# Data Analysis Report

## Question 1: ANPP vs Annual Temperature

The scatter plot below illustrates the relationship between ANPP (Annual Net Primary Production) and annual temperature for each site. The plot suggests a moderate positive correlation between ANPP and temperature. A linear regression analysis was conducted, revealing a statistically significant relationship ($p < 0.05$), indicating that a linear model can be fitted to these data.

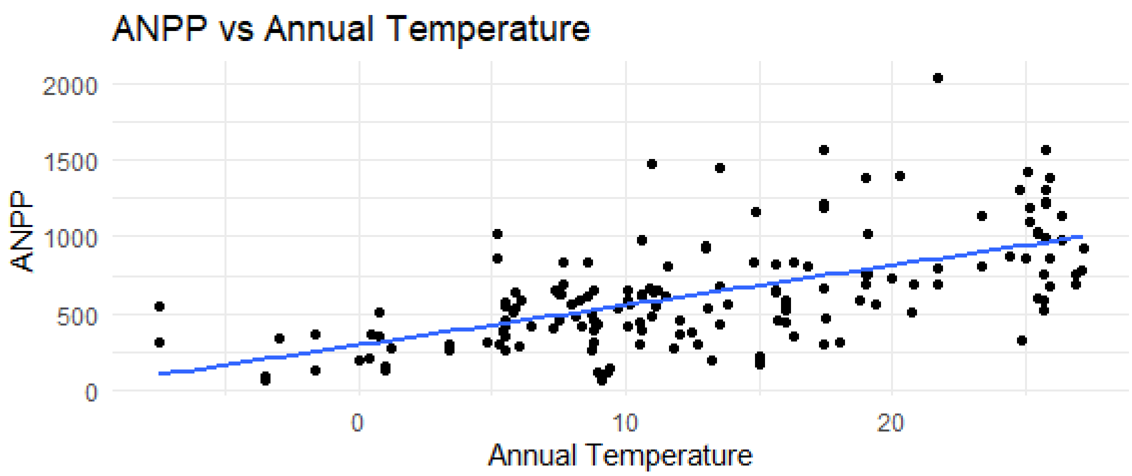
```
Call:
lm(formula = ANPP ~ ANNUAL_TEMPERATURE, data = annual_production)

Residuals:
    Min      1Q  Median      3Q     Max 
-609.76 -166.43  -47.03  129.58 1179.79 

Coefficients:
                   Estimate Std. Error t value Pr(>|t|)    
(Intercept)          296.28      41.39   7.158  2.9e-11 ***
ANNUAL_TEMPERATURE    25.95       2.70   9.610  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 285.6 on 158 degrees of freedom
  (6 observations effacées parce que manquantes)
Multiple R-squared:  0.3689,	Adjusted R-squared:  0.3649 
F-statistic: 92.35 on 1 and 158 DF,  p-value: < 2.2e-16
```

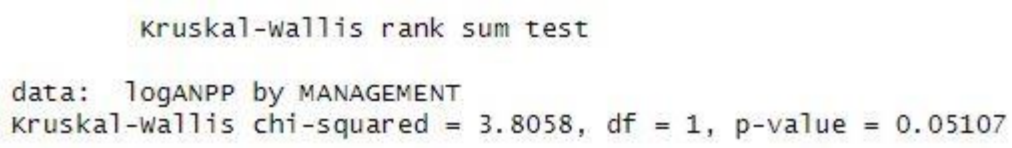
Figure 1: Summary of the linear regression analysis ($p < 0.05$).




Plot 1: ANNPP vs Annual Temperature

## Question 2: Kruskal-Wallis Test on logANPP

The Kruskal-Wallis test was used to determine if there is a significant difference in logANPP between managed and not-managed forests. The test resulted in a p-value slightly above 0.05, suggesting no significant difference between the two categories. However, the p-value is close to the threshold, which may indicate a potential trend that could be explored further.



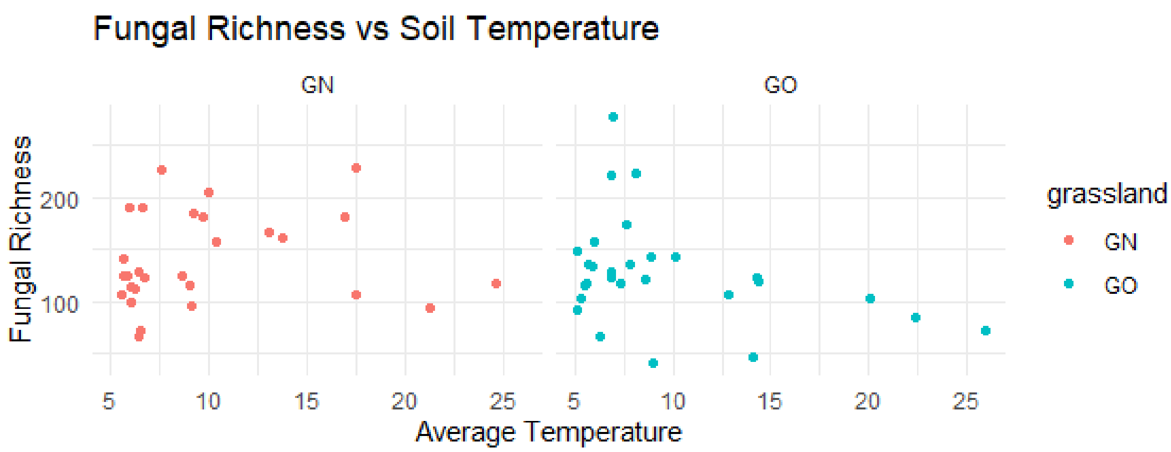
```
        Kruskal-Wallis rank sum test

data:  logANPP by MANAGEMENT
Kruskal-Wallis chi-squared = 3.8058, df = 1, p-value = 0.05107
```

Figure 2: Kruskal-Wallis test

## Question 3: Fungal Richness vs. Soil Temperature

Fungal richness, calculated as the count of non-zero OTUs in each sample, was plotted against soil temperature for two types of grasslands: GO and GN. The plots below illustrate how fungal richness varies with the average soil temperature in these ecosystems.




Plot 2: Fungal Richness vs Soil Temperature for two types of grasslands: GO and GN

**Interpretation of Plot 2: Fungal Richness vs. Soil Temperature in GO and GN Grasslands**

1. **Trend Analysis**:
    - The plot likely shows a scatter of points where each point represents a sample from either GO or GN grasslands.

- If there's a trend where fungal richness increases with temperature in either type of grassland, it suggests that fungal species in that grassland thrive better in warmer conditions.
- Conversely, a decreasing trend would imply that colder conditions are more favorable for fungal diversity in that grassland type.

2. **Comparison Between Grasslands**:
    - Are the trends for GO and GN similar or different? A similar trend could indicate that fungal species in both types of grasslands respond similarly to temperature changes.
    - Distinct patterns between GO and GN could suggest that these grasslands have different fungal communities or that the same fungal species respond differently to environmental conditions in each grassland type.
3. **Data Spread and Variability**:
    - How tightly clustered are the data points? A tight cluster might indicate a strong and consistent relationship between temperature and fungal richness.
    - Wide dispersion suggests high variability, implying that factors other than just soil temperature might be influencing fungal richness.
4. **Potential Anomalies or Outliers**:
    - Are there any data points that significantly deviate from the overall trend? These outliers might represent special cases or errors in data collection and should be investigated further.
5. **Ecological Implications**:
    - The observed relationship could be ecologically significant, indicating how fungal communities might adapt or be affected by changes in temperature. This is particularly relevant in the context of climate change.
    - Understanding this relationship helps in predicting the impact of temperature changes on soil health and ecosystem services provided by fungi, like nutrient cycling and organic matter decomposition.
6. **Statistical Confidence**:
    - If confidence intervals or statistical significance indicators (like p-values) are provided, they offer insight into the reliability of the observed trends.
    - A statistically significant trend reinforces the reliability of the observed relationship between temperature and fungal richness.

**Conclusion**

The plot provides valuable insights into the ecological dynamics of fungal communities in different grassland types and their responses to environmental temperature. Such information is crucial for ecological research, conservation efforts, and understanding the potential impacts of climate change on biodiversity and ecosystem function.

## Conclusion of Data Analysis Report:

Through the analysis of annual production and microbial diversity data, we uncovered key relationships between environmental factors and ecosystem dynamics. Our study revealed a significant correlation between ANPP and annual temperature, highlighting temperature's role in influencing ecological productivity. While the Kruskal-Wallis test on logANPP showed no strong differentiation between managed and unmanaged forests, it hinted at a subtle influence of forest management practices. The examination of fungal richness versus soil temperature in different grasslands provided insights into the adaptability of microbial communities to varying temperatures. Overall, this analysis underlines the importance of environmental factors in shaping ecological patterns and offers valuable perspectives for future ecological research and conservation efforts.