

Introduction

This document presents a brief introduction to the section of US Highway 441 (US 441) which crosses Paynes Prairie, Gainesville Florida in Alachua County (Figure 1). The intent of this document is to highlight key ecological benefits that would accompany the potential raising of US 441 across Paynes Prairie.

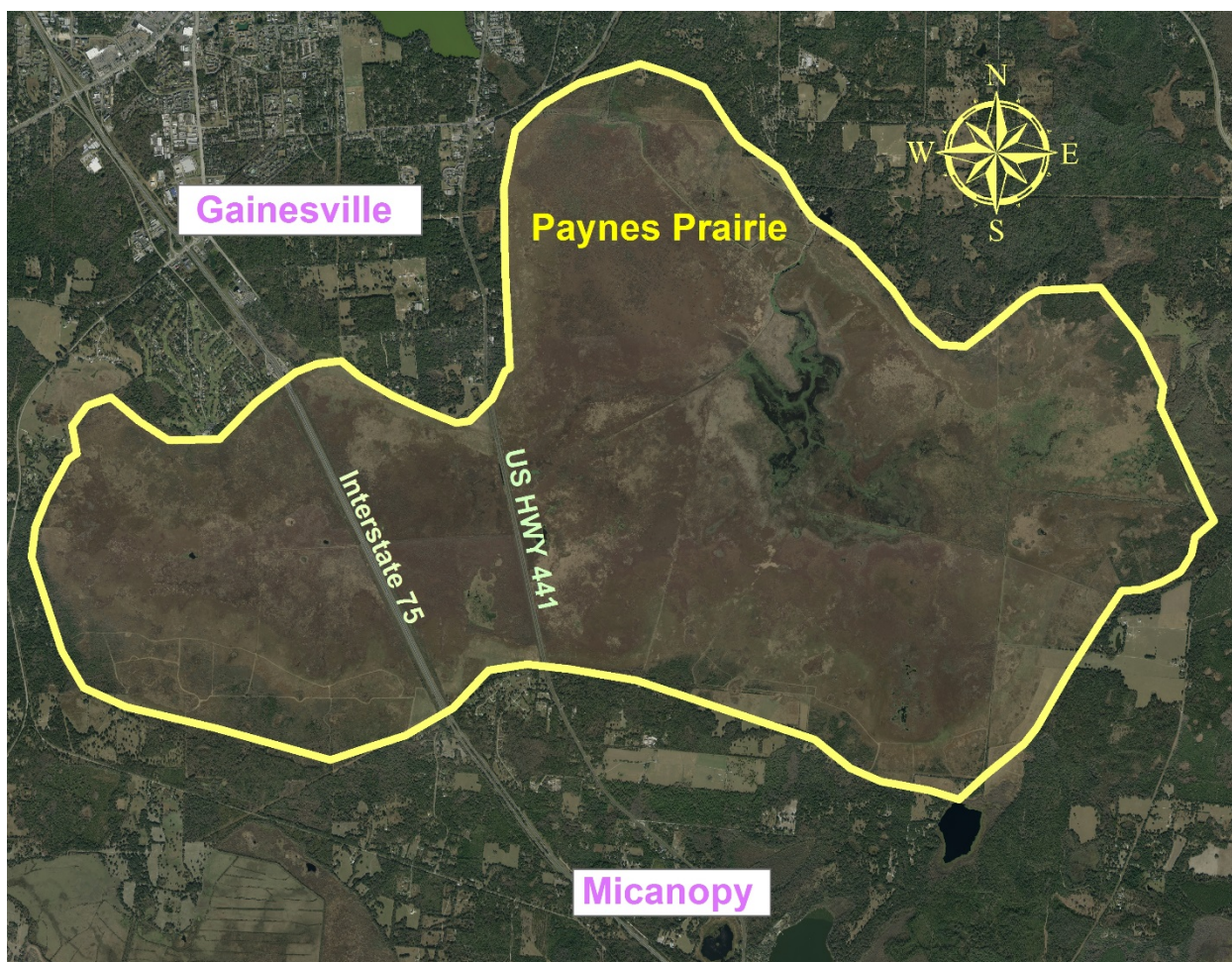


Figure 1. Approximate outline of the Paynes Prairie basin highlighting Interstate 75 and Highway 441.

Background

US 441 was constructed across Paynes Prairie in the early 1920s (Smith 1996; Smith and Dodd 2003). The approximately 2-mile-long stretch of road averages at 60.5ft (NAVD88) in elevation and receives an annual average daily traffic of 15,000 vehicles (2017 data). This section of 441 was modified in 2001 to reduce wildlife mortality and allow adequate flow of water via a wall-culvert system known as the Ecopassage. This Ecopassage consists of concrete barrier walls on either side connected by 8 culverts (Figure 2). A wildlife mortality study performed before and after construction of this Ecopassage found that this system reduced wildlife deaths by 65% (93.5% with hybrid tree frogs excluded, Dodd et al 2003).

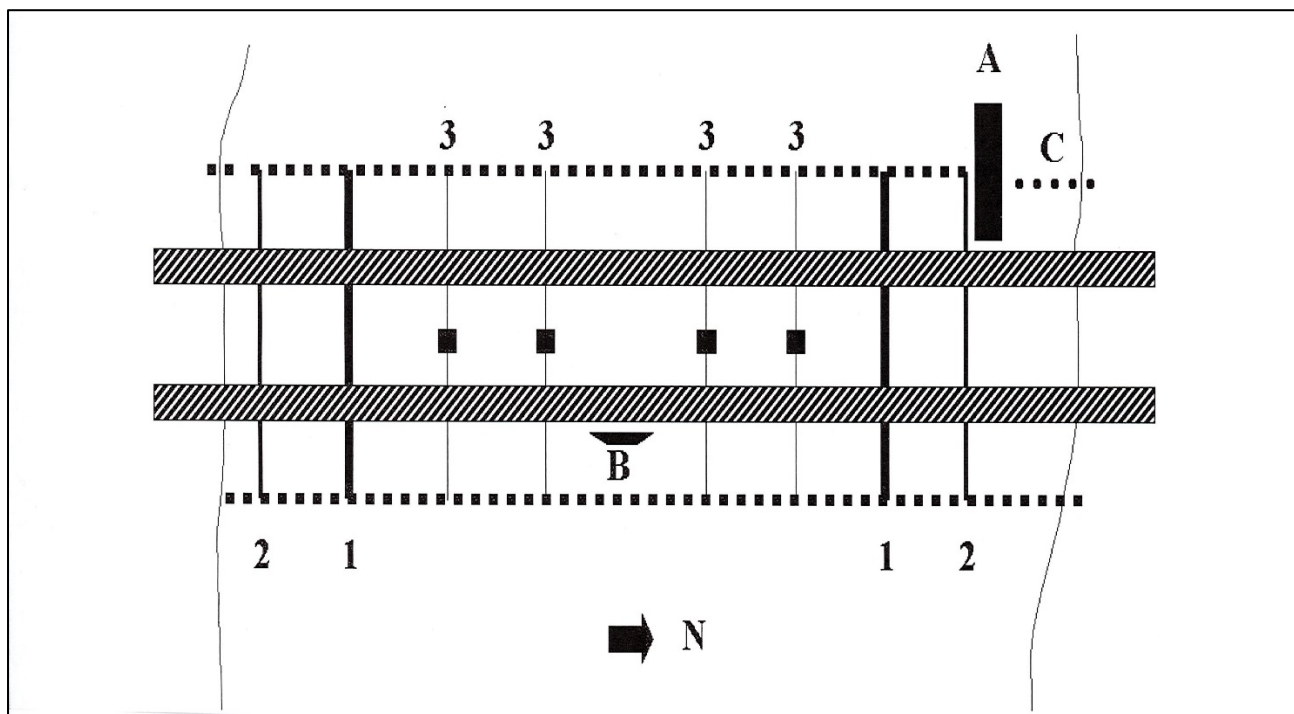


Figure 2. Schematic representation of US Highway 441 (diagonal hatching) across Paynes Prairie State Preserve. The road is bordered by a concrete barrier wall (square line) and underlain by 8 culverts: (1) wet 2.4 x 2.4 m box culverts; (2) dry 1.8 x 1.8m box culverts; (3) 0.9 m rounded culverts. Light boxes (squares) occur midway across the road in the small culverts to allow light. An access road enters on the southbound lane near the northern prairie rim (A), and a visitor turn out is located at B. A type-A fence borders private property along the southbound lanes on the north prairie rim (C). (Graphic provided by Barichivich and Dodd, 2002).

Most of the Paynes Prairie basin varies in elevation ranging from 50 to 63 ft (NAVD88, Figure 3). For the third time in 20 years, high rain events have disrupted traffic flow and undermined the structural integrity of the roadway. In 2017 and 2018, the flooding on US 441 resulted in alligator crossings over the road, partial road closures (approximately 8 months), and full road closure of both northbound lanes (approximately a week) in 2017.

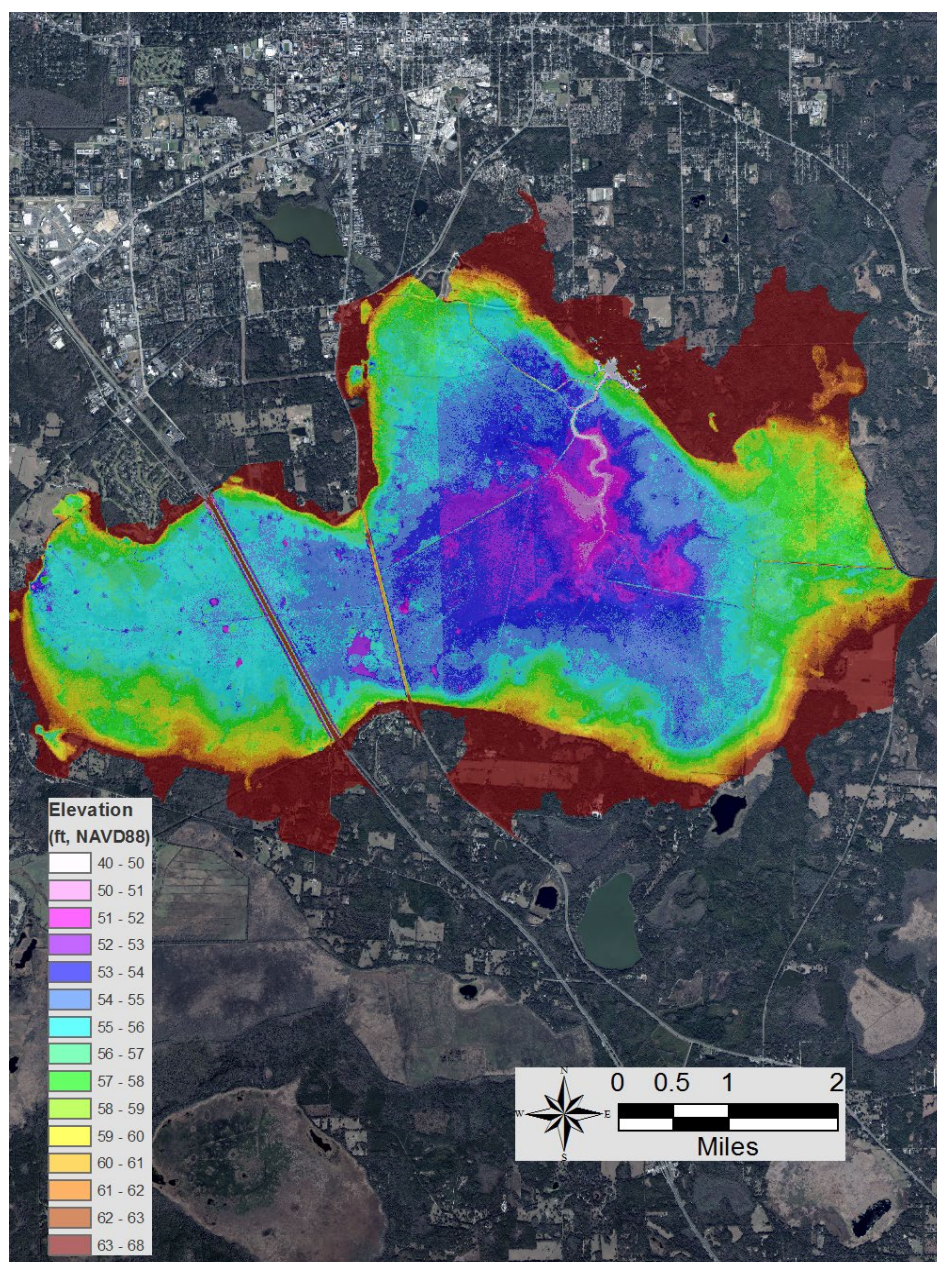


Figure 3. Map illustrating the varying elevations of Paynes Prairie. (Graphic provided by Yanfeng Zhang, SJRWMD).

Ecological Benefits to Paynes Prairie

The ecological benefits of water level fluctuations to wetland systems have long been recognized. Fluctuations in water level are critical to establishing and maintaining habitat and species diversity in wetlands (Mitsch and Gosselink, 2015; Miller et al., 1996). Annual plants germinate during low water or moist soil conditions, providing important waterfowl food. Extended periods of deep flooding prevent the colonization and establishment of invasive shrubs, including Carolina willow (Hall et al., 2017). Water level fluctuations are also important to the reproductive cycles of fish, wading birds and other wetland dependent species, serving as cues to initiate reproductive behavior and affecting reproductive

success. Moreover, overall biological productivity is enhanced by varying hydrology; fish biomass and community structure can be directly related to the duration of annual high-water events. Water level fluctuations and their duration also affect physical and chemical properties of wetlands such as nutrient cycling, soil anoxia, and pH. Water level management in wetlands that avoids extended dry periods can prevent oxidation of organic soils and nutrient release to downstream waterbodies (Osborne et al., 2014).

Full or partial bridge would allow for free and uninhibited flow to the east and west sides of US 441, in addition to ensuring that wildlife passage is much less inhibited. At the road's current height, all 8 culverts have the potential of complete submersion (as was shown after Hurricane Irma). Air breathing aquatic animals such as otters, snakes, and amphibians may be averse to crossing a flooded culvert, with no overhead space. In these times of extreme high waters, the concrete barrier wall becomes easier for wildlife to pass and cross the road, exposing them to traffic hazards. This scenario also presents a hazard to motorists attempting to swerve and avoid wildlife.

Flooding is a much more effective and more natural way to manage the Prairie Basin as an herbaceous wetland in comparison with prescribed fires. Prescribed and wild fires are difficult to manage on the Prairie Basin due to extreme smoke management concerns (US 441 and I-75). If the Prairie naturally floods, it will not require as much costly mowing, herbicide application, or prescribed fire to manage the habitat. Flooding in Paynes Prairie can also help increase populations of bird species. The recent high water, along with the expansion of the exotic apple snail, has coincided with limpkin population increases during the annual Christmas bird counts (CBC) with 18 in 2014, 235 in 2017, and 544 in 2018. Endangered snail kites, which were previously never counted in Paynes Prairie during a CBC, were at 29 in 2018, with 3 successful nests the previous summer. As of October 2019, a total of 75 snail kite nests have been documented in the Paynes Prairie basin making it one of the top two nesting areas for snail kites in Florida. Up to 80 snail kites are estimated to be using the Paynes Prairie basin at this time (UF/FWS Coop Unit, personal comm.).

References

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