Watershed Education Program (WEP)

Watershed analysis, water quality, macroinvertebrates, stream survey (VBAP), electrofishing, ArcGIS online (AGO)

Alignment with Next Generation Science Standards

Performance Expectations for **High School** (p. 1)

Developed by: Judy Tumosa, Watershed Education Specialist, NHF&G June 2020

NGSS	Performance Expectation	VBAP, electrofishing, AGO match
HS-PS4-2	Evaluate questions about the advantages of using a digital transmission and storage of information.	Use water quality probes (WEP), data loggers and pit tags (F&G fisheries data collection), stream gauges (USGS) that collect and store data. Use mobile devices (iPads) to collect stream data to upload to AGO maps and use AGO to store, analyze, and share that data to study watersheds.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	Examine the factors in an ecosystem such as water flow, water quality, temperature, prey, space, etc. that may impact fish populations. Use AGO analysis tools to predict presence of a cold or warm water fish population.
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	Examine the biodiversity of a stream and riparian area; a replanted riparian area or restored stream can lead to an increase in biodiversity for macros and fish, including mitigating the impact of climate change on NH wildlife.
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	Examine the river continuum theory where sections of the river receive different inputs and cycling of carbon for macroinvertebrate and fish species.
HS-LS2-6	Evaluate the 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.	Collect water quality, macroinvertebrate and fisheries data to study impacts on stream systems such as climate change, floods, drought, pollution, etc, and consider the resilience of restored streams.
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	Perform Citizen Science projects to restore a river or stream, including mitigating the impact of climate change on NH wildlife.
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	Explore the impact of climate change on the habitats, distribution and populations of macroinvertebrates and fish; how does increase in water temperature or introduction of non-native species impact cold water fish?
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity	Perform a culvert assessment to determine the impact of Aquatic Organism Passage on watershed connectivity.

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Alignment with Next Generation Science Standards
Performance Expectations for **High School** (p. 2)

NGSS	Performance Expectation	VBAP, electrofishing, AGO match
HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.	Study how watersheds can respond to many changes, including climate change.
HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.	Examine impacts of flowing water and the water cycle on the landscape, stream transportation and deposition using a stream table.
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems	Perform Citizen Science projects to benefit the watershed for fish and wildlife; culvert assessments and remediation, riparian zone repair, storm water management, BMP's, etc, including mitigating the impact of climate change on NH wildlife.
HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems	Use the NH Wildlife Action Plan (WAP) to focus on the impacts from climate change and pollution to vulnerable ecosystems such as warm water and cold water rivers and streams and aquatic species of concern.
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	Examine how the increasingly frequent cycles of flooding and drought impact watersheds and aquatic organisms, including the impact of climate change on NH wildlife.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	Remember watershed management <u>is</u> environmental engineering; impaired connectivity of the watershed is an example, including climate change impacts.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	Examine the trade-offs and impacts of aquatic ecosystem management such as dam removal, raising and stocking hatchery fish, etc.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	Use the WEP AGO watershed map to collect, post, share and analyze data to determine the impact on aquatic ecosystems and plan remediation for those impacts, including climate change.