Effect of Water Level and Nutrient Concentration on European Frog-Bit Turion Production
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Abstract

European Frog-Bit (EFB) is a free-floating aquatic plant that is native to Europe. It was introduced to North America in Ottawa, Canada in 1932 and has since spread throughout upper and eastern Michigan. In order to asexually reproduce and overwinter, EFB produces turions that settle in wetland sediment. Factors contributing to turion production, germination, and growth are currently unknown. I am investigating how water depth and nutrient concentrations affect the production of turions. To test this, I will conduct a fully-factorial experiment with EFB growing in buckets at two water depths and two nutrient concentrations. I will pair my controlled study with a field survey, in which I will quantify EFB turion production from plants growing across water level and nutrient gradients. The goal is to write a manuscript that will be sent out for publication and pair this data with future studies on creating a habitat suitability model.

Introduction

Great Lakes Coast Wetlands are habitats to a large variety of plant and animal species. Ever since the introduction of Humans to the Great Lakes region, a large number of invasive species have established in these delicate environments. European Frog-Bit is an invasive floating plant that greatly outcompetes native vegetation. It can decrease dissolved oxygen levels, lower property values, and negatively affect water travel. A study documented EFB as producing turions earlier in the season in water levels <20cm(5). As a plant that does well in eutrophic environments, EFB is able to establish quickly into a wide variety of new areas and outcompete native vegetation for vital nutrients. I hypothesize that when in an environment with shallow water and high nutrient concentration, EFB will produce turions earlier in the season and in greater abundance.

Methods

To conduct my experiment I will be going to Munuscong Marsh in Northern Michigan and collecting 40 plants from early July to Late August. The 40 plants will be divided equally into 4 treatments. Low water with low nutrient concentration, high water with low nutrient concentration, low water with high nutrient concentration, and high water with high nutrient concentration. In order to measure nutrient concentration I will be using a YSI multiparameter meter to measure, phosphorus, ammonium, pH, and conductivity. I will monitor the experiment weekly through early August, collecting the following data: water temperature, size of plant (diameter, number of leaves), date of flowering, fruiting and turion production, and total number of flowers, fruits, and turions produced. I will be conducting an observational field survey to pair with my experiment. I will be going to Fletcher pond, Duck Park, Munuscong Marsh, and Cheboygan Marsh. At each quadrat, I will record water depth, nutrient concentration (total N, total P), and water chemistry (temperature, dissolved oxygen, pH, conductivity). I will collect turion production data in the field following the methods of Cahill and Monfils (5) and Van Onsem et al. (3), wherein I will deploy a submerged turion collection basket below each quadrat. Baskets will be 20.32 cm diameter × 17.78 cm height, lined with 250-micron polyester mesh, and tied to a weight.

Results

I will be comparing the effects of water depth, nutrient concentration, and their interaction on turion production using ANOVA to compare how each treatment affected turion production and biomass. If my hypothesis is correct than I predict the treatment with less water and high nutrient solution will produce turions around one month earlier and the high nutrient solution will allow EFB to produce more turions.

References


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