



## COURSE OUTLINE: NET305 - SOURCE WATER PROTECT

Prepared: Lynn Goulding

Approved: Sherri Smith, Chair, Natural Environment, Business, Design and Culinary

<b>Course Code: Title</b>	NET305: SOURCE WATER PROTECTION
<b>Program Number: Name</b>	5221: NAT ENVIRONMENT TY
<b>Department:</b>	NATURAL RESOURCES PRG
<b>Academic Year:</b>	2022-2023
<b>Course Description:</b>	This course gives students the tools to answer the call for action to protect our globally dwindling fresh water supplies. Students will be introduced to source water protection plans as a means of protecting drinking water sources. The basic hydrology of surface water and groundwater supplies will be discussed. Threats to water quantity and quality will be examined, as well as methods of contamination. Students will learn the steps involved in developing source water protection plans and their implementation. The role of government in source water protection of source water will be discussed from a Canadian perspective. Students will apply their knowledge by tackling a local source water issue and implementing a solution.
<b>Total Credits:</b>	3
<b>Hours/Week:</b>	3
<b>Total Hours:</b>	42
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Vocational Learning Outcomes (VLO's) addressed in this course:</b>	<b>5221 - NAT ENVIRONMENT TY</b>
<b>Please refer to program web page for a complete listing of program outcomes where applicable.</b>	VLO 1 Collect, analyze, interpret and report on data from representative biological and environmental samples.
	VLO 2 Utilize natural resources information technology equipment to assemble, analyze and present identified ecosystem components for purposes of conserving and managing natural resources.
	VLO 3 Apply the basic concepts of science to natural resource conservation and management.
	VLO 6 Practice principles and ethics associated with natural resource conservation and management issues.
	VLO 7 Ensure all work is safely completed in adherence to occupational health and safety standards.
	VLO 8 Contribute to the development, implementation and maintenance of environmental management systems.
	VLO 9 Provide ongoing support for project management.
	VLO 10 Communicate technical information accurately and effectively in oral, written, visual and electronic forms.
	VLO 11 Develop and present strategies for ongoing personal and professional development to enhance performance as an environmental technologist.



<b>Essential Employability Skills (EES) addressed in this course:</b>	<p>EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.</p> <p>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>EES 3 Execute mathematical operations accurately.</p> <p>EES 4 Apply a systematic approach to solve problems.</p> <p>EES 5 Use a variety of thinking skills to anticipate and solve problems.</p> <p>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 10 Manage the use of time and other resources to complete projects.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>								
<b>General Education Themes:</b>	Science and Technology								
<b>Course Evaluation:</b>	<p>Passing Grade: 50%, D</p> <p>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.</p>								
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	Academic success is directly linked to attendance. Missing more than 1/3 of course hours in a semester shall result in an F Grade for the course.								
<b>Course Outcomes and Learning Objectives:</b>	<table border="1"> <thead> <tr> <th>Course Outcome 1</th> <th>Learning Objectives for Course Outcome 1</th> </tr> </thead> <tbody> <tr> <td>1. Understand the concepts of source water protection as the first step in a multi-barrier approach to protecting water resources and the delivery of safe drinking water.</td> <td>           1.1 Identify various sources for drinking water, their unique characteristics and reasons to protect source water            1.2 Recognize the various types of waterborne illnesses            1.3 Study the Walkerton Tragedy and understand the systemic causes by reviewing the Walkerton Inquiry Report         </td> </tr> <tr> <th>Course Outcome 2</th> <th>Learning Objectives for Course Outcome 2</th> </tr> <tr> <td>2. Apply the basics of hydrology and hydrogeology to understand surface water and groundwater supply models and water budgeting.</td> <td>           2.1 Comprehend the hydrologic cycle and hydrology            2.2 Learn about the 5 subdivisions of hydrology and the supporting sciences and management            2.3 Connect the impact of surface runoff, evaporation, transpiration and interception storage to source water            2.4 Distinguish the differences between various types of hydrogeological formations for source water storage            2.5 Know the importance of a water budget and its purpose in protecting source water            2.6 Identify the data required to calculate an accurate water budget         </td> </tr> </tbody> </table>	Course Outcome 1	Learning Objectives for Course Outcome 1	1. Understand the concepts of source water protection as the first step in a multi-barrier approach to protecting water resources and the delivery of safe drinking water.	1.1 Identify various sources for drinking water, their unique characteristics and reasons to protect source water 1.2 Recognize the various types of waterborne illnesses 1.3 Study the Walkerton Tragedy and understand the systemic causes by reviewing the Walkerton Inquiry Report	Course Outcome 2	Learning Objectives for Course Outcome 2	2. Apply the basics of hydrology and hydrogeology to understand surface water and groundwater supply models and water budgeting.	2.1 Comprehend the hydrologic cycle and hydrology 2.2 Learn about the 5 subdivisions of hydrology and the supporting sciences and management 2.3 Connect the impact of surface runoff, evaporation, transpiration and interception storage to source water 2.4 Distinguish the differences between various types of hydrogeological formations for source water storage 2.5 Know the importance of a water budget and its purpose in protecting source water 2.6 Identify the data required to calculate an accurate water budget
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	<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
	3. Explain the key water quality characteristics used to evaluate the safety of drinking water and demonstrate how they are measured.	3.1 Examine the basic requirements of Ontario Well Regulations as they pertain to well operations 3.2 Define the types of wells and their components including geologic structure, terminology and construction 3.3 Understand the impacts of Groundwater Under the Direct Influence of Surface Water (GUDI) 3.4 Study the operational guidelines of turbidity, colour, taste and odour for safe drinking water
	<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
	4. Identify different types of contaminants and methods of contamination which threaten source water quality	4.1 Recognize the health risks associated with microorganisms in drinking water 4.2 Describe water pathogens and indicator organisms 4.3 Identify various chemical parameters and concentrations that affect the quality of drinking water 4.4 Compare the differences between point and non-point source contaminants
	<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
	5. Explain the steps involved in developing a Source Water Protection Plan.	5.1 Review local Source Water Protection Plans to understand their various components 5.2 Identify the planning area based on the watershed approach 5.3 Comprehend what a Significant Threat Inventory is and how it contributes to an effective Source Water Protection Plan 5.4 Review the variables in estimating future water demand
	<b>Course Outcome 6</b>	<b>Learning Objectives for Course Outcome 6</b>
	6. Understand the concepts involved in mitigating hydrologic impact including prevention, pollution control and monitoring.	6.1 Investigate various forms of prescribed instruments for the protection of ground and surface water
<b>Course Outcome 7</b>	<b>Learning Objectives for Course Outcome 7</b>	
7. Utilize problem solving skills to resolve local source water threats.	7.1 Critically evaluate Case Studies to identify source water threats and possibilities for remediation	
<b>Course Outcome 8</b>	<b>Learning Objectives for Course Outcome 8</b>	
8. Understand the global water supply and the future predictions of escalating issues surrounding water quantity and quality.	8.1 Examine the impacts of climate change and global warming on source water 8.2 Identify how water quality is affected in an environment where mean temperatures are increasing 8.3 Investigate water supply response measures that address water supply, quality and habitat 8.4 Identify how climate change can be incorporated into Drinking Water Source Protection Plans	

**Evaluation Process and Grading System:**

Evaluation Type	Evaluation Weight
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	Class Assignments	15%
	Term Project	25%
	Tests (3)	60%

**Date:** June 30, 2022

**Addendum:** Please refer to the course outline addendum on the Learning Management System for further information.