OREGON ENVIROTHON 2023

CURRENT ISSUE: ADAPTING TO A CHANGING CLIMATE

TEAM #_____

Test Total: _____/ 50 points

Part I: Factors Contributing to a Changing Climate

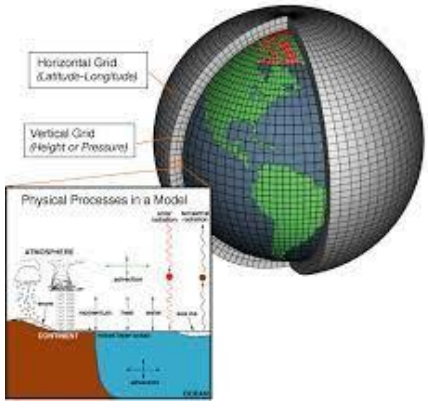
1. What's the difference between weather and climate? Define the two terms to explain the difference. [2 points] Possible answers:
   a. Weather is:
      - The short-term condition of the atmosphere.
      - What's happening outside right now or this week.
      - Atmospheric conditions that can change from hour-to-hour, day-to-day or season-to-season.
   b. Climate is:
      - The average daily weather for an extended period of time at a certain location.
      - The weather you might expect for a given time or space (versus what you actually get).

2. Define climate change and identify the main reason it is occurring. [2 points]
   a. Climate change is: Possible answers:
      - A change in long-term averages of daily weather.
      - A long-term shift in temperatures and weather patterns.
   b. The main reason it is occurring is: Possible answers:
      - A buildup of greenhouse gases in our atmosphere and the warming of the planet due to the greenhouse effect.
      - Human activity, such as factory emissions, driving gas-powered cars and generating electricity.
      - The burning of fossil fuels, which produces carbon dioxide, a greenhouse gas.

3. Non-renewable energy use is a leading cause of global greenhouse gas emissions. List two energy resources that are renewable. [2 points] Any three of these:
   a.
      - Biofuels
      - Biomass (such as wood)
   b.
      - Geothermal
      - Hydropower (or water)
      - Solar
      - Wind

Part II: Measuring and Monitoring a Changing Climate

4. Models are used to forecast climate, but these models always have some level of uncertainty. Circle the variable that is a common source of uncertainty in projecting future climate. [1 point]



   a. How accurately the models show past weather.
   b. How well models predict the high and low temperatures for the current week.
   c. The amount of CO_2 that human activities will produce in the future.

____/ 7 points

5. Name two weather pattern changes that climate models predict for the Pacific Northwest and Oregon. [2 points] Possible answers:
   a. • Increase in average air temperature
      • Heat waves
   b. • Extreme temperatures
      • More precipitation, except in summer months
      • Less snow/snowpack

Part III: Risks and Impacts to Natural Resources and Society

Use the following information to answer Questions 6–8.

Models show that the changing climate would affect the Pacific Ocean by increasing water temperature, lowering water oxygen levels, lowering water pH (making it more acidic), raising sea level, and changing the strength and action of tides (causing so-called "king tides").

6. What is a possible biological impact of these changes on marine life? Choose the best response. [1 point]
   a. They may affect what species can live where.
   b. They may affect many animals' ability to make shells or skeletons.
   c. They may affect the amount of food and oxygen available to fish and other marine life.
   d. All the above.

7. What are two management adaptations the fisheries industry could make to help prepare for these impacts? [2 points] Any two of these:
   a. • Changing where and how they catch fish.
      • Changing the types of fish they harvest.
   b. • Breeding oysters (or other ocean-farmed species) that are more resilient to ocean acidification and other changes.
      • Instituting policies (such as greater catch limits) to manage fisheries for climate change.
      • Protecting the coastline through human-made armoring (cement/rock wall) or natural armoring (planting sea grasses).
8. The oceans and their coastlines can be part of the climate solution because they store carbon and fisheries activities use energy. What is **one** ocean-based mitigation effort that could help reduce the effects of climate change? [2 points] Any of these:
   - Protecting and restoring coastal ecosystems, including salt marsh and dune restoration.
   - Maintaining eel grass, algae, and seaweed populations.
   - Protecting and restoring coral reefs.
   - Cultivating more shellfish to be filter feeders.
   - Reducing the amount of CO_2 emitted by boats and ocean-related activities.

____/ 7 points

Use the following information to answer Questions 9–10.

A changing climate impacts forests in a number of ways. Higher temperatures, heavier rains and longer periods of drought can increase natural disturbances that threaten forest health, such as insect outbreaks, wildfires, invasive species, storms and erosion. These conditions also affect what trees can grow where, causing a shift in species ranges and forest types.

9. What are two management adaptations a forester could make to help prepare for a changing climate? [2 points] Any two of these:

a. • Thinning to reduce stress and maintain vigor.
   • Favoring drought tolerant species.

b. • Assisting migration (planting species of trees in higher elevation to maintain favorable climate).
   • Increasing forest diversity.
   • Removing dry fuels to increase wildfire resistance.
   • Creating more urban forests.

10. Forests can be part of the climate solution because forests store carbon and forestry activities use energy. What is **one** forest-based mitigation effort that would help reduce the effects of climate change? [2 points] Any of these:

- Keeping forestland forested (that is don't develop it or convert it to other uses).
- Managing forests to store carbon for a longer time.
- Developing carbon markets.
- Harvesting trees on a longer rotation, making sure the harvest is sustainable.
- Planting more trees.
- Reducing carbon emissions.

Use the following information to answer Questions 11–12.

Climate change affects Oregon agriculture in many ways. Higher temperatures, more rain (except in summer), summer drought, fewer cold and freezing days, and less snowpack mean changes in the growing season and more limited water supplies. These conditions contribute to more pests and weeds, and put stress on crops and livestock.

11. What are two management adaptations a farmer or a rancher could make to prepare for a changing climate? [2 points] Any of these:

a. • Improving soil health.
   • Attracting beneficial insects.
   • Reducing tillage.

b. • Dry farming or reducing water used.
   • Selecting varieties suited to climate conditions.
   • Increasing soil health. Possibilities include using cover crops, adding organic material (such as manures), rotating crops or planting forage or biomass.
   • Increasing biodiversity. Possibilities include rotational grazing, planting pollinator species or using crop-livestock integration or agroforestry.

12. Agriculture can be part of the solution because soils store carbon and agriculture activities use energy. What is **one** agriculture-based mitigation effort that would help reduce the effects of climate change? [2 points] Any of these:

- Increasing soil health to absorb more carbon.
- Selecting the right crop or livestock for the climate.
- Using farm or ranch equipment that can run on biofuel or others carbon-neutral fuels. ____**/ 8 points**

Use the following information to answer questions 13–18.

The Oregon Climate Change Research Institute (OCCRI) has published future climate projections for Oregon counties. Figure 1 (below) shows OCCRI's projected direction and level of confidence in the changes of risk of climate-related hazards for Coos County. The OCCRI's projections are based on evidence from peer-reviewed scientific studies.

Parts of Coos County are shown in the map in Figure 2 (on page 5). As the map shows, the towns of North Bend, Coos Bay, and Charleston are all close to the ocean and at the mouths of rivers and sloughs. In this county, towns are surrounded by forestland. There is also a robust fishing industry and some agriculture.

Figure 1. Projected Direction and Level of Confidence in Changes of Risk of Climate-related Hazards for Coos County.

	Low Confidence	Medium Confidence	High Confidence	Very High Confidence
Risk Increasing ↑	Reduced Air Quality Loss of Wetlands	Drought Expansion of Pests, Pathogens, and Non-native Invasive Species	Heavy Rains Flooding Wildfire Changes in Ocean Temperature and Chemistry Coastal Hazards	Heat Waves
Risk Unchanging =	Windstorms			
Risk Decreasing ↓				Cold Waves

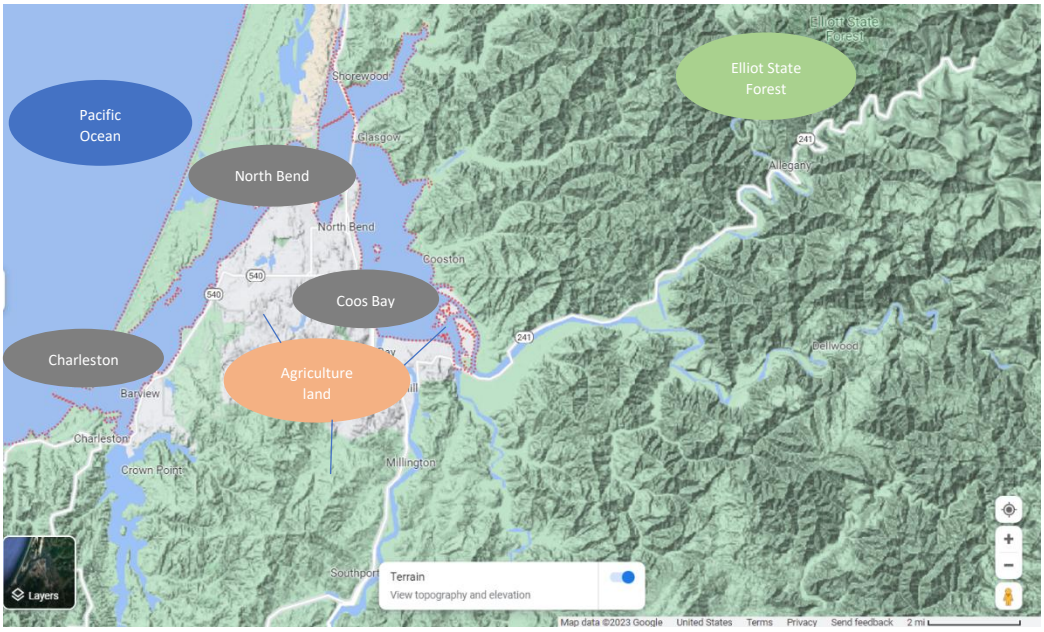
Very High Confidence means that the direction of change is consistent among nearly all global climate models and there is robust evidence in the peer-reviewed literature.

High Confidence means that the direction of change is consistent among more than half of models and there is moderate to robust evidence in the peer reviewed literature.

Medium Confidence means that the direction of change is consistent among more than half of models and there is moderate evidence in the peer-reviewed literature and.

Low Confidence means that the direction of change is small compared to the range of model responses or there is limited evidence in the peer-reviewed literature.

Figure 2. Partial Map of Coos County.



13. Based on Figure 1, list five ways that Coos County will likely be impacted by a changing climate.

a. Any five of these:

b.
- Heat waves
- Heavy rains, flooding
- Wildfire
- Changes in ocean temperature and chemistry
- Coastal hazards

c.

d.

e.

____/ 5 points

14. Use the information in Figures 1 and 2 to create a climate action plan for this county. [12 points] Answers will vary but they should be along these lines of the following.

Part 1 of the plan: Start your action plan by naming three ways this community and the surrounding natural areas could become more resilient to the predicted changes in climate.

a. Resilient and adapted forests:
- Planting drought-tolerant trees or planting trees in a higher elevation than traditional.
- Managing (e.g., by thinning the forest and removing woody debris to prepare for wildfire).
- Managing invasive species.
- Maintaining riparian areas to protect water temperature of water.
- Managing forests for carbon sequestration or carbon markets.

b. Resilient and adapted soils:
- Planting drought tolerant plants.
- Planning for longer growing seasons.
- Using little to no till.
- Using shade cloths or greenhouses with cooling mechanisms.
- Planting cover crops.
- Introducing animal grazing to put nutrients back in the soil.
- Using adaptive irrigation methods.

c.
- Planting roadside flowers to attract pollinators.
- Controlling invasives.

Resilient and adapted oceans:
- Continuously monitoring oceans and marine life.
- Planting more sea grass and kelp.
- Protecting estuaries.
- Monitoring and maintaining harvest levels, depending on species availability and adaptation.
- Building sea walls to prevent sea level rise.
- Conducting risk assessments for towns and vulnerable communities.

Part 2 of the plan: Finish your action plan by naming three large-scale community mitigation efforts that would help reduce greenhouse gas emissions.

d. Community mitigation efforts:
- Passing policies that support reducing greenhouse gas emissions.
- Using renewable energy.
- Providing incentives and motivation for any number of personal actions like riding a bike, not eating meat, eating locally, limiting airplane trips, using elective vehicles and planting more trees.
- Developing policies for climate-smart forestry and agriculture practices, such as no or little till

e. for soil, afforestation, restoration, agroforestry, animal integration to increase soil nutrients and composition, and regenerative agriculture.
- Updating land use planning goals and objectives, such as reducing urban growth, becoming a net zero cities, supporting urban forests and urban farming and incentivize mass timber

f.

____/ 12 points

15. The Coquille Indian Tribe has tribal lands in Coos County. What is one way climate change may impact the availability of their traditional First Foods that they hunt and gather from the land? [1 point]

Any of these: Climate change will impact gathering their First Foods, by changing growing seasons and locations, shifting species and migration patterns, or causing some species to disappear.

16. What are ways the Coquille Indian Tribe could adapt their First Foods practices to prepare for a changing climate? Circle all that apply. [2 points]

a. Harvest all they can find now before the species have disappeared.
b. Monitor and map the changes in species composition over time.
c. Adapt management practices and harvest levels as needed to sustain the species.

17. Low-income and disadvantaged communities are particularly challenged by climate change. How might they be affected? Circle all that apply. [2 points]

a. Climate change will widen social and economic inequities.
b. Nothing will change for these communities.
c. Climate change will mean a lack of funds to repair, relocate, or replace damage to resources such as parks, recreational facilities, and civic buildings.

Part 4: Policies and Programs for Adapting to a Changing Climate

18. In March 2020, the Oregon governor signed an executive order, called Oregon Climate Action Plan or OCAP. What are OCAP's three big goals? Circle them below. [3 points]

a. Establishes new state targets to reduce greenhouse gas emissions by at least 45% below 1990 levels by 2035, and by at least 80% by 2050.
b. Bans new companies from expanding into Oregon if they produce large amounts of greenhouse gas emissions.
c. Requires state agencies to help achieve emissions reduction goals and prioritize climate change and impacted communities in their decision-making.
d. Provides specific directives to reduce emissions from our state's largest polluters and protect our most vulnerable communities.

___/ 8 points

19. Looking at Figure 3 below, which Oregon sector is the largest contributor to greenhouse gas emissions? [1 point]

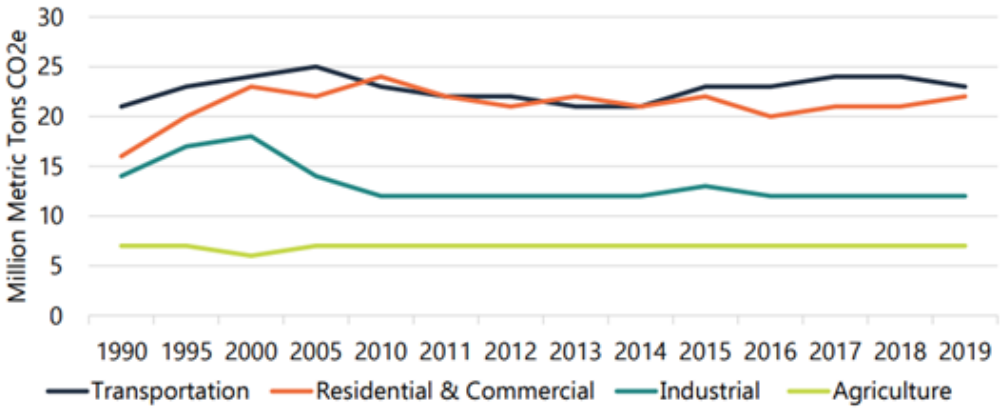
a. Transportation

b. Residential & Commercial

c. Industrial

d. Agriculture

Figure 3. Oregon emissions by sector: 1990-2019 (Source: DEQ, 2020).



20. Based on your answer from Question 19 above, identify two ways an individual could help reduce the amount of greenhouse gas emissions entering the atmosphere. [2 points]

a.

Can vary but any of these would work:

b.

- Ride a bike.
- Use electric vehicles and more charging stations, including electric plug-in for residential and low-income buildings,
- Use public transportation.
- Advocate for more electric vehicles and charging stations, including electric plug-in stations for residential and low-income housing.
- Talk with family about reducing air or automobile travel.
- Write representatives or letters to the editor about increasing clean fuel standards.

____/ 3 points