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### Edge influence on forest composition in a pine-oak forest in central Mexico

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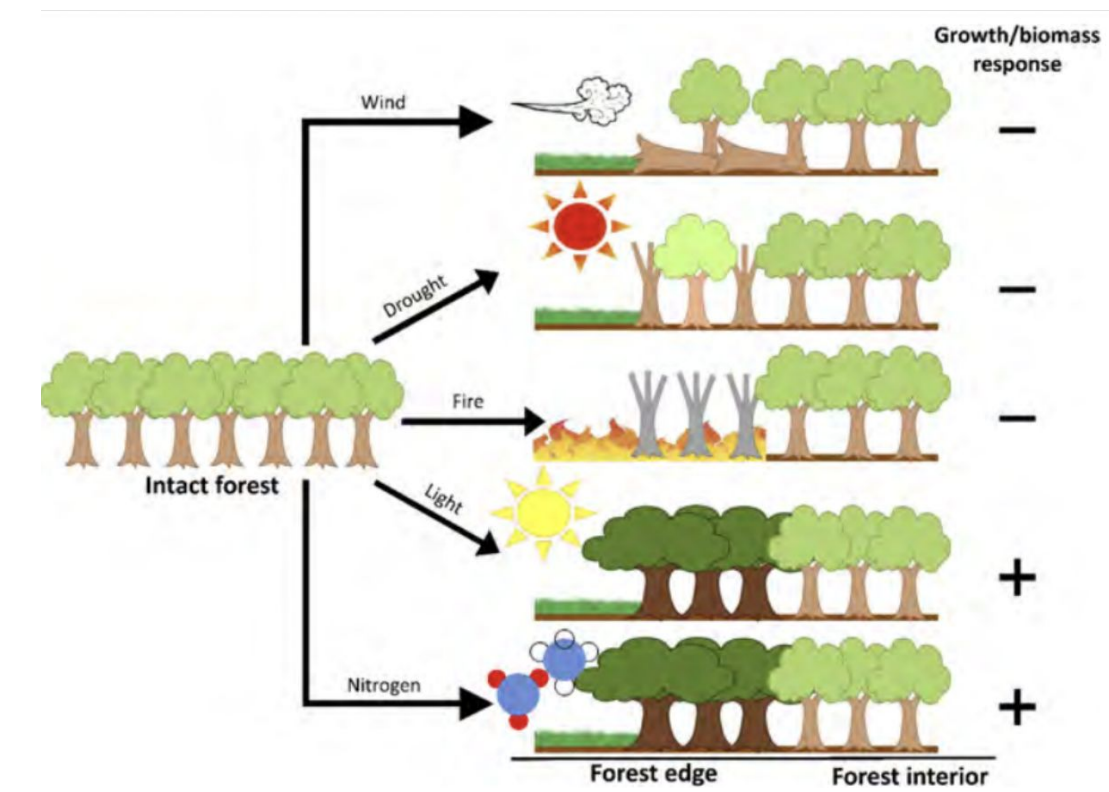
# Edge influence on forest composition in a pine-oak forest in central Mexico

Isidro Avila, Department of Biology, DePauw University

## Background

### Habitat Fragmentation

- **Greater exposure to human dominated landscapes** making edges more common
- Forest fragmentation has shown to result in:
  - Increase in **wildfire susceptibility** and **tree mortality**
  - Changes in **species composition**, **seed dispersal**, and **predation**
  - Changes to the **structure** and **function** of the remaining fragments.



**Figure 1. Edge Influence.** This figure shows the effects of habitat fragmentation and the creation of edges. The positive (+) sign and negative (-) sign indicate favorable and adverse conditions, respectively, for growth/biomass.

## Hypothesis and Predictions

An **edge influence** will be **present** between the forest edge (3m) and the forest interior (40m). The data will show a significant **increase** in **understory cover**, **number of trees**, **diameter at breast height** and **percent soil moisture**.

## Study Site

### Ojo de Agua (Aporo), Michoacán

#### 100-year-old Agricultural field

- Traditional corn, and wheat production
- Shifted to an avocado farm

#### Managed Dry Pine-Oak forest in the trans-Mexican volcanic belt.

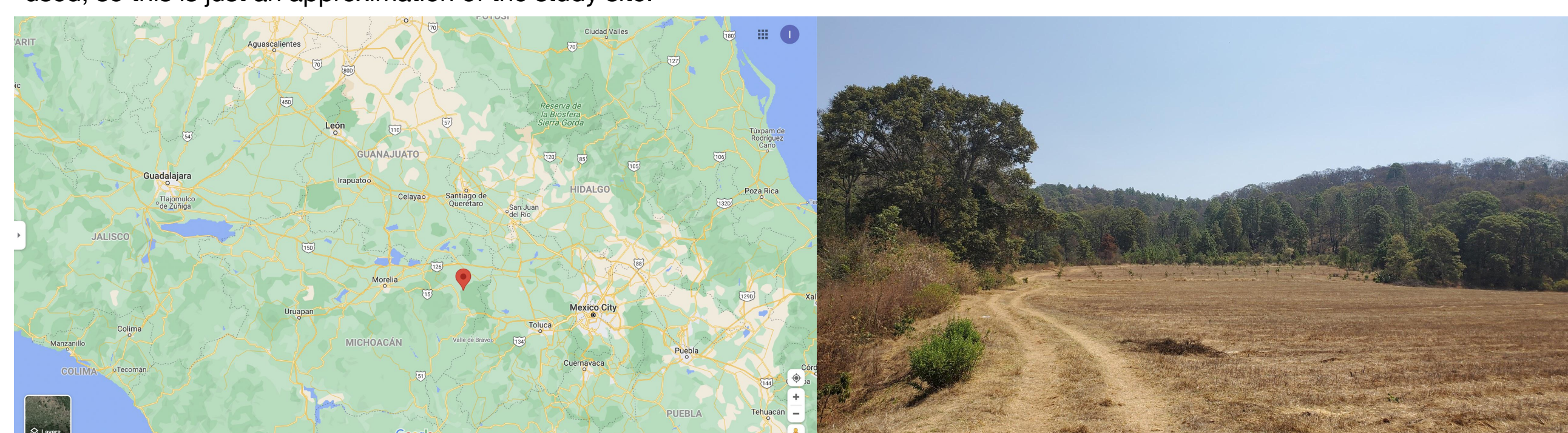
- **Wet season:** Late May – August
- **Dry season:** September – May



**Figure 2. Study Site.** This figure shows a google earth screenshot of the region, with a red box indicating the field site. Note that no GPS unit was used, so this is just an approximation of the study site.



**Figure 3. Study Site.** This image shows a picture of the agriculture field and the pine-oak forest that was studied.



**Figure 3. Mexico.** This image shows a zoomed out google maps screenshot of central Mexico. The red markers indicates where the study was conducted.

**Figure 4. Study Site.** This image shows a picture of the agriculture field and the pine-oak forest that was studied.

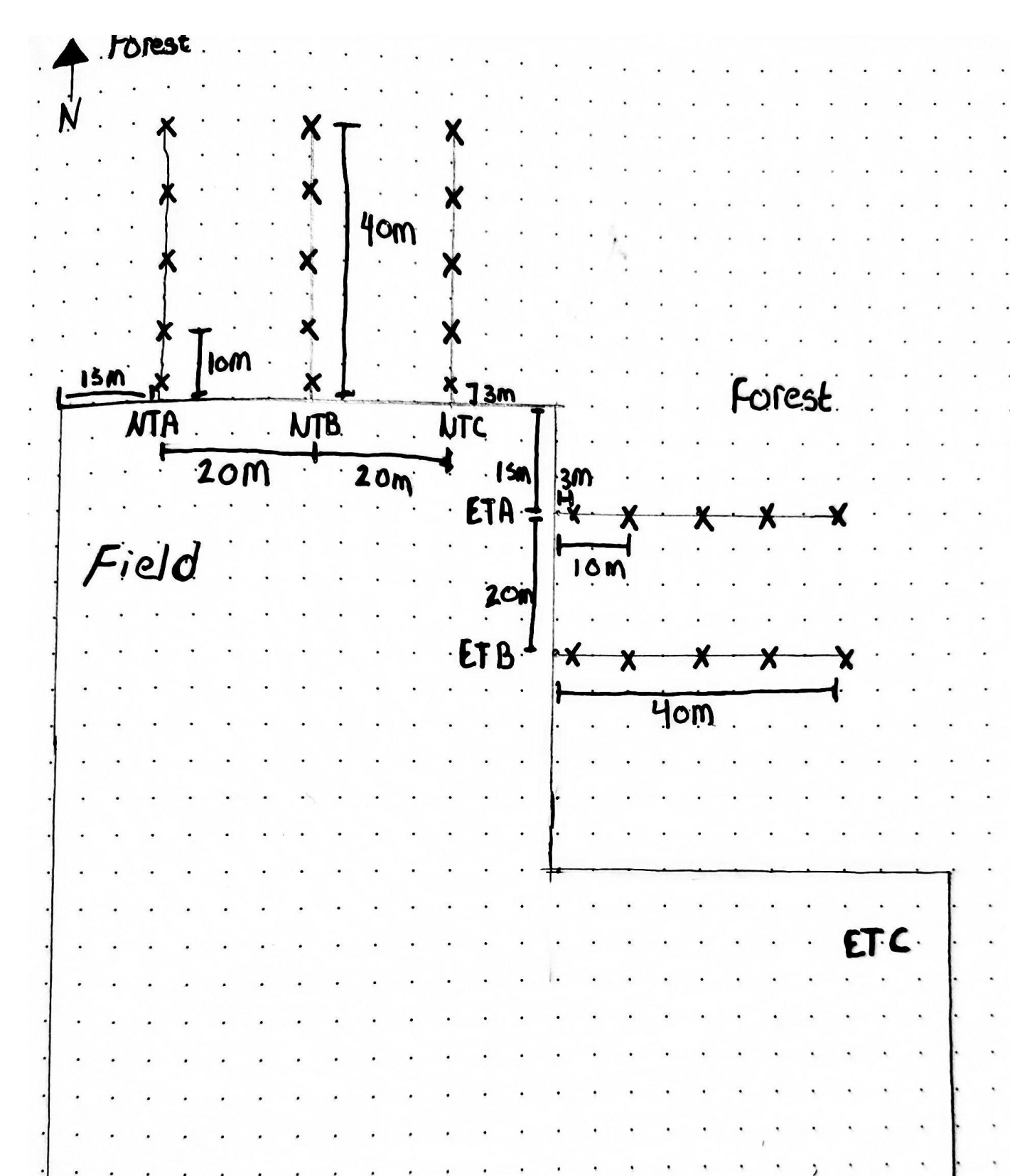
## Methods

### Study Design

- 6 Transects all 20m apart
- 3 Facing north, 3 facing east
- 5 Data points per transect
- 3, 10, 20, 30, 40m away from edge
- 3m radius at each data point

### Response Variables

- Species Richness
- Tree Count
- Diameter at Breast Height
- Soil Moisture
  - Collected soil samples at each study site on the same day Measured weight of soil right after collected (wet) and after 5 days (dried)
- Forest Floor Cover
  - Used a 0.5m x 0.5m quadrant at the center of each 3m radius

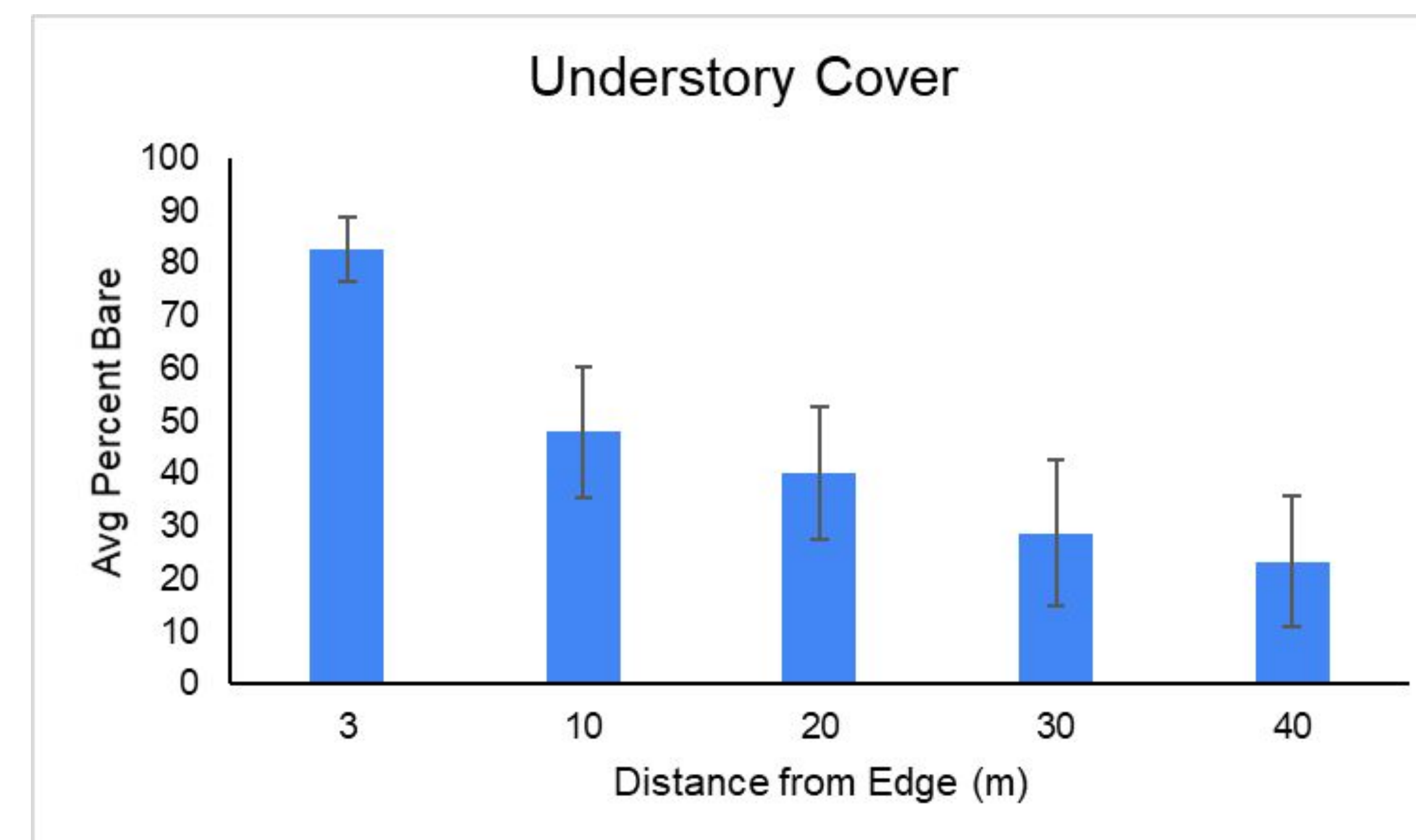


**Figure 5. Field Site Diagram.** This figure shows a diagram of the field site with 5 out of the 6 transects fully shown. The start of transect ETC is indicated in the diagram but the 3, 10, 20, 40m data points are not.

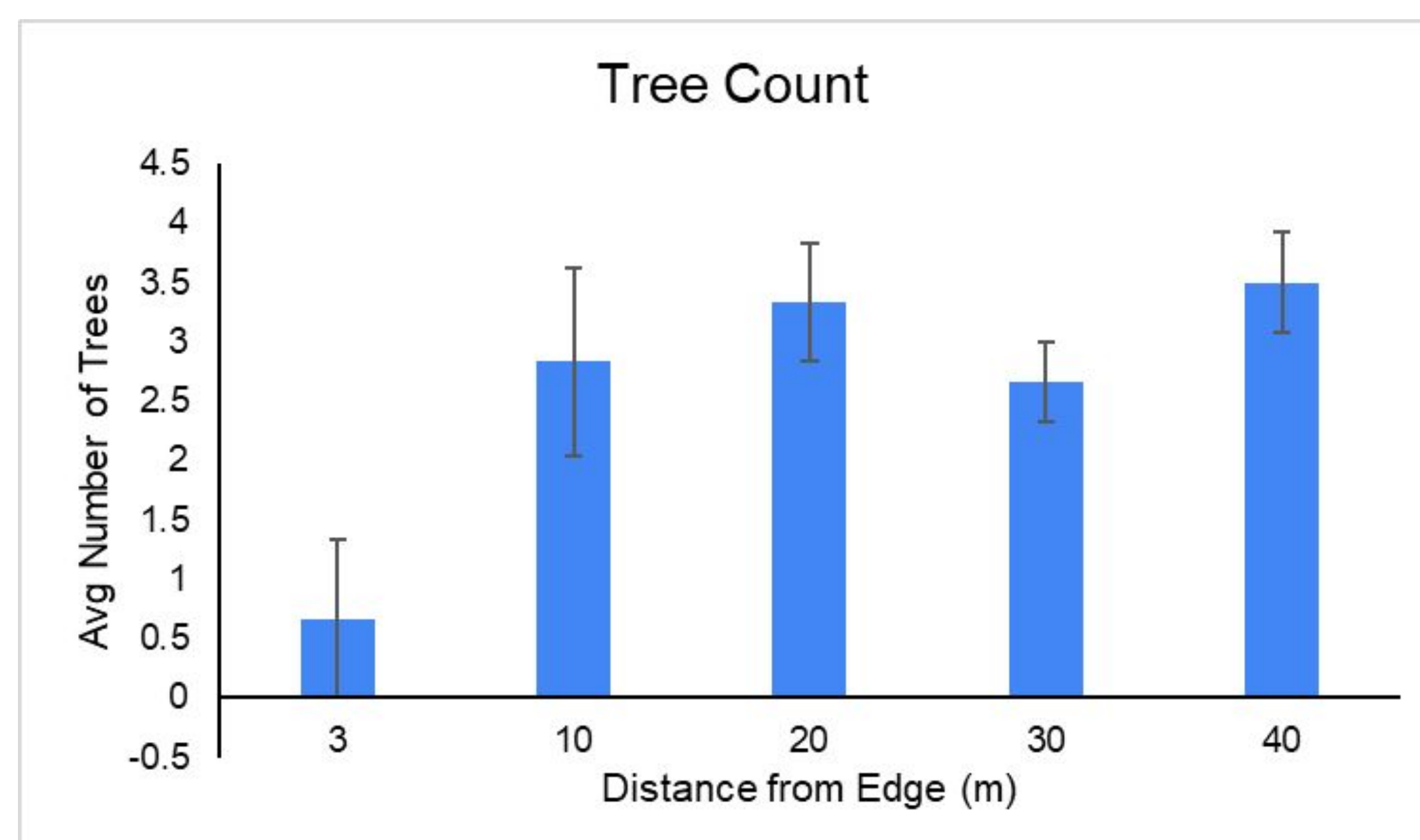


**Figure 6. Methods.** This figure shows the researcher measuring the diameter at breast height out on transect ETB.

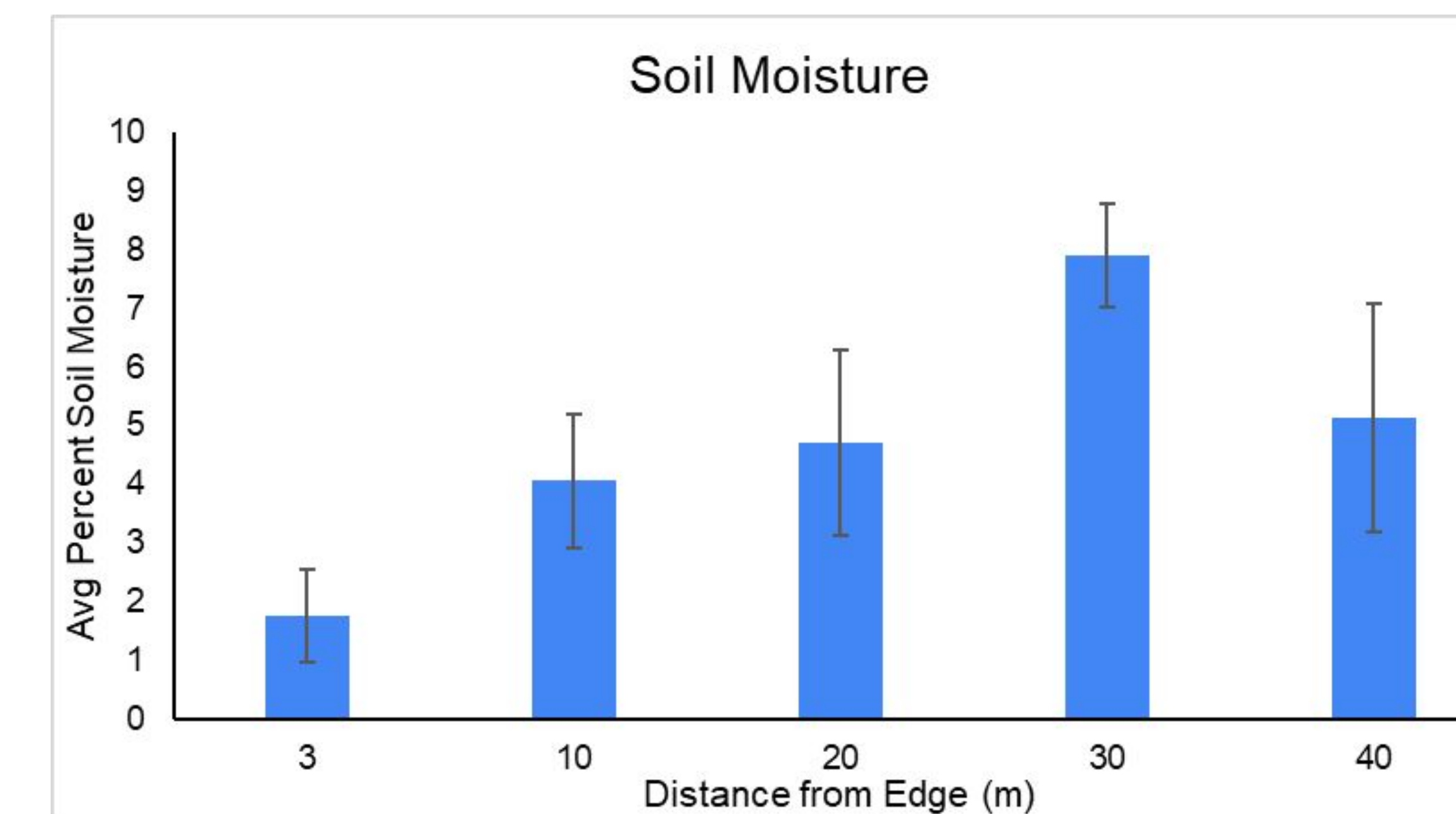
## Results



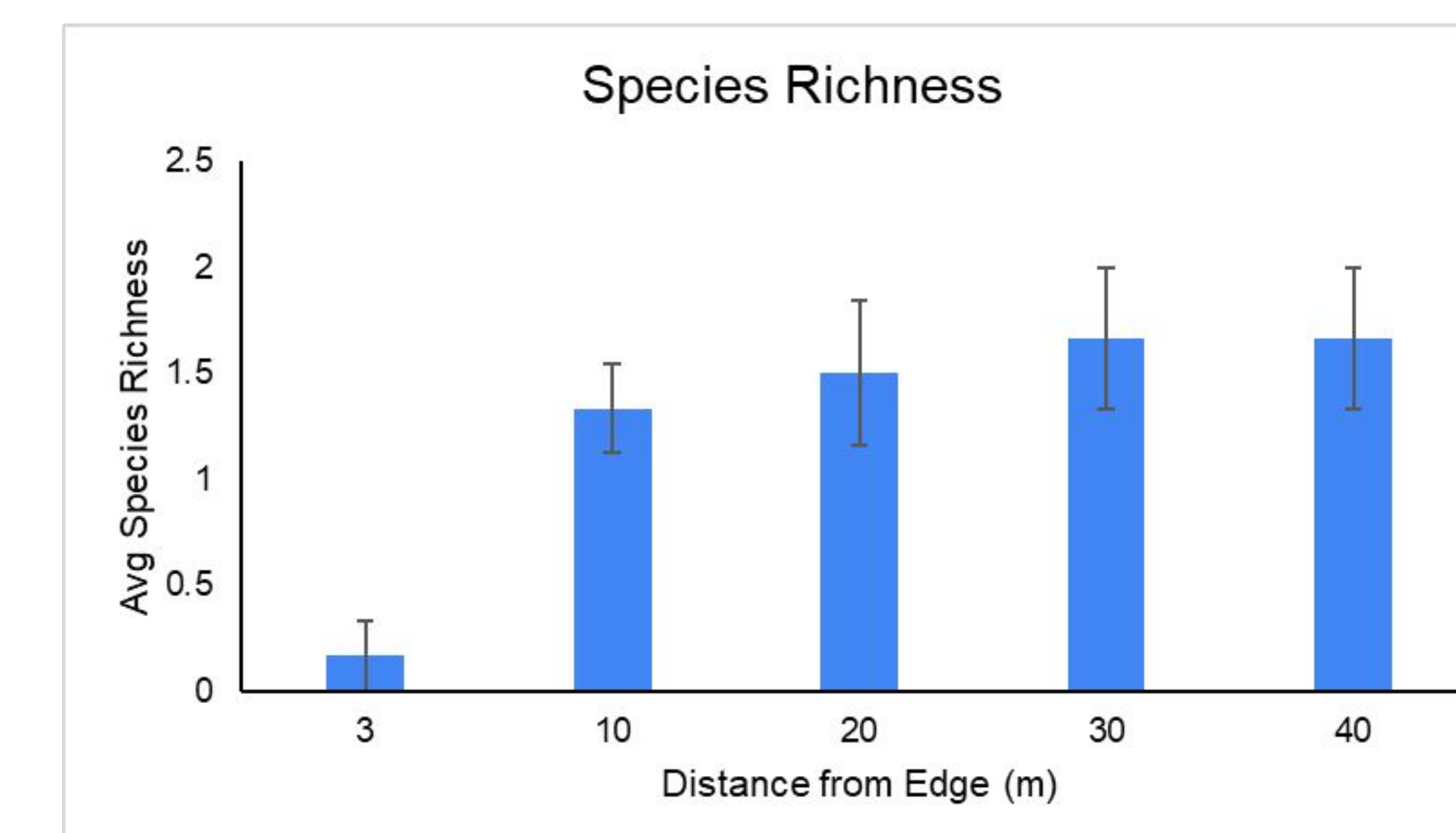
**Figure 7. Understory Cover.** This figure shows the average percent bare soil for 3, 10, 20, 30 & 40m from the edge. F value equals 3.94 and P value equals 0.012.



**Figure 9. Tree Count.** This figure shows the average number of trees for 3, 10, 20, 30 & 40m from the edge. F value equals 3.99 and P value equals 0.012.



**Figure 8. Soil Moisture.** This figure shows the average percent soil moisture for 3, 10, 20, 30 & 40m from the edge. F value equals 2.71 and P value equals 0.052.



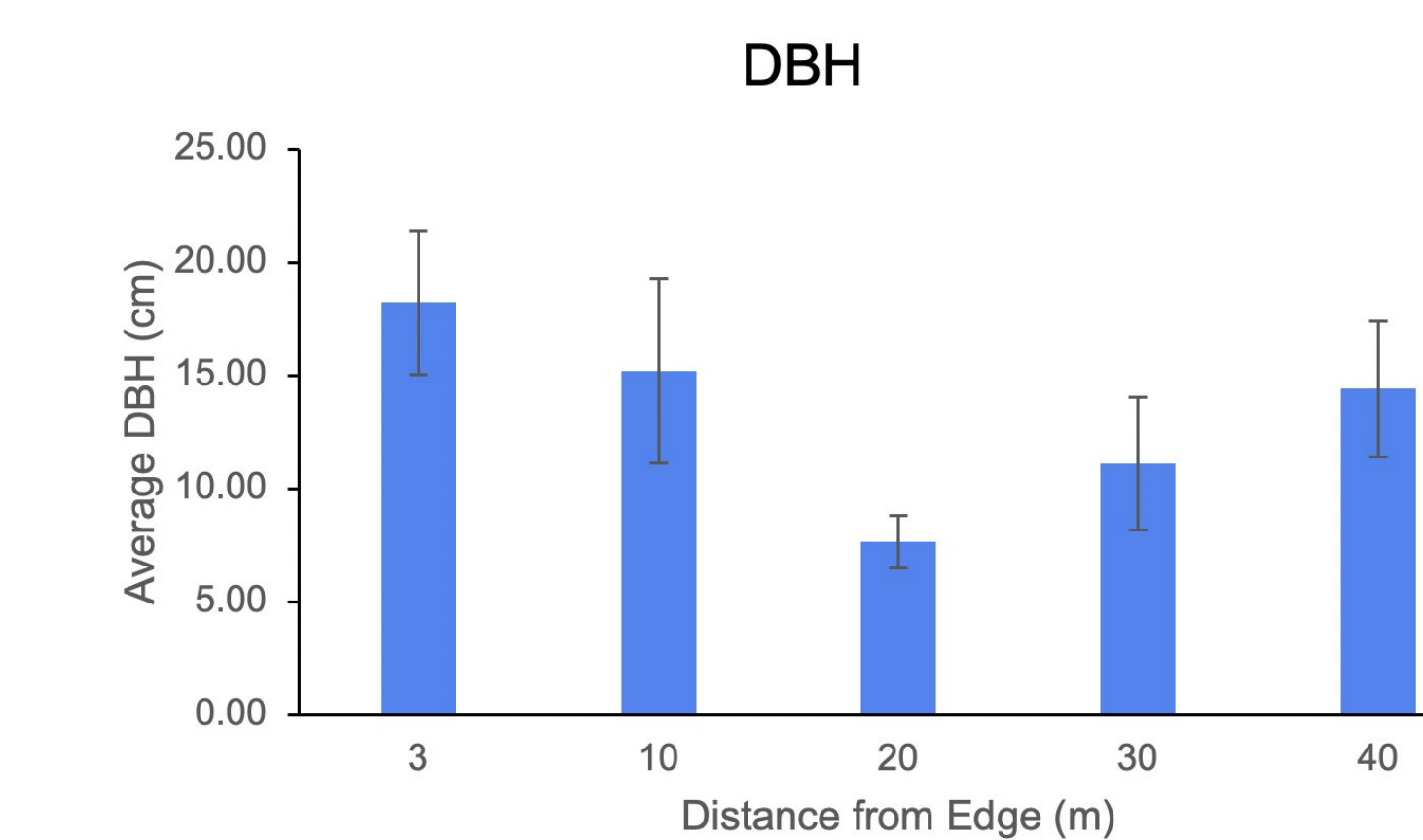
**Figure 10. Species Richness.** This figure shows the average species richness for 3, 10, 20, 30 & 40m from the edge. F value equals 2.38 and P value equals 0.005.

## Conclusion

- The null hypothesis was rejected since **an edge influence** noted between 3m and 40m. Understory cover, species richness, tree count, and soil moisture all showed an increase as we move further away from the edge.
  - But between each 10m interval the edge influence can vary
- Edge influence shown with most response variables including,
  - Soil moisture
  - Tree count
  - Species richness

## Follow Up Study

After the completion of the initial study a follow up study was conducted on the same managed forest. Transects were collected from a **road edge**. The dirt road has only been in use for the past five years. **No real edge influence** was noted at any of the response variables. A possible explanation for the results is that because the edge caused by the road fragmentation has not been established long enough to experience an edge influence.



**Figure 11. Diameter at Breast Height.** The figure to the immediate left shows the average diameter at breast height for 3, 10, 20, 30 & 40m from the edge. F value equals 1.97 and P value equals 0.06.



## Acknowledgements

I would like to thank the Department of Biology at DePauw University for the financial support, Professor Duple for assisting me in the planning of the study, and my family in Mexico for teaching me all about the land use history of the study site.

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