Chapter 4
Population and Land Cover

Population in the French Broad Basin

The population of the entire basin for the year 2000 was estimated at about 427,000, or about 151 people per square mile (Figure 4-1). Buncombe County has the largest overall population of any county in the basin and has the most dense population. Buncombe and Henderson Counties have both been experiencing very rapid growth over the past two decades. Municipalities with populations greater than 5,000 include: Asheville, Black Mountain, Brevard, Hendersonville, Mills River, and Waynesville. Table 4-1 provides population information for all counties in the basin and Table 4-2 contains population data for all municipalities in the basin.

Figure 4-1:1990 (left) and 2000 (right) Population Density (No. People/mi2) by 12-Digit Hydrologic

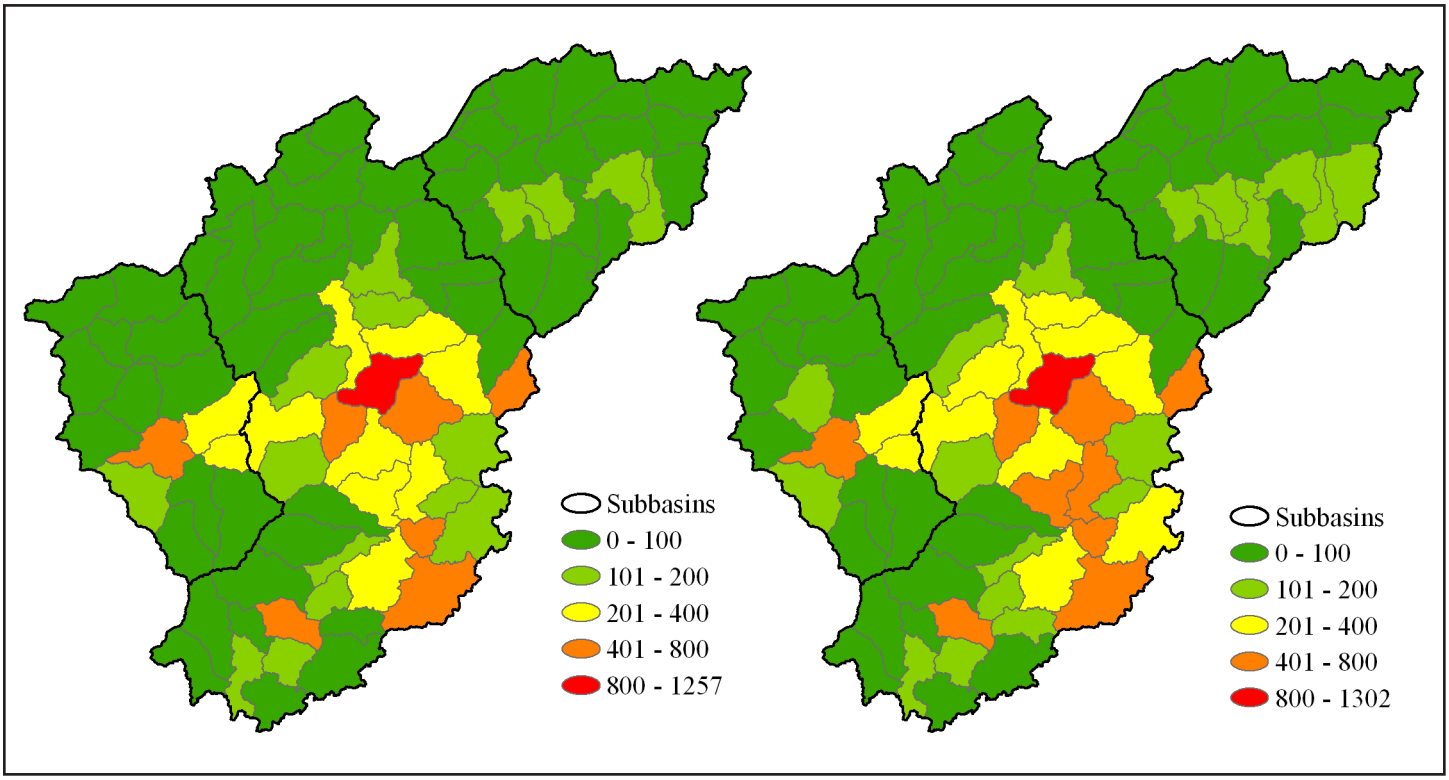


Table 4-1: County Population Estimates and Projections

County	% of County in Basin	2000 Population	2009 Estimated Population	Percent Change 2000 - 2009	2020 Projected Population	Percent Change 2000 - 2020
Avery	38.4	17,167	18,301	6.6	18,300	6.6
Buncombe	93.5	206,310	230,450	11.7	258,170	25.1
Haywood	100.0	54,033	58,043	7.4	62,361	15.4
Henderson	70.9	89,192	105,246	18.0	125,049	40.2
Madison	100.0	19,635	20,846	6.2	22,161	12.9
Mitchell	100.0	15,687	15,974	1.8	16,702	6.5
Transylvania	81.7	29,334	31,095	6.0	34,001	15.9
Yancey	100.0	17,777	18,554	4.4	19,596	10.2

Source: North Carolina Office of State Management and Budget July, 2010.

Table 4-2: Municipal Population Estimates

Municipality	County	2000 Population	2008 Estimated Population	Percent Change 2000 - 2008
Asheville	Buncombe	68,889	78,313	13.7
Bakersville	Mitchell	357	356	-0.3
Biltmore Forest	Buncombe	1,440	1,548	7.5
Black Mountain	Buncombe	7,511	8,597	14.5
Brevard	Transylvania	6,789	7,170	5.6
Burnsville	Yancey	1,623	1,691	4.2
Canton	Haywood	4,029	4,063	0.8
Clyde	Haywood	1,324	1,377	4.0
Flat Rock	Henderson	2,565	3,261	27.1
Fletcher	Henderson	4,185	6,427	53.6
Hendersonville	Henderson	10,569	12,993	22.9
Hot Springs	Madison	645	676	4.8
Laurel Park	Henderson	2,017	2,270	12.5
Maggie Valley	Haywood	607	1,308	115.5
Mars Hill	Madison	1,764	1,927	9.2
Marshall	Madison	2,360	3,090	30.9
Mills River	Henderson	5,639	6,442	14.2
Montreat	Buncombe	630	714	13.3
Newland	Avery	704	696	-1.1
Rosman	Transylvania	490	593	21.0
Spruce Pine	Mitchell	2,030	2,037	0.3
Sugar Mountain	Avery	226	247	9.3
Waynesville	Haywood	9,232	9,957	7.9
Weaverville	Buncombe	2,416	3,231	33.7
Woodfin	Buncombe	3,162	5,992	89.5

Land Cover in the French Broad Basin

Seventy-six percent of this basin is covered by forest. However, development has been increasing in the basin over the past decade particularly in the Upper French Broad River subbasin.

Explanation of the Land Cover Data and Categories

The national land cover database (2001) is a geographic information system raster file that was developed by the Multi-Resolution Land Characterization Consortium, which is made up of several Federal agencies. These agencies include the USGS, EPA, National Oceanic and Atmospheric Administration, US Forest Service, Bureau of Land Management, National Aeronautics and Space Administration, National Park Service, and Natural Resources Conservation Service. It was developed using multiple datasets including sets of infrared landsat imagery that were collected during the spring, summer, and fall seasons. These data were then improved upon using ancillary data files such as: 30 meter digital elevation model; population density; buffered roads; and city lights. The percent impervious cover and the percent tree canopy were created to show the intensity at which land was developed. For more information on this land cover data visit the ***Multi-Resolution Land Characteristics Consortium's website***.

Table 4-3: Land Cover in the French Broad River Basin

Type	Basinwide		06010105		06010106		06010108	
Year	2001	2006	2001	2006	2001	2006	2001	2006
Developed, Open Space	8.1	8.3	9.8	10.1	6.2	6.4	5.1	5.2
Developed, Low Intensity	1.4	1.5	1.8	2.0	1.1	1.1	0.4	0.4
Developed, Medium Intensity	0.4	0.5	0.6	0.7	0.3	0.3	0.1	0.1
Developed, High Intensity	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0
Developed	10.1	10.5	12.4	13.0	7.7	7.9	5.6	5.7
Forest, Deciduous	70.1	70.5	65.2	65.6	75.6	75.6	78.3	78.9
Forest, Evergreen	3.9	3.9	4.3	4.2	3.5	3.6	3.2	3.2
Forest, Mixed	2.0	2.0	0.1	2.2	1.7	1.7	0.1	1.9
Forest	76.0	76.4	69.6	72.0	80.8	80.9	81.6	84.0
Cultivated Crops	0.7	0.5	1.0	0.7	0.6	0.4	0.2	0.1
Pasture/Hay	11.3	10.8	13	12.5	9.4	9.2	8.3	7.7
Agriculture	12.0	11.3	14.0	13.2	10.0	9.6	8.5	7.8
Grassland	0.9	1.0	1.0	1.1	0.4	0.5	1.0	1.1
Scrub/Shrub	0.8	0.8	0.6	0.6	0.9	1.0	1.2	1.1
Wooded Wetlands	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Bare Earth or Transitional	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1

Open Water - All areas of open water, generally with less than 25 percent cover of vegetation or soil.

Developed, Open Space - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Developed, Low Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.

Developed, Medium Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.

Developed, High Intensity - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

Barren Land (Rock/Sand/Clay) - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.

Deciduous Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.

Evergreen Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

Mixed Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.

Shrub/Scrub - Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

Grassland/Herbaceous - Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

Cultivated Crops - Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

Woody Wetlands - Areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative

Figure 4-2: 2001 Land Cover in the French Broad River Basin

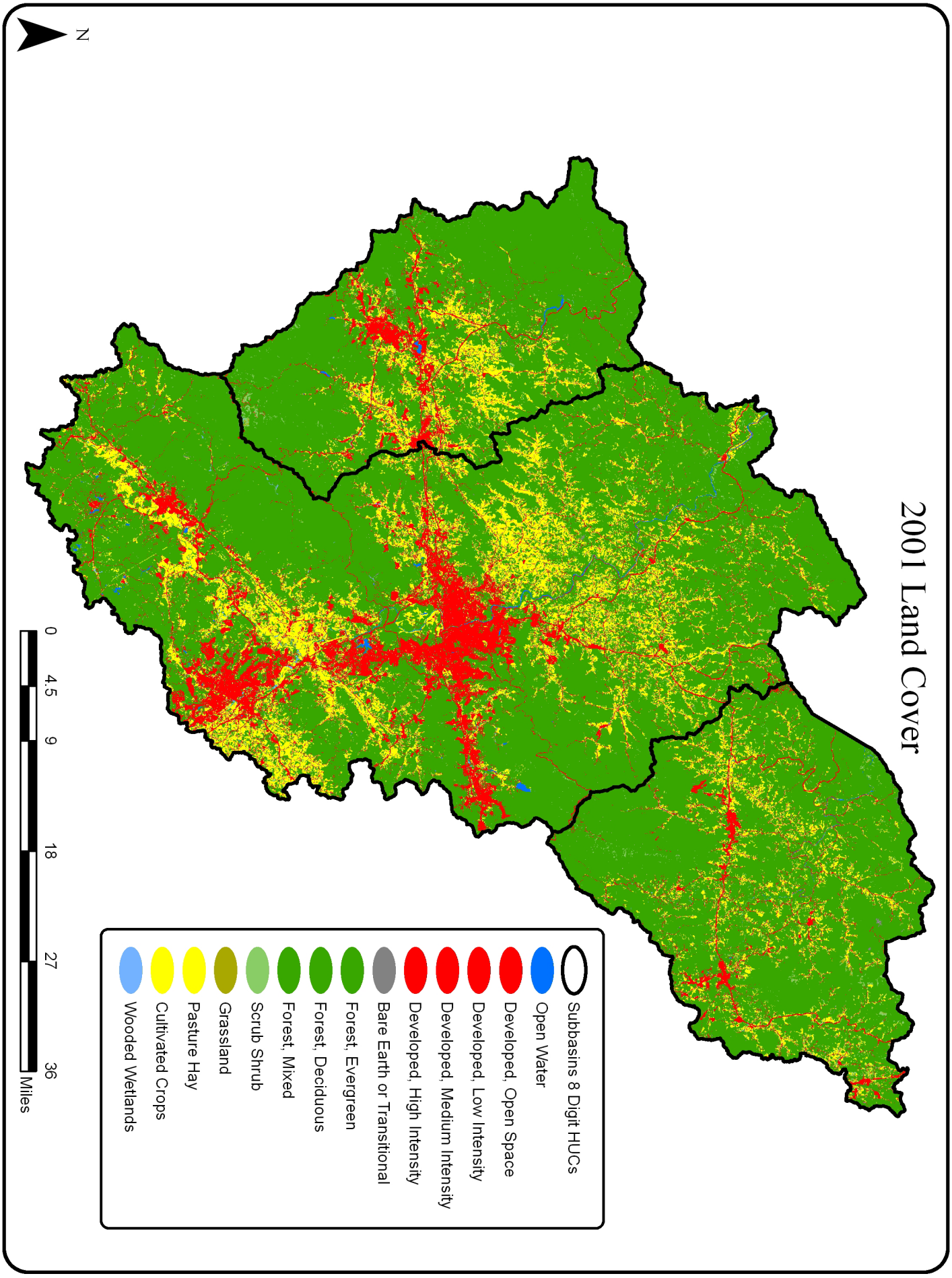
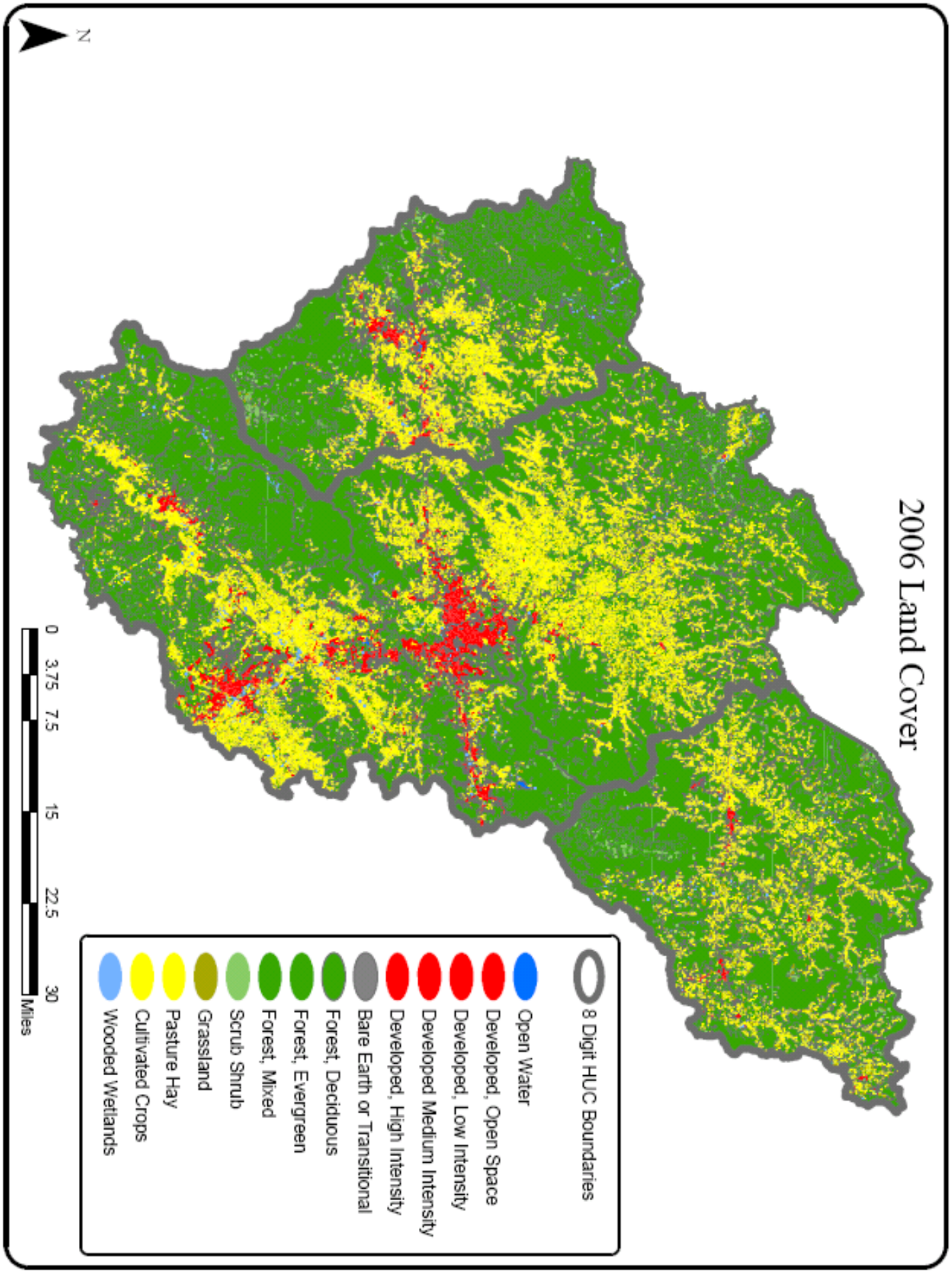


Figure 4-3: 2006 Land Cover in the French Broad River Basin



cover and the soil or substrate is periodically saturated with or covered with water.

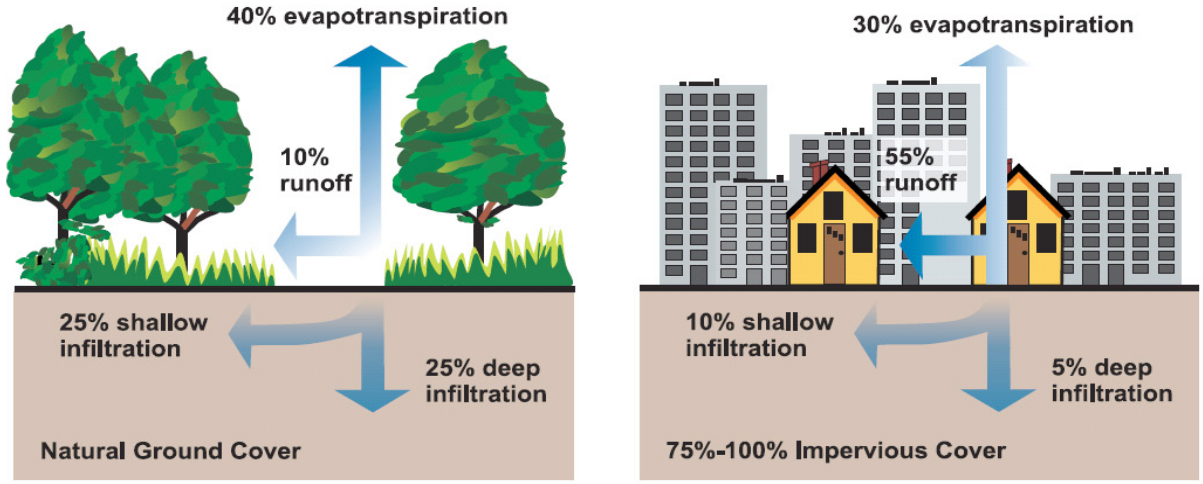
Population, Land Cover, and Stormwater

As population increases, so does the amount of land covered by impervious surfaces such as parking lots, roads, and roof tops. As impervious surface increases, the amount of precipitation that enters surface waters as runoff increases and the amount of precipitation infiltrating into the ground decreases (Figure 4-4). Increased stormwater runoff contributes to flooding during rainfall events and decreases the amount of groundwater available during droughts. Runoff harms aquatic life by physically and chemically altering the aquatic habitat. Increased flow or greater velocity of the flow causes greater stream channel and bank erosion and water pollution.

A comprehensive stormwater management program is often necessary to balance growth and water quality protection. Many areas throughout the basin have such programs in place, but some areas are still lacking adequate protection from stormwater (Figure 4-5). For more information on stormwater and how to manage it refer to Chapter 5 of the Supplemental Guide to Basinwide Planning or visit DWQ's ***Stormwater Branch website***.

As shown in Table 4-4, over half of the waters in the French Broad River Basin are impaired for biological integrity. In many of these instances, stormwater runoff is a contributing factor toward this impairment.

Figure 4-4: Impervious Surface and Runoff (EPA, 2003)



Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface ruunoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.

Table 4-4: Impaired Waterbodies in the French Broad River Basin

Assessment Unit Number	Hydrologic Unit Code	Name	Class	Parameter of Interest
6-2-(0.5)b	0601010501	West Fork French Broad River	B;Tr	Biological Integrity
6-34-(15.5)	0601010502	Davidson River	WS-V,B;Tr	Low pH
6-55-8-1a	0601010503	Bat Fork	C	Biological Integrity
6-55-8-1b	0601010503	Bat Fork	C	Biological Integrity
6-55-11-(1)a	0601010503	Clear Creek	B;Tr	Biological Integrity
6-55-11-(1)c	0601010503	Clear Creek	B;Tr	Biological Integrity
6-55-11-(5)a	0601010503	Clear Creek	C	Biological Integrity
6-55-8-2b	0601010503	Devils Fork	C	Biological Integrity
6-55b	0601010503	Mud Creek	C	Biological Integrity
6-55c	0601010503	Mud Creek	C	Biological Integrity
6-55d	0601010503	Mud Creek	C	Biological Integrity
6-54-6	0601010504	Brandy Branch	WS-III	Biological Integrity
6-54-3-(17.5)	0601010504	South Fork Mills River	WS-II,Tr,HQW	Biological Integrity
6-(47.5)UT23	0601010504	Unnamed Trib to French BroadR	WS-IV	Low DissolveOxygen
6-76d	0601010505	Hominy Creek	C	Turbidity
6-78-23b	0601010506	Ross Creek	B	Biological Integrity
6-57-(9)a	0601010507	Cane Creek	C	Biological Integrity
6-(54.5)d	0601010509	French Broad River	B	Turbidity
6-84a	0601010509	Newfound Creek	C	Biological Integrity
6-84b	0601010509	Newfound Creek	C	Biological Integrity
6-84c	0601010509	Newfound Creek	C	Biological Integrity
6-84d	0601010509	Newfound Creek	C	Biological Integrity
5-(7)b	0601010601	Pigeon River	C	Biological Integrity
5-(7)c	0601010601	Pigeon River	C	Biological Integrity
5-16-(1)a	0601010602	Richland Creek	B;Tr	Pathogens
5-16-(1)b	0601010602	Richland Creek	B;Tr	Biological Integrity
5-16-(11.5)a	0601010602	Richland Creek	B	Biological Integrity and Pathogens
5-16-(11.5)b	0601010602	Richland Creek	B	Pathogens
5-16-(11.5)c	0601010602	Richland Creek	B	Biological Integrity and Pathogens
5-16-(11.5)d	0601010602	Richland Creek (Lake Junaluska)	B	High pH
5-16-(16)b	0601010602	Richland Creek	C	Biological Integrity
5-16-14	0601010602	Raccoon Creek	B	Biological Integrity
7-2-(21.5)	0601010801	North Toe River	WS-IV;Tr	Copper and Turbidity
7-2-(27.7)b	0601010801	North Toe River	C;Tr	Turbidity
7-2-59	0601010802	Cane Creek	C;Tr	Biological Integrity
7-2-52-(1)	0601010802	South Toe River	B,Tr;HQW	Low pH
7-3-22	0601010803	Bald Creek	C	Pathogens
7-3-(13.7)	0601010803	Cane River	C;Tr	Turbidity

Assessment Unit Number	Hydrologic Unit Code	Name	Class	Parameter of Interest
7-3-22-1	0601010803	Fox Creek	C	Pathogens
7-3-22-4	0601010803	Elk Wallow Creek	C;Tr	Pathogens
7-3-22-5	0601010803	Lickskillet Branch	C;Tr	Pathogens
7-3-22-7	0601010803	Possumtrot Creek	C;Tr	Pathogens
7	0601010803	Nolichucky River	B	Copper and Turbidity
7-10	0601010806	Hollow Poplar Creek	C;Tr	Low pH
7-2-63	0601010806	Jacks Creek	C	Biological Integrity

Figure 4-5: Stormwater Permit Areas in the French Broad River Basin