

Chapter 1: INTRODUCTION AND BACKGROUND

#1 in Quality of Life among Major Markets - Portfolio.com/bizjournals, May 2010

4th Fastest Growing U.S. Metropolitan Area from 2000 to 2009 (Raleigh-Cary) - U.S. Census Bureau, Population Division, March 2010

#1 Top Business Climate (North Carolina) - Site Selection, November 2008

#1 among America's Most Wired Cities - Forbes.com, March 2010

#8 Best Place to Live - RelocateAmerica.com, April 2010

The Town of Cary consistently enjoys the distinction of being one of the most desirable places to live and work in the country. One of the core reasons for this recognition is balancing two decades of significant growth with a high quality of life for residents. The Town of Cary's robust infrastructure supports residential, commercial, and business communities while carefully integrating extensive community centers, greenways, lakes, parks, and recreational areas. The long-term result supports both the vigor of the economy as well as the well-being of the individuals who live and work in the town. The balance between growth, quality of life, and quality of the natural environment is a foundational principal of Cary's Mission Statement:

"AT THE TOWN OF CARY WE FOCUS EVERY DAY ON ENRICHING THE LIVES OF OUR CITIZENS BY CREATING AN EXCEPTIONAL ENVIRONMENT AND PROVIDING EXEMPLARY SERVICES THAT ENABLE OUR COMMUNITY TO THRIVE AND PROSPER."

An important aspect of complementing economic development and environmental protection is effective stormwater management. The Town has provided consistent leadership in this respect for over twenty years. From the use of progressive Urban Transition Buffer regulations to a robust Best Management Practice (BMP) Inspection program, the Town of Cary sets the standard for environmental stewardship even as it provides opportunity for economic stimulus.

The purpose of this Stormwater Master Plan is to explore the history of the Stormwater Management Program for the Town of Cary, assess the Programs' current condition in light of the state of the practice, its peers and the regulatory environment and, finally, to propose a framework for the next evolution of the Town's high standards of Stormwater Management in the coming decades.

A. General History and Demographics

The Town of Cary was founded in 1750 as Bradford's Ordinary. However, its modern beginning was in 1854 when Allison Francis "Frank" Page and his wife Catherine bought 300 acres of what is now the center of Cary. Mr. Page laid out the first streets and built a hotel that today is the Page Walker Arts & History Center. He also named the Town after Samuel Fenton Cary, a man he greatly admired. The Town was officially incorporated on April 6, 1871, thus insuring Cary's status as a viable, accessible rural community.

Cary grew at a steady pace for the next 80 years, recognized as a thriving and prosperous town. Even

Figure 1.1 Town Historical Limits

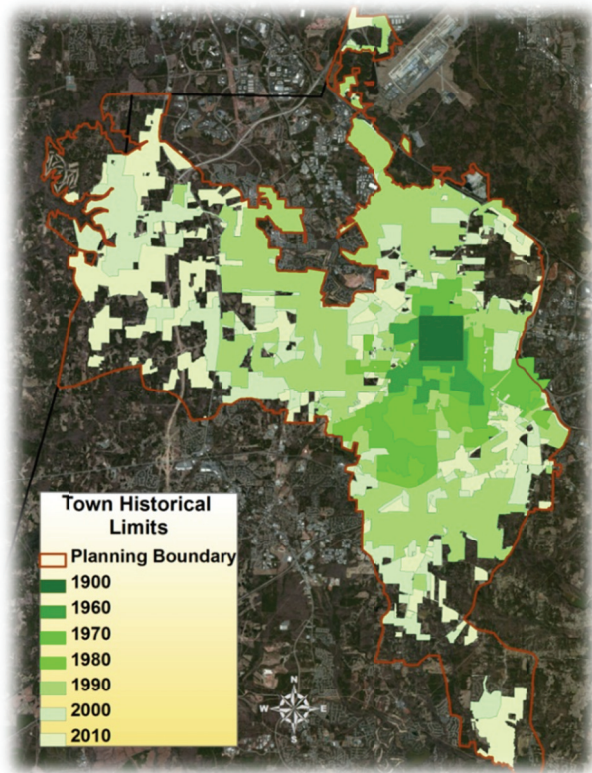


Table 1.1 - Cary Growth statistics

Census Year	Population	Ten-year Growth Rate	Town Area (mi ²)	Population Density
1940	1,141	NA	1.0	1,141
1950	1,496	31.1%	1.0	1,496
1960	3,356	124.3%	3.0	1,118
1970	7,640	127.7%	6.0	1,273
1980	21,763	184.9%	9.9	2,198
1990	43,858	101.5%	30.3	1,447
2000	95,869	118.6%	42.9	2,235
2010	136,590	42.5%	55.4	2,466
2020	175,598*	28.6%	67.3	2,609
2030	206,813*	17.8%	79.2	2,611

*Based on Town estimated rates of growth

so, Cary remained a town of a few thousand people into the 1960's. The catalyst for dramatic growth in Cary was the creation of the Research Triangle Park (RTP) on the Wake/Durham County line. While the RTP spurred growth for many large Wake and Durham towns and cities, its effect on Cary was nothing short of explosive.

With a unique combination of small town and suburban charm coupled with an enviable location, Cary became a desirable place to call home for both those working in the RTP and Raleigh. Table 1.1 shows the parallel growth in Cary's population and land area. The population doubled during the decades of the 1980's and 1990's while its borders extended from approximately 6.0 square miles to over 42 square miles by the year 2000.

Today the Town of Cary has a highly educated, diverse population of over 141,000 with an incorporated area of 55.4 square miles and a services area/planning boundary encompassing 79.2 square miles. Based on Town estimates, the population will continue to grow at an accelerated pace for the next decade, moderating by 2030 to an estimated 17.8% or less rate of growth per decade, or less than 2% annually. This moderation is expected as the Town expands to the limits of its planning boundary/service area.

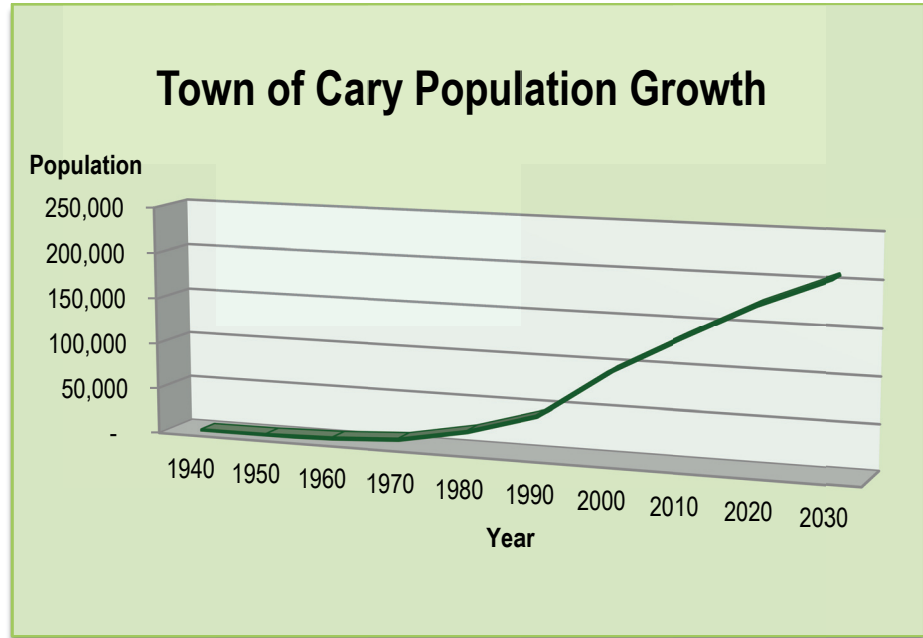


Figure 1.2 Town Population Growth

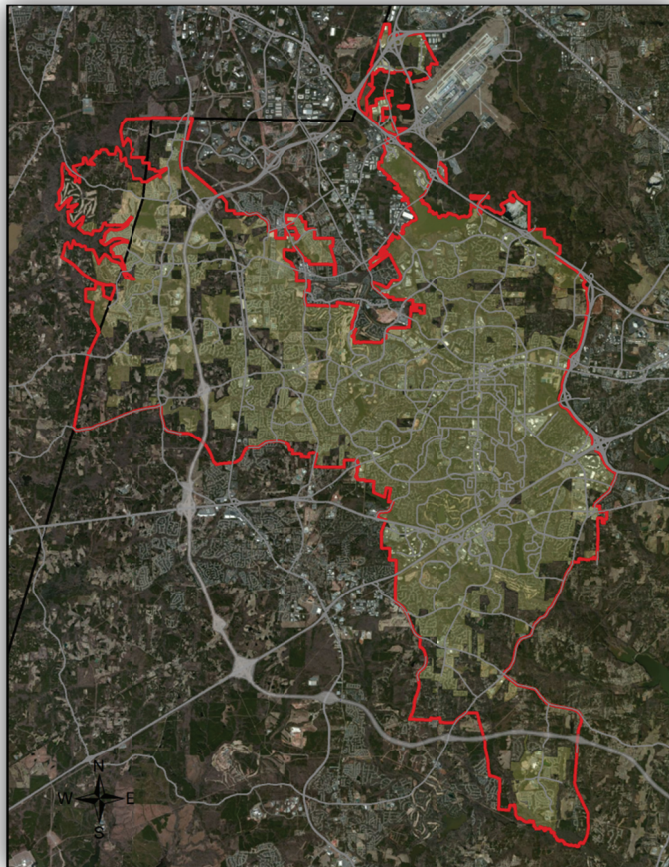


Figure 1.3 Town Boundary

With other municipalities, Lake Jordan, and Raleigh-Durham International Airport (RDU) bordering the planning boundary, there are no plans to grow beyond the planning area for the foreseeable future. The Town's ongoing challenge will be to maintain its relatively low population density as the expansion continues and then infill development occurs. The Town's commitment to maintaining open space and providing protection for its natural systems while accommodating projected increases in population density within the developable and livable areas will increase stress on existing and future stormwater systems. A key to the Town of Cary achieving its mission statement under these conditions will be for the stormwater program to creatively enhance its proactive approach while innovating new ways to embrace anticipated population growth.

B. Town Geography

The Town of Cary rests on 55.4 square miles in southwest Wake County and eastern Chatham County, in the rolling hills of the Piedmont Region of Central North Carolina. The Town rests on two natural ridgelines that separate Jordan Lake watersheds flowing to the west, Crabtree Creek watersheds flowing to the northeast, and Swift\Walnut Creek watersheds flowing to the south and east. As previously noted, the town is adjacent to the communities of Apex and Holly Springs to the south, Raleigh to the north and east, Morrisville and RTP/Durham to the northwest and Lake Jordan immediately west.

Connecting the Town of Cary to its surrounding communities and North Carolina is a robust transportation network. I-40 runs through the northern parts of town, US 1/64 through the southern section and the Triangle Expressway through the west. Cary proper is supported by the Maynard Loop which encircles the Town Center Area and the Cary Parkway which is also a radial collector for the Town suburbs tied to the Maynard Loop. Cary is located on a main railroad line and supports an Amtrak station in the Town Center. Cary also has easy access to air travel with RDU on the northeastern border. Accessibility to this transportation network contributes to Cary being a desirable place to work and live. However, it also increases maintenance of the Town's stormwater networks and stream crossings due to the addition of considerable impervious areas within Cary's borders.

A key focal point of growth for the Town of Cary is the Town Center Area as defined by the Town Center Area Plan (TCAP) adopted in 2001. The TCAP comprises 1.5 square miles located at the historic center of Cary at the intersection of Academy and Chatham streets. The TCAP is considered the traditional heart of Cary and the Town has developed the TCAP to prepare the area for future redevelopment into a higher density mixed use area that will be the geographic, business, social and cultural center for the town.

According to 2010 land use data from the Town, Cary's land use consists of approximately 50% Residential, 12% Commercial/Industrial, and 38% Vacant Land and other uses. (See Table 1.2 for breakdown of land use classifications and percentages.)

Figure 1.4 TCAP Planning Map depicting TCAP boundaries, streams and buffers

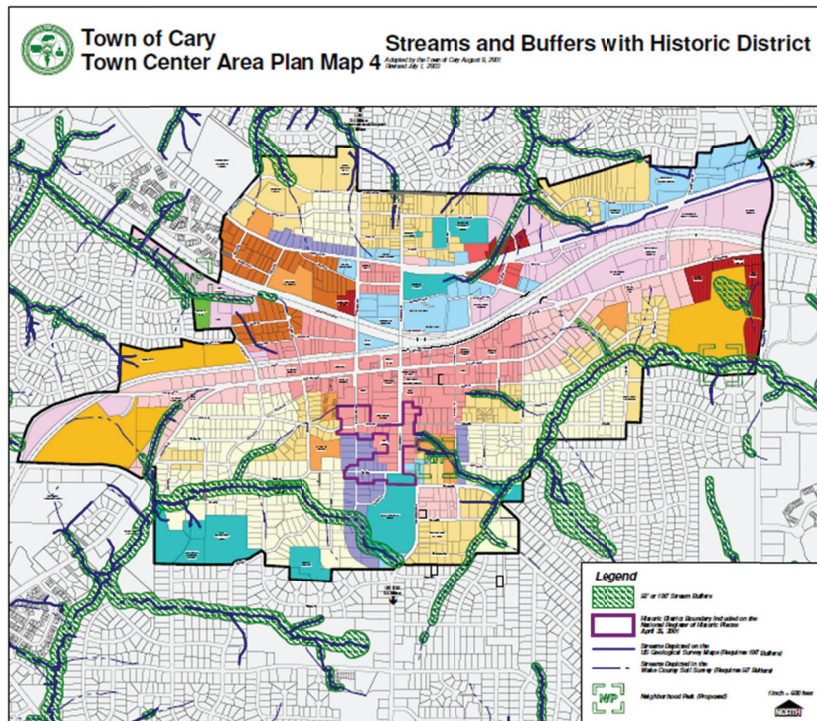


Table 1.2 – Town Land Use Data (2010)

Land Use Description	Parcels	Acres	% of Total Land Use
Residential < 10 Acres	38,473	11,441	38.5%
Residential > 10 Acres	22	160	0.6%
Apartments	252	1,352	4.5%
Manufactured Homes	15	96	0.3%
Home Owner Association	1,259	1,722	5.8%
Residential Subtotal	40,021	14,771	49.7%
Commercial	983	3,315	11.2%
Retirement Home	4	13	<0.1%
Industrial	28	265	0.9%
Commercial/Industrial Subtotal	1,015	3,593	12.1%
Golf Course	10	789	2.6%
Acreage with Improvements	40	144	0.5%
Agricultural/Farm	15	280	0.9%
Forestry/Farm	11	136	0.5%
Exempt Land	504	5,310	17.9%
Vacant	3,523	4,518	15.2%
Private Water Systems	6	3	<0.1%
Other	1,140	180	0.6%
Farm and Other Subtotal	5,249	11,359	38.2%
Total	46,285	29,723	

A crucial component to maintaining water quality is to manage stormwater and the amount of impervious area. Impervious ground surface (typically paving, rooftops, compacted gravel and similar surfaces) inhibit the normal infiltration of rainfall into the ground, reducing groundwater recharge and accelerating runoff. Such areas typically have higher levels of stormwater runoff, requiring robust stormwater controls, typically referred to as stormwater “Best Management Practices (or BMP)” to minimize or control the impact of the increased runoff. At the time of this report, analysis of the current Town of Cary GIS impervious area layer shows the TCAP area to have an impervious area of 31%, and the impervious area within the Town planning boundary is 14%.

We can infer from these statistics that Cary is predominantly a residential town with a relatively low density of

development with the exception of the Town Center area. This is due in part to its dedication to maintaining open space, such as an extensive parks and greenway system; which is an amenity to its residents. To keep pace with the anticipated population growth in the next two decades, the Town’s Land Use Plan and Zoning Ordinances will continue to guide smart growth development as it looks to re-imagine the Town’s center through high density development and redevelopment. Addressing the potential increases in impervious area and surface water runoff will continue to require innovative thinking and a flexible stormwater management strategy. The Town of Cary has demonstrated this kind of forethought with strategies to control peak runoff and limit impervious area for development and redevelopment that is flexible to the regulatory needs of Cary’s watersheds. These controls have both low density and high density requirements based on impervious area:

- For the Walnut Creek, Middle Creek, and Crabtree Creek watersheds, the breakpoint between low density and high density projects is 24% impervious surface area or more than two dwelling units per acre. Low density development requires transporting runoff by vegetative conveyances to the

maximum extent practicable. High density development requires control measures to treat the 1 year 24 hour storm and provide Total Suspended Solids (TSS) removal of 85%. These requirements are detailed within section 7.3.7 of the Land Development Ordinance (LDO).

- The Swift Creek and Jordan Lake Watersheds are part of the Watershed Overlay Zoning District and have their own specific requirements within section 4.4.6 of the LDO to address the sensitive protection issues for their areas. For these watersheds, there are also low and high density requirements based upon impervious area and amount of dwelling units. One critical difference for these watersheds is the inclusion of maximum impervious surface limits and a high density requirement to contain and treat the runoff from the first one inch of rainfall

The above strategies show the Town of Cary to be very progressive in its approach to stormwater management and show its willingness to create an environment for “green” development and protection of natural resources.

C. Town Watersheds

The Town of Cary is divided north to south by two major river basins: the Cape Fear and Neuse River Basins. Twenty-nine percent (29%) of the Town Planning Area (23 sq. mi.) is in the Cape Fear River basin and seventy-one percent (71%) of the Town Planning area is in the Neuse (56.2 sq. mi.).

The sub watersheds to the Cape Fear and the Neuse that the Town of Cary intersects with can be seen in Figure 1.5. Table 1.3 also lists these sub watersheds and shows their respective acreage and percent impervious within the limits of the Town Planning Boundary, and for the TCAP area.

Neuse River Watersheds

Upper Crabtree Creek

The Upper Crabtree Creek watershed is the largest watershed in Cary, draining 13,341 acres of northwest Cary eastward into the City of Raleigh. It is predominantly residential with some urban concentration in the Town Center. A significant portion of Morrisville and the RTP also drain into Cary as part of this watershed. Multiple lakes and ponds are located throughout the watershed, with the largest regional impoundment being Lake Crabtree. This watershed contains primary streams such as Crabtree Creek, Black Creek, Coles Branch, Stirrup Iron Creek, and Brier Creek. Some of these streams such as Crabtree Creek, Brier Creek, and Black Creek are listed on the Federal Section 303(d) list, signifying the stream to be impaired by federal water quality standards. The Black Creek sub watershed of Upper Crabtree Creek is a watershed of concern for the Town and the public. The Watershed Education for Communities and Officials (WECO) Black Creek Watershed Management Plan was developed with the Town to aid in improving the quality of the watershed and has significant public involvement through the Black Creek Watershed Association.

Middle Crabtree Creek

Middle Crabtree Creek drains 2,904 acres of northeast Cary and outfalls into Raleigh under I-40. The area is a mix of residential and office use with significant natural ground cover, including the SAS Campus. This watershed is considered a nutrient sensitive water this portion of Crabtree Creek is on the 303(d) list for impaired watersheds.

Walnut Creek

The Walnut Creek watershed drains 1,857 acres of east Cary downstream into Lake Johnson in Raleigh. The watershed contains a mix of the urban Town Center area and residential/office/commercial land use. Walnut Creek has been identified as a 303(d) impaired stream and is considered a nutrient sensitive water.

Swift Creek

The Swift Creek watershed is the second largest watershed in Cary draining 12,865 acres of central and southern Cary to the southeast to Lake Wheeler. The land use is predominantly residential with some urban from the Town Center, and mixed office and commercial throughout. Primary streams within the watershed are Swift Creek, Dutchmans Branch, Speight Branch, Lens Branch, and Swift Creek Trib. No. 7. A portion of Apex drains into the watershed from the west. Several community owned lakes such as Lake Kildaire, MacGregor Downs Lake, and Lake Lochmere are located in the watershed. As previously mentioned in this section, the Swift Creek watershed falls under the Watershed Overlay District for the Town and has specific stormwater management controls. Swift Creek is deemed a nutrient sensitive watershed by the Division of Water Quality (DWQ) and falls under the rules and requirements described in later sections for the Swift Creek Watershed Land Management Plan and the Swift Creek Total Maximum Daily Load (TMDL).

Upper Middle Creek

The Upper Middle Creek watershed constitutes 4,967 acres of the most southern portions of Cary. The Town portions of this watershed are mainly residential and rural. Primary creeks are Rocky Branch and Camp Branch that drain into Middle Creek.

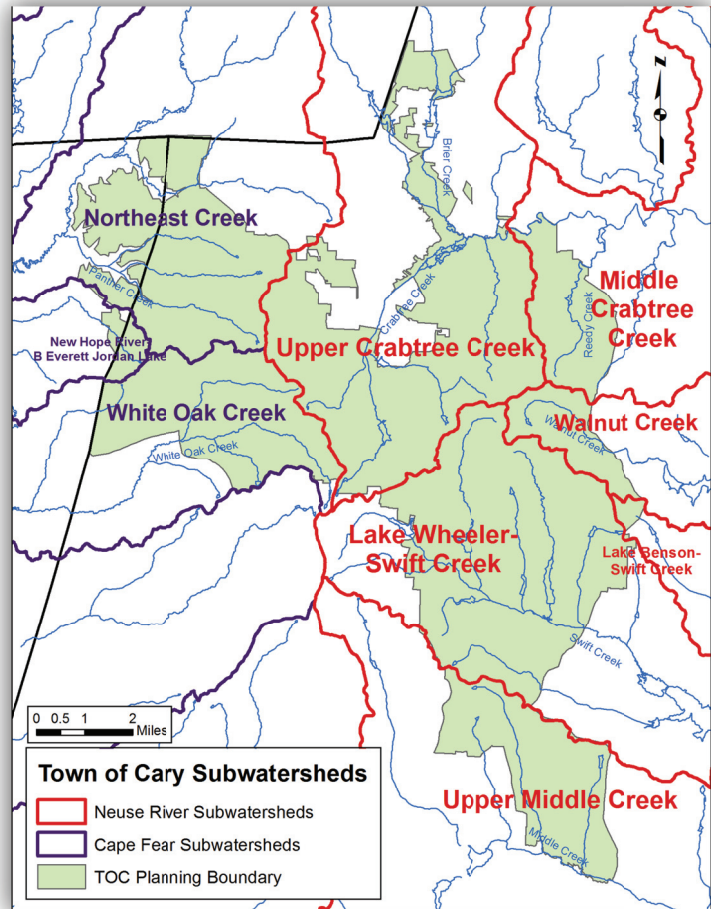


Figure 1.5 – Town of Cary Sub Watersheds

Cape Fear River Watersheds

Northeast Creek

The Northeast Creek watershed drains approximately 7,968 acres of northwest Cary into Jordan Lake in Chatham County. Land use consists of mainly low density residential and residential with rural and natural areas. The main streams in this watershed are Kit Creek, Morris Branch, and Panther Branch. Some portions of the RTP and Morrisville drain through Cary along Kit Creek as part of the overall watershed. The backwater effects of Jordan Lake do extend into the Town Planning Boundary. This watershed is covered under the Watershed Overlay District and has special stormwater quantity and quality requirements. It also falls under the requirements set forth under the Jordan Lake TMDL.

White Oak Creek

The White Oak Creek watershed drains approximately 6,147 acres of southwest Cary into Jordan Lake. Land use consists of mainly low density residential and residential with rural and natural areas. The main streams in this watershed are White Oak Creek, Bachelor Branch, and Jack Branch. The backwater effects of Jordan Lake do extend into the Town Planning Boundary. This watershed is also covered under the Watershed Overlay District and has special stormwater quantity and quality requirements. It also falls under the requirements set forth under the Jordan Lake TMDL.

Table 1.3 - Town Sub Watersheds, Area and Percent Impervious

Sub Watershed	Basin Area within Planning Boundary (acres)	Percent Impervious within Planning Boundary	Basin Area within Town Center (acres)	Percent Impervious within Town Center
<i>Neuse River Basin</i>				
Upper Crabtree Creek	13,341	17%	369	33%
Middle Crabtree Creek	2,904	13%	23	34%
Walnut Creek	1,857	31%	296	35%
Swift Creek (Lake Wheeler)	12,649	21%	270	24%
Swift Creek (Lake Benson)	216	23%	0	na
Upper Middle Creek	4,967	5%	0	na
<i>Cape Fear Basin</i>				
Northeast Creek	7,968	2%	0	na
New Hope River	632	2%	0	na
White Oak Creek	6,147	8%	0	na
Beaver Creek	7	14%	0	na
Total	50,687	14%	958	31%

Source: GIS Data from Town of Cary GIS

From this impervious data we can gain an understanding of how Cary has developed and is developing from a stormwater runoff point of view. Salient points to consider:

- As shown in Table 1.3, the portions of the four watersheds that intersect with the Town Center area planning boundary (Upper Crabtree Creek, Middle Crabtree Creek, Walnut Creek, and Swift Creek (Lake Wheeler)) indicate an average percent impervious of 31%. Development in the Town Center area ranges from centuries-old buildings to new development and redevelopment. Much of this development occurred prior to the benefit of current stormwater and land planning practices and regulations. Therefore, as redevelopment of the Town Center proceeds, solutions can be sought to allow improvements to water quality and quantity through retrofit opportunities and innovative best management practices.
- The Swift Creek (23% impervious) and Upper Crabtree (17% impervious) watersheds downstream of the Town Center area have similar concerns to the Town Center area. Like the Town Center area, both have communities that range from over 60 years old to current day with varying levels of stormwater management based on policy at the time. These areas should have a mix of retrofit solutions and new development going forward.
- The four sub basins that intersect the Town of Cary within the Cape Fear basin have an average impervious area of 5%. This area is relatively undeveloped and allows for more natural runoff characteristics. With the current water quality and water quantity regulations put in place by the Town and State to protect Jordan Lake, these watersheds will likely see less impact from additional runoff compared to others within the Town boundaries. The Town has demonstrated leadership in advancing the regulatory environment prior to development. This gives both developers and regulators common ground on how to develop this area as allowed and maintain water quality.

Watershed Hydrology and Hydraulics

As the Town of Cary has developed, so has the level and amount of watershed and flood studies in the area. Typically, hydrologic and hydraulic studies have only been conducted as the result of new development or for projects initiated by the Town, Federal Government, or State related to FEMA floodplain mapping, road or watershed improvement projects. Therefore, the types of hydrology and hydraulics utilized within the Cary watersheds have depended upon project requirements at the time of the study. The Town of Cary, through its management, standards, and guidelines within the Engineering Services/Stormwater Department, has maintained a consistent approach to hydrology and hydraulics within its service area. This gives both the development community and staff the consistency that is needed to manage the changes in watershed hydrology and hydraulics over time and allow for integration into state and/or federal modeling efforts such as FEMA floodplain mapping.

The majority of the streams within the Town of Cary Planning Boundary have been modeled as part of the FEMA National Flood Insurance Program. The hydrology has typically been determined by using USGS Rainfall gage analysis or HEC-HMS modeling. The stream models have been produced using the HEC-RAS program. For the current floodplain boundaries as defined by the 2006 Wake County and 2007 Chatham County Floodplain Mapping, see Appendix A. In addition, there have been approximately 37 studies completed by private entities and the Town of Cary for select watersheds greater than 50 acres since 2002. These studies were completed as part of development projects or watershed improvement projects. An analysis of these data sets can be seen in Chapter 3 of this report. It should be noted that at the publication of this report, the North Carolina Floodplain Mapping Program is updating flood studies throughout Wake County, including the Town of Cary. As part of this analysis, many of the watersheds will have new hydrology based on HEC-HMS modeling and new Floodplain mapping. It is estimated that the data associated with these studies will be available by the year 2014.

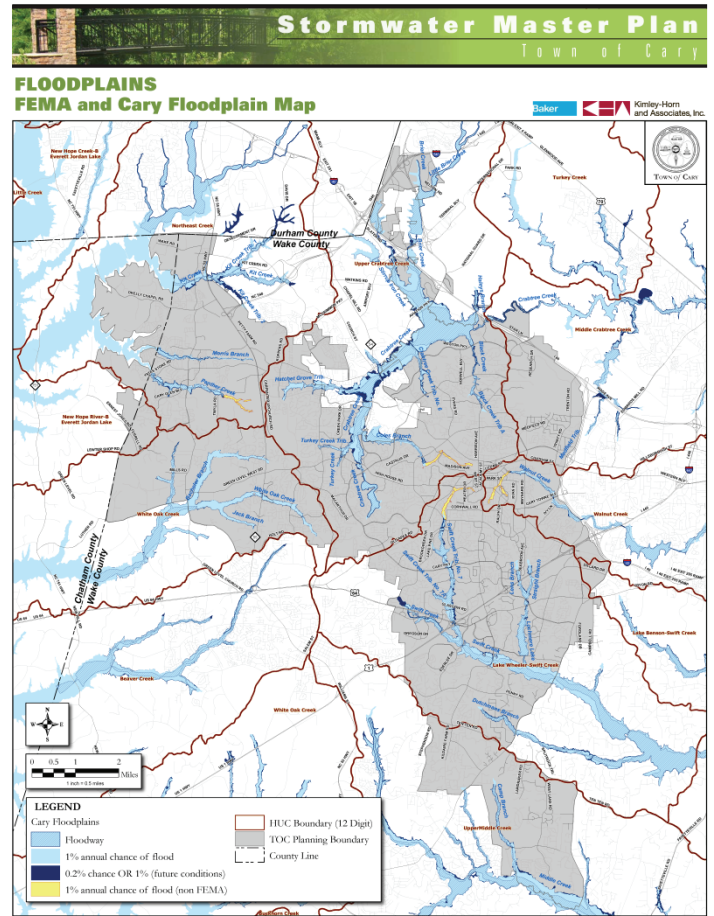


Figure 1.6 Floodplain Map