Applied Remote Sensing Training (ARSET) Program

Understanding Phenology with Remote Sensing

Homework Questions

Question 1

Changes in phenology can provide valuable information about:

Answers: (bold correct)

a. Invasive species management
b. Drought monitoring
c. Agricultural production
d. All of the above

Question 2

Name two drivers of phenology:

Short answer: Temperature and water availability

Question 3

The spatial resolution of the Visible Infrared Imaging Radiometer Suite (VIIRS) is

Answers: (bold correct)

a. 375 meters
b. 30 meters
c. 750 meters
d. Both A and C

Question 4

Which wavelengths are used to calculate the Normalized Difference Vegetation Index (NDVI)?

Answers: (bold correct)

a. Green and blue
b. Green and red
c. Red and near-infrared
d. Green and near-infrared

Question 5

In regions of greater bare ground coverage, which vegetation index may be best to use?

Answers: (bold correct)

a. The Normalized Difference Moisture Index (NDMI)
b. The Soil Adjusted Vegetation Index (SAVI)
c. The Enhanced Vegetation Index (EVI)
d. The Normalized Burn Ration (NBR)

Question 6

Vegetation indices and the leaf area index (LAI) always display a perfect linear relationship.

Answers: (bold correct)

a. True
b. False

Question 7

Name one difference between the MODIS and VIIRS NDVI product.

Short answer: MODIS is available at 250 m spatial resolution, VIIRS is not (it's only available 500m, 1km, and 0.5 degrees)

Question 8

The MODIS LAI and fPAR products are available:

Answers: (bold correct)

a. As 8-day composites
b. At 500 m spatial resolution
c. As 4-day composites
d. All of the above
e. None of the above

Question 9

Visit the WorldView website. Click on the "Add Layers" button on the left panel. Then click on the "Science Disciplines" tab. Under the "Biosphere" section click on "Gross Primary Productivity". In the map viewer take a look at the GPP globally for the first day of each month for the entire year of 2019. (Tip: you can move quickly from month-to-month using the arrows above and below the date abbreviation along the bottom). Describe the general patterns you observe in no more than 3 short sentences.

Short answer: For example: In the northern hemisphere, GPP is low in the winter months and increases rapidly throughout May and June. In desert regions, like the Sahara, GPP remains low year-round. In some tropical regions, GPP remains moderate to high throughout the year.

Question 10

The National Phenology network (NPN):

Answers: (bold correct)

a. Is focused on collecting, organizing, and delivering phenological data, information, and forecasts to support mgmt. and decision-making to advance the science of phenology, and to promote understanding and appreciation for phenology by a wide range of audiences
b. Is a network of near-surface cameras
c. Is a satellite used for phenology
d. Is a gardening collaborative

Question 11

Nature's Notebook can only be used by academic researchers.

Answers: (bold correct)

a. True
b. False

Question 12

Name three observations that can be catalogued using Nature's Notebook.

Short answer:
- breaking leaf buds
- leaves
- increasing leaf size
- colored leaves
- falling leaves
- flowers or flower buds
- open flowers
- pollen release
- fruits
- ripe fruits
- recent fruit

Question 13

As of early June 2020, in which portion of the U.S. are the Accumulated Growing Degree Days (AGDD) anomalies positive?

Answers: (bold correct)

a. The Southeast
b. The Northeast
c. The Great Plains
d. The Midwest

Question 14

Visit the NPN Visualization Tool. Click on the "Does arrival of White-winged Doves coincide with open flowers on saguaro cacti?" box. In this visualization you can see a peak of Saguaro open flowers and peak arrival of the White-winged Dove. Do there appear to be available Saguaro flowers during the arrival of the White-wigned Dove? Please explain.

Short answer: Observers started reporting milkweed open flowers in early June in the Midwest, and by mid July, nearly all observers were reporting a 'yes' for open flowers. Observers started reporting monarch butterflies in early May, with a peak in number of butterflies observed in mid July. An additional smaller peak in monarch activity was reported in mid September, but milkweed flowers declined by this time.

Question 15

Name two types of automated data collected at NEON sites.

Short answer:
- Meteorological: fluxes of carbon, water, energy
- Soil: physical properties, soil heat flux
- Phenological: Phenocam
- Surface water: precipitation
- Ground water data

Question 16

All PhenoCam sites collect imagery with near-infrared wavelengths.

Answers: (bold correct)

a. True
b. False

Question 17

At all PhenoCam sites locations, the Oak Ridge National Laboratory Distributed Active Archive Center provides subsets of:

Answers: (bold correct)

a. MODIS and VIIRS products
b. Landsat products
c. Sentinel-1 products
d. AVHRR products

Question 18

The Start of Season (SOS) using satellite imagery is identified when the NDVI values display:

Answers: (bold correct)

a. A consistent downward trend in time
b. A consistent upward trend in time
c. No trend
d. A value above 1

Question 19

An inflection point can be defined as:

Answers: (bold correct)

a. A predefined NDVI value
b. An increase in the atmospheric effects on a satellite image
c. The time when the time series changes direction (from concave upward to concave downward)
d. Predicted values based on previous time series observations in NDVI

Question 20

According to the NPN spring indices, spring leaf out arrived:

Answers: (bold correct)

a. Earlier in the Southeastern US
b. Earlier in the Northern Great Plains
c. At about the same time as normal in the Southern US
d. Later in the Southeastern US

Question 21

Which three plant types were used in the NPN green wave modeling:

Answers: (bold correct)

a. Lilac, honeysuckle, and poppies
b. Milkweed, monarchs, and cactus
c. Maples, oaks, and poplars
d. Ferns, redwoods, and cypress

Question 22

What two vegetation indices were generated using the PhenoCam data in the comparison study?

Answers: (bold correct)

a. The Green Chromatic Coordinate (GCC) and the Vegetation Contrast Index (VCI)
b. The Normalized Difference Vegetation Index (NDVI) and the Enhanced Vegetation Index (EVI)
c. The Enhanced Vegetation Index (EVI) and the Soil Adjusted Vegetation Index (SAVI)
d. The Soil Adjusted Vegetation Index (SAVI) and the Green Chromatic Coordinate (GCC)

Question 23

What are Urban Heat Islands (UHIs)?

Answers: (bold correct)

a. The flush of green that accompanies leaf-out
b. The accumulated growing degree days
c. Built up areas that are hotter than nearby rural areas
d. The population density of birds

Question 24

What tool or dataset presented during this training are you the most interested in learning more about?

Short answer: