Vegetation and Waterfowl Response to Temporal Inundation Variation in Moist-soil Managed Fallow Rice Fields on the Upper Texas Coast.

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ABSTRACT

The upper Texas coast provides important habitat for large numbers of wintering waterfowl and resident mottled duck populations (*Anas fulvigula*). Freshwater wetlands on the Texas coastal region serve as vital wintering areas for migrating waterfowl and as essential bastions for mottled duck populations. However, these habitats are experiencing precipitous declines in quantity and quality. Moist-soil management manipulates inundation duration and timing to promote production of annual seed-producing vegetation as forage for migrating and wintering waterfowl. While moist-soil management practices have been used to increase food production for wintering waterfowl in many regions, its application on the upper Texas coast has not been quantified. In Chambers County, Texas 21 fallow rice fields on Anahuac National Wildlife Refuge were assigned to early, mid, or late growing season inundation with either long or short duration drawdown treatments. We collected 1,260 moist-soil plant seedheads to estimate metabolizable energy production, collected 84 sweep-net and 252 benthic invertebrate samples to determine availability, sampled waterfowl use and behavior bi-monthly using ground surveys, camera surveys and aerial survey data to estimate waterfowl response to variations in inundation regimes. We performed step-count sampling along 126 transects to estimate plant community composition, collected 210 samples to quantify biomass production, and collected 378 soil samples to estimate nitrogen and phosphorus level change throughout the growing season. Seed production models will be constructed using phytomorphological features and production estimates to estimate waterfowl carrying capacity. The extrapolation and quantification of these parameters will aid refuge managers in creating a regional comprehensive moist-soil management plan.

INTRODUCTION

➢The Texas coast of the Central Flyway (CF) is vital wintering ground for >1 million geese and 13 million ducks (representing >50% of the CF waterfowl population. The Texas coast provides vital habitat for wintering waterfowl and resident mottled duck (*Anas fulvigula*) populations. However, these habitats are experiencing precipitous declines in quantity and quality

Wetland Trends

➢1955 to 1992 coastal palustrine wetland losses in Texas totaled > 230,000 acres

➢1992 coastal palustrine farmed wetlands accounted for 45% of total Texas coastal wetlands mostly in rice production

➢ 1992, >142,854 ha were in rice production in Texas

➢2011 < 73,652 Texas rice fields remained, most were converted to agriculture uplands

This represent a substantial loss of wetlands habitats through conversion to rice fields and then to uplands

Other anthropogenic causes for wetland reductions in quantity and quality include fragmentation, urbanization, freshwater inflow reduction, subsidence and saltwater incursion

Moist-Soil Management

➢Moist-soil management controls the chronology, depth and duration of flooding events to create areas of exposed saturated mudflats that promote germination, establishment and seed production of annual vegetation from the underlying seed bank

➢These high seed producing plants provide increased metabolizable energy foods available to waterfowl

➢These fields can then be flooded in fall in winter to depths that create preferred habitats for wintering and migrating waterfowl.

➢Increases in food availability and reduction in necessary foraging efforts can increase body condition which can influence survival, reproduction and recruitment

OBJECTIVES

The goals of this project are to quantify variations in vegetation response, vegetation production, invertebrate availability and waterfowl use as related to early, mid and late temporal flooding periods in moist soil managed fallow rice fields on the upper Texas coast. Specifically, the following will be examined

❖Estimate existing seed bank composition, above ground plant community composition and quantify soil nitrogen and phosphorus level preceding, during and post seed production periods in areas under varying temporal implementation regimes and treatment conditions.

❖Estimate seed production, plant biomass production, and model metabolizable energy production estimates between different treatment type and temporal inundation periods

❖Determine, compare and characterize bird use and behavior among treatments.

❖Determine effects of management and flooding initiation dates on aquatic invertebrate abundance and composition.

STUDY AREA

Research is being conducted in the Texas Chenier Plain National Wildlife Refuge Complex at Anahuac National Wildlife Refuge (ANWR) located on the upper Texas coast in Chambers County

Fallow rice fields comprising 335 ha located in ANWR which previously had levees constructed to produce 21 field units, capable of holding water depths up to 30.5 cm

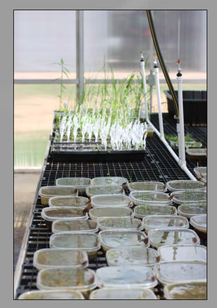
The humid sub-tropical climate with average rainfall >140 cm on the Chenier Plain Complex provide a prolonged growing season with few major frost periods

Moist-soil vegetation can vary widely and consist of sedge, *Echinochloa* sp., *Leptochloa* sp., submergent and emergent plant dominated communities

METHODS

Existing Seed Bank

➢105 soil samples collected from the 21 units along a central transect and processed using the emergence method. Plants geminated (>10000) were counted and identified to species (> 50)

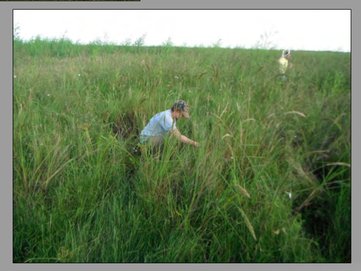


Nitrogen and Phosphorus Levels

➢Three soil samples from each unit collected at pre-seed production, seed production and post seed production plant phases will be used to estimate N and P levels as potentially limiting factors to plant growth

Plant composition

➢Plant community composition estimates quantified using data collected from 126 step count surveys performed along three transects in each unit after plant establishment totaling >26,500 survey points



Biomass production

➢Biomass production estimates tabulated using clipped vegetation samples from 0.5 m² quadrates at 210 points

Invertebrate availability

➢Fall invertebrate availability and abundance determined from 84 continuous sweep-net sample and 252 benthic core samples

Moist-soil seed production

➢Seed production estimates from 1,260 seedhead samples collected after recording phytomorphological biometrics generate geometric models estimating seed production

➢Production estimates used to extrapolate available metabolizable energy production and Duck Use Days

Bird use and Behavior

➢Bird use and behavior estimates conducted using bi-monthly ground surveys during one of four randomly assigned temporal periods and from photographs taken with time-lapse cameras placed within the units

➢Bird behavior determined by instantaneous survey methods during all bird use surveys

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