

CONSERVATION ELEMENT

INTRODUCTION

The Conservation Element inventories the natural resources of Keystone Heights in light of the increasing requirements placed on these support systems to meet the demands created by an increasing population. Since the initial adoption of the comprehensive plan by the City in 1991, statutory requirements for the Conservation Element have been added, notably in the area of water supply planning

INVENTORY AND ANALYSIS

Air Quality

The Florida Department of Environmental Protection (FDEP) manages Florida's Air Quality System providing the public and units of local, state, and federal government with measurements of pollutant concentration levels in the ambient air – ambient air being generally defined as that portion of the atmosphere near ground level and external to buildings or other structures.

Ambient air quality standards, defined as levels below health standards, have been established by the U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (DEP) for six pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter, and sulfur dioxide (SO₂).

Since health-based criteria have been used to establish the standards, these six pollutants are referred to as “criteria air pollutants.”

The FDEP identifies that an essential component of air quality management in the state is the identification of (1) areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards and (2) areas where the ambient standards are being met but plans are needed to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

Keystone Heights has a very limited amount of air pollution originating in or being transported into its air shed. Under the FDEP's Spatial Air Quality System, air quality is monitored for the state. Air quality for Keystone Heights is measured at stations in Duval County because the EPA's designations of nonattainment areas are typically based on county groupings of contributing jurisdictions. There are no air quality monitoring stations in Clay County.

Currently there are no violations of the air quality standards for Clay County and its municipalities.

Overview of Topography and Hydrology

Keystone Heights has a variety of natural resources because of its varied terrain. The topography ranges downward from a high elevation of 175 feet in the northwestern corner of the City to 110 feet along the shoreline of Lake Geneva.

The St Johns River Water Management District (the “District”) has published a monthly report of the hydrological conditions of the Keystone Heights Area in coordination with the Keystone Heights Lake Advisory Council and the citizens of the City. The report documents monthly and annual rainfall and compares current rates to historical rates since June 1999; documents water levels in five area lakes, including Lake Magnolia and Lake Brooklyn, since 1950; monitors the change in potentiometric surface of the Floridan Aquifer and compares the water levels in Lake Brooklyn with that in the Floridan Aquifer. Inflows to Lowry and Brooklyn Lakes are documented as are outflows from Lowry and Magnolia Lakes.

Historically, rainfall averaged 50 inches annually. Over half of this rainfall occurs between June and September and less than 20 percent occurs from November through February. Rainfall is a contributor to the groundwater and influences the lake levels in Lakes Brooklyn, Keystone and Geneva.

The rainfall drains into streams and lakes or is absorbed by the soil. Eventually, the water moves downward through the soil to the zone of saturation referred to as the groundwater table. Groundwater continues to move laterally within the limestone recharge area to areas of lower elevation. Some is discharged by evapotranspiration, seepages, springs or wells. Groundwater in Keystone Heights occurs in the surficial aquifer, and in the Floridan aquifer which is directly connected to the water table.

In the areas surrounding Keystone Heights, the uppermost aquifer also includes limestone beds of the Choctawhatchee Formation. Along Trail Ridge north of Kingsley Lake, the aquifer consists primarily of sand deposits which are directly connected to the Floridan Aquifer.

The depth of the water table ranges from more than 20 feet below land surface in the ridge area in the northern city limits to the lake level of Keystone, Geneva and Brooklyn. The aquifer is recharged by rainfall and fluctuates in response to variations in rainfall and groundwater withdrawals and the storage capacities in the City’s lakes and streams.

Water Resources

Stream flow is that part of surface water that appears in natural channels. In general, it is closely related to precipitation, groundwater and other occurrences of surface water, such as lakes and canals. A portion of the rainfall leaves the area annually as stream flow. The remainder leaves as evaporation, transpiration by plants or groundwater outflow.

The Consumptive Use Technical Staff Report issued by the St Johns River Water Management District in January 2007 to the CCUA identifies that the most detailed and

comprehensive investigation of the water resources of Clay County was made in a 4 county investigation by Clark and others of the Florida Geological Survey in 1964. A regional report by Snell and Anderson (1970), and Bentley (1977) describes the water resources of the area and provides a useful compilation of data specific to Clay County based on the 1964 study. The following descriptions are mainly from the reports by Snell and Anderson, and Bentley:

Surface water in Clay County is largely undeveloped except for recreational use. The principal surface water feature in the county is the tide-affected St. Johns River, but the water is often too saline and high in dissolved solids (TDS) for most uses. Black Creek, with an average flow of 515 cfs., is the largest freshwater stream in the county; however, excessive color, TDS, hardness and pH make the water unsuitable for many uses. Water from the lakes and streams of the Etonia Creek basin in southwestern Clay County generally is of good chemical quality. Groundwater occurs in the county in a water table or surficial aquifer, secondary artesian aquifers (Hawthorn Group), and the Floridan aquifer. The surficial aquifer and secondary artesian aquifers supply small to moderate quantities of water to domestic and livestock wells in the county.

The principal source of water in the county is the Floridan aquifer, often available in amounts exceeding 2,500 gallons per minute. The Floridan aquifer is located immediately beneath clays of the Hawthorn Formation and is comprised of over 1,000 feet of permeable limestone. The Floridan aquifer is recharged partly by rainfall and the lakes in southwestern Clay County and adjoining counties, and more significantly, by seepage from the water table aquifer through the confining beds in extensive areas where the potentiometric surface of the Floridan aquifer is lower than that of the water table. Water quality within the Floridan aquifer of Clay County is generally of potable quality and suitable for most uses. The quality has not changed in a statistically significant manner since records of water quality data have been kept. Saline water underlies the freshwater zone in the Floridan aquifer at depths ranging from 500 feet below land surface in the southeastern corner of the county to more than 2,000 feet below land surface in the northeastern section.

In the City, the aquifer yields sufficient quantities of water for domestic and stock purposes. The principal source of potable water in Keystone Heights and in northern Florida are wells drilled into the sequence of permeable limestone formations known as the Floridan Aquifer. The top of the aquifer is exposed at the surface in Keystone Heights. Recharge to the aquifer also occurs in most of western Clay County, where the potentiometric surface is below the water table, and water moves downward from the water table through the semi-permeable confining beds and into the Floridan Aquifer.

From the recharge area, water in the aquifer moves down-gradient in a northeasterly direction toward the principal area of discharge along the margin of the Continental Shelf in the Atlantic Ocean. The potentiometric surface of the aquifer slopes in the same general direction as does the top of the aquifer, but not as steep. The potentiometric surface is more than 80 feet above sea level in Keystone Heights. The lower levels in the City's lakes are largely the result of large withdrawals from the aquifer in the Jacksonville-Orange Park, Green Cove Springs and southern St Johns County farming areas as well as prolonged drought.

The Florida Aquifer is recognized as one of the most productive aquifers in the world. It has been estimated that, under the region, the Floridan Aquifer stores far more fresh water than is stored in all of the Great Lakes combined. However, there are restraints on the amount of fresh water that may be withdrawn from this aquifer. Withdrawals from the Florida Aquifer induce recharge from the surficial aquifer, thereby lowering the water table and lake levels.

A general decline in water levels began in the late 1940's with the trend continuing until about 1956; when water levels remained nearly constant except for seasonal fluctuation. In the mid- 1960's, water levels began declining again. The potentiometric surface in the area will continue to decline as pumping increases.

When the City's comprehensive plan was adopted in 1991, the completion of Phase II of the *Upper Etonia Creek Hydrological Study* was anticipated; this Study was finalized by the St Johns River Water Management District and made available to the City and the public in March 1992.

Subsequent to the completion of the Phase II study of the Upper Etonia Creek in 1991, the SJRWMD completed the *Keystone Heights Hydrologic Conditions Report* for the Keystone Heights Lake Advisory Committee and the Citizens of Keystone Heights in September 2000 and the U.S. Geological Survey produced Water-Resources Investigations Report 00-4204 *Simulation of the Interaction of Karstic Lakes Magnolia and Brooklyn within the Upper Florida Aquifer, Southwestern Clay County, Florida* in 2001. In February 2002, the *Investigation of Conceptual Design of Options for the Lake Brooklyn Watershed, Clay County, Florida* was prepared by Schreuder, Inc. (the "Schreuder Report") for the SJRWMD, Lake Region Council Association, the Keystone Lake Advisory Committee (now Save Our Lakes), Clay County, Camp Blanding, E.I. DuPont and State Representative Joe Pickens.

All of the studies were initiated because of significantly declining lake levels in the lakes of the Upper Etonia Creek Basin, the area of Putnam, Clay, Bradford and Alachua Counties that includes the City of Keystone Heights. Concerned citizens were joined by the local governments in asking the SJRWMD to lead investigations into the hydrology of the area with an eye to identifying the underlying causes of the declining lake levels. The City formed a Lake Advisory Committee to focus community efforts; this committee remains active.

In Phase I of the Upper Etonia Creek Hydrological Study, below average rainfall over several years was identified as the primary cause of the lake-level declines. A second phase of the study was recommended to investigate some of the hydrological factors in more detail.

Rainfall deficiencies remain the identified cause of the dramatically lower lake levels for the lakes in and immediately adjacent to the City (the lake level in Lake Brooklyn has fluctuated more than 27 feet since measurements began by the USGS in 1957). The studies suggest that flow occurs from Lake Brooklyn and the intermediate aquifer downward into the upper Floridan Aquifer. There has been a regional decline of water levels in the upper Floridan Aquifer and this has had an impact on the stage of Lake Brooklyn because it has been determined that there is significantly higher vertical leakage between Lake Brooklyn and the Floridan Aquifer and other lakes in the area. These studies, including the USGS Report in

2001, concludes that lakes that are not hydraulically isolated from the Upper Floridan aquifer may exhibit large stage fluctuations as water drains to the aquifer during dry periods and is replenished in excess of the drainage rate during wet periods.

It is this knowledge that has produced the latest efforts for restoring the lake levels in the lakes in and near the City. The Schreuder Report in 2002 looks at augmentation options for several of the lakes that consist of controlled outlets and pipelines. Most recent discussions include the use of reuse water to supply water in excess of the drainage rate.

The City is fully engaged and an active participant in the ongoing discussions related to lake level augmentation. A local non-profit, Save Our Lakes, meets monthly to discuss technical options and funding sources. One important role for the City on the issue of lake levels continues to be its leadership in facilitating community input and communication with the St. Johns River Water Management District as it considers maximum flows and levels for lakes within and abutting the City. Save Our lakes provides a forum for the dissemination of information to interested citizens; the City actively participates in its meetings to foster communication and coordination.

The St Johns River Water Management District has established minimum flows and levels (MFLs) for Lake Brooklyn and Lake Geneva pursuant to Sections 373.042 and 373.0421, Florida Statutes. Consideration is given in the establishment of MFLs to seasonal fluctuations in water flows or levels, non-consumptive uses, and environmental values associated with the aquatic and wetlands ecology of the area including recreation in and off the water; fish and wildlife habitats and the passage of fish; maintenance of fresh water storage and supply; aesthetic and scenic attributes; filtration and absorption of nutrients and other pollutants; sediment loads; water quality; and navigation.

The current surface water levels of Lake Brooklyn and Lake Geneva are below the adopted minimums established in Rule 40C-8.031, Florida Administrative Code. The City seeks directly, and indirectly through education and its community participation efforts to coordinate with the SJRWMD in the development of its required recovery strategies and shall consider the phasing or time table which will allow for the provision of sufficient water supplies fro all existing and projected reasonable-beneficial uses, including development of additional water supplies and implementation of conservation and other efficiency measures. The District, in its update to the Water Supply Plan, may consider the need for water resource or water supply development, additional regulatory measures and implementation of additional water conservation measures.

The City and Save Our Lakes work closely with agency representatives to ensure that the concerns raised by the residents of the City are considered in the development and implementation of programs to address the lake levels.

Water Quality

Keystone Heights is located in an area of southwest Clay County and northwest Putnam County which contains approximately 100 lakes, many of which have no surface outlets.

Runoff from this area is extremely low primarily because of seepage into groundwater and evapotranspiration from the lakes and creeks.

There are 66 natural lakes in excess of one acre which lie wholly or predominantly within Clay County. Ranging up to about 1,750 acres in size, these lakes now encompass an aggregate area of about 12,000 acres and provide a shoreline of some 55 miles. Many of these lakes, in particular Lake Geneva and Lake Brooklyn, are among the most attractive in Florida.

The US Geological Survey in cooperation with the State of Florida has collected and chemically analyzed water samples from wells that tap the Floridan aquifer in Keystone Heights. In general, water from the Floridan aquifer is of good chemical quality and meets the standards recommended by the Florida Department of Environmental Protection (FDEP) and the U.S. Environmental Protection Agency. The chemical quality of water from the aquifer has not changed noticeably.

In 2005 the St Johns River Water Management District updated its Floridan aquifer recharge mapping originally published in 1993 in *Mapping Recharge to the Floridan aquifer Using a Geographic Information System*. The original report offers insight into how recharge to the aquifer occurs in Florida: “Recharge to the Floridan aquifer occurs in areas where the elevation of the water table of the surficial aquifer is higher than the elevation of the potentiometric surface of the Floridan aquifer. In these areas, water moves from the surficial aquifer in a downward direction through the upper confining unit to the Floridan aquifer. Recharge also occurs directly from infiltrating rainfall where limestones of the Floridan aquifer are at or near land surface. In addition, significant local recharge may occur where sinkholes have breached the upper confining unit.

Recharge rates are highest in areas where the hydraulic pressure difference and leakage are greatest. Recharge rates are directly proportional to the hydraulic pressure difference and upper confining unit hydraulic conductivity and inversely proportional to upper confining unit thickness.”

The lakes in Keystone Heights represent a connection to the Floridan Aquifer. A small area of the City lies within the high recharge area of the Floridan aquifer (8-12 inches per year). Water quality and the potential for contamination of the aquifer from existing or future uses within the City is a concern that the City addresses by regulating permitted uses. Aquifer recharge rates (water quantity) are protected by applying maximum impervious cover percentages to new development and any expansion of existing development within the high recharge area.

Leaking underground storage tank systems present a hazard to the water quality in the Floridan aquifer; new underground storage tank systems must be constructed of non-corrosive materials, such as fiberglass, or protected from corrosion. Both underground and aboveground tank systems must also be constructed with these features to protect against leakage:

- doublewall construction or secondary containment to prevent releases.

- overfill and spill containment protection to prevent discharges when the tank is filled.
- leak detection system for both tanks and piping which is monitored at least every thirty days.

Existing facilities must meet a replacement schedule that ends in 2009 with all underground storage tank systems required to be constructed as doublewall tanks. Further, all facilities with petroleum storage tanks are required to have pollution liability insurance. The amount of coverage depends on whether the tanks are aboveground or underground and facility size.

Underground tanks greater than 110 gallons and aboveground tanks greater than 550 gallons, which contain regulated substances, are subject to the FDEP storage tank rules. These substances include gasoline, diesel fuel, kerosene, new and used oil, pesticides to be applied off-site and many industrial solvents. Unregulated tanks include those at private residences which are not used commercially, septic tanks, heating oil tanks and temporary use aboveground tanks. Facilities which have regulated storage tanks must register them with the Florida Department of Environmental Protection. The FDEP identifies 13 regulated underground storage tanks registered with FDEP as of March 1, 2011 within the City. These are gasoline tanks in four locations and one emergency fuel tank for Bellsouth.

Within the City there is one facility with registered discharge of petroleum in 2008 that has not been closed.

Historically water quality issues not related to contamination have been addressed with improvements to infrastructure: according to a January 1987 Stormwater Study by Kelley Engineering, water quality problems in area lakes (Keystone and Geneva) identified by FDEPR and Kelley Engineering were ~~are~~ related to soil erosion and introduction of sediment to the lakes or are due to contaminants other than soils which are washed off rooftops, roads and yards. Turbidity was determined to be the source of the water quality problems and the study recommended that the City:

- pave the dirt roads in the city with curb and gutter or grassed lined ditches,
- locate retention areas or ponds at the outfalls,
- detain drainage upstream and stage the runoff so as to minimize erosion and resultant sedimentation.

Since 1991, the City undertook a paving program using CDBG funds. All streets within the City with the exception of a portion of Forest Street and Fox Run are now paved. The pattern of streets within the City includes alleys that bisect each block of the old City; there is approximately 1 mile of alleys within the City. The alleys provide access to each parcel from the rear; most businesses have rear access and most residential units have garages that are accessed from the alleys. Alleys within the City remain unpaved.

In 2004 the FDEP prepared the Water Quality Assessment Report for the Lower St. Johns, pursuant to its watershed management approach for restoring and protecting water resource problems and to address Total Maximum Daily Load (TDML) Program requirements under

the federal Clean Water Act and the 1999 Florida Watershed Restoration Act. In the Water Quality Assessment Report, water bodies identified as potentially impaired in the FDEP's previously developed Status report were subject to additional data collection and analysis, resulting in a Verified List of Impaired Waters. With few exceptions, Total Maximum Daily Loads must be established for water bodies on the Verified List. The establishment of TMDLs for a water body means that monitoring will occur to document changes in water quality and that programs will be implemented that directly limit or eliminate the amount of pollutants entering the water body.

Water bodies in and near the City lie within the Etonia Creek Planning Unit. The City limits abut Lake Geneva to the southwest and its public beach provides access to this lake. The Water Quality Assessment Report identifies that of the 90 waterbody segments in this Planning Unit, 33 segments have sufficient data for assessment. Of these, 2 have been verified as impaired for at least one parameter, 5 remain on the Planning List and 26 meet standards. Lake Geneva remains on the Planning List with regard to Lead and Selenium. Lake Geneva is not on the Verified List.

For other parameters such as nutrients, turbidity and specific metals, Lake Geneva has been determined not to be impaired.

All other lakes adjacent to the City have been determined not to be impaired for any parameter and are not included on the FDEP Planning List.

The Clay County Utility Authority's potable water wells that serve Keystone Heights are constructed into the upper and lower Floridan aquifers. The CCUA routinely collects raw water samples from a selected well at each of their withdrawal/treatment sites for chemical analysis. All water samples that have been analyzed reflect no indication of saline water intrusion is occurring. A review of past water quality results at each existing facility shows no water quality degradation in the source aquifer. However, water quality sampling and analysis from a selected well at each of the wellfields will continue to be provided to the St Johns River Water Management District semi-annually through the planning period. Trend analysis of the data is required with the submittal of each compliance report to ensure saline water intrusion is not occurring.

Water Supply

The Florida Aquifer is recognized as one of the most productive aquifers in the world. It has been estimated that, under the region, the Floridan Aquifer stores far more fresh water than is stored in all of the Great Lakes combined. However, there are restraints on the amount of fresh water that may be withdrawn from this aquifer.

One way the SJRWMD manages water supply is through its Consumptive Use Permitting (CUP) process. For the City, the Clay County Utility Authority holds the CUP for the public water supply. In recent CUP permitting efforts, the CCUA evaluated the water supply in its service area, including the Keystone Heights area. The CCUA identifies that the Floridan aquifer in this area of the State has a high degree of primary and secondary porosity, yielding

abundant amounts of water. It is typically over 1,000- feet in thickness throughout Clay County. Water quality has historically been very good as confirmed by water quality sample analyses from a selection of the Clay County Utility Authorities' production wells. Water quality within the upper and upper portion of the lower Floridan aquifer is well within potable water drinking water standards without treatment and there are no indications of quality degradation as a result of the groundwater withdrawals in this area. Because of the large thickness, excellent water quality, and the fact that this aquifer has historically been able to supply all use put upon it without statistically significant impacts, the Floridan aquifer appears to be fully capable of supplying the requested amounts of water as long as withdrawals are monitored and actively managed.

The St Johns River Water Management District adopted its Water Supply Plan 2005 (WSP) in February 2006. The City is required to address issues raised in the WSP and to include long-range water supply facilities projects identified in the WSP.

The City of Keystone Heights does not lie within a priority water resource caution area; existing and reasonably anticipated sources of water and water conservation efforts are considered to be adequate to supply water for all legal uses and anticipated future uses and to sustain the water resources and related natural systems. The WSP identifies water supply development projects that must be included in a local government's comprehensive plan. No projects are identified as required for the City of Keystone Heights or its utility provider, the Clay County Utility Authority.

The SJRWMD has indicated that it will initiate a regional study in mid- 2009 with the Suwannee Water Management District to review the status of the area with regard to designation as a Priority Water Use Caution Area.

The City is served by central water service. Previously operated by a private company, Southern States Utilities, in 2005 the CCUA took over operation of the two water treatment plants that serve the City. The CCUA serves the City from two wells within the City limits. The WTP that serves the City (Keystone Heights) is looped with the Keystone Heights Club WTP, creating a combined service area that extends beyond the City limits. While the combined capacity for these two plants is 1.376 mgd, the Consumptive Use Permit (CUP) for this system authorizes withdrawals of 0.6499 mgd (236.747 MGY):

The average daily flow in the Keystone Grid is 0.5284 mgd and the annual withdrawal for 2008 is projected to exceed that permitted. The CCUA applied for a modification of its CUP in December 2006; the modification will consolidate the permits for the Keystone Grid, Postmasters Village (located in unincorporated Clay County) and Geneva Lakes Estates (located in unincorporated Bradford County) and increase the permitted withdrawals to 2 mgd. The consolidated CUP under review by the SJRWMD, increasing the permitted withdrawals to 2.0 mgd, includes in the service area portions of Clay County that are not within its Centralized Service Areas and as such, the requested withdrawal amounts are in excess of the projected demand associated with vacant land that can be served with central water.

Based on average demand per equivalent residential unit of 294 gallons per day, the City's daily consumption of potable water in 2008 is approximately ~~53,000 gallons~~ 0.1402 mgd.

The average daily flow in the Keystone Grid in 2008 was 0.5284 mgd. The potential increase in demand of 0.073 in 2015 represents a total demand in 2015 of 0.6014 mgd, less than the available capacity of 0.6499 permitted under the current CUP. The projected demand for 2025 is 0.6744 mgd, which just exceeds the 0.6499 mgd permitted withdrawals in the current CUP. The consolidated CUP under review by the SJRWMD, increasing the permitted withdrawals to 2.0 mgd, exceeds the projected increase in demand within the service area through 2025.

Aquifer Recharge

The City implemented land development regulations in 1992 that, consistent with its adopted goals, objectives and policies, address protection of the high recharge areas of the Floridan aquifer that are located within the City limits. Because the City is essentially built-out, there is little opportunity for new development that would impact the Floridan aquifer from a water quality or recharge perspective. Redevelopment activities and the intensification of uses on existing properties within the City do however represent a threat to the Floridan aquifer if not properly regulated. Policies have been added that will restrict uses within high recharge areas.

Water Conservation

The City has been served by central water since before adoption of the original comprehensive plan in 1991. All development within the City must connect to central water service. Southern States Utilities owned and operated the system prior to its acquisition by the Clay County Utility Authority in 2005.

The CCUA system serves primary residential customers. The residential customers are almost exclusively single family homes; the non-residential customers are primarily small service businesses. Except for the Clay Electric Cooperative's offices within the service area, the non-residential customers are service and retail establishments that serve the needs of the community.

Water conservation is accomplished in two ways: by the practices of the utility itself, where leaks and other sources of unaccounted use are limited through maintenance and monitoring systems and by a reduction in demand by the end user. The Clay County Utility Authority has reduced the percentage of unaccounted use, as a percent of the total use, since its acquisition of the potable water system and the Keystone Heights Grid operates above the standards established by the FDEP.

The CCUA has an adopted Water Conservation Plan that identifies its efforts in leak detection, public information programs and accurate accounting (meter replacement and Automatic Meter Reading). The average demand in the Keystone Heights system, exclusive of the demand generated in the Keystone Club area, located in Bradford County is 280.8 gpd.

With a household size of 2.62, this demand represents 107 gallons per day per person. The low demand rate can be attributed to the small lot sizes within the City, the lack of irrigation systems (attributed to the age of development and to the soil types, which make irrigation systems inefficient because of very high infiltration rates). These characteristics are not projected to change, even with new development.

Within the City limits, there are 74 vacant residential, platted single family lots, 9.21 acres of vacant land in the Commercial Land Use category and 52.25 acres of vacant land in the Residential Land Use category. At a maximum development potential of 6 units per acre, the vacant residential land has a maximum development potential of 313 residential units. The vacant commercial lands are located outside the City Core and are subject to an maximum FAR of 0.4. The vacant acres could be developed at a maximum of 160,475 square feet of non-residential use.

The City has issued an average of less than 1 residential building permit a year since 1991. Lot sizes in the City are small, averaging less than 6,000 square feet, so irrigation water demand is not significant. Because new development will represent a small percentage of the total water demand through 2025 and will be subject to building construction standards that require low flow fixtures to reduce water demand, the City will focus its water conservation efforts on reducing the water demand associated with existing development.

The majority of the existing residential structures within the City are older; 53 percent of the single family units in the City as of 2000 were more than 30 years old and 83 percent were more than 20 years old. As of 2008, the 207 structures that were greater than 30 years old are approaching 40 years old. The majority of the existing residential units in the City were constructed prior to the enactment of building codes that required water saving fixtures.

The replacement of aging fixtures within a structure with low-flow fixtures occurs over time; low-flow fixtures are the only fixtures currently available in the marketplace. As bathroom and kitchen fixtures are replaced, the water savings is provided in the replacement fixture. The City will undertake additional water conservation measures:

- the city will adopt an irrigation ordinance that establishes which two days irrigation is
- Support a public information program that educates citizens about water conservation inside and outside the home and business. The SJRWMD has materials available and the City could serve to distribute, publish and otherwise distribute the information.
- Strengthen the landscape ordinance with regard to xeriscape requirements for new development

The average water demand rates within the City are low in comparison to demand rates in unincorporated Clay County. The total demand on the water supply by City residents and businesses is a very small percentage of the overall demand in the County. These attributes of the CCUA system within the City are projected to continue. The City will focus on efforts to

educate its residents and businesses on water conservation opportunities and to work with the CCUA to implement any initiatives it undertakes.

Mineral Resources

Keystone Heights is located on Trail Ridge, an area which has been actively mined for sand and heavy minerals.

Vulcan is currently mining sand in the Keystone Heights area with other deposits located within 5 miles both north and south of the City of Keystone Heights. Heavy minerals mining by DuPont occurs within the boundary of Camp Blanding in the northwestern area of the facility and in northwest Clay County.

Wetlands, Floodplains and Soils

Within Keystone Heights the two major associations of wetlands are bottom land hardwood and freshwater marshes. The only wetlands in the City are freshwater marsh associations often referred to as marsh wetlands. The freshwater marshes surround the periphery of the lakes in Keystone Heights.

The freshwater marshes along the tributary creeks and surrounding the Keystone lakes were ~~are~~ flooded seasonally. Changes in lake levels have affected freshwater marshes adjacent to the shoreline of the lakes' this resource is being denied adequate water to sustain their characteristics. When adequate water is present, they are classified as palustrine with emergent vegetation of broad leaf trees and shrubs. These wetlands ~~are~~ would typically be flooded during the summer and fall wet seasons.

The floodplain areas in Keystone Heights comprise less than five percent of the land area of the City. The Natural Resources Map depicts the generalize flood plain locations within the City. Portions of the areas shown on the Natural Resources Map will flood periodically during severe thunderstorms ad extended periods of rain associated with frontal activity and hurricanes.

Much of the flood prone areas encompass wetlands with poor soils. While soil erosion is not a concern within the City, soils in wetlands will oxidize and shrink when drained. Special considerations and demucking should be accomplished when constructing roads or building pads. Additional discussion of soils in the City is included in the Future Land Use Element.

Native Vegetation and Forestry Resources

Dominant native vegetative species consist of oak and hickory at the higher elevations in Keystone Heights and cypress, maples, tupelo, hickory, oak and other hydrous hammock hardwoods at lower elevations bordering lakes and streams. Intervening lands are dominated by sand, long leaf and slash pine. These resources as well as majestic live oaks and other hardwoods, which dominate some of the City's residential areas, are of immeasurable value

for aesthetic purposes, buffer zones, noise abatement, and habitat for birds, squirrels and other wildlife.

Adjacent to the City is the upland hardwoods community which is an open forest community influenced by fire, heat and drought. Fires can occur frequently in drought conditions and the natural vegetation has adapted to withstand their effects. Fires prevent hardwoods from regenerating, allowing the longleaf pine, which cannot tolerate hardwood competition, to remain dominant. Grasses cover large areas of this community and provide fuel for the fires. Water moves rapidly through the soil to the aquifer with little runoff and minimal evaporation.

There are some oak/pine hammock communities which occur at various locations scattered throughout the City and can be readily identified by some dense canopies of predominantly laurel and live oak trees. There is very little understory. This community can be found on level to rolling topography. Many areas have been cleared or altered extensively for urban uses.

Open Space, Scenic Areas and Unique Environmental Features

Keystone Heights is located close to Goldhead State Park which provides unique scenic vistas associated with the Florida Trail. The Florida Trail traverses Goldhead State Park and Camp Blanding Wildlife Management Areas.

The most unique environmental feature within the City are the freshwater lakes, with access to Lake Geneva provided from the City's public beach. This resource provides recreation opportunities to residents of the city and surrounding unincorporated counties as well as sustaining wetlands, freshwater marshes and fisheries. The County boat ramp located on Lake Brooklyn has been closed for approximately 5 years because of declining lake levels. The County has elected not to invest in improvements and maintenance until such time as the lake levels increase sufficiently to allow access from the ramp. There is no longer public boating access to Lake Brooklyn.

The City has placed the lakes within its jurisdiction in the Conservation Land Use category and established standards for their protection that include coordination with the SJRWMD and community stakeholders.

Wildlife and Fisheries

Keystone Heights has a variety of wildlife and fishes. There are at least 100 plant types, 40 species of fish, 30 species of reptiles, 65 species of birds, 15 species of mammals, and 5 species of amphibians that exist within the City's boundaries. None of these are listed as rare, threatened or endangered species of special concern. The three basic classifications of endangerment used by federal and state wildlife and fish management agencies are defined below:

Endangered – The highest level of protection because of the potential for extinction.

Threatened – The population of these species have dramatically declined and these species have the potential of being endangered.

Species of Special Concern – The populations are declining.

Because the City has been subdivided and the land made for urban use, there are no significant habitat areas for any animal or plants listed as endangered or threatened. The animals (mammals, birds, amphibians and reptiles) and plants which are listed on the Florida Fish and Wildlife Conservation Commission (FWC) list of Rare and Endangered Species which may be found in an isolated location includes:

Plants:	Curtiss' Milkweed (Endangered) Chapman's Rhododendron (Endangered)
Birds	Red Cockaded Woodpecker (Species of Special Concern)
Reptiles and Amphibians:	Gopher Tortoise (Species of Special Concern)

Source: Florida National Areas Inventory, FNAI, July 1989.

Of the listed endangered species, the various State and Federal agencies as well as private volunteer organizations are only able to monitor the location of the red cockaded woodpecker and the closest sighting are 5 miles north in Camp Blanding.

Fishery resources of Keystone Heights are associated with the major lakes. The numerous lakes once supported good large-mouth bass, crappie, shellcracker and bluegill populations. The lack of rainfall has drastically affected the water level in the area lakes and fishery resources have all been adversely affected. The recovery of these resources will depend on the future lake levels. Regulatory decisions by the St Johns River Water Management District with regard to minimum flows and levels for lakes within and adjacent to the City are critical to the restoration of fishery resources historically associated with these lakes.

Hazardous Waste

Keystone Heights does not have any large scale hazardous waste generators within its corporate limits.

The only significant generator in Keystone Heights is the Clay Electric Cooperative Headquarters. The Cooperative cleans their electric transformers at their offices. The wash water is treated onsite in accordance with FDEP requirements. Other generators are small business generators.

The FDEP offers assistance under its Small Business Environmental Assistance Programs to small quantity generators and local governments in understanding how to handle small

quantities of hazardous waste. Materials are provided on the FDEP website for the following businesses that may locate within the City:

- Asbestos (removal)
- Dry Cleaner
- Demolition Contractor/ Services
- Furniture refinishers
- Laboratories
- Paint and Body Shop
- Pharmacies
- Photo Shop
- Printer