Project Overview

The swamps surrounding Lake Maurepas are severely stressed. During spring of 2000, a large study was launched in the baldcypress/tupelogum swamps of Lake Maurepas to determine the feasibility of diverting freshwater, sediments, and associated nutrients from the Mississippi River into these swamps via a proposed diversion at Hope Canal. This study was created to assess the health of the Maurepas swamps and experimentally mimic diversion conditions in selected plots by measuring both plant and tree response.

This portion of the study focuses on the response of herbaceous plants to the addition of nutrients under pressure by large herbivores such as white-tailed deer and nutria, and without that pressure (by erecting cages around some plots). We mimicked diversion scenarios by fertilizing caged and un-caged plots at dosages that would mimic a small diversion opened only during spring, a small diversion opened throughout the growing season, and an intermediate diversion opened only during spring. We compared these treatments with unfertilized caged and un-caged control plots and measured changes in vegetative cover and primary production.

In general, the intermediate and small diversions opened throughout the growing season produce significantly greater vegetation than a small diversion opened only through the spring or no diversion. When uncaged, the standing crop stayed at steadily low levels, implicating extensive browsing. It appears that the low herbaceous production for the southern Maurepas swamps as a whole is primarily due to nutrient limitation.

Background

The swamps surrounding Lake Maurepas appear to be severely stressed, as evidenced by canopy crown die-off. Natural regeneration events resulting in seedlings and saplings are very limited. Over time, this lack of regeneration may lead to loss of this component of the swamp as older, relic trees die. As relative elevations in the area continue to decrease due to subsidence and sea level rise, the frequency and duration of flooding will increase and it is therefore expected that most of the dying swamp will succeed to open water. In addition, over the past several decades, the substrate in the area has become increasingly unconsolidated, almost certainly due to the reduction of belowground root production. In response to these and other stressors, a diversion of the Mississippi River into the southwestern Maurepas area has been proposed. The proposed diversion would deliver sediment and nutrients as well as fresh water, stimulate primary productivity, and through a combination of these factors counteract subsidence and diminish the persistence of flooding. This and other related studies examines the feasibility of such a diversion; here, we specifically examine the effects of nutrient addition and browsing by large herbivores such as nutria on herbaceous (non-woody) vegetation.

Experimental Design

Thirty-five caged and un-caged plots were fertilized at dosages that would mimic a small diversion opened only during spring (236 g/m² of timed release Osmocote 18-6-12 fertilizer), a small diversion opened throughout the growing season (236 g/m², applied in the spring and again mid-summer), and an intermediate diversion opened only...
during spring (572 g/m² applied during spring), compared with no-diversion unfertilized caged and uncaged control plots). To gauge response, aboveground plant material was removed, dried, and weighed from portions of the plots.

Results

Nutrient Augmentation

The effects of timed-release fertilizer on vegetative standing crop were similar for 2002 and 2003. In general, standing crop of the caged plots double-fertilized in the spring, and those fertilized during the spring and again in summer, produced significantly greater standing crops than the once-fertilized and control plots. When uncaged, the standing crop stayed at steadily low levels, implicating extensive browsing. It appears that the low herbaceous production for the southern Maurepas swamps as a whole is primarily due to nutrient limitation. The caged plots that were fertilized during the spring and again during the summer contained nearly three-fold higher standing crop than the uncaged control plots (see Figure 2).

Mammal Exclusion Experiment

Mammals appear to have a dramatic effect on herbaceous standing crop, regardless of nutrient regime. Our mammal-exclusion experiment reveals that the actual biomass production of herbaceous material is over 50% greater than that which is clipped twice annually (compare caged and uncaged control plots in Figure 2). The ratio of (caged to uncaged) biomass in those plots has a mean of 1.53. We use this ratio to adjust our annual production estimates for productivity. In the Maurepas swamp, plots that were fertilized to simulate a small diversion during spring, or a small diversion open year round, had no effect on biomass production, at least during year one. Conversely, plots fertilized to emulate an intermediate diversion open during the spring had greater than double the biomass production as the unfertilized control plots.

Figure 2: Herbaceous Biomass (g/m²) in 2003 with regard to nutrient augmentation and caging treatment. Caged plots generally yielded higher biomass increasing with nutrient application, while uncaged plots tended to yield similar biomass regardless of nutrient application.