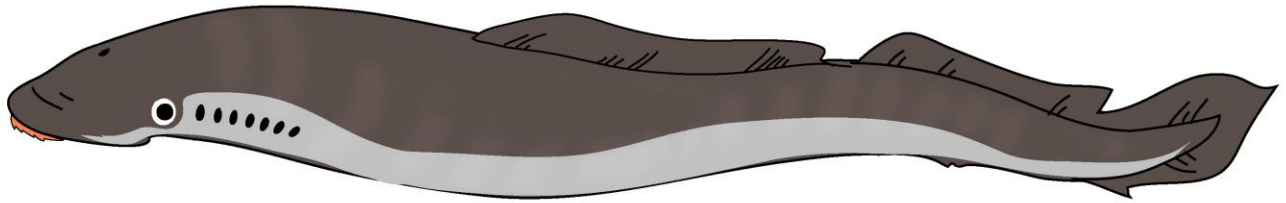
Activity 2 - Salmon and Lamprey

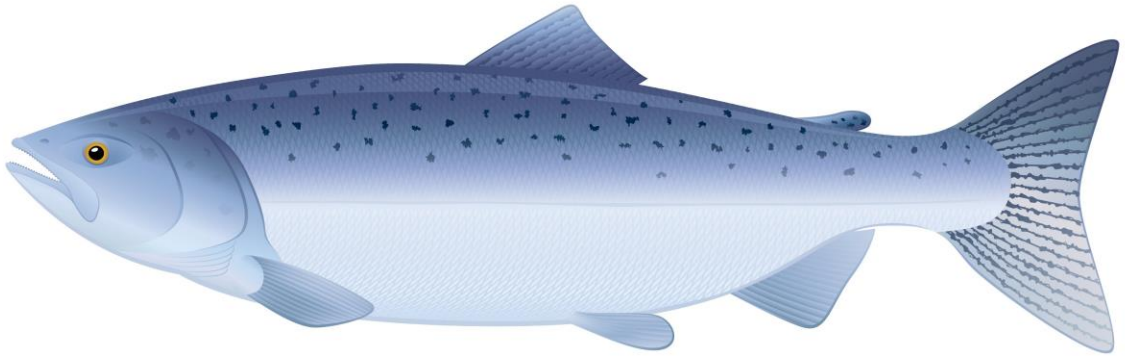
Grade 4

Notice and Wonder

Fish A



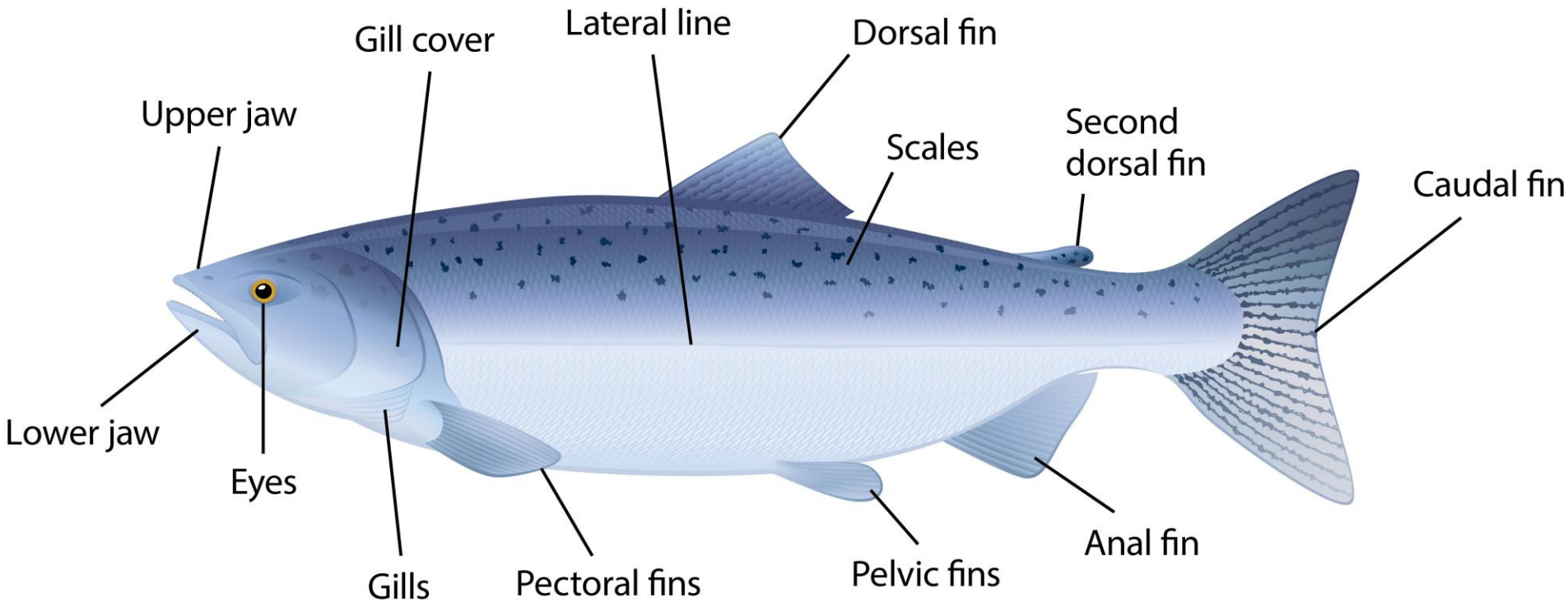
Fish B



**Not to scale*

Image sources: 1) (lamprey) Wikimedia Commons 2) (salmon) iStockPhoto

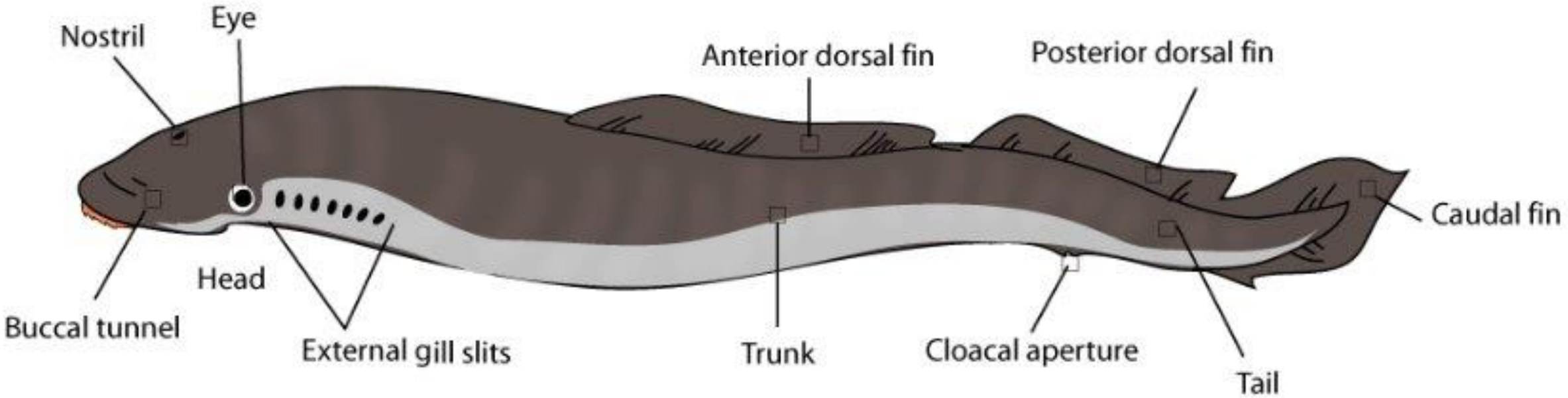
Structures of the Salmon: What do you think this fish uses to help it move upstream?



**Not to scale*

Image sources: 1) (lamprey) Wikimedia Commons 2) (salmon) iStockPhoto; 3) (labels) U.S. Fish and Wildlife Service

Structures of Lamprey: What do you think this fish uses to help it move upstream?



**Not to scale*

Image sources: 1) (lamprey) Wikimedia Commons 2) (salmon) iStockPhoto; 3) (labels) U.S. Fish and Wildlife Service

Structures of Lamprey vs. salmon, part 2*

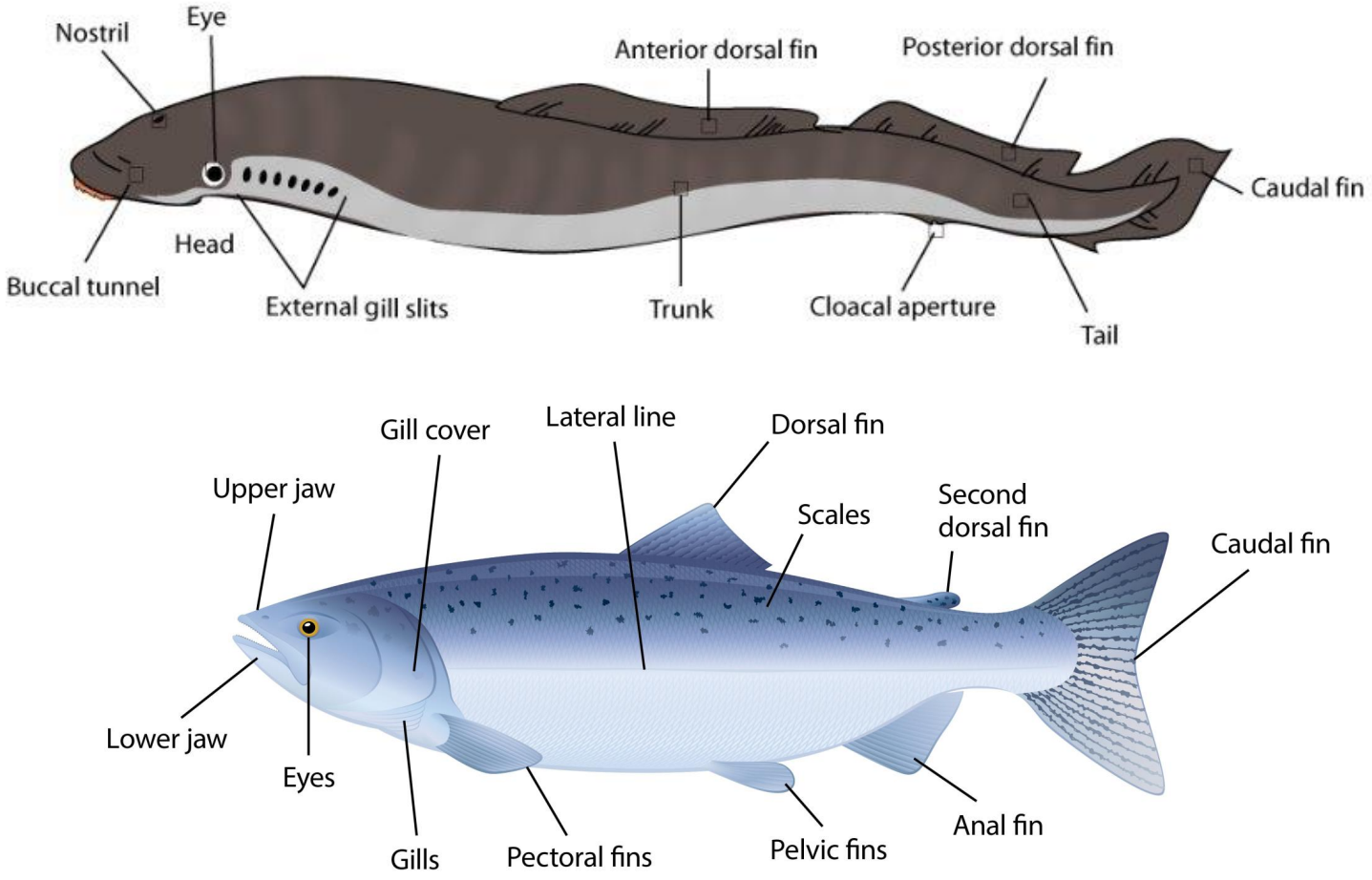


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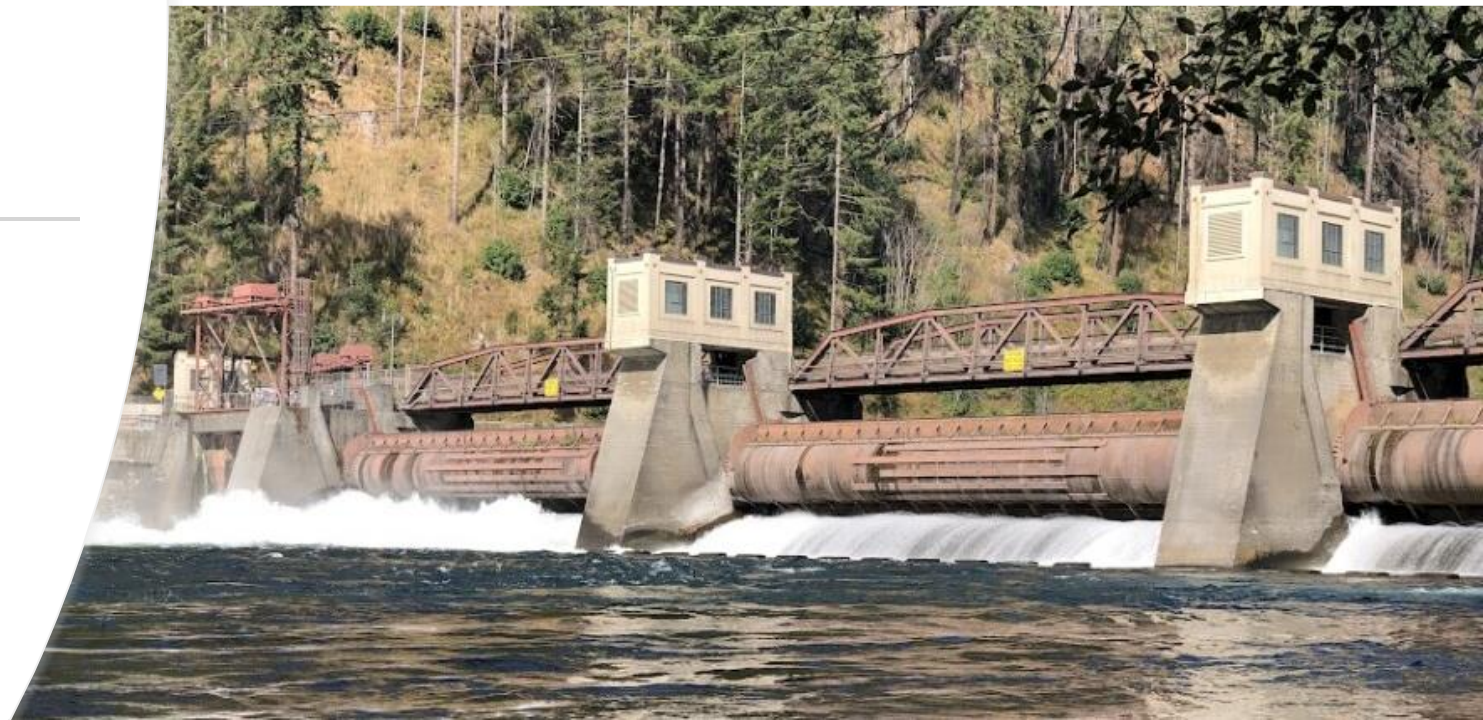
Image sources: 1) (lamprey) Wikimedia Commons 2) (salmon) iStockPhoto; 3) (labels) U.S. Fish and Wildlife Service

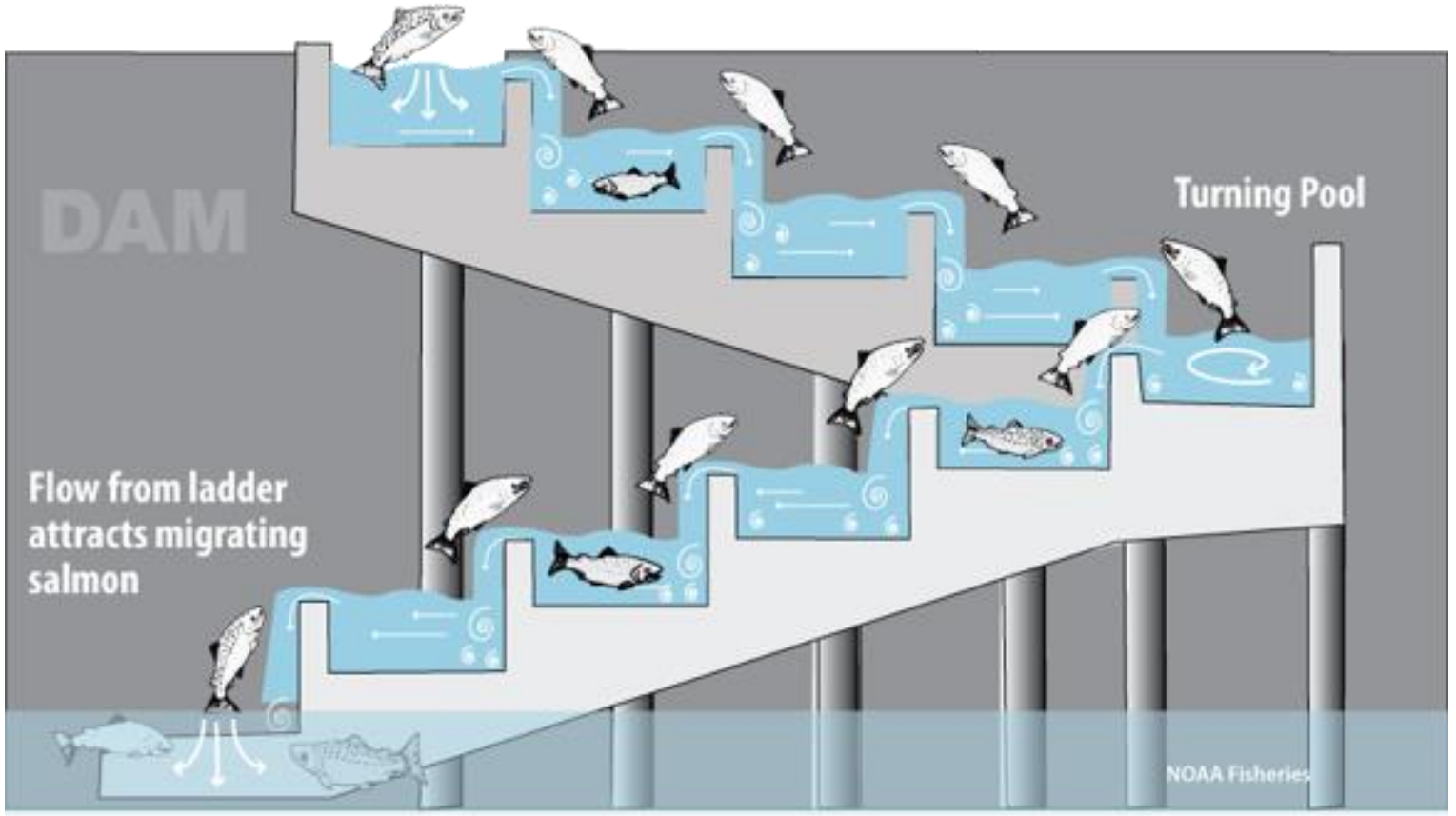
Fish Barriers to Upstream Movement





One Example of Fish Passage: the fish ladder

Image sources: NOAA Fisheries

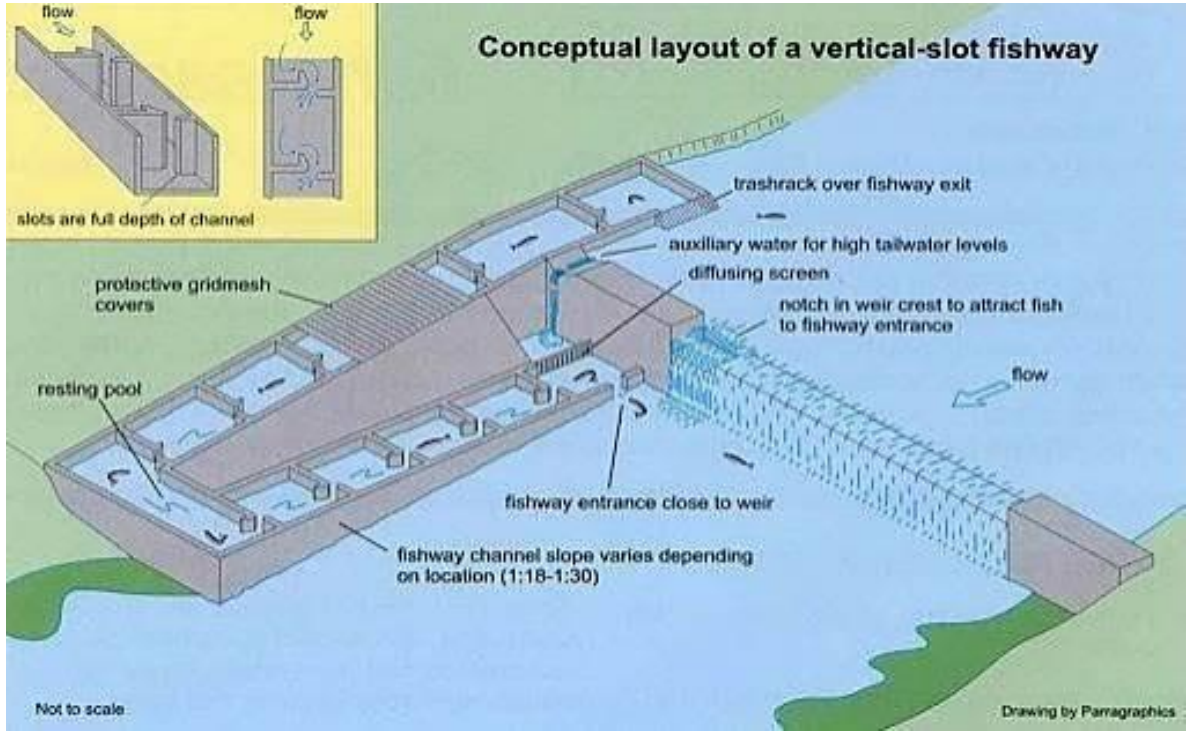


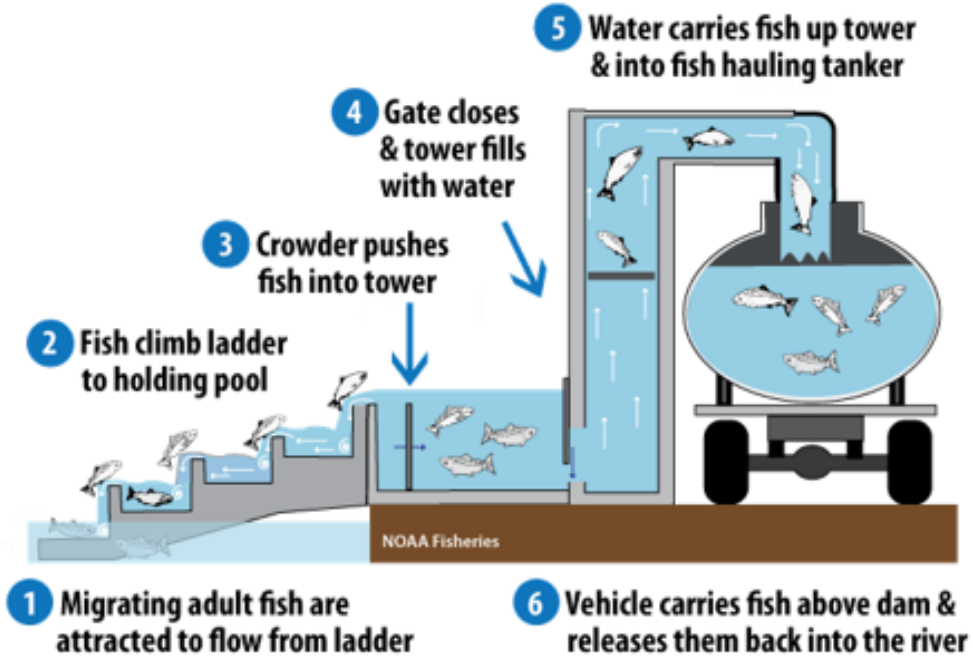
Activity 3 - Fish Ladder Challenge

Grade 4

Investigating Many Solutions

Image sources: NOAA Fisheries and ResearchGate





Baffle Fishway

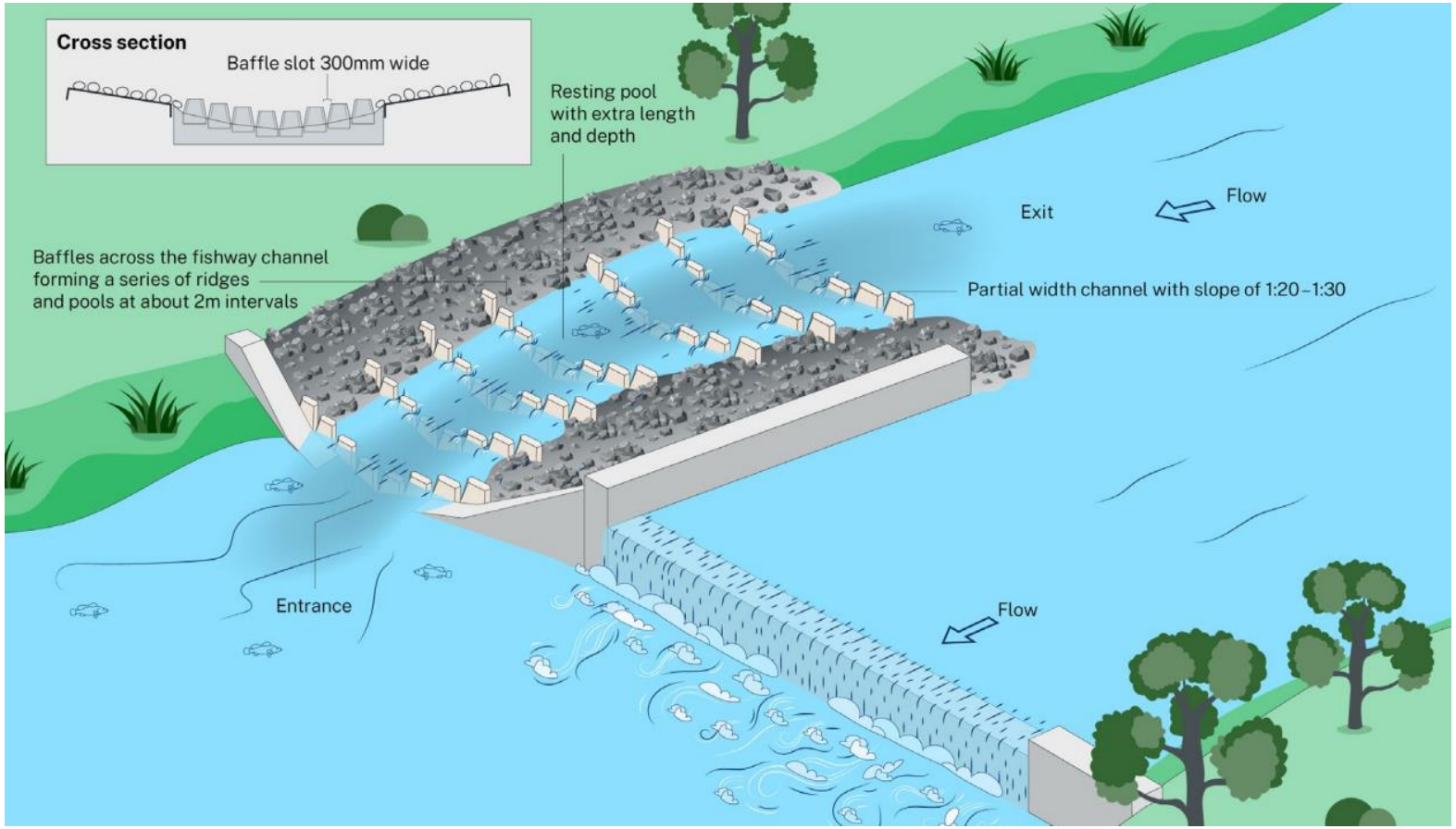


Image sources: Baffle fishway: State of New South Wales (license info)

A Baffle Fishway uses walls and barriers to slow the water down and create areas of calmer water. Fish can swim through the channel by moving from one section to the next instead of fighting the strongest current all at once.

Think about:

- What do you notice?
- How do you think this design works?
- What features might help fish move upstream?
- How might salmon use this design?
- How might lamprey use this design?

Pool and Weir Fish Passage



Image source: State of New South Wales (license info)

A Pool and Weir Fish Passage creates a series of small pools connected by short drops. Instead of swimming up one steep barrier, fish move from pool to pool, resting and continuing upstream a little at a time.

Think about:

- What do you notice about the pools?
- How might the pools help the fish move upstream?
- Why might fish need places to rest?
- How is this different from fish jumping a tall barrier all at once?
- How might salmon use this design?
- How might lamprey use this design?

Fish Lock Fish Passage

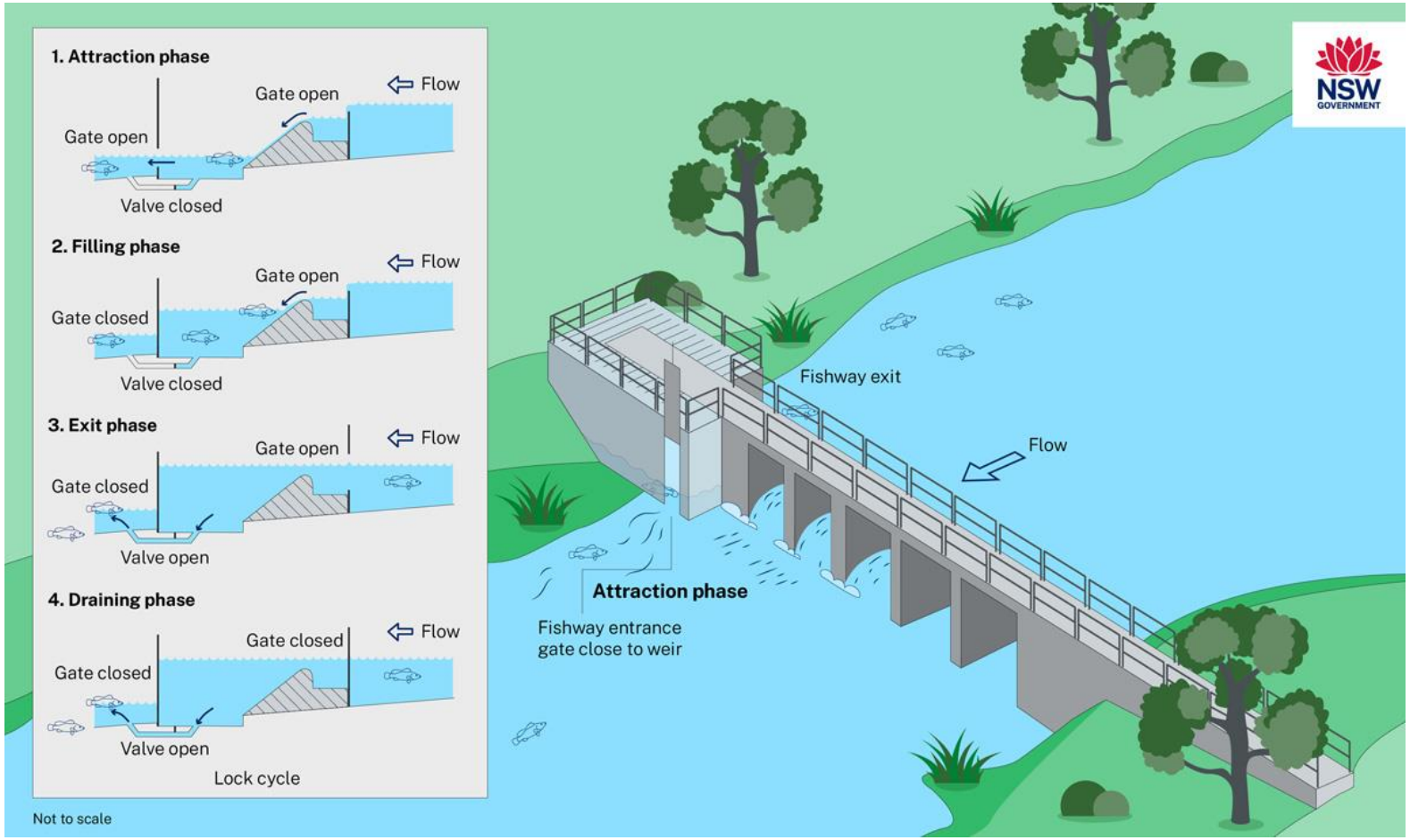


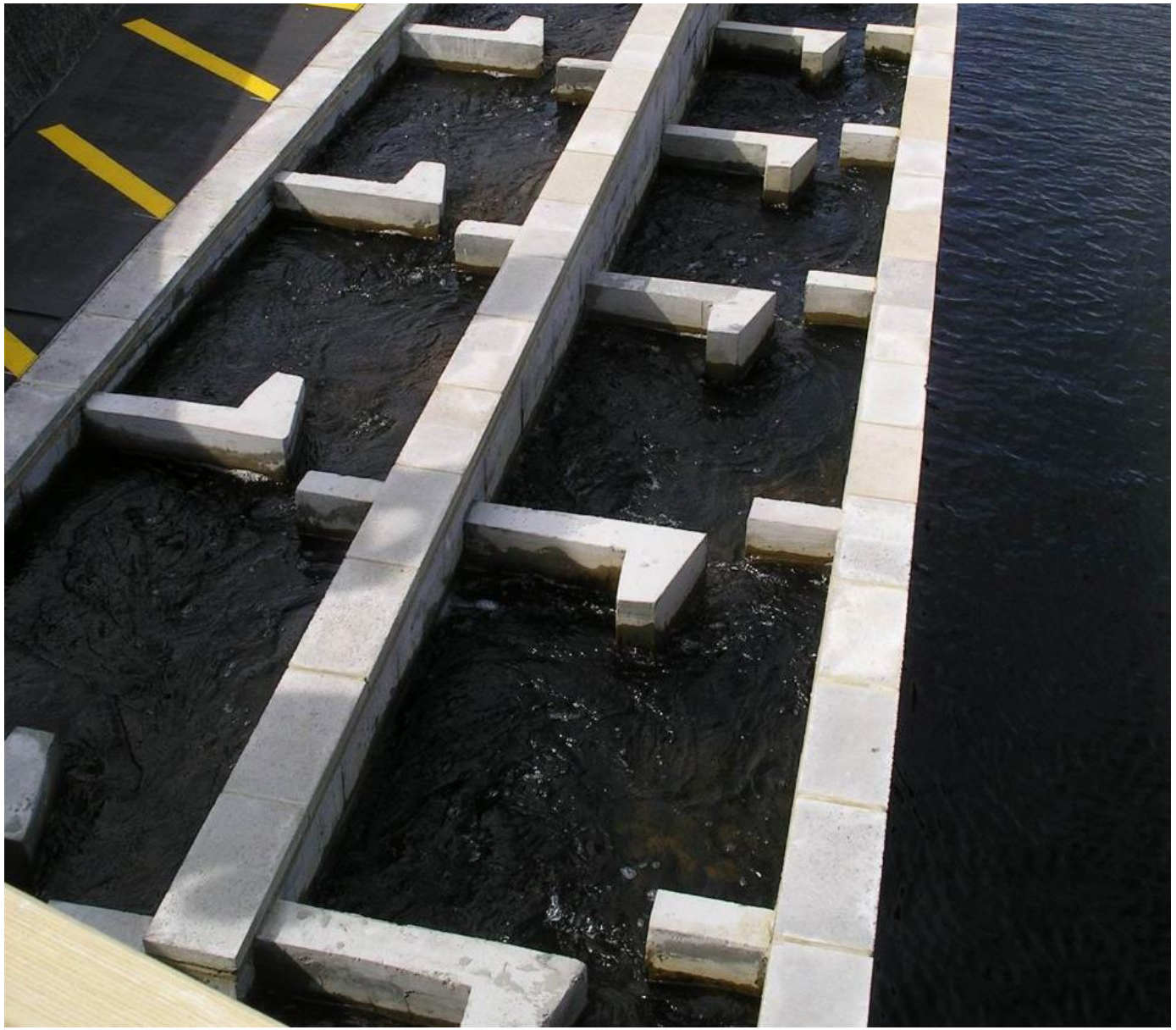
Image source: State of New South Wales (license info)

A Fish Lock Fish Passage works like a little elevator for fish. Fish swim into a holding area at the bottom of a barrier. Water is then added to raise the fish to a higher level. When the water reaches the top, the fish can continue their journey upstream.

Think about:

- What do you notice about this design?
- How do you think fish get into the chamber?
- How does this design help fish move to a higher level?
- How might salmon use this design?
- How might lamprey use this design?

Vertical Slot Fish Passage



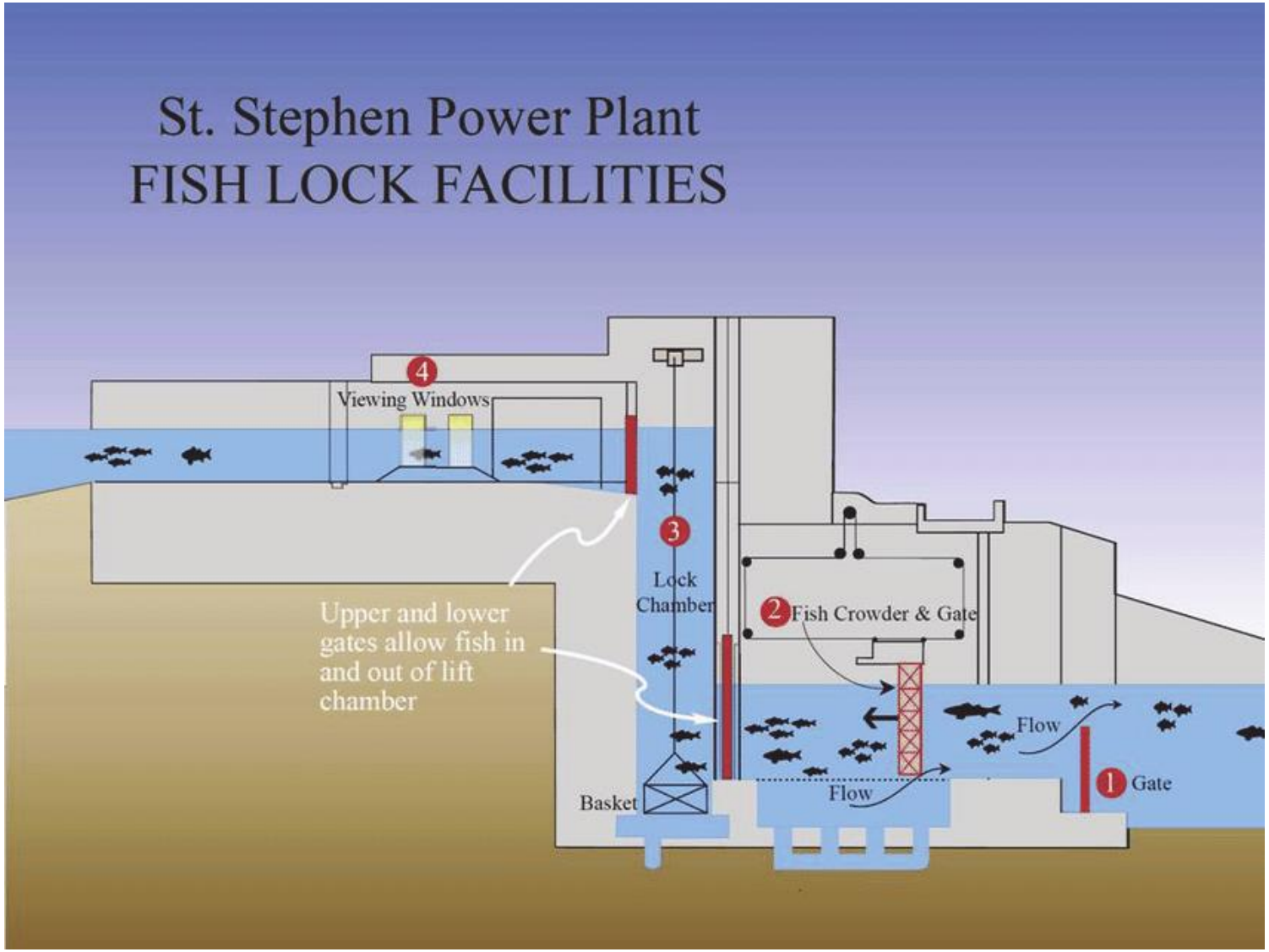
Images source: State of New South Wales (license info)

A Vertical Slot Fish Passage has a series of pools connected by narrow openings, or slots. Fish can swim through the slots to move from one pool to the next without needing to jump over a barrier.

Think about:

- What do you notice about the opening between the pools?
- How might the slots help fish move upstream?
- Why might fish benefit from swimming through openings instead of jumping?
- How might salmon use this design?
- How might lamprey use this design?

Mechanical Lift Fish Passage



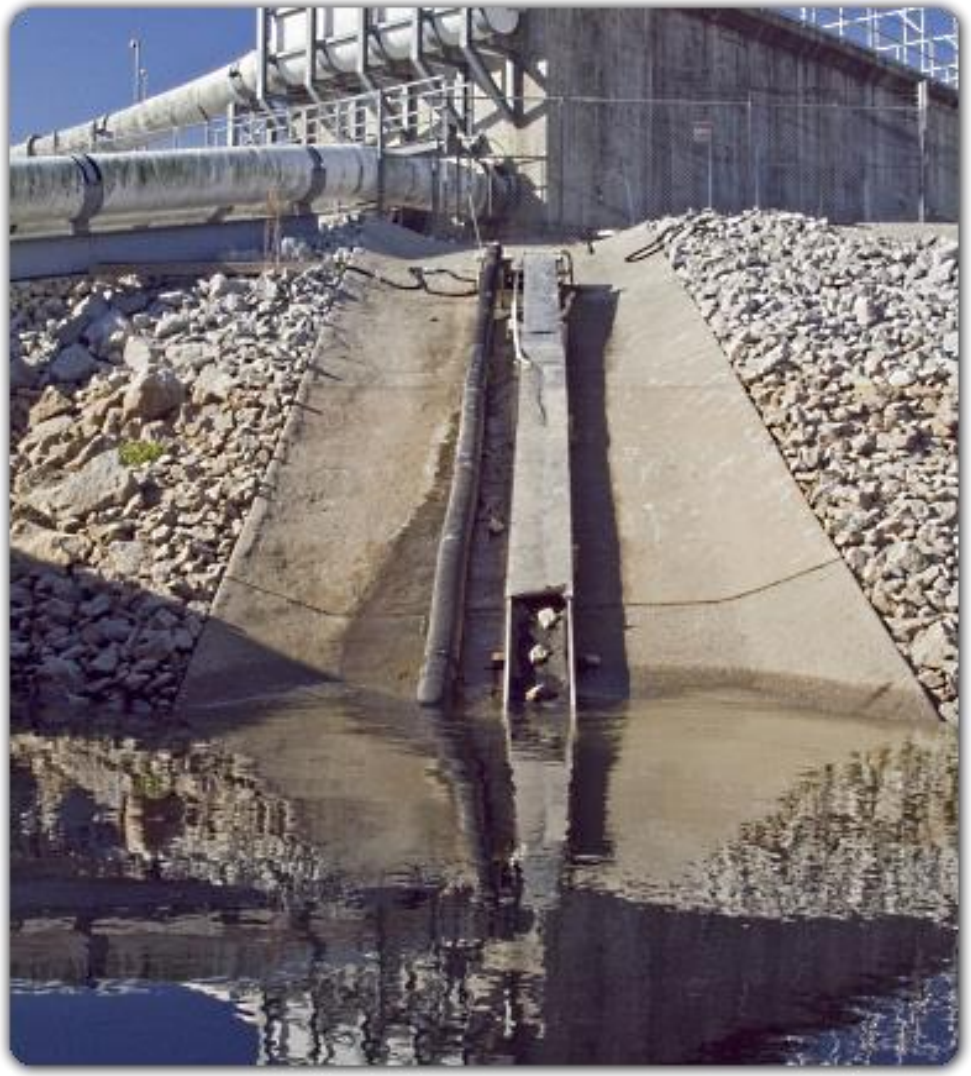
Images source: South Carolina Department of Natural Resources

A Mechanical Lift Fish Passage works like an elevator for fish. Fish swim into a holding area at the bottom of a barrier. The lift raises to a higher level, where they can continue their journey upstream.

<u>Think about:</u>

- What do you notice about this design?
- How is this design like an elevator??
- Why might fish need help being lifted over a barrier?
- How might salmon use this design?
- How might lamprey use this design?

Eel Ramp Fish Passage



Images source: South Carolina Department of Natural Resources

An Eel or Lamprey Ramp Fish Passage provides a rough surface that the lamprey can grip as they climb around a barrier. Water flows down the ramp while the lamprey use their suction-cup mouths and flexible bodies to wiggle and climb to the top.

<u>Think about:</u>

- What do you notice about this design?
- How does this design work with the lamprey's natural structures and behaviors?
- How might lamprey use this design?
- Would this design work as well for salmon? Why or why not?

How does this fish passage work?

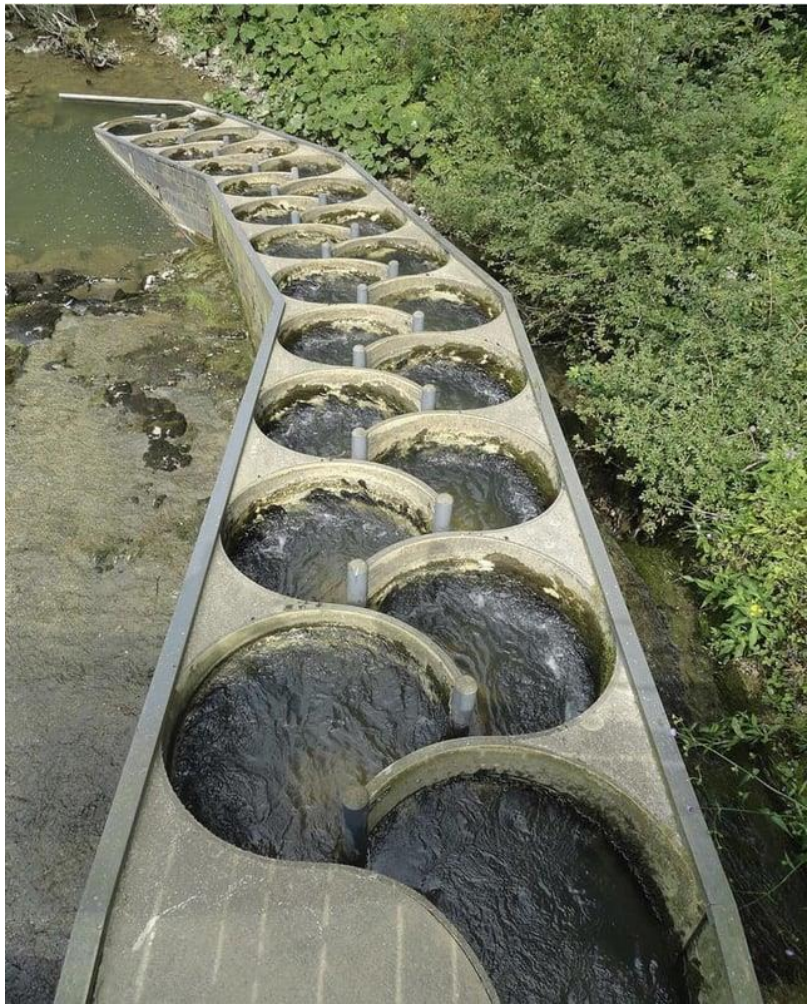


Image source: Tywikiwdbi.blogspot.com

SCIENCE

Fishway Design Challenge Worksheet

Your Team Name: _____Date: _____

Team Members: _____

Step 1: Plan Your Design

Before you draw, discuss with your team:

- Which design features do you want to include in your fishway design? Why?

- How will your design help both salmon and lamprey move upstream?



Step 2: Design a Fish Passage Solution

Using what you learned about salmon, lamprey, barriers, and fish passage systems, design a fish passage solution that helps both species move upstream.

Remember to:

- ✓ Label important parts of your design.
- ✓ Show how fish move through or around the barrier.
- ✓ Include features that support both salmon and lamprey.
- ✓ Use drawings, labels, arrows, words, numbers, or combinations of these.
- ✓ Be ready to share your design with the class.



Step 3: Explain Your Design

What features did your team include and why?

How does your design help salmon?

How does your design help lamprey?

Reflection:

1. How do salmon and lamprey use different structures or behaviors to move upstream?

2. Why are salmon and lamprey important to the Coos, Lower Umpqua and Siuslaw People?

3. What should people consider before changing a river or other natural environment?





SCIENCE

Fishway Investigation Recording Sheet

Your Team Name: _____Date: _____

Team Members: _____

Fishway Name: _____

What do we notice?

Please use words, sketches, labels, arrows, symbols, or a combination of these.

How do we think this fishway works?

How might this fishway help fish move upstream?

How might salmon use this fishway?



How might lamprey use this fishway?

One idea from this fishway we might use in our design:



Fishway Investigation Resource Sheet

- Pool and weir (slide 7): One of the oldest styles of fish ladders. It uses a series of small dams and pools of regular length to make a long, sloping channel for fish to travel around the obstruction. The channel acts as a fixed lock to gradually step down the water level; to head upstream, fish must jump from box to box in the ladder.

- Baffle fishway (slide 7): Uses a series of symmetrical close-spaced baffles in a channel to redirect the flow of water, allowing fish to swim around the barrier. Baffle fishways do not need to have resting areas, although pools can be included to provide a resting area or to reduce the velocity of the flow. Such fishways can be built with switchbacks to minimize the space needed for their construction. Baffles come in a variety of designs. The most common design is the Larinier pass, named after the French engineer who designed them. They are suitable for coarse fish as well as salmonids and can be built large enough to be used by canoes.

- Fish lock (slide 8): A fish lock is a structure designed to facilitate the passage of fish over barriers such as dams or weirs, enabling them to access upstream habitats essential for spawning and growth. It operates similarly to a navigation lock, using a chamber that fills and empties to move fish across the barrier by adjusting water levels to match the upstream and downstream sections.

- Vertical slot (slide 9): Similar to a pool and weir system, except that each "dam" has a narrow slot in it near the channel wall. This allows fish to swim upstream without leaping over an obstacle. Vertical slot fish passages also tend to handle the seasonal fluctuation in water levels on each side of the barrier. Recent studies suggest that navigation locks have the potential to operate as vertical slot fishways to provide increased access for a range of biota, including poor swimmers.

- Mechanical lift (slide 10): A mechanical fish lift is a special machine that helps fish get over big barriers in rivers, like tall dams, when they can’t swim past them on their own. First, the fish swim into a big tank or chamber at the bottom of the dam. Once some fish are inside, the tank closes, kind of like an elevator door. Then, the tank is lifted. When the tank reaches the top of the dam, the door opens, and the fish swim into the river on the other side.

- Eel/lamprey ramp (slide 10): An eel or lamprey ramp is a special structure that helps eels and lampreys get past things like dams or waterfalls in rivers. It looks like a long, slanted slide with water flowing down it. The ramp has a rough or brushy surface so the eels can grip it and climb up, almost like crawling up a wet, bumpy ramp. When young eels reach a barrier, they find the ramp and use their

bodies to wiggle and climb up to the top. Once they reach the end of the ramp, they can continue swimming up the river to where they need to go.