Guided Notes:
What Does a Microbiome Contribute to the Forest as a Whole?

Name, role and affiliation of the scientist featured:

_____

1. The Role of Microbes in Large Ecosystems

Forests are some of the largest terrestrial ecosystems on Earth. While we often focus on plants and animals, the _____ species play a critical role in maintaining these systems. Broadly, forests are driven by the exchange of elements between the _____ and terrestrial biomass. This involves the cycling of two specific inert gases: _____ _____ and _____ _____. These elements are needed to build biological macromolecules like proteins, carbohydrates, lipids, and nucleic acids.

2. Primary Production: Nitrogen and Carbon Fixation

Because atmospheric gases are inert, they must be transformed through specialized biochemical processes:

- **Nitrogen Fixation:** Mediated by bacteria in the soil, this process converts stable nitrogen gas into _____, which plants use to build biomass.
- **Carbon Fixation:** Plants and some microbes use _____ to fuel the conversion of CO_2 into _____.

Together, these two processes constitute the majority of _____ _____ in the forest ecosystem.

3. Animal-Microbe Interactions

Animals like deer, bears, and insects (ants and termites) rely on microbes for survival. Many animals use dead plant material for food, but they lack the _____ capacities to break it down. Microbes living in the _____ systems of these animals aid in the breakdown of complex plant material. This partnership promotes the _____ of forest biomass, turning deadfall back into usable nutrients.

4. Returning to the Atmosphere: Respiration and Denitrification

To bring the cycle "full circle," elements must return to the atmosphere:

- **Heterotrophic Respiration:** The process of breaking down plant biomass for energy, which releases _____ back into the air.
- **Denitrification:** Bacteria in the soil use biologically available nitrogen and produce _____ gas as a byproduct.

These processes ensure the forest stays in an _____ state, though events like fire or _____ can disrupt this balance.