LABORATORY VERSUS FIELD COMPARISON OF AQUATIC VEGETATION IN THE COMAL ECOSYSTEM

Objective

The objective of the Laboratory versus Field Comparison is to compare aquatic vegetation growth over time when conducted simultaneously in laboratory and *in-situ* experiments held at similar flow and water quality conditions. The null hypothesis is that when held under similar physiochemical conditions, similar aquatic vegetation growth will be experienced between the laboratory and field treatments.

Study Sites

Sites for this study will consist of a field study site located on the Comal River (Old Channel) below Elizabeth Street. The laboratory portion of the study will be carried out at the San Marcos Aquatic Resources Center (ARC) located on McCarty Lane in San Marcos, TX.

Materials and Methods

Experimental design (Figure 1) will include ten replicates of three native species, *Cabomba caroliniana, Ludwigia repens and Sagittaria platyphylla.* Plants will be tested at two general velocity regimes (Minimal flow and Low flow) with three replicates per treatment. This results in 10 plants x 3 species x 2 velocity treatments x 3 replicates x Lab and Field for a total of 360 plants needed for the active portion of the experiment. Additionally, 10 replicates of each of the 3 species will be sacrificed following the acclimation period for baseline biomass comparisons.

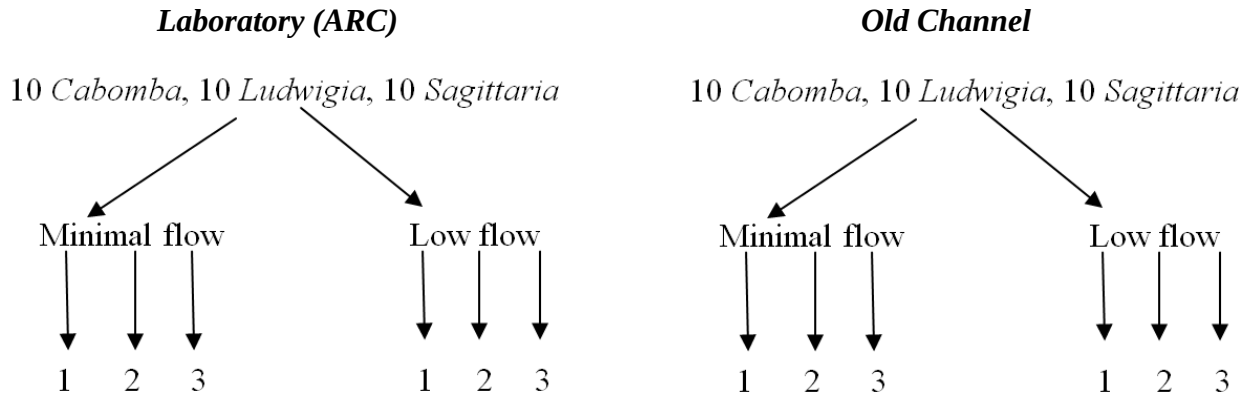

Figure 1: Experimental design diagram

Applied Research - Laboratory vs. Field

Following approval of the final experimental design, BIO-WEST will measure flow velocities in consistent vegetated and open water habitats within the Old Channel to establish an appropriate range of "Minimal" and "Low" flow conditions to simulate in the laboratory. Sites will be characterized based on velocity, depth, light, CO_2, dissolved oxygen, temperature, pH and conductivity. These parameters will be replicated as close as possible within the respective laboratory treatments to be conducted at the ARC. The laboratory portion of the study will be conducted in 4 m long fiberglass troughs 1 m in depth.

Parent material for plant propagation will be obtained from stock material held at the ARC. If needed, parent material will be collected from the Comal River and treated to prevent introduced organisms per ARC protocols. Plants will be propagated in 10.16 cm diameter X 10.16 cm tall pots, referred to as "quart pots" in the plant nursery trade, with a maximum volume of 900 mL of soil. Parent material will be divided into 20 cm long apical segments. Two segments per pot will be planted in a sandy clay loam soil mix regularly used by botanists at the ARC for aquatic plant propagation. Fertilizer amendments may be added to the media as deemed necessary. A total of 420 planted pots will be produced initially to allow culling of any obvious outliers (sickly or unusually poor initial growth).

All plants for the experiment will be cultured under controlled conditions at the ARC facility. and monitored during the acclimation period for health and growth. Once plants have sufficient top growth, similar to Figure 2, they will be randomly selected and moved into the field and laboratory treatments. Only uniform sized plants will be used. Sickly or damaged plants will be discarded. In addition, plants with observed reproductive structures will not be selected. At the beginning of the experiment, ten additional plants of each species from the initial cultures will be dried to a constant weight to determine the "before-treatment" biomass.

Figure 2. Example of healthy *Sagittaria platyphylla*

Plants will be transported to the field in sealed ice chest containers to prevent desiccation in transport. Potted plants will be assigned to two selected velocity ranges (3 replicates) within the Old Channel study reach and monitored for an anticipated period of four weeks. In the field, pots will be placed in plastic trays to keep them upright and will be held submersed and in place by a Mobile Underwater Plant Propagation Tray (MUPPT) (Figure 3). The tray will be staked into the channel bottom at the upstream end. Standard water quality parameters and velocity will be measured a minimum of three times per week within each treatment. If changes occur in any water quality or velocity parameter during

the study those changes will be replicated to the degree practicable in the corresponding lab treatment. Growth measurements will also be taken from five plants of each species per treatment once a week.

Figure 3. Mobile underwater plant propagation tray (MUPPT)

Plants used for the simultaneous laboratory portion of the study will be separated into their treatments and randomly assigned to one of the six fiberglass flow through troughs. Water quality parameters and velocity will be adjusted based on measurements taken at the field study sites. Standard water quality parameters and velocity will be measured a minimum of three times per week within each treatment. Non-destructive growth measurements (for example, survival, maximum length) will also be taken from five plants of each species per treatment once per week.

Additionally, a grab water sample will be collected from the Old Channel and ARC source water prior to the start of the study and analyzed by a certified laboratory for total nitrogen, total phosphorus, alkalinity, and pH. One additional grab sample from the Old Channel and ARC source water will be collected at the midpoint of the study.

Response Variables

Plant survival will be recorded at each observation period. At the end of the study period, all surviving plants will be collected, rinsed, dried in a standard drying oven and weighed. Plants will be weighed (grams) within two hours of removal from the drying oven. Growth of each species will be measured by quantifying relative growth rate (RGR), shoot dry mass, root dry mass, number of stems, internode length and maximum stem length.

Statistical analyses

Data used in analyses will include survival, total biomass, relative growth rates as well as the above ground and below ground biomass of each plant at the end of the experiment. Survival (a categorical variable) will be analyzed by Chi-Square analysis separately for each species. Analyses of the continuous variables (RGR, biomass, AG:BG ratio, number of stems, maximum length, internode length) will be analyzed using a one-factor analysis of variance (ANOVA). Following any siginficant ANOVA's a Tukey's test will be used to determine which treatments differed from one another.