Minimum and Guidance Levels for Jessamine Lake in Pasco County, Florida

March 17, 2008

Ecologic Evaluation Section
Resource Projects Department

Southwest Florida
Water Management District

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Brooksville, Florida 34604-6899

Cover: Ground-level photograph of Jessamine Lake and the District water level gauge in 1993 (Southwest Florida Water Management District files).

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Minimum and Guidance Levels for Jessamine Lake

State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum flow for a given watercourse "shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area", and the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Minimum flows and levels are used by the Southwest Florida Water Management District (District) for water resource planning, as one of the criteria used for evaluating water use permit applications, and for the design, construction and use of surface water management systems. Establishing a minimum flow or level does not in itself protect a water body from significant harm; however, resource protection, recovery and regulatory compliance may be ensured once the flow or level standards have been adopted.

Minimum flows and levels are established based upon the best available information with consideration given to "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). The Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.) provides additional guidance for the establishment of minimum flows and levels, requiring that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; and j) navigation."

The Southwest Florida Water Management District has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, subjected the methodologies to independent, scientific peer-review, and incorporated the methods into its Water Level and Rates of Flow Rule (Chapter 40D-8, F.A.C). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress-dominated wetlands greater than 0.5 acre in size, and for those without fringing cypress wetlands. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to levels expected to fully maintain the integrity of the wetlands are classified as Category 2 Lakes. Lakes without at least 0.5 acre of fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of

Guidance Levels, which serve as advisory information for the District, lakeshore residents and local governments, or to aid in the management or control of adjustable water level structures. Information regarding the development of adopted methods for establishing guidance and minimum lake levels is provided in Southwest Florida Water Management District (1999a) and Leeper *et al.* (2001). Bedient *et al.* (1999) and Dierberg and Wagner (2001) provide peer-review findings regarding the lake-level methods.

Two Minimum Levels and three Guidance Levels have typically been established for lakes, and upon adoption by the District Governing Board, incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

- The Ten Year Flood Guidance Level is provided as an advisory guideline for lakeshore development. It is the level of flooding expected on a frequency of not less than the ten-year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.

- The High Guidance Level is provided as an advisory guideline for construction of lakeshore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time on a long-term basis.

- The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis.

- The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis.

- The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lakeshore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time on a long-term basis.

In October 2007, the District Governing Board approved rule amendments pertaining to the elimination of Ten Year Flood Guidance Levels and references to the levels from Chapter 40D-8, F.A.C. Work related to the development of ten-year flood levels and other flood-recurrence levels is currently conducted through the District Watershed Management Program, and information pertaining to flood levels is included in watershed management plans that result from program activities.

In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Jessamine Lake, a Category 3 Lake located in Pasco County, Florida (Southwest Florida Water Management District 2006). The levels were

established using best available information, including data that were obtained specifically for the purpose of minimum levels development. Following a public input process, the District Governing Board approved adoption of the proposed levels on November 30, 2006 and the levels (Table 1) were subsequently incorporated into Chapter 40D-8, F.A.C. The data and analyses used for development of the adopted levels are described in the remainder of this report.

Table 1. Minimum and Guidance Levels for Jessamine Lake.

Minimum and Guidance Levels	Elevation (feet above NGVD)
High Guidance Level	141.1
High Minimum Lake Level	140.3
Minimum Lake Level	133.3
Low Guidance Level	127.1

Data and Analyses Supporting Development of Minimum and Guidance Levels for Jessamine Lake

Lake Setting and Description

Jessamine Lake is located in north-central Pasco County, Florida (Sections 1, 2, 11 and 12, Township 24 South, Range 20 East) in the Hillsborough River Basin of the Southwest Florida Water Management District (Figures 1 and 2). White (1970) classified the region of central or mid-peninsular Florida containing Jessamine Lake as the Brooksville Ridge. Brooks (1981) categorized the area surrounding the lake as the Dade City Hills division of the Ocala Uplift District, and described the region as 'a spectacular ridge of high hills dissected from Upper Miocene sand and silty sand". He also noted that "drainage is downward to the Floridan Aquifer and [that] solution is now the dominant process influencing the landscape". As part of the Florida Department of Environmental Protection's Lake Bioassessment/ Regionalization Initiative, the area has been identified as the Southern Brooksville Ridge region (Griffith *et al.* 1997). Lakes in the region tend to be neutral to alkaline, slightly colored, mesotrophic to meso-eutrophic systems.

Uplands in the immediate lake basin include areas that are currently used for low-density residential development, citrus production, livestock grazing and silviculture. Historical photographs from 1941 through 2005 (Figures 3-11) provide evidence for a long history of agriculture activity in the lake watershed. The District currently maintains a water-level gauging station along the southern shore of the lake.

The lake lies within the Crews Lake Outlet drainage basin in the Upper Coastal Areas watershed (United States Geological Survey Hydrologic Unit Classification System). Surface water inputs include direct precipitation on the lake surface, and runoff from immediately adjacent upland areas. No surface water drainage occurs from the basin currently (see Figure 3), and based on historical photography (United States Department of Agriculture 1941, 1944, 1951a, b, 1957a, b, United States Geological Survey 1984, 1994, 1999, 2005, Southwest Florida Water Management District 1987a, b, Woolpert Inc. 2003), this has been the case for the past 65 years. There are currently no surface-water withdrawals from the lake permitted by the District, although historically, lake water was likely used for irrigation purposes. There are currently several permitted groundwater withdrawals in the lake vicinity.

The "Gazetteer of Florida Lakes" (Florida Board of Conservation 1969, Shafer *et al.* 1986) lists a water surface elevation of 145 feet for Jessamine Lake, and lists the lake area at 77 acres. The 1954 and 1988 photorevised United States Geological Survey 1:24,000 Spring Lake quadrangle 7.5 minute topographic maps do not include a water surface elevation for Jessamine (Figure 12). A topographic map of the lake basin generated in support of minimum levels development (Figure 13) indicates that the lake extends over 80 acres when the water surface is at 145 feet above NGVD.

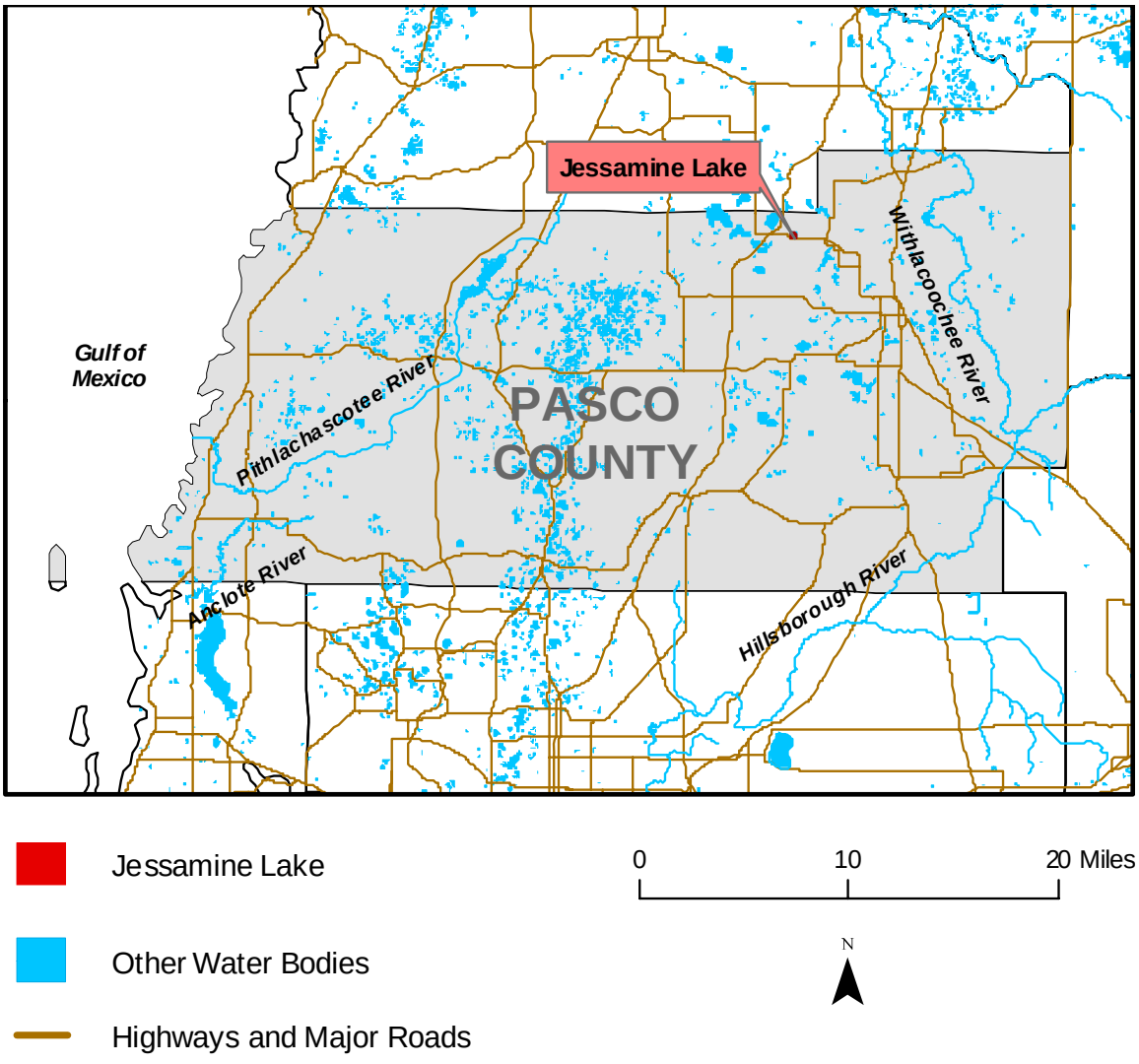


Figure 1. Locations of Jessamine Lake, other regional water bodies, highways and other major roads within and near Pasco County, Florida.

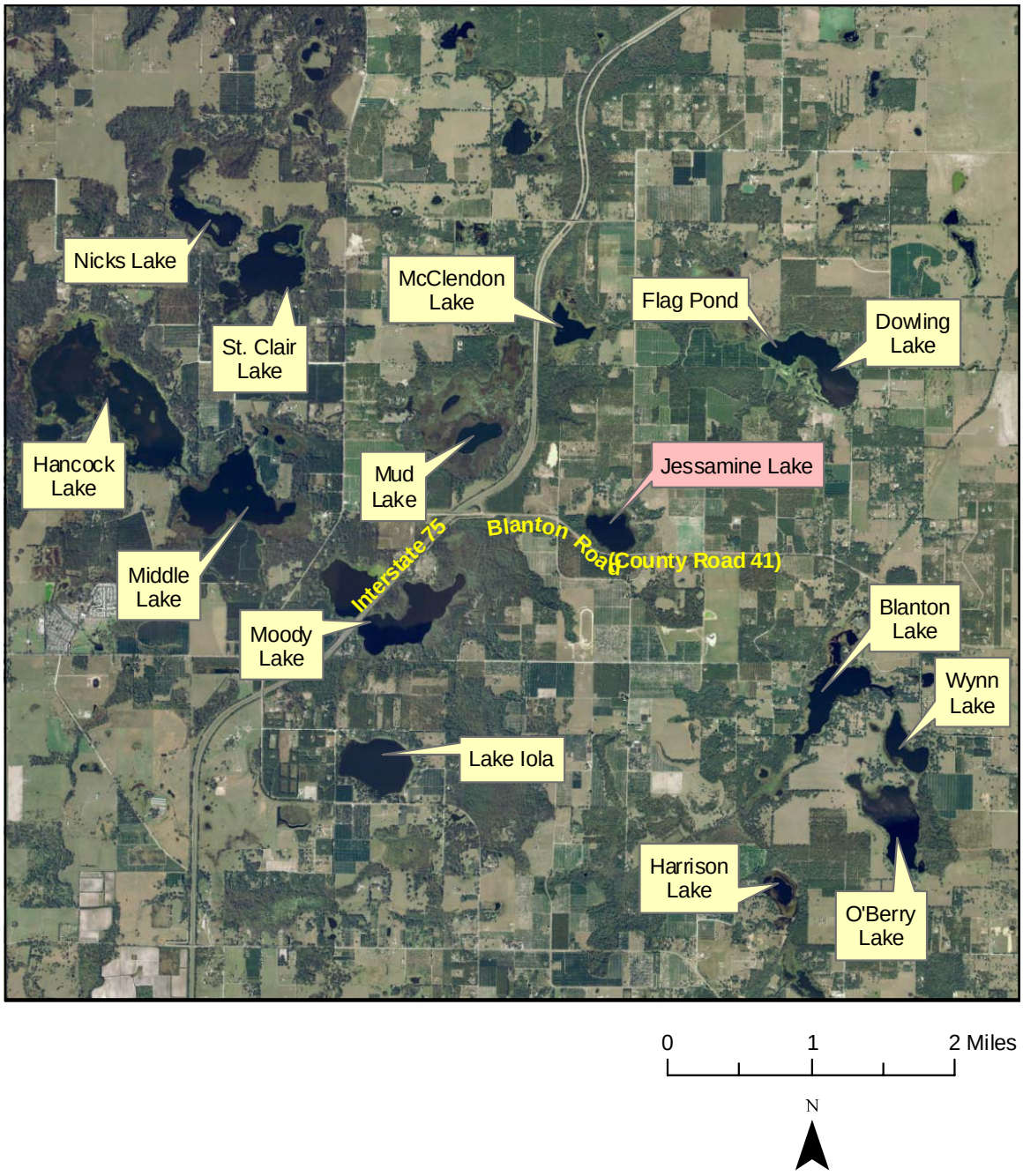


Figure 2. Aerial photograph of the Jessamine Lake area in 2005, showing major water bodies and roads. Photographic image is from United States Geological Survey digital orthophotography (United States Geological Survey 2005).

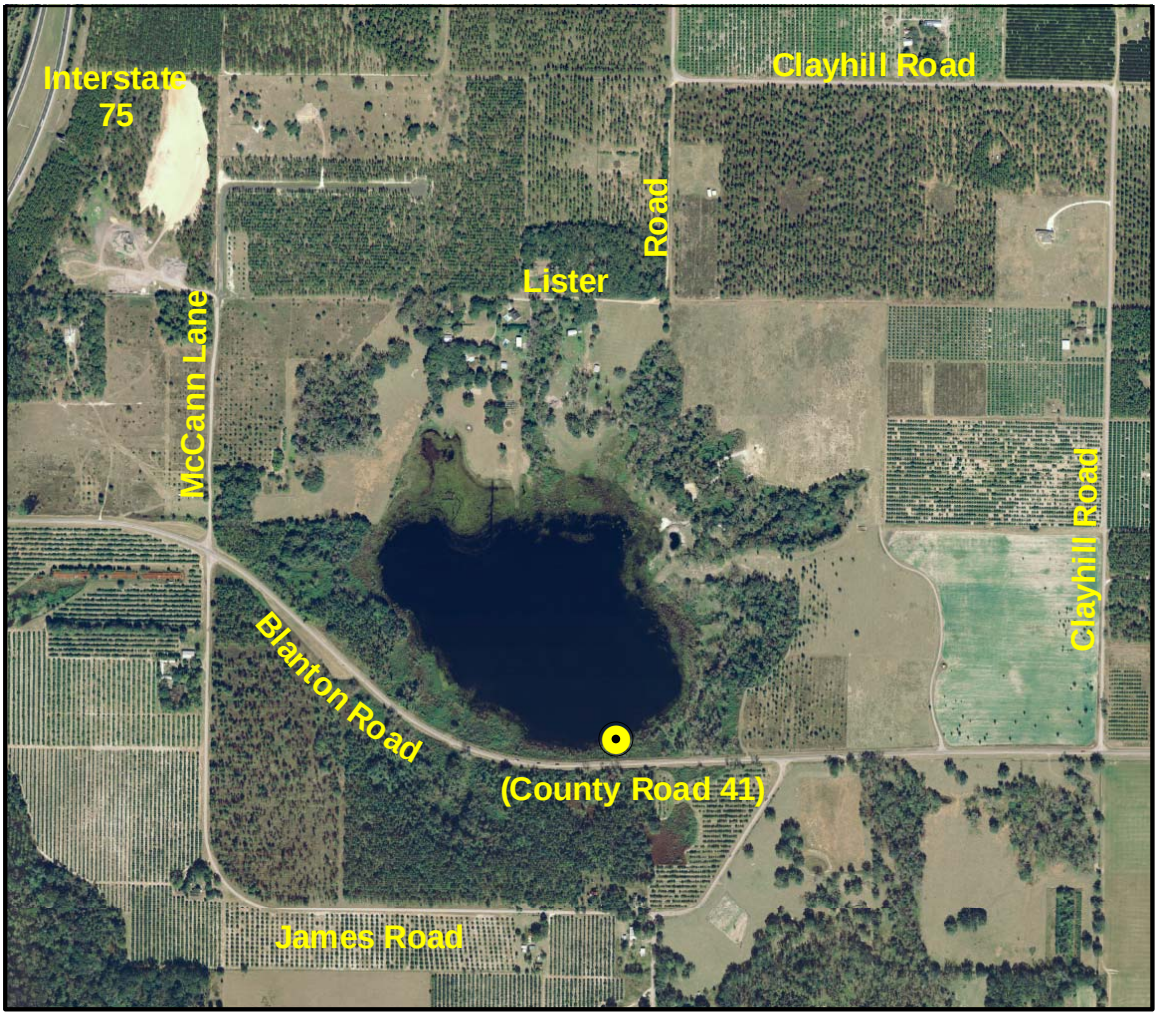


Figure 3. Aerial photograph of Jessamine Lake in 2005, showing the District water level gauge site and area roads. The photographic image is from United States Geological Survey digital orthophotography (United States Geological Survey 2005).

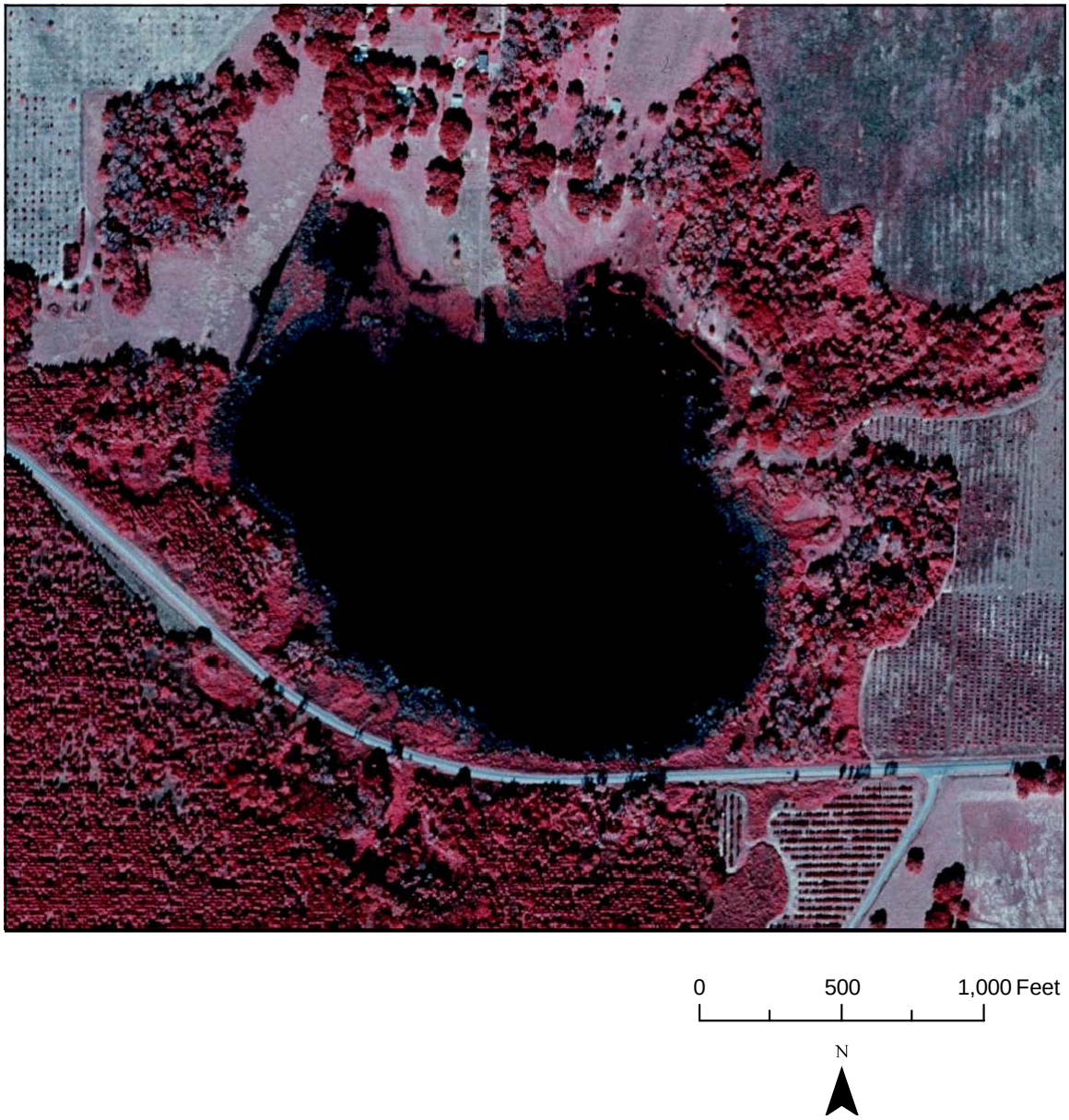


Figure 4. Aerial photograph of Jessamine Lake in 1999. Image is from United States Geological Survey digital orthophotography (United States Geological Survey 1999).

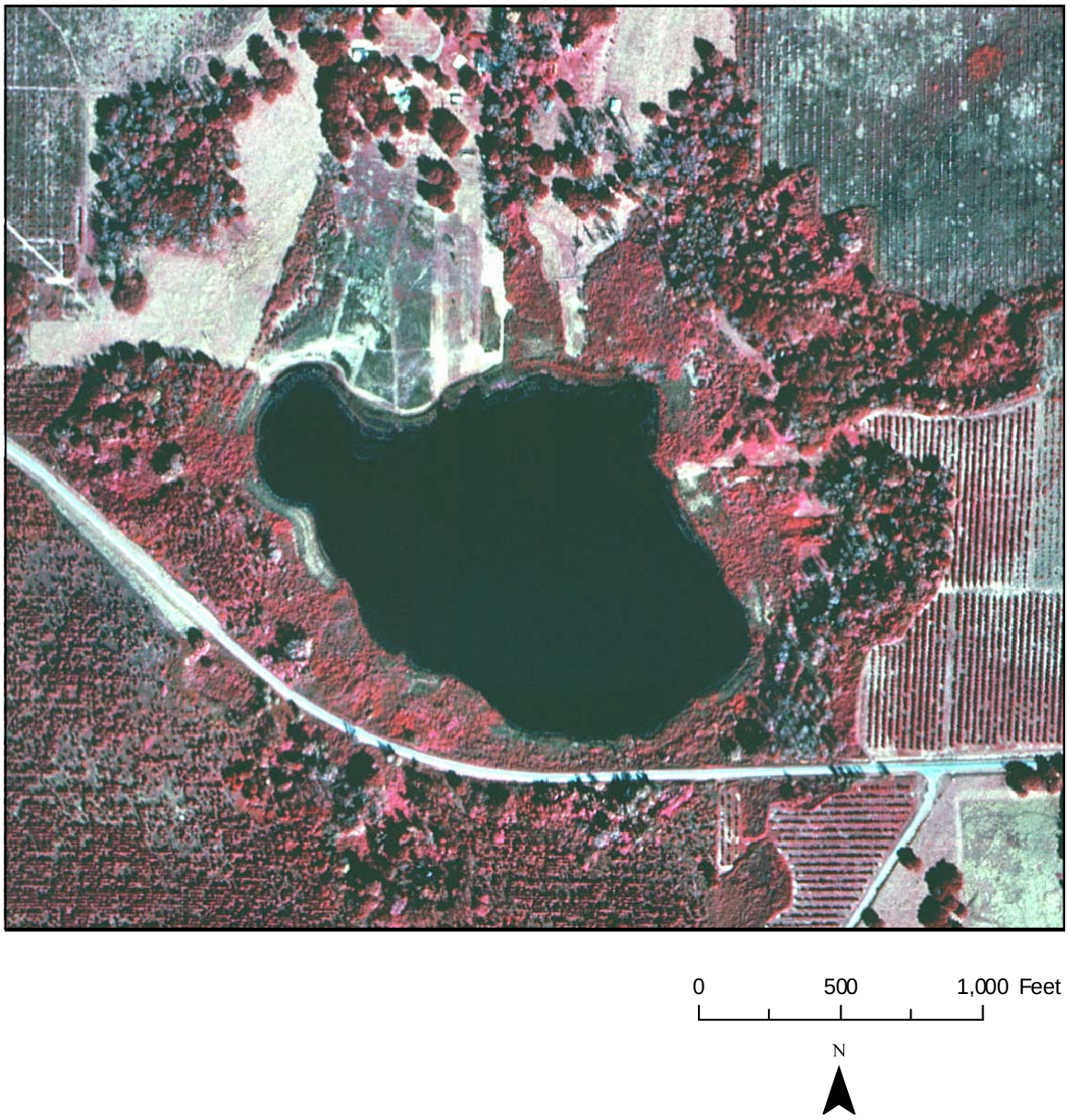


Figure 5. Aerial photograph of Jessamine Lake in 1994. Image is from United States Geological Survey digital orthophotography (United States Geological Survey 1994).

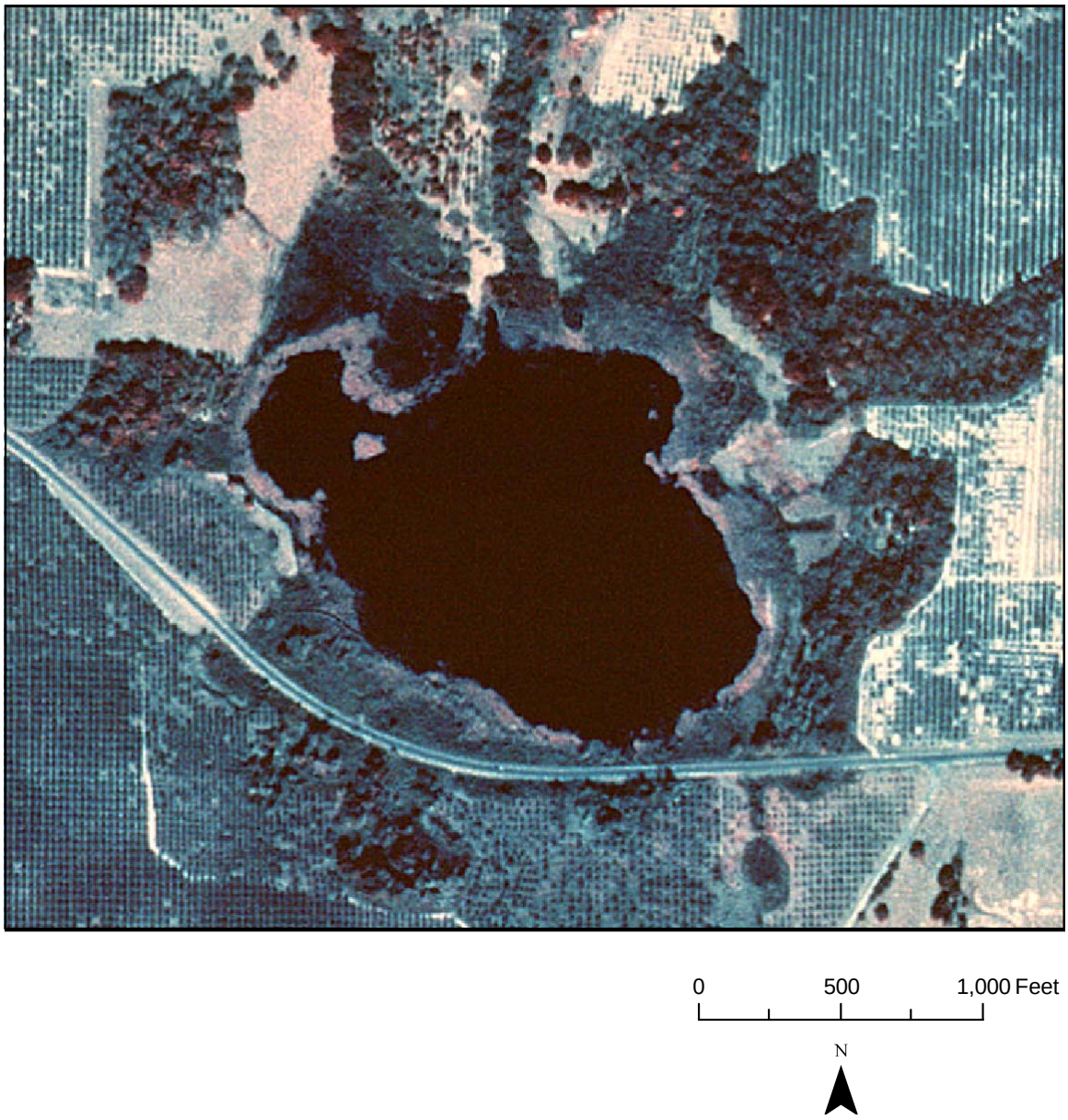


Figure 6. Aerial photograph of Jessamine Lake in 1984. Image is from United States Geological Survey National High Altitude Photography (United States Geological Survey 1984).

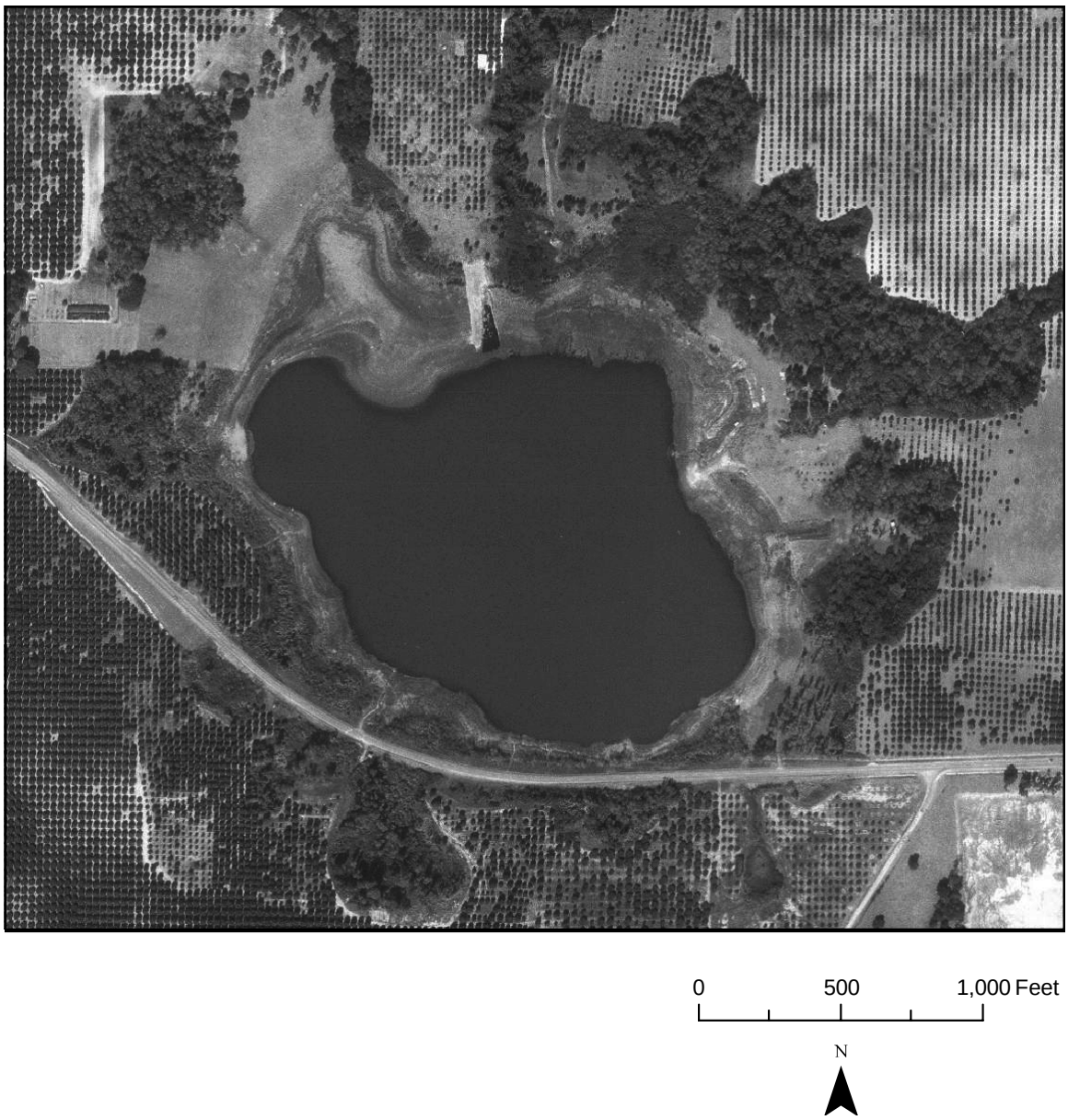


Figure 7. Aerial photograph of Jessamine Lake in 1973. Image is from Woolpert (2003).

Figure 8. Aerial photograph of Jessamine Lake (indicated by the yellow star) and areas west of the lake in March 1957 (United States Department of Agriculture 1957b).

Figure 9. Aerial photograph of Jessamine Lake (indicated by the yellow star) and areas west of the lake in May 1951 (United States Department of Agriculture 1951a).

Figure 10. Aerial photograph of Jessamine Lake (indicated by the yellow star) and areas west of the lake in November 1944 (United States Department of Agriculture 1944).

Figure 11. Aerial photograph of Jessamine Lake (indicated by the yellow star) and areas to the southwest of the lake in January 1941 (United States Department of Agriculture 1941).

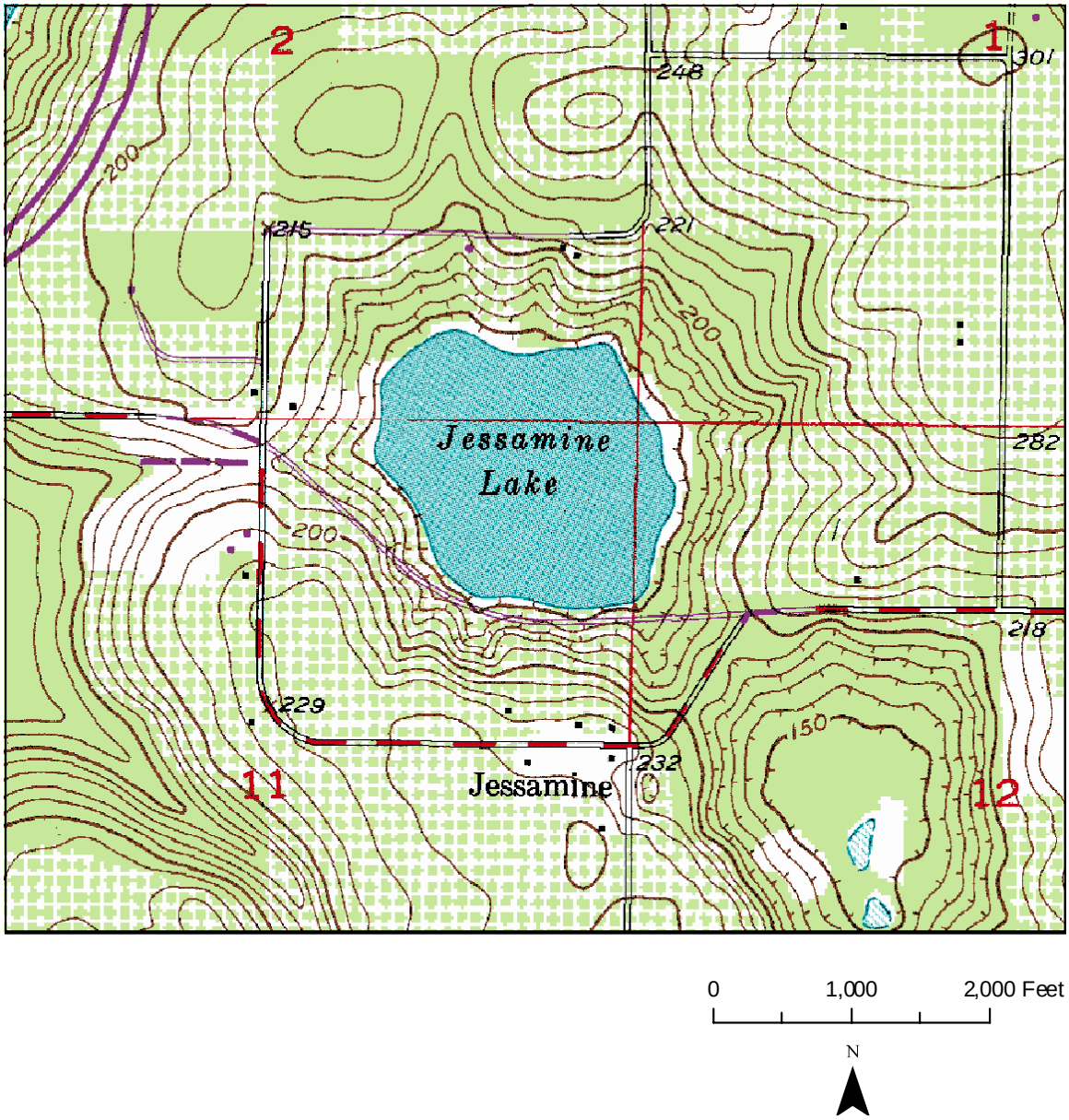
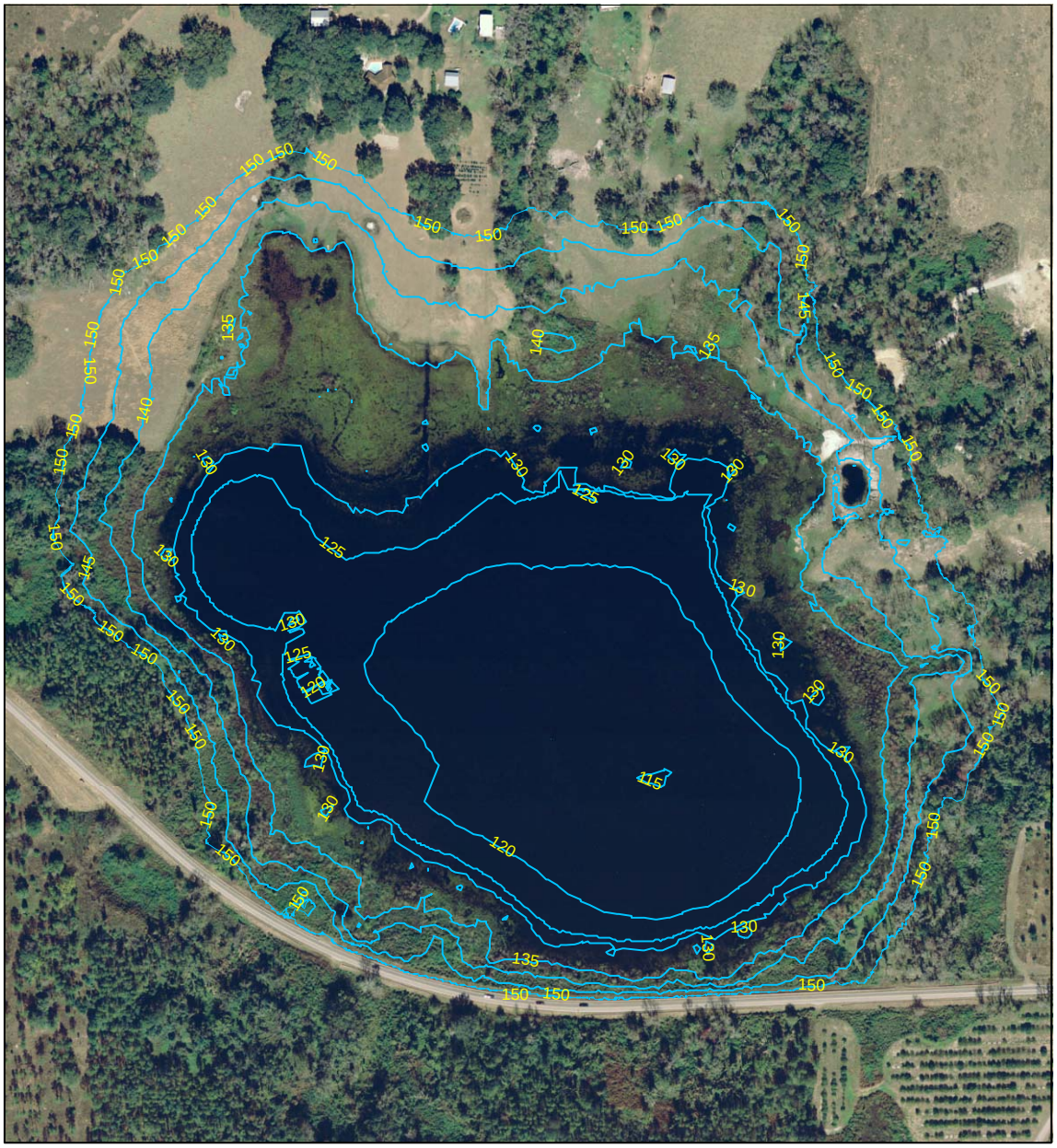


Figure 12. Ten-foot elevation (feet above NGVD) contours in the vicinity of Jessamine Lake as shown on United States Geological Survey 7.5 minute series topographic maps (United States Geological Survey 1954, 1988). Image is from the U.S. Geological Survey 1:24,000 scale topographic map (DRG) layer available from the Mapping and GIS Section of the Southwest Florida Water Management District.



Map prepared using spot elevation data collected by D.C. Johnson Associates in May 2005, LiDAR data collected by EarthData International, Inc. in 2004, and USGS (2005) digital orthophotography.

Figure 13. Five-foot elevation (feet above NGVD) contours within the Jessamine Lake basin.

Previously Adopted Guidance Levels

The Southwest Florida Water Management District has a long history of water resource protection through the establishment of lake management levels. With the development of the Lake Levels Program in the mid-1970s, the District began establishing management levels based on hydrologic, biological, physical and cultural aspects of lake ecosystems. By 1996, management levels for nearly 400 lakes had been established.

Management levels (Table 2, currently referred to as Guidance Levels) for Jessamine Lake were approved by the Governing Board in May 1986 and incorporated into District rules (Chapter 40D-8, F.A.C.). A Maximum Desirable Level of 140.00 feet above NGVD was also developed but was not adopted by rule. The levels were developed using a methodology that differs from the current District approach for establishing Minimum and Guidance Levels, and do not, therefore, necessarily correspond with levels developed using current methods. Following the November 2006 adoption of Minimum and Guidance Levels for Jessamine Lake that were developed using the current methods, the previously adopted Guidance Levels were removed from Chapter 40D-8., F.A.C.

Annually since 1991, a list of stressed lakes has been developed to support the District's water-use permitting program. As described in the District's Consumptive Use of Water Rule (Chapter 40D-2, F.A.C.), "a stressed condition for a lake is defined to be chronic fluctuation below the normal range of lake level fluctuations". For lakes with adopted High, Low and Extreme Low Levels, chronic fluctuation below the Low Level is considered a stressed condition. For lakes without adopted levels, the evaluation of stressed condition is conducted on a case-by-case basis.

Jessamine Lake has previously been classified as a stressed lake (see Gant 1999a, 1999b, 2000, 2002, 2003, 2004, 2005, 2006). Based on the adoption of Minimum Levels for the lake in November 2006, Jessamine Lake was not included in the most recent stressed lakes list (Gant 2007) nor will it be included in future list evaluations. Evaluation of water level fluctuations within the basin will instead be incorporated in annual determinations of compliance with adopted Minimum Levels.

Table 2. Previously adopted guidance Levels for Jessamine Lake.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	144.18
High Level	142.00
Low Level	138.00
Extreme Low Level	136.00

Summary Data Used for Minimum and Guidance Levels Development

Minimum and Guidance Levels were developed for Jessamine Lake using the methodology for Category 3 lakes described in Chapter 40D-8, F.A.C. The levels and additional information are listed in Table 3, along with lake surface areas for each elevation. Detailed descriptions of the development and use of these data are summarized in subsequent sections of this report.

Table 3. Minimum and Guidance Levels, lake stage exceedance percentiles, normal pool, control point elevation, significant change standards and associated surface areas for Jessamine Lake.

	Elevation (feet above NGVD)	Lake Area (acres)
Lake Stage Exceedance Percentiles		
Historic P10	141.1	72
Historic P50	134.1	54
Historic P90	127.1	31
Period of Record P10	136.8	62
Period of Record P50	131.2	42
Period of Record P90	124.9	28
Normal Pool and Control Point		
Normal Pool	NA	NA
Control Point	NA	NA
Guidance Levels		
High Guidance Level	141.1	72
Low Guidance Level	127.1	31
Significant Change Standards		
Wetland Offset	133.3	51
Species Richness Standard	131.9	46
Basin Connectivity Standard*	131.4 (132.4)	43 (48)
Aesthetic Standard	127.1	31
Lake Mixing Standard	115.5	1
Dock-Use Standard	NA	NA
Recreation/Ski Standard	NA (133.0)	NA (51)
Minimum Levels		
High Minimum Lake Level	140.3	70
Minimum Lake Level	133.3	51

NA = not available or not applicable

* = Elevations and lake areas listed parenthetically correspond to values associated with Basin Connectivity and Recreation/Ski Standards that could be developed if powerboats were used at the lake.

Lake Stage Data and Exceedance Percentiles

Lake stage data, *i.e.,* surface water elevations, for Jessamine Lake (Site Identification Number 18330, formerly Universal Identification Number STA 437 438) are currently available from the District Water Management System from February 1978 and from June 1980 through November 2007 (Figure 14, see Figure 3 for current location of the District water level gauge). The highest surface water elevation for the lake included in the database, 140.88 feet above NGVD, occurred on June 7, 1989. The low of record, 122.07 feet above NGVD, was recorded on December 22, 1981.

For the purpose of Minimum Levels determination, lake stage data are categorized as "Historic" for periods when there were no measurable impacts due to water withdrawals, and impacts due to structural alterations were similar to existing conditions. In the context of levels development, "structural alterations" means man's physical alteration of the Control Point, or highest stable point along the outlet conveyance system of a lake, to the degree that water level fluctuations are affected. Lake stage data are categorized as "Current" for periods when there were measurable, stable impacts due to water withdrawals, and impacts due to structural alterations were stable.

Based on water-use estimates and analysis of lake water levels and regional ground water fluctuations, all available lake-stage data for Jessamine Lake were classified as Historic data. Although the water level data record extends over 28 years, it was determined that Historic lake-stage exceedance percentiles would be better estimated using a longer data record. Historic lake-stage exceedance percentiles were, therefore, developed using a composite 60-year record of monthly mean lake surface elevations based on available stage records that were supplemented with modeled estimates. The 60-year period was considered sufficient for incorporating the range of lake-stage fluctuations that would be expected based on long-term climatic cycles that have been shown to be associated with changes in regional hydrology (Enfield et al. 2001, Basso and Schultz 2003, Kelly 2004).

Modeled monthly mean lake stage values for the composite data set were estimated using a linear fitting procedure known as the line or organic correlation (see Helsel and Hirsch 1992). The procedure was used to describe the relationship between available lake stage data for Jessamine Lake and potentiometric surface elevations for the Upper Floridan Aquifer system, as measured at the Sharpes Ferry West Floridan well site (District Universal Identification Number WEL 2555 1834; United States Geological Survey Number 29111508592501) in Marion County. The line of organic correlation equation developed for the lake and well data collected from February 1978 through September 2002 was used to estimate water surface elevation values for Jessamine Lake for the period from January 1946 through December 2005 (M. Hancock, Southwest Florida Water Management District unpublished data). A Historic, composite data set of monthly mean water surface elevations for Jessamine Lake was then developed using the modeled water surface elevations and available lake stage records (Figure 15). The composite record includes periods when estimated water surface elevations were higher than the values that have been measured at the lake gauging

station. The highest value included in the composite data set, 149.77 feet above NGVD, was estimated for October 1960.

The Historic P10 elevation, the elevation the lake water surface equaled or exceeded ten percent of the time during the historic period, was 141.1 feet above NGVD. The Historic P50, the lake water surface elevation equaled or exceeded fifty percent of the time during the historic period, was 134.1 feet above NGVD. The Historic P90, the elevation the lake water surface equaled or exceeded ninety percent of the time during the historic period, was 127.1 feet above NGVD. The Historic lake stage exceedance elevations are slightly higher than percentiles derived from the empirical data collected during the past twenty-eight years. Period of record P10, P50 and P90 elevations, based on measured values, were 136.8, 131.2 and 124.9 feet above NGVD, respectively.

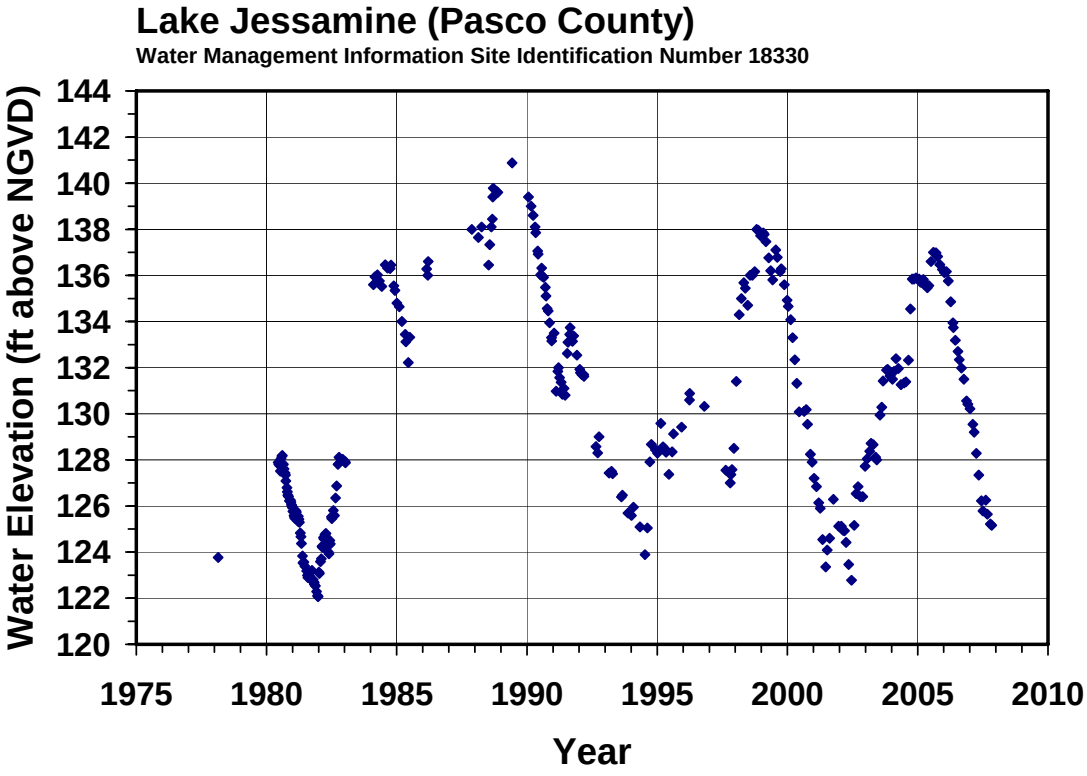


Figure 14. Measured surface water elevations for Jessamine Lake through November 2007. Data were obtained from the District Water Management Information System.

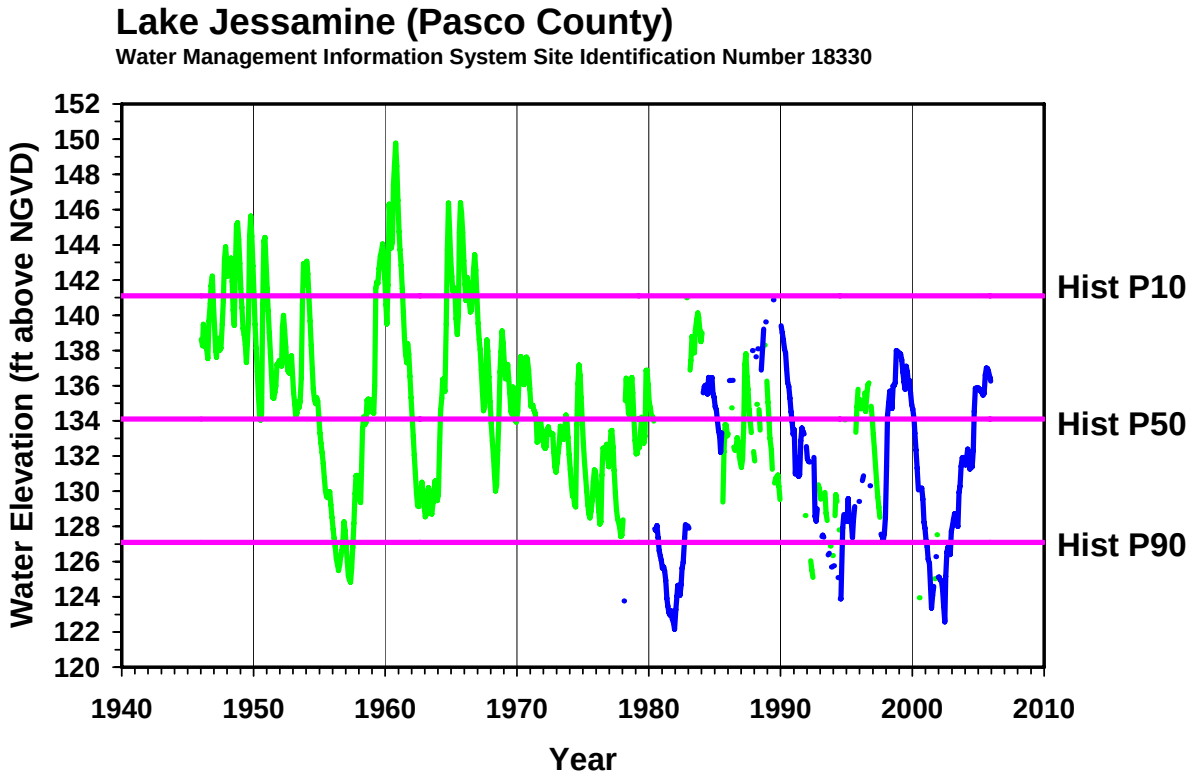


Figure 15. Composite monthly-mean surface water elevations and Historic lake-stage exceedance percentiles for Jessamine Lake, from January 1946 through December 2005. Composite data include values based on measured water surface elevations (blue) and modeled values (green). Historic exceedance percentiles include the Historic P10 (Hist P10), Historic P50 (Hist P50) and Historic P90 (Hist P90).

Normal Pool, Control Point Elevation and Determination of Structural Alteration Status

The Normal Pool elevation, a reference elevation used for development of minimum lake and wetland levels, is established based on the distribution of Hydrologic Indicators of sustained inundation. Hydrologic indicators of Normal Pool include biological and physical features that become established as a result of recent or long-term water levels. No reliable indicators of normal pool were identified along the margin of Jessamine Lake, so a Normal Pool elevation was not established. District field notes from 1978 (Southwest Florida Water Management District 1996) indicate that an old pumping station on the lakeshore at that time suggested that water elevations were historically, at or higher than 142.0 feet above NGVD. The Florida Department of Environmental Protection has identified a safe upland line for the lake at 136.0 feet above NGVD (Malloy 2005).

For development of minimum and guidance levels, lakes are classified as open or closed basin lakes. Open basin lakes are systems that are connected to, or are part of an ordered surface water conveyance system, *i.e.*, they have outlets or inlets for conveyance of surface water. Closed basin lakes are those that are not part of an ordered conveyance system. Because Jessamine Lake does not currently and does note appear to have historically had an outlet, the lake was classified as a closed basin lake.

The Control Point elevation is the elevation of the highest stable point along the outlet profile of a surface water conveyance system (*e.g.,* weir, canal or culvert) that is the principal control of water level fluctuations in the lake. A Control Point may be established at the invert or crest elevation associated with a water control structure at a lake outlet, or at a high, stable point in a lake-outlet canal, ditch or wetland area. The invert elevation is the lowest point on the portion of a water control structure that provides for conveyance of water across or through the structure. A crest elevation typically refers to the top or ridge of fixed-weirs or operable gates, over which water may flow. Because Jessamine Lake does not have an outlet, a Control Point elevation was not established for the basin.

Structural alteration status is determined to support development of the High Guidance Level. In addition to identification of outlet conveyance system modifications, comparison of the Control point elevation with the Normal Pool is typically used to determine if a lake has been structurally altered. If the Control Point elevation is below the Normal Pool, the lake is classified as a structurally altered system. If the Control Point elevation is above the Normal Pool or the lake has no outlet, then the lake is not considered to be structurally altered. Based on review of available survey data (D.C. Johnson Associates 2006) and topographic maps, and because the lake lacks an outlet, Jessamine Lake was determined not to be Structurally Altered.

Guidance Levels

The Ten Year Flood Guidance Level has historically been provided as advisory information for lakeshore development and is the level of flooding expected on a frequency of not less than the ten-year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year. District rules (Chapter 40D-8, F.A.C.) previously included a Ten Year Flood Guidance Level of 144.18 feet above NGVD for Jessamine Lake (see Southwest Florida Water Management District 1991, 1996a). Recent work completed in support of the District's Watershed Management Program has, however, yielded a new, provisional ten-year recurrence flood stage for the lake. Based on a storm-event modeling approach, Ardaman and Associates, Inc. (2007) identified a ten year flood recurrence level for Jessamine Lake at 143.0 feet above NGVD. It should be noted that the Watershed Management Plan that includes the provisional flood elevation for Jessamine Lake will be subjected to public review prior to finalization of project results.

In October 2007, the District Governing Board approved rule amendments to remove all adopted Ten Year Flood Guidance Levels from Chapter 40D-8, F.A.C. The intent of this action was not to discontinue development of regional and site-specific flood stage information, but rather to promote organizational efficiency by eliminating unnecessary rules. Flood stage levels continue to be developed under the District's Watershed Management Program, but ten year flood recurrence levels are not incorporated into Chapter 40D-8, F.A.C. In accordance with this policy, Chapter 40D-8, F.A.C. does not currently include a Ten Year Flood Guidance Level for Jessamine Lake.

The High Guidance Level is provided as an advisory guideline for construction of lakeshore development, water dependent structures, and operation of water management structures. The High Guidance Level is the expected Historic P10 of the lake, and is established using historic data if it is available, or is estimated using the Current P10, the control point and the normal pool elevation. Based on the availability of Historic data for Jessamine Lake, the High Guidance Level was established at the Historic P10 elevation, 141.1 feet above NGVD.

The Low Guidance Level is provided as an advisory guideline for water dependent structures, and as information for lakeshore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time on a long-term basis, and is established using Historic or Current data and, in some cases, reference lake water regime statistics. Reference lake water regime statistics are used when adequate historic or current data are not available. These statistics represent differences between P10, P50 and P90 lake stage elevations for typical, regional lakes that exhibit little or no impacts associated with water withdrawals (*i.e*., reference lakes). Reference lake water regime statistics include the RLWR50, RLWR90 and RLWR5090, which are, respectively, median differences between P10 and P50, P50 and P90, and P10 and P90 lake stage percentiles for a set of reference lakes. Based on the availability of Historic data for Jessamine Lake, the Low Guidance Level was established at the Historic P90 elevation, 127.1 feet above NGVD.

Lake Classification

Lakes are classified as Category 1, 2 or 3 for the purpose of Minimum Levels development. Systems with fringing cypress wetlands greater than 0.5 acres in size where water levels regularly rise to an elevation expected to fully maintain the integrity of the wetlands (*i.e.,* the Historic P50 is not more than 1.8 feet below the Normal Pool elevation) are classified as Category 1 Lakes. Lakes with fringing cypress wetlands greater than 0.5 acres in size that have been structurally altered such that the Historic P50 is more than 1.8 feet below the Normal Pool elevation are classified as Category 2 Lakes. Lakes without fringing cypress wetlands or with less than 0.5 acres of fringing cypress wetlands are classified as Category 3 Lakes. Based on the lack of lake-fringing cypress wetlands within the lake-basin, Jessamine Lake was classified as a Category 3 lake.

Significant Change Standards and Other Information for Consideration

Lake-specific significant change standards and other available information are developed for establishing Minimum Levels. The standards are used to identify thresholds for preventing significant harm to cultural and natural system values associated with lake ecosystems, in accordance with guidance provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, F.A.C.). Other information taken into consideration for Minimum Levels development includes potential changes in the coverage of herbaceous wetland and submersed aquatic plants.

For Category 3 lakes, six significant change standards, including a Species Richness Standard, an Aesthetics Standard, a Lake Mixing Standard, a Recreation/Ski Standard, a Dock-Use Standard and a Basin Connectivity Standard are developed. These standards identify desired median lake stages that if achieved, are intended to preserve various natural system and human-use lake values.

The Basin Connectivity Standard is developed to protect surface water connections between lake basins or among sub-basins within lake basins to allow for movement of aquatic biota, such as fish, and support recreational use of the lake. The standard is based on the elevation of lake sediments at a critical high spot between lake basins or lake sub-basins, identification of water depths sufficient for movement of biota and/or watercraft across the critical high spot, and use of Historic lake stage data or region-specific reference lake water regime statistics. For Jessamine Lake, the Basin Connectivity Standard was established at 131.4 feet above NGVD, based on the elevation that ensures connectivity between the major and minor sub-basins of the lake (123.4 feet above NGVD), a one-foot water depth in the area of connectivity to allow for movement of biota between the sub-basins, and the difference between the Historic P50 and Historic P90 elevations (7.0 feet). The standard elevation was equaled or exceeded sixty-eight percent of time during the Historic period of record; *i.e*., the standard elevation corresponds to the Historic P68. If powerboats were used at the lake, the Basin Connectivity Standard would be established at 132.4 feet above NGVD, based on the requirement for a water depth of two feet at the critical high spot of connectivity.

The Species Richness Standard is developed to prevent a decline in the number of bird species that may be expected to occur at or utilize a lake. Based on an empirical relationship between lake surface area and the number of birds expected to occur at a lake, the standard is established at the lowest elevation associated with less than a fifteen percent reduction in lake surface area relative to the lake area at the Historic P50 elevation. For Jessamine Lake, the Species Richness Standard was established at 131.9 feet above NGVD. The Species Richness Standard was equaled or exceeded sixty-five percent of the time during the Historic period of record; *i.e.*, the standard elevation corresponds to the Historic P65.

The Aesthetics Standard is developed to protect aesthetic values associated with the inundation of lake basins. The standard is intended to limit potential change in aesthetic values associated with the median lake stage from diminishing beyond the values associated with the lake when it is staged at the Low Guidance Level. The Aesthetic Standard is established at the Low Guidance Level, which for Jessamine Lake occurs at an elevation of 127.1 feet above NGVD. Because the Low Guidance Level was established at the Historic P90 elevation, water levels equaled or exceeded the Aesthetics Standard ninety percent of the time during the Historic period of record.

The Dock-Use Standard is developed to provide for sufficient water depth at the end of existing docks to permit mooring of boats and prevent adverse impacts to bottom-dwelling plants and animals caused by boat operation. The standard is based on the elevation of lake sediments at the end of existing docks, a two-foot water depth for boat mooring, and use of Historic lake stage data or region-specific reference lake water regime statistics. Based on the lack of docks in the basin, a Dock-Use Standard was not developed for Jessamine Lake.

The Recreation/Ski Standard is developed to identify the lowest elevation within the lake basin that will contain an area suitable for safe water skiing. The standard is based on the lowest elevation (the Ski Elevation) within the basin that can contain a 5-foot deep ski corridor delineated as a circular area with a radius of 418 feet, or a rectangular ski area 200 feet in width and 2,000 feet in length, and use of Historic lake stage data or region-specific reference lake water regime statistics. Based on field observations indicating that Jessamine Lake is not used for water skiing, a Recreation/Ski Standard was not developed. If the lake was used for skiing, a Recreation/Ski Standard could be established at 133.0 feet above NGVD, based on the sum of the Ski Elevation (126.0 ft above NGVD) for the basin and the 7.0-foot difference between the Historic P50 and Historic P90. The elevation associated with this standard was equaled or exceeded fifty-eight percent of the time during the Historic period, *i.e.,* the standard elevation corresponds to the P58.

The Lake Mixing Standard is developed to prevent significant changes in patterns of wind-driven mixing of the lake water column and sediment resuspension. The standard is established at the highest elevation at or below the Historic P50 elevation where the dynamic ratio (see Bachmann *et al.* 2000) shifts from a value of <0.8 to a value >0.8, or from a value >0.8 to a value of <0.8. For Lake Jessamine, this would occur at an elevation of 115.5 feet above NGVD (Figure 16). Because the lake would extend over only one acre at this elevation, development of a Lake Mixing Standard was not considered appropriate for Jessamine Lake.

Herbaceous Wetland Information is taken into consideration to determine the elevation at which change in lake stage would result in substantial change in potential wetland area within the lake basin (*i.e*., basin area with a water depth of four or less feet). Review of changes in potential herbaceous wetland area in relation to change in lake stage did not indicate that of use of the applicable significant change standards would be inappropriate for establishment of the Minimum Lake Level (Figure 16). However,

because herbaceous wetlands are common within the lake basin, it was determined that an additional measure of wetland change should be considered for minimum levels development. Based on a recent review (Hancock 2006) of the development of minimum level methods for cypress-dominated wetlands, it was determined that up to an 0.8 foot decrease in the Historic P50 elevation would likely not lead to significant change in the herbaceous wetlands occurring within lake basins. A Wetland Offset elevation of 133.3 feet above NGVD was therefore established for Jessamine Lake by subtracting 0.8 feet from the Historic P50 elevation.

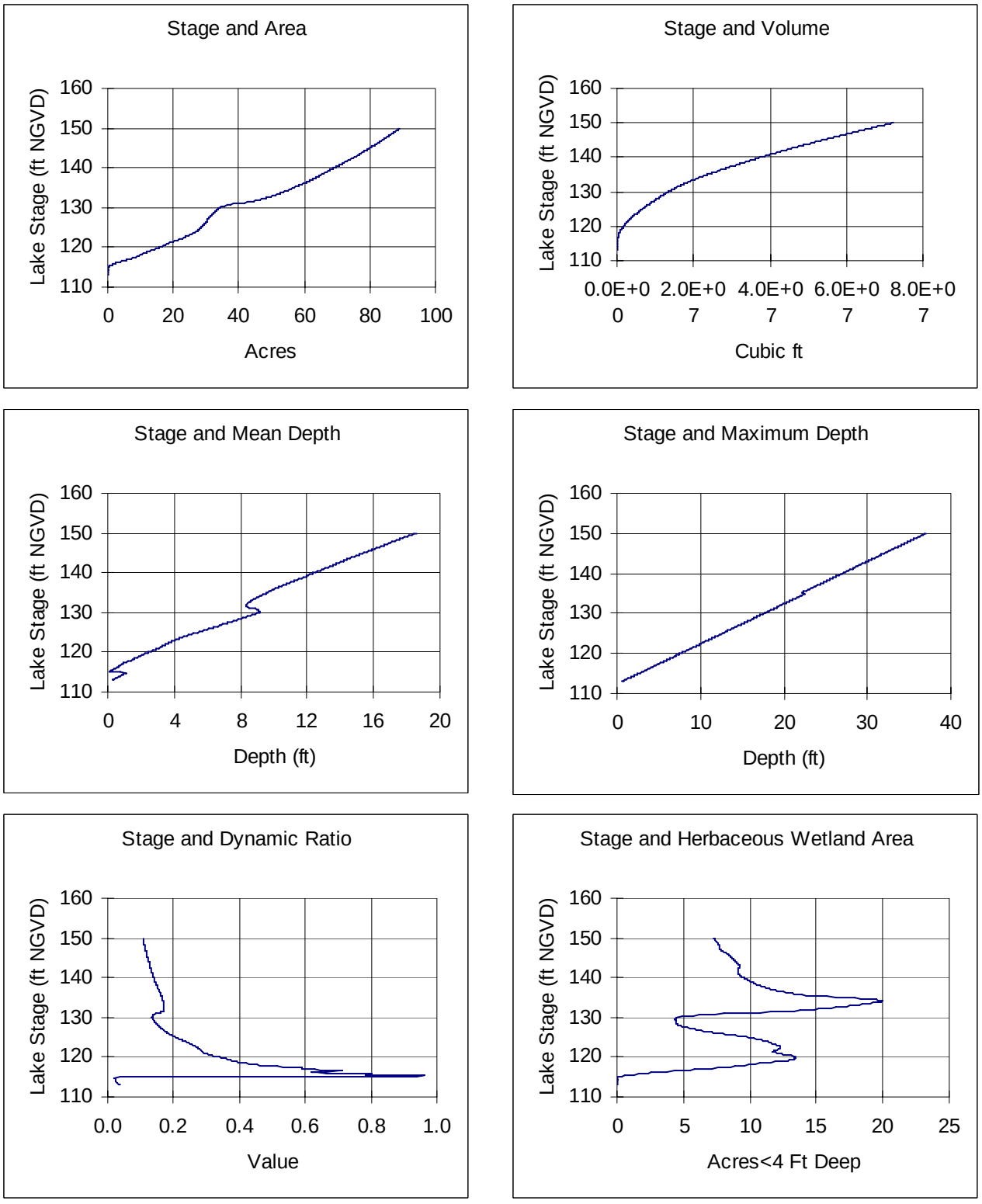


Figure 16. Jessamine Lake surface area, volume, mean depth, maximum depth, dynamic ratio (basin slope) and potential herbaceous wetland area versus lake stage.

Minimum Levels

Minimum Lake Levels are developed using specific lake-category significant change standards and other available information or unique factors, including: potential changes in the coverage of herbaceous wetland vegetation and aquatic macrophytes; elevations associated with residential dwellings, roads or other structures; frequent submergence of dock platforms; faunal surveys; aerial photographs; typical uses of lakes (*e.g.,* recreation, aesthetics, navigation, irrigation); surrounding land-uses; socio-economic effects; and public health, safety and welfare matters. Minimum Level development is also contingent upon lake classification*, i.e.,* whether a lake is classified as a Category 1, 2 or 3 lake.

The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis. For Category 3 lakes, the Minimum Level is typically established at the elevation corresponding to the most conservative significant change standard*, i.e.,* the standard with the highest elevation, except where that elevation is above the Historic P50 elevation, in which case, the Minimum Level is established at the Historic P50 elevation. Because all significant change standards were below the Historic P50 elevation, the Minimum Level could be established at the Species Richness Standard, the highest of the developed standards. The Minimum Lake Level was, however, established at 133.3 feet above NGVD, the Wetland Offset elevation. This level is expected to afford protection to the natural system and human-use values associated with the identified significant change standards and also provide protection for wetlands occurring within the basin.

The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis. For Category 3 lakes, the High Minimum Lake Level is developed using the Minimum Lake Level, Historic data or reference lake water regime statistics. If Historic Data are available, the High Minimum Lake Level is established at an elevation corresponding to the Minimum Lake Level plus the difference between the Historic P10 and Historic P50. If Historic data are not available, the High Minimum Lake Level is set at an elevation corresponding to the Minimum Lake Level plus the region-specific RLWR50. Because Historic data are available for Jessamine Lake, the High Minimum Lake Level was established at 140.3 feet above NGVD, by adding the difference between the Historic P50 and Historic P10 (7.0 feet) to the Minimum Lake Level.

The minimum and guidance levels for Jessamine Lake are shown in Figure 17 along with monthly mean water surface elevations based on measured lake stage values. Review of available data indicated that staging of the lake at the minimum levels would not flood any man-made features within the immediate lake basin (see Figure 18 for the approximate lake margins when the water surface is at the minimum levels). Based on review of recent field survey data (D.C Johnson Associates 2006) and an aerial photography with contours map (Southwest Florida Water Management District 1987), the High Minimum Lake Level was found to be approximately 12.7 feet below the lowest

spot on the paved roads in the lake vicinity, and about 37 feet below the floor elevation of the lowest residential home within the immediate lake basin (Table 4).

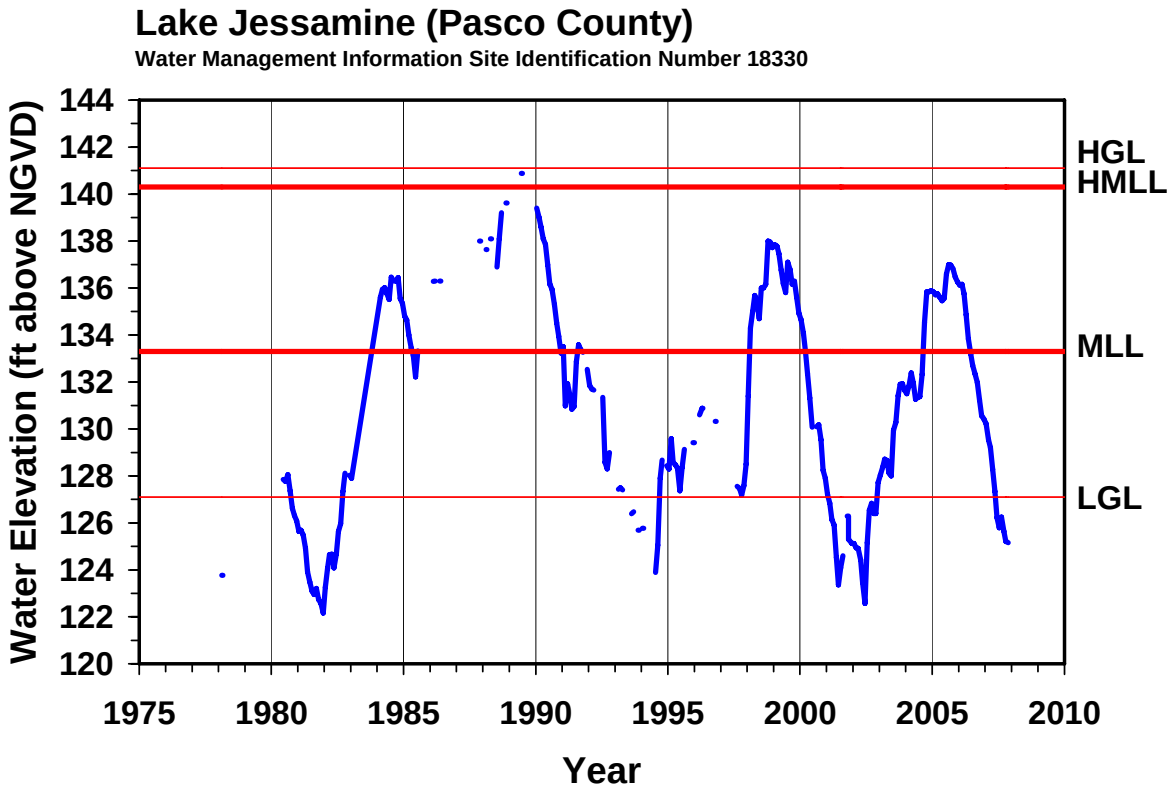
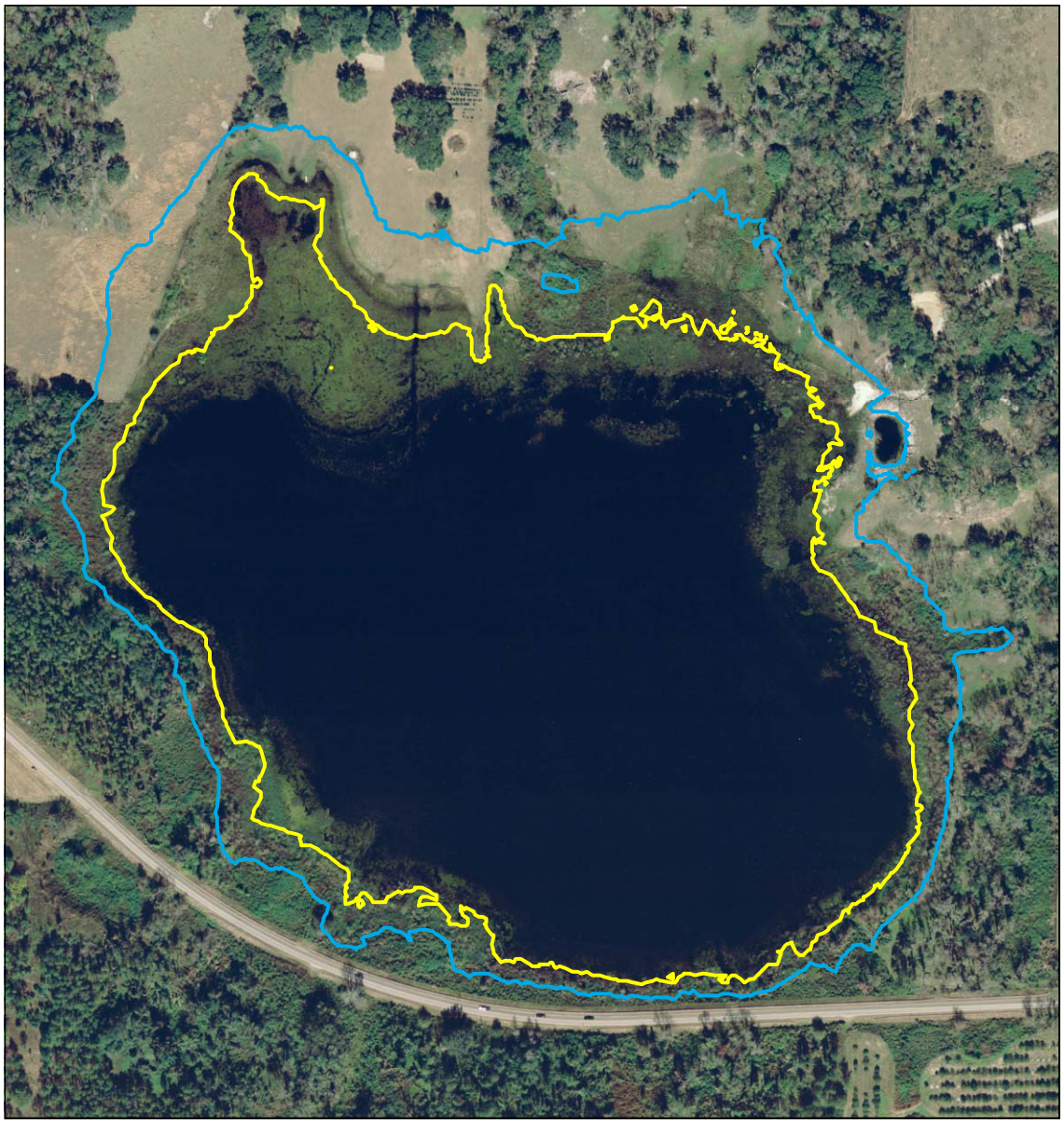


Figure 17. Guidance and Minimum Levels and mean monthly water surface elevations through November 2007 for Jessamine Lake. Adopted levels include the High Guidance Level (HGL), High Minimum Lake Level (HMLL), Minimum Lake Level (MLL) and Low Guidance Level (LGL).

Table 4. Elevations of lake basin features in the immediate Jessamine Lake basin.

Lake Basin Features	Elevation (feet above NGVD)
Low paved road	153.0
Low Floor Slab	177 (estimated)



Minimum Levels Contours

MLL = 133.3 ft above NGVD

HMLL = 140.3 ft above NGVD

0 250 500 Feet

N

Map prepared using spot elevation data collected by D.C. Johnson Associates in May 2005, LiDAR data collected by EarthData International, Inc. in 2004, and USGS (2005) digital orthophotography.

Figure 18. Approximate location of the Minimum Lake Level (MLL) and High Minimum Lake Level (HMLL) for Jessamine Lake.

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