

Lesson 3-2: Nechako White Sturgeon Life Cycle

Time of Lesson: 1.5 hours

Rationale: The purpose of this lesson is to introduce the life cycle of the Nechako white sturgeon to further develop the students' understanding of the Nechako white sturgeon. Understanding the life cycle of a species helps foster a greater respect for all sizes of animal as well as time of year, as well as make the connection between animal, habitat and season.

Instructional Objectives: Students can illustrate the life cycle of the Nechako white sturgeon.

Strategies and Activities: Brainstorm about what students know about the life cycle of the Nechako white sturgeon. Use the 'Every Sturgeon Counts' video to inform students about real-life interactions with sturgeon. Use art activity and student lead discussion to promote understanding of each life cycle stage. Encourage work on Unit Project.

Materials:

- SMARTboard PowerPoint Presentation: *NWS Life Cycle*
- Handout: *Worksheet 3b - Nechako White Sturgeon Life Cycle (2 page Handout)*.
- Handout: *Worksheet 3c - Venn diagram: Sturgeon versus Sockeye Salmon*
- YouTube Video: *Every Sturgeon Counts - Part 1*
(<http://www.youtube.com/watch?v=YhrEJUEi-ow>)
- Class Activity: Art supplies including large paper, markers, tape etc.

Student Assessment:

- Observation and participation in class and small group activities.
- Ability to identify the stages of the life cycle.
- Participation and quality of work in class activity.
- 'Ticket out the Door' "Tell me one stage of the life cycle of the Nechako white sturgeon."

LESSON PLAN

Activity (5 minutes)

Brainstorm about what the students already know about the life cycle of fish in general or specifically the Nechako white sturgeon.

Activity (10 minutes)

Call up the YouTube Video: *Every Sturgeon Counts* (<http://www.youtube.com/watch?v=YhrEJUEi-ow>) on the SMARTboard. Watch Part 1 (00:00 to 04:10). This video provides a simple and clear introduction to the life history of the Nechako white sturgeon as well as the issues it faces for continued survival.

Key Points

Nechako white sturgeon are endangered, there are less than 350 animals in the river.

The factors leading to the observed **recruitment failure** (the number of young surviving to adulthood and reproducing) is not completely understood. Research and education continue.

Activity (25 minutes)

Handout *Worksheet 3b - Nechako White Sturgeon Life Cycle*. Draw attention to the life cycle diagram and point out the 5 main stages - Adult, Spawning, Eggs, Larvae and Juvenile. Have students follow along as they watch the PowerPoint presentation. Show *Nechako White Sturgeon Life Cycle* PowerPoint presentation.

Ask

What life cycle stage is causing recruitment failure and the decline of the species? *The egg to juvenile stage. Very few young sturgeon currently in the river.*

Life cycle facts

Because sturgeon are so long lived they reach maturity at a much later age than most species. **Female reach maturity at 40 years of age, males reach maturity in their 20-25 years old.**

Mature sturgeon spawn between **May to July** when the water temperature is between **14-18°C**.

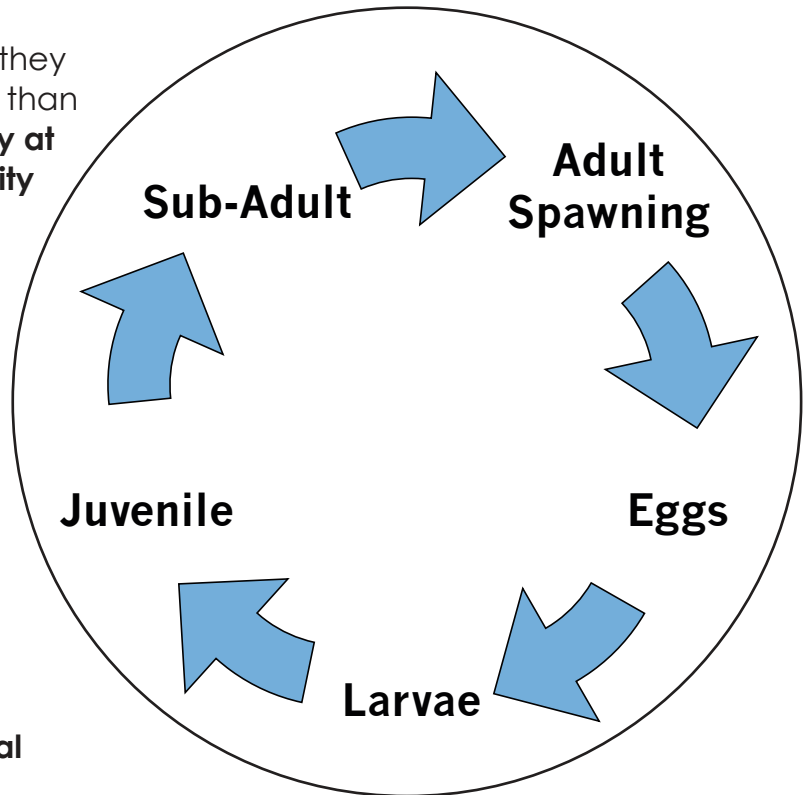
High-quality spawning habitat needs the following conditions:

- substrate – **clean stones-gravel to large rocks**, not sand
- water velocity – **swift flowing water**
- depth – **deep water**

A single female can produce **several million eggs**. They **spawn every 3 to 6 yrs**. **Whether a female spawns depends on having an adequate spawning site, and the proper water temperature**. If conditions are unfavourable she will **reabsorb** her eggs and miss spawning that year.

Female sturgeon **broadcast (releases) their eggs into water**, one or more male sturgeon then fertilize the eggs. In the Nechako River, only one known spawning site has been identified - in proximity to the bridge in Vanderhoof.

Once fertilized **eggs sink to the bottom and adhere to plants and rocks**. If too much sand is in the gravel, the eggs can not adhere and they drift downstream. Also, they get covered with sand and can not 'breathe' so they choke and die.



Eggs hatch between 7 and 10 days (cooler temperatures cause them to hatch later) into **tadpole like larvae**. The larvae hide in the gravel and live off their **yolk sac for the first 12 days** and then start to feed on **aquatic insects and zooplankton**.

After **20 days larvae develop into juveniles and emerge to find habitat in the river**. They resemble their parents with a full set of scutes, and fins.

White sturgeon are vulnerable throughout their egg and larvae stage. In areas of poor habitat they are **susceptible to predation, and lack of food**. **Less than 0.1 percent of juveniles survive past their first year**.

Lack of young sturgeon surviving to reproductive again = recruitment failure.

Activity (20 minutes)

Gather craft supplies including large paper, markers and tape. Have students split into groups of 2 or 3. Each group selects a life cycle stage and illustrates their paper with words and images of key points from that life cycle stage (note, more than one group will have each life cycle stage). After 10 minutes have the groups tape their papers around the room, in the order of the life cycle. Have the students cycle around the room to view each other's work, or the teacher can walk around and read out each group's responses and have a class discussion considering the following questions:

Ask

How important is habitat and river conditions to sturgeon spawning and egg development?

How much impact do predators have on sturgeon survival?

What things do we do along the Nechako River and in the watershed that may impact sturgeon spawning conditions?

Activity (15 minutes)

If the class has covered the salmon life cycle recently and/or is familiar with the salmon life cycle, Handout *Worksheet 3-1c Venn Diagram: Sturgeon vs. Sockeye Salmon*. Have the class work in small groups or as a class to complete the Venn Diagram. See the answer key of the worksheet for hints.

Key Points

Nechako white sturgeon have a very different life cycle and spawning behaviour than salmon.

Sturgeon and salmon both require clean gravel and swift water for successful spawning.

OPTIONAL CONTENT: Aging Sturgeon

Offer this information to students if time permits and/or interest from the class.

How to age a sturgeon: Because a sturgeon does not have scales, scientists use a small piece of the **sturgeon's pectoral fin to determine their age**. The rays are finger like pieces of bone which give a fin its strength. Like the rings of a tree, **layers are added to a ray each year**. These layers can then be counted to provide the sturgeons' age. Like a tree the space between the layers show how fast the sturgeon is growing.

Procedure for collecting fin sample for aging: To provide consistency, sampling of the fin ray is always done in the same place and in the same way. A small section of the left pectoral fin ray is cut using a hacksaw blade. Once this is done a scalpel is used to completely remove the sample from the rest of the fin. Finally, using a jeweller's saw the sample is cut into 4 to 6 cross sections. Cross sections are then mounted onto slides, which can be viewed under a microscope.

Closure (5 minutes)

Review the five stages of the sturgeon life cycle.

Ask how the information learned today can add to their Unit Project.

Nechako White Sturgeon Life Cycle

SUB-ADULT

What defines a sub-adult? _____

 _____.

ADULTS & SPAWNING

Female Nechako white sturgeon spawn at _____ years old. Males at _____ years old. Sturgeon spawn when river conditions are just right!
 Time of year: _____
 Water temperature: _____
 Substrate: _____
 Water Speed: _____ Depth: _____

JUVENILE

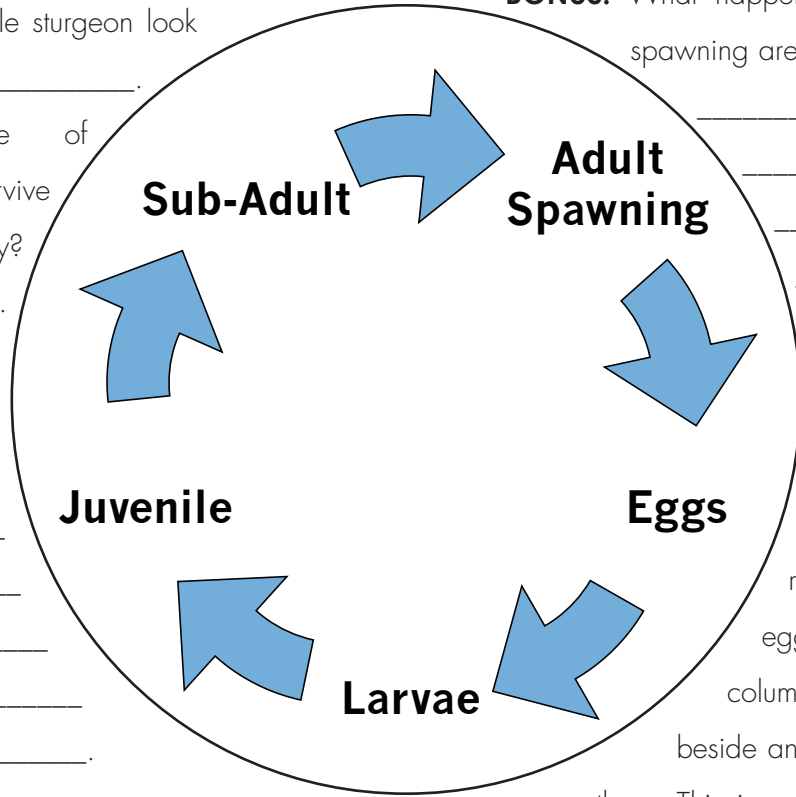
Juvenile sturgeon look like _____.
 What percentage of juvenile sturgeon survive past their first birthday?
 _____.

BONUS: Name four potential predators that feed on juvenile sturgeon. _____

 _____.

BONUS: What happens if the conditions for spawning are **not** adequate? _____

 _____.



EGGS

Female white sturgeon release _____ eggs into the water column and the male swims beside and release milt to fertilize them. This is called _____ spawning. The eggs then _____ on the river bottom. Eggs hatch within _____ days.
BONUS: What water condition causes the eggs to take longer to hatch? _____.

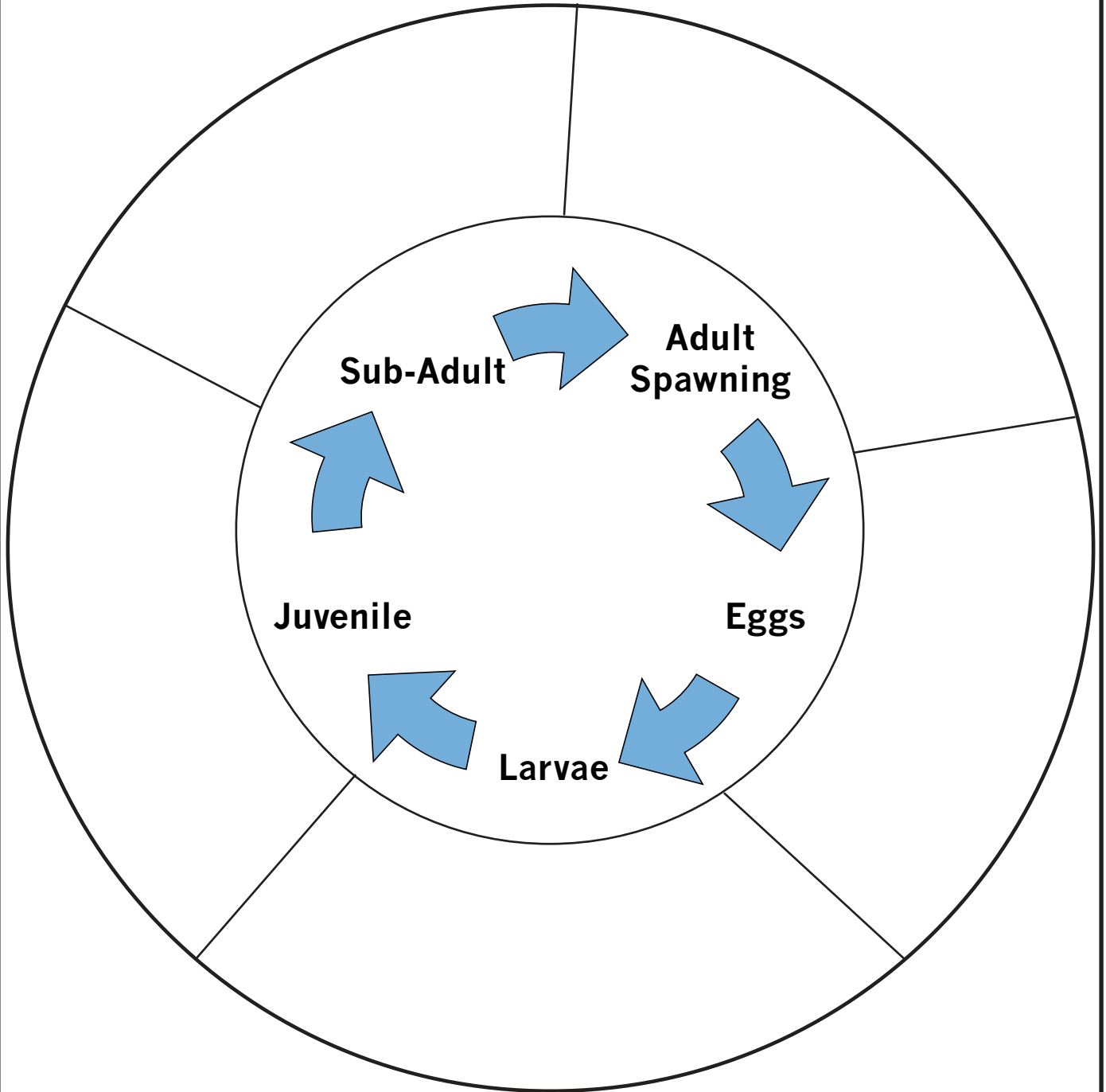
LARVAE

Larvae look like _____. They get their food from their _____ for the first _____ days. After that they eat _____. After another _____ days they are called juveniles.
BONUS: Where do you think larval sturgeon are found in the river? _____.



Nechako White Sturgeon Life Cycle

Draw a picture of a Nechako white sturgeon at each life cycle stage: Adult-Spawning, Eggs, Larvae, Juvenile and Sub-Adult. BONUS: At each life cycle stage include what habitat is needed by Nechako white sturgeon.



Nechako White Sturgeon Life Cycle - Answer Key

ADULTS & SPAWNING Female Nechako white sturgeon spawn at **40** years old. Males between **teens to 20s** years old. **BONUS:** Why? **Because they are a long lived species.** Sturgeon spawn when river conditions are just right!

Time of year: **May-July** Water temperature: **14°-18°C** Substrate: **Clean gravel to rocks, no sand (if too much fine substrate the eggs do not survive)** Water Speed: **fast** Depth: **deep**

BONUS: What happens if the conditions for spawning are **not** adequate? **The female resorbs the eggs and waits from 4-5 years later to spawn.**

EGGS Female white sturgeon release **million** eggs into the water column and the male swims beside and release milt to fertilize them. This is called **broadcast** spawning. **The eggs then sink to the bottom and adhere to rocks and plants** on the river bottom.

Eggs hatch within **7-10** days. **BONUS:** What water condition causes the eggs to take longer to hatch? **Colder water temperatures.**

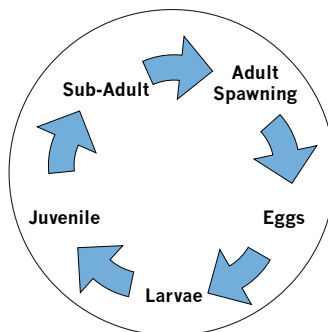
LARVAE Larvae look like **tadpoles**. They get their food from their **yolk sac** for the first **12** days. After that they eat **aquatic insects and zooplankton (microscopic invertebrates in the water column)**. After another **20 days** they are called juveniles. **BONUS:** Where do you think larval sturgeon are found in the river? **In the gravel and vegetation. Hidden from predators.**

JUVENILE Juvenile sturgeon look like **adult sturgeon with their scutes and fins etc..** What percentage of juvenile sturgeon survive past their first birthday? **0.1 percent = 1000 per million eggs.**

BONUS: Name four potential predators that feed on juvenile sturgeon. **salmon, trout, mergansers, kingfisher birds, gulls, osprey, other fish, larger sturgeon, otters, etc.**

SUB-ADULT What defines a sub-adult? **Greater than 1 metre in length but NOT reproductive.**

deep river water, Stuart, Fraser or Takla lakes



back eddies, gravel and vegetative cover



clean gravel, aquatic vegetation

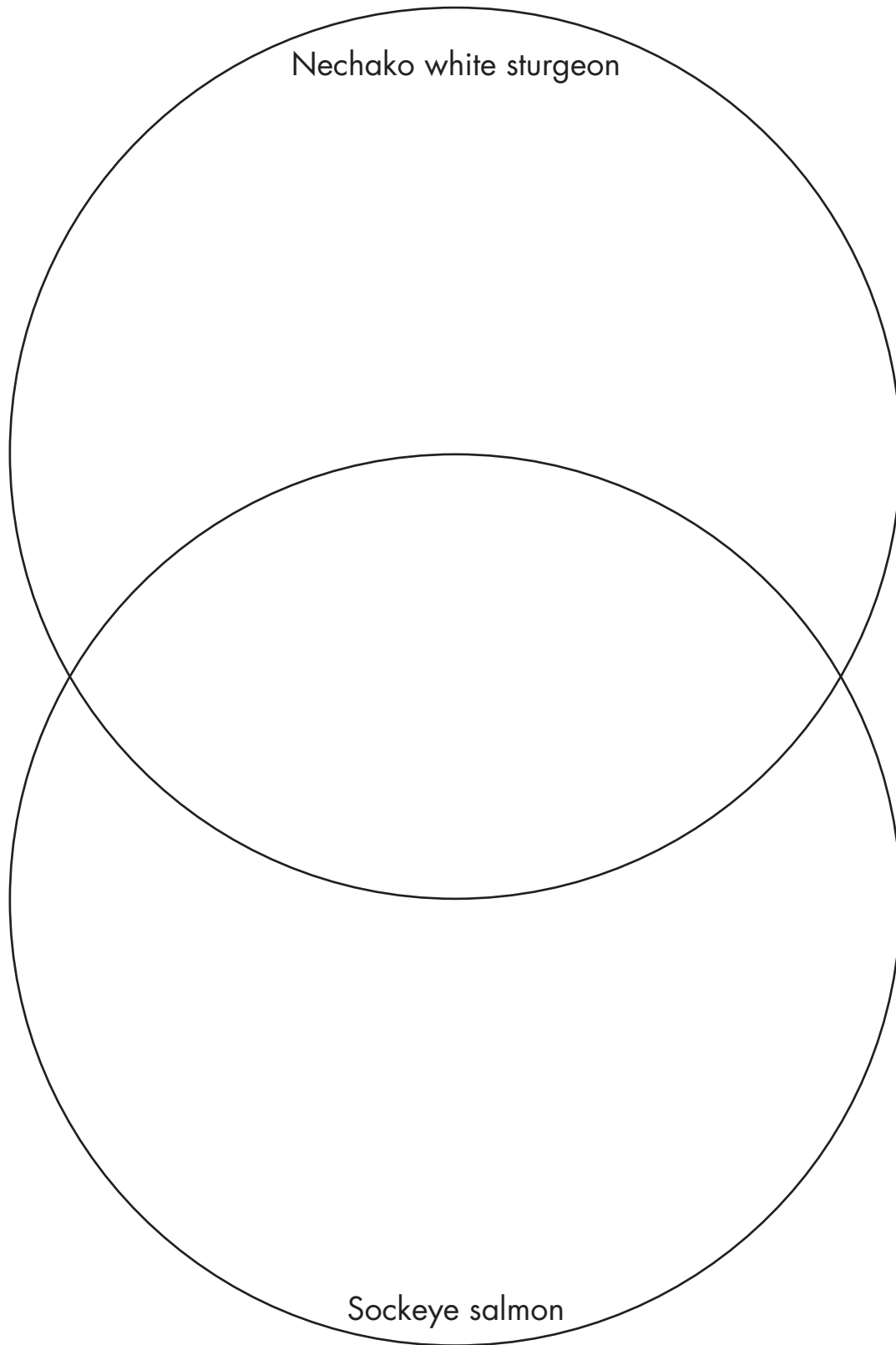


clean gravel, aquatic vegetation. This image is an example of an egg that is smothered by fine sand substrate and dies.

clean gravel, swift moving water, deep water, water 14-18°C

Venn Diagram: Sturgeon Vs. Sockeye Salmon

Fill in the circles of the Venn Diagram to determine SIMILARITIES and DIFFERENCES between the life cycles of the Nechako white sturgeon and sockeye salmon.



Venn Diagram: Sturgeon Vs. Sockeye Salmon - Answer Key

Fill in the circles of the Venn Diagram to determine SIMILARITIES and DIFFERENCES between the life cycles of the Nechako white sturgeon and sockeye salmon.

