ROVe
the GREAT LAKES

Teacher's Guide

ROVe the Great Lakes

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ROVe

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Teacher's Guide

CONTENTS

Website with all lesson plans and supporting materials
go.wisc.edu/ROV2

SUMMARY

BRIEF DESCRIPTION

Students will explore Great Lakes maritime vocabulary; maneuver a remotely operated vehicle (ROV); enhance their communication skills through information gathering, presentation and creative writing opportunities; and learn about various careers, particularly maritime archaeology, that use remotely operated vehicles.

KEYWORDS

Middle school science, high school science, Wisconsin Sea Grant, Great Lakes maritime history, Great Lakes shipwrecks, claims and supporting evidence, career pathways

TEACHING AREAS

Literacy, social studies, science

GRADES

6-10

DAILY DESCRIPTIONS
5-DAY UNIT PLAN

Day 1: Students will answer true/false questions to evaluate prior knowledge of Great Lakes and maritime vocabulary. They will then read a fictional text of a Great Lakes schooner voyage that introduces maritime-related vocabulary and complete vocabulary connection activities. Teacher will overview a short research project to determine the meaning of words and phrases as they are used in a text, and students will complete the project.

Day 2: Students will share the results of their research activity via PowerPoint presentations. Students will be introduced to the Trident, a remotely operated vehicle.

Day 3: Students will operate the Trident to collect "evidence" that will provide a foundational understanding of the opportunities and challenges associated with conducting maritime archaeology. This "evidence" may be used to determine and defend a claim upon which students may choose to write a narrative on day five.

Day 4: Teacher introduces maritime archaeology as a profession that uses evidence to investigate shipwrecks and other historical events within a water environment. Students are introduced to a maritime archaeologist and the Antelope, a schooner that sunk in Lake Superior in 1897. Students compare using an ROV in a pool environment versus real-world maritime archaeology conducted within the Great Lakes.

Day 5: Students support a claim with logical reasoning by writing a creative narrative, play script or series of illustrations with captions. The written piece uses description of imagined experiences and events to determine and defend a claim regarding the fate of a fictional 19th century schooner (i.e., complete the story "The Moonrise: A Fictional Account of a Great Lakes Voyage" read on day one). Alternatively, students can choose to support a claim with logical reasoning by writing a narrative that compares and contrasts how the conditions of a pool environment and conditions found within Lake Superior (or another Great Lake of the student's choice) affect the type of "evidence" that may be acquired and the corresponding results of a "maritime archaeology" investigation. Students will peer edit the creative narrative of a classmate. The teacher will reinforce that there are many possible conclusions to the fictional story, including the possibility that the Moonrise did not sink but rather became "a rescue ship." This claim/evidence model will reinforce that a central focus of a marine archaeologist's work is the use of all clues when putting forward a hypothesis about historical events.

3-DAY UNIT PLAN

Day 1: Students will answer true/false questions to evaluate prior knowledge of Great Lakes and maritime vocabulary. Students will be introduced to a remotely operated vehicle (ROV): what it is, how it is used and how to operate it.

Day 2: Students will operate the Trident, an ROV, to collect "evidence" that will provide a foundational understanding of the opportunities and challenges associated with conducting maritime archaeology.

Day 3: Students will be introduced to the Antelope, a Great Lakes shipwreck, and use critical thinking skills to interpret video footage and learn about various careers, particularly maritime archaeology, that use remotely operated vehicles.

BUILD YOUR OWN UNIT PLAN

ACTIVITY	TIME NEEDED
Great Lakes True or False	10 minutes
Introduction to Shipwrecks and "The Moonrise: A Fictional Great Lakes Voyage"	20 minutes
Introduce Research Activity	5 minutes
Small Group Research Activity and Presentation Preparation	20 minutes
Extension Activity: Reflective Dictionary	15 minutes
Review Note-Taking Requirements	5 minutes
Small Group Presentations	30 minutes
Overview of ROVs, the Trident and Trident Operation	10 minutes
Overview of Simulated Maritime Archaeologist with an ROV Activity	5 minutes
Trident Behavior Form Overview and Signature	5 minutes
Trident Set-up and Reminder Regarding Student Responsibilities	5 minutes
Demonstration of How to Navigate the Trident	5 minutes
Demonstration of How to Record "Evidence" in the Trident Data Points Log	5 minutes
Students Navigate the Trident and Record "Evidence"	35 minutes
What Can ROVs Be Used for and What Are Some Concerns?/Student Reflection Discussion	15 minutes
Introduce Maritime Archaeology and Archaeologist	15 minutes
Introduce the Antelope: A Lake Superior Shipwreck	15 minutes
Comparing and Contrasting: Pool vs. Great Lakes Maritime Archaeology	10 minutes
Antelope Summary Sheet	20 minutes
Overview of Writing a Claim-Based and Evidence-Based Narrative	10 minutes
Students Write a Claim-Based and Evidence-Based Narrative	25 minutes
Sample Moonrise Completion Narrative to Edit	5 minutes
Students Peer Edit	10 minutes
Unit Wrap-Up—Claim and Evidence	5 minutes

MATERIALS

MATERIALS SUPPLIED

- ☐ Trident, a remotely operated vehicle
- ☐ Trident Controller
- ☐ Laminated Trident Controller image
- ☐ Trident Quick Start Guide
- ☐ Trident Operation Manual
- ☐ Trident battery and charger
- ☐ 25-foot Tether
- ☐ Can of compressed air
- ☐ Can of silicone spray
- ☐ Moonrise banner

MATERIALS NEEDED

- ☐ Computer
- ☐ LCD projector
- ☐ 1:1 Devices for students
- ☐ Access to pool (or use the classroom option)
- ☐ Five cloths or towels
- ☐ Easel
- ☐ Enlarged images from banner
- ☐ Safety tape or cones for pool deck

Website with all lesson plans and supporting materials
go.wisc.edu/ROV2

LESSON OUTLINES

DAY ONE: INTRODUCTION TO THE GREAT LAKES
Full Day One Lesson Plan ↗

SUMMARY
1. Answer true or false questions to evaluate prior knowledge.

2. Read the fictional story of the Moonrise and note unfamiliar vocabulary words.

3. Complete a research activity and prepare a presentation.

Learning objectives

I can identify several features of the Great Lakes.

I can comprehend a fictional narrative and gather information about topics related to the Great Lakes in the 1880s.

CLASSROOM NEEDS
☐ Computer and LCD projector

☐ 1:1 Devices

DOCUMENTS
Green number links to online document.

For students

☐ Great Lakes True or False **1**

☐ The Moonrise: A Fictional Account of a Great Lakes Voyage **3**

☐ Research Activity and Rubrics **6**

☐ Research Presentation Template (PowerPoint) **7**

For educator

- ☐ Great Lakes True or False Answer Key **1**
- ☐ Great Lakes True or False for Display (PowerPoint) **2**
- ☐ The Moonrise: A Fictional Narrative with Vocabulary Annotated **4**
- ☐ The Moonrise: A Fictional Narrative Vocabulary List **5**

Extension

- ☐ Shipwreck Bibliography **8**
- ☐ Reflective Dictionary **9**

LESSON

For a complete guide for teaching this lesson, see the <u>full day one lesson plan</u>.

Background Knowledge (10 min.)
- Have students answer Great Lakes true or false questions.
- Ask them to pair share their responses.

Guided and Independent Practice (45 min.)
- Introduce shipwrecks.
- Read "The Moonrise: A Fictional Account of a Great Lakes Voyage" and have students highlight unfamiliar words.
- Place students in groups of 2-3 (for the duration of the week).
- Assign students research topics (or have them choose).
- Ask students to research their topics and prepare a presentation to present to the class on the next day.
- **Extension:** Shipwreck Bibliography, Reflective Dictionary

LESSON SUPPORTS
- Audio file of The Moonrise: A Fictional Account of a Great Lakes Voyage is available. ↗
- Group work (students who are higher performing can work with lower-performing students).
- Students with modified assignments will be assigned some of the easier topics (e.g., smallpox, Great Lakes specifications).
- Students with modified assignments will be assessed with the modified rubric.

ASSESSMENT

Teacher assesses progress on research activity and development of PowerPoint presentation.

DAY TWO: STUDENT PRESENTATIONS AND INTRODUCTION TO THE TRIDENT (ROV)
Full Day Two Lesson Plan ↗

SUMMARY

1. Students present their research.

2. Students are introduced to the Trident, a remotely operated vehicle (ROV).

Learning objectives

I can convey information I have gathered to others in a comprehensible way.

I can summarize information that was shared with me.

I can explain how an underwater ROV operates.

CLASSROOM NEEDS

☐ Computer and LCD projector

☐ Trident, Controller and Tether

DOCUMENTS

Green number links to online document.

For students

☐ Research Activity Rubric **6**

☐ Note-Taking Handout **10**

☐ Trident Controller Diagram **11**

☐ Sketch of Ship **14**

☐ Trident Data Points Log **15**

☐ Trident Behavior Expectations Form **16**

For educator

☐ Trident Controller Diagram Answer Key **11**

☐ Trident Quick Start Guide **12**

☐ Trident Operation Manual **13**

☐ Trident Data Points Log Answer Key **15**

Extension

☐ Reflective Dictionary **9**

LESSON

For a complete guide for teaching this lesson, see the full day 2 lesson plan.

Guided Practice (5 min.)
- Review presentation and note-taking requirements.

Independent Practice (30 min.)
- Have students give presentations.

- Ask students to self-reflect on their presentations.

Guided Practice (10 min.)
- Discussion: What do you know about remotely operated vehicles?

- Introduce the Trident with video.

- Show the Trident's Controller, camera, propellers, battery and Tether.

Guided Practice (10 min.)
- Introduce the use of the Trident to relate to the fictional story of the Moonrise.

- Explain the process of exploring the banner with the Trident.

- Make the behavior expectations at the pool clear; have students sign the behavior expectations form.

- **Extension:** Pair share reflective dictionaries.

LESSON SUPPORTS

- Group work (students who are higher performing can work with lower-performing students).

- Note-Taking Handout is designed to support listening and summarizing skills.

- Students with modified assignments will be assessed with the modified rubric.

ASSESSMENT

- Completed Note-Taking Handout for each presentation.
- Completed Research Activity Rubric.

DAY THREE: SIMULATED MARITIME ARCHAEOLOGY WITH AN ROV
Full Day Three Lesson Plan ⬈

SUMMARY
Students will operate an ROV to collect "evidence."

Learning objectives

I can operate an ROV under controlled conditions while exploring for and analyzing "evidence."

I can engage in a collaborative discussion, making connections between the "evidence" found during a simulated maritime archaeology activity and my prior knowledge of "The Moonrise: A Fictional Account of a Great Lakes Voyage."

CLASSROOM NEEDS
- ☐ Pool
- ☐ Trident, Controller and Tether
- ☐ Banner
- ☐ Easel
- ☐ Safety tape or cones for pool deck
- ☐ Compressed air or silicone spray
- ☐ Cloths or towels

DOCUMENTS
Green number links to online document.

For students
- ☐ The Moonrise: A Fictional Account of a Great Lakes Voyage **3**
- ☐ Sketch of Ship **14**
- ☐ Trident Data Points Log **15**

For educator
- ☐ Trident Controller Diagram Answer Key **11**
- ☐ Trident Quick Start Guide **12**
- ☐ Trident Operation Manual **13**
- ☐ Sketch of Ship Answer Key **14**
- ☐ Trident Data Points Log Answer Key **15**
- ☐ Enlarged Images from Banner **17**

LESSON

For a complete guide for teaching this lesson, see the <u>full day 3 lesson plan</u>.

(Before class) Prepare pool area for students. Complete the steps in the Trident Quick Start Guide (e.g., charge the Trident and the Controller).

Note: Classroom option for lesson adaption for use without pool is available as a separate file. **18**

Guided Practice (15 min.)
- Review behavior expectations.

- Demonstrate operation of ROV to collect "evidence."

- Demonstrate how to record "evidence" (data points).

- Model discussion of what the "evidence" may mean.

Independent Practice (remainder of class period)
- Groups take turns gathering "evidence" with the Trident.

- Groups discuss what conclusions they can draw from the data points.

LESSON SUPPORT
- Group work (higher-performing students can work with lower-performing students).

ASSESSMENT
- Completed Trident Data Points Log.

DAY FOUR: INTRODUCTION TO GREAT LAKES MARITIME ARCHAEOLOGY, THE ANTELOPE
Full Day Four Lesson Plan ⬈

SUMMARY

1. Introduction of maritime archaeology as a profession.

2. Exploration of unintended consequences of ROV technology.

4. Exploration of the Antelope, a Great Lakes shipwreck in Lake Superior.

3. Discussion of similarities and differences in using an ROV in a pool versus real-world conditions.

Learning objectives

I can describe some of the responsibilities/duties of a maritime archaeologist.

I can identify various uses for underwater ROV technology and possible unintended consequences of underwater ROV use.

I can compare and contrast use of ROV technology in a pool and a Great Lake.

CLASSROOM NEEDS

☐ Computer and LCD projector

DOCUMENTS

Green number links to online document.

For students

☐ Comparing and Contrasting: Pool vs. Great Lakes Maritime Archaeology **19**

For educator

☐ Antelope Images for Display (PowerPoint) **20**

☐ ROV Footage of Antelope Shipwreck video **21**

☐ Video of maritime archaeologist **22**

Extension

☐ Antelope Research Resources **23**

☐ Antelope Summary Sheet **24**

LESSON

For a complete guide for teaching this lesson, see the full day 4 lesson plan.

Guided and Independent Practice (15 min.)
- Discuss ways an ROV could be used with the class.

- Have the class list intended and unintended consequences of using an ROV.

Maritime Archaeology with Guided and Independent Practice (15 min.)
- Introduce a real maritime archaeologist (video).

- Ask the class to reflect on additional positive and negative consequences identified by the maritime archaeologist.

Guided and Independent Practice (25 min.)
- Introduce the Antelope by sharing images and watching "The Antelope: What Do You See?" and/or "The Antelope: What Does a Maritime Achaeologist See?" video/s.

- Have students complete the Comparing and Contrasting: Pool vs. Great Lakes Maritime Archaeology document.

- **Extension**: Research the Antelope shipwreck by examining primary sources (ROV footage and enrollment documents) and secondary sources (newspaper articles and a research file). Use these resources to complete the Antelope Summary Sheet (a secondary source).

ASSESSMENT
- Completed Comparing and Contrasting: Pool vs. Great Lakes Maritime Archaeology document.

- Completed Antelope Summary Sheet (extension activity).

DAY FIVE: WRITING A CLAIM-BASED AND EVIDENCE-BASED NARRATIVE
Full Day Five Lesson Plan ↗

SUMMARY

Students write a narrative that uses evidence to support a claim.

Learning objectives

I can identify and analyze evidence/data in order to form and support a claim.

I can use accurate data and logical reasoning to compose an organized narrative.

I can write a narrative that uses precise words and phrases, relevant descriptive details and sensory language to capture action and convey experiences and events OR that distinguishes one thing from another.

I can write a narrative that uses a variety of transition words and phrases to convey a sequence of events OR to link similarities and differences.

I can write a narrative that includes a conclusion that follows from and reflects on narrated experience or events OR that follows from and reflects on previously described attributes.

CLASSROOM NEEDS

☐ Computer and LCD projector

DOCUMENTS

Green number links to online document.

For students

☐ The Moonrise: A Fictional Account of a Great Lakes Voyage **3**

☐ Completed Ship Sketch **14**

☐ Completed Trident Data Points Log **15**

☐ Completed Comparing and Contrasting: Pool vs. Great Lakes Maritime Archaeology **19**

☐ Moonrise Fictional Narrative Final Assignment and Rubrics **25**

☐ Compare and Contrast Narrative Final Assignment and Rubrics **26**

☐ Sample Moonrise Completion Narrative to Edit **27**

For educator

☐ Sample Moonrise Completion Narrative Marked-Up **27**

LESSON

For a complete guide for teaching this lesson, see the [full day 5 lesson plan](#).

Teacher Input (10 min.)
- Introduce two assignment choices.

Independent Practice (25 min.)
- Students compose a narrative.

Guided and Independent Practice (20 min.)
- Demonstrate peer editing using Sample Moonrise Completion Narrative to Edit.

- Have students complete peer editing and then a self-reflection.

- Analyze Sample Moonrise Completion Narrative Marked-Up for its ability to justify claims.

LESSON SUPPORTS
- Multiple options to demonstrate learning: narrative, play or series of illustrations with captions.

- Audio file of The Moonrise: A Fictional Account of a Great Lakes Voyage is available. ⬈

- Students with modified assignments will be assessed with the modified rubric.

ASSESSMENT
- Final narrative assignment and rubric.

FILES NEEDED BY DAY

Green number links to online document

DAY ONE

☐ Detailed version of day one Lesson Plan ↗

☐ Great Lakes True or False and Answer Key **1**

☐ Great Lakes True or False for Display (PowerPoint) **2**

☐ The Moonrise: A Fictional Account of a Great Lakes Voyage **3**

☐ The Moonrise: A Fictional Narrative with Vocabulary Annotated **4**

☐ The Moonrise: A Fictional Narrative Vocabulary List **5**

☐ Research Activity and Rubrics **6**

☐ Research Presentation Template (PowerPoint) **7**

☐ **Extension:** Shipwreck Bibliography **8**

☐ **Extension**: Reflective Dictionary **9**

DAY TWO

☐ Detailed version of day two Lesson Plan ↗

☐ Research Activity and Rubrics **6**

☐ Note-Taking Handout **10**

☐ Trident Controller Diagram and Key **11**

☐ Trident Quick Start Guide **12**

☐ Trident Operation Manual **13**

☐ Sketch of Ship and Answer Key **14**

☐ Trident Data Points Log and Answer Key **15**

☐ Trident Behavior Expectations Form **16**

☐ **Extension:** Reflective Dictionary **9**

DAY THREE

- ☐ Detailed version of day three Lesson Plan ⬈
- ☐ The Moonrise: A Fictional Account of a Great Lakes Voyage **3**
- ☐ Trident Controller Diagram and Key **11**
- ☐ Trident Quick Start Guide **12**
- ☐ Trident Operation Manual **13**
- ☐ Sketch of Ship and Answer Key **14**
- ☐ Trident Data Points Log and Answer Key **15**
- ☐ Enlarged Images From Banner **17**
- ☐ **Optional:** Lesson Adaptation for Use Without a Pool **18**

DAY FOUR

- ☐ Detailed version of day four Lesson Plan ⬈
- ☐ Comparing and Contrasting: Pool vs. Great Lakes Archaeology **19**
- ☐ Antelope Images for Display (PowerPoint) **20**
- ☐ ROV Footage of Antelope Shipwreck (video) **21**
- ☐ Video of Maritime Archaeologist **22**
- ☐ **Extension:** Antelope Research Resources **23**
- ☐ **Extension:** Antelope Summary Sheet **24**

DAY FIVE

- ☐ Detailed version of day five Lesson Plan ⬈
- ☐ The Moonrise: A Fictional Account of a Great Lakes Voyage **3**
- ☐ Completed Ship Sketch **14**
- ☐ Completed Trident Data Points Log **15**
- ☐ Completed Comparing and Contrasting: Pool vs. Great Lakes Maritime Archaeology **19**
- ☐ Moonrise Fictional Narrative Final Assignment and Rubrics **25**
- ☐ Compare and Contrast Narrative Final Assignment and Rubrics **26**
- ☐ Sample Moonrise Completion Narrative to Edit and Marked-Up **27**

WISCONSIN MODEL ACADEMIC STANDARDS

COMMON CORE STATE STANDARDS FOR LITERACY IN ALL SUBJECTS

Reading/Literature
RL.8.10 By the end of the year, read and comprehend literature, including stories, dramas and poems, in the grades 6-8 text complexity band independently and proficiently. Day 1

Reading/Informational Text
RI.8.4 Determine the meaning of words and phrases as they are used in a text including figurative, connotative and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts. Day 1, Day 4

Writing
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.

   b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text. Day 5

   c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. Day 5

   e. Provide a concluding statement or section that follows from and supports the argument presented. Day 5

W.8.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. Day 5

   a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. Day 5

   c. Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one-time frame or setting to another, and show the relationships among experiences and events. Day 5

   d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. Day 5

   e. Provide a conclusion that follows from and reflects on the narrated experiences or events. Day 5

W.8.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. Day 2

Speaking and Listening Standards for Literacy
S.L.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. Day 4

b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. Day 3, Day 4

c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. Day 2, Day 3, Day 4

d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented. Day 1 through Day 5

Language Standards for Literacy
L.8.4 Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. Day 1, Day 4, Day 5

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). Day 1, Day 4, Day 5

WISCONSIN STANDARDS FOR SOCIAL STUDIES

SS.Inq3.c.m Analyze the extent to which evidence supports or does not support a claim, and if it does not, adjust claim appropriately. Day 3, Day 5

SS.BH4.a.m Differentiate between intended and unintended consequences of various forms of technology and how they may affect societies and cultures. Day 4

SS.Geog3.b.m Analyze spatial patterns of social and economic development in a variety of regions in the world. Identify how people, products, and ideas move between places (e.g., internet commerce, outsourcing). Day 1

WISCONSIN STANDARDS FOR SCIENCE/NEXT GENERATION SCIENCE STANDARDS

SCI.CC2.m Students classify relationships as causal or correlational, and recognize correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause and effect relationships in systems can only be explained using probability. Day 3, Day 4, Day 5

SCI.ESS3.A.m Humans depend on Earth's land, oceans, fresh water, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes. Day 1

SCI.ETS2.A.m Engineering advances have led to important discoveries in virtually every field of

science, and scientific discoveries have led to the development of entire industries and engineered systems. Science and technology drive each other forward. Day 2, Day 3, Day 4

WISCONSIN ENVIRONMENTAL LITERACY AND SUSTAINABILITY STANDARDS

ELS.EX2.B.m Analyze the relationships between living (biotic) and non-living (abiotic) parts in an ecosystem and examine the impact of each on the system. Describe how relationships among humans and organisms, species, populations, communities, ecosystems, and biomes affect the sustainability of natural and cultural systems. Day 1

ELS.EX3.A.m Evaluate sustainability issues from multiple perspectives, including unstated, absent, or under-represented perspectives, and assess how perspectives impact outcomes of the issue. Analyze and evaluate the logic, relevance, and accuracy of others' claims, taking into consideration potential bias and consider how sources influence perspectives and outcomes on environmental issues. Understand the role of cultural and science-based evidence in evaluating sustainability. Day 5

GREAT LAKES LITERACY PRINCIPLES

1. The Great Lakes, bodies of fresh water with many features, are connected to each other and to the world ocean.

   A. The Great Lakes are a dominant physical feature of North America and form part of the political boundary between the United States and Canada.

   B. The Great Lakes system includes five Great Lakes (Superior, Huron, Michigan, Erie and Ontario), Lake St. Clair and the connecting channels, along with many harbors and bays. Each lake has distinctive basin features, circulation and ecology.

   C. The Great Lakes contain nearly 20 percent of the world's fresh surface water and have a coastline longer than the East coast of the United States. Most of North America's fresh surface water (95%) is in the Great Lakes.

   H. The Great Lakes stratify in the summer and in winter under ice cover, forming distinct layers based on water temperature differences. Turnover occurs in the spring and fall when cooler weather minimizes temperature differences and the layers mix. Turnover is the main way that oxygen and nutrient-poor water in the deeper areas of the lakes can be mixed with oxygen and nutrient-rich surface water.

   I. Although the Great Lakes are large, they are finite and their resources are limited.

3. The Great Lakes influence local and regional weather and climate.

   A. The Great Lakes affect weather and climate by impacting the basin's energy and water cycles. Changes in the Great Lakes' water circulation, water temperatures and ice cover can produce changes in weather patterns.

   C. The Great Lakes modify the local weather and climate. Because water temperatures change more slowly than land temperatures, lake waters gain heat in summer and release heat during cooler months. This results in cooler springs, warmer falls, delayed frosts and lake effect snow.

7. Much remains to be learned about the Great Lakes.

   A. Exploration and understanding of Great Lakes interactions and links among diverse ecosystems and people are ongoing. Such exploration offers great opportunities for inquiry and investigation.

   D. New technologies and methods of observation are expanding our ability to explore the Great Lakes. Freshwater scientists rely on such tools to monitor conditions in the Great Lakes and provide information to policy makers and leaders in coastal communities.

   F. Exploring, understanding and communicating about the Great Lakes ecosystem

are interdisciplinary efforts. They require close collaboration among professionals in science, technology, engineering and math, as well as public outreach and education.

8. The Great Lakes are socially, economically, and environmentally significant to the region, the nation and the planet.

A. The Great Lakes are a source of inspiration, recreation, rejuvenation and discovery. They are also an important element in the heritage of many cultures.

B. The waters of the Great Lakes have been significant to historical settlement and development. The lakes' names and the names of many cities, counties and landmarks along their shores have Native American or immigrant origins. This fresh water resource will continue to play a role in future habitation of the area.

D. Waterborne commerce moves millions of tons of cargo annually through the Great Lakes. Shipping is an economically efficient method of transporting raw materials, finished goods and agricultural products. However, shipping is also a vector for non-native species, several of which may be detrimental to the Great Lakes ecosystem.

Complete list of Great Lakes Literacy Principles available at: www.greatlakesliteracy.net

EXTENSION
ACTIVITIES AND RESOURCES

DAY ONE

Activity

Complete the **Reflective Dictionary** (add link and delete this text) worksheet for 10 of the words that the student circled during the reading of the "Moonrise: A Fictional Narrative" story.

Documents

Shipwreck Bibliography

Reflective Dictionary

Bonus Videos

The Sinking of the Titanic
youtube.com/watch?v=4pywFRpEcZA

Titanic Real Footage: Leaving Belfast for Disaster (1911-1912)
youtube.com/watch?v=05o7sOAjtXE

Bonus Reading

Shipwreck Museum: Edmund Fitzgerald
shipwreckmuseum.com/edmund-fitzgerald/ the-fateful-journey/

DAY FOUR

Activity

Research the Antelope shipwreck by examining primary sources (ROV footage and enrollment documents) and secondary sources (newspaper articles and a research file). Use these resources to complete the **Antelope Summary Sheet** (a secondary source).

Documents

Antelope Summary Sheet

Antelope Research Resources

Buffalo Daily Courier Thursday, August 29, 1861

Detroit Free Press Oct. 9, 1897 p 7 c 1

Door County Advocate Oct. 16, 1897 p 1 c 1

Antelope Enrollment August 1861

Antelope Enrollment Loss November 1897

Bonus Videos

The Washington Shipwreck
youtube.com/watch?v=HkchDnISmkc

Map of Wisconsin Shipwrecks
wisconsinshipwrecks.org/Map/All

Bonus Reading

Eber and Samuel Ward, Captains of the Great Lakes Shipping Industry
magicmastsandsturdyships.weebly.com/eber- and-samuel-ward-captains-of-the-great-lakes- shipping-industry.html

ADDITIONAL RESOURCES

Maritime History of the Great Lakes
images.maritimehistoryofthegreatlakes.ca

My Submarine Ocean Explorer
coexploration.org/oe/kws/

NOAA's National Marine Sanctuaries
sanctuaries.noaa.gov

NOAA's Office of the Coast Survey
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go.wisc.edu/ROVe

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