

POSITION PAPER:
**CRITICAL CONSIDERATIONS FOR RESTORING AND CONSERVING
EVERGLADES WILDLIFE AND HABITATES**

**FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
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Purpose

A stated goal of the Comprehensive Everglades Restoration Plan (CERP) is “to capture fresh water that now flows unused to the ocean and the Gulf and redirect it to areas that need it most. Most of the water will be devoted to environmental restoration, reviving a dying ecosystem.” The Florida Fish and Wildlife Conservation Commission (FWC) believes that guidelines currently being considered for management of water in and through this ecosystem may result in high and low water conditions that have an impact on fish and wildlife populations, habitat, and diversity, particularly certain state- and federally listed imperiled species. Such outcomes would be inconsistent with the goal of reviving a dying ecosystem; however, modifications are feasible to ensure water management guidelines are consistent with CERP goals. The purpose of this paper is to provide biologically based guidance for managing water levels in the Everglades to ensure restoration of fish and wildlife populations, habitats, and diversity so that CERP goals can be fully realized.

Executive Summary

The Florida Fish and Wildlife Conservation Commission (FWC) fully supports the stated goals of CERP. It is the position of the FWC that water levels in the Central Everglades should be managed in a manner that sustains and restores native fish and wildlife populations, habitat, and diversity. To achieve this outcome FWC asserts that water levels in the Water Conservation Areas (WCAs) should not exceed two feet in depth at the height of the wet season with water recession and ascension rates not exceeding 0.25 feet per week. The FWC has revisited the regulation schedule recommended to the U.S. Army Corps of Engineers for WCA 3A by its predecessor agency, the Florida Game and Fresh Water Fish Commission in 1980, and has reviewed the U.S. Fish and Wildlife Service’s draft *Multi-Species Transition Strategy for Water Conservation Area 3A* to form this position on a biologically based water management strategy. Together, these two proposals explicitly take into account the hydrologic tolerances and limitations of a variety of species and communities that are characteristic of the Everglades. Other sources supporting this position include research on the relationship of water levels and tree islands; apple snails; maximum foraging depths for wading birds (five of which are listed as a Species of Special Concern); and over three decades of telemetry data on movements of Florida panthers in the Everglades and Big Cypress region, which correlates effectively to depths that white-tailed deer can access. In addition, this position and findings in this paper have been informed by six decades of FWC staff experience in managing the Everglades and Francis S. Taylor Wildlife Management Area (EWMA).

Comprising Water Conservation Areas 2A, 2B, 3A, and 3B, the EWMA totals 671,831 acres or 82% of the Water Conservation Areas in south Florida and roughly 30% of the remaining Everglades landscape south of the Everglades Agricultural Area. We conclude the 1980 recommendation remains generally applicable and the draft *Multi-Species Transition Strategy for Water Conservation Area 3A*, with a few exceptions noted, recommends water depths that fall within reasonable ranges. In general, the FWC recommends optimal water depths no more than two feet during the height of the wet season (late October – early November) and close to ground level during the driest time of the year (late May – early June), as measured from the average slough elevation. Extreme high water resulting from prolonged rainfall, hurricanes, or tropical storms causing water levels to exceed two feet must not be allowed to persist longer than 60 days.

Introduction

The Florida Fish and Wildlife Conservation Commission (FWC) is committed to supporting the Central Everglades Planning Project (CEPP) and working collaboratively with our partners. CEPP represents a water management plan for the Everglades that stems from and is central to the Comprehensive Everglades Restoration Plan (CERP). We intend for this document to serve as the foundation for the FWC's recommendations regarding the planning and implementation of CERP and CEPP. We acknowledge this document may need to be refined further as we work with other agencies, researchers, and stakeholders to evaluate subsequent CERP projects and other CEPP-related activities such as water regulation schedules that would affect the Everglades and Francis S. Taylor Wildlife Management Area (EWMA or Water Conservation Areas [WCAs] 2A, 2B, 3A, and 3B). It is our intent to make sure water management parameters provide for water depths and durations for this area that will sustain and restore resident fish and wildlife, including imperiled species.

There is a long history of research, biological observation, and expertise associated with identifying water management parameters most suitable for wildlife. Staff review of two documents was central to the development of this position paper; these include the draft *USFWS Multi-Species Transition Strategy for Water Conservation Area 3A* (U.S. Fish and Wildlife Service [USFWS] 2010) and the regulation schedule recommended by the Florida Game and Fresh Water Fish Commission (GFC) in 1980 (Schortemeyer 1980). Both of these documents present a multi-species approach toward determining biologically based recommendations for managing water in the EWMA.

This paper provides guidelines based on historical information for maintaining fish and wildlife diversity and richness in the largest part of the EWMA: WCA 3A. Most of the research in the EWMA has focused on WCA 3A since it is the largest of the WCAs. This paper addresses water management aspects of Everglades restoration from a fish and wildlife diversity perspective and recommends general ranges of water depths for both the peak of the wet season (October into November) and the driest part of the dry season (May into June). Additionally, this paper describes how water levels managed outside of the desired range of conditions have impacted vegetation communities, wildlife diversity, and species richness, particularly for state- and

federally listed species. The FWC's position statement references the experiences and reports the FWC and its predecessor agency, the GFC, have provided since the authorization of the Central and South Florida Project in 1948 and continuing into current CERP planning efforts.

Background

Because roughly half of the original extent of the Everglades has been lost to development and agriculture, today's water managers face a difficult task of routing the same amount of rain that historically fell through today's much-reduced system consisting of canals, levees, and impoundments while providing water supply, flood control, and conserving the remaining Everglades landscape for fish and wildlife. One of the greatest challenges for CERP is to accomplish this three-pronged mission. The WCAs in this area are now subject to extremely high water levels for extended periods of time, particularly in the southern end of WCA 3A, when the capacity of the Central and South Florida Project is exceeded by periods of high rainfall. They are also subject to artificially low water levels, and particularly in the northern part of WCA 3A, during drought periods.

The FWC and GFC have six decades of experience in managing the large part of the Everglades landscape that is today referred to as WCAs 2A, 2B, 3A, and 3B. The Central and South Florida Project was authorized by Congress in 1948, and construction of its levee and canal system, including the WCAs, began in 1952 (Light and Dineen 1994). In 1952, WCAs 2 and 3 were designated as the EWMA with the GFC as the land management agency, and in 1953 the GFC began the Everglades Impoundment Investigation with funding from the Federal Aid in Fish and Wildlife Restoration Acts (Wallace 1960). The July 1953 annual report by Clay Gifford, GFC biologist, clearly recognized even then that a multi-species approach would be required (Gifford 1953). It also acknowledged the difficulty in developing the knowledge base necessary to link engineered hydrologic regimes with the ecological needs of a complex biological community.

The GFC continued to investigate, implement, and evaluate management approaches within the EWMA. In 1960, it issued a formal status report, *Recommended Program for Conservation Area 3* (Wallace 1960), outlining the expected impacts of constructing the proposed L-67 levee system. Later, and primarily as a result of a dramatic deer die off in the WCAs in the late 1960s, the Florida Chapter of the Wildlife Society appointed the Special Study Team on the Florida Everglades, a group of five national fish and wildlife biologists, to "evaluate the...wildlife situation in the Everglades...and suggest some possible courses of action." This team was assembled at the request of the Central and Southern Florida Flood Control District (predecessor of today's South Florida Water Management District), and with agreement by the GFC. Their 1970 report, *Everglades Water and Its Ecological Implications*, also recognized the need to address a suite of native species if the WCAs were to be successfully managed (Cornell et al. 1960). For deer management, it recommended that water levels not exceed two feet during the wet season and recede to a depth of six to eight inches in February, during fawning. In 1983, staff developed a deer management approach that reduced the likelihood of catastrophic deer mortalities due to high water levels (GFC 1983).

A decade later, the GFC published its first set of comprehensive recommendations for managing water levels to support fish and wildlife in WCA 3A (Schortemeyer 1980). This report, *An Evaluation of Water Management for Optimum Wildlife Benefits in Conservation Area 3A*, recognized three hydrologic zones in WCA 3A: an area that was negatively affected by low water and peat fires, largely lying north of Alligator Alley; an area in central WCA 3A where the sawgrass ridges, sloughs, and tree islands appeared to be relatively intact; and an area along eastern and southern WCA 3A that had suffered from prolonged high water levels. Based on an analysis of Everglades plant communities and selected wildlife species, Schortemeyer (1980) developed schedules for seven species or suites of species: the deer; the alligator, passerine birds, and the pig frog; the Everglade snail kite; wood stork; largemouth bass; diving ducks; and dabbling ducks. Recognizing that no one place would be optimal for all species, he summarized these recommendations in a proposed water regulation schedule that would allow water levels in the sawgrass community to peak at a depth of about 1.38 feet on November 1 and then gradually and steadily recede to a low of -0.05 feet by June 1. At that time, water levels would increase to the 1.38-foot depth at the beginning of November. This proposal was formally approved as a recommended schedule for WCA 3A by the GFC's Commissioners in May 1980.

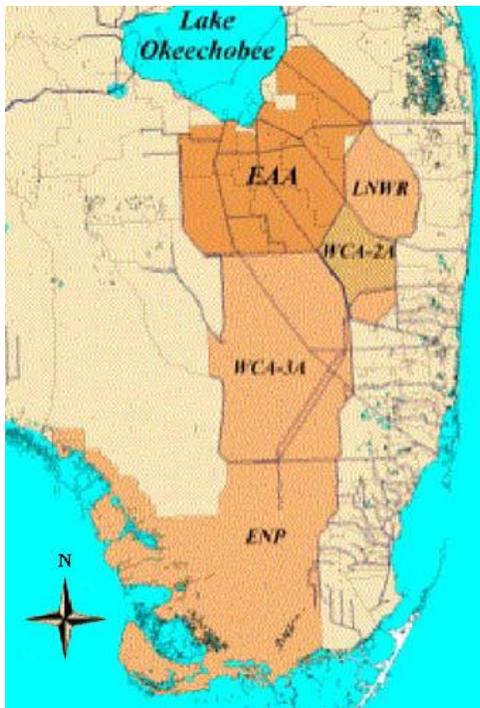
The GFC continued to provide recommendations based on experience in the EWMA to water managers in the 1980s (Schortemeyer 1999), and in 1995 formed a team of biologists to participate in the interagency "Restudy" that developed CERP, which was approved in 2000. During that time, the GFC drew on its past experience, including its analysis of the effects of the extreme high-water event in 1994–1995 (Coughlin and Richards 1995, Guerra 1997), to influence the development of key performance measures used during the Restudy to evaluate alternative draft plans, particularly in WCAs 2 and 3. The GFC also gathered data from WCAs 3A and 3B in a field study that investigated the vegetative community structure and composition on the heads of tree islands from the three zones identified by Schortemeyer (1980), a fourth zone of hardwood hammocks in southwestern WCA 3A, and in WCA 3B. This study determined that both extremely high and extremely low water levels are predictors of tree and shrub species diversity on tree islands in the WCAs (Heisler et al. 2002). The information from this effort enabled the Restudy to refine its performance measures in key indicator regions in WCAs 3A and 3B. Anderson (2000) further analyzed the effects of hydrologic and topographic gradients on woody vegetation of tree islands in the dry zone of northern WCA 3A and the moderately wet zone in central WCA 3A. He concluded that the optimal hydrology to maintain the natural diversity of woody vegetation on tree islands in WCA 3A would involve fewer extremely high and low water events, and would include hydroperiods ranging from 80 to 90% inundation and average ponding depths of 0.78 to 1.41 feet. More recently, staff co-authored a report that concluded that canopy composition and structure of tree islands in WCAs 3A and 3B are strongly correlated with extremely wet and extremely dry conditions, as opposed to mean annual water levels (Wetzel et al. 2008).

The FWC has continued to contribute its knowledge and expertise after CERP was approved through contributions to the initial raising of the Tamiami Trail and into the development of the Everglades Restoration Transition Plan. Since the inception of the WCAs, FWC staff has built on its experience in managing WCAs 2 and 3 (with the exception of the portion of WCA 3A that is the Reservation of the Miccosukee Tribe of Indians of Florida), relying on field observations, field studies, and reports by other researchers (e.g. by the U.S. Geological Survey, South Florida

Water Management District, and universities). An excellent summary of knowledge gained, particularly as related to high water levels, was presented as a PowerPoint presentation to the RECOVER team by FWC biologist Tim Towles in 2009 (Towles 2009).

Hydrology of the Everglades

The hydrology of the Everglades is driven by a pattern of high levels of precipitation in late May through October and a dry season between October and May (Cornwell et al. 1970, Duever et al. 1994). It is generally accepted that the predrainage system existed as a hydrologic unit that originated in the Kissimmee headwaters, meandered through the Kissimmee River and its oxbows and marshes, and then gathered into Lake Okeechobee. Lake Okeechobee would periodically overflow into the sawgrass plains immediately south of the lake into what is now the Everglades Agricultural Area, and traveled south via sheetflow through the ridge and slough system into Shark River Slough in today's Everglades National Park (Cornwell et al. 1970, Light and Dineen 1994). The scale of this system allowed for water level fluctuations that were attenuated by marsh vegetation.



Because roughly half of the original extent of the Everglades has been lost to development and agriculture (Davis and Ogden 1994), the capacity of the Central and South Florida Project is exceeded by periods of high rainfall, particularly in the southern part of WCA 3A, where water levels tend to pond. Conversely, artificially low water levels in the northern part of WCA 3A have caused damaging peat fires during drought periods.

Imperiled Species and their Relation to Water Depth in the EWMA

Florida panther

Water depths in western WCA 3A in particular are of significance to the Florida panther. This area lies within the eastern part of the panther's breeding range (Oronato et al. 2011). Consistent with this range estimate, telemetry data confirm that panthers consistently used the western part of WCA 3A before the year 2000. Since that time, however, in spite of the fact that panther populations have increased significantly, their use of this area has dropped dramatically, coinciding with deeper water levels persisting for longer durations and fewer deer (an important prey species). MacDonald-Beyers and Labisky (2005) studied the relationship between water levels in the Big Cypress prairies and radio-collared deer and concluded that the depth at which deer movement is negatively affected is about 19.7 inches. Ensuring water levels in this historical panther breeding range can support a healthy deer herd will be critical not only to the conservation of panthers, but also to their recovery.

While panthers can and do use shallow wetlands, they rely on forested areas to stalk their prey and to rest. The tree islands and their associated thicker vegetation provide this type of habitat in western WCA 3A, but deeper water and a reduced amount of upland areas provided by tree islands would discourage panther use of this part of WCA 3A (Darrell Land, FWC, personal communication 2013). Water levels managed not to exceed a depth of two feet at the peak of the wet season and to near the ground surface at the peak of the dry season will be necessary for the panther to regain use of western WCA 3A.

Wading birds

To a large extent, the depth at which wading birds can forage is limited by the length of their bills. For the seven wading bird species (white ibis, snowy egret, little blue heron, tricolored heron, roseate spoonbill [all of which are Species of Special Concern], great egret, and great blue heron) that commonly forage in the Everglades, maximum depths at which they can forage range from about 6.3 inches to about 15.3 inches (Powell 1987). These depths need to be taken into account if the EWMA is to continue to provide foraging opportunities for these species. Recession rates are also an important factor to consider when managing wading birds. The FWC recommends recession rates averaging between 0.05 and 0.25 feet per week, with no water-level reversals, beginning in January and ending at the end of May. Water levels managed not to exceed a depth of two feet at the peak of the wet season and to near the surface at the peak of the dry season will be necessary for these species to nest and forage in the EWMA.

Everglade snail kite

Snail kites search for prey by sight, so they typically forage over relatively open wet prairies and sloughs. They capture apple snails within about four inches of the surface as the snails come to the surface to respire (Bennetts et al. 1994). Apple snails feed on the periphyton component of both wet prairies and sloughs (Browder et al. 1994). Wet prairies, as opposed to sloughs, appear to be an important area for apple snail production, particularly in areas dominated by maidencane (Karunaratne et al. 2006). Water depths greater than 1.6 feet during the peak apple snail breeding season result in fewer egg clusters and delayed egg laying that result in a larger number of juvenile snails that are too small for snail kites in the following year. The main areas where snail kites nested historically were in the WCAs and Lake Okeechobee; however, in recent years,

most of the snail kite nesting effort has been at the northern extent of its range, in the Kissimmee Chain of Lakes. This northward shift is problematic in that colder weather at the start of the nesting season would delay nesting, resulting in poor nest success for that year (Z. Welch, FWC, personal communication 2013). Water levels managed not to exceed a depth of two feet at the peak of the wet season and to near the ground surface at the peak of the dry season with ascension and recession rates not exceeding 0.25 feet per week will be necessary for snail kites to forage on apple snails in the EWMA. The science on snail kites and apple snails lead us to conclude that if water levels are not managed as prescribed above, snail kites will become further imperiled if not extirpated.

Draft USFWS Multi-Species Transition Plan

The USFWS (2010) recommends recommended ranges of water levels, specifically in WCA 3A, that would benefit the wood stork; Everglade snail kite and the kite's main prey species, the Florida apple snail; tree islands; and the wet prairie in southwestern WCA 3A. These individual species/community requirements were then blended to provide a multi-species approach to estimating appropriate water depths overall. This plan did not address limits to water depths for the stork, kite, or apple snail during the wet season, but instead focused on a maximum desirable depth during the pre-breeding season, starting on January 1. The following are their recommendations.

Wood stork: Water depths should peak in October and recede to about 1.16 to 2.03 feet in January. The recommended water level recession rate is about 0.84 inches per week. During the dry season (May), the minimum water depth should fall to between -0.34 and 0.52 feet.

Everglade snail kite: During the dry season (May), water levels should fall no lower than -0.34 and +0.52 feet in the southwestern part of WCA 3A.

Florida apple snail: Water depths for apple snails should reach 1.31 to 1.97 feet in January. The recession rate should be about 0.8 inches per week. During the dry season (May), the water depth should be no greater than 1.31 feet and no less than 0.33 feet, the depth at which apple snails quit moving. However, FWC staff recommends revisiting these water levels because they understand that Phil Darby, who collected the field data upon which this was based, disagrees with the USFWS' calculations, believing them to be too deep (Z. Welch, FWC, personal communication). Recession rates are important for managing for apple snails. The FWC recommends ascension rates no greater than 0.05 to 0.25 feet per week from the beginning of June to the beginning of October.

Taking into account these water depths, as well as ones estimated for tree islands and wet prairie, the USFWS (2010) developed a regulation schedule that peaked at a depth of about 2 feet.

Major Vegetation Communities in the EWMA and Their Importance to Fish and Wildlife

Three major vegetation communities occur in the EWMA: tree islands, sawgrass ridges and sloughs (collectively known as the ridge and slough system), and wet prairies. These communities support a wide variety of aquatic, wetland-dependent, and semi-terrestrial species,

including some that are listed for special protection by the State of Florida and the USFWS. Water levels managed not to exceed a depth of two feet at the peak of the wet season and to near the surface at the peak of the dry season will be necessary for the continued existence and recovery of these plant communities.

Tree islands: Tree islands are a unique structural component of the Everglades, providing habitat for wildlife species that require some component of upland habitat with trees or brush in an overall matrix of marsh. Tree islands may occur (in order of increasing height above the slough bottom) as willow strands, bayhead swamp forests, and tropical hardwood hammocks. The last of these may be found throughout the EWMA, but are more numerous in southwestern WCA 3A and southern WCA 3B. Willow strands, which may also contain other brushy species such as pond apple, provide colonial wading bird habitat (Rodgers et al. 1996), while the bayheads and tropical hardwood hammocks may be important for neotropical migrating passerine birds (Mitchell 2010, Gawlik and Rocque 1998). Alligators, turtles, and snakes lay their eggs on the dry parts of tree islands (Towles 2009).

Much attention has also been given to the higher tree islands as refugia for Everglades's wildlife species, such as deer, bobcats, marsh rabbits, raccoons, and other small mammals. During extreme high-water events, these terrestrial or semi-terrestrial species crowd onto what remains at or above water on tree islands and onto levees, where overcrowding and competition for food create physical stress (in extreme cases, resulting in death) and susceptibility to disease and parasites. This is particularly true for does, yearling, and fawns (Cornwell et al. 1970). Cornwell et al. (1970) noted that the situation became so severe during the high-water events in 1957–1958 and 1966 that all vegetation was completely removed, the bark of trees and shrubs eaten as high up as a deer could reach, and tree island soils were trampled into mud by both deer and wild hogs.

While less information is available on impacts to Everglades wildlife species other than deer, Schortemeyer (1980) noted that water reversals during periods of naturally occurring recession have caused nest failure for alligators and turtles. FWC staff has also reported opossums, grey foxes, bobcats, and raccoons crowded on levees during high-water events in 1986 and in 2005, and evidence of extensive predation on marsh rabbits during the 1986 event (unpublished GFC internal reports; T. Towles, FWC, personal communication 2013). Much of the effect on the diversity and abundance of wildlife can be inferred by changes in tree island vegetation. For example, the willow strand that supported the Andytown rookery in WCA 3A was one of the largest (over 60 acres) used by nesting wading birds before 1994; now only one-quarter acre of it remains.

High-water events are not the only threat to tree islands. While fire naturally occurred in the pre-drainage Everglades (Gunderson and Snyder 1994), water management has exacerbated the extent and duration of extreme drought, particularly in WCA 2 (Worth 1988) and WCA 3A. By 1970, a combination of peat fires and high water levels had severely degraded tree islands in much of WCA 2 (Cornwell et al. 1970, Light and Dineen 1994). Loss of tree islands, whether it is through flood or fire, results in loss of an important habitat component of the Everglades landscape.

The draft *USFWS Multi-Species Transition Plan* (USFWS 2010) proposes that the maximum water depths (expected to occur from mid-September to mid-October) that tree islands could tolerate was 2.5 feet for no longer than 120 days. However, FWC staff does not consider this to be interpreted as an acceptable water depth to be reached on a regular basis; a slightly lower depth of 2.46 feet would represent the deepest water that tree islands in WCA 3A can tolerate as long as this depth does not exceed 60 days. Furthermore, the plan does not examine the potential effects of extremely low water levels, such as those that contributed to conditions that burned out tree islands in northern WCA 3A.

Ridge and slough system: The ridge and slough system is typified by a generally north to south orientation of alternating ridges that support sawgrass and slough communities. The sloughs are characterized by water lilies, floating hearts, and spatterdock at the surface and submerged bladderworts, whose stems provide a substrate for growth of periphyton, a naturally occurring algal community (Gunderson 1994). Periphyton is an important contributor to the primary production in the Everglades (Browder et al. 1994). During periods of relatively high water, the fish population expands into the higher sawgrass areas (Wallace 1960). When water levels recede, fishes are concentrated into the sloughs, where they provide prey for up to 11 species of wading birds, including the federally listed wood stork and the state-listed white ibis, little blue heron, tricolored heron, snowy egret, and roseate spoonbill (Gawlik 1999). Bancroft et al. (1991) noted that the southern part of WCA 3A is a critical foraging area for overwintering wood storks during dry years, when much of their foraging habitat elsewhere has dried out. Alligator holes are an important feature in the transition area between the sloughs and the ridges, becoming critical refugia for fishes and other aquatic species during periods of low water, particularly for larger fishes (Robertson and Frederick 1994), and a source of water for deer (Loveless 1959) and presumably for other mammal species as well. During extreme drought, however, they can be destroyed by peat fires, which can also kill the alligators themselves (Schortemeyer 1980).

Wet prairies: Wet prairies are a form of marsh dominated by emergent grass-like species, usually spikerush, beakrush, and maidencane (Gunderson 1994). Periphyton is also an important component of the submerged part of this community (Browder et al. 1994). They generally have a hydroperiod of 290 to 365 days (Goodrick 1974). Wet prairies in the EWMA, particularly in southwestern WCA 3A, have historically been important habitat for the federally endangered Everglade snail kite and its prey, the apple snail. The wet prairies and the ridge and slough communities provide critical foraging habitat for a wide variety of wading birds, including those currently designated by the State as Species of Special Concern. Wet prairies also provide high-quality browse for deer as long as the water depths remain below about 20 inches, a depth above which begins to hamper deer movement (MacDonald-Beyers and Labisky 2005).

The USFWS (2010) acknowledged the need for dry-downs of wet prairies to a depth below 1.6 inches for no longer than four to six weeks every four to five years. The recommended duration range has been shortened by two weeks in order to avoid overdrying the northern part of WCA 3A.

Recommended Water Depths

In response to data indicating that the snail kite and the apple snail population in WCA 3A had greatly declined in the late 1990s and early 2000s, the USFWS worked with snail kite and apple snail researchers in 2008 to determine measures that would help return kites and the snails to their previous numbers and densities in WCA 3A. The product was the *WCA 3A Snail Kite Transition Strategy*. It was subsequently revised with input from FWC and South Florida Water Management District staffs; expanded to address the wood stork, tree islands, and wet prairie; and was renamed the *USFWS Multi-Species Transition Strategy for Water Conservation Area 3A* (USFWS 2010). We have reviewed this draft report, and considered it in light of the regulation schedule that the GFC officially recommended in 1980. We have also consulted studies conducted by others (see Towles 2009) who have investigated the effects of water levels on tree islands and the wet prairie community. The USFWS (2010) target depths are slightly deeper than those recommended by Schortemeyer (1980), having been developed for a different suite of species and habitats, primarily south of Alligator Alley (Interstate 75). In general, however, both reflect a range of desired targets with peak water levels occurring in the late October to early November timeframe, receding steadily to a low at or near ground level in late May and early June, and then rising steadily to a peak again by late October and early November. It is important to recognize that interannual variations in rainfall may not allow these targets to be reached during all years, and that actual depths will vary depending on the location at which they are measured; however, these figures provide an envelope for an ecologically acceptable hydrologic regime for WCA 3A, and perhaps for WCA 3B, for most years.

An integral component of the USFWS approach is that an interagency team would meet regularly during the year to determine the targets for each specific season based on an assessment of the species' needs. This assessment would include up-to-date monitoring data, forecasted climate conditions, and the past years' hydrology. As new information and technologies become available, these guidelines will have to be revised. It is also important to recognize that all of these targets may not be attainable during all years and that their application should not cause unintended adverse consequences.

Conclusions

- A review of the two multi-species regulation schedules that have been proposed for WCA 3A, data on the effects of hydrology on its tree islands, and maximum depths for foraging for wading birds common to the Everglades provides the basis for the FWC's position. Guidance for water level management within the EWMA generally remains as recommended by Schortemeyer (1980), with a high-water depth no more than two feet by late October to early November and then a gradual and a steady recession to a low of near ground level by late May to early June. At that time, water levels would increase back to no deeper than two feet by the end of October to early November.
- During extreme storms or unusually wet seasons, water levels may rise above the desired levels, but even then depths should not persist for longer than 60 days above desired levels. At an average water depth of two feet north of Alligator Alley, the FWC has to

close the EWMA to avoid exacerbating stress on the terrestrial and semi-terrestrial species that crowd on the highest points of tree islands and the levees.

- Recession rates are an important factor to consider when managing wading birds. The FWC recommends recession rates averaging between 0.05 and 0.25 feet per week, with no water-level reversals, beginning in January and ending at the end of May. Recession rates are also important for managing for apple snails. The FWC recommends ascension rates no greater than 0.05 to 0.25 feet per week from the beginning of June to the beginning of October.
- WCA 3B has not been subjected to a regulation schedule; thus, water levels are not dictated by human-induced extreme fluctuations. Instead, water levels are affected by precipitation, evapotranspiration, seepage, and inflow from the S-151 structure. As a result, the tree islands in WCA 3B represent some of the least impacted islands north of Everglades National Park. Transferring high water levels from WCA 3A to WCA 3B via CEPP or any other water management plan is not an acceptable approach to the FWC. Staff has developed a draft management strategy for WCA 3B: water depths at the beginning of January should be 1.7 feet and recede at a rate of 0.6 inches per week until it hits a dry-season low of 0.7 feet (8.4 inches) in late May. At that time, water would rise to a depth of a little less than 1.9 feet in the first part of October, after which the water would recede gradually to the 1.7-foot level recommended for the beginning of January.
- The stated goal of CERP prioritizes water management for restoration of the Everglades ecosystem. CERP components, including CEPP, should strive not just to conserve, but to restore conditions for listed species, including the federally endangered Florida panther.
- If we continue down the path of managing the hydrology in the EWMA based on the current water regulation schedule that allows for periods of prolonged high water levels, the science and basic biology lead us to conclude that native plant and wildlife species that characterize the central Everglades will not be restored, but instead will be further harmed.
- While this paper represents our current opinion, it is the intent of FWC to continue working with partners and stakeholders to continue to refine hydrologic requirements as more information becomes available. We continue our commitment to ensuring that, in the near term, CEPP and, in the longer term, CERP realize the goal of restoration of the greater Everglades system.

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