

Characteristics of the Haikey Creek Watershed



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Acronyms

BMP – Best Management Practice
CPP – Continuing Planning Process
FEMA – Federal Emergency Management Agency
GIS – Geographic Information System
INCOG – Indian Nations Council of Governments
MAWPR – Middle Arkansas Watershed Planning Region
OCWP – Oklahoma Comprehensive Water Plan
ODEQ – Oklahoma Department of Environmental Quality
OWRB – Oklahoma Water Resources Board
PBCR – Primary Body Contact Recreation
SCAP – Site Cleanup Assistance Program
TMDL – Total Maximum Daily Load
WBID – Water Body Identification Number
WQS – Water Quality Standard
WWAC – Warm Water Aquatic Community

Introduction

This report provides information obtained through numerous sources regarding the physical characteristics of the Haikey Creek watershed. Maps, data tables and photos are used along with text to help watershed managers gain more insight into watershed activities that can have an impact on water quality. Haikey Creek is an impaired waterbody and not meeting water quality criteria established by the State of Oklahoma for all assigned beneficial uses. By better understanding the population and activities along with the features within a watershed it becomes easier to select and place best management practices (BMPs) designed to reduce the pollutant load causing the impairment.

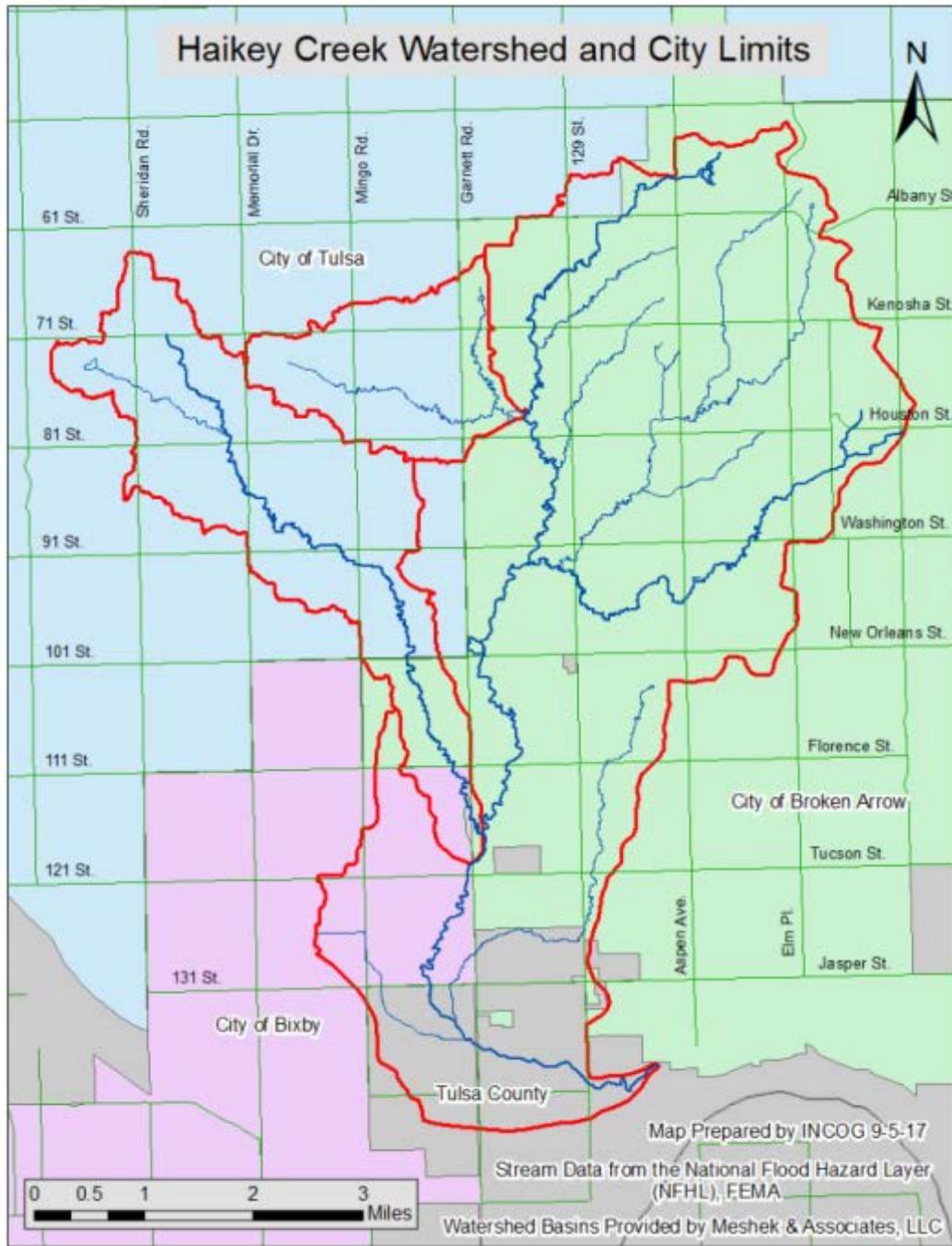
The Haikey Creek watershed along with the Coal Creek, Polecat Creek and Ranch Creek watersheds made up the study area for this report. Each watershed is listed separately, but combined; they make up the whole study.



Physical Description and Location

Haikey Creek (WBID OK120410010210_00) is 10.9 miles long and flows south through the City of Broken Arrow, City of Bixby and an unincorporated area of Tulsa County and the watershed reaches into the City of Tulsa. This watershed lies entirely within Tulsa County and discharges to the Arkansas River. See Map 1 Haikey Creek Watershed and City Limits.

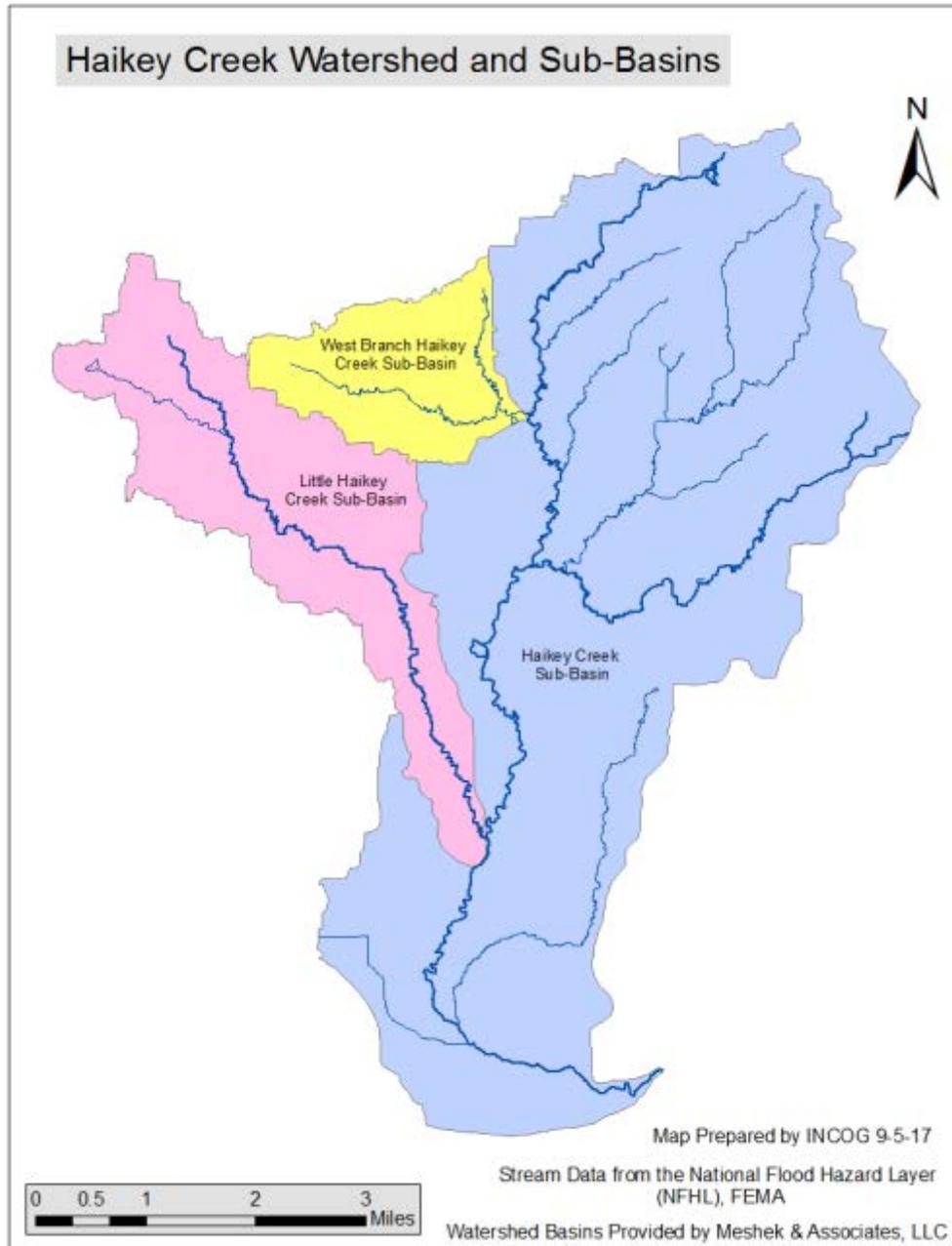
Map 1: Haikey Creek Watershed and City Limits



The Haikey Creek watershed is comprised of three sub-watersheds and totals 33.6 square miles with 49.7 miles of creek. The watershed drained by the West Branch of Haikey Creek is 2.7 square miles. The watershed drained by Little Haikey Creek is 6.3 square miles. The watershed drained by Haikey Creek is 24.6 square miles. The watershed boundaries used in this

report were provided by Meshek & Associates, LLC. See Map 2: Haikey Creek Watershed and Sub-Basins.

Map 2: Haikey Creek Watershed and Sub-Basins



Streams within this watershed are listed and shown in Table 1 and Map 3 below. According to the 2014 Integrated Report, only three of these streams (or reaches) have been assigned water body identification numbers (WBID) and only one stream, Haikey Creek, has been assigned a name by the Oklahoma Water Resources Board (OWRB) or Oklahoma Department of Environmental Quality (ODEQ). (Water Quality In Oklahoma, 2014 Integrated Report)

The Federal Emergency Management Agency (FEMA) lists names for thirteen more streams in this watershed on their “National Flood Hazard Layer (Official)”. To avoid duplicate names for the same stream, INCOG recommends the adoption of the names FEMA uses for the streams OWRB/DEQ has not published names or issued WBIDs for. FEMA’s names are already in use and on their maps and these names will be used in this report.

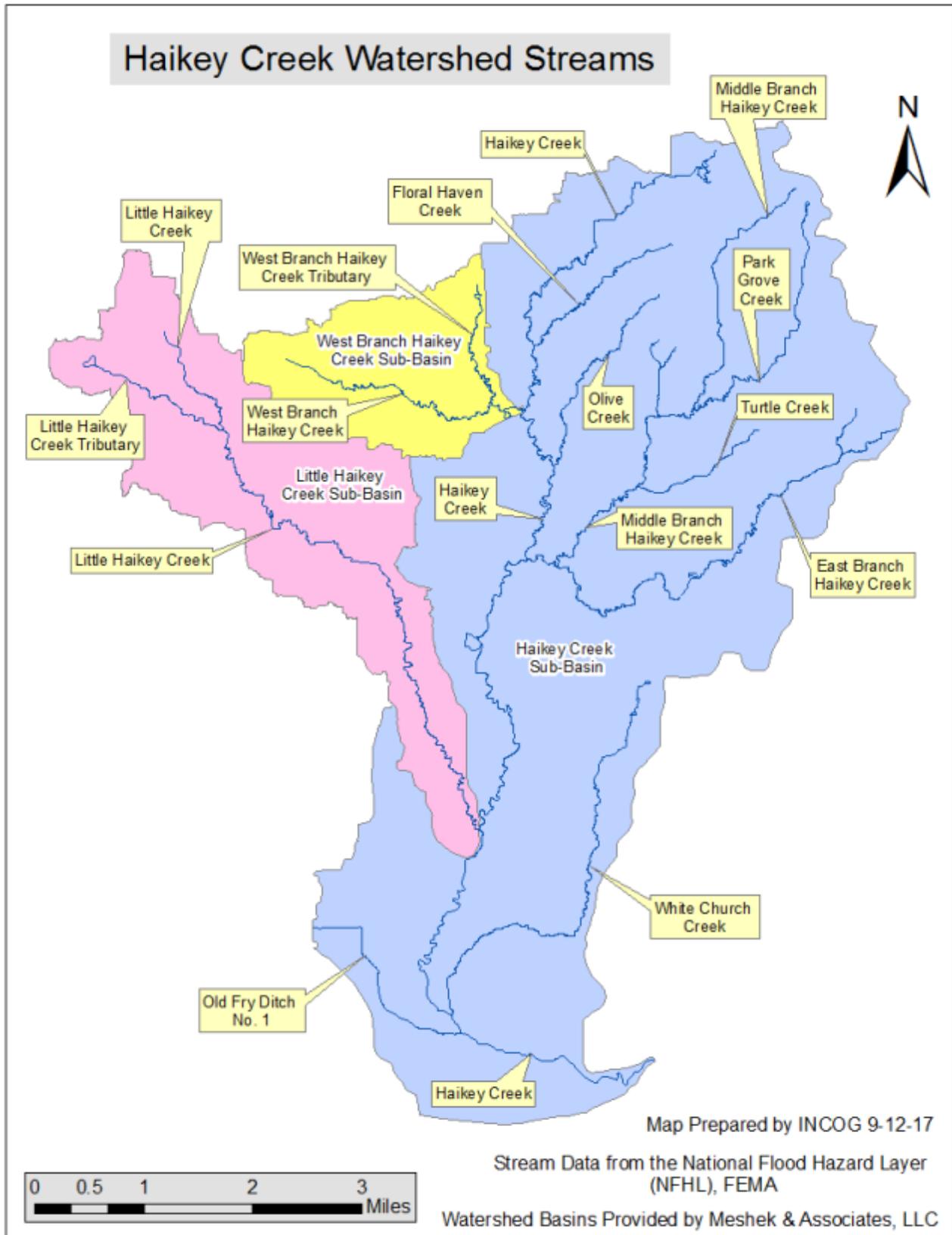
Table 1: Haikey Creek Watershed Streams and WBIDs			
DEQ/OWRB Water Body Identification (WBID)	DEQ/OWRB Water Body Name	Length (Miles) Area (Acres)	Federal Emergency Management Agency Water Body Name
OK120410010210_00	Haikey Creek	10.9 (2014 Integrated Report) 15.9 (FEMA)*	Haikey Creek
OK120410010230_00	Unnamed Tributary of Haikey Creek	8.5	Little Haikey Creek
-----	-----	1.3	Little Haikey Creek Tributary
OK120410010240_00)	Unnamed Tributary of Haikey Creek	5.3	East Branch Haikey Creek
-----	-----	2.8	Middle Branch Haikey Creek
-----	-----	2.0	Old Fry Ditch No. 1
-----	-----	2.3	Olive Creek
-----	-----	3.1	Park Grove Creek
-----	-----	1.4	Turtle Creek
-----	-----	1.1	Unnamed Stream
-----	-----	2.7	West Branch Haikey Creek
-----	-----	1.6	West Branch Haikey Creek Tributary
-----	-----	4.6	White Church Creek
-----	-----	2.1	Floral Haven Creek

*2014 Integrated Report lists Haikey Creek as 10.9 miles. The FEMA map shows Haikey Creek extending further up into the watershed in a different channel and measuring it with the GIS measuring tool shows it to be 15.9 miles.

Haikey Creek at W. New Orleans St. (101 St.), 3-26-18

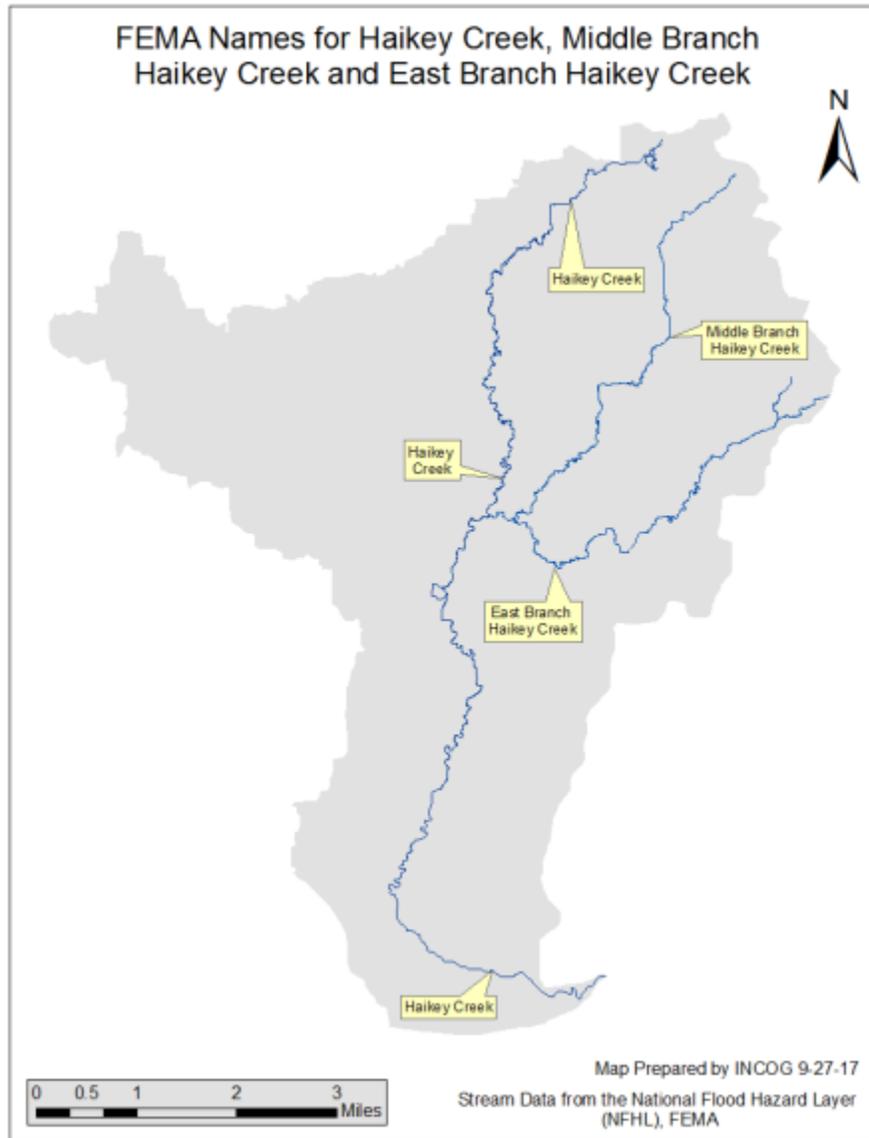


Map 3: Haikey Creek Watershed Streams



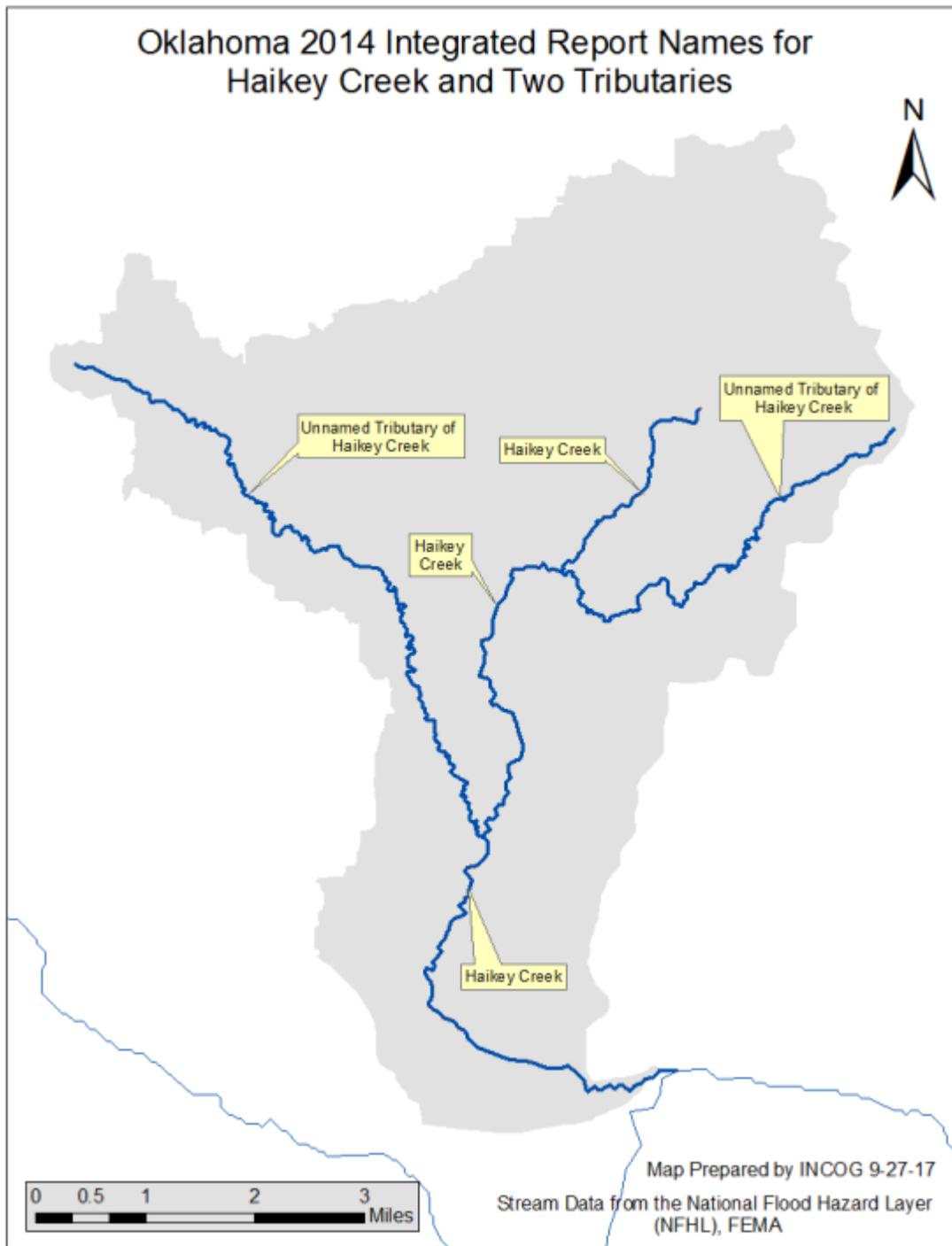
There is a discrepancy between FEMA and the state of Oklahoma as to exactly where the Haikey Creek channel is. FEMA maps show it extending much further up into the watershed (five miles longer) than Oklahoma’s 2014 Integrated Report data. See Map 4: FEMA Names for Haikey Creek, Middle Branch Haikey Creek and East Branch Haikey Creek.

Map 4: FEMA Names for Haikey Creek, Middle Branch Haikey Creek and East Branch Haikey Creek



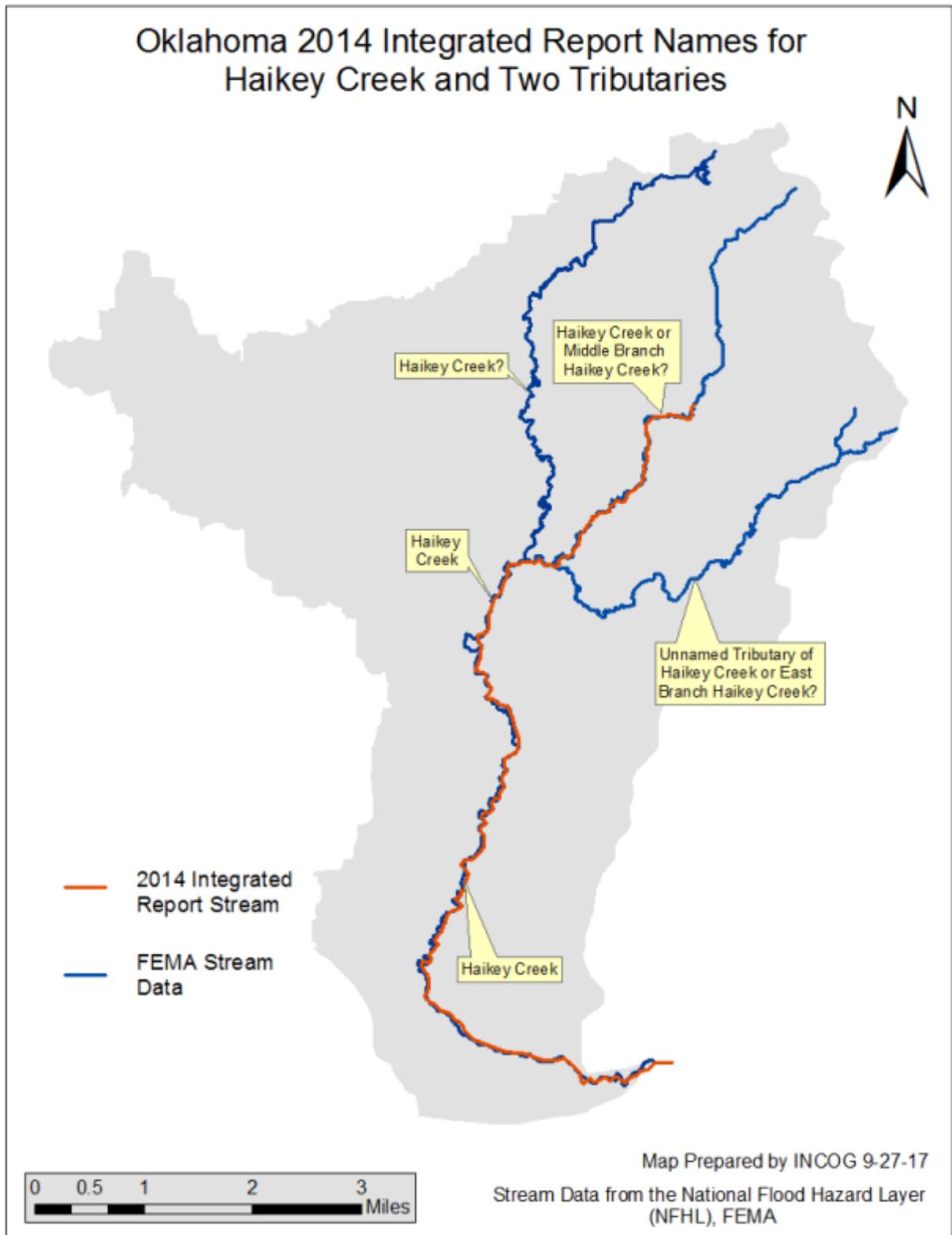
Oklahoma’s 2014 Integrated Report shows Haikey Creek extending from the Arkansas River north and then east on what is labeled East Branch Haikey Creek on the FEMA maps. From there it goes a few miles up what is labeled Middle Branch Haikey Creek on the FEMA maps. See Map 5: Oklahoma 2014 Integrated Report Names for Haikey Creek and Two Tributaries

Map 5: Oklahoma 2014 Integrated Report Names for Haikey Creek and Two Tributaries



The naming discrepancy could cause confusion. Keep in mind FEMA flood maps and DEQ/OWRB impairment and permitting maps show a portion of the Haikey Creek channel in two different places. See Map 6: Oklahoma 2014 Integrated Report and FEMA Overlay.

Map 6: Oklahoma 2014 Integrated Report and FEMA Overlay



The advent of stormwater collection systems has changed the shape of some watersheds in developed areas. Runoff does not always flow to the closest receiving stream. It may get intercepted by a stormwater collection system inlet and piped somewhere else. Therefore caution should be exercised when determining watershed boundaries in developed areas with just topo maps.



Watershed Demographics for Haikey Creek Watershed

To manage a watershed you have to manage the people within the watershed. Any changes that occur within the watershed will be made through the actions of the people living there so it is advisable to understand the population demographics. The following tables show the current demographics for the three sub-basins of the Haikey Creek watershed and how they have changed from 2000 to 2017 with projections out to 2022. The 2017 values are estimates. Data from the United States Census Bureau were used for these demographics.

Some comments are offered following some of the tables to help get individuals thinking about how demographic information can be used to help develop watershed plans and what actions could be implemented to improve watershed conditions. Detailed studies of the data will reveal opportunities that are sometimes overlooked.

Haikey Creek Sub-Basin

The following tables show the current demographics for the Haikey Creek sub-basin and how they have changed from 2000 to 2017 with projections out to 2022. The 2017 values are estimates.

Table 2: Population Demographics										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Population	42,966		47,647		52,701		55,012		10.9%	4.4%
Population Density (Pop/Sq Mi)	1,745.38		1,882.94		2,140.81		2,234.71		7.9%	4.4%
Total Households	14,870		17,305		19,171		20,463		16.4%	6.7%
Population by Gender:										
Male	20,963	48.8%	23,162	48.6%	25,533	48.5%	26,670	48.5%	10.5%	4.5%
Female	22,004	51.2%	24,485	51.4%	27,168	51.6%	28,342	51.5%	11.3%	4.3%

The total population within this sub-watershed increased 10.9% from 2000 to 2010 and is expected to increase another 4.4.0% from 2017 to 2022. The population density increased by 7.9% from 2000 to 2010 and is expected to increase by 4.4% from 2017 to 2022. Overall the population is steadily growing within this sub-watershed.

Table 3: Population by Race										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
White	36,581	85.1%	37,700	79.1%	40,819	77.5%	41,685	75.8%	3.1%	2.1%
Black	1,474	3.4%	2,142	4.5%	2,484	4.7%	2,667	4.9%	45.3%	7.3%
American Indian or Alaska Native	1,890	4.4%	2,301	4.8%	2,607	5.0%	2,761	5.0%	21.8%	5.9%
Asian/Native Hawaiian/Other Pacific Islander	933	2.2%	2,132	4.5%	2,859	5.4%	3,291	6.0%	128.6%	15.1%
Some Other Race	608	1.4%	943	2.0%	1,144	2.2%	1,327	2.4%	55.0%	15.9%
Two or More Races	1,481	3.5%	2,429	5.1%	2,787	5.3%	3,282	6.0%	64.0%	17.8%

Table 4: Population by Ethnicity										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Hispanic	1,485	3.5%	2,833	5.9%	3,306	6.3%	3,798	6.9%	90.8%	14.9%
Not Hispanic or Latino	41,482	96.5%	44,814	94.1%	49,395	93.7%	51,214	93.1%	8.0%	3.7%

Educational outreach efforts should take into consideration the race and ethnicity of the target audience. Cultures and languages vary and priorities may be different so these factors need to be evaluated when coordinating educational outreaches, forming watershed alliances and trying to gain support for changes that could improve watershed conditions.

Table5: Population by Age										
	2000 Census		2010 Census		2017A Estimates		2022 Projections		Percent Change	
									2000 to 2010	2017 to 2022
0 to 4	3,483	8.1%	3,282	6.9%	3,439	6.5%	3,472	6.3%	-5.8%	0.9%
5 to 14	7,600	17.7%	7,461	15.7%	7,725	14.7%	7,507	13.6%	-1.8%	-2.8%
15 to 19	3,460	8.1%	3,668	7.7%	3,975	7.5%	4,042	7.3%	6.0%	1.7%
20 to 24	2,098	4.9%	2,456	5.2%	3,025	5.7%	3,434	6.2%	17.1%	13.5%
25 to 34	5,996	14.0%	6,302	13.2%	6,639	12.6%	6,804	12.4%	5.1%	2.5%
35 to 44	8,086	18.8%	6,858	14.4%	7,359	14.0%	7,642	13.9%	-15.2%	3.8%
45 to 54	6,200	14.4%	7,204	15.1%	7,368	14.0%	7,058	12.8%	16.2%	-4.2%
55 to 64	2,982	6.9%	5,584	11.7%	6,994	13.3%	7,231	13.1%	87.3%	3.4%
65 to 74	1,715	4.0%	2,780	5.8%	3,908	7.4%	5,019	9.1%	62.0%	28.4%
75 to 84	996	2.3%	1,506	3.2%	1,618	3.1%	2,130	3.9%	51.2%	31.6%
85+	350	0.8%	547	1.2%	650	1.2%	674	1.2%	56.4%	3.7%
Median Age:										
Total Population	33.4		36.0		37.1		38.0			

The median age within this sub-watershed is steadily increasing. From 2000 to 2010 the most notable change is the big jump in the 55 to 85+ year age brackets. The 65 to 84 year age brackets are expected increase the most from 2017 to 2022.

	2000 Census		2010 Census		2017A Estimates		2022 Projections		Percent Change	
									2000 to 2010	2017 to 2022
\$0 - \$15,000	1,020	6.9%	983	5.7%	944	4.9%	766	3.7%	-3.6%	-18.9%
\$15,000 - \$24,999	1,301	8.7%	1,075	6.2%	1,117	5.8%	969	4.7%	-17.4%	-13.2%
\$25,000 - \$34,999	1,548	10.4%	1,417	8.2%	1,430	7.5%	1,250	6.1%	-8.5%	-12.6%
\$35,000 - \$49,999	2,576	17.3%	2,461	14.2%	2,534	13.2%	2,259	11.0%	-4.5%	-10.9%
\$50,000 - \$74,999	4,211	28.3%	4,066	23.5%	4,410	23.0%	4,292	21.0%	-3.4%	-2.7%
\$75,000 - \$99,999	2,296	15.4%	3,062	17.7%	3,480	18.2%	3,929	19.2%	33.4%	12.9%
\$100,000 - \$149,999	1,461	9.8%	2,945	17.0%	3,393	17.7%	4,458	21.8%	101.6%	31.4%
\$150,000 +	433	2.9%	1,297	7.5%	1,863	9.7%	2,539	12.4%	199.2%	36.3%
Average Hhld Income	\$62,083		\$81,449		\$87,344		\$98,983		31.2%	13.3%
Median Hhld Income	\$55,259		\$65,808		\$69,948		\$78,987		19.1%	12.9%
Per Capita Income	\$21,487		\$29,630		\$31,817		\$36,860		37.9%	15.8%

Hhld = Household

Average household income, median household income and per capita income have steadily increased throughout the watershed.

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Population 16+	31,140		36,102		40,692		43,187		15.9%	19.6%
Total Labor Force	22,991	73.8%	26,136	72.4%	28,422	69.8%	30,424	70.4%	13.7%	7.0%
Civilian, Employed	22,191	96.5%	24,704	94.5%	27,417	96.5%	29,581	97.2%	11.3%	7.9%
Civilian, Unemployed	768	3.3%	1,416	5.4%	990	3.5%	829	2.7%	84.5%	-16.3%
In Armed Forces	33	0.1%	15	0.1%	15	0.1%	15	0.1%	-53.7%	0.0%
Not In Labor Force	8,149	26.2%	9,966	27.6%	12,270	30.2%	12,763	29.6%	22.3%	4.0%
% Blue Collar	6,342	28.6%	8,105	32.8%	9,074	33.1%	9,742	35.5%	27.8%	7.4%
% White Collar	15,863	71.4%	16,599	67.2%	18,343	66.9%	19,838	72.4%	4.6%	8.1%

Table 8: Housing Units										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Housing Units	15,337		18,182		19,917		21,277		18.5%	6.8%
Total Occupied Housing Units	n/a	n/a	17,305	95.2%	19,171	96.3%	20,463	96.2%	n/a	6.7%
Owner Occupied:Owned with a mortgage or loan	n/a	n/a	10,965	63.4%	11,564	60.3%	12,287	60.0%	n/a	6.2%
Owner Occupied:Owned free and clear	n/a	n/a	2,519	14.6%	3,231	16.9%	3,496	17.1%	n/a	8.2%
Renter Occupied	n/a	n/a	3,822	22.1%	4,376	22.8%	4,680	22.9%	n/a	7.0%
Vacant	467	3.0%	876	4.8%	746	3.7%	814	3.8%	87.7%	9.1%

Total housing units increased 18.5% from 2000 to 2010 and are expected to increase another 6.8% through 2022 so residential development and residential construction related runoff pollutants are likely to increase as well if best management practices are not put in place to minimize the effects of the additional impervious area.

Table 9: Vehicles Available										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
0 Vehicles Available	473	3.2%	296	1.7%	385	2.0%	414	2.0%	-37.3%	7.4%
1 Vehicle Available	3,461	23.3%	4,115	23.8%	4,529	23.6%	4,812	23.5%	18.9%	6.3%
2+ Vehicles Available	10,937	73.5%	12,894	74.5%	14,257	74.4%	15,236	74.5%	17.9%	6.9%
Average Vehicles Per Household	1.90		2.09		2.10		2.11		8.9%	0.1%

The average number of vehicles per household increased by 8.9% from 2000 to 2010, then leveled off and is expected to remain constant through 2022. Vehicles can contribute a variety of pollutants, but unless traffic from outside the watershed increases or the average age of the local vehicles increases, transportation related pollutants might remain constant.

Table 10: Marital Status

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
									Married, Spouse Present	21,074
Married, Spouse Absent	959	3.0%	707	1.9%	1,120	2.7%	1,221	2.8%	-26.3%	9.0%
Divorced	2,688	8.4%	3,900	10.6%	5,069	12.2%	5,454	12.4%	45.1%	7.6%
Widowed	1,178	3.7%	1,850	5.0%	2,074	5.0%	2,233	5.1%	57.0%	7.7%
Never Married	6,023	18.9%	8,992	24.4%	10,289	24.8%	11,063	25.1%	49.3%	7.5%
Age 15+ Population	31,883		36,904		41,537		44,034		15.7%	6.0%

Table 11: Educational Attainment

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
									Grade K - 8	450
Grade 9 - 11	1,776	6.7%	1,586	5.2%	1,556	4.5%	1,596	4.4%	-10.7%	2.6%
High School Graduate	6,061	23.0%	7,044	22.9%	8,064	23.4%	8,498	23.3%	16.2%	5.4%
Some College, No Degree	6,927	26.3%	8,623	28.0%	9,227	26.7%	9,683	26.5%	24.5%	4.9%
Associates Degree	2,595	9.8%	3,706	12.0%	4,063	11.8%	4,270	11.7%	42.8%	5.1%
Bachelor's Degree	6,259	23.7%	6,984	22.7%	7,958	23.0%	8,519	23.3%	11.6%	7.0%
Graduate Degree	2,252	8.5%	2,126	6.9%	2,857	8.3%	3,137	8.6%	-5.6%	9.8%
No Schooling Completed	46	0.2%	119	0.4%	170	0.5%	185	0.5%	157.4%	8.4%
Age 25+ Population	26,365		30,779		34,537		36,558		16.7%	5.9%

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Haikey Creek West Branch Sub-Basin

The following tables show the current demographics for the Haikey Creek West Branch sub-basin and how they have changed from 2000 to 2017 with projections out to 2022. The 2017 values are estimates.

Table 12: Population Demographics										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Population	7,192		8,652		10,298		11,654		20.3%	13.2%
Population Density (Pop/Sq Mi)	2,673.56		3,353.60		3,828.09		4,332.05		25.4%	13.2%
Total Households	3,209		3,743		4,530		5,158		16.6%	13.9%
Population by Gender:										
Male	3,578	49.8%	4,103	47.4%	4,874	47.3%	5,536	47.5%	14.7%	13.6%
Female	3,614	50.3%	4,549	52.6%	5,424	52.7%	6,118	52.5%	25.9%	12.8%

The total population within this sub-watershed increased 20.3% from 2000 to 2010 and is expected to increase another 13.2% from 2017 to 2022. The population density increased by 25.4% from 2000 to 2010 and is expected to increase by 13.2% from 2017 to 2022. Overall the population is steadily growing within this sub-watershed with a shift from rural to urban areas.

Table 13: Population by Race										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
White	5,663	78.8%	5,877	67.9%	6,568	63.8%	7,204	61.8%	3.8%	9.7%
Black	540	7.5%	887	10.3%	1,131	11.0%	1,262	10.8%	64.3%	11.6%
American Indian or Alaska Native	167	2.3%	286	3.3%	347	3.4%	391	3.4%	70.8%	12.8%
Asian/Native Hawaiian/Other Pacific Islander	417	5.8%	840	9.7%	1,231	12.0%	1,548	13.3%	101.6%	25.8%
Some Other Race	163	2.3%	316	3.7%	440	4.3%	530	4.5%	94.3%	20.3%
Two or More Races	242	3.4%	446	5.2%	582	5.7%	719	6.2%	84.0%	23.6%

Table 14: Population by Ethnicity										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Hispanic	420	5.8%	701	8.1%	916	8.9%	1,105	9.5%	67.0%	20.6%
Not Hispanic or Latino	6,772	94.2%	7,951	91.9%	9,382	91.1%	10,549	90.5%	17.4%	12.4%

Educational outreach efforts should take into consideration the race and ethnicity of the target audience. Cultures and languages vary and priorities may be different so these factors need to be evaluated when coordinating educational outreaches, forming watershed alliances and trying to gain support for changes that could improve watershed conditions.

Table 15: Population by Age										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
0 to 4	444	6.2%	545	6.3%	661	6.4%	755	6.5%	22.7%	14.3%
5 to 14	1,030	14.3%	1,148	13.3%	1,249	12.1%	1,331	11.4%	11.5%	6.6%
15 to 19	370	5.1%	631	7.3%	626	6.1%	706	6.1%	70.8%	12.7%
20 to 24	893	12.4%	861	10.0%	952	9.2%	844	7.2%	-3.6%	-11.4%
25 to 34	1,335	18.6%	1,323	15.3%	1,901	18.5%	2,281	19.6%	-0.8%	20.0%
35 to 44	1,408	19.6%	1,212	14.0%	1,389	13.5%	1,600	13.7%	-14.0%	15.2%
45 to 54	828	11.5%	1,250	14.5%	1,358	13.2%	1,450	12.4%	51.0%	6.8%
55 to 64	329	4.6%	865	10.0%	1,140	11.1%	1,325	11.4%	162.5%	16.2%
65 to 74	222	3.1%	384	4.4%	558	5.4%	812	7.0%	72.8%	45.6%
75 to 84	185	2.6%	262	3.0%	254	2.5%	338	2.9%	41.4%	33.3%
85+	147	2.1%	170	2.0%	211	2.1%	212	1.8%	15.6%	0.5%
Median Age:										
Total Population	31.1		33.4		33.4		34.5			

The median age within the watershed is slowly increasing. Most noticeably the age groups 15 to 19, 55 to 64 and 65 to 74. The percent of the population reaching retirement age and expected to leave the work force is going up and these retirees may have more free time to pursue other passions. Maybe watershed protection will interest some of these people and stream monitors and advocates will be easier to recruit.

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
\$0 - \$15,000	280	8.7%	370	9.9%	410	9.1%	367	7.1%	32.2%	-10.6%
\$15,000 - \$24,999	388	12.1%	507	13.5%	563	12.4%	528	10.2%	30.8%	-6.1%
\$25,000 - \$34,999	575	17.9%	439	11.7%	520	11.5%	495	9.6%	-23.8%	-4.7%
\$35,000 - \$49,999	501	15.6%	524	14.0%	621	13.7%	625	12.1%	4.7%	0.5%
\$50,000 - \$74,999	604	18.8%	633	16.9%	806	17.8%	884	17.1%	4.9%	9.7%
\$75,000 - \$99,999	385	12.0%	449	12.0%	533	11.8%	711	13.8%	16.6%	33.4%
\$100,000 - \$149,999	309	9.6%	541	14.5%	665	14.7%	948	18.4%	75.3%	42.6%
\$150,000 +	123	3.8%	281	7.5%	412	9.1%	600	11.6%	128.0%	45.6%
Average Hhld Income	\$57,647		\$71,113		\$74,825		\$87,342		23.4%	16.7%
Median Hhld Income	\$45,143		\$51,107		\$55,052		\$67,254		13.2%	22.2%
Per Capita Income	\$25,721		\$30,877		\$33,010		\$38,743		20.0%	17.4%

Average household income, median household income and per capita income have steadily increased throughout the watershed.

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Population 16+	5,636		6,831		8,256		9,418		21.2%	37.9%
Total Labor Force	4,292	76.2%	5,055	74.0%	5,957	72.2%	6,835	72.6%	17.8%	14.7%
Civilian, Employed	4,112	95.8%	4,694	92.9%	5,679	95.3%	6,593	96.5%	14.1%	16.1%
Civilian, Unemployed	174	4.1%	349	6.9%	265	4.4%	227	3.3%	100.8%	-14.1%
In Armed Forces	6	0.1%	12	0.2%	14	0.2%	15	0.2%	100.6%	3.3%
Not In Labor Force	1,344	23.8%	1,776	26.0%	2,299	27.8%	2,583	27.4%	32.1%	12.4%
% Blue Collar	838	20.5%	1,137	24.2%	1,450	25.5%	1,660	29.2%	35.6%	14.5%
% White Collar	3,247	79.5%	3,557	75.8%	4,229	74.5%	4,934	86.9%	9.5%	16.7%

Table 18: Housing Units										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Housing Units	3,753		4,032		4,805		5,425		7.4%	12.9%
Total Occupied Housing Units	n/a	n/a	3,743	92.8%	4,530	94.3%	5,158	95.1%	n/a	13.9%
Owner Occupied: Owned with a mortgage or loan	n/a	n/a	1,289	34.4%	1,385	30.6%	1,616	31.3%	n/a	16.7%
Owner Occupied: Owned free and clear	n/a	n/a	322	8.6%	410	9.0%	480	9.3%	n/a	17.2%
Renter Occupied	n/a	n/a	2,132	57.0%	2,735	60.4%	3,062	59.4%	n/a	11.9%
Vacant	544	14.5%	289	7.2%	275	5.7%	267	4.9%	-46.8%	-2.9%

Total housing units increased 7.4% from 2000 to 2010 and are expected to increase another 12.9% through 2022 so residential development and residential construction related runoff pollutants are likely to increase as well if best management practices are not put in place to minimize the effects of the additional impervious area.

Table 19: Vehicles Available										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
0 Vehicles Available	235	7.3%	187	5.0%	283	6.3%	339	6.6%	-20.3%	19.9%
1 Vehicle Available	1,336	41.6%	1,549	41.4%	1,917	42.3%	2,154	41.8%	15.9%	12.4%
2+ Vehicles Available	1,638	51.0%	2,007	53.6%	2,330	51.4%	2,665	51.7%	22.5%	14.4%
Average Vehicles Per Household	1.30		1.76		1.74		1.75		32.7%	0.2%

There was a significant increase in the average number of vehicles per household (32.7%) from 2000 to 2010, then it leveled off to 0.2% from 2017 through 2022. Vehicles can contribute a variety of pollutants, but unless traffic from outside the watershed increases or the average age of the local vehicles increases, transportation related pollutants might remain constant.

Table 20: Marital Status

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
									Married, Spouse Present	2,936
Married, Spouse Absent	233	4.1%	284	4.1%	265	3.2%	296	3.1%	21.8%	11.6%
Divorced	563	9.8%	866	12.4%	1,175	14.0%	1,351	14.1%	53.9%	14.9%
Widowed	314	5.5%	351	5.1%	387	4.6%	459	4.8%	11.8%	18.6%
Never Married	1,638	28.6%	2,715	39.0%	2,837	33.8%	3,150	32.9%	65.8%	11.0%
Age 15+ Population	5,718		6,959		8,388		9,567		21.7%	14.1%

Table 21: Educational Attainment

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
									Grade K - 8	73
Grade 9 - 11	202	4.6%	214	3.9%	293	4.3%	335	4.2%	6.1%	14.2%
High School Graduate	781	17.6%	938	17.2%	1,145	16.8%	1,329	16.6%	20.1%	16.1%
Some College, No Degree	1,112	25.1%	1,366	25.0%	1,715	25.2%	2,024	25.2%	22.8%	18.0%
Associates Degree	355	8.0%	453	8.3%	592	8.7%	690	8.6%	27.8%	16.5%
Bachelor's Degree	1,382	31.2%	1,704	31.2%	2,076	30.5%	2,468	30.8%	23.3%	18.9%
Graduate Degree	501	11.3%	668	12.2%	835	12.3%	994	12.4%	33.4%	19.0%
No Schooling Completed	24	0.6%	92	1.7%	110	1.6%	130	1.6%	279.6%	18.1%
Age 25+ Population	4,429		5,466		6,810		8,018		23.4%	17.7%

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Little Haikey Creek Sub-Basin

The following tables show the current demographics for the Little Haikey Creek sub-basin and how they have changed from 2000 to 2017 with projections out to 2022. The 2017 values are estimates.

Table 22: Population Demographics										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Population	16,465		19,064		20,176		20,842		15.8%	3.3%
Population Density (Pop/Sq Mi)	2,605.01		3,123.3 0		3,192.11		3,297.63		19.9%	3.3%
Total Households	6,735		8,331		8,822		9,219		23.7%	4.5%
Population by Gender:										
Male	8,080	49.1%	9,284	48.7%	9,778	48.5%	10,115	48.5%	14.9%	3.4%
Female	8,385	50.9%	9,779	51.3%	10,397	51.5%	10,728	51.5%	16.6%	3.2%

The total population within this sub-watershed increased 15.8% from 2000 to 2010 and is expected to increase another 3.3% from 2017 to 2022. The population density increased by 19.9% from 2000 to 2010 and is expected to increase by 3.3% from 2017 to 2022. Overall the population is growing within this sub-watershed with a shift from rural to urban areas.

Table 23: Population by Race										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
White	14,070	85.5%	15,071	79.1%	15,463	76.6%	15,638	75.0%	7.1%	1.1%
Black	702	4.3%	1,046	5.5%	1,172	5.8%	1,238	5.9%	49.1%	5.6%
American Indian or Alaska Native	472	2.9%	778	4.1%	875	4.3%	916	4.4%	64.7%	4.7%
Asian/Native Hawaiian/Other Pacific Islander	476	2.9%	814	4.3%	1,110	5.5%	1,250	6.0%	70.8%	12.6%
Some Other Race	299	1.8%	468	2.5%	560	2.8%	635	3.1%	56.6%	13.3%
Two or More Races	445	2.7%	886	4.6%	996	4.9%	1,167	5.6%	99.0%	17.1%

Table 24: Population by Ethnicity										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Hispanic	606	3.7%	1,281	6.7%	1,496	7.4%	1,697	8.1%	111.5%	13.4%
Not Hispanic or Latino	15,859	96.3%	17,783	93.3%	18,679	92.6%	19,146	91.9%	12.1%	2.5%

Educational outreach efforts should take into consideration the race and ethnicity of the target audience. Cultures and languages vary and priorities may be different so these factors need to be evaluated when coordinating educational outreaches, forming watershed alliances and trying to gain support for changes that could improve watershed conditions.

Table 25: Population by Age										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
0 to 4	1,050	6.4%	1,018	5.3%	1,117	5.5%	1,161	5.6%	-3.1%	4.0%
5 to 14	2,297	14.0%	2,248	11.8%	2,268	11.2%	2,238	10.7%	-2.1%	-1.3%
15 to 19	1,106	6.7%	1,284	6.7%	1,240	6.1%	1,231	5.9%	16.1%	-0.7%
20 to 24	1,187	7.2%	1,500	7.9%	1,530	7.6%	1,352	6.5%	26.4%	-11.6%
25 to 34	2,311	14.0%	2,611	13.7%	3,026	15.0%	3,240	15.5%	13.0%	7.1%
35 to 44	2,849	17.3%	2,481	13.0%	2,462	12.2%	2,575	12.4%	-12.9%	4.6%
45 to 54	2,480	15.1%	2,689	14.1%	2,499	12.4%	2,335	11.2%	8.4%	-6.6%
55 to 64	1,352	8.2%	2,497	13.1%	2,751	13.6%	2,728	13.1%	84.6%	-0.8%
65 to 74	1,027	6.2%	1,466	7.7%	1,917	9.5%	2,375	11.4%	42.8%	23.9%
75 to 84	572	3.5%	931	4.9%	944	4.7%	1,156	5.5%	62.8%	22.5%
85+	233	1.4%	340	1.8%	423	2.1%	450	2.2%	46.0%	6.6%
Median Age:										
Total Population	36.0		38.5		38.7		39.5			

The median age within the watershed is slowly increasing. Most noticeably the age groups 55 to 64 and 75 to 84. The percent of the population reaching retirement age and expected to leave the work force is going up and these retirees may have more free time to pursue other passions. Maybe watershed protection will interest some of these people and stream monitors and advocates will be easier to recruit.

	2000 Census		2010 Census		2017A Estimates		2022 Projections		Percent Change	
									2000 to 2010	2017 to 2022
\$0 - \$15,000	629	9.3%	704	8.4%	681	7.7%	542	5.9%	12.0%	-20.4%
\$15,000 - \$24,999	627	9.3%	689	8.3%	657	7.4%	563	6.1%	10.0%	-14.3%
\$25,000 - \$34,999	700	10.4%	687	8.3%	616	7.0%	540	5.9%	-1.7%	-12.3%
\$35,000 - \$49,999	1,023	15.2%	1,157	13.9%	1,169	13.3%	1,010	11.0%	13.1%	-13.6%
\$50,000 - \$74,999	1,370	20.3%	1,470	17.6%	1,607	18.2%	1,536	16.7%	7.3%	-4.4%
\$75,000 - \$99,999	1,073	15.9%	1,335	16.0%	1,420	16.1%	1,560	16.9%	24.4%	9.8%
\$100,000 - \$149,999	943	14.0%	1,432	17.2%	1,514	17.2%	1,940	21.0%	51.8%	28.1%
\$150,000 +	372	5.5%	856	10.3%	1,157	13.1%	1,529	16.6%	130.2%	32.1%
Average Hhld Income	\$67,394		\$86,385		\$92,654		\$107,055		28.2%	15.5%
Median Hhld Income	\$56,743		\$64,975		\$69,663		\$81,385		14.5%	16.8%
Per Capita Income	\$27,569		\$37,831		\$40,592		\$47,429		37.2%	16.8%

Average household income, median household income and per capita income have steadily increased throughout the watershed.

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Population 16+	12,934		15,532		16,537		17,200		20.1%	10.7%
Total Labor Force	9,362	72.4%	10,845	69.8%	11,188	67.7%	11,770	68.4%	15.8%	5.2%
Civilian, Employed	9,101	97.2%	10,376	95.7%	10,868	97.1%	11,496	97.7%	14.0%	5.8%
Civilian, Unemployed	260	2.8%	459	4.2%	310	2.8%	264	2.2%	76.2%	-14.9%
In Armed Forces	0	0.0%	10	0.1%	10	0.1%	10	0.1%	2,175.8%	1.8%
Not In Labor Force	3,572	27.6%	4,687	30.2%	5,349	32.4%	5,429	31.6%	31.2%	1.5%
% Blue Collar	1,780	19.6%	2,445	23.6%	2,615	24.1%	2,757	25.4%	37.3%	5.4%
% White Collar	7,324	80.4%	7,932	76.4%	8,252	75.9%	8,739	80.4%	8.3%	5.9%

Table 28: Housing Units										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
Total Housing Units	7,138		8,920		9,319		9,705		25.0%	4.1%
Total Occupied Housing Units	n/a	n/a	8,331	93.4%	8,822	94.7%	9,219	95.0%	n/a	4.5%
Owner Occupied: Owned with a mortgage or loan	n/a	n/a	3,540	42.5%	3,546	40.2%	3,782	41.0%	n/a	6.7%
Owner Occupied: Owned free and clear	n/a	n/a	1,245	14.9%	1,418	16.1%	1,531	16.6%	n/a	7.9%
Renter Occupied	n/a	n/a	3,546	42.6%	3,858	43.7%	3,906	42.4%	n/a	1.2%
Vacant	402	5.6%	589	6.6%	497	5.3%	486	5.0%	46.4%	-2.2%

Total housing units increased 25.0% from 2000 to 2010 and are expected to increase another 4.1% through 2022 so residential development and residential construction related runoff pollutants are likely to increase as well if best management practices are not put in place to minimize the effects of the additional impervious area.

Table 29: Vehicles Available										
	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
0 Vehicles Available	344	5.1%	314	3.8%	336	3.8%	351	3.8%	-8.7%	4.4%
1 Vehicle Available	2,136	31.7%	2,777	33.3%	3,068	34.8%	3,171	34.4%	30.0%	3.3%
2+ Vehicles Available	4,255	63.2%	5,239	62.9%	5,418	61.4%	5,697	61.8%	23.1%	5.2%
Average Vehicles Per Household	1.70		1.88		1.86		1.87		11.3%	0.4%

There was a noticeable increase in the average number of vehicles per household (11.3%) from 2000 to 2010, then it leveled off to 0.4% from 2017 through 2022. Vehicles can contribute a variety of pollutants, but unless traffic from outside the watershed increases or the average age of the local vehicles increases, transportation related pollutants might remain constant.

Table 30: Marital Status

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
									Married, Spouse Present	7,947
Married, Spouse Absent	329	2.5%	554	3.5%	566	3.4%	595	3.4%	68.1%	5.2%
Divorced	1,223	9.3%	1,945	12.3%	2,158	12.9%	2,266	13.0%	58.9%	5.0%
Widowed	591	4.5%	908	5.8%	982	5.9%	1,032	5.9%	53.7%	5.2%
Never Married	3,029	23.1%	4,063	25.7%	4,628	27.6%	4,773	27.4%	34.1%	3.1%
Age 15+ Population	13,117		15,798		16,791		17,443		20.4%	3.9%

Table 31: Educational Attainment

	2000 Census	%	2010 Census	%	2017A Estimates	%	2022 Projections	%	Percent Change	
									2000 to 2010	2017 to 2022
									Grade K - 8	123
Grade 9 - 11	362	3.3%	367	2.8%	370	2.6%	382	2.6%	1.4%	3.3%
High School Graduate	1,692	15.6%	2,078	16.0%	2,233	15.9%	2,347	15.8%	22.9%	5.1%
Some College, No Degree	2,820	26.1%	3,475	26.7%	3,639	26.0%	3,843	25.9%	23.2%	5.6%
Associates Degree	831	7.7%	905	7.0%	1,024	7.3%	1,094	7.4%	8.9%	6.8%
Bachelor's Degree	3,466	32.0%	3,938	30.3%	4,243	30.3%	4,517	30.4%	13.6%	6.4%
Graduate Degree	1,510	14.0%	2,047	15.7%	2,273	16.2%	2,422	16.3%	35.6%	6.6%
No Schooling Completed	18	0.2%	39	0.3%	71	0.5%	78	0.5%	112.0%	9.0%
Age 25+ Population	10,822		13,014		14,021		14,860		20.3%	6.0%

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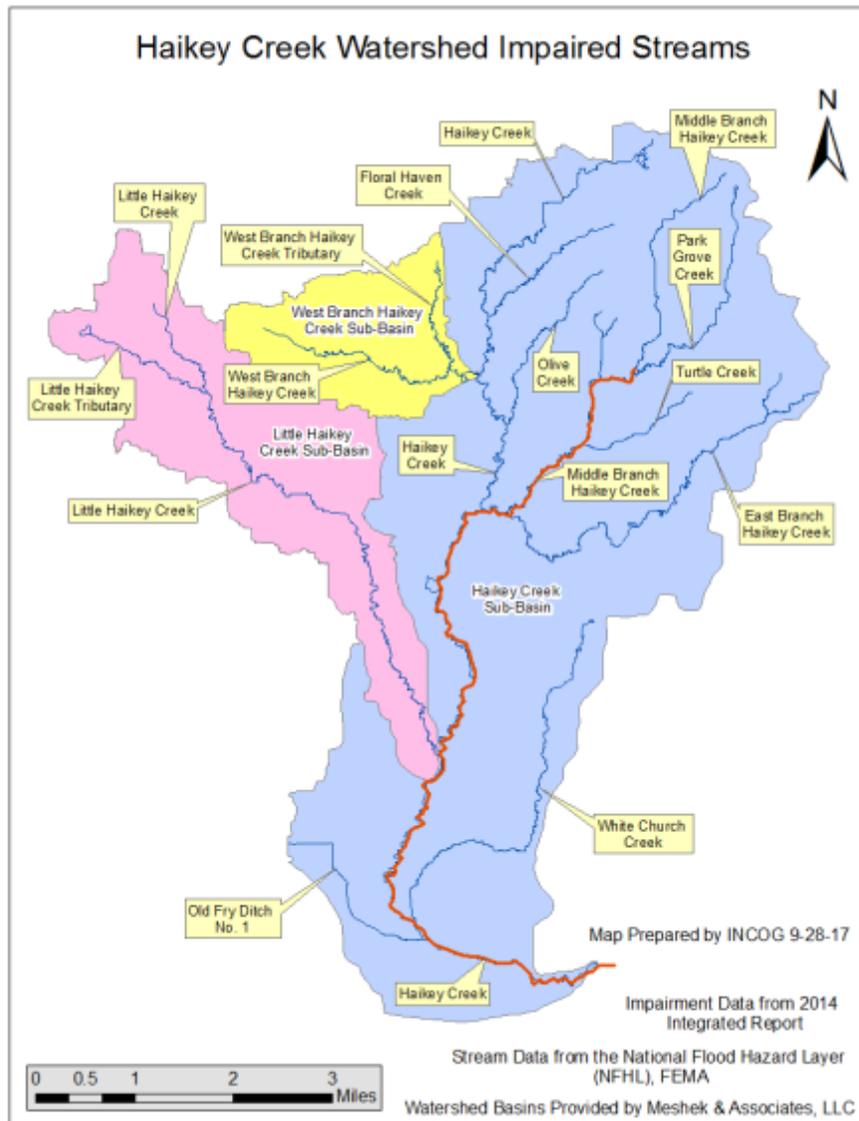
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Impaired Waters

Every two years the State of Oklahoma evaluates its waterbodies to determine which ones are not meeting minimum water quality standards and beneficial use criteria. The currently approved report is “Water Quality In Oklahoma, 2014 Integrated Report”. In it, Haikey Creek is the only waterbody listed as impaired, or not meeting minimum water quality criteria in the Haikey Creek watershed. See Map 7: Haikey Creek Watershed Impaired Streams.

Map 7: Haikey Creek Watershed Impaired Streams



Haikey Creek impairment status, as published in the 2014 Integrated Report 303(d) list, can be seen in the two tables below. The warm water aquatic community (impaired for Diazinon and macroinvertebrate biology) and primary body contact recreation (impaired for *Escherichia coli*) beneficial use criteria are not being met.

The Draft 2016 Integrated Report has been recently released and it still shows Haikey Creek as impaired, but is not yet approved. Currently it shows the reason for not meeting the warm water aquatic community beneficial use as high Diazinon levels (a pesticide), low dissolved oxygen levels and not meeting the macroinvertebrate bio and fishes bioassessment criteria. The reason for not meeting the primary body contact recreation beneficial use is listed as high levels of *E. coli*.

Table 32: Haikey Creek Impairments							
Waterbody ID	Waterbody Name	Category	Aesthetic	Agriculture	Warm Water Aquatic Community	Fish Consumption	Primary Body Contact Recreation
OK120410010210_00	Haikey Creek	5a	I	I	N	X	N
F=Fully Supporting I=Insufficient Information N=Not Supporting X=Not Assessed (Water Quality In Oklahoma 2014 Integrated Report)							

Haikey Creek at W. Florence St.
(111 St.), 3-26-18



Cause of Impairment	Impaired Use	Unconfirmed Potential Sources Code	Source Description	Cause Category
Diazinon	WWAC	140	Source Unknown	5a
Macroinvertebrate Biology	WWAC	46	Grazing in Riparian or Shoreline Zones	5c
		49	Highway/Road/Bridge Runoff (Non-construction Related)	
		59	Impacts from Land Application of Wastes	
		87	Non-irrigated Crop Production	
		92	On-site Treatment Systems (Septic Systems and Decentralized Systems)	
		102	Petroleum/natural Gas Activities (Legacy)	
		108	Rangeland Grazing	
		111	Residential Districts	
		136	Wildlife Other than Waterfowl	
		140	Source Unknown	
Escherichia coli	PBCR	TMDL Completed on 11/18/2008		4a

(Water Quality In Oklahoma 2014 Integrated Report)

A Total Maximum Daily Load (TMDL) report has been completed for the *Escherichia coli* (*E. coli*) impairment. The TMDL ID for this report is 35680 and was prepared by INCOG and dated October, 2008.

Once an impairment is determined, the waterbody is placed in one of five categories:

Category 1 - Attaining the water quality standard and no use is threatened. Waterbodies listed in this category are characterized by data and information that meet the requirements of the Continuing Planning Process (CPP) to support a determination that the water quality standard is attained and no use is threatened. Consideration will be given to scheduling these waterbodies for future monitoring to determine if the water quality standard continues to be attained.

Category 2 - Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened. Waterbodies listed in this category are characterized by data and information which meet the requirements of the CPP to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient or no data or information. Monitoring shall be scheduled for these waterbodies to determine if the uses previously found to be in attainment remain in attainment, and to determine

the attainment status of those uses for which data and information was previously insufficient to make a determination.

Category 3 - Insufficient or no data and information to determine if any designated use is attained. Waterbodies are listed in this category when the data or information to support an attainment determination for any use is not available or consistent with the requirements of the CPP. To assess the attainment status of these waterbodies, supplementary data and information shall be obtained, or monitoring shall be scheduled as needed.

Category 4 - Impaired or threatened for one or more designated uses but does not require the development of a TMDL.

4A - TMDL has been completed. Waterbodies are listed in this subcategory once all TMDL(s) have been developed and approved by EPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of a waterbody, the waterbody will remain in Category 5 until all TMDLs for each pollutant have been completed and approved by EPA. Monitoring shall be scheduled for these waterbodies to verify that the water quality standard is met when the water quality management actions needed to achieve all TMDLs are implemented.

4B - Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. Consistent with the regulation under 130.7(b)(i),(ii), and (iii), waterbodies are listed in this subcategory when other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard (WQS) applicable to such waters. These requirements must be specifically applicable to the particular water quality problem. Monitoring shall be scheduled for these waterbodies to verify that the water quality standard is attained as expected.

4C - Impairment is not caused by a pollutant. Waterbodies are listed in this subcategory if the impairment is not caused by a pollutant. Scheduling of these waterbodies for monitoring to confirm that there continues to be no pollutant-caused impairment and to support water quality management actions necessary to address the cause(s) of the impairment, shall be considered.

Category 5 - The water quality standard is not attained. The waterbody is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL. This category constitutes the Section 303(d) list of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed. A waterbody is listed in this category if it is determined, in accordance with the CPP, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. Where more than one pollutant is associated with the impairment of a single waterbody, the waterbody will remain in Category 5 until TMDLs for all pollutants have been completed and approved by EPA. For waterbodies listed in this category, monitoring schedules shall be provided that describe when data and information will be collected to support TMDL establishment and to determine if the standard is attained. While the waterbody is being monitored for a specific pollutant to develop a TMDL, the watershed shall also be monitored to assess the attainment status of other uses. A schedule for the establishment of TMDLs for all waters in Category 5 shall be submitted. This schedule shall reflect the priority

ranking of the listed waters. Category 5 waterbodies are further divided into the following subcategories:

5A – TMDL is underway or will be scheduled.

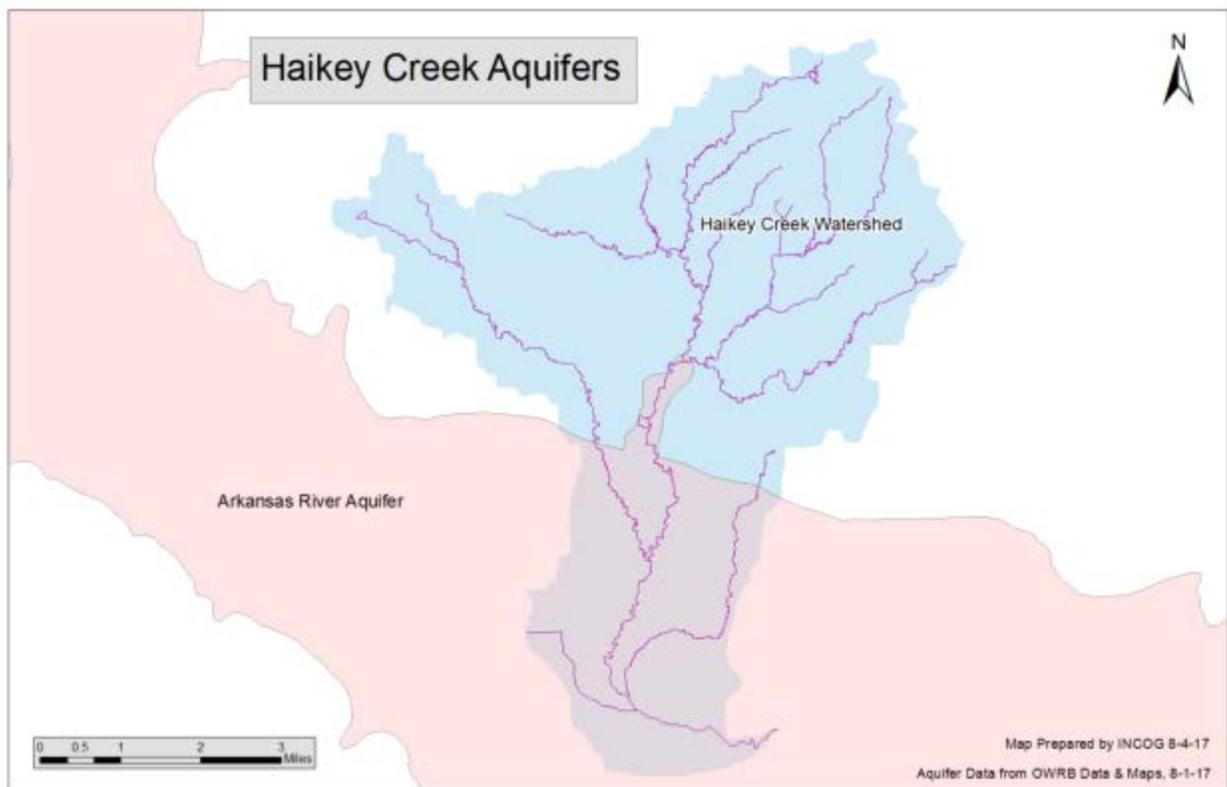
5B – A review of the Water Quality Standards will be conducted before a TMDL is scheduled.

5C – Additional data and information will be collected before a TMDL or review of the Water Quality Standards is scheduled.

Aquifers

The southern portion of the watershed is above the Arkansas River aquifer which is an alluvium and terrace basin and considered a major aquifer. Major aquifers are distinct underground bodies of water overlain by contiguous land and having substantially the same geological and hydrological characteristics and from which groundwater wells yield at least one hundred fifty (150) gallons per minute, on the average basinwide, in an alluvium and terrace aquifer, or as otherwise designated by the Oklahoma Water Resources Board. (OWRB website, groundwater, 8-1-17) Alluvium and terrace deposits consist mainly of unconsolidated sand, silt, clay and gravel. See Map 8: Haikey Creek Aquifers.

Map 8: Haikey Creek Aquifers



Groundwater Wells

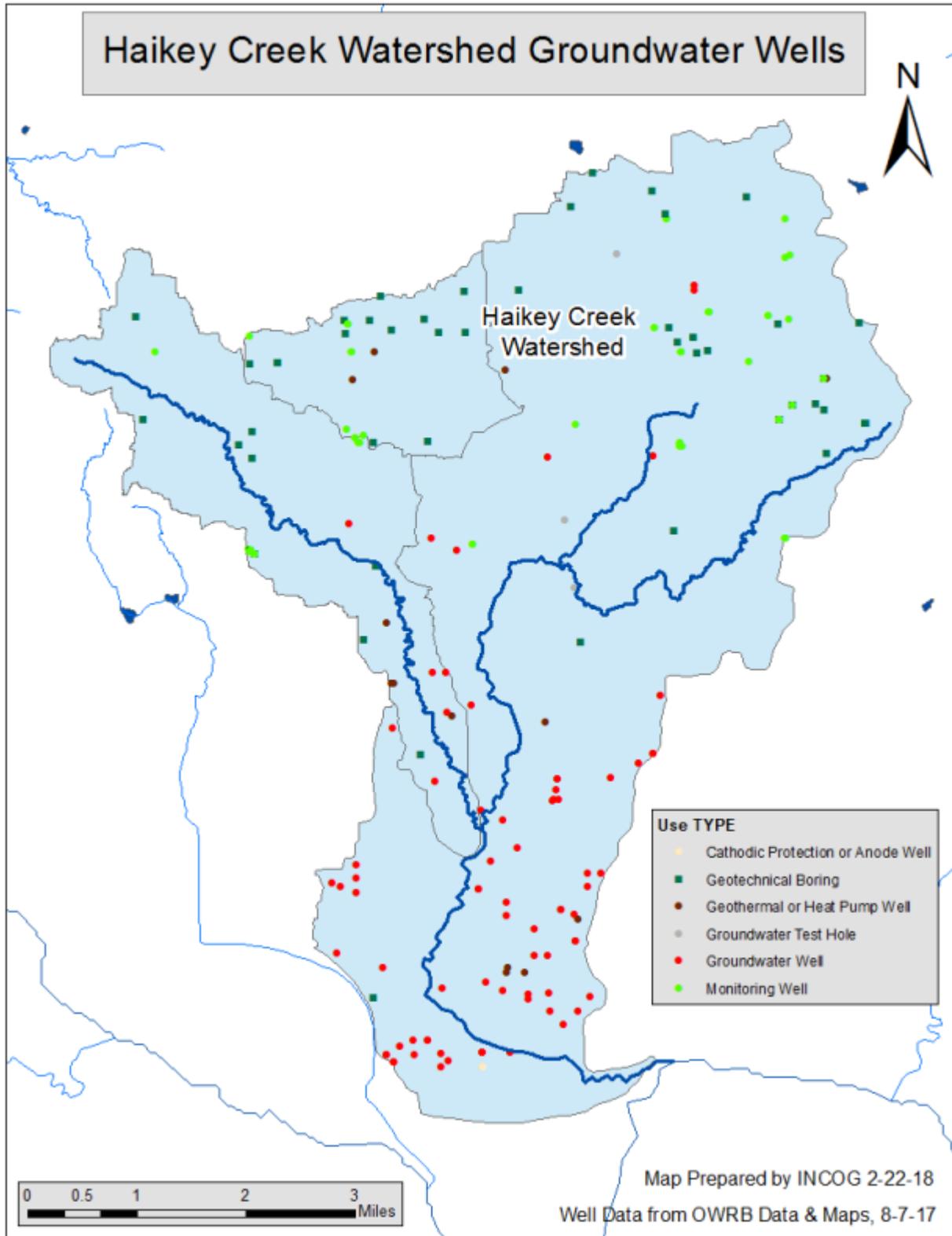
There are 228 groundwater wells within the watershed according to the Multi-Purpose Well Completion Reports filed by licensed well drillers with the Oklahoma Water Resources Board. These reports are required for each new well constructed. The uses vary and are shown in the table below with some of the information available. See Table 34: Groundwater Wells in Haikey Creek Watershed and Map 9: Haikey Creek Watershed Groundwater Wells.

Improperly maintained wells, improperly plugged wells and abandoned wells are potential sources of groundwater pollution. Therefore, it is always advisable to consider the number, type and condition of wells in an area when looking for potential pollutant sources.

The Wellhead Protection program is part of a federal program geared to improving drinking water quality by protecting the area around a well. The goal of Oklahoma's Wellhead Protection program is to minimize the risk of pollution by limiting activities on the land around public water supply wells. DEQ rules state that public drinking water wells are not to be located within 300 feet horizontally from any existing or potential source of pollution.

Number of Wells	Type of Well	Use Class	Depth Range	Comments
1	Cathodic Protection or Anode Well	Corrosion Protection	155 ft.	
50	Groundwater Well	Domestic	0 to 185 ft.	
18	Groundwater Well	Irrigation	0 to 97 ft.	
7	Groundwater Well	Agricultural	0 to 70 ft.	Non-irrigation Wells
1	Groundwater Well	Mining	60 ft.	
1	Groundwater Well	Commercial	37 ft.	
16	Geothermal or Heat Pump Well	Heat Exchange	250 to 400 ft.	
54	Geotechnical Boring	Soil Evaluation	0 to 45 ft.	
3	Groundwater Test Hole	Water Location	5 to 40 ft.	
13	Monitoring Well	Water Quality	0 to 20 ft.	
64	Monitoring Well	Site Assessment	0 to 30 ft.	

Map 9: Haikey Creek Watershed Groundwater Wells



Watershed Aerial

An aerial photo of the Haikey Creek watershed during the summer months shows vegetation and development. Here we have a mix of residential, commercial and industrial development with some undeveloped areas in the lower portion of the watershed.

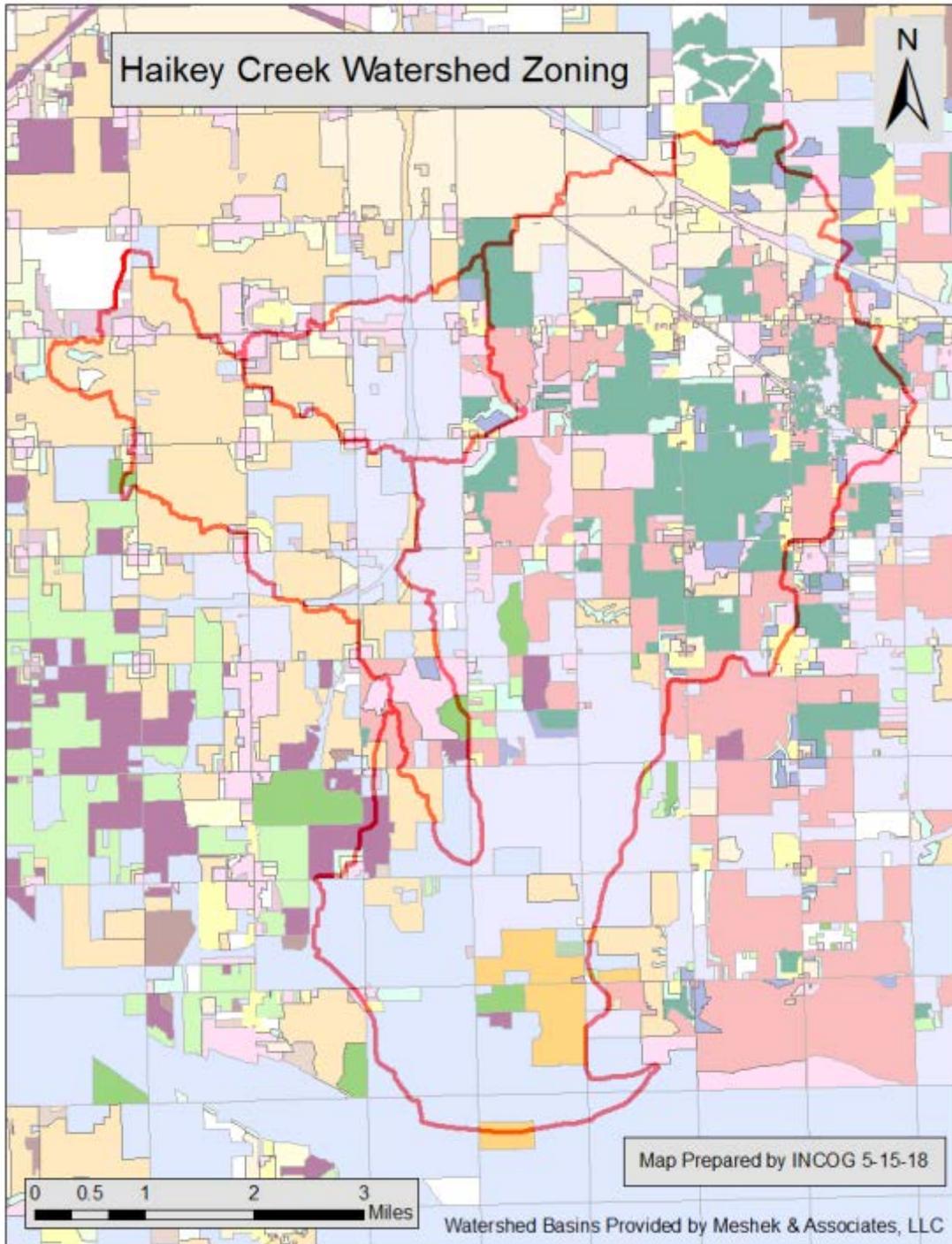
Map 10: Haikey Creek Watershed Aerial



Zoning

Much of the southern part of the watershed is zoned for agriculture and residential use. Other than a few parcels, most of the commercial and industrial areas are located in the northern part of the watershed with smaller residential blocks mixed in.

Map 11: Haikey Creek Watershed Zoning



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| <ul style="list-style-type: none"> A-1 Agricultural A-RE AG AG-R CG Commercial General CH Commercial Heavy CN Commercial Neighborhood CO CS DM Downtown Mixed-use Core FD IL Industrial Light OL OM ON Office Neighborhood | <ul style="list-style-type: none"> R-1 Single-family Residential-1 R-2 Single-family Residential District R-3 Single-family Residential-3 RD Residential Duplex RE Residential Estate RM Residential Multi-family RM-0 RM-1 Single-family Residential-1 RM-2 Single-family Residential-2 RS RS-1 Single-family Residential District RS-2 Single-family Residential District RS-3 Single-family Residential-3 RS-4 Single-family Residential-4 |
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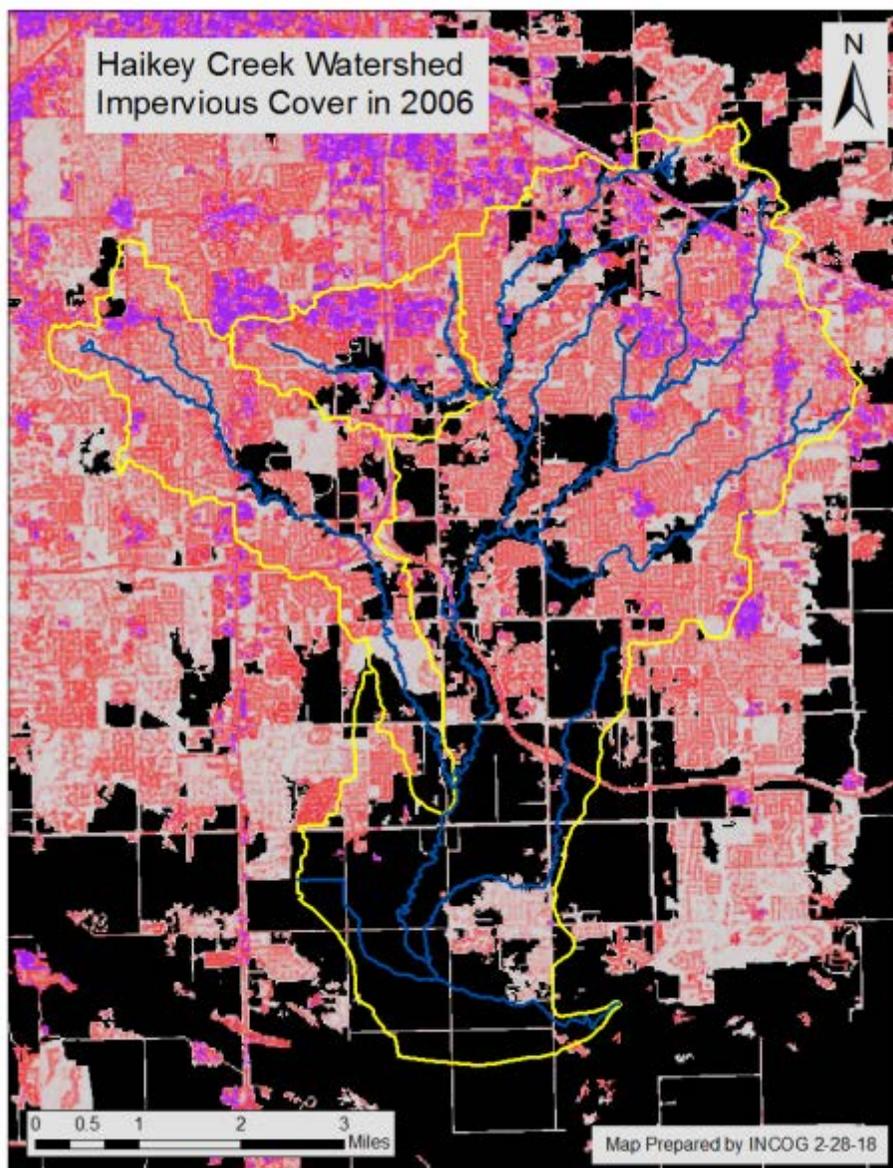


Impervious Cover

The National Land Cover Database products are created through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) and used to show how much and where impervious cover exists.

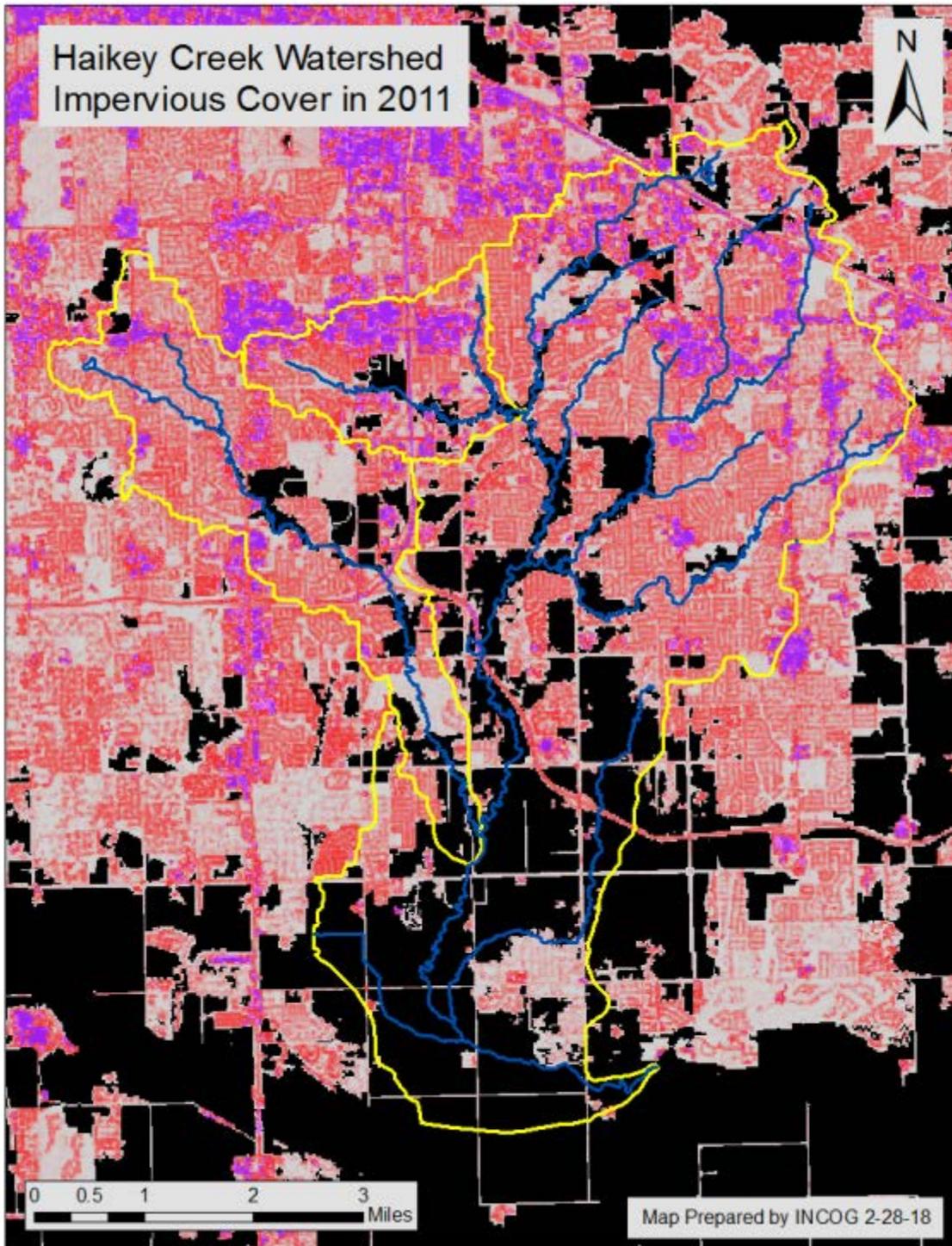
This type of information is helpful in determining where development may concentrate stormwater runoff. In the following maps, the darker the red the more impervious the surface. The purple areas indicate the densest portions and the black areas indicate the least impervious or less developed areas. In 2006, the most impervious areas are in the upper portions of the watershed while the lower portion of the watershed has the least amount of impervious surface area.

Map 12: Haikey Creek Watershed Impervious Cover 2006



By comparing the 2006 and 2011 impervious cover maps it becomes more obvious where growth and development are occurring.

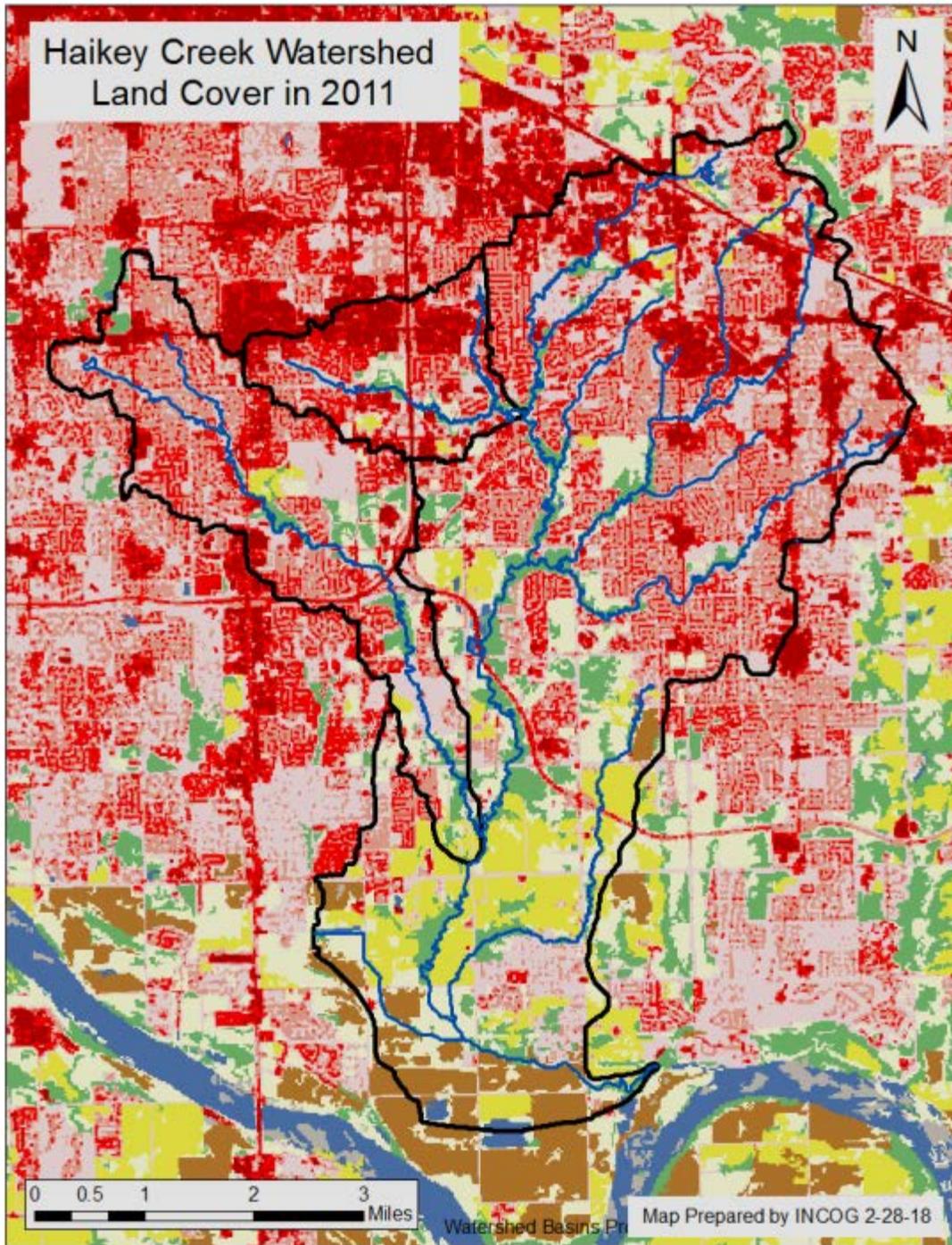
Map 13: Haikey Creek Watershed Impervious Cover 2011



Land Cover

The National Land Cover Database products are created through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. This data is used to depict how the land is being used.

Map 14: Haikey Creek Watershed Land Cover 2011



Much of the undeveloped portions of the lower watershed are used agriculturally for pasture, haying and row crops with some of the remainder in deciduous forest. The developed areas are shown as “Commercial/Industrial/Transportation”, “Low Intensity Residential” and “High Intensity Residential”. See the legend for land cover below.

Legend

The classification system used by NLCD1992 is modified from the [Anderson Land Cover Classification System](#)*. [Download](#) the NLCD1992 land cover classification legend.

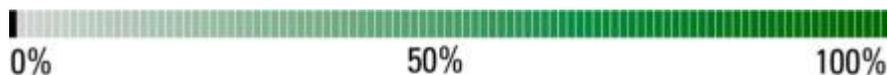
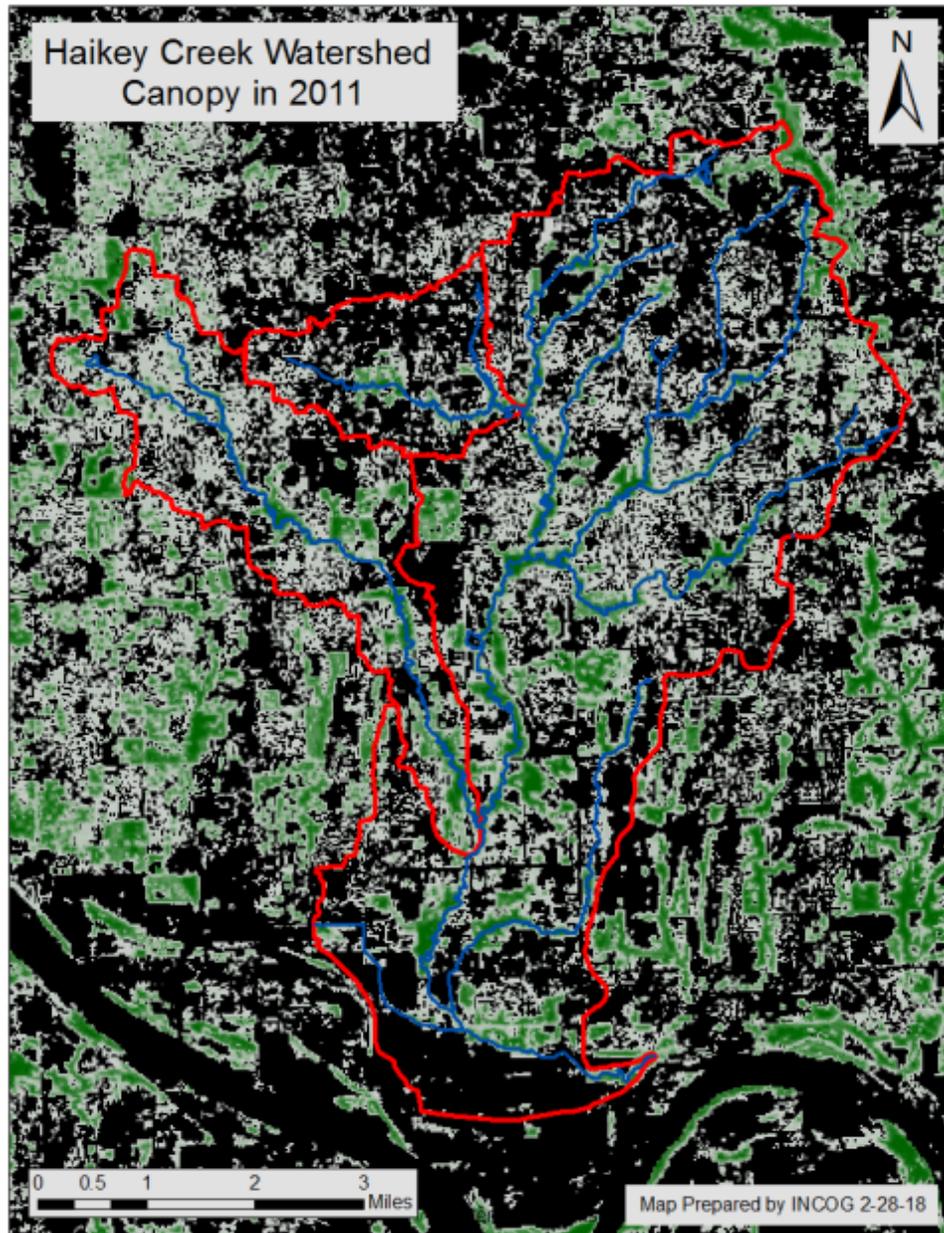
Class\ Value	Classification Description
Water	<i>areas of open water or permanent ice/snow cover.</i>
11	Open Water - areas of open water, generally with less than 25% cover of vegetation/land cover.
12	Perennial Ice/Snow - areas characterized by year-long surface cover of ice and/or snow.
Developed	<i>areas characterized by a high percentage (30 % or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc.).</i>
21	Low Intensity Residential - areas with a mixture of constructed materials and vegetation. Constructed materials account for 30% to 80% of the cover. Vegetation may account for 20% to 70 % of the cover. These areas most commonly include single-family housing units. Population densities will be lower than in high intensity residential areas.
22	High Intensity Residential - areas highly developed where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20% of the cover. Constructed materials account for 80% to 100% of the cover.
23	Commercial/Industrial/Transportation - areas of infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential
Barren	<i>areas characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than that in the green vegetated categories; lichen cover may be extensive.</i>
31	Bare Rock/Sand/Clay - perennially barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, beaches, and other accumulations of earthen material.
32	Quarries/Strip Mines/Gravel Pits - areas of extractive mining activities with significant surface expression.
33	Transitional - areas of sparse vegetative cover (less than 25% of cover) that are dynamically changing from one land cover to another, often because of land use activities. Examples include forest clear cuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and changes due to natural causes (e.g. fire, flood, etc.).
Forest	<i>areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); tree canopy accounts for 25% to 100% of the cover.</i>
41	Deciduous Forest - areas dominated by trees where 75% or more of the tree species shed foliage simultaneously in response to seasonal change.
42	Evergreen Forest - areas dominated by trees where 75% or more of the

	tree species maintain their leaves all year. Canopy is never without green foliage.
43	Mixed Forest - areas dominated by trees where neither deciduous nor evergreen species represent more than 75% of the cover present.
Shrubland	<i>areas characterized by natural or semi-natural woody vegetation with aerial stems, generally less than 6 meters tall, with individuals or clumps not touching to interlocking. Both evergreen and deciduous species of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions are included.</i>
51	Shrubland - areas dominated by shrubs; shrub canopy accounts for 25 to 100% of the cover. Shrub cover is generally greater than 25% when tree cover is less than 25%. Shrub cover may be less than 25% in cases when the cover of other life forms (e.g. herbaceous or tree) is less than 25% and shrubs cover exceeds the cover of the other life forms.
Non-natural woody	<i>areas dominated by non-natural woody vegetation; non-natural woody vegetative canopy accounts for 25% to 100% of the cover. The non-natural woody classification is subject to the availability of sufficient ancillary data to differentiate non-natural woody vegetation from natural woody vegetation.</i>
61	Orchards/Vineyards/Other - orchards, vineyards, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.
Herbaceous Upland	<i>upland areas characterized by natural or semi-natural herbaceous vegetation; herbaceous vegetation accounts for 75% to 100% of the cover.</i>
71	Grasslands/Herbaceous - areas dominated by upland grasses and forbs. In rare cases, herbaceous cover is less than 25%, but exceeds the combined cover of the woody species present. These areas are not subject to intensive management, but they are often utilized for grazing.
Planted/Cultivated	<i>areas characterized by herbaceous vegetation that has been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for 75% to 100% of the cover.</i>
81	Pasture/Hay - areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.
82	Row Crops - areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.
83	Small Grains - areas used for the production of graminoid crops such as wheat, barley, oats, and rice.
84	Fallow - areas used for the production of crops that do not exhibit visible vegetation as a result of being tilled in a management practice that incorporates prescribed alternation between cropping and tillage.
85	Urban/Recreational Grasses - vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Wetlands	<i>areas where the soil or substrate is periodically saturated with or covered with water as defined by Cowardin et al., (1979).</i>
91	Woody Wetlands - areas where forest or shrubland vegetation accounts for 25% to 100 % of the cover and the soil or substrate is periodically saturated with or covered with water.
92	Emergent Herbaceous Wetlands - areas where perennial herbaceous vegetation accounts for 75% to 100% of the cover and the soil or substrate is periodically saturated with or covered with water.

Haikey Creek Canopy

The National Land Cover Database 2011 (NLCD2011) USFS percent tree canopy product was produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. The darker the green, the denser the tree canopy. A black background indicates zero percent tree canopy. Haikey Creek has a sparse and thin riparian canopy throughout most of the watershed.

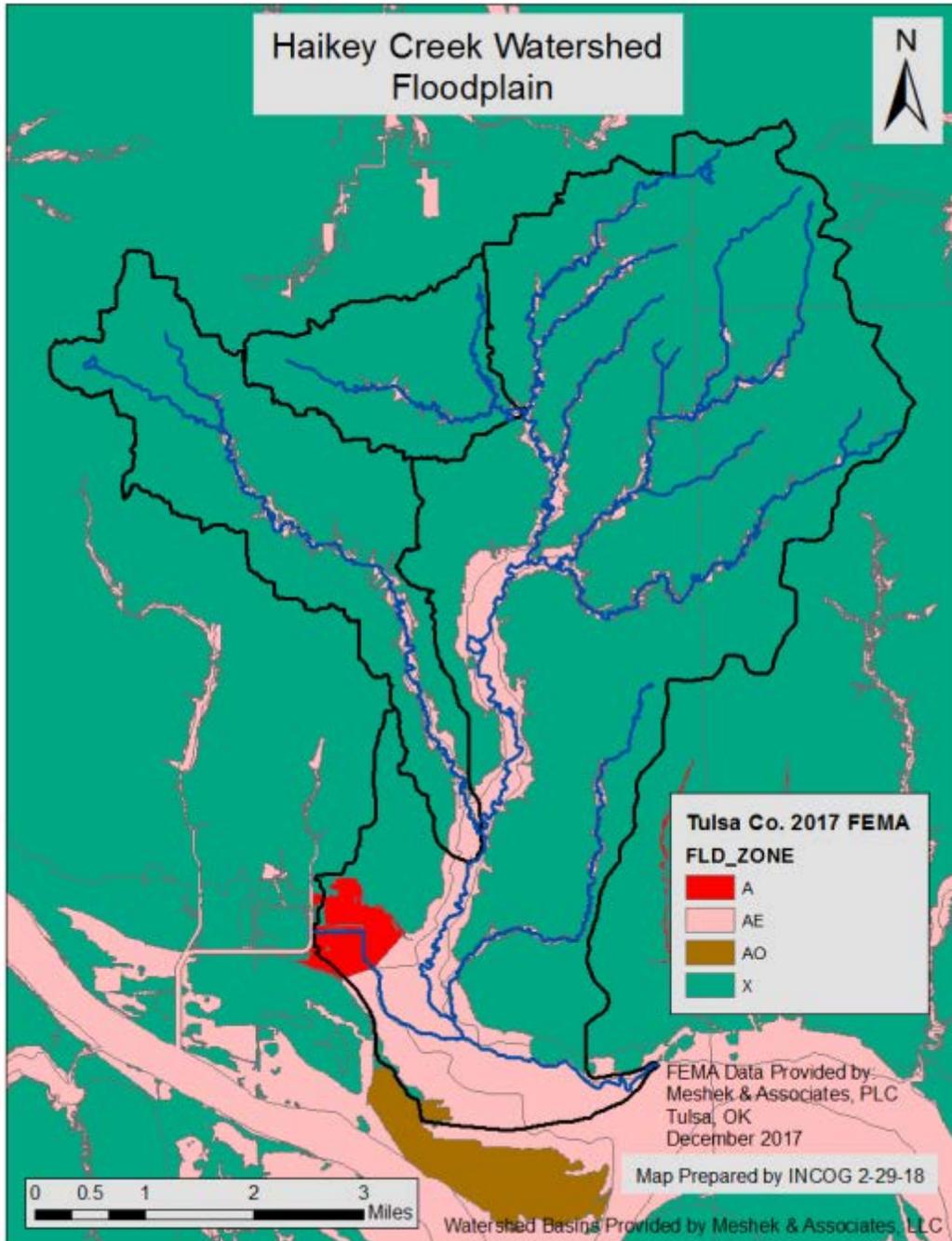
Map 15: Haikey Creek Watershed Canopy 2011



Floodplain

The southern portion of the watershed that is still largely undeveloped and agricultural is within the 100 year (Zone A, AE and AO) floodplain which extends up the Haikey Creek and tributary channels. The 100 year floodplain has a 1% chance of flooding each year. The rest of the watershed is in Zone X which is the 500 year floodplain or has a 0.2% chance of flooding each year.

Map 16: Haikey Creek Watershed Floodplain



Zone A is the area with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas: no depths or base flood elevations are shown within these zones.

Zone AE is the base floodplain where base flood elevations are provided.

Zone AO is a river or stream flood hazard area and an area with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage.

Zone X is the 500 year floodplain with a 0.2% annual chance of flooding.



Haikey Creek at W.
Florence St. (111 St.),
3-26-18

Wetlands

Map 17 shows wetlands and deep water habitats as reported by the National Wetlands Inventory (version 2) from the US Fish & Wildlife Service GIS Wetlands Data. There are numerous small wetlands scattered throughout the watershed and primarily aligned with creek channels. These wetlands correlate well with areas prone to flooding shown on the floodplain map.

Abandoned Coal Mine Features

There are no areas listed in the Oklahoma Conservation Commission's Abandoned Mine Land Reclamation Program (AML) and potential problem areas within this watershed. However, unknown AML features may exist and have not been discovered or reported yet.

Remediation Sites

DEQ lists all properties associated with Brownfields, voluntary cleanup, Site Cleanup Assistance Program (SCAP), and Superfund sites that have had institutional controls placed on the property and all sites that have been awarded a Brownfield Certificate through the DEQ's Brownfields Program. This is handled by the Land Protection Division. This watershed has no properties listed by DEQ as remediation sites with institutional controls.

Hazardous Waste Facilities

DEQ permits hazardous waste landfill disposal sites, facilities that store hazardous wastes, hazardous waste transfer facilities, and certain types of recycling or treatment facilities, and Commercial Hazardous Waste Receiving Facilities. Permits allow these facilities to receive, store and transfer hazardous materials above threshold amounts. There are no permitted hazardous waste facilities within this watershed.

Water Supply

The 1995 Oklahoma Comprehensive Water Plan (OCWP) was last updated (portions) in 2012. The purpose of this study was to determine the availability of water in Oklahoma and establish a reliable supply of water for state users for at least the next 50 years. It provides information useful to water providers, policy makers and water users enabling informed decisions concerning the use and management of Oklahoma's water resources.

The state was divided into 82 surface water basins within 13 Watershed Planning Regions. The Middle Arkansas Watershed Planning Region (MAWPR) includes eight basins numbered 49 and 73-79. Most water users in MAWPR rely on surface water supplies and to a lesser extent on alluvial and bedrock groundwater and will continue to do so in the future.

Map 18: Middle Arkansas Watershed Planning Region



Reservoirs in Oklahoma may serve multiple purposes, such as water supply, irrigation, recreation, hydropower generation, and flood control. Reservoirs designed for multiple purposes typically possess a specific volume of water storage assigned for each purpose.

(OCWP) Oklahoma Comprehensive Water Plan, Version 1.1, 2012 Update.

Currently surface water is used to meet about 95% of this regions demand. Conservation measures could reduce or eliminate some shortages and surface water alternatives, such as bedrock groundwater supplies from major aquifers and/or developing new reservoirs could mitigate surface water gaps without major impacts to groundwater storage. No basins within this

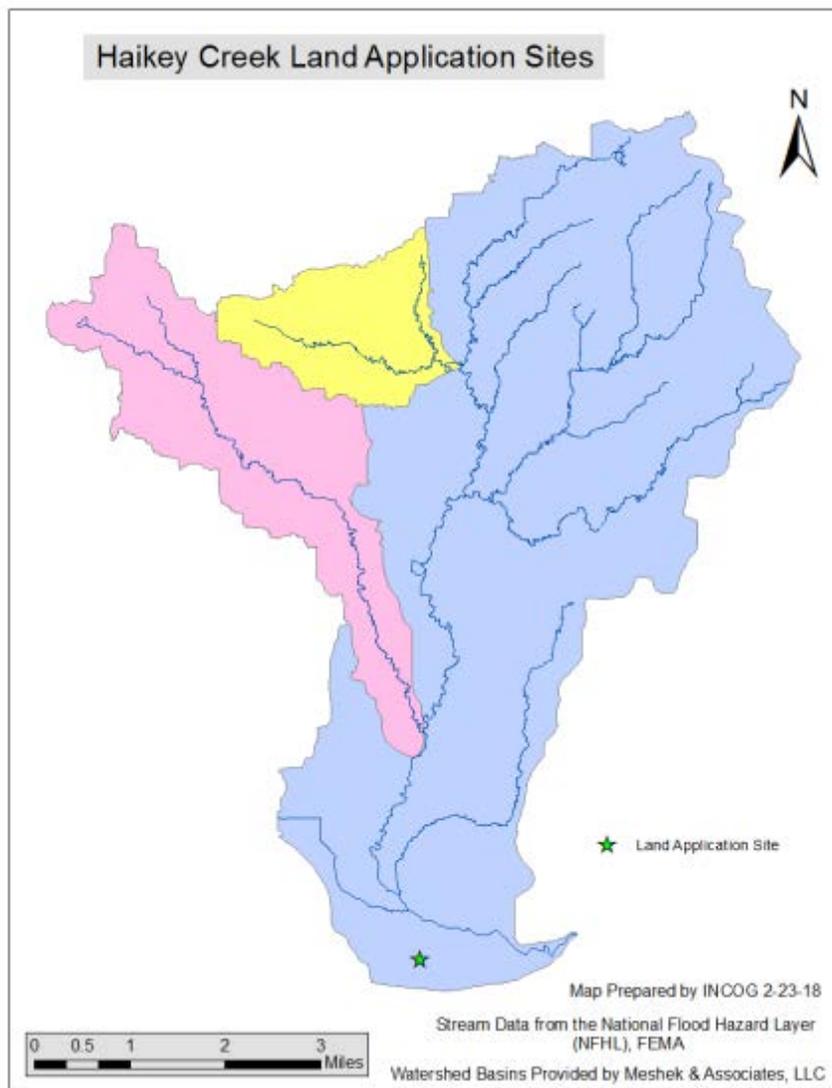
region have been identified as water availability “hot spots,” or areas where severe deficits or gaps in supply are anticipated.

The Haikey Creek watershed is in Basin 49. For Basin 49, water users are expected to continue to rely primarily on reservoirs and surface water supplies and by 2020 there is a low probability of surface water gaps from increased demands on existing supplies during low flow periods. Alluvial groundwater storage depletions may occur by 2020, but will be minimal in size relative to aquifer storage in the basin. However, localized storage depletions may cause adverse effects for users.

Land Application

DEQ lists only one land application site within this watershed and it is in the southern most portion. See Map 19.

Map 19: Haikey Creek Land Application Sites



Permitted Discharge Sites

DEQ does not list any permitted discharge sites within the Haikey Creek watershed.

Haikey Creek at N. Olive Ave.
(between 61 & 71 St.),
3-26-18





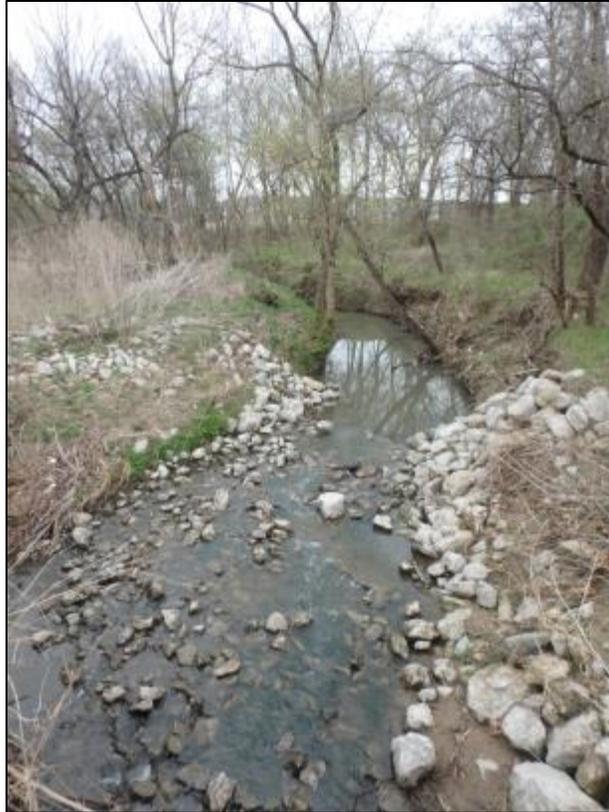
Haikey Creek Tributaries

East Branch Haikey
Creek, 3-26-18



Floral Haven Creek, 3-26-18

Middle Branch
Haikey Creek,
3-26-18



Olive Creek, 3-26-18

