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 Virginia Science SOL's		
		Elementary	**Middle** *(LS is 7th grade Life Science, PS is 8th grade Physical Science)*	**High School** *(BIO= Biology, ENV= Environmental Science, Ec= Ecology, PH= Physics)*
Water chemistry	Fish have specific water chemistry requirements, which the hatchery tests.	K.4- importance of water 3.7 c- water cycle	6.6- properties of water 6.9 c- health concerns associated with poor water quality LS.5 a- nutrient cycles LS.7 a- biotic and abiotic factors of aquatic ecosystems LS.9 c -variations in biotic and abiotic factors can change ecosystems LS.11 c-environmental factors and genetic variation influence survivability	BIO.2 a- water chemistry BIO.8 b- nutrient cycle with energy flow through ecosystems EC 4- biogeochemical cycles ENV 2- biogeochemical cycles
Water flow	Hatcheries depend on a continuous flow of freshwater from local springs.	K.4- importance of water 2.5 b- plants and animals are connected with each other and nonliving surroundings 3.7- water cycle 4.8- VA natural resources (water)	6.6 f- importance of water for humans and agriculture LS.7 a- biotic and abiotic factors of aquatic ecosystems LS.9 c-variations in biotic and abiotic factors can change ecosystems	BIO.2 a- water chemistry PH.2- velocity, displacement PH.7- gravitational force ENV 6- freshwater resources

Basic Needs	The basic needs of fish and how are those needs met in the environment and in hatcheries.	K.7- animal basic needs 1.5 a- animal needs 2.5- animal needs 3.5- aquatic ecosystems 4.3- interactions with nonliving environment	LS.5- biotic and abiotic factors affect an ecosystem. LS.6- populations in a biological community interact and are interdependent.	BIO.8 a- limiting factors ENV.4- abiotic and biotic factors ENV 5- limiting factors EC. 4- flow of matter EC. 5- population growth
5-Life Cycle	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 3.5- aquatic ecosystems 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
Adaptation	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 EC. 6- animal adaptations (body size/shape, oxygen uptake, maintaining temperature, variations to light/temp.)
Food chain/webs	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 3.5- aquatic ecosystems 4.3 b- food webs	LS.4 - energy transfer LS.5 b- food webs LS.6 a- predator/prey LS.6 b- competition for resources	BIO.8 b- nutrient cycle with energy flow through ecosystems ENV.4- dynamic equilibrium EC.4- flow of matter
Genetics	Hatcheries attempt to maintain genetic		LS.10 genetics	BIO.5- genetics, inheritance, synthetic biology (triploid)

	diversity among the fish they raise.		LS.11 c-environmental factors and genetic variation influence survivability	BIO.7 b, c- genetic variation and environmental pressures affect survival; emergence of hybrids and new species ENV.5- genetics' role in conservation
Population Dynamics: Mark and Recapture	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.		LS.1- scientific and engineering practices	BIO.1- scientific and engineering practices ENV.1- scientific and engineering practices EC.1- scientific and engineering practices EC.5- modeling predictions of population growth

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 5-7, ENV 9, EC.2, EC. 7)

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, ENV 8)

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)