

# AP Environmental Science Assessment 2

DATE OF ADMINISTRATION: JANUARY 8 - 12

TOPICS COVERED: ALL UNITS THROUGH LAND AND WATER USE

In the second assessment, the focus will be on all units up to and including land and water use. There will be 50 multiple choice questions (45 minutes) which will account for 60 % of the exam score. There will also be 2 free-response questions (45 minutes) which will account for the remaining 40 %.

## MULTIPLE CHOICE KEY AND CROSSWALK

Q1	C	Population – Human population – historical population sizes
Q2	C	Land and Water Use – Agriculture – feeding a growing population
Q3	B	Land and Water Use – Mining – extraction
Q4	D	Land and Water Use – Fishing – aquaculture
Q5	B	Land and Water Use – Agriculture – controlling pests
Q6	E	Earth Systems and Resources – Global Water Resources and Use – domestic use
Q7	C	Living World – Natural Biogeochemical Cycles – nitrogen
Q8	A	Land and Water Use – Other Land Use – urban sprawl
Q9	C	Land and Water Use – Agriculture – controlling pests
Q10	B	Land and Water Use – Mining – extraction
Q11	B	Land and Water Use – Feeding a growing population – human nutrition
Q12	D	Land and Water Use – Feeding a growing population – Green Revolution
Q13	C	Population – Human Population – growth rates
Q14	E	Land and Water Use – Agriculture – types of agriculture
Q15	A	Earth Systems and Resources – Soil and Soil Dynamics – other soil problems
Q16	B	Land and Water Use – Agriculture – irrigation
Q17	B	Population – Population Biology Concepts – population ecology
Q18	E	Population – Population Biology Concepts – carrying capacity
Q19	A	Land and Water Use – Agriculture – feeding a growing population
Q20	A	Land and Water Use – Other Land Use – land conservation options

Q21	A	Earth Systems and Resources – Soil and Soil Dynamics – composition
Q22	C	Land and Water Use – Other Land Use – public and federal lands
Q23	C	Global Change – Global Warming – greenhouse gases and the greenhouse effect
Q24	E	Global Change – Global Warming – greenhouse gases and the greenhouse effect
Q25	D	Global Change – Global Warming – greenhouse gases and the greenhouse effect
Q26	D	Land and Water Use – Forestry – forest management
Q27	B	Land and Water Use – Agriculture – feeding a growing population
Q28	E	Land and Water Use – Agriculture – irrigation
Q29	B	Land and Water Use – Agriculture – controlling pests
Q30	A	Land and Water Use – Agriculture – feeding a growing population
Q31	D	Land and Water Use – Other Land Use – urban sprawl
Q32	B	Land and Water Use – Other Land Use – urban sprawl
Q33	A	Land and Water Use – Forestry – forest management
Q34	E	Earth Systems and Resources – Global Water Resources and Use – domestic use
Q35	C	Land and Water Use – Forestry – deforestation
Q36	A	Earth Systems and Resources – Global Water Resources and Use – freshwater
Q37	A	Earth Systems and Resources – Global Water Resources and Use – global problem
Q38	A	Earth Systems and Resources – Soil and soil dynamics – composition
Q39	A	Living World – Energy Flow – food webs
Q40	B	Living World – Energy Flow – food webs
Q41	D	Living World – Natural Biogeochemical Cycles – nitrogen
Q42	A	Population – Population Biology Concepts – population ecology
Q43	B	Population – Human Population – growth rates
Q44	E	Land and Water Use – Rangelands – overgrazing
Q45	A	Population – Human Population – doubling times
Q46	B	Population – Human Population – growth rates
Q47	C	Population – Human Population – case studies
Q48	D	Earth Systems and Resources – Earth Science Concepts – earthquakes
Q49	A	Population – Human Population – demographic transition
Q50	E	Earth Systems and Resources – Soil and soil dynamics – physical and chemical

## FREE RESPONSE SCORING GUIDELINES AND CROSSWALK

Free Response Question 51 - Earth Systems and Resources – Earth Science Concepts – plate tectonics

- a) Japan, Indonesia, and the Philippines are examples of volcanic island chains that have formed along subduction zones between plates in the western Pacific.
- i. Describe what happens when two tectonic plates collide along a subduction zone. (1 point for a correct description of plate movement in a subduction zone)
    - One plate is pushed beneath the other, or equivalent description
    - A trench may be formed at the subduction zone
  - ii. **Explain how subduction leads to volcanic activity.** (2 points: 1 point for a correct explanation of one plate being pushed down and melted and 1 point for a correct explanation of molten material/magma rising to the surface near the zone)
- b) Although the landscape following a volcanic eruption may appear unable to support ecological communities, over time the area can be transformed through succession.
- i. What is primary succession? (1 point for a correct description of the establishment of organisms where bare rock/ash/sand/inorganic substrate, or no soil previously existed)
  - ii. Explain how primary succession can lead to soil formation on a newly formed volcanic landscape. (2 points: 1 point for a correct explanation of the role of organisms in physically/chemically weathering rock and 1 point for a correct explanation of the role of organisms and decomposition in soil formation over time)
- c) In addition to volcanic activity, highly destructive tsunamis are generated along Pacific Plate subduction zones.
- i. Explain how a tsunami is generated along a subduction zone. (2 points: 1 point for a correct explanation of tsunami generation resulting from an underwater earthquake and 1 point for a correct explanation of rapid water displacement leading to tsunami formation)
  - ii. Describe one negative ecological impact that tsunamis have on coastal environments. (1 point for a correct description of a negative ecological impact; only the first description given can earn points)
    - Destruction of/loss of habitat such as mangrove forests, coral reefs, etc.
    - Flooding resulting from tsunami waves can create saltwater intrusion into coastal ecosystems
    - Drowning of terrestrial species

- d) Southern California experiences periodic devastating earthquakes along the San Andreas Fault, which is a transform boundary located along the eastern edge of the Pacific Plate.
- i. Describe what happens to the tectonic plates along a transform boundary at the moment when an earthquake occurs. (1 point for a correct description of the movement of plates when an earthquake occurs)
    - A large amount of energy is released
    - Plates suddenly/rapidly slide past each other in opposite directions
  - ii. Describe what happens to the tectonic plates along a transform boundary during the time between earthquakes.  
  
(1 point for a correct description of tectonic plates along transform faults binding or locking-up causing pressure to build up over time)

## Free Response Question 52 - Living World – Ecosystem Diversity – biodiversity

a) Describe TWO characteristics shared by ecosystems that have high biodiversity. (2 points: 1 point for each description of a characteristic)

- Large number of different species
- Large number of individuals of different species
- Complex food webs
- Greater genetic diversity
- Variety of ecological roles I niches
- Abundant resources

b) Identify TWO specific human activities that result in a loss of biodiversity, and explain how each activity lowers biodiversity. (4 points: 1 point for each activity and 1 point for each correctly linked explanation)

Activity	Explanation
Clearing land for construction/homes/roads	<ul style="list-style-type: none"> <li>• Reduces habitat for many species</li> <li>• Results in habitat fragmentation</li> </ul>
Logging/clear cutting/deforestation	<ul style="list-style-type: none"> <li>• Reduces habitat for many species</li> <li>• Results in habitat fragmentation</li> </ul>
Agriculture: <ul style="list-style-type: none"> <li>• Monoculture</li> <li>• GMOs</li> <li>• Clearing forests to create pastureland</li> <li>• Pesticide use</li> </ul>	<ul style="list-style-type: none"> <li>• Eliminates native species; decreases genetic variation</li> <li>• Reduces habitat for many species</li> <li>• Eliminates native species and beneficial organisms</li> </ul>
Overfishing/hunting (overhunting)/poaching	<ul style="list-style-type: none"> <li>• Reduces keystone species</li> <li>• Reduces top predators</li> <li>• Depletes endangered species</li> </ul>
Water contamination by: <ul style="list-style-type: none"> <li>• Excess fertilizer</li> <li>• Runoff from feedlots</li> <li>• Runoff from construction</li> <li>• Untreated sewage</li> </ul>	<ul style="list-style-type: none"> <li>• Overloads sediments and nutrients</li> <li>• Decreases dissolved oxygen (only certain species can survive)</li> </ul>
Burning of fossil fuels	<u>Climate change</u> <ul style="list-style-type: none"> <li>• Death of coral reefs</li> <li>• Loss of reef habitat</li> <li>• Increases sea level with resulting loss of coastal habitat</li> </ul> <u>Acid rain</u> <ul style="list-style-type: none"> <li>• Increases acidity of freshwater systems (only certain species can survive)</li> </ul>
Introduction of invasive species	<ul style="list-style-type: none"> <li>• Displaces native species</li> </ul>
Dams/hydroelectric plants	<ul style="list-style-type: none"> <li>• Fragments habitat</li> </ul>
Surface mining	<ul style="list-style-type: none"> <li>• Destroys habitat</li> </ul>

- c) For each human activity you discussed in (b), propose a practical strategy (other than simply banning the activity) to reduce the loss of biodiversity. (2 points: 1 point for each reasonable solution correctly linked to the activity or explanation in part b)

Activity (or explanation) from part (b)	Solution
Clearing land for construction/homes/roads	<ul style="list-style-type: none"> <li>Cluster development</li> <li>Smart Growth planning</li> <li>Develop urban boundaries</li> <li>Habitat-conservation areas</li> </ul>
Logging/clear cutting/deforestation	<ul style="list-style-type: none"> <li>Replant trees</li> <li>Selective cutting</li> </ul>
Agriculture: <ul style="list-style-type: none"> <li>Monoculture</li> <li>GMOs</li> <li>Clearing forests to create pastureland</li> <li>Pesticide use</li> </ul>	<ul style="list-style-type: none"> <li>Encourage polyculture, agroforestry, intercropping</li> <li>Require GMO crops to be sterile</li> <li>Create wildlife/habitat corridors</li> <li>Grow shade-tolerant crops</li> <li>Implement IPM techniques, biological pest controls</li> </ul>
Overfishing/hunting (overhunting)/poaching	<ul style="list-style-type: none"> <li>Regulate activities and/or establish quotas</li> <li>Enforce existing laws (ESA)</li> <li>Ban trade (CITES)</li> </ul>
Water contamination by: <ul style="list-style-type: none"> <li>Excess fertilizer</li> <li>Runoff from feedlots</li> <li>Runoff from construction</li> <li>Untreated sewage</li> </ul>	<ul style="list-style-type: none"> <li>Regulate non-point sources of water pollution (e.g., buffer zones, swales, containment ponds, storm water treatment areas)</li> <li>Secondary or tertiary treatment</li> </ul>
Burn fossil fuels	<u>Climate change</u> <ul style="list-style-type: none"> <li>Implement the Kyoto Protocol</li> <li>Carbon sequestration</li> <li>Carbon cap-and-trade</li> <li>Carbon tax</li> <li>Switch to renewable energy sources</li> </ul> <u>Acid rain</u> <ul style="list-style-type: none"> <li>Require scrubbers on coal burning power plants</li> <li>Switch to renewable energy sources</li> </ul>
Introduction of invasive species	<ul style="list-style-type: none"> <li>Checkpoints for agricultural inspections</li> <li>Tighter enforcement on import of horticultural or exotic species</li> <li>Education regarding strategies to prevent invasives</li> </ul>
Dams/hydroelectric plants	<ul style="list-style-type: none"> <li>Steps to allow fish migration</li> </ul>
Surface mining	<ul style="list-style-type: none"> <li>Enforce Surface Mining and Reclamation Act</li> </ul>

- d) Describe ONE naturally occurring factor that could lead to a loss of biodiversity. (1 point)
- Particulates from asteroids/volcanoes can alter the atmosphere (e.g., block sunlight, resulting in cooler temperatures and reduced photosynthesis)
  - Widespread wildfires can wipe out small populations
  - Natural, long-term climate change can result in warmer or cooler temperatures
  - Hurricanes/tsunamis can wipe out coastal nursery/estuary areas
  - Droughts (e.g., food source may be lost; populations may be unable to adapt to drier conditions)
  - Mutation/evolution may lead to new diseases/predators
- e) Describe TWO ecological benefits that greater biodiversity provides. (2 points: 1 point for each ecological benefit)
- Pollination (by insects and other organisms)
  - Water/air filtration by intact ecosystems
  - Stability/survivability of ecosystems
  - Control of pest species
  - More source material for evolution
  - Soil microorganisms can contribute to nutrient recycling, leading to higher primary productivity