

Plant Ecophysiology

The effect of the irradiance environment on the composition of plant communities in the Jewel Moore Nature Reserve

RESEARCH QUESTION AND HYPOTHESES

RQ: Is the composition of plant communities in the transition from forest to prairie related to differences in the radiation environment?

Hypothesis 1: The prairie and forest habitats will have distinctively different plant community structure.

Hypothesis 2: The prairie and forest habitats will have distinctively different radiation environments.

METHODS

Survey

Look around both the prairie and forest habitats. Try to identify plants that are found in both the prairie and the forest and plants that are found only in one habitat. Pay specific attention to the prairie/forest transition zone to see if specific plants are found there.

Line transect

1. Find a point in the forest that is away from the prairie/forest transition. Mark this point with a flag. Starting from this flag, stretch the measuring tape to another point on the prairie that is not shaded by any trees (or appears that it will be shaded later in the day). This distance should be at least 30 meters. Mark this point with another flag.
2. Return to the original forest point and divide this transect into two meter sections (mark each point with an additional flag).

Radiation Environment

1. Measure light intensity (PPFD) at each flag along the transect using the quantum sensor. Keep the sensor one meter off the ground when taking readings and keep it as horizontal as possible
2. Repeat step 1 at midday and in the early morning and late afternoon when the sun is below the level of the tree canopy.
3. DO NOT FORGET TO PICK UP YOUR FLAGS AND BRING THEM BACK TO THE LAB WHEN YOU ARE DONE.

Plant Analysis

1. For the forest habitat, identify at least two different species and count the total number of all plants of each species that either physically touch the transect line or whose aerial foliage overlies **each transect segment**. **PLEASE AVOID STEPPING ON THE MEASURING TAPE!** For the sake of simplicity, avoid grass species and concentrate on herbaceous plants, trees, shrubs and vines.
2. For the prairie, identify at least two different plants and count the total number of all plants of each species that physically touch the transect line in each transit segment. For the sake of simplicity, avoid grass species and concentrate on herbaceous plants, trees, shrubs and vines.

CALCULATIONS

Light Intensity

1. Calculate an average light intensity for each transect interval.
2. Make a plot showing average light intensity vs. transect interval.

Plant Density

1. For **each transect interval** calculate the relative density (RD):

$$RD = n_1 / \Sigma n_1$$

n_1 = number of a particular plant species

Σn_1 = total number of individuals of a particular species

2. Make a histogram plot showing the relationship between RD (for each identified species) and transect interval.

QUESTIONS AND ANALYSIS

1. Are there particular plants that are found only in either the forest or prairie habitat?
2. Did you notice a specific transaction in light environment in the transition between forest and prairie?
3. What sort of differences would you expect to see in plants adapted to live in either forests or prairies?
4. What would happen if prairie plants were planted in the forest understory or understory plants in open prairies?
5. What other environmental factors might be involved in explaining the distribution of plants in prairie and forest?
6. What are the strengths and weaknesses of this laboratory exercise? If you were to do it again, what would you change?