Researchers were interested in whether there are differences in aboveground biomass between two microhabitats (creekbank and mid-marsh). Replicate plots were established *within* *each microhabitat each year*, and biomass was measured annually for 18 years. The provided table includes 4 variables: aboveground biomass, microhabitat (Zone), plot and year.

In addition to microhabitat, researchers were interested in identifying other explanatory variables that relate to differences in biomass. 6 potential explanatory variable are considered: air temperature, precipitation, river discharge (reduces salinity, a stressor), mean sea level (affects salinity and soil anoxia in complicated ways), mean tide range (same) and SPDI (a measure of drought, combining temperature and precipitation).

1. **Choose and identify a process for selecting a model that best predicts biomass as a function of microhabitat, year, their interaction, and a subset of the other 6 variables of interest and their interaction.**

Using leaps package in R or forward stepwise regression by fitting linear model using lmer function in R and comparing between a full model and a reduced model in a step wise fashion. Starting with the few terms/variables and adding new terms in the model.

**Rcode:**

lmer(Aboveground~(1|Year)+(1|Year:Zone)+River\_discharge+River\_discharge:Zone+Mean\_Tide\_Range:Zone+Zone,Marsh,REML=FALSE)

**Linear Expression:**

Biomass~year+year: zone+zone+river discharge+ river discharge: zone+ mean tide range: Zone

1. **In multiple complete sentences detail what your full model reveals about the relationship between each explanatory variable and biomass, including any interaction terms.**

The model that includes year, Zone/microhabitat and River discharge as fixed effects and interaction term between Zone and the other three variables- river discharge, year and mean tide explained significantly more variation in biomass than alternative models.

The variation in aboveground biomass was dependent on year, Zone/microhabitat and River discharge but not on air temperature and precipitation. The relationship between biomass and zone was dependent on the year, river discharge and the mean tide range. On average mid-marsh had 6883.47 more biomass than creekbank and river discharge accounted for 1.93 more biomass and accounted for 1.6 less biomass in mid-marsh. Mean-tide range had 3323.5 more biomass in Creekbank whereas it had 233 less biomass in mid-marsh.

1. **Describe how your model compares to other potential models. Does it provide a significantly better fit or are there multiple alternative models that describe a similar amount of variation in biomass? Be specific about the criteria you use to establish the relative fit of your model.**

The model compared to other potential models provided a significantly better fit based on the likelihood ratio test.