

Florida LAKEWATCH

Dedicated to Sharing Information About Water Management and the Florida LAKEWATCH Program Volume XXIV 2006

Lake water levels and trophic state variables in Florida lakes



Photos courtesy of Maurice Logan

Maurice Logan, LAKEWATCH sampler on Blue Lake in Polk County, started building a 5-sided, 9 foot high gazebo in 1989 which was well above the water level at the start of its construction. Picture on left was taken in July 1989 when Blue Lake in Polk County was 2 feet above its lowest point in 39 years. The middle photo shows Maurice standing on the floor of the gazebo without the water anywhere near the dock. The lowest water level of 103.38 feet above sea level was recorded by Mr. Logan in 1982. But last year, with over 78 inches of rain, the water level rose. The current level of the lake is 119.36 feet above sea level—a difference of 16 feet. See the picture on the right. The 5-sided gazebo is now sitting in a foot of water.

Rainfall either directly through run off or indirectly through increasing ground water is the single greatest factor influencing lake water levels. Lake levels can fluctuate over the short term with large storm events, annually with seasonal rainfalls or over the long term. During the last decade Florida has experience extreme drought conditions and tremendous rains associated with hurricanes crossing the state. During drought conditions many lakes experienced all time low water levels and some lakes even dried completely. The rains from the hurricanes then pushed many lakes to all time high water levels causing flooding in many areas.

The following are some affects droughts have on lakes that are easy to detect:

- Boat access may be hampered if not totally eliminated
- Aquatic vegetation in the lake can increase moving toward open water areas

- Aquatic bird abundance may increase as shallow water habit increases
- Muck areas may be exposed to sunlight and consolidate

The following are some affects high water levels have on lakes that are easy to detect:

- Boating areas may become more available but more hazardous because of submerged objects
- Tussocks and floating vegetation may be floated up into shallow areas to dry
- Adjacent terrestrial and wetland area may flood causing increases in fish habitat
- Water color may increase from runoff causing a decrease in water transparency

Because of these and other affects, water level fluctuation is often used as a lake management

tool for improving lake conditions. However, what does all of this water level fluctuation do to the water chemistry of Florida lakes?

This question was recently addressed by LAKEWATCH staff, who examined long-term LAKEWATCH water chemistry data on 84 lakes that were also monitored for water levels by Florida Water Management Districts. This effort culminated in a scientific publication entitled "Lake Level and Trophic State Variables Among a Population of Florida Lakes and Within Individual Lakes."^{*}

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^{*} Hoyer, M. V., C. A. Horsburgh, D. E. Canfield, Jr., and R. W. Bachmann. 2005. Lake level and trophic state variables among a population of shallow Florida lakes and within individual lakes. *Canadian Journal of Fisheries and Aquatic Sciences*. 62: 2760-2769.



Featured Fish

Redear sunfish (*Lepomis microlophus*)



Photo taken from http://www.eopb.org/watershed_info/wildlife/images/redearsun.gif

The redear sunfish is light golden above with dusky grey spots or bars on the side and are white to yellow/orange below. They have a bright red or orange spot with a light-colored edge on a black earflap, which is how it derives one of its common names—redear.

The redear sunfish is a popular sportfish in Florida because of its food value and enjoyment of catch. It is common throughout the whole state of Florida. They are native to the southeast extending north to North Carolina in the east, to Indiana and Missouri in the Midwest and west to Oklahoma and Texas, but have been transplanted outside the native area as far north as Pennsylvania and northern Illinois.

The redear sunfish is light golden above with dusky grey spots or bars on the side and are white to yellow/orange below. They have a bright red or orange spot with a light-colored edge on a black earflap, which is how it derives one of its common names—redear. The pectoral fin is long and pointed and usually extends far past the eye when bent forward. They have a fairly pointed snout with a small mouth.

Redear are found in ponds, swamps, and lakes and vegetated pools with mud or sand bottoms of small to medium rivers. They are frequently found near

vegetation, stumps, logs and other cover. They are occasionally found in brackish water.

Redear sunfish are opportunistic bottom feeders feeding mainly during the daylight hours on a variety of organisms including algae, aquatic plants, zooplankton, and aquatic and terrestrial insects. Redear also use extensive flat top teeth in its throat to crunch mollusk shells thus providing it with another common name “shellcracker”.

Redear spawn when water temperatures reach 70°F, usually April through August in northern Florida and as early as March through August in Central and South Florida. They usually prefer water three to four feet deep and a firm bottom. They will frequently nest near water lilies, maidencane and other emergent aquatic vegetation. Males build and defend the nest until larvae hatch often making grunting noises during courtship. Females can lay up to 30,000 eggs during a spawn.

Redear grow faster than other sunfish and nine to ten inch redear are not uncommon in Florida. They can live to over eight years. The State record is 4 lbs, 4oz

caught in Merritt’s Mill Pond in 1986.

Redear are strong fighter but are more difficult to catch than other sunfish because they do not take readily to artificial lures but prefer natural baits. According to the Florida Fish and Wildlife Conservation Commission most redear in Florida are taken on cane poles with small hooks, corks and split shot for weight. Redear meat is white and flaky and sweet tasting.

In a study of 60 Florida lakes, redear were found in 46 of the 60 lakes sampled. These lakes ranged from 2 to 12,412 hectares in size and had an average depth of 0.6 to 5.9 meters. These lakes ranged from very weedy (100% of the surface area covered in aquatic plants) to very open (less than 1% of the surface area covered in aquatic plants). The lakes were very green (chlorophyll > 240 µg/l) to very clear (chlorophyll <1 µg/l). This suggests that redear sunfish can inhabit many diverse types of lakes in Florida.

Wood Duck (*Aix sponsa*)

Featured Bird



Photo taken from http://amica.csustan.edu/photos/animals/wood_duck.jpg

A male wood duck with his multi-colored breeding plumage. The body colors include iridescent dark green-blue back and wings, chestnut breast and neck, green head, and white throat patch with white stripes forming a complex pattern on the face and neck. There's even some maroon and purple coloration to tie everything together.

The wood duck is a distinctly North American species and has as its only close relative the Mandarin Duck, which is found in eastern Asia. Other common names for this species include woodie, summer duck, acorn duck, swamp duck, and squealer because of the squealing alarm call they sometimes make when startled. They prefer quiet undisturbed woodlands, creeks, rivers, floodplains, lakes, deciduous hardwood swamps, and beaver ponds. When swimming in the water, wood ducks are usually secretive and make use of overhanging woody vegetation as cover until approached closely.

The wood duck is one of the most beautiful ducks in North America. From October through June is when the males are in their most dazzling multi-colored breeding plumage. The body colors include iridescent dark green-blue back and wings, chestnut breast and neck, green head, and white throat patch with white stripes forming a complex pattern on the face and neck. They even have some maroon and purple coloration to tie everything together. Females have a duller coloration consisting of a gray-brown neck and head with a white teardrop shaped eye-ring, white throat, gray-brown breast stippled with white that

fades to a white belly, and a dark brown back. On the wings, both males and females have blue-green colored speculums with a white rear borders. Male wood ducks have red eyes and red bills while females have brown eyes and gray bills. Both sexes have long crests that point downwards at the back of the head.

The wood duck is a medium sized bird from 14 to 20 inches in length, with a wingspan of 28 to 30 inches, and weighing about 1 to 1.5 pounds. They have short necks and long, square-shaped tails. In flight, wood ducks tend to keep their heads held above the level of the body with their bills pointed down at an angle. Because they have long and relatively broad wings, they are agile flyers and can easily weave in and out of the tree canopies where they roost and nest. Woodies also have sharp claws on their webbed feet that help them perch on tree limbs where they spend much of their time when not swimming, feeding, or flying. Although they share some habits with dabbling ducks, they are considered by experts to be members of the Tribe Cairinini or perching ducks.

This species rides relatively high in the water and feeds on the water's surface similar to dabbling ducks. The

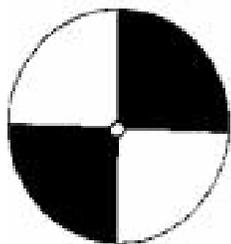
adult wood duck is mainly herbivorous with plant materials making up about 90% of its diet. Important plant materials include algae, watermeal, water shield, duckweed, cypress seeds, sedges, grasses, pondweeds, mulberries, wild grapes, and acorns. In some areas where it is grown, corn may also be included in their diet.

The wood duck is widely distributed in the United States where it nests in areas east of the Mississippi River, along the lower Missouri River into South Dakota, in eastern Texas, along the Pacific coast, and in the southeastern coastal states. It winters mainly along the Atlantic coast from New York south, along the gulf coast into central Texas, to the lower Mississippi River valley and western California. Some wood ducks winter in Mexico south to the Distrito Federal.

Like other perching ducks, wood ducks normally nest in tree cavities but will accept artificial nest boxes. Preferred nesting sites include trees hollowed out by large woodpeckers like the Pileated Woodpecker or hollow logs and branches resulting from broken limbs, lightning, fire scars, heart rot, and logging operations. Nests are located from 3 to 45 feet above the ground in trees that are greater than 16 inches in diameter. Ideally the nests will be located near water although sometimes they are found up to half a mile from water. To encourage nesting in artificial nest boxes, wooden boxes should be provided in open woods or on a pole in standing water where the female can see the nest box opening. Line the box with sawdust to serve as a nesting material because this species does not carry nesting materials.

Females begin breeding when one year old and line the nest with down and fine feathers pulled from their breasts. Nesting occurs from March to July and after laying from 8 to 15 dull white eggs, the female will incubate them for 28 to 35 days until they hatch. If the weather is unusually cold, or if the female is kept away from

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Great North American Secchi Dip-In for 2006

In the past, many LAKEWATCH volunteers have participated in the Secchi Dip-In. This project, housed out of Kent State University in Ohio, helps instill a sense of connection among all volunteer water samplers throughout the world.

If you want to participate in this program this year please go to their website (listed below) and download a copy of the questionnaire directly. All of the data, including 2005 data, are now available on the Dip-In website.

The Dip-In provides a national perspective of water quality. It gives a comprehensive glimpse of transparency at volunteer-monitored sites across the United States, Canada and the rest of the world. Scientists and volunteers can get a sense of how transparency varies according to water type, regional geology and land use. What is more important, these annual Dip-In snapshots can be put together to form a picture of changes in transparency over time.

If you want all of the information for your state, please contact Bob Carlson via e-mail at Dipin@kent.edu or call (330) 672-3992.

This year's Secchi Dip-In will take place June 24 to July 16.

To download this year's questionnaire go to: <http://dipin.kent.edu/questionnaire.htm>

WANTED Volunteers:

If you or someone you know is interested in joining the LAKEWATCH team and help sample any of the following lakes, please contact our office by calling 1-800-525-3928 or e-mail us at lakewat@ufl.edu.

Bradford County Lakes

Bedford	Bolt
DeValerio	Rowel
Silver	

Continued on page 8.



Thank you, Mr. Logan, for sharing your lake with us!

The photos on the front page were provided by Maurice Logan of Blue Lake located in Polk County. Mr. Logan has been recording rainfall and lake levels in Blue Lake since mid-1967. You may remember a past LAKEWATCH article that highlighted his lake level and rainfall data ("Where Does Lake Water Come From?" in Volume XV on page 5). His efforts deserve repeating!

Mr. Logan has documented that the water level in Blue Lake is directly influenced by rainfall. He recorded the lowest levels (103.38 ft above sea level) in 1982 when the annual rainfall was only 31.89 inches. He also recorded record high levels (119.36 ft above sea level) last year with over 78 inches in annual rainfall. Mr. Logan's has documented that Blue Lake has fluctuated by as much as 16 feet over the last 39 years. WOW!

Maurice has also been an active LAKEWATCH sampler since early 1991. He has collected 147 months of LAKEWATCH data and he doesn't appear to be slowing down. He just celebrated his 90th Birthday in March—Happy Birthday Mr. Logan!

Update to the Lake Griffin Project

The University of Florida/Institute of Food and Agricultural Sciences' Department of Fisheries and Aquatic Sciences with funding from the Lake County Water Authority is stocking Florida large-mouth bass into Lake Griffin located in Lake County. This is the second year of this project. All fish stocked are tagged. Anyone catching a tagged fish is asked to call our office and report where and when they caught each fish along with the tag number of the fish.

Thanks to all our Bass Anglers for calling in the information. It is a crucial part of this project. The ultimate end result is to improve the fishing on Lake Griffin.

Judging from the number of phones coming in, this has been a successful project!



Good job LAKEWATCHers!

We thank all of you for taking the time to fill out and return the mail list update information / questionnaire form from the last newsletter. We received the biggest response thus far—literally hundreds!

Thank you all!

To continue to receive the LAKEWATCH newsletter you need to fill out the information form from the last LAKEWATCH newsletter (last page) and return it. If you haven't returned your form and still want to remain on our mailing list please call us at 1-800-LAKEWATCH (525-3928) so we can verify your mailing address.

☆☆ Collection Center Update ☆☆

In Citrus County, the TOOFAR office in Inverness will be modifying their office hours for the spring/summer. They will be open Monday through Thursday from 10 am to 3 pm. The office will be closed on Fridays. The new hours will be in effect from Memorial Day through Labor Day.

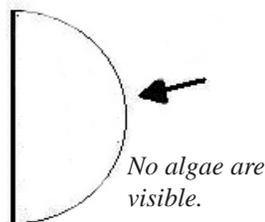
Please make note of this change.

Greetings From the Water Chemistry Laboratory

Algae Filter Refresher Course

When folding your algae sample filters, please be sure to fold them exactly in half, with the algae inside. Don't let any green algae show! If any part of the algae sample is uncovered and exposed while putting the filter into its wrapper,

some of it can rub off the sample filter and stick to the outside wrapper. That portion of the algae is lost and the sample is less than accurate. You work hard to collect these samples and we all want them to be the very best they can be. Thanks for your help and keep up the good work!



Like this!

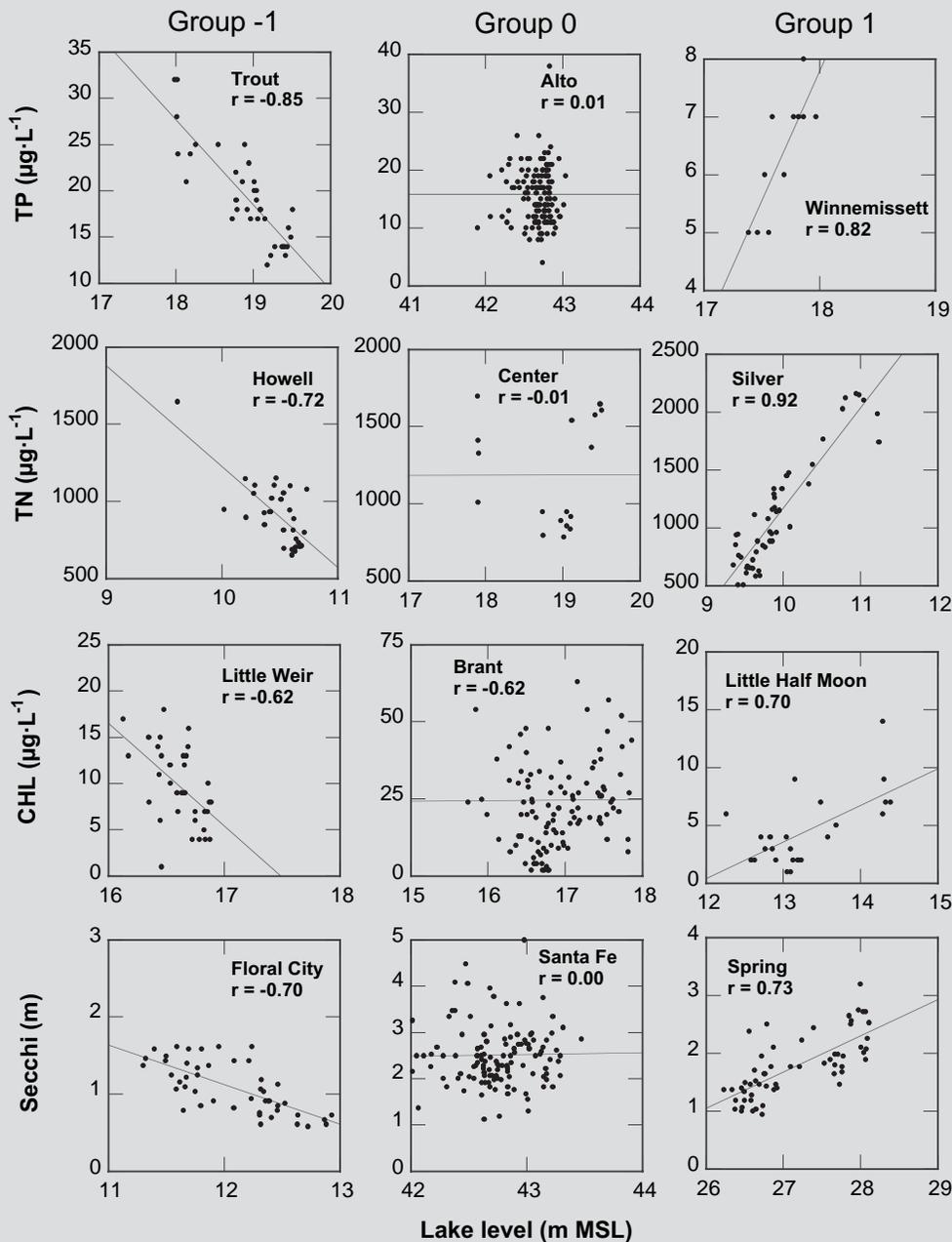


Not like this!

The data were analyzed and the results are in....

The results of this research were somewhat surprising. There were no holistic relations between lake level and lake trophic state variables among all lakes. Looking at individual lakes, however, showed that trophic state variables decreased with increasing water level in about 25% of the lakes. A selection of these lakes are displayed by Group -1 in the graphs to the left. Trophic state variables increased with water level in about 25% of the lakes. A selection of these lakes are displayed by Group 1 in the graphs to the left. Finally, trophic state variables showed no real relation to water level in about 50% of the lakes. These lakes are represented by Group 0 lakes in the graphs to the left.

The conclusion for these findings suggest that predicting how water levels will impact trophic state variables among a population of lakes will be difficult if not impossible and that accurate prediction will have to be made after first examining several mechanisms within individual lake systems.



Plots of total phosphorus (TP), total nitrogen (TN), and chlorophyll (Chl) concentrations and Secchi depth (Secchi) versus corresponding monthly water levels for selected lakes (MSL, mean sea level). Group -1 includes lakes with significant inverse relationships (about 25% of the lakes), Group 0 includes lakes with no relationships (about 50% of the lakes), and Group 1 includes lakes with direct relationships (about 25% of the lakes) between trophic state variables and lake levels.

So what does this mean for me?

The importance of this finding for LAKEWATCH volunteers is that it may be beneficial to monitor lake water level along with their standard monthly water sampling. Determining if there is a relation between lake water level and trophic state variables may help in future management activities for the lake. Within the last year approximately 100 volunteers have begun to monitor lake levels. If any additional volunteers would like to begin monitoring water levels on their lake contact your Regional Coordinator at 1-800-LAKEWATCH (525-3928) for information on how to get started.

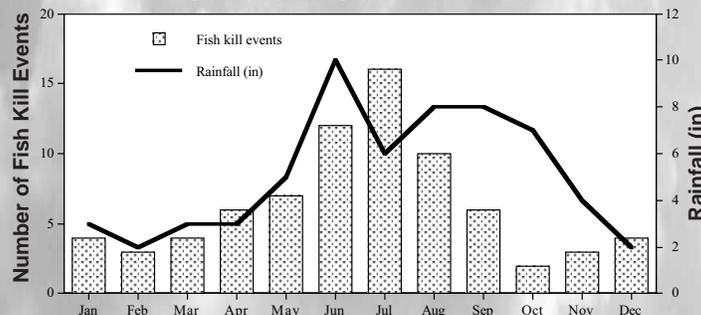
April Showers May Bring More Than May Flowers in Florida...



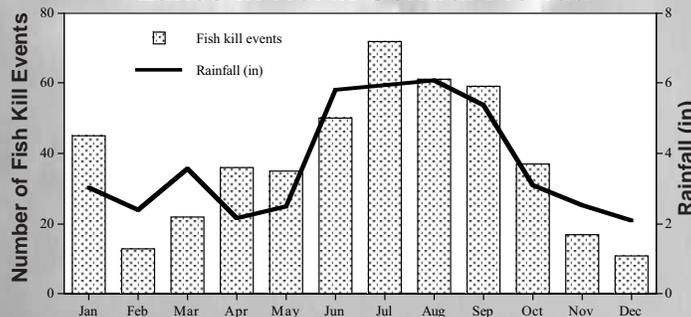
The traditional rainy season in Florida is between May and September. As much as we all love rain and in many circumstances look forward to the rainy season and the onset of Spring, the rain can bring some unwanted events. In the Florida LAKEWATCH Fish Kill Circular* data from canals located in the South Florida Water Management District were evaluated. Average rainfall for Florida's traditional rainy season (May through September) accounted for 61% of the annual average, whereas rainfall for the preceding four months accounted for only 18% of the annual average (see the top figure below—the black line represents the rainfall average for each month in South Florida). Also notice on that same graph that a large majority (64%) of the fish kill events occurred between May and September (each bar represents fish kill events for each month in South Florida canals).

We recently received a similar data set from the Florida Fish and Wildlife Conservation Commission. This data set contains lakes that are located in North Central Florida. There was a similar relationship in North Central lakes as was found in South Florida canals between rainfall and fish kills. Average rainfall for this same time period accounted for 60% of the annual average, whereas rainfall for the preceding four months accounted for only 25% of the annual average. The majority of the fish kill events (60%) also occurred between May and September.

Canals in South Florida



Lakes in North Central Florida



Data provided above are a good example of how useful long-term data can be for making such comparisons. These graphs provide strong evidence that many of the fish kills in Florida are related to rain events, particularly during the summer months. But why?

There are two major reasons. First, heavy rains tend to wash large amounts of organic matter such as dried leaves, grasses, etc. into nearby canals, lakes, and ponds. As bacterial organisms begin to decompose the new material, oxygen is used at a faster rate than normal. Secondly, cloudy skies decrease the amount of sunlight that the algae and plants have to photosynthesize. Photosynthesis is the process that algae and plants produce oxygen. Since warm water physically holds less oxygen than cold water, the low levels of oxygen in the water caused by both of these scenarios is exacerbated by the fact that they often occur when the water temperatures are warm. So, there is a potential for oxygen concentrations in the water to get low enough to result in a summer fish kill under warm, cloudy, rainy weather—which, unfortunately, describes a typical Florida summer.*

*For more information about Fish Kills in Florida see *A Beginner's Guide to Water Management — Understanding Fish Kills in Florida Freshwater Systems*. Florida LAKEWATCH Informational Circular 107. Florida LAKEWATCH © 2003. Free copies are available for download from our website: <http://lakewatch.ifas.ufl.edu/> or call our office at 1-800-LAKEWATCH (525-3928).

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Polk County

Annie	Ariana	Arietta
Aurora	Bentley	Blue 2
Blue North	Blue South	Bonny
Buffum	Cannon	Clearwater
Conine	Crago	Deer
Eagle	Elbert	Eloise
Fannie	Haines	Hamilton
Hartridge	Henry	Hollingsworth
Howell	Howard	Ida
Idylwild	Jesse	Josephine
Juliana	Link	Little Hamilton
Little Otis	Little Spirit	Livingston
Lizzie	Lost	Lucerne
Lulu	Mabel	Marianna
Marion	Mattie	Maude
May	Mirror	Ned
Otis	Otter	Pansy
Parker	Patrick	Ring
Rochelle	Roy	Ship
Silver	Smart	Summit
Symphony		

REWARD:

- ◆ Access to lake experts around the state.
- ◆ Quarterly and annual water chemistry reports on the lake(s) of your choice.
- ◆ Free quarterly newsletters and educational publications about lake ecology.
- ◆ The knowledge that you are contributing to the future of Florida's lakes.

Florida



LAKEWATCH

This newsletter is generated by the Florida LAKEWATCH program, within UF/IFAS' Department of Fisheries and Aquatic Sciences. Support for the LAKEWATCH program is provided by the Florida Legislature, grants and donations. For more information about LAKEWATCH, to inquire about volunteer training sessions, or to submit materials for inclusion in this publication, write or call:

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the nest for some reason, incubation may require a few extra days. The males do not help with incubation.

The hen broods her newly hatched young for 24 hours before calling them from the nest site. They respond with peeping calls and immediately spring upward towards the nest entrance, pausing momentarily before launching themselves outward to the water or land that is sometimes as much as 60 feet below. Surprisingly enough, they usually land unharmed. If the nest is located over land, the clutch is quickly led to water, which may take as long as several hours. Snapping turtles have been known to take a heavy toll on the young as they learn how to swim.

The brood bonds break up after 5 weeks and the ducklings are fully feathered and can fly at from 8 to 10 weeks of age. Ducklings require a high protein diet to fuel their rapid growth so aquatic invertebrates such as dragonflies, aquatic insects and their larvae, beetles, and spiders are eaten during the early weeks in their life cycle. For successful recruitment into the adult population it is important that these food sources be abundant where the young grow and develop.

Wood ducks have an amazing ability to return to the same breeding area year after year. Sometimes several females will lay their eggs in one big "dump" nest that can contain from 30 to 50 eggs! Although these dump nests are sometimes abandoned, if they are successfully hatched and brooded they can greatly increase production. Over much of the year, wood ducks occur in pairs or small flocks of 4 to 15 birds, but hundreds may gather at fall and winter roost sites.

Heavy hunting pressures and habitat destruction through the early 1900s nearly brought the wood duck to near extinction. The total closure of wood duck hunting season from 1918 to 1941 along with habitat manipulation, the creation of artificial nesting sites, and captive breeding programs led to a rapid recovery in numbers over the following 20 years. However, the wood duck is no longer common in the Central Valley. There are now estimated to be well over 2 million wood ducks in North America. Another threat has come from the introduction of European Starlings that invade nesting cavities and displace the native birds like the wood duck.

The wood duck was a common species reported by Florida LAKEWATCH bird survey participants. This species was observed on 36 different lakes located throughout Florida and sightings ranged from as few as a single duck to as many as 44 ducks per survey. The average number of wood ducks observed was about 6 birds per survey. Data reported by the volunteers revealed that morning sightings were as likely as afternoon or early evening sightings. Although wood ducks were reported for all 12 months of the year, they were observed more frequently for the months of February through June. This may be related to their breeding/brooding behavior patterns where they may be more readily observed and localized.



Females have a duller coloration—a gray-brown neck and head with a white teardrop shaped eye-ring, white throat, gray-brown breast stippled with white that fades to a white belly, and a dark brown back. Both males and females have blue-green colored speculums with white rear borders on their wings. Pictured above are a female (in front) and male (in back) wood duck.

www.borealforest.org