THE RING OF DARHAD

MONGOLIA WOLVERINE EXPEDITION

ADVENTURERS & SCIENTISTS FOR CONSERVATION
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Mountains & Minds

THE RING OF DARHAD
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TEACHER RESOURCES

Explore the Ring of Darhad in northern Mongolia alongside the Adventurers and Scientists for Conservation team and enhance your students' understanding of science, technology, engineering and math (STEM). This unit follows the Ring of Darhad Mongolia Wolverine Expedition and includes seven standards-based lessons that align with both the traditional National Standards and Common Core Standards Initiative. Filled with hands-on and inquiry-based activities, these lessons will guide you and your students through the biodiversity of the mountainous northern Mongolian ecosystem while applying wildlife ecology research techniques to your own local schoolyard. Lessons on ecosystems, biodiversity, wildlife ecology, and climate change were provided by the Montana Institute on Ecosystems (IoE) (http://montanaioe.org) via its CLimate In My Backyard (CLIMB) curriculum series (http://eu.montana.edu/CLIMB)

The lessons can be completed in any order and can be taught independently and outside of the unit. For those following the Ring of Darhad Mongolia Wolverine Expedition in live time during Spring 2013, it is recommended that lessons are completed in sequential order. Lesson seven can be completed at the end of the unit, or completed in portions after each of the other lessons to complement lessons one through six. Each lesson is approximately one hour long and has options for adapting the lessons to different age groups and extending the learning.

Lesson 1: Meet the Team

Discover the mission of the Ring of Darhad Mongolia Wolverine Expedition and the planning that was required to make this journey a success. "Meet" the members of the team through short videos and start to uncover and appreciate how exciting adventures like this can support science.

Lesson 2: Discover the Darhad

Explore northern Mongolia and the Darhad region, including its location, topography, and people. Trace the expedition's route on a map, learn about resupply points and compare American culture with the Mongolian culture through research.

Lesson 3: Explore the Ecosystem of Northern Mongolia

Learn more about the Darhad region's ecosystem and how its species are interconnected through games and diagrams. Students will explore how the wolverine's survival depends on the health of the entire Darhad ecosystem through research.

Lesson 4: Become a Wildlife Ecologist

Explore how scientists gather data on wildlife and the techniques they use in the field. Investigate signs of life and search for evidence of life in your own schoolyard.

Lesson 5: Biodiversity of the Ring of Darhad

Discover how biodiversity is calculated by using candy, then calculate biodiversity of a model of northern Mongolia. Research species that live in the Ring of Darhad and play a whole-class game to explore the biodiversity of the region.

Lesson 6: Climate Change and the Wolverine

Study various climates around the world by exploring global data and comparing different cities. Identify how your actions contribute to climate change and how the wolverine is affected by warming temperatures. Take action to help protect the wolverine.

Lesson 7: Schoolyard Biodiversity Study

Become an adventure scientist by examining the biodiversity of your schoolyard. Use a field journal to plan and prepare for your adventure, collect data in the field, and draw conclusions from your findings. NOTE: This lesson's activities can be completed after each corresponding lesson or as a whole project at the end of the unit.

ALIGNMENT WITH NATIONAL CONTENT STANDARDS

National Science Education Content Standards Addressed	A: Science as Inquiry	B: Physical Science	C: Life Science	D: Earth & Space Science	E: Science & Technology	F: Science in Personal & Social Perspectives	G: History & Nature of Science
Lesson 1: Meet the Team						X	X
Lesson 2: Discovering the Darhad			X	X	X	X	
Lesson 3: Explore the Ecosystem			X		X		
Lesson 4: Wildlife Ecologist	X		X				X
Lesson 5: Biodiversity	X		X				X
Lesson 6: Climate Change		X	X	X			
Lesson 7: Schoolyard Biodiversity Study	X		X			X	X

Common Core Math Domains Addressed	Counting and Cardinality	Operations and Algebraic Thinking	Number and Operations in Base Ten	Number and Operations – Fractions	Measurement and Data	Geometry	Ratio and Proportional Relations	The Number System	Expressions and Equations	Statistics and Probability	Functions
Lesson 1: Meet the Team	X	X	X	X	X						
Lesson 2: Discovering the Darhad			X		X	X					
Lesson 3: Explore the Ecosystem											
Lesson 4: Wildlife Ecologist	X		X		X	X					
Lesson 5: Biodiversity	X	X	X	X	X	X	X	X	X		X
Lesson 6: Climate Change					X				X	X	
Lesson 7: Schoolyard Biodiversity Study	X	X	X	X	X	X	X	X	X		X

National English Language Arts Education Content Standards Addressed	1: Read a wide range of print and non-print texts	4: Adjust their use of spoken, written, and visual language	5: Employ a wide range of strategies as they write and use different writing process elements appropriately	7: Conduct research on issues and interests	8: Use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge
Lesson 1: Meet the Team					
Lesson 2: Discovering the Darhad				X	
Lesson 3: Explore the Ecosystem	X			X	X
Lesson 4: Wildlife Ecologist		X		X	
Lesson 5: Biodiversity	X	X	X	X	X
Lesson 6: Climate Change	X				
Lesson 7: Schoolyard Biodiversity Study		X	X	X	

National Math Education Content Standards Addressed	1: Numbers & operations	2: Algebra	3: Geometry	4: Measurement	5: Data analysis & probability
Lesson 1: Meet the Team	X	X		X	
Lesson 2: Discovering the Darhad	X		X	X	
Lesson 3: Explore the Ecosystem					
Lesson 4: Wildlife Ecologist	X		X	X	
Lesson 5: Biodiversity	X	X	X	X	X
Lesson 6: Climate Change				X	X
Lesson 7: Schoolyard Biodiversity Study	X	X	X	X	X

National Social Studies Content Standards Addressed	1: Culture	2: Time, continuity, and change	3: People, places & environments	4: Individual Development & Identity	5: Individuals, groups, & institutions	6: Power, authority & governance	7: Production, distribution & consumption	8: Science, technology, & society	9: Global connections	10: Civic ideals & practices
Lesson 1: Meet the Team		X	X	X	X	X	X	X	X	
Lesson 2: Discovering the Darhad	X	X	X			X	X		X	
Lesson 3: Explore the Ecosystem			X						X	
Lesson 4: Wildlife Ecologist			X							
Lesson 5: Biodiversity			X						X	
Lesson 6: Climate Change	X	X	X		X	X	X		X	
Lesson 7: Schoolyard Biodiversity Study			X			X				

National Geography Content Standards Essential Elements Addressed	1: The World in Spatial Terms	2: Places and Regions	3: Physical Systems	4: Human Systems	5: Environment & Society	6: The Uses of Geography
Lesson 1: Meet the Team		X		X	X	
Lesson 2: Discovering the Darhad	X	X	X	X		
Lesson 3: Explore the Ecosystem			X			
Lesson 4: Wildlife Ecologist	X					
Lesson 5: Biodiversity			X			X
Lesson 6: Climate Change	X	X	X		X	X
Lesson 7: Schoolyard Biodiversity Study	X	X	X			

Common Core English Language Arts CCR Anchors Addressed	Reading	Writing	Speaking and Listening	Language
Lesson 1: Meet the Team			X	X
Lesson 2: Discovering the Darhad	X	X	X	X
Lesson 3: Explore the Ecosystem	X		X	X
Lesson 4: Wildlife Ecologist		X	X	X
Lesson 5: Biodiversity	X	X	X	X
Lesson 6: Climate Change	X		X	X
Lesson 7: Schoolyard Biodiversity Study		X	X	

Extending your learning with ASC

The Adventurers and Scientists for Conservation (ASC) organization works with educators to expand learning beyond the four walls of the classroom. Through ASC's outdoor programs, students interact directly with professional scientists and have the opportunity to collect data for ongoing scientific research projects. ASC offers students the skills to design and implement their own research projects while serving as mentors for younger students. ASC believes that experiences with Adventurers and Scientists for Conservation will provide the spark for future interest in the scientific field.

ASC offers learning opportunities both during the school year and over the summer. The organization works with educators to ensure that students have safe, fun, and rewarding experiences that complement standard curriculum and support STEM learning. ASC's student outings are generally between two and 10 days and can be designed for students of all levels, kindergarten through university.

Visit http://www.adventureandscience.org/schools-univerisites.html or contact ASC for more details.

Curriculum Developers

Angie Weikert has worked on several teacher resources projects including Montana State University's Everest Education Expedition (http://www.montana.edu/Everest) and MacGillivray Freeman Films' To the Arctic IMAX film. She has an M.S. in Science Education from Montana State University and has taught in both formal and informal settings for ten years.

Some content for this curriculum comes from the Climate In My Backyard (CLIMB) (http://eu.montana.edu/climb) curriculum series developed by the Montana Institute on Ecosystems, Montana NSF EPSCoR and MSU Extended University.

Montana NSF EPSCoR (the Experimental Program to Stimulate Competitive Research) (http://mtnepscor.org) is a federally funded program to promote the development of science and technology capacity in the United States. Funded by the National Science Foundation, Montana NSF EPSCoR supports capacity building by investing in researchers and institutions to better position them to compete for federal research funds. The project also works to broaden participation of Native American students in STEM disciplines through focused programs at the tribal colleges and recruitment of students into STEM majors. The theme of this award is climate change across multiple scales and temporal zones. The Montana University System Institute on Ecosystems (http://montanaioe.org) is the hub of research activities around this theme.

For other K-12 educational resources related to climate science, visit http://eu.montana.edu/CLIMB