\*\*Interpretation of the Slope:\*\*

The slope of the regression line represents the estimated change in the amount of nitrogen removed (in percentage) for each additional foot of width in the grass buffer strip. A positive slope would indicate that wider buffer strips are expected to remove more nitrogen.

\*\*Prediction Use:\*\*

Using this model to predict nitrogen removal for buffer strips between 0 and 30 feet may be risky. The study data only covers buffer strips of 6 and 13 feet. Extrapolating beyond this range assumes the same linear relationship holds, which may not be valid due to possible non-linearity or different environmental factors over a broader range.

\*\*Sampling Distribution:\*\*

The sampling distribution of the sample mean for the four 6-foot buffer strips will be approximately normal according to the Central Limit Theorem, assuming a sufficiently large dataset or underlying normal distribution of individual observations. The mean of the distribution will equal the population mean of the 6-foot strips, and the standard deviation will be the population standard deviation divided by the square root of four.

\*\*Constructing a 95% Confidence Interval:\*\*

To construct a 95% confidence interval for the sample mean of the 6-foot buffer strips, use:

\[ \bar{x} \pm t^\* \left(\frac{s}{\sqrt{n}}\right) \]

where \(\bar{x}\) is the sample mean, \(t^\*\) is the critical t-value for 3 degrees of freedom from the t-distribution table, \(s\) is the sample standard deviation, and \(n\) is 4.

\*\*Better Estimator:\*\*

The better estimator of the slope of the regression line will likely be the one with smaller variability in observed values. Comparing variability in the accompanying plots, the study with tighter confidence intervals (narrower error bars) represents more precise estimation, which aids in better slope estimation.

\*\*Alternative Width Selection:\*\*

To check the straight-line relationship assumption, select buffer strip widths across a broad range, such as 5, 10, 15, 20, 25, and 30 feet, ensuring coverage at both ends and middle of the range. This diverse range allows hypothesis testing for linearity and potential identification of non-linear patterns.