WATERSHED EVALUATION REPORT

DUCK LAKE WATERSHED (L737)

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1.0 INTRODUCTION

1.1 AUTHORIZATION AND PURPOSE

The Southwest Florida Water Management District (SWFWMD) entered an agreement with Pasco County to provide a multi-year Watershed Management Plan (WMP) for the Duck Lake Watershed. Inwood Consulting Engineers, Inc. (Inwood) was authorized by SWFWMD to perform engineering and GIS services to provide the WMP under Agreement No. 11CC0000005 (L737).

1.2 PROJECT LOCATION AND GENERAL DESCRIPTION

Duck Lake Watershed is located in northeastern Pasco County, west of the Withlacoochee River. It is approximately 39.6 square miles in size and is tributary to the Withlacoochee River. Dade City lies near the geographic center of the watershed and the cities of St. Leo and San Antonio are located along its western edge. US 301 traverses from south to north through the center of the watershed, and State Road 52 runs from west to east terminating in Dade City. The center of the watershed, within the vicinity of Dade City, is highly urbanized while the land use for the remainder of the watershed consists of a mixture of agricultural, wetland and lower density urban land use types. A project location map is shown in **Figure 1**.

1.3 PURPOSE AND OBJECTIVES

The goal of developing the WMP is to provide a basis for which to evaluate the capacity and performance of the watershed concerning flood protection, water quality, and natural systems. The SWFWMD process for watershed analysis is comprised of three elements:

1. Watershed Evaluation
2. Watershed Management Plan
3. Maintenance of Watershed Parameters and Models

This report presents a summary of the data collected and work completed through the Watershed Evaluation element of the Watershed Management Plan. The Watershed Evaluation element has the following goals:

- Compile, review and evaluate existing watershed data;
- Collect, review and prepare topographic data;
- Develop watershed features that define watershed hydrology and hydraulics;
- Identify survey requirements;
- Develop a watershed GIS database.

This report is intended to be used in conjunction with the concurrently submitted electronic data. All work was completed according to the SWFWMD's Guidelines and Specifications (G&S) and supporting Guidance Documents.

2.0 WATERSHED INVENTORY

2.1 CHARACTERIZATION OF THE WATERSHED AND TRIBUTARIES

Duck Lake Watershed is a predominantly deranged terrain, but there are some incidences of channelized connectivity. The area is typically represented by rolling hills surrounding relatively flat plains. Slopes can be significant along the ridges, but are generally mild in the lower areas. The topography consistently slopes from the west towards the Withlacoochee River, located east of the watershed. Elevations range from approximately 57 feet (NAVD 88) in the east to approximately 270 feet (NAVD 88) in the west. A low ridge defines the eastern boundary of Duck Lake Watershed and represents a break between the watershed and the Green Swamp/Withlacoochee River. Within the watershed, Dade City, St. Leo, and the Lake Jovita subdivision reflect significant developed areas drained by stormwater collection systems.

Hydrologically, the western areas in the watershed are typically internally drained through sandy, permeable soils or into depressional storage areas. Runoff flows toward the east by overtopping depressions or culvert connections. Numerous depressions are landlocked and either do not discharge or do so only under high stage conditions. Along the eastern portion of the watershed (east of Old Lakeland Highway and US 301), the hills give way to flatter, lower-lying topography that is dominated by wetlands. The western portion of the watershed discharges to these wetlands via numerous cross drains located beneath Old Lakeland Highway and US 301. Much of the wetlands systems have been modified for agricultural purposes. Duck Lake, located along the central-eastern boundary of the watershed, connects to these wetlands.

The wetland system generally flows from south to north via overland flow and culvert connections. Near Dade City, flow is consolidated into an excavated canal (Dade City Canal), which continues north until it exits the northeastern part of the watershed. Upon exiting the watershed, the canal continues northeast toward the Withlacoochee River. The Dade City Canal represents the primary discharge outlet for Duck Lake Watershed.

Under higher stages, Duck Lake provides an additional point of discharge via a culvert under Duck Lake Canal Road. Duck Lake discharges to the east via the culvert and a short length of canal that ultimately drains to the Withlacoochee River. The 100-year flood elevation (FEMA, 2014) for the Withlacoochee River ranges from approximately 75 feet (NAVD88) in the north to 78 feet (NAVD88) in the south for the segment of the river adjacent to Duck Lake Watershed. The flood elevations suggest significant interplay between river and the eastern portion of the watershed during high stage conditions.

The watershed was separated into seven subwatersheds. Subwatershed boundaries were developed based on topography (ridgelines and depression areas) and locations of significant hydraulic features (typically road crossings). See **Figure 2** for a Watershed Boundary Map.

2.2 PREVIOUS STUDIES

Several studies have been completed for the Duck Lake Watershed. These studies were reviewed for pertinent information and hydrologic understanding of the project area. These studies include:

- Duck Lake Watershed Evaluation (URS, 2008) – This study defined a watershed boundary, assembled watershed feature data, developed preliminary catchments and connectivity, documented existing flooding problems within the watershed, and identified survey needs in preparation for a watershed analysis.

- Tank Lake Area Watershed Management Plan (URS, 2006) – This study developed the watershed management plan elements for the Tank Lake area, which is a subwatershed of Duck Lake Watershed. This study defined a watershed boundary, inventoried hydrologic and hydraulic features, identified survey needs, and developed a watershed model for analysis of the Tank Lake area.
- Tank Lake Operable Structure Evaluation (URS, 2008) – This study presents the background data, analysis and results of an evaluation to construct an operable outfall structure for Tank Lake.
- Duck Lake Stormwater Management Master Plan (Water and Air Research, 1987) – This study presents a comprehensive Stormwater Management Master Plan (SWMMP) for the Duck Lake study area. This report includes information on historic flood events, the primary drainage system, hydrologic and water surface profile modeling, and stormwater management regulations.

2.3 DIGITAL TERRAIN MODEL DEVELOPMENT

The DTM for the Duck Lake Watershed was created from elevation and breakline data developed from Light Detection and Ranging (LiDAR) technology. The following subsections provide details about the data used to produce the DTM.

2.3.1 Topographic Data Source

SWFWMD provided topographic data (i.e., LiDAR points and breaklines) for the watershed area. The LiDAR data were captured under the M112 Contract by Earth Data International in April 2004 and evaluated by Watershed Concepts in September 2004. LiDAR points were provided in LAS format and 3-D breaklines were provided in an ArcGIS geodatabase.

2.3.2 Horizontal and Vertical Datum

Topographic data were provided in the North American Datum (NAD) of 1983 (feet) for horizontal and the North American Vertical Datum (NAVD) of 1988 (feet) for vertical. All topographic data were projected in State Plane Florida West FIPS 0902 (Feet - HARN), per SWFWMD requirements.

2.3.3 Digital Elevation Model (DEM)

SWFWMD performed preliminary topographic processing and provided the initial project DEM. The DEM was built using a 5-foot by 5-foot grid according to SWFWMD guidelines.

2.3.4 Topographic Voids and Issues

Per the SWFWMD G&S document, topographic voids are defined as areas where "the available topographic information does not represent the current topography" as a result of (1) land alterations, (2) limitations of aerial photogrammetric projection methods, or (3) topography is not available. Inwood conducted a review of the DEM to evaluate topographic voids, areas of new development, and appropriate breakline enforcement. This review was conducted using aerial review of 2004 and 2011 imagery, LP360 and preliminary Arc Hydro results. Topographic issues identified during the review are summarized as follows:

- Approximately 700 acres of new development/surface change;
- Streamlines were burned into the DEM at some culvert crossing locations;

- LiDAR was flown during a wetter period, which resulted in a loss of detail in wetland areas due to high water and vegetation; and
- Due to significant slopes and the accuracy of LiDAR, some road centerlines were not defined clearly enough to result in catchment breaks in Arc Hydro.

Inwood performed limited topographic updates from plans information. Due to budget constraints, topographic voids were replaced with limited topographic information (e.g., pond dimensions, general site grading). The intent of topographic void replacement was to capture enough detail to reflect drainage patterns, represent system storage for modeling, and plot floodplains extents. The topographic updates did not necessarily capture all the topographic detail available in the plan set.

Roads with questionable catchment breaks were reviewed with Google Street View™ and/or in the field to confirm drainage patterns. Because adding a center breakline for the road typically did not correct the issue, roadway breaks were handled by using the "Build Walls" aspect of Arc Hydro to enforce catchment boundaries.

The issues with high water conditions within wetlands were not addressed due to a lack of additional topographic data. This issue will be revisited when setting initial stages and developing stage-storage relationships during model development.

2.3.5 Final DEM Creation

A final DEM was generated to incorporate topographic updates that were digitized from plans information. LAS point data was loaded into LP360, along with 3D breaklines from both the original LiDAR vendor and from the plans information digitized for this project. LAS points were reclassified in the areas where breaklines were added from plans information. A 5-foot by 5-foot grid DEM was generated for the project area using LP360. The DEM was plotted with extents such that the cell corners fell at coordinate intervals of 0 and 5.

See **Figure 3** for a Digital Elevation Model Map.

2.3.6 QA/QC Process Description

A senior engineer reviewed the final DEM by visual inspection and compared the updated areas against plans information to confirm the appropriateness of elevations. The revised surface was also checked using test runs in Arc Hydro to confirm drainage patterns and appropriateness for future modeling efforts.

2.4 HYDROLOGIC INVENTORY

2.4.1 Catchment Delineation Process

Catchments were delineated using Arc Hydro Tools, an extension for ArcGIS, which were executed on the DEM. Catchments were delineated for water bodies, wetlands, stormwater facilities, culvert crossings, and at intervals along channels. Catchments were delineated for areas both identified by Arc Hydro Tools and manually identified through desktop review.

The watershed was delineated predominantly as a deranged watershed. The terrain is generally not dendritic and lent itself to processing through use of sinks in Arc Hydro. In developed areas with drainage systems routed to stormwater ponds, catchments were delineated for the total drainage area to the pond. In general, local level drainage infrastructure was not distinguished as having separate catchments. However, in some cases for Dade City, long pipe runs were subdivided into multiple catchment areas. In these cases, catchments were subdivided

considering the contributing areas, convergence of multiple pipelines, and the length of stormsewer pipe that would be modeled.

2.4.2 Tributary Catchments and Characterization

There are seven subwatersheds identified within the watershed. These subwatersheds are grouped with respect to topography and points of discharge. Within the subwatersheds, there are 1,226 catchments, which range in size from approximately 0.1 acres to 388 acres. There are 68 catchments less than an acre in size. These smaller catchments are distributed throughout the watershed. They typically represent small wetland depressions, ponds for small developments, or percolation ponds for small, privately operated wastewater treatment facilities. The average catchment size across the watershed is 20.9 acres.

The subwatersheds characteristics vary across the watershed with regards to elevation ranges and land use characteristics. Subwatersheds A, D, and G in the western portion of the watershed have the highest variation in elevation with elevations ranging from approximately 70 feet to over 200 hundred feet. Wetlands areas dominate in Subwatersheds C, F, and G in the eastern portion of the watershed. The urban portions of the project area are concentrated in Subwatershed B, D, and E, which includes the Dade City area. Subwatershed A also has a fair amount of development due to the presence of the Lake Jovita subdivision and St. Leo University. Dade City Canal, the main outfall feature, is located in subwatersheds F and G. Of the eight subwatersheds, A is the largest (6,826 acres) and E is the smallest (1,079 acres).

The catchments are summarized by subwatershed in **Table 1** and illustrated in **Figure 4**.

2.4.3 Soil Characterization

The Natural Resources Conservation Service (NRCS) SSURGO (Soil Survey Geographic Database) data were obtained from SWFWMD. Soils in the watershed are predominantly (74.5%) well-drained, sandy soils represented by hydrologic group A. Hydrologic group B/D (11.6%) makes up the next largest group of soils followed by hydrologic group C (5.4%). The remaining soils are a mix of hydrologic groups A/D, B, D, and unclassified soils (pits, urban land complex, etc.). Group A soils are prevalent in the upland areas throughout the watershed. The more poorly drained soils are concentrated in the depressional areas, particularly in the low-lying areas in the central-western and eastern portions of the watershed.

Hydrologic soil groups are listed by subwatershed in **Table 2** and are depicted in **Figure 5**.

2.4.4 Land Use Characterization

Land use data (2011) were obtained from SWFWMD. Duck Lake Watershed is predominantly rural though there is a significant portion that is covered by urban land uses. The two largest land use categories are agricultural (37%) and urban (35%). The most prevalent land use in the watershed is cropland and pastureland (29%) followed by water and wetlands (15.4%). Low density residential (14.6%), forest (10 %), and medium density residential (9.2%) are the next largest land uses. The remaining land uses are evenly distributed among undeveloped and developed land uses.

Land uses are tabulated by subwatershed in **Table 3** and depicted in **Figure 6**.

2.4.5 Existing Floodplain Characterization

FEMA recently issued new Digital Flood Insurance Rate Maps (DFIRMs) for Pasco County. The floodplain mapping by the DFIRMs is effective as of September 26, 2014. There are

approximately 6,778 acres of existing Special Flood Hazard Areas (SFHA or floodplains) in the watershed.

Floodplains cover approximately 26% of the watershed area. Of these, 4,679 acres (17.7% of watershed) are classified as Zone AE with Base Flood Elevations (BFE) being determined. The Zone AE flood zones are located predominantly in the eastern part of the watershed and result from conditions along the Withlacoochee River. Zone A flood zones (an area inundated by 100-year flooding for which no BFEs have been determined) cover approximately 1,287 acres (7.5% of the watershed). A small percentage (123 acres – 0.5%) is classified as 0.2 Percent Annual Chance or within the 500-year flood zone. These flood zones are located in the vicinity of Dade City and appear to correspond to areas serviced by stormwater pump stations. The remainder of the watershed is classified as Zone X, or outside of the 500-year flood zone.

The FEMA DFIRM floodplains are shown in **Figure 7**.

2.4.6 Tributary Hydrologic Parameterization

Hydrologic parameterization will be conducted under the next scope of work element for this project, the Watershed Management Plan. Hydrology will be analyzed using the Interconnected Channel and Pond Routing (ICPR) model, version 3.10, which will use the Green-Ampt method to predict rainfall excess. Parameters for the Green-Ampt method will be developed from the soils and land use data compiled during this Watershed Evaluation. Time of concentrations for each subbasin will be calculated using NRCS TR-55 methodology. Time of concentration flow paths will be created using Arc Hydro Tools executed on the 5 foot grid DEM to generate the longest flow paths and slopes.

2.4.7 QA/QC Process Description

Catchments were iterated several times in Arc Hydro to refine and obtain an acceptable level of detail. After each iteration, the project engineer reviewed the catchments for accurate delineation and appropriateness in relationship to the DEM. A senior engineer reviewed the final catchments for appropriateness and conformity with the G&S.

2.5 HYDRAULIC FEATURE INVENTORY

2.5.1 Hydraulic Feature Inventory Development

A hydraulic feature inventory was compiled based on ERP documents, roadway plans, subdivision plans, existing stormwater feature inventory (Dade City Stormwater Stormwater Inventory, 2011), review of aerial imagery, Google Street View™, and field reconnaissance. Hydraulic features were cataloged as a HydroNetwork in the project GWIS database using HydroJunctions (points) and HydroEdges (lines) to document structures (inlets, weirs, etc.) and pipes, respectively.

HydroJunctions and HydroEdges were placed for all stormwater infrastructure that was documented on plans and/or identified through reconnaissance efforts. Hydraulic Element Points (HEPs) were created for key features that were anticipated to be incorporated into future modeling efforts. These features typically included cross drains and pond control structures (drop structures and structural weirs). Local infrastructure (local street drainage) was typically documented with HydroEdges and Hydrojunctions, but not with HEPs. The inventoried data were used to identify areas requiring additional detailed data collection (topographic survey). Supporting documentation (permits, plans, etc.) for the HydroNetwork is included with the electronic deliverables for this project.

2.5.2 Summary of Water Body Features

Over 330 wetlands and water bodies are identified in the National Hydrography Dataset (NHD). Most of these features are small ponds or seasonal wetlands. Based on aerial imagery, many wetland areas fluctuate significantly between wet and dry periods.

There are 23 named lakes in the watershed, the largest of which being Clear Lake (a.k.a., Lake Jovita) at 153 acres. Other significant lakes include Sumner Lake, Harrison Lake, Sandbar Lake, Indian Lake, and Tank Lake. Duck Lake, for which the watershed is named, has relatively small area (4.5 acres) per the NHD data, but is situated in a larger wetland area that is approximately 185 acres. Water bodies are summarized by subwatershed in **Table 4**.

2.5.3 Summary of Conveyance Features

There are numerous channel conveyance features within the watershed resulting from the topography. However, many of these are localized drainage features (e.g., roadside swales) that will not be considered for modeling. A review of the watershed identified 37 channel segments as significant features that will be included in the model. These features are distributed throughout the watershed, but the most significant being the Dade City Canal, which is located in Subwatersheds F and G.

The hydraulic feature inventory process mapped over 2000 pipes. Most of the pipes represent local level drainage networks. Almost half of the pipes are located within Subwatershed A, which contains the Lake Jovita development. Many of the rest are associated with the Dade City area in Subwatersheds B, D, and E. Of these, approximately 400 pipe segments have been identified for inclusion in the model.

2.5.4 Hydraulic Connectivity

A hydrologic and hydraulic network consisting of hydraulic junctions (HydroJunctions) and reaches (HydroEdges) was generated using Arc Hydro Tools in ArcGIS. Arc Hydro Tools created the hydraulic network for overland flow based upon the flow paths interpreted from the DEM. Flow lines representing drainage infrastructure connectivity (culverts and control structures) were generated by manually placing the junctions and edges for hydraulic elements and incorporating them into the greater network using Arc Hydro Tools.

2.5.5 QA/QC Process Description

A project engineer reviewed the hydraulic inventory and hydraulic network to check for completeness (a hydrojunction for every catchment and boundary), accuracy of representation and topological correctness (e.g., every hydroedge began and ended at a hydrojunction). A senior engineer conducted a final Quality Control check.

3.0 SURFACE WATER RESOURCE ASSESSMENT APPROACH

An inventory of water quantity, hydrologic, and water quality data was performed to support future modeling efforts. Data from several sources, including the Florida Department of Environmental Protection (FDEP), Environmental Protection Agency (EPA), National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA), and the United States Geological Survey (USGS) were reviewed. These data are included in the supporting electronic documentation.

3.1 INVENTORY OF WATER QUANTITY DATA

Water quantity data include surface water levels and discharges from streams/rivers, lakes, springs and wetlands. Data were reviewed from several sources, including the USGS, SWFWMD, FDOT, FDEP, and Pasco County. Available data include four stations for SWFWMD and two stations for USGS. In addition, there are five SWFWMD Groundwater Well stations monitoring aquifer levels and 45 historical water level elevations. Of the historical water level locations, 30 are from FDOT, 14 are from SWFWMD, and one location is from Pasco County.

The water quantity data are summarized in **Table 5** and depicted in **Figure 9**.

3.2 INVENTORY OF WATER QUALITY DATA

A search was conducted of both the FDEP STORET database and the USGS for water quality monitoring stations. There were no water quality stations for the USGS located within the extent of the project area. However, FDEP STORET database listed 14 surface water samplings stations, which provide various biological and chemical data. There is one impaired water body directly adjacent to the project area. The Withlacoochee River (WBID 1329F) was flagged for Mercury (in fish tissue) in the 2010 Waterbody Report for Withlacoochee River and is listed as impaired in the most recent (2013) FDEP Impaired Waters GIS layer.

The water quality stations are listed in **Table 6** and the sampling station distribution is shown in **Figure 10**.

3.3 INVENTORY OF HYDROLOGIC DATA

Several sources, including SWFWMD, USGS, and NOAA, were researched for rainfall and evaporation data relevant to the study area.

SWFWMD has rainfall data for five sites within one mile or less of the Duck Lake Watershed boundary. Most of the locations provided daily accumulation values; however, one (Saint Leo - USC00087851) can provide 15-minute interval data. Additionally, there are five NOAA weather stations within one mile or less of the watershed boundary. One NOAA site inside the project boundary corresponds to the Saint Leo station in the SWFWMD dataset, but the four other NOAA sites are not listed by SWFWMD. The Saint Leo location provides 15-minute rainfall, temperature and weather type records, and the remaining stations record hourly precipitation totals. The rainfall stations are summarized by source in **Table 7** and depicted in **Figure 11**.

In addition to rainfall stations, there is also radar rainfall data available through SWFWMD. The radar rainfall data is based upon radar returns during storm events and then calibrated against ground monitoring stations. The SWFWMD radar rainfall data is formatted in 15-minute increments and available from 1994 through the present. The SWFWMD radar rainfall data grid is shown in **Figure 11.**

3.4 SURFACE WATER ASSESSMENT APPROACH

The Surface Water Resource Assessment (SWRA) will estimate pollutant loading to surface water resulting from stormwater runoff. Other sources of pollutants, such as atmospheric deposition, will not be considered. It is recommended to employ a non-point source pollutant loading model that estimates pollutant loading from surface water runoff using Event Mean Concentrations (EMCs) methodology. EMC Methodology estimates annual loading by determining mean annual runoff coefficients based on intersections of soil, land use, and directly connected impervious area

(DCIA), and by assigning average pollutant loading concentrations to different land use types. This methodology is documented in the *Environmental Resource Permit Stormwater Quality Applicant's Handbook* (FDEP and Water Management Districts, Draft – 2010). The EMC methodology is currently being utilized in other District projects.

The Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE-Seasonal), developed by Jones Edmunds and Associates, provides a GIS-based pollutant loading model to estimate pollutant loads and uses EMC methodology. Hernando County and SWFWMD have developed a methodology to employ the SIMPLE model for the SWRA that is documented in the *Approach to Assessing Level-of-Service, Surface Water Resources, and Best Management Practices for Watersheds in Hernando County, Florida* (Hernando County, 2013). Using the SIMPLE-Seasonal model and the Hernando County methodology, with adjustments as needed for Pasco County, is the recommended approach for this project.

The methodology to be utilized will be confirmed during the development of Surface Water Resource Assessment Task performed under the Watershed Management Plan phase. EMCs values will be aggregated from literature values as appropriate for the land use classifications prevalent in the study area. At a minimum, the following constituents are recommended for inclusion in the analysis:

- Total Nitrogen (TN)
- Total Phosphorous (TP)
- Total Suspended Solids (TSS)

The following constituents may also be considered:

- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Ammonia
- Nitrate/Nitrite
- Oil & Grease
- Total Recoverable Copper (Cu)
- Total Recoverable Lead (Pb)
- Total Recoverable Zinc (Zn)
- Total Recoverable Cadmium (Cd)

There are some limited water quality data to which the results of the pollutant loading model can be compared. However, results from this model will be best used to identify problem areas and to develop future water quality goals.

4.0 TOPOGRAPHIC SURVEY

4.1 ELEVATION CONTROL AND COLLECTION ACCURACY

Survey data will be collected per the specifications of the Southwest Florida Water Management District (SWFWMD) document "*Acquisition of Geospatial Information to Complete the Generic Watershed Parameters*" (Appendix of future *Watershed Management Program Guidelines and Specifications*). The horizontal datum for the data will be the North American Datum of 1983 (NAD83) upgraded to the High Accuracy Reference Network (HARN) and projected in the State Plane West coordinate system. The vertical datum for the data will be the North American Vertical Datum of 1988 (NAVD88). Horizontal and vertical control will be established using GPS/RTK with an accuracy of better than 0.1 foot horizontally and 0.2 foot vertically.

4.2 REQUIRED SURVEYS

Additional topographic survey will be needed to support future modeling efforts. Survey needs were identified from the inventoried hydraulic features. These features were selected based upon size, location, contributing area, and availability of existing information from plans data. The majority of identified features were road culverts, pond control structures, and channel cross sections. Locations of identified survey needs are shown in **Figure 12**.

4.2.1 Collected Survey

SWFWMD is providing survey assistance for this project. In September 2013, the SWFWMD collected a first phase of survey that was identified for the project area. This survey included the collection of 55 pipe locations of which 31 were control structures that included weir data. The survey data collected to date are shown in **Figure 12**.

4.2.2 Hydraulic Feature Surveys Needs

Features from the hydraulic feature inventory that are expected to be represented in future modeling efforts and which lacked existing information from plans data were identified for detailed survey. In general, the following types of features were selected:

- Bridges;
- Culverts connecting water bodies;
- Culverts located in conveyance paths; and
- Control structures on ponds

155 pipes (including control structures), 9 weirs, and 4 bridges have been identified for survey acquisition.

4.2.3 Cross Section Survey Needs

The desktop review and field reconnaissance identified key locations along conveyance features, including ditches, canals, and streams/creeks that would require surveyed cross sections to support modeling. A total of 69 channel cross sections have been identified for survey collection.

5.0 PRELIMINARY MODEL FEATURES

Preliminary model features were created based upon the updated GWIS database from survey data and from the Arc Hydro catchments and connectivity. Under future tasks, these features will be parameterized and imported to ICPR for hydrologic and hydraulic analysis of the watershed. Preliminary model features are depicted in **Figure 13**.

5.1 SUBBASINS

Model subbasins were created from the catchments delineated using Arc Hydro. Subbasins were delineated with sufficient detail to accurately represent storage and hydrology for the watershed. Key features identified for inclusion in the model were natural wetland / waterbodies, stormwater treatment ponds, other natural or manmade storage areas, and conveyance features (channels, cross drains and bridges). There are 1,223 model subbasins.

5.2 NODES

Model nodes were developed from the Hydrojunction feature class. Model nodes represent system storage within the model and are points at which the model computes flood stages. There is at least one model node for every subbasin. Additional nodes were added for connections along channels and as boundary nodes. All model nodes correspond to a HydroJunction in the HydroNetwork. There are 1,249 model nodes.

5.3 PIPES AND DROP STRUCTURES

Pipe and drop structure links were created based upon topographic survey data, ERP plans, FDOT roadway plans, and infrastructure inventory data. These links correspond to HydroEdges in the HydroNetwork. There are 227 pipe and 78 drop structure links.

5.4 CHANNELS

Channels were delineated along incised areas within the DEM. The channels are located along the major outfall channel (Dade City Canal), and at various other locations in throughout the watershed where the terrain indicates the presence of significant channel conveyance. Roadside swales and conveyance features were considered for inclusion in the model. Model channels correspond to channel hydroedges in the hydro network. There are 51 channel links.

5.5 WEIRS

There are two types of weir links incorporated in to the model features – structural weirs and natural overland flow weirs. Structural weirs were created based upon survey or plans data. Natural overflow weirs were developed using the HydroEdges created during Arc Hydro processing. Overflow links were only created to be internal to the watershed, except at the outfall locations. The overflow weirs are considered preliminary and it is anticipated they will be revised after initial model runs are used to identify any additional boundary overflow locations. There are currently 3,363 weir links.

5.6 BRIDGES

Four bridge links are included in the model features. The bridges will be modeled with rating curves developed using the WSPRO component in ICPR.

REFERENCES

1. SWFWMD's Guidelines and Specifications (G&S), SWFWMD, August 2002 (current revision)
2. Acquisition of Geospatial Information to Complete the Generic Watershed Parameters, SWFWMD, Current Version.

TABLES

Table 1 - Catchment Statistics by Subwatershed

Subwatershed		Catchments			
Name	Area (acres)	Count	Min Area (acres)	Max Area (acres)	Avg. Area (acres)
A	6,777	238	0.3	349.7	28.5
B	3,079	211	0.1	217.8	14.8
C	5,549	232	0.1	388.7	23.9
D	1,913	87	0.4	185.9	22.0
E	1,072	95	0.1	81.8	11.3
F	2,947	136	0.4	327.4	21.7
G	3,992	224	0.1	279.2	17.9
Totals	25,329	1,223			

Table 2 - Soils Characterization by Subwatershed

Subwatershed	Hydrologic Group	Acres	% Area
A	A	4,440.9	65.5%
A	A/D	108.0	1.6%
A	B/D	450.1	6.6%
A	C	882.3	13.0%
A	D	582.1	8.6%
A	N/A*	56.4	0.8%
A	W	257.7	3.8%
Subtotal		6,777.5	100.0%
B	A	2,567.7	83.4%
B	B/D	223.8	7.3%
B	C	60.9	2.0%
B	D	147.9	4.8%
B	N/A*	69.2	2.2%
B	W	9.3	0.3%
Subtotal		3,078.8	100%
C	A	4,351.1	78.4%
C	B/D	946.3	17.1%
C	C	73.0	1.3%
C	D	80.2	1.4%
C	N/A*	3.8	0.1%
C	W	94.4	1.7%
Subtotal		5,548.8	100%
D	A	1,579.5	82.6%
D	A/D	27.1	1.4%
D	B/D	50.2	2.6%
D	C	124.1	6.5%
D	D	49.6	2.6%
D	N/A*	71.3	3.7%
D	W	11.1	0.6%
Subtotal		1,912.9	100.0%
E	A	906.1	84.5%
E	B/D	16.4	1.5%
E	C	25.4	2.4%
E	N/A*	118.8	11.1%
E	W	5.4	0.5%
Subtotal		1,072.1	100.0%

* Pits, borrow areas, Urban Land Complex and other unclassified

Subwatershed	Hydrologic Group	Acres	% Area
F	A	1,665.8	56.5%
F	A/D	8.6	0.3%
F	B/D	824.7	28.0%
F	C	149.8	5.1%
F	D	101.6	3.4%
F	N/A*	57.1	1.9%
F	W	139.2	4.7%
Subtotal		2,946.8	100.0%
G	A	3,161.1	79.2%
G	A/D	88.8	2.2%
G	B	9.6	0.2%
G	B/D	553.9	13.9%
G	C	70.0	1.8%
G	D	26.4	0.7%
G	N/A*	25.5	0.6%
G	W	56.5	1.4%
Subtotal		3,991.8	100.0%

* Pits, borrow areas, Urban Land Complex and other unclassified

Table 3 - Land Use Characterization by Subwatershed

Subwatershed	FLUCCS Code	Land Use Description	Acres	% Area
A	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	1412.1	20.8%
A	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	519.2	7.7%
A	1300	RESIDENTIAL HIGH DENSITY	55.6	0.8%
A	1400	COMMERCIAL AND SERVICES	31.1	0.5%
A	1500	INDUSTRIAL	9.5	0.1%
A	1700	INSTITUTIONAL	164.0	2.4%
A	1800	RECREATIONAL	62.1	0.9%
A	1820	GOLF COURSES	424.2	6.3%
A	1900	OPEN LAND	142.0	2.1%
A	2100	CROPLAND AND PASTURELAND	1044.8	15.4%
A	2200	TREE CROPS	449.0	6.6%
A	2400	NURSERIES AND VINEYARDS	21.2	0.3%
A	2500	SPECIALTY FARMS	32.5	0.5%
A	2600	OTHER OPEN LANDS <RURAL>	135.1	2.0%
A	3100	HERBACEOUS	3.3	0.0%
A	3300	MIXED RANGELAND	1.7	0.0%
A	4100	UPLAND CONIFEROUS FOREST	8.1	0.1%
A	4110	PINE FLATWOODS	19.7	0.3%
A	4120	LONGLEAF PINE - XERIC OAK	122.3	1.8%
A	4340	HARDWOOD CONIFER MIXED	550.6	8.1%
A	4400	TREE PLANTATIONS	342.2	5.0%
A	5200	LAKES	161.9	2.4%
A	5300	RESERVOIRS	48.1	0.7%
A	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	436.7	6.4%
A	6210	CYPRESS	0.9	0.0%
A	6300	WETLAND FORESTED MIXED	31.3	0.5%
A	6410	FRESHWATER MARSHES	287.7	4.2%
A	6430	WET PRAIRIES	194.3	2.9%
A	6440	EMERGENT AQUATIC VEGETATION	15.3	0.2%
A	6530	INTERMITTENT PONDS	2.8	0.0%
A	7400	DISTURBED LAND	48.2	0.7%
Subtotal			6777.5	100%
B	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	508.9	16.5%
B	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	642.3	20.9%
B	1300	RESIDENTIAL HIGH DENSITY	76.4	2.5%
B	1400	COMMERCIAL AND SERVICES	190.6	6.2%
B	1500	INDUSTRIAL	14.8	0.5%
B	1700	INSTITUTIONAL	162.2	5.3%
B	1800	RECREATIONAL	54.4	1.8%
B	1900	OPEN LAND	164.7	5.3%
B	2100	CROPLAND AND PASTURELAND	545.7	17.7%
B	2200	TREE CROPS	124.9	4.1%

Subwatershed	FLUCCS Code	Land Use Description	Acres	% Area
B	2400	NURSERIES AND VINEYARDS	8.0	0.3%
B	2600	OTHER OPEN LANDS <RURAL>	35.4	1.1%
B	4100	UPLAND CONIFEROUS FOREST	22.8	0.7%
B	4110	PINE FLATWOODS	19.7	0.6%
B	4120	LONGLEAF PINE - XERIC OAK	19.4	0.6%
B	4340	HARDWOOD CONIFER MIXED	51.5	1.7%
B	4400	TREE PLANTATIONS	32.8	1.1%
B	5200	LAKES	2.9	0.1%
B	5300	RESERVOIRS	7.0	0.2%
B	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	10.2	0.3%
B	6410	FRESHWATER MARSHES	184.9	6.0%
B	6430	WET PRAIRIES	131.3	4.3%
B	6440	EMERGENT AQUATIC VEGETATION	5.4	0.2%
B	6530	INTERMITTENT PONDS	1.9	0.1%
B	8100	TRANSPORTATION	60.5	2.0%
Subtotal			3078.6	100%
C	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	685.4	12.4%
C	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	45.7	0.8%
C	1300	RESIDENTIAL HIGH DENSITY	114.2	2.1%
C	1400	COMMERCIAL AND SERVICES	16.2	0.3%
C	1500	INDUSTRIAL	27.5	0.5%
C	1600	EXTRACTIVE	0.1	0.0%
C	1800	RECREATIONAL	26.2	0.5%
C	1900	OPEN LAND	3.5	0.1%
C	2100	CROPLAND AND PASTURELAND	2732.1	49.2%
C	2200	TREE CROPS	463.4	8.4%
C	2300	FEEDING OPERATIONS	42.2	0.8%
C	2400	NURSERIES AND VINEYARDS	35.6	0.6%
C	2600	OTHER OPEN LANDS <RURAL>	59.3	1.1%
C	3300	MIXED RANGELAND	7.7	0.1%
C	4100	UPLAND CONIFEROUS FOREST	2.3	0.0%
C	4110	PINE FLATWOODS	0.5	0.0%
C	4120	LONGLEAF PINE - XERIC OAK	6.5	0.1%
C	4340	HARDWOOD CONIFER MIXED	137.4	2.5%
C	4400	TREE PLANTATIONS	72.1	1.3%
C	5200	LAKES	59.7	1.1%
C	5300	RESERVOIRS	19.6	0.4%
C	6200	WETLAND CONIFEROUS FORESTS	3.6	0.1%
C	6210	CYPRESS	0.9	0.0%
C	6300	WETLAND FORESTED MIXED	3.8	0.1%
C	6410	FRESHWATER MARSHES	546.2	9.8%
C	6430	WET PRAIRIES	231.4	4.2%
C	6440	EMERGENT AQUATIC VEGETATION	32.1	0.6%

Subwatershed	FLUCCS Code	Land Use Description	Acres	% Area
C	6530	INTERMITTENT PONDS	3	0.1%
C	7400	DISTURBED LAND	73.5	1.3%
C	8100	TRANSPORTATION	97.1	1.7%
Subtotal			5548.8	100.0%
D	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	199.1	10.4%
D	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	209.9	11.0%
D	1300	RESIDENTIAL HIGH DENSITY	17.6	0.9%
D	1400	COMMERCIAL AND SERVICES	59.0	3.1%
D	1500	INDUSTRIAL	86.2	4.5%
D	1700	INSTITUTIONAL	113.5	5.9%
D	1900	OPEN LAND	30.1	1.6%
D	2100	CROPLAND AND PASTURELAND	694.7	36.3%
D	2200	TREE CROPS	181.6	9.5%
D	2600	OTHER OPEN LANDS <RURAL>	35.8	1.9%
D	4340	HARDWOOD CONIFER MIXED	130.5	6.8%
D	4400	TREE PLANTATIONS	45.1	2.4%
D	5200	LAKES	12.9	0.7%
D	6410	FRESHWATER MARSHES	58.3	3.0%
D	6430	WET PRAIRIES	19.6	1.0%
D	6440	EMERGENT AQUATIC VEGETATION	0.9	0.0%
D	6530	INTERMITTENT PONDS	1.5	0.1%
D	8100	TRANSPORTATION	16.6	0.9%
Subtotal			1912.9	100.0%
E	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	4.9	0.5%
E	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	527.6	49.2%
E	1300	RESIDENTIAL HIGH DENSITY	22.7	2.1%
E	1400	COMMERCIAL AND SERVICES	165.0	15.4%
E	1500	INDUSTRIAL	50.3	4.7%
E	1700	INSTITUTIONAL	51.9	4.8%
E	1800	RECREATIONAL	6.6	0.6%
E	1900	OPEN LAND	25.4	2.4%
E	2100	CROPLAND AND PASTURELAND	0.6	0.1%
E	2200	TREE CROPS	93.8	8.8%
E	4340	HARDWOOD CONIFER MIXED	21.1	2.0%
E	4400	TREE PLANTATIONS	52.7	4.9%
E	5300	RESERVOIRS	4.4	0.4%
E	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	9.8	0.9%
E	6410	FRESHWATER MARSHES	0.3	0.0%
E	6440	EMERGENT AQUATIC VEGETATION	0.6	0.1%
E	8100	TRANSPORTATION	22.6	2.1%
E	8200	COMMUNICATIONS	9.5	0.9%
E	8300	UTILITIES	2.2	0.2%
Subtotal			1072.0	100.0%

Subwatershed	FLUCCS Code	Land Use Description	Acres	% Area
F	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	286.4	7.1%
F	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	184.2	4.6%
F	1400	COMMERCIAL AND SERVICES	34.0	0.8%
F	1500	INDUSTRIAL	72.8	1.8%
F	1700	INSTITUTIONAL	15.5	0.4%
F	1800	RECREATIONAL	3.5	0.1%
F	1900	OPEN LAND	136.8	3.4%
F	2100	CROPLAND AND PASTURELAND	830.7	20.7%
F	2200	TREE CROPS	72.3	1.8%
F	2600	OTHER OPEN LANDS <RURAL>	34.7	0.9%
F	4100	UPLAND CONIFEROUS FOREST	9.0	0.2%
F	4110	PINE FLATWOODS	7.4	0.2%
F	4120	LONGLEAF PINE - XERIC OAK	7.2	0.2%
F	4340	HARDWOOD CONIFER MIXED	117.3	2.9%
F	4400	TREE PLANTATIONS	122.7	3.1%
F	5100	STREAMS AND WATERWAYS	11.7	0.3%
F	5200	LAKES	43.7	1.1%
F	5300	RESERVOIRS	2.9	0.1%
F	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	101.5	2.5%
F	6200	WETLAND CONIFEROUS FORESTS	7.5	0.2%
F	6210	CYPRESS	14.9	0.4%
F	6300	WETLAND FORESTED MIXED	6.5	0.2%
F	6410	FRESHWATER MARSHES	423.9	10.5%
F	6430	WET PRAIRIES	185.5	4.6%
F	6440	EMERGENT AQUATIC VEGETATION	70.0	1.7%
F	6530	INTERMITTENT PONDS	22.0	0.5%
F	7400	DISTURBED LAND	60.4	1.5%
F	8100	TRANSPORTATION	8.6	0.2%
F	8300	UTILITIES	53.4	1.3%
Subtotal			4019.0	100.0%
G	1100	RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	491.0	12.3%
G	1200	RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	166.9	4.2%
G	1300	RESIDENTIAL HIGH DENSITY	46.7	1.2%
G	1400	COMMERCIAL AND SERVICES	42.2	1.1%
G	1500	INDUSTRIAL	4.0	0.1%
G	1600	EXTRACTIVE	15.4	0.4%
G	1820	GOLF COURSES	113.2	2.8%
G	1900	OPEN LAND	91.3	2.3%
G	2100	CROPLAND AND PASTURELAND	1605.9	40.2%
G	2200	TREE CROPS	55.4	1.4%
G	2500	SPECIALTY FARMS	159.6	4.0%
G	2600	OTHER OPEN LANDS <RURAL>	6.0	0.2%
G	4340	HARDWOOD CONIFER MIXED	239.1	6.0%
G	4400	TREE PLANTATIONS	293.0	7.3%
G	5100	STREAMS AND WATERWAYS	9.9	0.2%
G	5200	LAKES	81.7	2.0%

Subwatershed	FLUCCS Code	Land Use Description	Acres	% Area
G	5300	RESERVOIRS	12.9	0.3%
G	6150	STREAM AND LAKE SWAMPS (BOTTOMLAND)	60.0	1.5%
G	6210	CYPRESS	9.5	0.2%
G	6300	WETLAND FORESTED MIXED	14.7	0.4%
G	6410	FRESHWATER MARSHES	265.6	6.7%
G	6430	WET PRAIRIES	146.6	3.7%
G	6440	EMERGENT AQUATIC VEGETATION	19.5	0.5%
G	8100	TRANSPORTATION	41.9	1.0%
Subtotal			3992.0	100.0%

Table 4 - Summary of Water Body Statistics

Water Body	Acreage by Subwatershed						
	A	B	C	D	E	F	G
Clear Lake / Lake Jovita	153.4						
Duck Lake			4.5				
Ferguson Lake						33.4	
Hamilton Lake						22	
Harrison Lake	50						
Hester Lake		12.7					
Horseshoe Lake							10.1
Hudson Lake	30.7						
Indian Lake				36.3			
Ivy Stag Lake							7.1
Jordan Lake							17.2
Knee Deep Lake			26.6				
Lake Linda			4.3				
Larkin Camp Lake			8.4				
Larkin Lake			9.5				
Moss Lake			1.3				
Point Lake			5.2				
Sandbar Lake			33.2				
Seaboard Pond							17
Sumner Lake						64.6	
Suwannee Lake	14.3						
Tank Lake		28.9					
Tobe Lake						28.1	
Unnamed	597.5	383.9	751.7	48.1	17.2	812.9	529
Total	845.9	425.5	844.7	84.4	17.2	961	580.4

Table 5 - Summary of Water Quantity Stations

Station Number	Station Type	Begin Date	End Date	Name	Collection Interval
SWFWMD Surface Water Stations					
18323	Lake	01/2001	Active	HUDSON LAKE	Monthly
18899	Lake	01/2001	Active	CLEAR LAKE LJ-1	6 Months
18896	Lake	01/2001	1/15/2005	CLEAR LAKE LJ-1S	One Time Measurement
282136082094201	Lake	02/1997	03/2005	SUMNER LAKE	One Time Measurement
USGS Stations					
02311600	Lake	01/2001	Active	CLEAR LAKE AT SAN ANTONIO	Weekly
02311700	Canal	01/2001	Active	DADE CITY CANAL NR DADE CITY	2 Months
SWFWMD Groundwater Stations					
23207	Well		Active	LYKES PASCO FLDN	Daily
23206	Well		1/7/2005	WATER PLANT 4 FLDN	2 Months
713050	Well		9/21/2000	SELF FLDN	6 Months
713047	Well		9/13/2011	HAYCRAFT FLDN	6 Months
713048	Well		9/7/2007	COLLURA 1 FLDN	6 Months
SWFWMD Historical Water Level					
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1950		FDOT_14120-201	One Time Measurement
N/A	HW Mark	09/08/2004		Pasco County	One Time Measurement
N/A	HW Mark	10/13/1949		FDOT_14120-201	One Time Measurement
N/A	HW Mark	10/11/1949		FDOT_14120-201	One Time Measurement

Station Number	Station Type	Begin Date	End Date	Name	Collection Interval
SWFWMD Historical Water Level					
N/A	HW Mark	10/14/1949		FDOT_14120-201	One Time Measurement
N/A	HW Mark	10/14/1949		FDOT_14120-201	One Time Measurement
N/A	HW Mark	10/20/1949		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1949A		FDOT_14120-201	One Time Measurement
N/A	HW Mark	10/18/1949		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1949A		FDOT_14120-201	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	06/08/1966		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	06/16/1966		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	06/16/1966		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	06/23/1966		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	06/10/1966		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	1968		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	06/16/1966		FDOT_14650-3602	One Time Measurement
N/A	HW Mark	9/8/2003		SWFWMD Hydrologic Data Section	One Time Measurement
N/A	HW Mark	10/2/2004		SWFWMD Hydrologic Data Section	One Time Measurement
N/A	HW Mark	2004		SWFWMD ENG FB# 19/11, page 26.	One Time Measurement
N/A	HW Mark	2004		SWFWMD ENG FB# 19/11, page 26.	One Time Measurement
N/A	HW Mark	2003		SWFWMD ENG FB# 19/11, page 27.	One Time Measurement
N/A	HW Mark	1998		SWFWMD ENG FB# 19/11, page 28.	One Time Measurement

Station Number	Station Type	Begin Date	End Date	Name	Collection Interval
SWFWMD Historical Water Level					
N/A	HW Mark	2004		SWFWMD ENG FB# 19/11, page 26.	One Time Measurement
N/A	HW Mark	2004		SWFWMD ENG FB# 19/11, page 28.	One Time Measurement
N/A	HW Mark	10/04/2004		SWFWMD ENG FB#19/11, page 38.	One Time Measurement
N/A	HW Mark	10/04/2004		SWFWMD ENG FB#19/11, page 38.	One Time Measurement
N/A	HW Mark	10/04/2004		SWFWMD ENG FB#19/11, page 38.	One Time Measurement
N/A	HW Mark	09/17/2003		SWFWMD ENG FB#19/11, page 38.	One Time Measurement
N/A	HW Mark	09/17/2003		SWFWMD ENG FB#19/11, page 38.	One Time Measurement
N/A	HW Mark	09/17/2003		SWFWMD ENG FB#19/11, page 38.	One Time Measurement

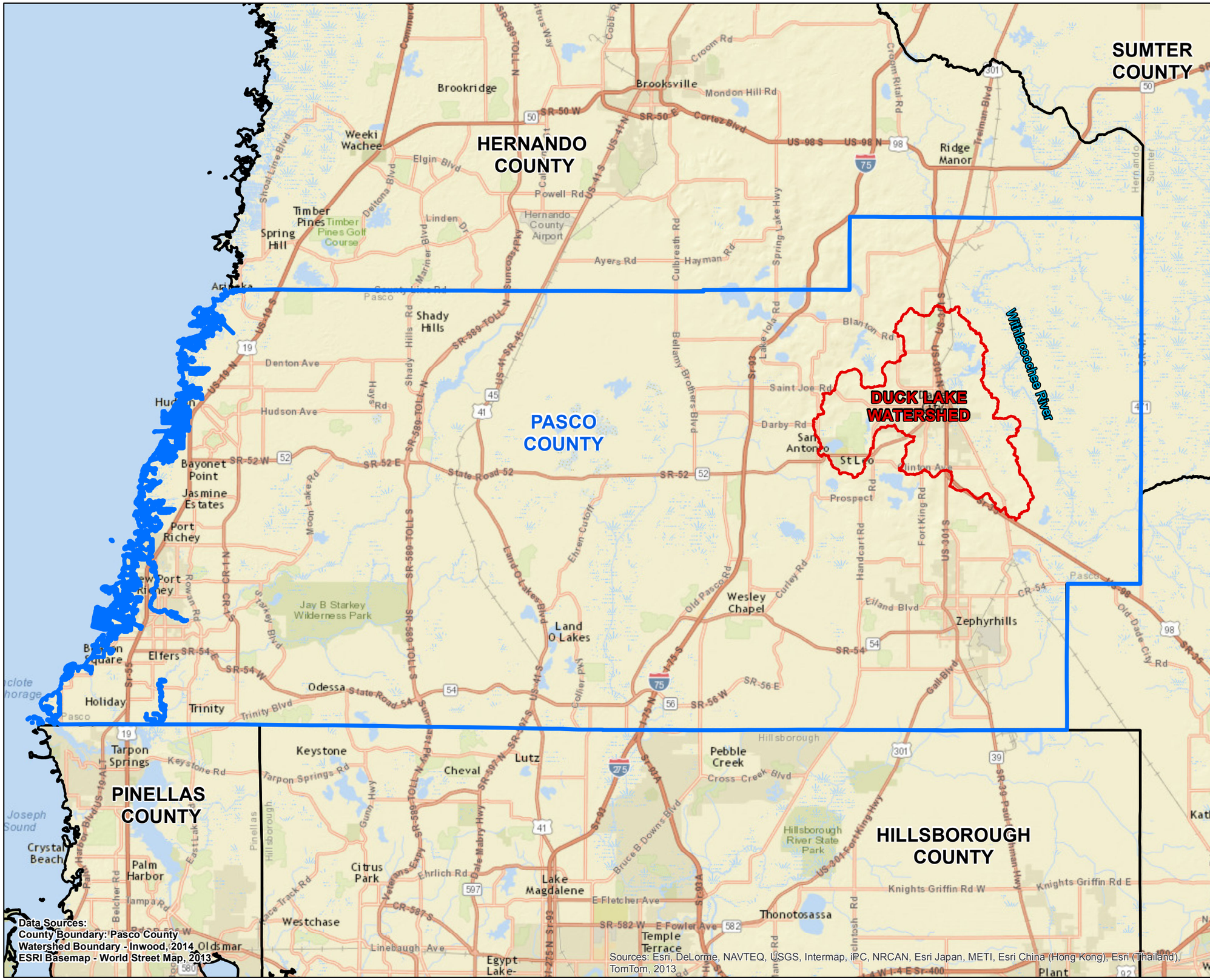
Table 6 - Summary of Water Quality Stations

Station Number	Station Type	Station Name	Source
FDEP STORET			
33283	Lake	SW4-SL-2008 Jordan Lake	FDEP STORET
23010436	River/Stream	TP92 - DADE CITY CANAL	FDEP STORET
28243238209448	River/Stream	TP256-Dade City Canal	FDEP STORET
28233158210162	River/Stream	TP255-Dade City Canal	FDEP STORET
42519	Lake	Z4-SL-6020 UNNAMED SMALL LAKE	FDEP STORET
18899	Lake	CLEAR	FDEP STORET
23208	Canal	DADE CITY CANAL NR DADE CITY	FDEP STORET
23204	Lake	SUMNER	FDEP STORET
PAS-JOVITA-2	Lake	Pasco-Jovita-2	FDEP STORET
PAS-JOVITA-1	Lake	Pasco-Jovita-1	FDEP STORET
PAS-JOVITA-3	Lake	Pasco-Jovita-3	FDEP STORET
1399-A	Canal	1399 - Dade City Canal - at River Rd	FDEP STORET
SWFWMD WUP			
451	Well	TANLER WATER CO	SWFWMD WUP
1631	Well	CITY OF DADE CITY	SWFWMD WUP

Table 7 - Summary of Rainfall Stations

Station Number	Station Type	Begin Date	End Date	Name	Collection Interval	Distance
NOAA Stations						
USC00087851	Weather	7/1/1964	Present	SAINT LEO FL US	15 min	---
US1FLPS0015	Rainfall	3/7/2010	Present	DADE CITY 4.3 N FL US	Daily	<1 mile
US1FLPS0010	Rainfall	12/20/2009	Present	DADE CITY 1.8 WSW FL US	Daily	<1 mile
US1FLPS0021	Rainfall	3/5/2009	Present	DADE CITY 4.3 S FL US	Daily	<1 mile
US1FLPS0016	Rainfall	2/12/2008	Present	DADE CITY 4.7 WNW FL US	Daily	<1 mile
SWFWMD Stations						
18901	Weather	01/2001	Present	SAINT LEO NWS	15 min	---
18864	Rainfall	02/1986	Present	LAKE PASADENA	Hourly	<1 mile
18873	Rainfall	01/1942	12/1958	DADE CITY RANGER STATION	Hourly	<1 mile
17517	Rainfall	12/1958	Present	ROMP 90 DADE CITY	Hourly	<1 mile
19054	Rainfall	05/1971	Present	SAINT LEO TOWER	Hourly	<1 mile
737478	Rainfall	12/1958	Present	DEAD RIVER PARK ET (USGS)	Hourly	<15 miles
20881	Rainfall	05/1971	Present	SWFWMD HQ ET	Hourly	<15 miles

FIGURES



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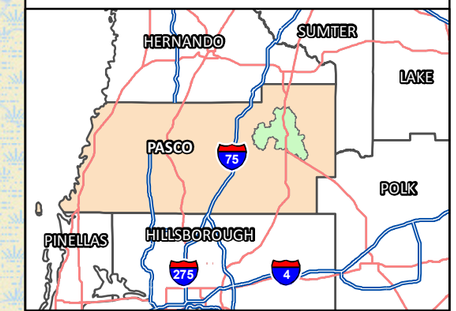


LEGEND

- Watershed Boundary
- Pasco County

N W E S

1 inch = 20,000 feet

0 20,000 40,000 Feet

0 5 Miles

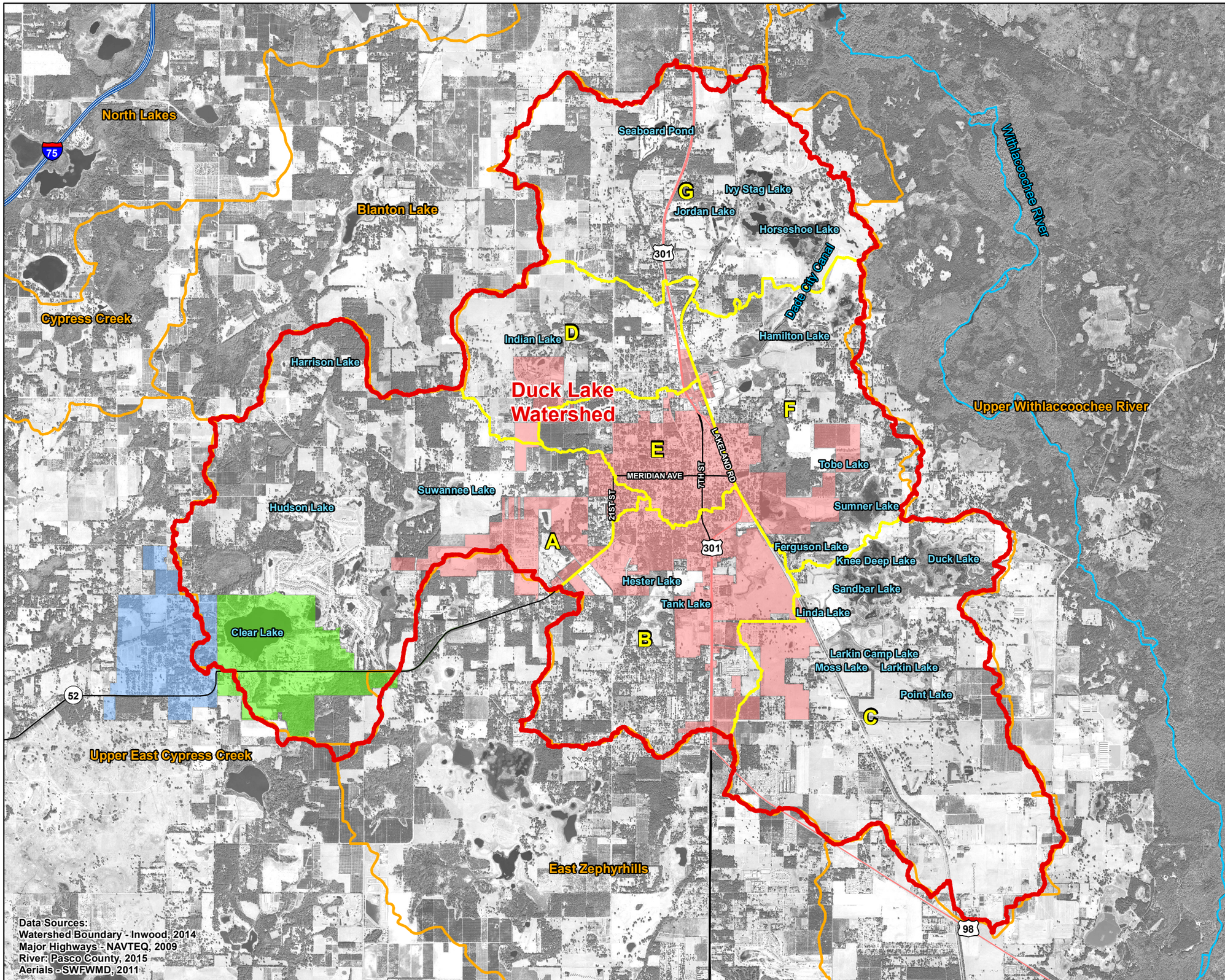
Figure 1
Project Location Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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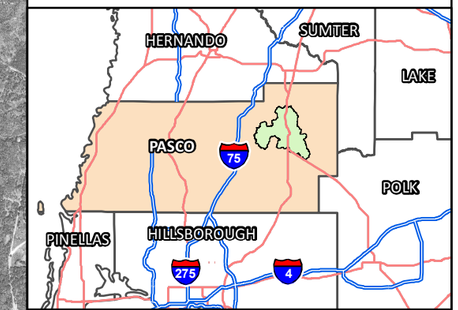


LEGEND

- Watershed Boundary
- Subwatershed Boundary
- SWFWMD Planning Unit
- Withlacoochee River

City Limits

- DADE CITY
- SAN ANTONIO
- ST. LEO

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

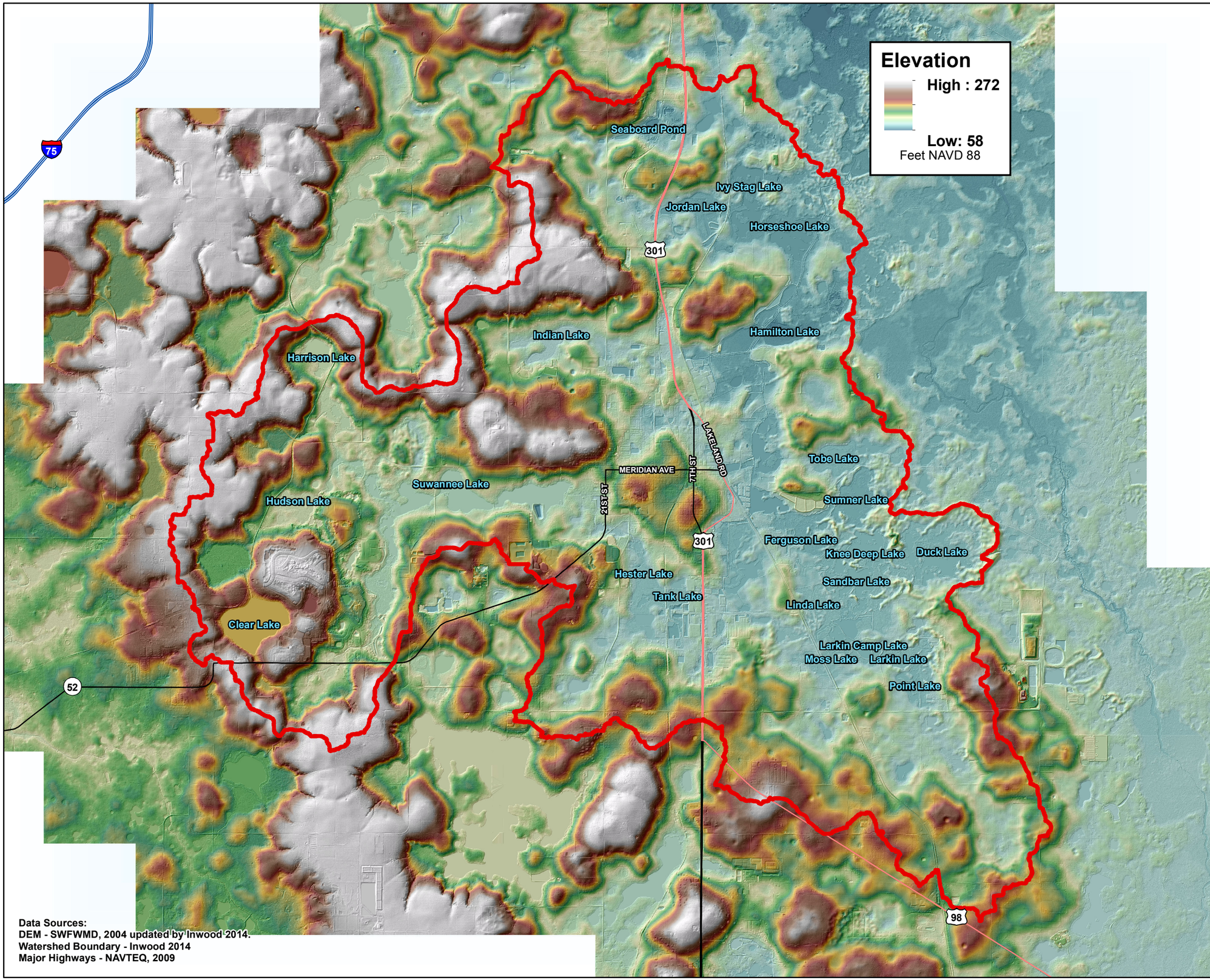
Figure 2
Watershed Boundary Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



Data Sources:
DEM - SWFWMD, 2004 updated by Inwood 2014.
Watershed Boundary - Inwood 2014
Major Highways - NAVTEQ, 2009

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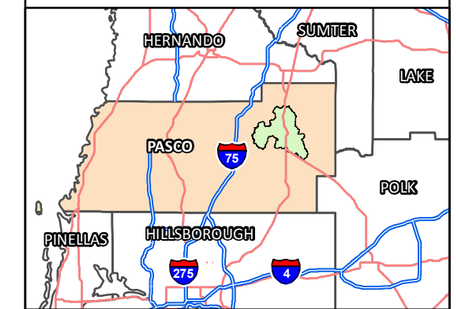


LEGEND

- Watershed Boundary
- Interstate
- Highway
- Secondary Roads

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

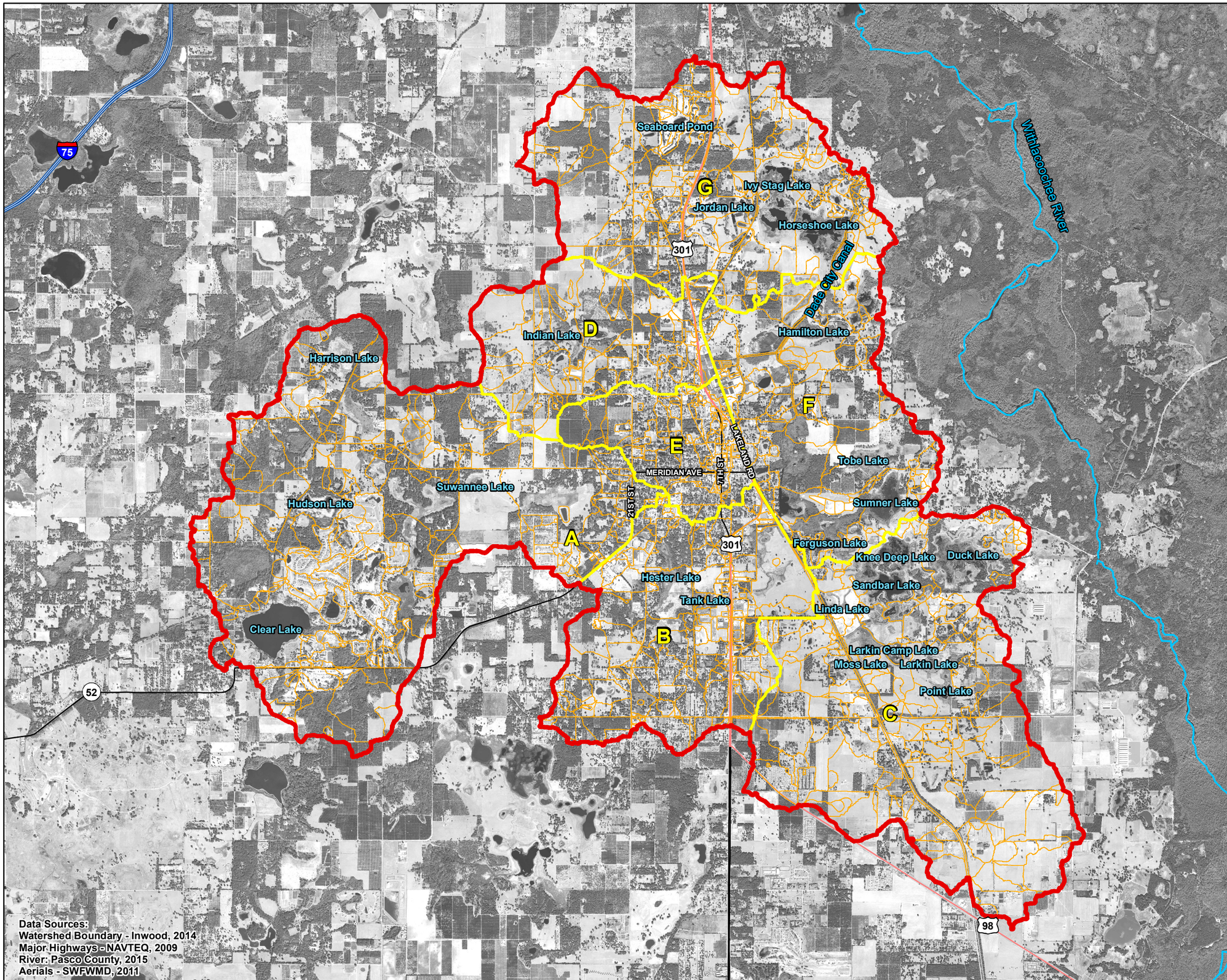
Figure 3
Digital Elevation Model

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
No Aerial Imagery



Data Sources:
Watershed Boundary - Inwood, 2014
Major Highways - NAVTEQ, 2009
River: Pasco County, 2015
Aerials - SWFWMD, 2011

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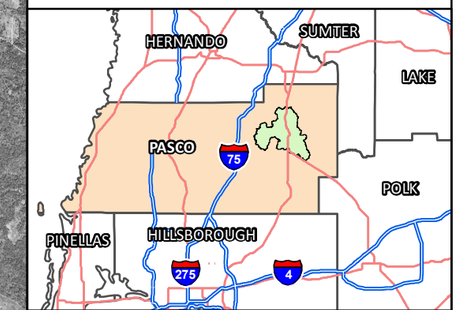


LEGEND

- Watershed Boundary
- Subwatershed Boundary
- Catchments
- Withlacoochee River

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

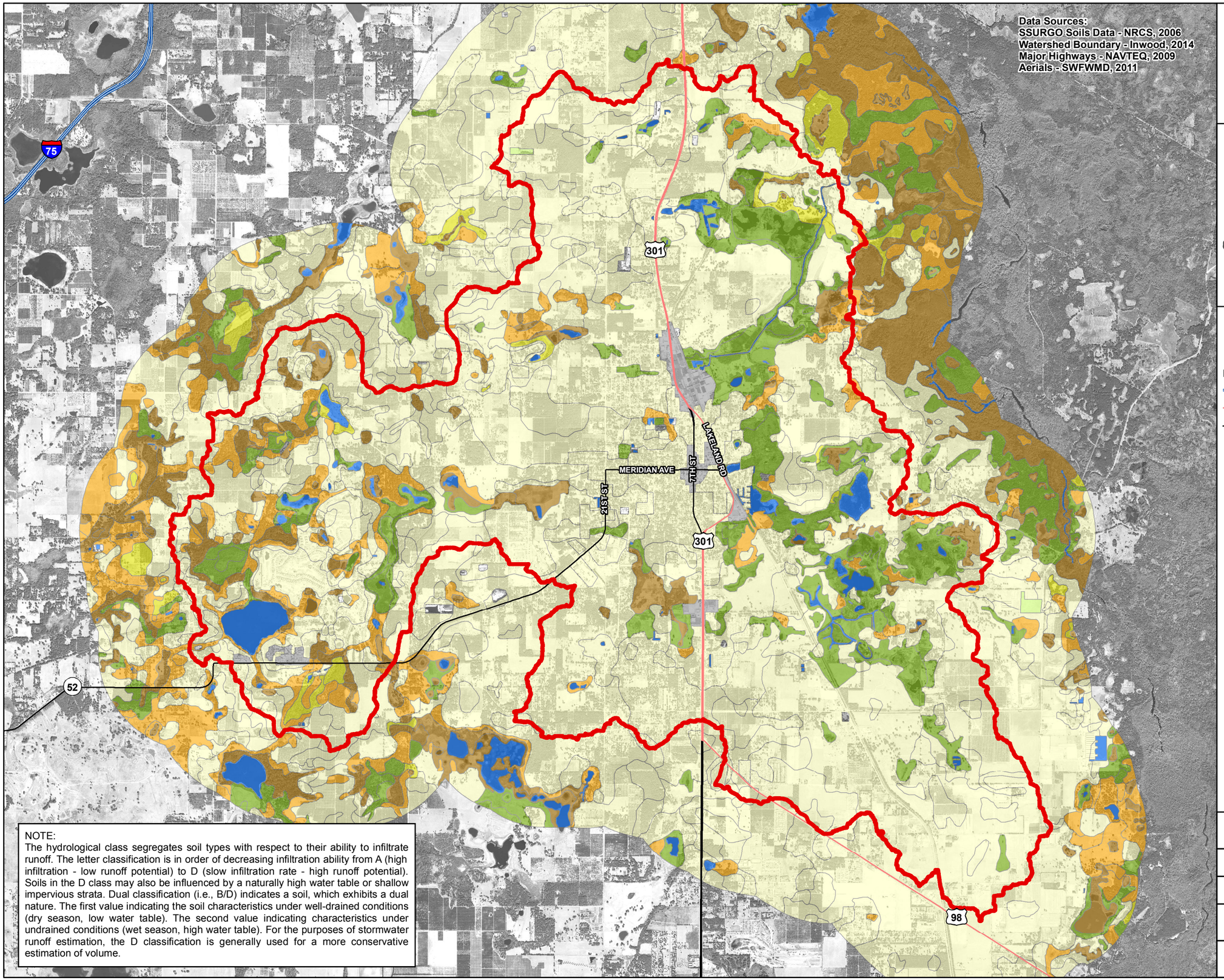
Figure 4
Catchment Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



NOTE:
The hydrological class segregates soil types with respect to their ability to infiltrate runoff. The letter classification is in order of decreasing infiltration ability from A (high infiltration - low runoff potential) to D (slow infiltration rate - high runoff potential). Soils in the D class may also be influenced by a naturally high water table or shallow impervious strata. Dual classification (i.e., B/D) indicates a soil, which exhibits a dual nature. The first value indicating the soil characteristics under well-drained conditions (dry season, low water table). The second value indicating characteristics under undrained conditions (wet season, high water table). For the purposes of stormwater runoff estimation, the D classification is generally used for a more conservative estimation of volume.

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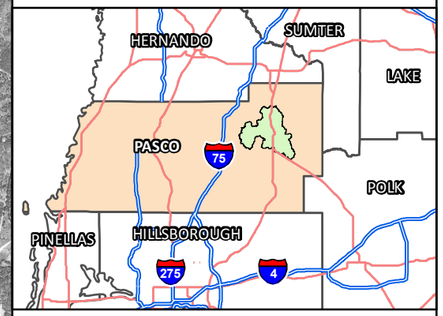


LEGEND

Watershed Boundary

Major Roads
- Interstate
- Highway
- Secondary Roads

SSURGO Soils
- A (73%)
- A/D (1.3%)
- B (0.04%)
- B/D (12%)
- C (5.6%)
- D (4.2%)
- Pits (0.2%)
- Urban Land (1.3%)
- Water (2.2%)

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

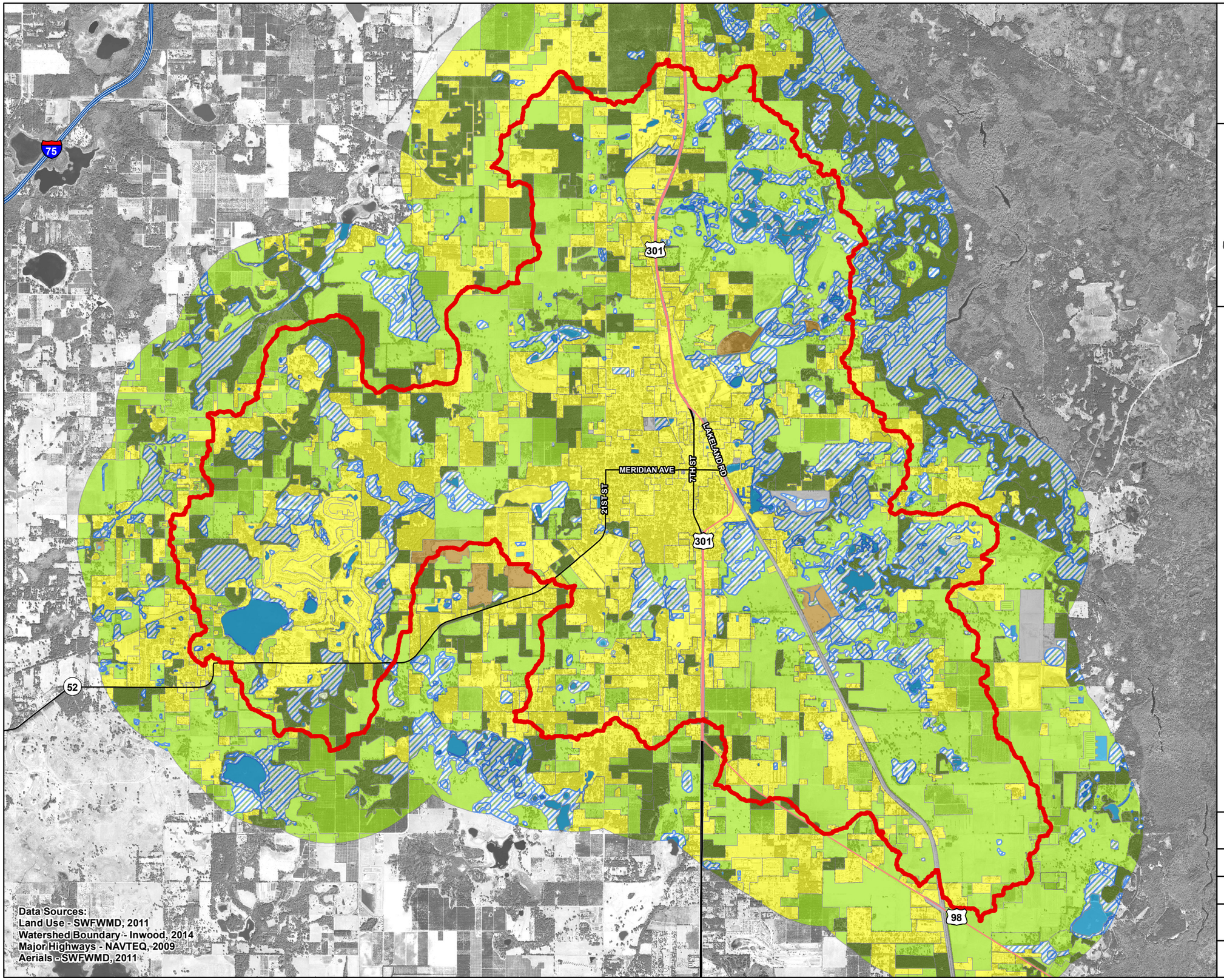
Figure 5
Soils Data Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



Data Sources:
Land Use - SWFWMD, 2011
Watershed Boundary - Inwood, 2014
Major Highways - NAVTEQ, 2009
Aerials - SWFWMD, 2011

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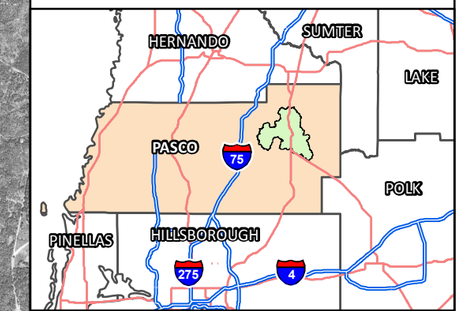


LEGEND

EXISTING LAND USE

- Urban and Built-up
- Agriculture
- Rangeland
- Upland Forest
- Water
- Wetland
- Barren Land
- Trans, Comm, Utility

- Watershed Boundary

Major Roads

- Interstate
- Highway
- Secondary Roads

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

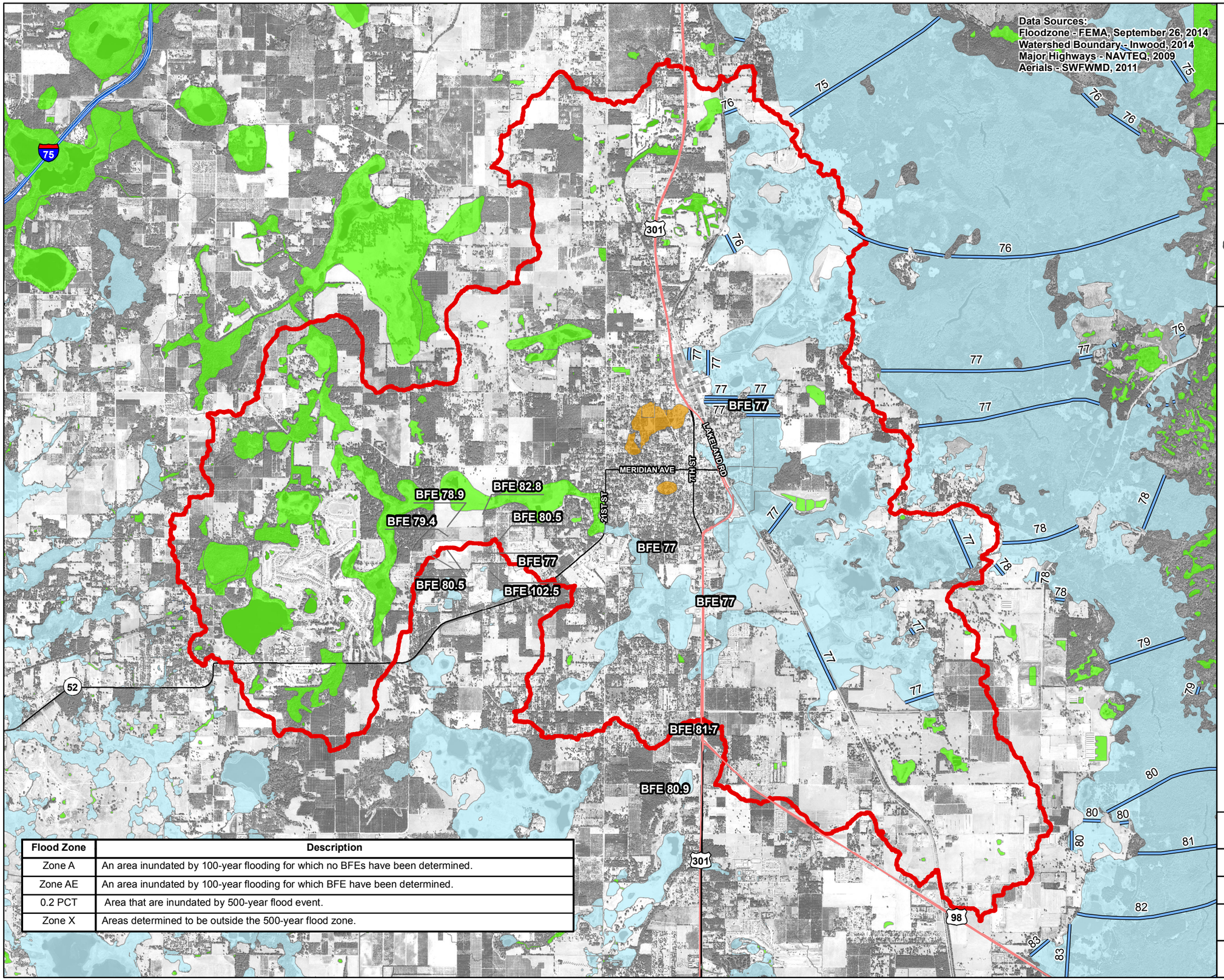
Figure 6
Existing Land Use Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



Flood Zone	Description
Zone A	An area inundated by 100-year flooding for which no BFEs have been determined.
Zone AE	An area inundated by 100-year flooding for which BFE have been determined.
0.2 PCT	Area that are inundated by 500-year flood event.
Zone X	Areas determined to be outside the 500-year flood zone.

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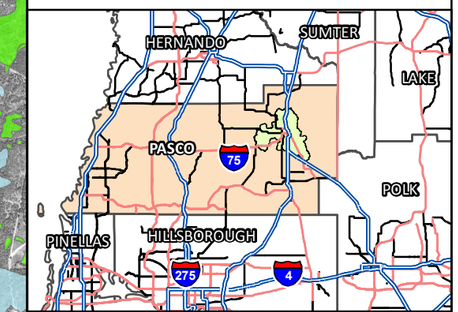


LEGEND

FEMA Flood Zone
- Zone A
- Zone AE
- 0.2 PCT Annual Chance Flood Hazard
- Zone X

Major Roads
- Other Major Road
- State Highway and Route
- US Highway

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

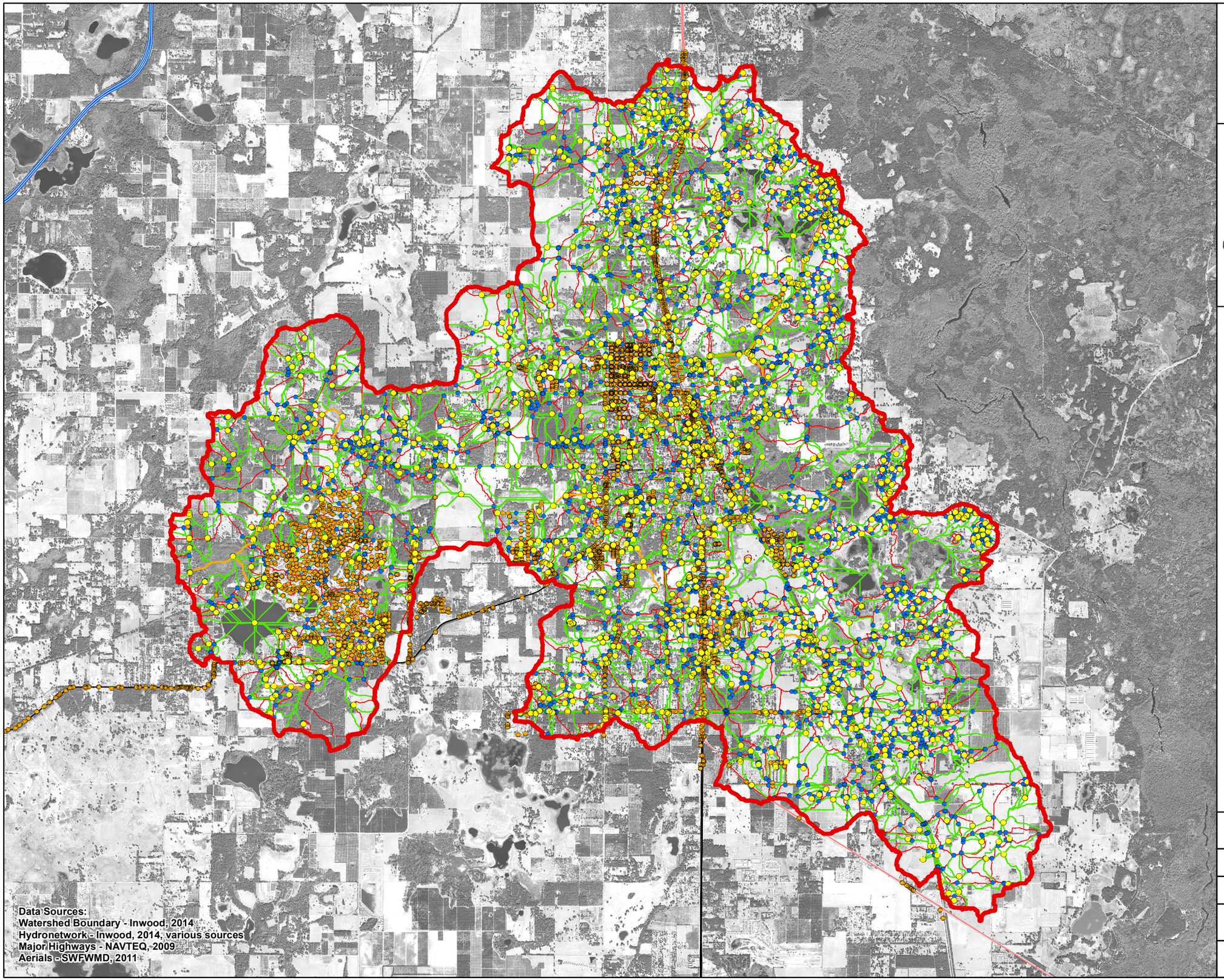
Figure 7
Existing FEMA Floodplains Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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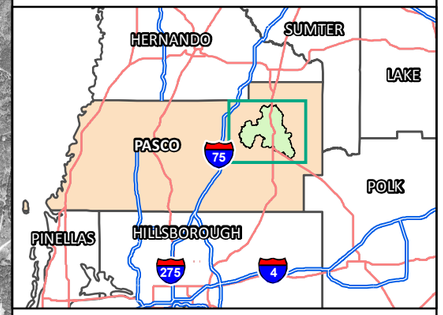


LEGEND

- Watershed Boundary

HydroEdge
- Channel
- Conduit
- Shallow Concentrated

HydroJunction
- Hydrualic Element
- Low Point of Boundary
- Low Point of Basin
- Catchment

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

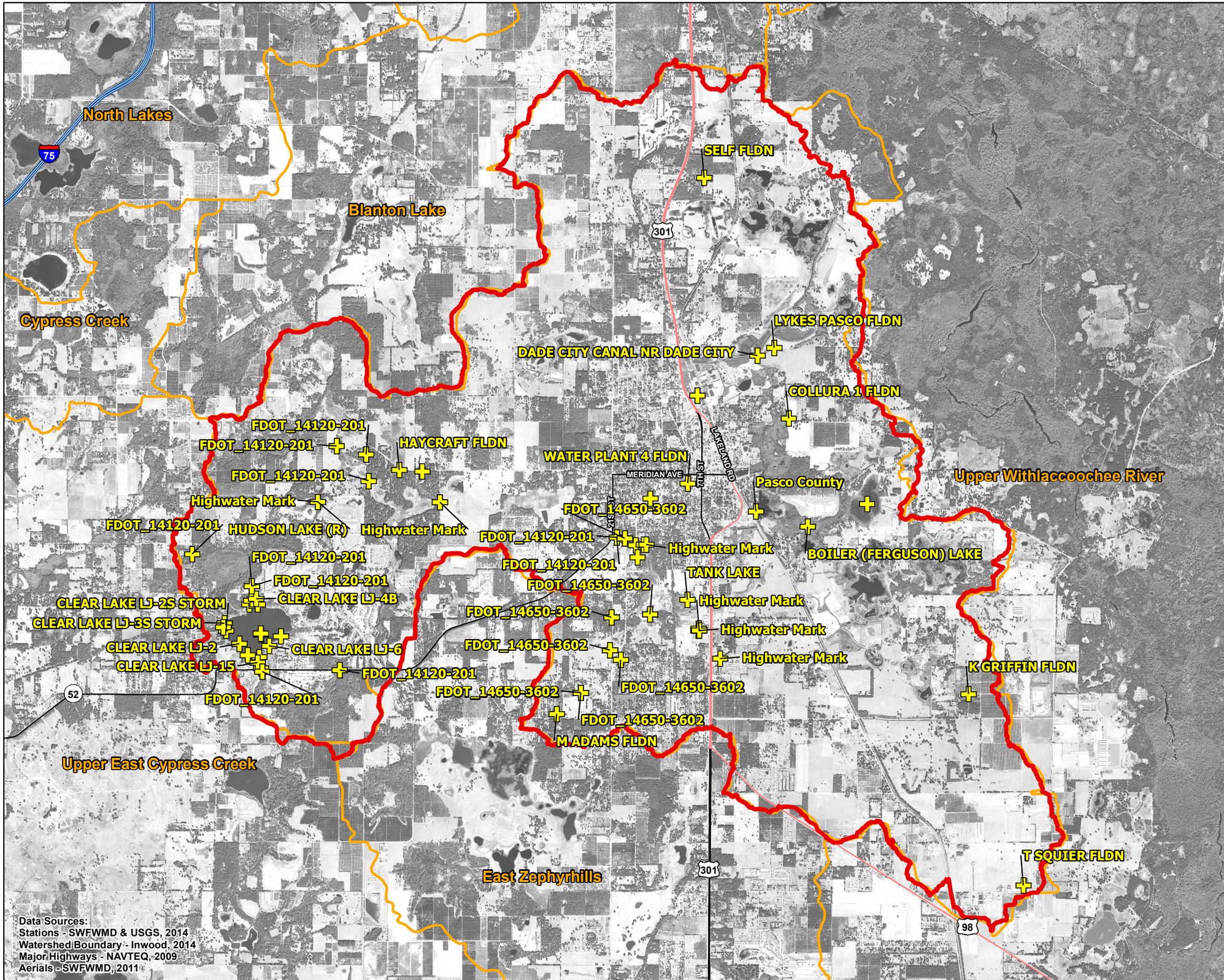
Figure 8
Hydraulic Network Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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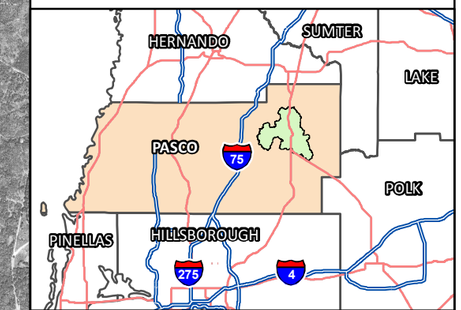


LEGEND

- Water Quantity Stations
- Watershed Boundary
- SWFWMD Planning Unit

Major Roads

- Interstate
- Highway
- Secondary Roads

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

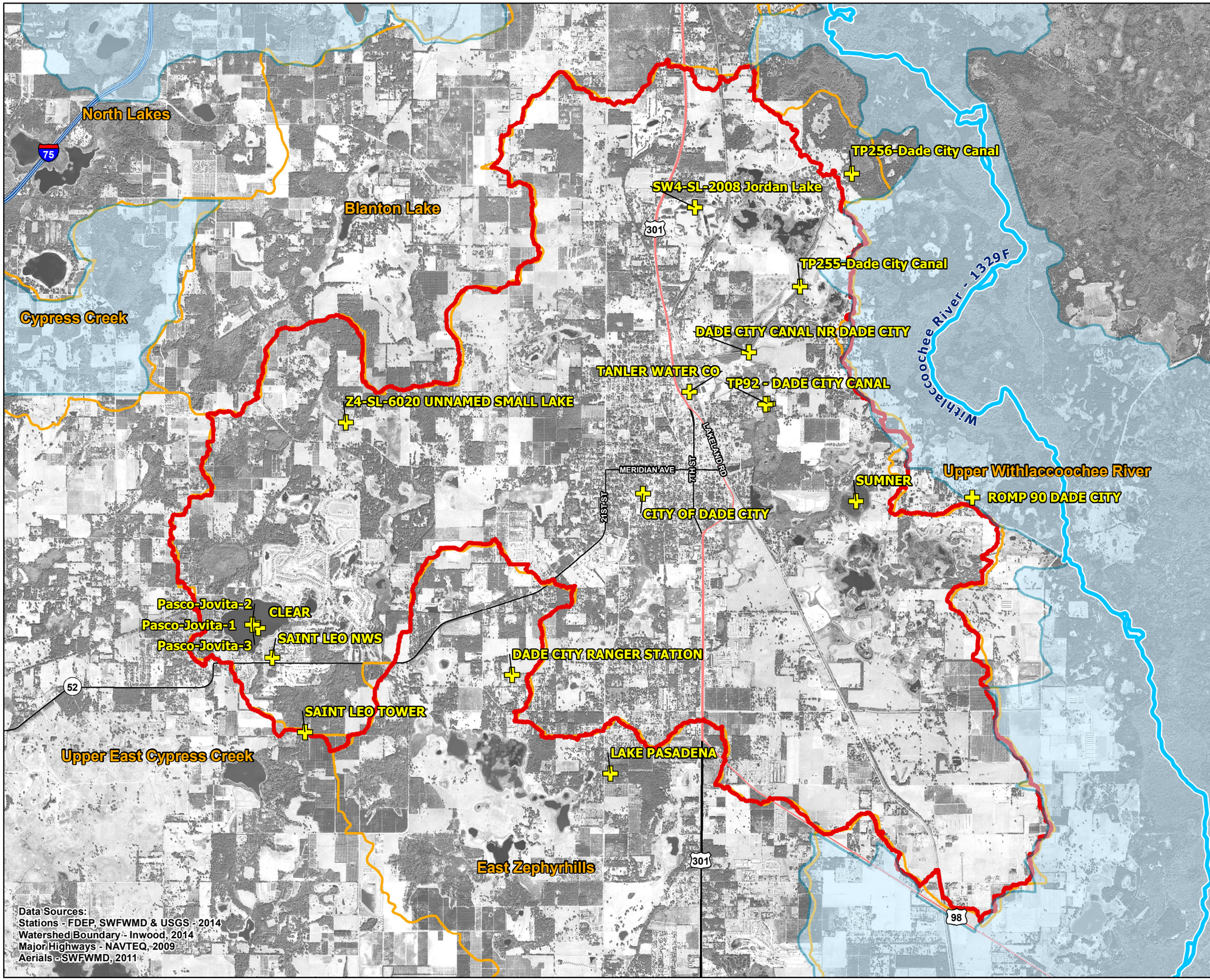
Figure 9
Water Quantity Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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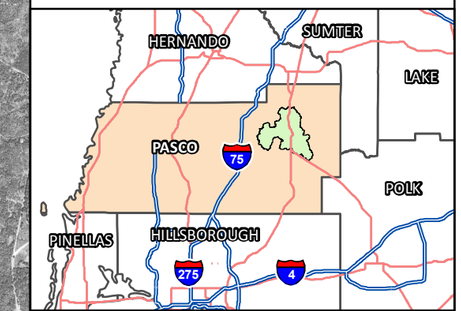


LEGEND

- Water Quality Stations
- Impaired River
- Impaired Waters
- Watershed Boundary
- SWFWMD Planning Unit

Major Roads

- Interstate
- Highway
- Secondary Roads

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

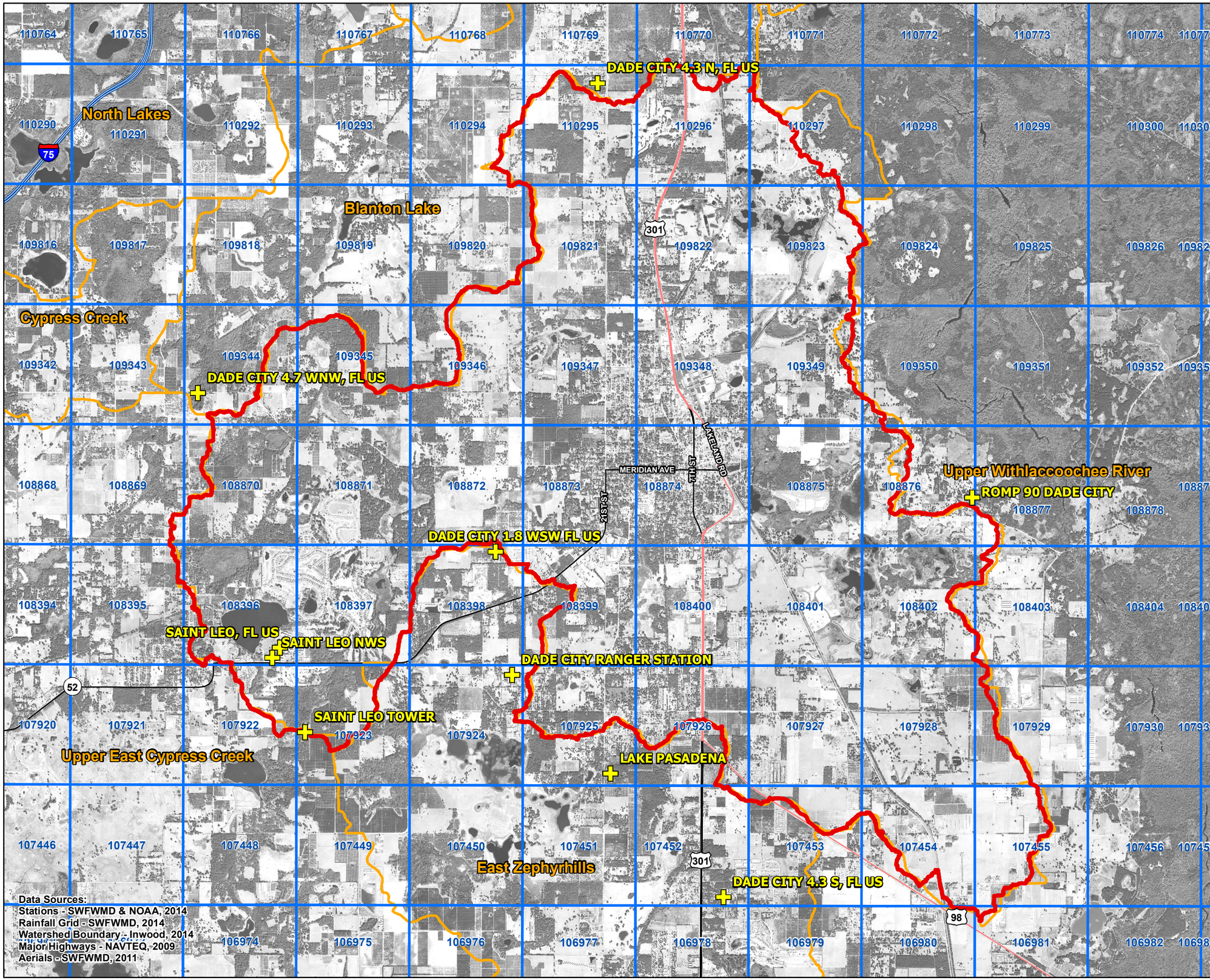
Figure 10
Water Quality Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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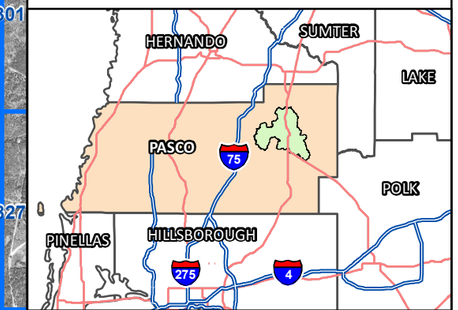


LEGEND

- Rainfall Stations
- SWFWMD Radar Rainfall
- Watershed Boundary
- SWFWMD Planning Unit

Major Roads

- Interstate
- Highway
- Secondary Roads

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

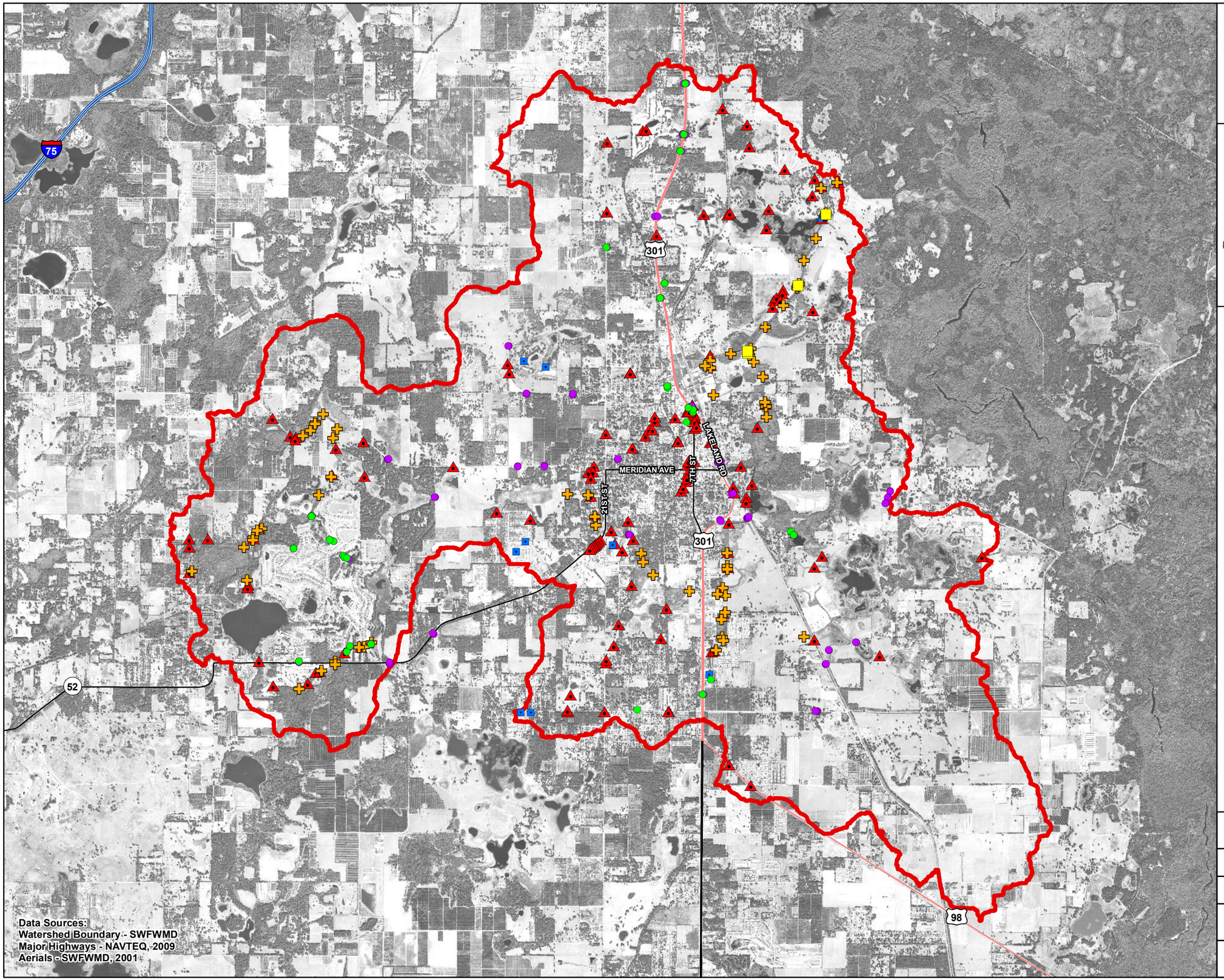
Figure 11
Hydrologic Data Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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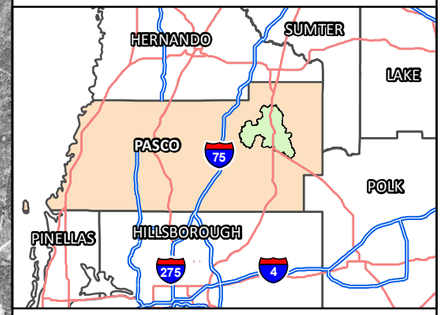


LEGEND

- SWFWMD Survey Pipes
- SWFWMD Survey Weirs
- Watershed Boundary
- Survey Needs - Cross Section
- Survey Needs - Bridge
- Survey Needs - Weirs
- Survey Needs - Pipe

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

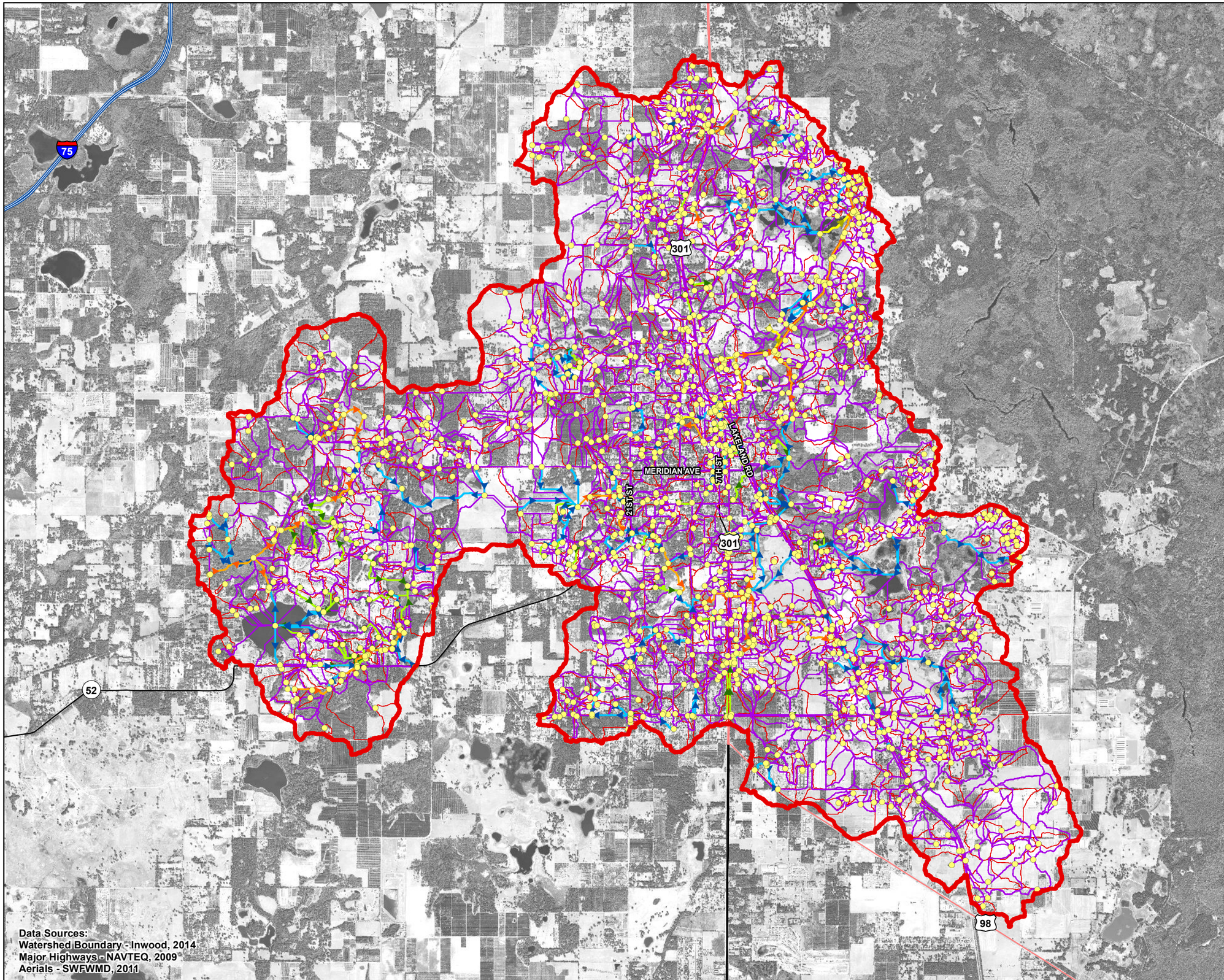
Figure 12
Survey Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011



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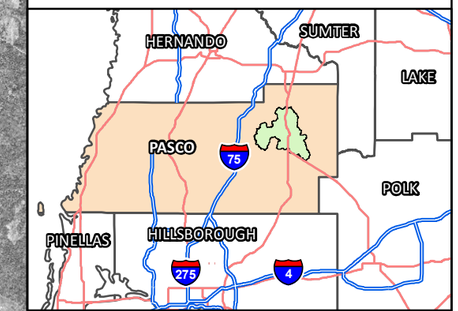

LEGEND

- Watershed Boundary
- ICPR Basin
- ICPR Node

ICPR Link

- CHANNEL
- PIPE
- DROP STRUCTURE
- RATING CURVE
- WEIR

N W E S

1 inch = 5,000 feet

0 2,500 5,000 Feet

0 0.5 1 Miles

Figure 13
Preliminary Model Features Map

Project: L737

Watershed: Duck Lake

Map Date:	Map Prepared By:
March 2015	Inwood

Date of Photography:
2011