Each year, the Spirit Lake Fish Hatchery (SLFH) is tasked with producing over 90 million Walleye fry, 300,000 Walleye fingerlings, 4 million Northern Pike fry, 300,000 Northern Pike fingerlings, 1 million Muskellunge fry, and 30,000 Muskellunge fingerlings to stock in Iowa's waters. The water supply for the hatchery is Big Spirit Lake. Water for the hatchery travels from the lake through a 20-inch pipe that extends 700 feet into the lake. The intake for this pipe is 13 feet deep and capped off with a ½ inch metal screen. The outlet of the pipe in a hatchery filter pond, where it is filtered through a 4-inch rock crib before being pumped to a head tank in the hatchery.

In 2017, zebra mussels (*Dreissena polymorpha)* were found in Big Spirit Lake. Zebra mussels are a prolific aquatic invasive species (AIS) that start to reproduce when water temperatures reach 54◦F. Zebra mussels spread during the free-floating, microscopic larval stage of their life. The young, known as veligers, float through the water column until they have developed enough to attach to a hard surface. Big Spirit Lake reaches 54◦F in April and continues to stay above this temperature through October. In these conditions, a female zebra mussel can release up to one million eggs per year, causing populations to expand rapidly once established.

The presence of zebra mussels in the source water for SLFH poses two primary risks to fish production. First, adult zebra mussels will adhere to the intake screen, potentially clogging the intake and restricting the water supply to the hatchery. Second, during most of the fish production season, there is the potential for zebra mussel veligers to be present in the water that enters the hatchery. This requires all fish and water loaded onto hatchery trucks to be treated before leaving the hatchery to ensure that zebra mussels are not being spread during stocking operations.

In addition to the threat zebra mussels pose to fish production at SLFH, a water quality issue has been reducing fish production during the past 5 years. The hatchery has observed an influx of gas supersaturation coming from the lake. This issue has caused an extensive loss of Walleye eggs in the spring. Eggs attach to the bubbles produced by supersaturation, causing them to float out of the incubator system. In the past two years, this issue has caused a loss of over 50% of the Walleye eggs needed for production each year, resulting in unmet annual quotas for Walleye fry.

Between the threat posed by the recent zebra mussel infestation, and the loss of Walleye eggs due to gas supersaturation, the hatchery needs to start making improvements to its systems to be able to continue to produce the Walleye, Northern Pike, and Muskellunge fry and fingerlings requested each year for the anglers of Iowa.

1. PURPOSE:

The purpose of this grant is to address current threats to the water source for the SLFH. The current incubation system will be converted to a Recirculating Aquaculture System (RAS) that will use an AIS-free water source. This type of system will address the current water quality issues that are reducing fish production and it will ensure that fry are being produced in a zebra mussel free water source.

2. OBJECTIVES:

The objective of this project is to convert the incubation system to an AIS-free water source by March 1, 2020 so the SLFH can continue to produce fish and create fishing opportunities for Iowa anglers.

3. EXPECTED RESULTS AND BENEFITS:

The new Incubator RAS will eliminate the issue of zebra mussel infestation and egg loss due to supersaturation in the current hatchery incubator system. Control of temperature will also allow staff to manipulate hatch times, assisting with stocking strategies for each species. These changes will improve egg hatch rates and allow the hatchery to meet annual requests. Ultimately, these changes will increase fishing opportunities for Iowa anglers.

4. APPROACH:

Incubator RAS

The existing incubation system will be removed, and a new Incubator RAS will be designed and installed. The new system will be comprised of an egg fertilization station, 300 jar Walleye incubator RAS with temperature control, a Walleye egg hardening station and catch tank system, and a 25 jar Esocid incubator RAS system with temperature control, and an escocid egg hardening station and catch tank system. The Walleye fry catch tank system will tie into the existing piping for transfer to hauling trucks. Demolition of the current system can occur in the summer, after egg hatch.

Request for proposal for the design of the Incubator RAS will be posted on the Iowa DNR bid opportunities website. Proposals will be reviewed by a committee, and a contractor will be selected. Once a contractor is selected, a contract will be drafted. The contract will be submitted to the Natural Resources Commission (NRC) for approval. Once approved, the design of the system will begin.

Once design of the Incubator RAS is completed and approved by staff, a request for proposal for construction of this project will be posted. Qualifying proposals will be reviewed by committee, and a contractor will be selected. Once a contractor is selected, a contract will be drafted. The contract will be submitted to the Natural Resources Commission (NRC) for approval. Once approved, construction will begin. Construction will be completed by February prior to the fish production season.

5. FACILITY AND GEOGRAPHIC LOCATION:

The SLFH is a coolwater facility located one mile north of the City of Spirit Lake in Dickinson County. The hatchery complex is situated on an isthmus between Big Spirit Lake and East Okoboji Lake. Hatchery water gravity flows through a pipe from Spirit Lake into a hatchery filter pond and is then pumped to a head box in the hatchery.

6. TIMELINE:

Below is a tentative timeline for the two projects in this grant. These projects need to be completed during the production off season (July-February); therefore, if there are any delays the timeline will need to be delayed a full year. For this reason, this proposed end date for this grant is June 30, 2022; however, if we are able to adhere to the schedule below, the projects will be completed a year earlier.

- Issue for design of Incubator RAS –- February 2020

- Design contract for Incubator RAS approval from Natural Resources Commission (NRC) - March 2020
- Design Incubator RAS - April-June 2020
- Request for bids for construction of Incubator RAS – August 2020
- Construction contract approval for Incubator RAS approval from NRC – September 2020
- Construction of Incubator RAS - September 2020 - February 2021