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ALASKA STATE ACADEMIC STANDARDS

The following grade level standards come from Alaska State Science Standards (2020) and the Fairbanks North Star Borough School District Science Curriculum (2016), which overlap significantly and are thus not distinguished. Standards are compiled here based on their potential to be clearly connected to scientific topics relevant to the Alaska Songbird Institute (e.g. bird song, migration, habitat). Note: the Fairbanks North Star Borough School District Science Curriculum for grades 6-8 and 9-12 were updated in 2024, and this document may not yet reflect these changes.

Standards can be integrated into programs according to grade level and lesson theme. Examples of ways standards can be integrated into programs relevant to ASI are listed at the bottom of each grade level.

Kindergarten (habitat, human impact on Earth)

- Living things need water, air, and resources from the land, and they live in places that have the things they need.
- Humans can reduce their impact on the land, water, air, and/or other living things in the local environment.
- *ASI connection ideas: bird habitats at Creamer's Field; how to help your backyard birds.*

1st Grade (heredity, growth and development, structure and function, sound)

- Young animals and plants are very much, but not exactly, like their parents
- Individuals of the same kind of plant or animal are similar, but vary in many ways
- Adult plants and animals can have young. In many kinds of animals, parents and offspring engage in behaviors that help the offspring to survive.
- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air.
- Sound can make matter vibrate and vibrating matter can make sound.
- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.
- *ASI connection ideas: bird life cycles; bird adaptations; why songbirds sing; how and why birds migrate (using sun, moon, and stars).*

2nd Grade (biodiversity, ecosystem interactions)

- There are many different kinds of living things in any area, and they exist in different places on land and in water.
- Plants depend on animals for pollination and seed dispersal.
- *ASI connection ideas: Alaskan bird/songbird biodiversity; why birds matter as pollinators/seed dispersers.*

3rd Grade (reproduction, inheritance and variation, forces)

- Reproduction is essential to the continued existence of all organisms.
- Habitats are beneficial to some organisms but not others
- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.
- Many characteristics of organisms are inherited from their parents.
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and the environment.
- Each force on an object has both strength and direction. An object at rest has forces acting on it, but a net force of zero. Forces that do not sum to zero can cause changes in the object's speed or direction.
- Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.
- *ASI connection ideas: bird life cycles; bird habitats at Creamer's Field; to flock or not to flock; bird pigmentation and inheritance vs. environment; physics of flight; how and why birds migrate.*

4th Grade (structure and function, senses)

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain
- *ASI connection ideas: bird adaptations! Migration through magnetism, song through syrinx anatomy, physics of flight through hollow bones, feathers, etc.*

5th Grade (matter and energy flow in organisms, ecosystems, gravity)

- Food provides animals with the materials they need for body repair and growth, and the energy they need to maintain body warmth and motion.
- Organisms have interdependent relationships in ecosystems. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
- *ASI connection ideas: migration (birds need energy), winter bird adaptations for food storage and warmth, the role of birds in the boreal forest, physics of flight.*

6th Grade (interactions, behavioral adaptations, classification, gravity)

- Organisms in an ecosystem interact in different ways (e.g. competition, predation, mutualism)

- Differences and similarities in living things are based on structures and basic behaviors (e.g., migrations, communication, adaptation, hibernation) used by organisms to meet the requirements of life.
- All organisms are scientifically classified by their structure.
- Gravity is the force that causes two particles to pull towards each other.
- *ASI connection ideas: the role of birds in the boreal forest; behavioral adaptations (migration, winter bird food caching, song communication), songbirds as a classified group, physics of flight.*

7th Grade (natural selection, adaptation)

- Design and conduct a simple investigation about the local environment.
- Natural selection leads to the predominance of certain traits in a population and the suppression of others.
- 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 changes.
- Animals engage in characteristic behaviors that increase the odds of reproduction.
- *ASI lesson ideas: bird investigation (what do you want to learn about birds?), bird adaptations (in terms of natural selection and adaptation), spring mating and sexual selection.*

8th Grade (electromagnetism)

- Electric and magnetic forces can be attractive or repulsive, and their size depends on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between interacting objects.
- *ASI connection ideas: migration and magnetism.*

High School Biology, grades 10-12 (evolution, biodiversity)

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.
- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment.
- Communicate scientific information in multiple formats (including orally, graphically, textually, and mathematically).
- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from challenges such as predation, competition, and disease.

Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance of any species in any given ecosystem.

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status, as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.
- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).
- Humans depend on the living world for the resources and other benefits provided by biodiversity. However, human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes for recreational or inspirational value.

Alaska Zoology: Fish & Birds, grades 10-12

Themes mirror the above Biology standards, but apply those concepts to Alaskan wildlife.

Performance objectives include:

- Identify the major bird groups of Alaska including general anatomy, physiology, and behavioral patterns.
- Explain how the diversity of present species through evolution fills all available niches with organisms.
- Discuss Alaska ecosystems and environmental issues and their relationship and impact on the major bird groups.
- Describe classification based on evolutionary relationships.
- Describe how species evolve over time due to recombination and mutation of genes.