Ecosystem Interactions

Middle School: Grades 6-8 Program Suggestions

Our middle school stewardship nature walk programs are all about the relationships between ecosystems and the organisms they support. Below is a list of potential programs for grades 6-8 with *suggested* locations and seasons for each program. Please keep in mind that all programs can be modified to fit your school's curriculum goals and the learning interests of your classroom. If you are unable to come to Manomet, we can always find a way to bring programming to your school in-person or virtually!

We recommend combining **Songbird Science** with one of our **Stewardship Nature Walks**; however, programs can be mixed and matched in any way.

	Program Description	Location			Season	
		Manomet	Classroom	Greenspace	Fall	Spring
Songbird Science	Students will take on the role of banding lab scientists as they learn how we use mist nets and bird banding to study birds! They'll retrieve a realistically sized and weighted model bird from a net, noting variation within and between species in size and plumage as they identify their bird. Students will weigh and band these models, in the process learning how banding lab scientists assess health and migration status. Students will also interpret graphs based on Manomet's 50+ year banding dataset to find out how the population of their bird has been changing over time. Student scientists will introduce their bird to their peers, reporting on health, migration, and population changes, and constructing explanations based on evidence for what they have learned. We'll discuss how bird form relates to function and consider birds as modern-day dinosaurs by comparing them to some of their fossilized relatives! We'll also discuss how human activity affects bird populations both here in Massachusetts and elsewhere along their migratory paths, and ways families in Massachusetts can support migratory birds at their schools and in their back yards. **The experience will culminate with a visit to the Manomet banding lab* - in person or virtual – to meet some live birds and see their adaptations in real life!**	Manomet	Classroom	Greenspace	Fall	Spring
Monarchs & Milkweed	Students will become land stewards and help to manage milkweeds at Manomet! Monarch butterflies depend on milkweed as caterpillars, and then help to pollinate it as adults before departing on their amazing migratory journeys. Students will learn through participation in Manomet's milkweed management efforts. They will measure milkweed height, count stalks and seed pods, and record distribution with a designated plot. After data collection, each group will calculate the total number of seeds present, and then discuss what their data mean for the future of milkweeds at Manomet. Students will be tasked with noting any signs of monarch butterflies including eggs, adult butterflies, caterpillars, or chrysalises, and they'll also look for other, less well-known pollinators that might be present in our milkweed patch. Manomet uses student-collected data to track our milkweed populations and to plan future plantings. We'll work together to compile our data, graph our findings, and brainstorm recommendations for milkweed management and monarch butterfly conservation. *Optional: it may be possible to arrange a visit with a local beekeeper as part of this activity.*	Manomet	Classroom	Greenspace	Fall	Spring
Climate Lab!	Climate change often conjures up images of hotter summers and milder winters – but what does climate change really mean for the plants and animals in an ecosystem? In this activity, students will participate as climate scientists to directly monitor climate change through the study of phenology – the timing of seasonal changes. Students will measure leaves of plants to determine the precise timing of seasonal changes in leaf size, number, and color. We'll compare our findings to data from other years to try to find trends and make predictions about the future. Students will discuss their findings in small groups, and then propose explanations for any differences they observe. We'll also brainstorm and discuss how the timing of seasonal changes in plants might affect animals – like insects and birds – that depend on them. We will set up frass traps at the beginning of the lesson to explore caterpillar abundance in the plants we are observing. In the fall, students will also consider the availability of fruiting bodies and document berry abundance of native plants. This is an ideal long-term monitoring activity – try it out at Manomet, and then work with us to set up a Climate Lab monitoring stie on school grounds!	Manomet	Classroom	Greenspace	Fall	Spring
Survival Instincts	Birds are fun to watch, but why do they do the things they do, and how do their behaviors help them survive? Students will participate as behavioral ecologists in this fun session focused on how scientists measure and interpret behavior. We'll closely observe and record the behaviors of bluebirds and tree swallows in nesting boxes, robins and other birds foraging on the ground, and birds singing in trees or visiting our feeders. We'll track the behaviors we see – creating and ethogram – and discuss how these behaviors contribute to survival. We'll also compare behavior between species and habitats. We'll discuss when it might be worth it for a bird to take risks, and when a bird would want to play it safe, and relate our ideas to the biology of the species we see. Finally, we will use our observations and our prior knowledge to make predictions about the life stage and ecological status of the animals we see – are they migrating, nesting, or preparing for winter? Are they trying to attract attention, or trying to avoid detection?	Manomet	Classroom	Greenspace	Fall	Spring

*The banding lab operates in the Spring and Fall. If you are unable to schedule your program during these times, we can provide a link to a pre-recorded visit to the banding lab so students can see banding in action!

Manomet Programs and MA STE/NGSS: Manomet education programs can be used to support student progression toward a wide range of Massachusetts Science and engineering/NGSS performance expectations. Below, we provide a list of relevant Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Cross-Cutting Concepts covered. All Manomet education programs are customizable; teachers are encouraged to reach out to share their curricular priorities.

Performance Expectations Supported:

6.MS-LS4-2. Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms.

7.MS-LS1-4. Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants.

7.MS.LS2-1. Analyze and interpret data to provide evidence for the effects of periods of abundant and scarce resources on the growth of organisms and the size of populations in an ecosystem.

7.MS.LS2-2. Describe how relationships among and between organisms in an ecosystem can be competitive, predatory, parasitic and mutually beneficial and that these interactions are found across multiple ecosystems.

7.MS.LS2-4. Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations.

7-MS-LS2-5. Evaluate competing design solutions for protecting and ecosystem. Discuss benefits and limitations of each design. (Stewardship Nature Walk only)

8.MS-LS1-5. Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.

		Songbird Science	Stewardship Nature Walk
Science and Engineering Practices	**Developing and Using Models**	Students will manipulate and use model birds to identify the birds and to determine their health status. They will also interpret scientific models such as graphs and diagrams to learn more about migration and bird populations and to make predictions about future trends of the species being investigated.	
	Analyzing and Interpreting Data	Students will analyze and interpret graphs to identify and describe patterns about bird health and population trends.	Students will collect data and interpret it to explain ecological phenomena.
	Constructing Explanations	Students will use bird models and datasets provided to make claims regarding the health, migratory status and adaptations of songbirds. Students will propose explanations for the population trends observed and answer scientific questions using provided graphs, scientific ideas and their own observations.	Students will use data and observations to examine the relationships between organisms and use those relationships to describe natural phenomena. Students will apply scientific reasoning to their observations and share how their data support their explanations or conclusions.
	Asking Questions and Defining Problems		Students will participate in data collection of one or more of Manomet's environmental monitoring programs. Students will develop follow-up questions based on their observations and findings.

	Planning and Carrying Out Investigations		Students will participate in one or more of Manomet's ongoing environmental monitoring programs by taking measurements, performing point count surveys, or collecting other environmental data. Students will evaluate the collection methods and consider potential sources of error.
	Communicating Information	Students will interpret data and observations to clearly communicate findings to their classmates. Students will consider how their data and observations relate to patterns and phenomena overtime and share their conclusions with each other.	
Cross-Cutting Concepts	**Structure and Function**	Students will analyze bird bill structure and function and relate their findings to the bird's diet. Students will examine adaptations of migratory birds and these adaptations contribute greatly to the ability to migrate.	
	Cause and Effect	Students will analyze songbird population trends and suggest explanations for patterns observed. We will discuss how environmental change can impact bird populations.	Students will analyze the plant-animal interactions they observe as causal or correlational. Students will then use the cause-and-effect relationships they observe to make predictions about what might happen as different ecological factors change over time.
	Scale, Proportion and Quantity	Students will use scales and proportional relationships to describe the weight of their bird models and relate those measurements to bird ecology.	In Monarchs and Milkweed, students will calculate milkweed seed numbers based on pod counts. Teachers can take advantage of follow-up activities focused on graphing.
	Patterns	Students will use provided graphs and charts to identify patterns in migratory bird populations and migration health.	Students will use patterns observed to identify cause and effect relationships in the ecosystems explored.
	Stability and Change	Students will explore different aspects of stability and change seen in natural systems and make predictions about population patterns and ecosystem interactions in relation to changing environments.	

Disciplinary Core Ideas Addressed	**LS1.B:** Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. Genetic factors as well as local conditions affect the growth of the adult plant.
	LS2.A: Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. Growth of organisms and population increases are limited by access to resources.
	LS2.C: Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems.
	LS4.B: Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
	LS4.C: Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population change.
	ESS3.C: Human activities have significantly altered the biosphere, sometimes damaging, or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.