



## Virginia DWR Fish Hatchery Concepts Correlated to the Virginia Science SOL/Course Guidelines

This document is intended to provide general concepts covered during a general fish hatchery tour. The content covered in a fish hatchery tour can vary across the state and not all hatcheries have the capacity for tours. Please call your [local fish hatchery manager](#) to discuss availability and possible topics before booking your tour.

*\*A note about CTE Courses.* If your school system offers any of the following CTE courses, consider planning a tour of your local fish hatchery: Aquaculture Infusion Units, Fisheries and Wildlife Management, Introduction to Natural Resources and Ecology Systems, Ecology and Environmental Management, Biological Applications in Agriculture. While this document does not cover CTE course competencies many correlate to hatchery tour content.

| Hatchery Content       | Brief Description of Content   | Correlation to 2018 Virginia Science SOL's  |   |  |
|------------------------|--|---|---|--|
|                        |  | Elementary  | Middle<br><i>(LS is 7<sup>th</sup> grade Life Science, PS is 8<sup>th</sup> grade Physical Science)</i>   | High School<br><i>(BIO= Biology, ENV= Environmental Science, Ec= Ecology, PH= Physics)</i> |
| <b>Water chemistry</b> | Fish have specific water chemistry requirements, which the hatchery tests. | K.4- importance of water<br><br>3.7 c- water cycle  | 6.6- properties of water<br>6.9 c- health concerns associated with poor water quality<br><br>LS.5 a- nutrient cycles<br>LS.7 a- biotic and abiotic factors of aquatic ecosystems<br>LS.9 c -variations in biotic and abiotic factors can change ecosystems<br>LS.11 c-environmental factors and genetic variation influence survivability | BIO.2 a- water chemistry<br>BIO.8 b- nutrient cycle with energy flow through ecosystems    |
| <b>Water flow</b>      | Hatcheries depend on a continuous flow of freshwater from local springs.   | K.4- importance of water<br>2.5 b- plants and animals are connected with each other and nonliving surroundings<br>3.7- water cycle<br>4.8- VA natural resources (water) | 6.6 f- importance of water for humans and agriculture<br><br>LS.7 a- biotic and abiotic factors of aquatic ecosystems<br>LS.9 c-variations in biotic and abiotic factors can change ecosystems  | BIO.2 a- water chemistry<br><br>PH.2- velocity, displacement<br>PH.7- gravitational force  |

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| <b>Basic Needs</b>     | The basic needs of fish and how are those needs met in the environment and in hatcheries.  | K.7- animal basic needs<br>1.5 a- animal needs<br>2.5- animal needs<br>3.5- aquatic ecosystems<br>4.3- interactions with nonliving environment | LS.5- biotic and abiotic factors affect an ecosystem.<br>LS.6- populations in a biological community interact and are interdependent. | BIO.8 a- limiting factors<br>ENV.5- abiotic and biotic factors, limiting factors<br>EC.6- limiting factors   |
| <b>Life Cycle</b>      | Many of our hatcheries raise fish from eggs to fingerlings before releasing them into the environment and can talk about the stages of each fish's life cycle. | K.7 b- animals have life cycles<br>3.5- aquatic ecosystems<br>4.2 animal structures for obtaining energy and reproduction                      | LS. 2- cell division (growth and reproduction)  | BIO 6- structures, functions, and processes allow for classification of organisms<br>EC.2- organism life history   |
| <b>Adaptation</b>      | Many of our fish are adapted to specific water chemistry and environments. Some characteristics of fish are adaptations for survival in specific environments. | 1.5 b- animals have characteristics to perform specific functions  | LS.7 - physical and behavioral characteristics for survival   | BIO.7 b, c- genetic variation and environmental pressures affect survival; emergence of hybrids and new species<br>Ec.5- animal adaptations (body size/shape, oxygen uptake, maintaining temperature, variations to light/temp.) |
| <b>Food chain/webs</b> | The fish raised in hatcheries are part of a greater food web in the environment.   | 2.5 a- plants and animals are connected with each other and nonliving surroundings<br>3.5- aquatic ecosystems<br>4.3 b- food webs              | LS.4 - energy transfer<br>LS.5 b- food webs<br>LS.6 a- predator/prey<br>LS.6 b- competition for resources                             | BIO.8 b- nutrient cycle with energy flow through ecosystems<br>ENV.5- food webs<br>Ec.9- food webs   |
| <b>Genetics</b>        | Hatcheries attempt to maintain genetic diversity among the fish they raise.  |  | LS.10 genetics<br>LS.11 c-environmental factors and genetic variation influence survivability   | BIO.5- genetics, inheritance, synthetic biology (triploid)<br>BIO.7 b, c- genetic variation and environmental pressures  |

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|---|--|--|---|--|
|   |  |  |   | <p>affect survival; emergence of hybrids and new species</p> <p>ENV.6- genetics' role in conservation</p> <p>Ec.8- species diversity as it relates to the stability of communities and ecosystems</p>          |
| <p><b>Population Dynamics: Mark and Recapture</b></p> | <p>Discuss the various methods of marking fish that hatcheries perform so biologists can study stocked fish populations. -- how many fish are marked to create a sample size, etc.</p> |  | <p>LS.1- scientific and engineering practices</p> | <p>BIO.1- scientific and engineering practices</p> <p>ENV.1- scientific and engineering practices</p> <p>Ec.1- scientific and engineering practices</p> <p>Ec.6- modeling predictions of population growth</p> |

**Additional content hatcheries may weave into tours**

**Classification-** at minimum genus and species but can also talk about members of fish families have characteristics in common (1.5c, 4.3d, LS3c, BIO.6)

**Human influence/use of resources-** many of our hatcheries are tied to the health of natural streams; the human influence on why we are raising these fish (K.11, 1.8, 3.8a-b, LS.8, BIO.8, ENV 8, ENV.12, Ec.11)

**Watershed-** what watershed is the hatchery a part of and how does the hatchery take care to not contaminate the watershed (4.8a, 6.8, ES. 8)

**Renewable energy-** if the hatchery is tied to renewable energy (5.9, 6.9)

**Technology-** how advancements in technology helped transform hatcheries. (5.9c , LS.1, BIO. 1, ENV. 1, Ec. 1)

**Disease-** how does a hatchery prevent disease and treat it when disease? (BIO.4, BIO.8 a)

**Career readiness-** the educational background of a fish Culturist and day to day activities of a hatchery worker. (for CTE courses)