# Wading Bird Abundance
# (Foraging and Nesting)
# Everglades National Park Area

**Methods:** Systematic reconnaissance flights (SRF's) were performed monthly between Dec 2005 and May 2006. Flights were conducted over 3 to 4 consecutive days using a fixed-wing Cessna 182 at an altitude of 60 m. The area covered, included Everglades National Park and the southern region of Big Cypress National Preserve. The area was surveyed using transects oriented E to W and separated by 2Km (Figure 1). Wading birds were counted, identified and geographically located using GPS units. Changes in surface water patterns (hydro patterns) were also recorded. Five categories were used to describe the hydro patterns: DD - absence of surface water and no groundwater visible in solution holes or ponds; WD - absence of surface water but groundwater present in solution holes or ponds; DT - ground surface area mostly dry but small scattered pools of surface water present and groundwater visible in solution holes or ponds; WT - ground surface area mostly wet but small scattered dry areas; and WW - continuous surface water over the area.

Data obtained during each SRF were compiled into a database, which contains the information collected since 1985 to the present. During this period, SRF surveys were not conducted during December 1984, December 1987 and January 1998. Missing data for those months were estimated using years with complete sets of data. From those years, it was calculated the overall percentage of increase or decrease from month to month in order to estimate missing values. In some years, due to personnel constraints, only one observer was used to collect those data. This situation occurred during the surveys of April 1990, May 1990 and from January 1991 to May 1991. Finally, some transects were missing for one observer during April 2004 and May 2005. Densities of birds were estimated using a 2X2 Km grid. The number of birds counted during the SRF inside the 300m width surveyed stripe were extrapolated to the rest of the 4Km$^2$ cell dividing the number of birds observed by 0.15 for surveys were data from two observers were available. In cases were only data from one observer were available the number of birds inside the 150m stripe were extrapolate to the rest of the cell by dividing the birds observed by 0.075.

**Results:** During the survey period (December 2005 – May 2006) an increase of eighteen-percent in the abundance of wading birds was observed, for all species combined, in comparison to the previous year (Figure

2). This increase in the number of birds observed in 2006 ads more positive slope to the overall increasing trend observed from 1985 to the present, when a linear regression model is used to fit those data.

Figure 3 shows that seven of the nine species of birds increased their numbers in relation to those observed in 2005. Small dark herons (SMDH) increase 31%, great white heron (GWHE) 27%, white ibis (WHIB) 23%, small white heron (SMWH) 18%, great blue herons (GBHE) 15%, great egrets (GREG) 13%, and wood stork (WOST) with a 9%, increase. Roseate spoonbill (ROSP) decreased 9% and glossy ibis (GLIB) 7%. Figure 3 also shows the annual estimates of the number of birds by species from 1985 to the present. Once again, linear regression models were use to determine the general trend for each species. A tendency to increase in the number of birds estimated for GREG, GBHE, SMWH, WOST, and GLIB was observed. Some species such as ROSP, and WHIB showed a stable trend; while only two species SMDH and GWHE, showed tendencies to decrease. Although this type of analysis can provide some idea of the general trends in the number of individuals observed for each species or groups of birds through those years, additional studies and more data analysis will be necessary in order to evaluate the significance of these observations and its relevance to the wading bird populations occurring in Everglades National Park.

The maximum density of birds occurred this year during the month of January (see Table 1). During January the highest numbers of GREG, WHIB, GBHE, and WOST were observed. Other species such as SMWH and GLIB reached their maximum numbers in December and April respectively, while ROSP, SMDH and GWHE peaked in the month of May. The months of March and April were the months with the least number of birds observed. It was during these months that the lower numbers of birds occurred for all the species but for GLIB and GWHE which showed the minimum numbers of birds during December.

Table 2 shows the distribution and abundance of wading birds in the different drainage basins. The Shark Slough (SS) basin contained the highest number of wading birds (25%), followed by Shark Slough Mangrove Estuary (SSME) with 20% and East Slough (ES) with 12%. These three basins combined, made up 57% of the total number of birds observed during the entire season. In contrast; the basins with the lowest number of birds were Eastern Panhandle Mangrove Estuary (EPME) with 1%, Northern Taylor Slough (NTS) and Eastern Panhandle with 2% each. Most birds were concentrated in SSME and Southern Big Cypress (SBC) during December. By January, most birds still concentrated in SSME. However, as the water receded, a great increase in the number of wading birds was observed in Big Cypress Mangrove Estuary (BCME) and East

Slough (ES). As water levels declined during February, SS became the basin with the larger number of birds followed by SSME. SS continues with this increasingly trend from March until the end of the season, followed by ES.

Considerable changes in hydro-patterns and birds distribution were observed throughout the season as shown in Figure 4. The greatest changes in the area covered by the different hydro patterns took place at the extreme categories. From December to May, the original extend of the area covered by WW was reduced from 45% to only 12% (1,596 $Km^2$) by the end of the season, while DD area experienced an increase from 3% to 33% (1,452 $Km^2$). Despite the magnitude of these changes, they occurred gradually from month to month. Intermediate categories such as WT and WD showed moderated changes, with a change from 35% to 22% (632$Km^2$) decrease and from 6% to 17% (576 $Km^2$) increase respectively. Finally, fairly small fluctuations occurred in the middle category, DT.

During the month of December, the highest densities of birds were observed mainly in the WT and WD categories respectively. By January, as water receded, some of the birds began foraging in WW areas; making this hydro-pattern as well as WT and WD contain the highest densities of birds. As water depth continued to decrease during the following months, densities at the WW, WT and DT continued increasing. Despite that WW area was covered completely by water, overall low water levels made these new territories accessible to foraging birds.

Birds were found foraging in 56% of the study area during the month of December (see Figure 5). By January the birds were more widely distributed, occupying 62% of the total available area; reaching a peak in February with 63% of the area. After February, the area utilized by birds started declining from March with 55% to May were all the birds were concentrated in only 32% of the total surveyed area.

Mario A. Alvarado and Sonny Bass
*Everglades National Park*
*South Florida Natural Resources Center*
*40001 State Road 9336*
*Homestead, FL 33034-6733*
Mario_Alvarado@nps.gov
Sonny_Bass@nps.gov

**Table 1.** Estimated abundance of wading birds in the Everglades National Park and adjacent areas, Dec 2005-May 2006.

| Species | Dec-05 | Jan-06 | Feb-06 | Mar-06 | Apr-06 | May-06 | Total |
|---|---|---|---|---|---|---|---|
| **GREG** | 24,349 | 24,836 | 24,332 | 20,580 | 21,936 | 23,075 | 139,108 |
| **GBHE** | 1,147 | 1,676 | 1,540 | 813 | 1,187 | 1,375 | 7,738 |
| **SMDH** | 2,517 | 3,119 | 2,199 | 1,915 | 1,635 | 3,482 | 14,867 |
| **SMWH** | 9,315 | 4,869 | 6,373 | 3,806 | 4,304 | 7,674 | 36,341 |
| **WHIB** | 32,749 | 42,943 | 34,473 | 36,617 | 29,040 | 33,749 | 209,571 |
| **GLIB** | 67 | 855 | 968 | 976 | 3,006 | 406 | 6,278 |
| **WOST** | 4,357 | 4,615 | 4,591 | 1,842 | 2,778 | 3,197 | 21,380 |
| **ROSP** | 721 | 590 | 537 | 222 | 574 | 1,694 | 4,338 |
| **GWHE** | 0 | 28 | 63 | 63 | 88 | 156 | 398 |
| **TOTAL** | 75,222 | 83,531 | 75,076 | 66,834 | 64,548 | 74,808 | 440,019 |

**Table 2.** Estimated abundance of wading birds (all species combined) for the different drainage basins in the Everglades National Park, Dec 2005 – May 2006.

| Month | SBC | BCME | SS | NESS | ES | SSME | NTS | LPK/STS | EP | CS | LPK/STSM | EPME | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec-05 | 10,556 | 8,092 | 4,985 | 919 | 3,384 | 23,778 | 1,254 | 1,813 | 3,674 | 6,297 | 8,470 | 2,000 | 75,222 |
| Jan-06 | 8,905 | 11,963 | 10,041 | 1,456 | 9,649 | 22,857 | 3,108 | 2,963 | 1,946 | 4,355 | 5,180 | 1,108 | 83,531 |
| Feb-06 | 3,640 | 5,794 | 23,125 | 3,108 | 4,640 | 17,462 | 2,962 | 2,514 | 767 | 2,534 | 7,977 | 553 | 75,076 |
| Mar-06 | 3,775 | 3,163 | 26,236 | 2,523 | 9,800 | 5,956 | 1,157 | 4,680 | 1,462 | 2,149 | 5,457 | 476 | 66,834 |
| Apr-06 | 5,194 | 4,986 | 20,754 | 3,361 | 10,719 | 6,690 | 462 | 4,647 | 844 | 645 | 6,137 | 109 | 64,548 |
| May-06 | 849 | 8034 | 26,891 | 3,761 | 13,067 | 11,150 | 34 | 1,610 | 282 | 2,398 | 6,711 | 21 | 74,808 |
| Tota | 32,919 | 42,032 | 112,032 | 15,128 | 51,259 | 87,893 | 8,893 | 18,227 | 8,975 | 18,378 | 39,932 | 4,267 | 440,019 |

**SBC** = Southern Big Cypress (South of US 41)
**BCME** = Big Cypress Mangrove Estuary (South of US 41)
**SS** = Shark Slough
**NESS** = Northeast Shark Slough
**ES** = East Slough
**SSME** = Shark Slough Mangrove Estuary
**NTS** = Northern Taylor Slough
**LPK/STS** = Long Pine Key / South Taylor Slough
**EP** = Eastern Panhandle
**CS** = Cape Sable
**LPK/STSM** = Long Pine Key / South Taylor Slough Mangrove Estuary
**EPME** = Eastern Panhandle Mangrove Estuary

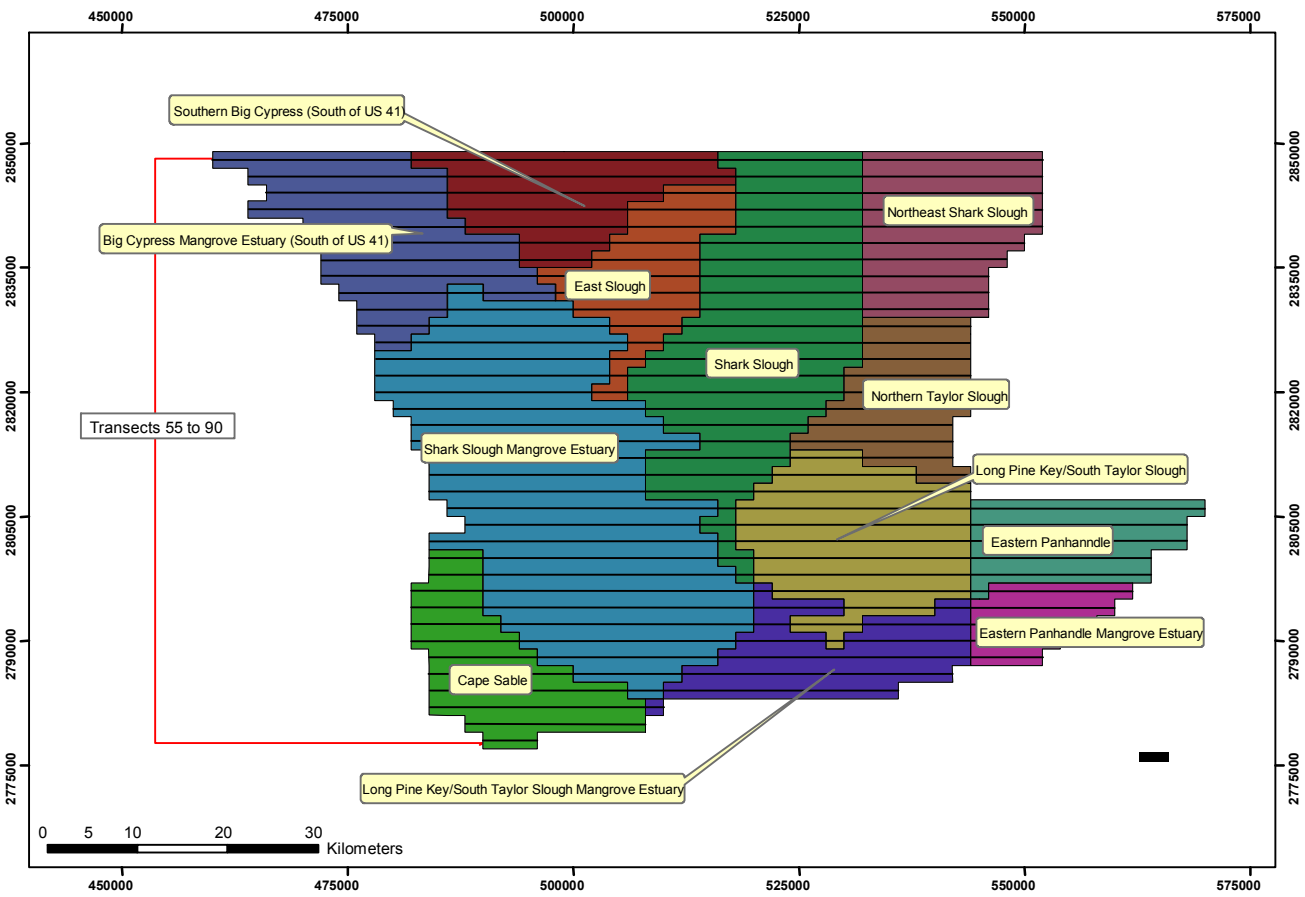


**Figure 1.** Map of ENP and southern Big Cypress National Preserve with sampling transects and drainage basins.

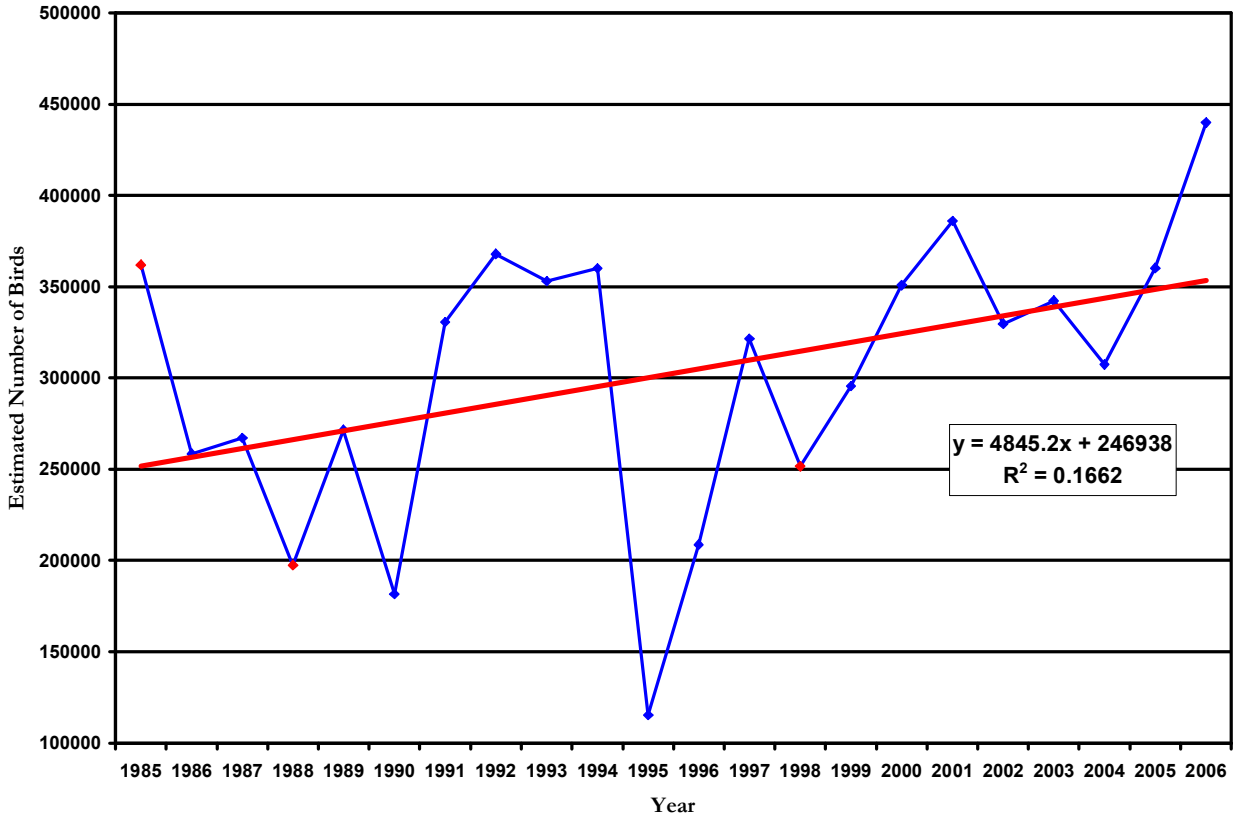


**Figure 2.** Estimated number of wading birds (all species pooled) observed from the months of Dec-May from 1985 to 2006. Red marks represent years with estimated missing data for one month.

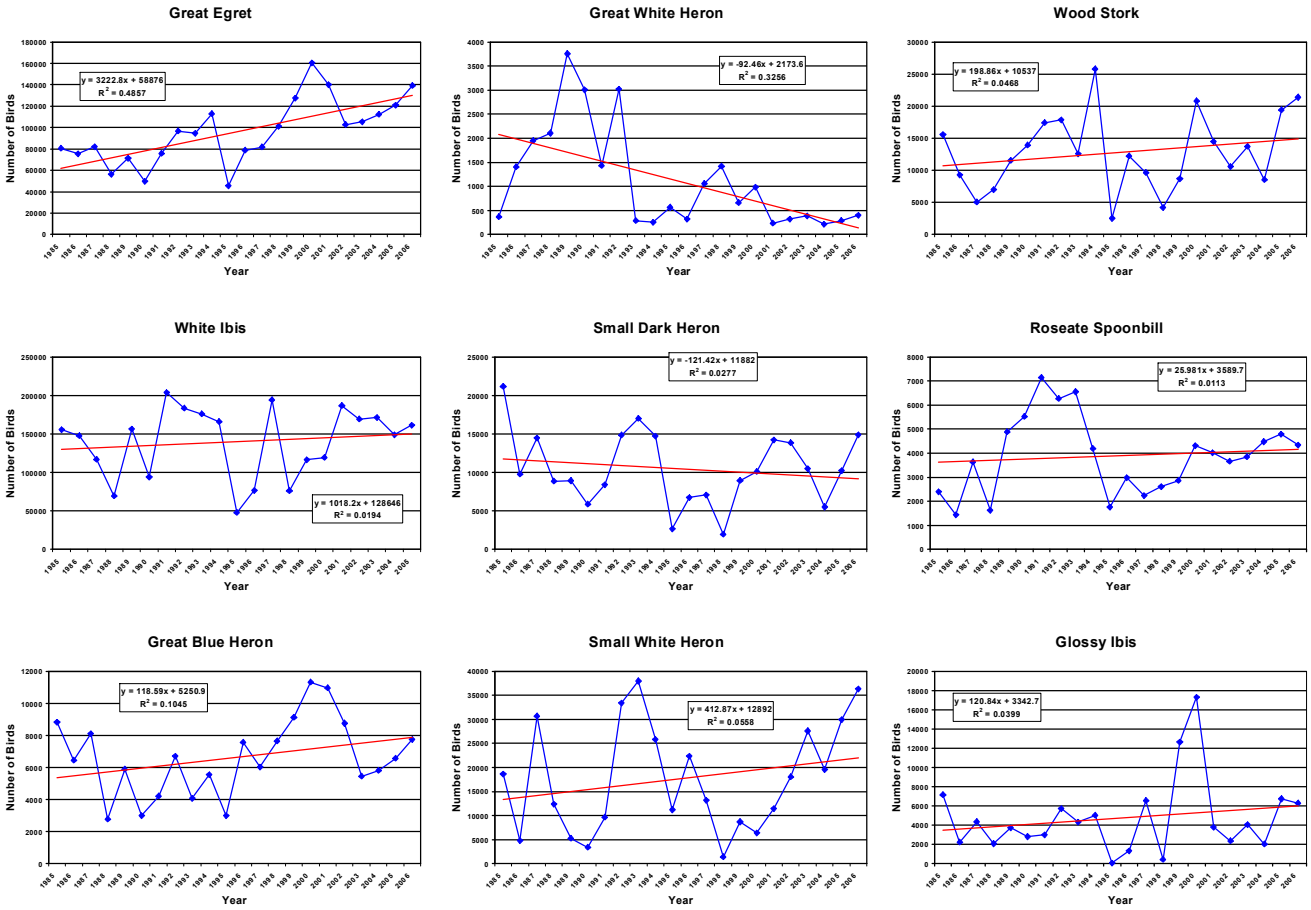


**Figure 3.** General trends in wading bird populations based on the total number of birds estimated during the surveys performed each year in the Everglades National Park from 1985 to the present.

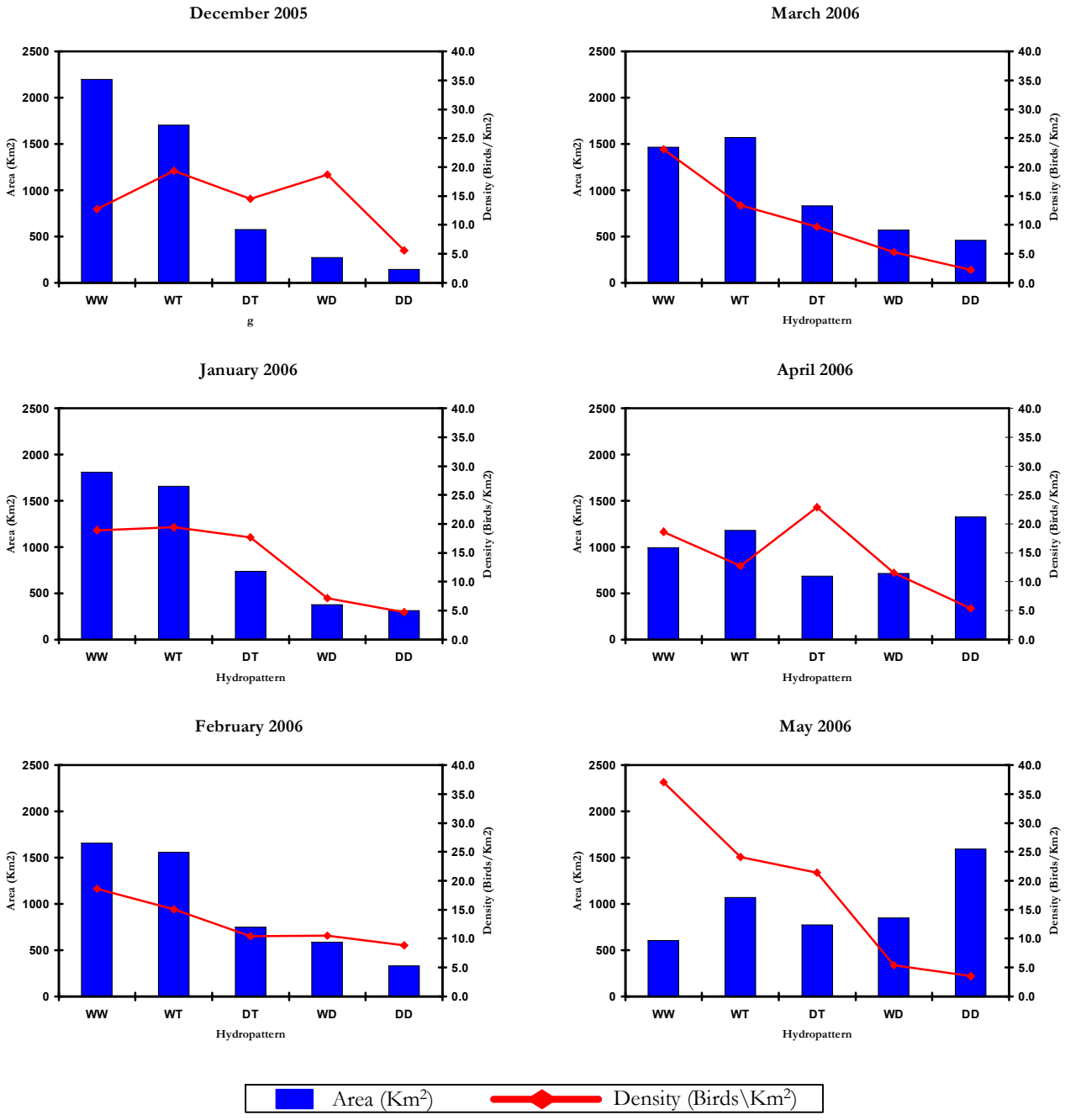


**Figure 4.** The areal extent and density of wading birds (all species pooled) in each surface water category. WW = continuous surface water; WT = mostly wet with scattered dry areas; DT = mostly dry with small scattered pools of water; WD = dry with water only in solution holes; DD = dry surface.

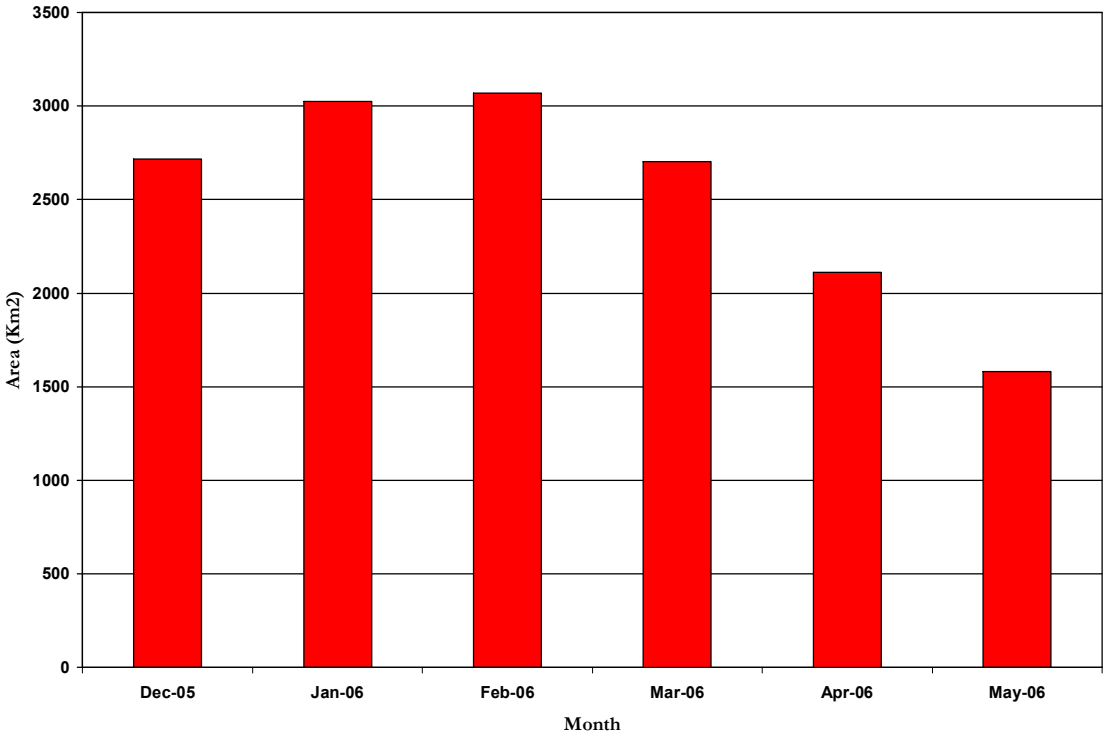


**Figure 5.** Monthly changes in wading bird areal utilization in the Everglades National Park from Dec-2005 to May-2006