Aquatics Test

Total of 50 points

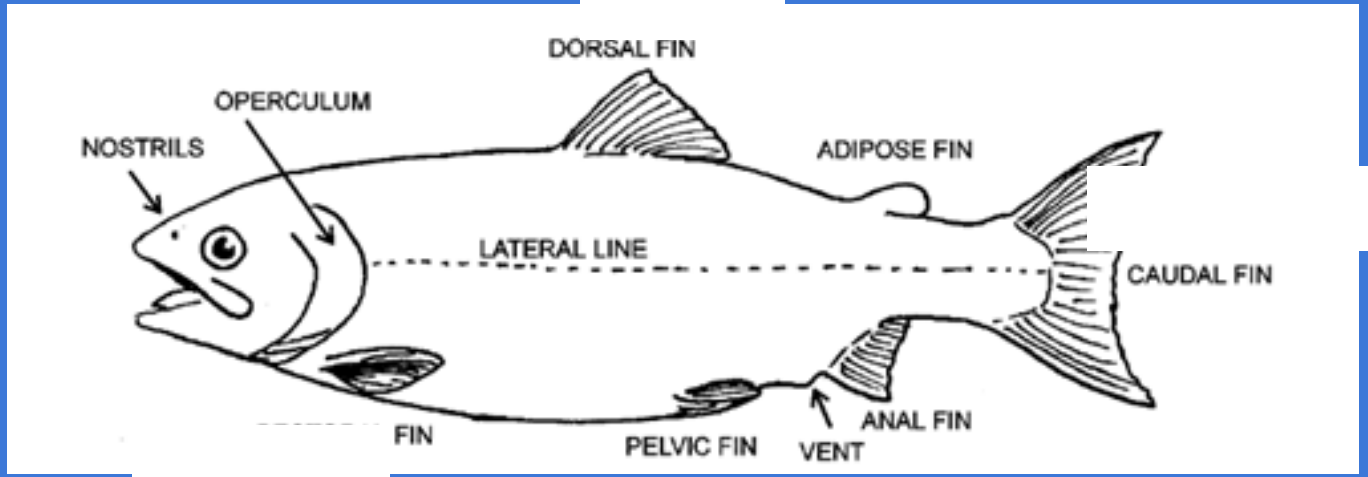
Sponsored by:

Marion Soil & Water Conservation District

CITY OF Salem AT YOUR SERVICE

Part 1: Fish Anatomy

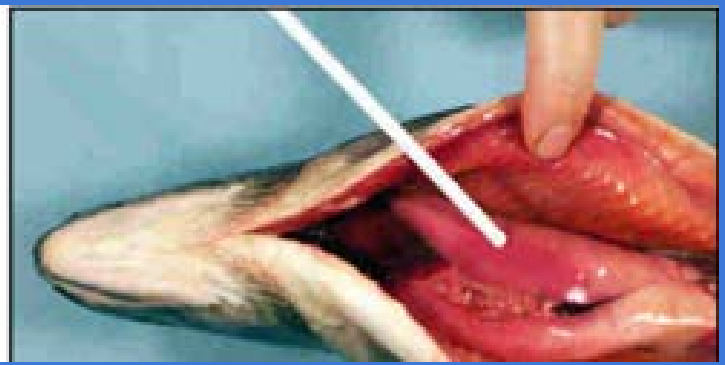
1. Salmon are streamlined and move easily through water. The external anatomy of the fish includes 8 fins that provide maneuverability. Label the 6 fins shown in the picture below. (6 points, one for each fin) Resource Link: SALMONID ANATOMY & DISSECTION WORKSHOP HANDBOOK



Part 1: Fish Anatomy

3. In the pictures below: label the gender (male or female) of the fish and correctly label the structures at the end of the white pointer. Grading notes: (4 points) one point for each answer. Resource Link: SALMONID ANATOMY & DISSECTION WORKSHOP HANDBOOK

Gender: Female
Structure: Eggs or ovaries



Gender: Male
Structure: Testes or sperm sac

Part 1: Fish Anatomy

4. Circle the name of the organ at the end of the white pointer. Grading notes: (1 point) Resource Link: SALMONID ANATOMY & DISSECTION WORKSHOP HANDBOOK

a. Heart

b. Liver

c. Kidney

d. Swim Bladder

Answer: C

Part 1: Fish Anatomy

5. What is the function of the pictured organ? Grading notes: (1 point)Resource Link: SALMONID ANATOMY & DISSECTION WORKSHOP HANDBOOK

a. Pump blood

b. Assist digestion

c. Filtration and osmoregulation

d. Floatation

Answer: C

Part 2: Macroinvertebrates

Follow these instruction on how to find the video here: salmon watch video instructions.docx
Watch the Macroinvertebrate video at https://worldsalmoncouncil.org/salmonwatch/ to answer the following questions.

6. Name two of the main groups of macroinvertebrates? (2 Points)

Insects, crustaceans, mollusk, mites and worms

7. What is a bioindicator?

Grading notes: (1 point) Answer: an organism whose status in an ecosystem is an indication of the ecosystem's health

8. How are macroinvertebrates classified as bioindicators? Grading notes: (1 point)

a. Large to small

B. Tolerant, intolerant, Sensitive

c. Coloration

d. All the above

Part 2: Macroinvertebrates

Follow these instruction on how to find the video here: salmon watch video instructions.docx
Watch the Macroinvertebrate video at https://worldsalmoncouncil.org/salmonwatch/ to answer the following questions.

9. Why are macroinvertebrates important to salmon?

Grading notes: (1 points)

1 point for relation from macros to salmon: some are important food source for salmon. Could also relate to ecosystem: the macros are a part of the overall food chain/web. Can also include… They help cycle nutrients (within the stream and outside the stream because many macros live outside the water as adults).

Part 3: Harmful algal blooms (HABs)

Harmful algal blooms (HABs) can affect ecosystems, recreation, and water systems. As a manager of a popular summer lake located in a watershed that has both an urban and agricultural uses you need to know the risks associated with HABs and plan to mitigate the risks to recreationists. Resources that can be used:

Oregon Health Authority : Frequently Asked Questions : Cyanobacteria Blooms

10. What are cyanobacteria (harmful algae) and what causes them to bloom? (2 point)

(1 point for bacteria and 1 point for they multiply quickly in warm weather, in areas where there is low flow and high nutrient levels.

Cyanobacteria are not algae at all. They are primitive bacteria found naturally in fresh and salt water all over the world. They are a beneficial bacteria that helped to create and sustain our oxygen atmosphere. In Warm weather, nutrients and low water flow can help these bacteria multiply quickly into what we call a bloom. Sometimes these blooms can produce cyanotoxins that can be harmful to people and pets.

Part 3: Harmful algal blooms (HABs) Cyanobacteria

Harmful algal blooms (HABs) can affect ecosystems, recreation, and water systems. As a manager of a popular summer lake located in a watershed that has both an urban and agricultural uses you need to know the risks associated with HABs and plan to mitigate the risks to recreationists. Resources that can be used:
Oregon Health Authority : Frequently Asked Questions : Cyanobacteria Blooms

11. List two negative effects to people or pets from HABs. Grading notes: (2 points)

Potential answers: When cyanotoxin levels exceed EPA health advisory levels for tap water, people are at risk of various adverse health effects, from gastrointestinal issues to liver and kidney damage. They can get rashes too. Drinking water supplies can be impacted and shellfish and seafood can become contaminated. Recreation areas may need to close, which can have economic impacts to people. Pets can get ill too. Dogs are especially prone because they drink and play in the water. Any two of these or other good answers will suffice.

Not all blooms are harmful, but some cyanobacteria can produce cyanotoxins that can cause **serious illness or death in pets, livestock and wildlife**. These toxins can also **make people sick**, and in sensitive individuals also cause a red, raised rash or skin, ear and eye irritation.

Part 3: Harmful algal blooms (HABs) Cyanobacteria

Harmful algal blooms (HABs) can affect ecosystems, recreation, and water systems. As a manager of a popular summer lake located in a watershed that has both an urban and agricultural uses you need to know the risks associated with HABs and plan to mitigate the risks to recreationists. Resources that can be used:
Oregon Health Authority : Frequently Asked Questions : Cyanobacteria Blooms

12. If you suspect a algae bloom in the lake you manage, explain what your monitoring plan would be for the HAB and how would notify the public. Grading notes: (2 points)

Possible answers:(1 point) Take water quality samples confirm the bloom has toxins – the lab should provide a timeline for monitoring – # days of weeks and weeks per months. But could also say every other week.

1 point for notifying the OHA and the public about the HAB, through posters, website,flyers, etc.

Part 3: Harmful algal blooms (HABs)

Harmful algal blooms (HABs) can affect ecosystems, recreation, and water systems. As a manager of a popular summer lake located in a watershed that has both an urban and agricultural uses you need to know the risks associated with HABs and plan to mitigate the risks to recreationists. Resources that can be used:

Oregon Health Authority : Frequently Asked Questions : Cyanobacteria Blooms

13. When looking at what causes cyanobacteria blooms, can you identify two groups in the watershed that you can work with to help reduce the amount of nitrogen and phosphorus from reaching the lake. Explain a practice or method that can be used with each to help reduce runoff from their land use or activities. Grading notes: (4 points)

Any two groups will work: farmers, ranchers, city dwellers, cities, the county, watershed councils, conservation agencies, forest managers. (2 correct answers = 2 point).

Any two actions that reduce N or P loads to the waterbody. Most common answers: less fertilization or herbicide application, create buffers, keep cows out of creeks, pick up dog waste, reduce irrigation runoff from ag and urban areas, reduce stormwater runoff in urban areas, improve nutrient management, use conservation tillage, use cover crops. (2 correct answers = 2 points).

Part 4: Surface Water

You are contacted by a landowner to assess the site for water quality and backyard habitat along a creek in town. Resource: https://www.cityofsalem.net/Pages/benefits-of-riparian-areas.aspx

14. List two benefits of a riparian area. (2 points)

Any of these answers:

A.filtering pollutants such as nutrients and sediments, helping to keep in-stream water cleaner.

- holding streambanks in place, helping to reduce erosion and reduce localized flooding due to buildup of in-stream sediment, all of which help protect property.
- shading streams, which helps keep stream water cool. Cooler water holds more dissolved oxygen, which is critical for aquatic life.
- slowing and absorbing flood waters.
- providing food and habitat for wildlife whether they live on land, in the water, or in the sky.
- allowing for wildlife movement within natural corridors.

Part 4: Surface Water

You are contacted by a landowner to assess the site for water quality and backyard habitat along a creek in town. Resource: https://www.cityofsalem.net/Pages/benefits-of-riparian-areas.aspx

14. List two ways the landowner could improve this riparian habitat. (2 points)

- Preserve and maintain current riparian areas on your property.
- Plant bare slopes with native vegetation to create a riparian buffer.
- Remove invasive species such as Himalayan blackberry and English ivy and replace them with native Oregon vegetation such as Snowberry and Douglas spirea.
- Reduce or eliminate fertilizer, pesticides, and herbicides from your yard and garden. Check out alternatives.
- Reduce the amount of impervious surface on your property, consider switching to pervious pavers, or removing impervious surfaces where possible.
- Create a rain garden on your property to help filter out rooftop runoff pollution. Download a DIY guide to creating a rain garden.

Part 4: Surface Water

15. In the water cycle, what is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration by plants? Grading notes: (1 point) Reference: USGS – Evapotranspiration and the Water Cycle

a. Condensation

b. Evapotranspiration

c. Perspiration

d. Transpiration

Part 4: Surface Water

16. The amount of water that plants transpire varies greatly geographically and over time. There are a number of factors that determine transpiration rates. Name two of them. (2 points) Reference:USGS – Evapotranspiration and the Water Cycle

- **Temperature**: Transpiration rates go up as the temperature goes up, especially during the growing season, when the air is warmer due to stronger sunlight and warmer air masses. Higher temperatures cause the plant cells which control the openings (stoma) where water is released to the atmosphere to open, whereas colder temperatures cause the openings to close.
- **Relative humidity**: As the relative humidity of the air surrounding the plant rises the transpiration rate falls. It is easier for water to evaporate into dryer air than into more saturated air.
- **Wind and air movement**: Increased movement of the air around a plant will result in a higher transpiration rate. Wind will move the air around, with the result that the more saturated air close to the leaf is replaced by drier air.
- **Soil-moisture availability**: When moisture is lacking, plants can begin to senesce (premature aging, which can result in leaf loss) and transpire less water.
- **Type of plant**: Plants transpire water at different rates. Some plants which grow in arid regions, such as cacti and succulents, conserve precious water by transpiring less water than other plants.

Part 4: Surface Water

17. Which floating leaf aquatic weed is pictured here? Hint: This aquatic invasive plant forms large dense mats that decrease oxygen available in the water, decrease overall water quality, and are damaging to native plants, amphibians, fish, birds, and other wildlife. Grading notes: (1 point) Reference:https://agsci.oregonstate.edu/sites/agscid7/files/ag-ed-sci/sytsma_aquatic_invasive_weeds.pdf

a. Gorse

b. Yellow Flag Iri

c. Ludwigia

d. River Poison Plant

Part 4: Surface Water

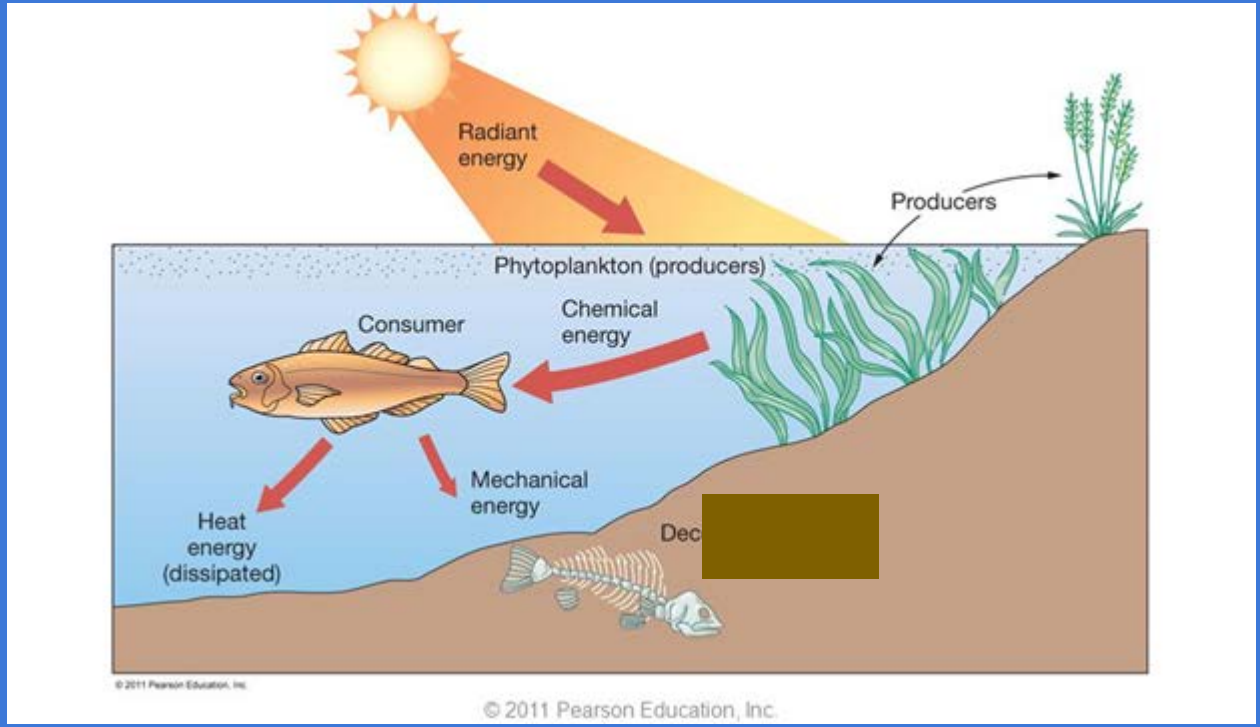
18. What role does the dead fish play in this food web diagram? Grading notes: (1 point)

a. decomposer

b. secondary producer

c. primary consumer

d. secondary consumer



Part 5: Water Power

Read this article to help answer these question: Tri-City groups leery of $33 billion proposal to remove dams,

22. List two alternate power solutions that would replace the power provided by the dams. Grading notes: (2 points, 1 point for each alternative). Grading: possible answers can include wind, solar, small modular nuclear reactors.

23. List one argument against the dam removal by people whose livelihood depends on the transportation access provided by dam. Grading notes: (1 point): answers can include increased carbon emissions due to rail/road travel versus barges, loss of easy access to water source, loss of transportation of farmed goods by barge.

Part 5: Water Power

Read this article to help answer these questions: Tri-City groups leery of $33 billion proposal to remove dams,

24. List two economic impacts of removing dams. Grading notes: (2 points): possible answers can include blackouts, increased power rates, increased carbon emissions, loss of industry and processors in the Northwest due to barge travel being removed, decrease in power available for region.

25. Name one other challenge facing endangered salmon besides the dams? Grading notes: (1 points) Possible answers include ocean conditions, global climate change, increasing temperatures of reservoirs and rivers.

Part 6: Water and Fire

During the fires of 2020, you were called out to investigate a recent kill of cold-water fish at a shallow slough in a local park. You assessed the site and took water quality samples. This is what you found:

- 50 dead fish floating in the slough
- freshwater flowing into the slough was minimal
- water levels were very low, even for the time of year

The water quality test results yielded the following information:

pH	Dissolved oxygen	Water Temperature	Turbidity	Air temperature
7.2	6.0 mg/L	68 F/ 20C	6 NTU	85 F/ 29.4C

Review the data you collected, and the water quality charts in the link below to answer question 26.
https://docs.google.com/document/d/160cU85VIdFYktceXJ_4aRVVzUiZQjQ5z/edit#heading=h.gjdgxs

Part 6: Water and Fire

26. What conditions do you suspect led to the fish kill and why? (4 points)

2 points: the condition(s) of WQ that cause the issue. Answer: Low DO/high temp

2 points: the reason why that is the issue killed the fish. Too low of DO to breathe.

27. How could you mitigate this issue in the future? (4 points)

4 points: How to mitigate the issue.The key/clue was that the water levels were low even for this time of year. ensure no water blockages upstream so that water can flow, reduce illegal water withdraws from upstream, reduce water legal water withdraws from upstream sites. We can also accept add shade/plant trees or anything that can increase DO and reduce temp:

End of Aquatics Test!

Team total _____/50 points

Sponsored by:

Marion Soil & Water Conservation District

CITY OF Salem AT YOUR SERVICE