

Ecosystem Unit (Gr. 4-6) – 10 hrs.

	Driving Question	Key Concepts	Core Lesson	Enhancements	Extensions & Additional Resources (On CD)
Ecosystem Unit (Gr. 4-6)	<i>What is an "ecosystem" & what types of ecosystems do we have in Michigan?</i>	Biome; ecosystem; habitat; community; population; organism; Michigan ecosystems (forests, coastal dunes, wetlands, streams/rivers/lakes, Great Lakes, agricultural land and cities);	1- What is an Ecosystem? Students identify what living and non-living components all ecosystems have in common with one another, and are briefly introduced to some of Michigan's ecosystems, using the 5 MDNR posters. (45 min.)	<ul style="list-style-type: none"> • <i>"Is that Really an Ecosystem?" Card activity.</i> • <i>Schoolyard Ecosystem Exploration:</i> Students look for evidence of ecosystems in the schoolyard. • <i>Michigan Habitat Riddles-</i> Students match descriptions of animal habitat to wildlife species. • <i>Prime Habitat Activity-</i> Students write "real estate" type advertisements describing habitat that would appeal to one wildlife species. 	<ul style="list-style-type: none"> • Virtual Guide to Michigan's Ecosystems (TechAlive Web Project) • <i>Mini-Ecosystem Terrarium/Aquarium Project</i> – Students plan, build, and maintain 2 liter "mini-ecosystems." • <i>A Guide to Michigan Habitats PowerPoint slide show.</i>
	<i>How do living things obtain the energy they need to live?</i>	Energy flow and food chains/food webs. (producer, consumer, decomposer)	2- It's All Connected! Students research, identify and label possible Michigan-specific food chains/webs using the 5 MDNR posters and later examine their own place in the food chain. (2 X 45 min.)	<ul style="list-style-type: none"> • <i>Energy Flow Scavenger Hunt</i> – a schoolyard hunt to find evidence of terms used in the lesson (producer, consumer, foodchain, etc.) • <i>Who Am I?</i> – Interactive game designed to reinforce vocabulary and questioning skills. • <i>"Pour-A-Pond"</i> activity- students study food webs in samples of concentrated pond water in the classroom. 	<ul style="list-style-type: none"> • <i>Energy Flow Role Play</i> – a high energy game simulating energy flow within ecosystems. Can also be used to illustrate effects of exotic species and bioaccumulation. • On-going observation of <i>Mini-Ecosystem Terrariums/Aquarium</i> projects. (Refer to Lesson 1)
	<i>How are water air, and nutrients cycled within and between ecosystems?</i>	Ecosystem cycles (water, carbon-oxygen, and nutrients); photosynthesis; and decomposition.	3- Nature's Recycling Using a number of hands-on activities students are introduced to the ideas that water, nutrients and carbon are cycled within and between ecosystems. (3 X 45 min.)	<ul style="list-style-type: none"> • <i>Nature's Recycling Detective Hunt</i> - Students look for evidence of water, carbon and nutrient cycling in their schoolyard. 	<ul style="list-style-type: none"> • Virtual Guide to Michigan's Ecosystems (TechAlive Web Project) • On-going observation of <i>Mini-Ecosystem Terrariums/Aquarium</i> projects. (Refer to Lesson 1) • Earthworm Observatory –Students observe decomposition in long-term project.
	<i>How do people benefit from natural ecosystems?</i>	Social, economic, and environmental benefits provided by ecosystems.	4- Michigan Ecosystems: What have they done for YOU lately? Students develop an appreciation for the many ways people benefit from Michigan ecosystems. (2 X 45 min.)	<ul style="list-style-type: none"> • <i>Michigan Nature Tourism Project</i> – Students design an advertisement to promote one of Michigan's ecosystems. 	<ul style="list-style-type: none"> • Additional Teacher/Student Resource: <i>Biodiversity around the Great Lakes</i> Interactive CD-ROM. (U.S. EPA.)
	<i>How have Michigan ecosystems come to exist as they do today?</i>	Formation of the Great Lakes; Native Americans; fur-trading era; settlement; logging boom; conservation efforts, stewardship; environmental role models.	5- Michigan Time Machine Students research a time-line of Michigan's environmental history and then travel back in time to reverse one decision in history. (45 min.)	<ul style="list-style-type: none"> • <i>How Many People?</i> - Students use U.S. Census data to graph changes in human population in Michigan over the past 100 years and relate to impacts on Michigan's environment. 	<ul style="list-style-type: none"> • Virtual Guide to Michigan's Ecosystems (TechAlive Web Project) • Glacial Lakes Flip Book (MDEQ) (on CD) • <i>Michigan's Environmental History PowerPoint slide show</i> (on CD) • Additional Teacher/Student Resource: <i>Biodiversity around the Great Lakes</i> Interactive CD-ROM. (U.S. EPA.)
	<i>How do my personal actions affect the environment?</i>	Sustainability, individual decision-making & stewardship.	6- Let's Get Personal Students are introduced to concept of sustainability. Later they evaluate how individual decisions affect the environment & identify simple steps they can take to help care for the environment. (45 min.)		

BIODIVERSITY (Middle School) – 10 hrs.

	Driving Question	Key Concepts	Core Lesson	Enhancements	Extensions & Additional Resources (On CD)
BIODIVERSITY (Middle School)	<i>What is biodiversity & why is it important?</i>	Interdependence, community.	7- Michigan's Web of Life Students use a ball of twine to create a classroom web that shows the interconnections and interdependence within a natural community. (45 min.)	<i>Michigan Eco-Savvy Survey</i> – A fun survey where students find out how much they know about biodiversity in their local community.	<ul style="list-style-type: none"> Virtual Guide to Michigan's Ecosystems (TechAlive Web Project) Additional Teacher/Student Resource: <i>Biodiversity around the Great Lakes</i> Interactive CD-ROM. (U.S. EPA.)
	<i>How is biodiversity threatened in Michigan?</i>	Habitat degradation, invasive species, pollution, population and overconsumption.	8- Michigan's Dirty Dozen Students first examine major threats to biodiversity within Michigan. Students later apply knowledge of cause & effect relationships to various threats. (2 X 45 min.)		<ul style="list-style-type: none"> Virtual Guide to Michigan's Ecosystems (TechAlive Web Project) Additional Teacher/Student Resource: <i>Biodiversity around the Great Lakes</i> Interactive CD-ROM. (U.S. EPA.)
	<i>How can we measure biodiversity? & How can we use knowledge of biodiversity to help make land-use decisions?</i>	Biodiversity sampling (species richness), decision-making and land-use.	9- How Can We Measure Biodiversity? <i>A- Indoor Option:</i> Students use information about the biodiversity of birds in Michigan ecosystems to make a land-use decision. (2 X 45 min.) <i>B- Outdoor Option:</i> Students use information about schoolyard biodiversity to make a land-use decision. (2 X 45 min.)		<ul style="list-style-type: none"> U.S. Fish & Wildlife Service Schoolyard Habitat Guide.
	<i>What is the role of government and individuals in protecting biodiversity?</i>	Michigan threatened and endangered species and stewardship.	10- Michigan's Threatened Species Students learn what it means for a species to be listed as threatened or endangered and the role of government and individuals in protecting biodiversity. (2 X 45 min.)		<ul style="list-style-type: none"> Virtual Guide to Michigan's Ecosystems (TechAlive Web Project) Resource: U.S. Fish & Wildlife Service Endangered Species Teacher's Packet Additional Teacher/Student Resource: <i>Biodiversity around the Great Lakes</i> Interactive CD-ROM. (U.S. EPA.)
	<i>How do my personal actions affect the environment?</i>	Sustainability, individual decision-making & stewardship.	(same as 6) Let's Get Personal (45 min.) Students are introduced to concept of sustainability. Later they evaluate how individual decisions affect the environment & identify simple steps they can take to help care for the environment.		

Invasive Species Extensions

	Invasive Species Extensions					
Invasive Species	Here Today, Gone Tomorrow - An interactive game simulating the effects of invasive species on overall diversity of bird species.	Deadly Plant Invaders Game (<i>Picture Rocks National Lakeshore, National Park Service</i>) - An interactive game simulating the effects of invasive plants on native plants.	Schoolyard Invasive Study - Students investigate occurrence of invasive and their impact on biodiversity in their schoolyard.	Michigan Invaders Research Project - Students research invasive species associated with Michigan and/or the Great Lakes, the problems they present, how they were introduced, and how to prevent their spread in the future.	Invasive Plant Germination Study	<ul style="list-style-type: none"> <i>Michigan Invasive Species</i> PowerPoint Presentation (on CD) "Seven Ways" mini-poster <i>Purple Loosestrife Project</i> – MSU Extension Additional Teacher/Student Resource: <i>Biodiversity around the Great Lakes</i> Interactive CD-ROM. (U.S. EPA.) Virtual Guide to Michigan's Ecosystems (TechAlive Web Project)