

Lake Okeechobee Drought Management: The Impact of Water Levels on the Everglade Snail Kite

Abstract

Lake Okeechobee is the endangered Everglade Snail Kite's (Kite) second most important habitat. Since 2000, Kite populations in Florida have declined from about 3000 individuals to less than 700 today. During this period, Lake Okeechobee has experienced extreme weather patterns and been subjected to new water management protocols that have created record low water levels, for record lengths of time, and at increased frequencies. As a result, Lake Okeechobee now rarely provides suitable habitat for Kite nesting, or even foraging. The impacts on Kites are both short-term, including an inability to nest and lowered survival during droughts, and long-term because of the reduction of apple snails, their primary food source. Once depleted, apple snail populations require a multi-year recovery period, precluding Kite use during this time. Water management decisions have been a significant factor in Kite problems on Lake Okeechobee. Without important changes, it is anticipated that water managers will continue managing Lake Okeechobee with an emphasis on water supply, further degrading the lake's value for Kites and its potential role in recovery of the species. Therefore, Kite use of the lake requires increased consideration in water management decisions.



Everglade Snail Kite © Larry Frogge

I. Introduction

Lake Okeechobee is designated as Critical Habitat for the endangered Everglade Snail Kite by the United States Fish and Wildlife Service (USFWS) and is second only to Water Conservation Area 3 (WCA3) as the most important location for the Kite's long-term population viability.¹ However, the lake's habitat has been harmed by extreme water level changes, and little Kite nesting has occurred since 1995. This has coincided with a massive decrease in state-wide Kite populations from an estimated 3000 in the late 1990s, to recent estimates of less than 700. Without Lake Okeechobee and WCA3, Kites do not have sufficient habitat to sustain their population.

Kites are currently attempting to nest on Lake Okeechobee. If lake levels drop below 11 feet this spring, Kites will abandon nesting efforts, causing short-term harm. Additionally, populations of apple snails could be significantly reduced or eliminated, requiring a multi-year recovery period and causing long-term harm to Kites. Weather forecasts predict an extremely dry spring, increasing the risk of the lake dropping below 11 feet from both the lack of recharge from the watershed and from water management and supply decisions.

II. Kite Habitat Quality Depends on Adequate Water Levels in Lake Okeechobee

Excessively low water levels in Lake Okeechobee can lead to the destruction of the Kite's food supply and habitat, contributing to population decline.

The Kite's diet is limited almost exclusively to apple snails.² Apple snails live in aquatic vegetated areas such as Lake Okeechobee's marshes. When lake water levels fall below 11 feet, about 90% of this marsh dries. Snails can survive for about 3 months without standing water, but mortality increases sharply beyond this time.³



The record-setting 2001 and 2007-08 droughts significantly exceeded this three month drying threshold (below 11 feet for about 6 and 17 months, respectively) and snails were almost eliminated in both events. Snail populations required about four years to recover to densities that could sustain Kite nesting after the 2001 drought (Table 1), and have recolonized only part of the marsh as of 2011. These multi-year snail population recovery periods are consistent with Rodgers' (1996)⁴ estimate of a 2-5 year recovery period after severe drought.

When wetlands dry, Kites respond by moving to deeper-water, such as lakes. Audubon's Lake Okeechobee Warden, Roderick Chandler, wrote of increased Kite use of the lake during the 1981 drought. Similarly, the USFWS Multi-species Recovery plan (p. 3-92) shows that as Kite numbers declined in the WCAs during the drought of 1990-91, they increased on Lake Okeechobee, indicating the importance of lake habitat during droughts. The lake dropped to a low of 10.5 feet in 1991, but was below 11 feet for less than 3 months. Plus, the outer edges of the marsh remained partly inundated and usable. When the lake's levels dropped almost a foot lower in the 2001 and 2007-08 droughts, to below 9 feet, all marsh habitat dried and the lake was unsuitable for Kites.

The record low water levels correlate with declines in Kite nesting, population, and survival rates. Since the late 1990s, Kite nesting on Lake Okeechobee has been virtually nonexistent (Table 1). During the 2001, and 2007-08, drought years (Figure 1), Kite populations experienced a decrease in survival of adults and juveniles. While annual adult survival in the Everglades decreased by 16% during drought, juvenile survival dropped by a staggering 86% (Figure 2). Kitchens et al. (2008) calculate that if present population trends do not improve, Kites could be functionally extinct in Florida within 30 years.⁵

Year	Number of Kite nests on Lake Okeechobee	Number of young fledged
1992	~60	
1993	~90	
1994	10	4
1995	28	16
1996	34	30
1997	4	0
1998	8	5
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	5	1
2004	11	7
2005	33	3
2006	19	16
2007	0	0
2008	0	0
2009	0	0
2010	14	3

Table 1. Lake Okeechobee is the second most important Kite nesting area in Florida and has had little nesting since the mid 1990s.

Audubon projects that if a Minimum Flow and Level (MFL) exceedance occurs in 2011 (an exceedance occurs when Lake Okeechobee drops below 11 feet for more than 80 days), it will halt nesting, and worse, strand and kill enough of the apple snail population to require a multi-year recovery period. This scenario could make the lake uninhabitable to Kites for almost two decades (mid-1990s to around 2015).

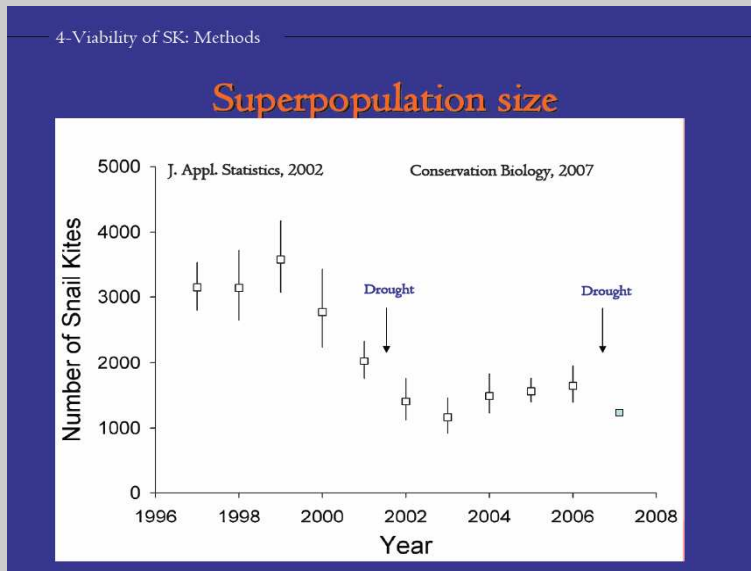


Figure 1. Kite populations have declined precipitously in the past decade, with significant population losses during droughts.⁶

IV. Water Supply Plans and Lake Levels

Water supply deliveries contribute to low lake levels. Water managers cannot control the severity or duration of a drought, but water supply deliveries can be managed to minimize loss of habitat for Kites. The Lake Okeechobee Regulation Schedule (LORS) and the Lake Okeechobee Water Supply Management plan (LOWSM), discussed further below, have increased the severity of low lake levels on Kite habitat.

III. Lake Okeechobee Droughts Have Increased in Frequency

Lake Okeechobee has historically experienced periodic droughts and low lake levels. In recent years, droughts appear to be occurring with greater frequency. From the 1960s through 1990s, droughts requiring significant water rationing from the lake occurred approximately once a decade (i.e., 1962, 1971, 1981, 1990, and 2001). In the past 10 years, however, South Florida has had two significant droughts, and indications are that this year will likely bring a third. October 2010 to February 2011 was the driest period within the South Florida Water Management District (SFWMD) in 80 years.⁸ The frequent droughts appear to be associated with a change in weather patterns that began in 1995, yielding more extreme wet and dry years.⁹

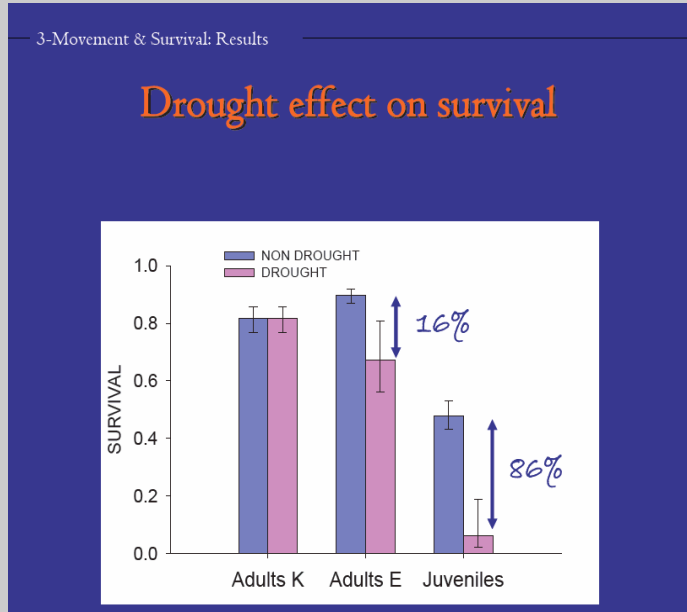


Figure 2. Kite survival drops significantly during drought periods, emphasizing the need to provide the best habitat possible during these stress periods. Adults “K” and “E” represent Kissimmee and Everglades regions, respectively, and indicate greater drought survival near lake habitats than near shallow marshes.⁷

Previously, drought water supply was allocated through “supply-side management” (SSM).¹⁰ The SSM was designed to prevent water levels from dropping below 10 foot elevation. Thus, SSM allocated water based upon how much water supply was available *without dropping below 10 feet* (accounting for expected rainfall, evaporative losses, and water supply use). In certain scenarios, water supply deliveries could be cut to zero.

In the 2001 drought, the SSM approach was replaced by the LOWSM protocols, which allocated water through a “demand-side management” that based deliveries on a guaranteed allocation, *no matter how low the lake dropped*.¹¹ With this change, the low water level record for Lake Okeechobee was exceeded by almost one foot in the 2001 drought (Table 2). LOWSM protocols were used again during droughts of 2007-08, further exceeding the 2001 record low.

Year	Minimum Lake Level (feet)
1956	10.3
1962	10.2
1971	10.4
1981	9.8
1982	10.7
1990	10.5
2001	8.97
2007	8.82
2008	9.25

Table 2. Droughts since 2000 have broken low level records by almost an entire foot.



Everglade Snail Kite feeding © Larry Frogge

Water supply deliveries lowered Lake Okeechobee’s water level about an additional 1.3 feet during the last two droughts. From January through July of 2007, 415,000 acre-feet of water were taken from the lake. Without those deliveries, the lowest level the lake would have reached would have been close to 10.1 feet, as opposed to the 8.82 foot level that was actually reached. Similarly, 380,000 acre-feet of water allocated in the 2001 drought would have left the lake at about 10.2 feet instead of the 8.97 foot level. Thus, had these water supply deliveries not been made, or had at least been reduced, portions of the lake’s marsh could have sustained greater apple snail survival and kite foraging, and created a shorter recovery period.



Lake Okeechobee © Paul Gray

Finally, the LORS water level management plan keeps average levels in the lake lower to maintain the safety of the Herbert Hoover Dike. This amplifies the impacts of droughts. The USFWS expressed concerns about the combined impacts of LORS and LOWSM on the Kite in the “Final Fish and Wildlife Coordination Act Report” for the LORS (USFWS 2007 pg.52), stating:

“The [US Fish and Wildlife] Service does not concur with the Corps’ determination that the project may affect, but is not likely to affect, the Everglade snail kite or its designated critical habitat.... Specifically, the Service is concerned about the effects of the TSP [tentatively selected plan] on the apple snail populations within the lake’s littoral zone, and the resulting effects on the kite...”

V. Summary and Conclusion

The recent confluence of three factors greatly affects the use of Lake Okeechobee by Kites:

- Recent weather patterns have created more frequent and severe droughts.
- The new water rationing plan (LOWSM) guarantees water supply deliveries no matter how low the lake drops.
- The LORS schedule keeps lake levels lower on average.

These factors have combined to reduce Lake Okeechobee levels to record lows, for record durations, and at a greater frequency. During these record-setting periods, Kite populations have declined drastically. As conditions have also continually degraded in WCA3, Lake Okeechobee habitat is vital to the survival of this species. The persistent decline constitutes a high level of threat, warranting extra measures and precautions to protect and enhance Kite populations.

The Importance of the Everglade Snail Kite as an Indicator for the Everglades

The Comprehensive Everglades Restoration Plan has more than 50 performance measures used to assess success. Only three of these measures rank as “Total System-wide Performance Measures,” and the success of the Everglade Snail Kite is one of them. The Kite attains this high rank because of its reliance on a properly functioning Everglades ecosystem. Achieving Kite persistence is expected to result in system-wide sustainable restoration.

As noted in this paper, Kites are running out of options in Florida. Fewer habitat choices exist, and the remaining habitats can be made unsuitable by human management decisions. The third biennial review of Everglades restoration by the National Research Council (2010) focused on the Kite’s recent problems and recommended not only long-term remedies such as full restoration, but short-term management changes as well. If Kites are not sustained, it will reflect that the Greater Everglades Ecosystem is profoundly dysfunctional. Because the sustainability of wildlife and citizens alike in South Florida is so closely tied to the Everglades, this is a resounding issue with far-reaching implications for the future.



Everglade Snail Kite © Larry Frogge

Audubon Recommendations

Managing water levels in Lake Okeechobee to protect the Everglade Snail Kite should be a top priority for the SFWMD. With extremely dry conditions this year, there is great likelihood of an MFL exceedence, and the first-ever MFL violation, which occurs when there are two exceedences in 6 years. Potentially devastating effects on the Kite could result. As a guardian of the Everglades, the SFWMD should take deliberate steps to protect Kites, including:

- **Manage water supply needs in balance with Kite habitat protection needs.**
- **Explore creative water management measures to prevent an exceedence of the Lake Okeechobee MFL.**
- **Increase communication with the Florida Fish and Wildlife Conservation Commission to assess impacts of water levels on Kite habitat.**



Everglade Snail Kite in flight
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