
8. Consider the large water users in your area. How is their wastewater dealt with? **9.** What are common causes of "non-point*" source water pollution in your community? ***Non-point source pollution:** Pollution is contributed to the water source from a wide variety of places in the watershed. This can happen when water running over non-permeable surfaces such as pavement and concrete picks up pollutants along the way (*e.g.* oil/gas, dog poop, litter, chemicals, *etc.*)	**For question 8:** The Polaris Institute's Community Water Profiles (<u>www.polarisinstitute.org/education</u>) provide a source of information for assessing contributors to water pollution. **For question 9:** Try contacting a local environmental organization in your area for information/ data on historical sources of water pollution. If you don't know of any, start with your Conservation Authority.

Acknowledgements

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Appendix A: Curriculum Expectations

Science (Gr.9), SNC1D – <u>academic</u>

Strand A: Scientific Investigation Skills
A. Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating)

Strand B: Biology – Sustainable Ecosystems

B1: Assess the impact of human activities on the sustainability of terrestrial and/or aquatic ecosystems, and evaluate the effectiveness of courses of action intended to remedy or mitigate negative impacts;

B2: Investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems;

B3: Demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems

Science (Gr.9), SNC1P – <u>applied</u>

Strand A: Scientific Investigation Skills
A. Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating)

Strand B: Biology – Sustainable Ecosystems

B1: Analyse the impact of human activity on terrestrial or aquatic ecosystems, and assess the effectiveness of selected initiatives related to environmental sustainability;

B2: Investigate some factors related to human activity that affect terrestrial or aquatic ecosystems, and describe the consequences that these factors have for the sustainability of these ecosystems;

B3: Demonstrate an understanding of characteristics of terrestrial and aquatic ecosystems, the interdependence within and between ecosystems, and the impact humans have on the sustainability of these ecosystems

Environmental Science (Gr.11), SVN3M – <u>university/college preparation</u>

Strand B: Scientific Solutions to Contemporary Environmental Challenges

B2: Investigate a range of perspectives that have contributed to scientific knowledge about the environment, and how scientific knowledge and procedures are applied to address contemporary environmental problems

Strand C: Human Health & the Environment

C2: Investigate environmental factors that can affect human health, and analyse related data

Environmental Science (Gr.11), SVN3E – <u>workplace preparation</u>

Strand B: Human Impact on the Environment

B2: Investigate air, soil, and water quality in natural and disturbed environments, using appropriate technology

B3: Demonstrate an understanding of some of the ways in which human activities affect the environment and how the impact of those activities is measured and monitored

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Strand C: Human Health & the Environment

C3: Demonstrate an understanding of the ways in which environmental factors can affect human health

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Strand E: Natural Resource Science & Management

E3: Demonstrate an understanding of the sustainable use of resources and its relationship to the biodiversity and sustainability of ecosystems

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Note re: curriculum

Although designed to meet expectations from the Gr.9 Science: Biology, *Sustainable Ecosystems* strand of the Ontario secondary school curriculum (2008), this resource may also provide useful activities for geography courses (see Activity __: Community Water Map), as well as Gr.11 Environmental Science.

This package was designed as a progression of learning activities that build on one another, but activities can also be taken and used as stand-alone resources.

Appendix B: Engaging Students in Action Projects

There are several good reasons for engaging your students in action projects. For example:
- They cater to different learning styles (because they are experiential in nature)
- They offer relevant and meaningful learning opportunities (which is motivating for students)
- These projects allow students to relate to the trans-disciplinary nature of real-world issues, and encourage holistic thinking and problem-solving[1]

Learning for a Sustainable Future (LSF) has created a guide for educators entitled: "Engaging Students in Sustainable Action Projects." It can be accessed via LSF's *Resources for Rethinking* website: <http://resources4rethinking.ca/en/professional-development/resources>. The document outlines 12 steps for facilitating the creation of meaningful action projects with your students.

One of these steps outlines how to **facilitate choosing a project idea** with students. The guide also makes available a 9-page **Project Planning Template**, which takes students through a step-by-step thought process for designing the most effective action project (using their initial project idea). Another step in the guide addresses **building motivation** for student engagement in the project. It involves exercises for exploring the diverse reasons for students to care about something, as well as activities for exploring the difference between emotional and rational responses to an issue.

There are various types of action projects students can engage in. Some examples include:
- Projects to **educate and inform** (often with the intent to **persuade others** to initiate change)
- Projects for **political or civic action** (and/or to **influence policy**)
- Projects that **support the needs of organizations** (already working for change)

Common Types of Action Projects

Educate/ inform/ persuade
- Awareness campaigns (*e.g.,* posters/ pamphlets, videos, public service announcements, advertisements, school fairs, *etc.*)
- Community education programs (*e.g.,* workshops, presentations, special events, *etc.*)
- Written communication (*e.g.,* newspaper articles, letters to the editor, short stories, poems, *etc.*)
- Oral communication (*e.g.,* plays, street theatre, public debates, mock town halls, *etc.*)

Political/ civic action & public policy
- Meeting with elected officials
- Speaking at public meetings or hearings (*e.g.*, making presentations to city hall or town council)
- Circulating petitions
- Supporting political candidates (*e.g.*, volunteering with a campaign)
- Engaging in peaceful dissent (*e.g.*, parades with protest signs, gatherings in public places [with a permit], *etc.*)

Supporting "change-maker" organizations
- Assisting with community clean-ups
- Engaging in citizen science monitoring projects
- Beautification projects (*e.g.*, tree plantings, public space naturalizations)

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[1] Burgess, Terry. (2003). *Engaging Students in Sustainable Action Projects*. Learning for a Sustainable Future <http://resources4rethinking.ca/en/professional-development/resources>