Program Specific Descriptions and Colorado Academic Standards

Please read: The following lists our developed curriculum topics as well as the targeted standards aligned with each topic. In our programs, we can focus on a deep dive into one specific topic or approach with a broader view to several topics. All of our programs address the standards through the lens of outdoor and experiential education specific to our location. Our standard programs consist of a one hour classroom lesson followed by a three hour field trip on a seperate day. If there is a standard or topic not listed below that you would like to explore or you would like a longer or shorter program, please reach out to us for a custom lesson on the topic of your choice. If you are interested in a lesson series for a longer term project, please do not hesitate to reach out with any questions.

PROGRAM PRICING

Please reach out to Adriana Stimax at astimax@sjma.org for up to date information on available grants and a quote for your program.

Note: We used an abbreviated method to reference the standards. The format is as follows: Grade. Subject. Standard. Grade Level Expectation. Evidence outcome. For example, "4.LS2.1a" means 4th Grade, Standard 2 Life Science, Grade Level Expectation 1, Evidence outcome (a). Another example: “MS.ESS3.4b means Middle School, Standard 3 Earth and Space Science, Grade Level Expectation 4, Evidence outcome (b).

1. Rock Cycle--Building Up and Breaking Down

Students will explore the processes that create landforms and break them down, with an emphasis on weathering, erosion, and deposition as key forces that mold landscapes and distribute critical soil to different ecosystems.

Suggested Grade Levels: 2 - 8

Topics: Rock cycle, rock types, mountain formation, forces that shape landscapes, weathering, erosion, deposition

Aligned Performance Indicators

- **2.ESS3.1a** Use information from several sources to provide evidence that Earth events can occur quickly or slowly
- **2.ESS3.2a** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- **4.ESS3.1a** Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- **4.ESS3.2a** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- **5.ESS3.3a** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere and/or atmosphere interact.
- **MS.ESS3.3a** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
- **MS.ESS3.4b/6a** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

2. Plant Adaptations

Weave together topics of plant physiology, identification, habitat, and ethnobotany by exploring how plants have developed unique adaptations to survive the extremes of a high desert environment. Students will measure and compare stomatal density of plants across different habitats in the field, learn to use a dichotomous key to identify plant species, learn and apply technical plant identification vocabulary, do botanical sketching, and use biological field sampling techniques.

Suggested Grade Levels: 6 - 12

Topics: Desert plant adaptations, a plant's budget (ins and outs), photosynthesis equation, the stomatal density conundrum, abiotic factors, plant morphology, plant taxonomy, introduction to dichotomous keys

Aligned Performance Indicators

- **MS.LS2.2a** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

- **MS.LS2.2b** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- **MS.LS2.3a** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- **MS.LS2.5a** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- **MS.LS2.10a** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- **MS.LS2.11a** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- **HS.LS2.3a** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- **HS.LS2.9a** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- **HS.LS2.11b** Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- **HS.LS2.12a** Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

3. Animal Adaptations

Deepen your understanding of the animal species that call Southwest Colorado home by studying the unique physical characteristics that help them survive and thrive in their various habitats and lifestyles. Explore specific adaptations through hands-on investigation in the classroom, then extend this knowledge to an open-ended adaptation scavenger hunt in the field. Students will also experience live examples of some of the more unique animal adaptations, from echolocation in bats to the incredible traps set by spiders and antlions, among others.

Suggested Grade levels: K - 5

Topics: Physical adaptations, behavioral adaptations, herbivores, carnivores, omnivores, predator and prey

Aligned Performance Indicators:

- **K.LS2.1a** Use observations to describe patterns of what plants and animals (including humans) need to survive
- **K.LS2.2a** Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
- **1.LS2.1b** Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
- **2.LS2.2a** Make observations of plants and animals to compare the diversity of life in different habitats.
- **3.LS2.2a** Construct an argument that some animals form groups that help members survive.

- **3.LS2.5a** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well and some cannot survive at all.
- **4.LS2.1a** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction.

4. Living things (and populations) Grow and Change -- Life Cycles and Adaptation

Students will learn about life cycles as a fundamental process for the continuation of life, and as the basis of adaptation across generations in a population. Students will explore the diversity of life cycles seen in the various flora and fauna of the area, and will be challenged to use their observational skills to create and compare visualizations of life cycles across a diversity of life forms they observe in the field. We will also experience how adaptations are traits that confer an advantage in particular environmental contexts, and how variation inherited traits can lead to differential success of offspring.

Suggested Grade levels: 1 - 5

Topics: Life cycles across the kingdoms (bacteria, fungi, plant, animal), complete metamorphosis, incomplete metamorphosis, growth, selection, microevolution of populations

Aligned Performance Indicators

- **1.LS2.1b** Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
- **1.LS2.2a** Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
- **2.LS2.1b** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- **2.LS2.2a** Make observations of plants and animals to compare the diversity of life in different habitats.
- **3.LS2.1a** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death.
- **3.LS2.3a** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
- **3.LS2.5b** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
- **4.LS2.1a** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction.

5. Trophic Detectives

Learn about feeding relationships, food webs, and ecological roles through hands-on nature detective work. Animal tracking is thrilling and rewarding in any context, but this program will use it specifically to answer the question: “who eats whom in our area?” In the classroom, students will learn about how plants “fix” energy-rich biomass in an ecosystem by using energy from the sun to combine carbon dioxide and water to create sugars. In the field, dissection and analysis of owl pellets will set students up for their own “scat search” in the wild. Along the way,

we will become fluent in the use of food web diagrams to cast light on the structure and functioning of ecosystems as a collection of feeding relationships.

Suggested Grade levels: K - 12

Topics: Trophic Levels, energy flow, biomass pyramid, food webs, animal tracking

Aligned Performance Indicators:

- **K.LS2.1a** Use observations to describe patterns of what plants and animals (including humans) need to survive.
- **2.LS2.1a** Plan and conduct an investigation to determine if plants need sunlight and water to grow.
- **5.PS1.4a** Use models to describe that energy in animals' food (used for body repair, growth and motion and to maintain body warmth) was once energy from the sun.
- **5.LS2.1a** Support an argument that plants get the materials they need for growth chiefly from air and water.
- **5.LS2.2a** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- **MS.LS2.3a** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- **MS.LS2.5b** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- **MS.LS2.6a** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- **HS.LS2.3a** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- **HS.LS2.4a** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- **HS.LS2.5b** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- **HS.LS2.5c** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

6. Weather, Climate, and Habitat

We all are affected by the weather, but what drives the differences we feel from day to day, and how do daily weather phenomena factor into climate? This program will get students thinking quantitatively about weather as a set of variables that affect individuals and shape ecosystems. In the classroom, we will explore how uneven heating of the Earth's surface drives measurable weather phenomena and explore these relationships using real-time visualizations of surface winds. In the field, students will use quantitative techniques to record and track weather variables, employ data to make predictions about weather effects on individuals and ecological communities, and conduct hands-on experiments to explore how animals in extreme climates can find favorable "microclimates" to maintain homeostasis.

Topics: Weather vs. climate, weather measurables, cloud types, atmospheric pressure rules the weather, data collection, graph reading, microclimate, climate and the biosphere.

Suggested Grade levels: K - 12

Aligned Performance Indicators:

- **K.ESS3.1a** Use and share observations of local weather conditions to describe patterns over time.
- **5.ESS3.3a** Develop a model using an example to describe ways the geosphere, biosphere and/or hydrosphere interact
- **MS.ESS3.7a** Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- **MS.ESS3.7b** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- **HS.ESS3.7a.** Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

7. Watersheds and River Ecology

Water is life, but have you ever thought about where your water comes from, how it gets to you, and the myriad ecosystem services that deliver clean, dependable flows to various habitats for organisms (including humans) to thrive off? This program will get students up close and personal with the watersheds of the San Juan Mountains. Using the children's book "My Water comes from the San Juan Mountains" as a template, we'll use 3D maps to model local snowmelt and river flows, explore the different life zones water flows through on its journey downhill, model the impacts of erosion on water quality, test the efficacy of different land management solutions in ensuring clean runoff, and sample communities of river invertebrates to measure river health.

Suggested Grade levels: 4 - 12

Topics: Watersheds, river systems, runoff, discharge, point vs. non-point pollution, components of a river ecosystem, water quality parameters (turbidity, conductivity, dissolved oxygen, pH) and their effects on river biodiversity, ecosystem services of rivers

Aligned Performance Indicators:

- **4.ESS3.2a** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- **5.ESS3.4a** Describe and graph the amounts and percentages of saltwater and freshwater in various reservoirs to provide evidence about the distribution of water on Earth.
- **MS.LS2.7b.** Students can evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- **MS.ESS3.6a** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

- **MS.ESS3.6b** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- **HS.LS2.4b** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- **HS.ESS3.6a** Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

8. Ecological Relationships

What does it mean to be part of a community? This two-part program will take a scientific approach to the question, in which students explore the web of interconnections that support life within different ecosystems. Students will learn to categorize different types of ecological relationships including predation, herbivory, parasitism, mutualism, and competition. Their observation and analytical skills will be tested as they search for and experience examples of these relationships in the field. We'll conclude with a community map of all the relationships in the high desert ecosystem of the area.

Suggested Grade levels: K - 12

Topics: Ecological Niche, mutualism, commensalism, parasitism, predation/herbivory, reciprocity

Aligned Performance Indicators:

- **2.LS2.1b** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- **2.LS2.2a** Make observations of plants and animals to compare the diversity of life in different habitats.
- **MS.LS2.5b** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- **HS.LS2.4b** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- **HS.LS2.7a** Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.

9. Fire Ecology

Modern ecology recognizes nature as a dynamic and ever-changing system, characterized by cycles of disturbance and change. SW Colorado, with its fire-adapted forests and avalanche paths, provides a perfect outdoor learning lab for learning about the ecology of disturbance. This program will focus on fire and the role it plays in our home habitat. Students will learn about ecological succession and the fire triangle, and use their understanding of each to assess forests in terms of their overall health, susceptibility to destructive fire, and their potential for restoration by prescribed fire. A classroom "matchstick forest" simulation will challenge students to identify and test variables that affect fire size and behavior. In the field, students will explore an actual burn scar, learn about forest resilience, and experience the species-level adaptations that allow different types of forests to persist and thrive amidst the threat of wildfire.

Suggested Grade levels: 3 - 12

Topics: Life cycle of a forest, fire-adapted forests, ecological succession, fire triangle, forest resilience, wildfire management and risk mitigation.

Aligned CAS Evidence Outcomes:

- **4.LS2.1a.** Students can construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- **5.ESS3.5a.** Students can generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- **MS.LS2.7b.** Students can evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- **MS.LS3.9a.** Students can analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technology to mitigate their effects.
- **HS.LS2.6a** Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

10. Nature through the 5 Senses

Sight, sound, touch, smell, taste… what can our senses teach us about the natural world and how do animals (and even plants) use sensation to gather information and thrive in their environments? This program will get students connecting to the natural world through all five of their senses through a series of games, guided explorations, and case studies of how different animals use their senses. In the classroom, students will learn to categorize animals into 5 different vertebrate groups using their senses of sight and touch. In the field, they'll learn about wild edible plants, do touch-based scavenger hunts, stay in touch with one another by sound, and explore the incredible diversity of smells that nature offers. Along the way, we will learn about how each of these senses have evolved to help animal life--humans included--to find resources and avoid danger.

Suggested Grade levels: PreK - 1

Topics: Vertebrate animal families, habitat, biodiversity, observation through the 5 senses

Aligned Performance Indicators:

- **PreK.PS1.1a.** Students can use senses to explore the properties of objects and materials.
- **PreK.LS2.1.** Students can recognize that living things have unique characteristics and basic needs that can be observed and studied.
- **K.ESS3.2a.** Students can use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
- **1.LS2.1a.** Students can use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
- **1.LS2.1b.** Students can read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

11. Watersheds in Winter / Snow Science

In the catalog of “things every Colorado kid should know,” the connection between snowpack and water supply ranks near the top. In this program, students will explore this relationship in depth through hands-on simulations in the classroom, and data collection in the field. Classroom activities will guide students through an exploration of snow-water equivalent, density calculation, snow crystal types and metamorphosis, groundwater infiltration, and how to predict and avoid avalanches. In the field, students will dig snow pits to collect data on all of the above, quantifying the water content of the snow and assessing the stability of the snowpack using actual snow-forecasting techniques along the way. We will conclude by comparing our data to long-term historical data collected from nearby SNOTEL sites, exploring the relationship between climate, snowpack, river flows, and wildfire events in the Animas River watershed.

Suggested Grade levels: 5 - 10

Topics: Watersheds, S.W.E., snow density, snow metamorphosis, crystal types, story of a winter reconstruction, avalanche awareness.

Aligned Performance Indicators:

- **5.ESS3.3a.** Students can develop a model using an example to describe ways the geosphere, hydrosphere, and/or atmosphere interact.
- **5.ESS3.5a.** Students can obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.
- **MS.ESS3.6b.** Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity.
- **MS.ESS3.9a.** Students can analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- **HS.ESS3.9.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- **HS.ESS3.11a.** Create computational simulations to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

12. Surviving and Thriving in Winter

This classic program exposes students to all aspects of wildlife during the wintertime. As the title indicates, students will discover that life has found myriad ways to not just survive in winter, but to continue to thrive. In the classroom, we will explore thermodynamics and heat transfer as the primary lens through which we examine the challenge of winter survival. Older students will take their understanding further by learning about energy budgets and how different organisms adapt to the challenge of staying warm while conserving energy. In the field, a series of inquiry-based experiences will put students’ knowledge to the test as they solve a series of challenges related to real-life examples of animal survival in the harsh winter environment.

Suggested Grade levels: 3 - 8

Topics: Homeostasis, endotherms vs ectotherms, heat transfer (conduction, convection, evaporation, radiation), energy budgets, hibernation, migration, torpor, microclimate, shelters, adaptations for life in the snow, subnivean animal life.

Aligned Performance Indicators:

- **3.LS2.2a.** Students can construct an argument that some animals form groups that help members survive.
- **3.ESS3.2a.** Students can make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
- **4.PS1.2a.** Students can make observations to provide evidence that can be transferred from place to place by sound, light, heat, and electric currents.
- **4.LS2.1a.** Students can construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- **MS.LS2.5a.** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

13. Archaeology and Human History in the Southwest

In sandstone canyons across Southwest Colorado, a rich human history can be interpreted from countless archaeological sites hundreds to thousands of years old. With access to sites at the Durango Nature Center and throughout Canyons of the Ancients National Monument, students participating in this program will have a unique opportunity to participate interpret the rich human history of our region in situ, through live exploration of the environment, hands-on interaction with artifacts, and activities that blend modern science, indigenous knowledge systems, and art. **Note:** Trips to Canyon of the Ancients National Monument are paid for by a grant from the BLM and are free of charge at this time.

Suggested Grade levels: 4 - 12

Topics: Ancestral Puebloan history, archaeological interpretation, ethnobotany, art and nature

Aligned Performance Indicators:

- **Intermediate Elementary Social Studies 1.a -** Analyze significant historical documents, cartoons, artifacts, artwork, charts, and graphs related to eras and themes in history.
- **Intermediate Elementary Social Studies 2.b -** Describe the history, interaction, and contribution of the various peoples and cultures that have lived in or migrated to a community or region.
- **Intermediate Elementary Science 3.e -** Compare and contrast a human system to that of another organism, and provide hypotheses about why the similarities and differences exist.
- **Middle School Social Studies 1.c -** Construct a written historical argument using evidence from primary and secondary sources.
- **Middle School Science 3.a -** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- **High School Social Studies 1.c -** Construct and defend a written historical argument using relevant primary and secondary sources as evidence.
- **High School Social Studies 1.d -** Differentiate between facts and historical interpretations, recognizing that a historian's narrative reflects his or her judgment about the significance of particular facts.