Applied Remote Sensing Training (ARSET) Program

Earth Observations of Blue Carbon Ecosystems (2024)

Homework Questions

Question 1

What makes mangrove, sea grass, and salt marsh ecosystems actionable for climate mitigation?

Answers: (bold correct)

a. The presence of high carbon stocks
b. Evidence of long-term carbon storage
c. The capacity for people to manage and effectively measure GHG emissions and removals resulting from changes to these ecosystems.
d. **All the above**

Feedback:
All three characteristics make these blue carbon ecosystems actionable as climate mitigation solutions. Other ocean and coastal ecosystems can be essential components of the ocean carbon cycle, but aren't suitable for climate mitigation because they don't store carbon long term.

Question 2

What makes blue carbon ecosystems distinct from other carbon ecosystems?

Answers: (bold correct)

a. **Blue Carbon is carbon that is stored, captured, and removed by ocean systems.**
b. Blue Carbon ecosystems are found in tropical, low-latitude regions.
c. Blue Carbon ecosystems provide short-term carbon storage.
d. Blue Carbon is carbon that is located under the ocean's surface.

Feedback
The correct answer is "Blue Carbon is carbon that is stored, captured, and removed by ocean systems." All the other statements are false. Sea grasses and salt marshes can be found at higher, temperate latitudes. One reason blue carbon ecosystems are attractive mitigation targets is

because they store carbon long term. While sea grasses can be found primarily underwater, mangroves and salt marshes are not fully submerged.

Question 3

There is a single mangrove mapping method that should be used for all objectives, such as mapping mangrove extent and change for national level reporting, or mapping mangroves to develop and sell blue carbon credits.

Answers: (bold correct)

a. True
b. False

Feedback:
There are many ways to map mangrove ecosystems and you should ensure that the methods you are using produce the quality of results that you need and that you follow any approved methodologies.

Question 4

There are several existing datasets available for mangrove extent, height, and biomass. Which of the following are some key considerations when choosing a dataset?

a. Spatial Resolution
b. Date Range
c. Dataset Calibration over your Region of Interest

Answers: (bold correct)

a. A & C
b. A & B
c. B & C
d. A, B, & C

Feedback:
All of the factors listed should be considered when selecting a dataset.

Question 5

Which characteristic of mangrove ecosystems can be measured using remote sensing techniques and is directly related to biomass estimation, and subsequently mangrove ecosystem carbon stock?

Answers: (bold correct)

a. **Canopy Height**
b. Vegetation Health

c. Sea Salinity
d. Tree Diameter

Feedback:
The canopy height, or the height of a tree, is a good indicator of how much biomass is stored in that tree. Diameter at breast height (DBH) is a better indicator of tree biomass, but this cannot be directly measured using spaceborne data.

Question 6

When using remote sensing information to map salt marsh extent, which variables or characteristics increase the accuracy of classification?

a. Elevation
b. Lower Spatial Resolution
c. Higher Spatial Resolution
d. Single Image
e. Multi-Day Image Composite

Answers: (bold correct)

a. A, B, & D
b. A, B, & E
c. **A, C, & E**
d. C & E

Feedback:
When mapping salt marsh extent, elevation data is useful because above a certain elevation tidal inundation does not occur, so salt marshes will not be present. Higher spatial resolution is needed to increase accuracy and resolve smaller finer scale features. Multi-day image composites can combine information for different tidal stages or seasons.

Question 7

Which 'tier' of data would be required for national or global estimates of carbon emissions and removals?

Answers: (bold correct)

a. **Tier 1**
b. Tier 2
c. Tier 3

Feedback:

Tier 1 methodologies usually use activity data that are spatially coarse, such as nationally or globally available estimates. Tier 2 and Tier 3 methodologies use country-specific and sub-national activity data, respectively.

Question 8

When using remote sensing observations to map seagrass extent, high tide conditions are desired for ideal detection.

Answers: (bold correct)

a. True
b. False

Feedback:
Low tide conditions that expose the seagrass canopy are ideal for seagrass detection.

Question 9

For Tier 1 analyses, carbon stocks can be estimated by multiplying the ecosystem extent and a global Tier 1 estimate of carbon per hectare for that ecosystem.

Answers: (bold correct)

a. **True**
b. False

Feedback:
Carbon stocks can be estimated by multiplying the ecosystem extent and a global Tier 1 estimate of carbon per hectare for that ecosystem. Tier 2 approaches use country-specific data, and Tier 3 uses sub-national information.

Question 10

Earth observation data of carbon stocks in blue carbon ecosystems can inform decision making in which of the following contexts?

Answers: (bold correct)

1. In policy, by improving understanding of the areal extent and existence of blue carbon ecosystems and monitoring for national GHG inventories to inform nature-based climate solutions.
2. In carbon projects, by identifying project areas, setting baseline rates of ecosystem degradation or loss, estimates of biomass, monitoring effectiveness, and project implementation.

3. In resource management, by monitoring and surveillance of illegal destruction/logging across a large scale and remote detection of the health and condition of plants.
4. **All of the above**

Feedback:
Earth observation data of carbon stocks in blue carbon ecosystems informs decision making in all three areas: policy, science projects, and natural resource management.