



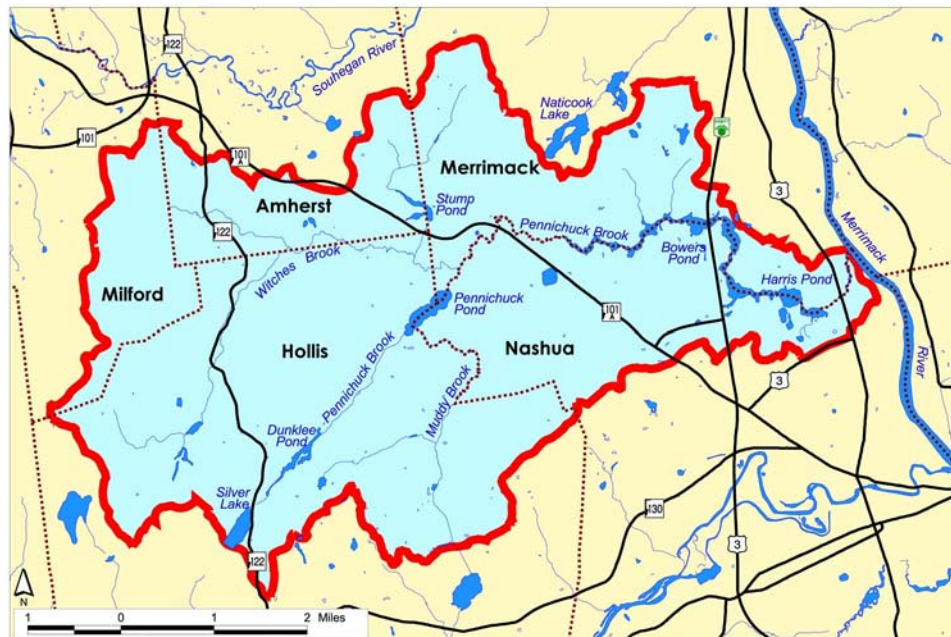
## INTRODUCTION

The Pennichuck Brook watershed (Figure 1) includes approximately 17,700 acres within the communities of Amherst, Hollis, Merrimack, Milford and Nashua and is the primary drinking water supply for the City of Nashua and several of other communities. In 2003, the Nashua Regional Planning Commission obtained grant funds under the Regional Environmental Planning Program to assist in developing a better understanding of the current health of the watershed and work with the surrounding communities to develop a comprehensive approach toward watershed protection.

The information presented in this buildout analysis was generated through Geographic Information System (GIS) technology. The figures and maps presented in this report are based on an analysis of statistical data, local zoning ordinances and private covenants. These data sources were used to develop an estimate of the potential area of impervious surface that could be developed within the Pennichuck Brook watershed. It is important to note, however, that this buildout analysis does not take into consideration the EPA Phase II Stormwater Regulations and their impact on the future amount of impervious surface predicted for the watershed. While important, that level of analysis is beyond the scope of this project.

The goal of this analysis was to determine the potential future imperviousness of the Pennichuck Brook Watershed based on existing land use regulations. This analysis can be used by municipalities to evaluate the impacts of local zoning as it currently exists, review proposed development, suggest transportation improvements, and to cooperatively develop a more comprehensive, regional approach towards watershed protection. The analysis can also be used as a local and regional guide to gauge the general health of the subwatersheds within each community and mitigate development impacts to protect the Pennichuck Brook watershed.

**Figure 1: Pennichuck Brook Watershed Location**



Source: NRPC GIS, 2003



The analysis includes four tasks, as follows:

- **Task 1. Existing Conditions Analysis** – Map features in the watershed including community and watershed boundaries, parcels, roads and waterbodies
- **Task 2. Riparian Buffer Analysis** - Identify existing and proposed riparian buffers in the watershed to understand the existing level of protection as well as what is potentially available for future protection in the watershed.
- **Task 3. Impervious Surface Analysis** – Calculate the amount of impervious surface in the watershed according to land use by municipality and subwatershed.
- **Task 4. Buildout Analysis** – Conduct a statistical assessment of the quantity of new development that could be constructed based on each community’s existing land use regulations and physical development constraints.

## TASK 1. EXISTING CONDITIONS ANALYSIS

In the first task, existing GIS data for the watershed was collected to develop a base map of the watershed. Map 1 provides a snapshot of the existing conditions in the watershed. The various features on Map 1 include community and watershed boundaries, parcels, roads and waterbodies. Note: In order to be consistent, the information used to develop Map 1 and subsequent maps included the existing conditions in the watershed as of February 2003. The GIS data sources that were used to develop the base map are in Appendix A.

## TASK 2. RIPARIAN BUFFER ANALYSIS

In the second task, existing and proposed riparian buffers in the watershed were identified for the purpose of understanding the existing level of protection as well as what is potentially available for future protection in the watershed. Riparian buffers are strips of vegetation along the banks of rivers and streams that filter polluted runoff and provide a transition zone between water and human land use.<sup>1</sup> They are an effective and cost-efficient best management practice that can be used to maintain or enhance water quality, prevent flooding, and provide wildlife habitat.

State and municipal land use regulations and restrictive covenants effective within the Pennichuck Brook watershed have established riparian buffers within a defined distance from the shoreline. These regulations provide a variety of protection to the surface waters in the watershed. For example, the City of Nashua established a 75-foot no-disturbance buffer around all prime wetlands and Pennichuck Pond and its tributaries. The Town of Hollis, however, designated a 100-foot restricted buffer around all wetlands and hydric soils in addition to Pennichuck Pond and its tributaries. Table 1 summarizes the various buffers applicable to the watershed. Map 2 illustrates these established buffers for the entire watershed.

As shown in Table 1, the established riparian buffers provide some areas of the watershed more protection than others. For example, a restrictive covenant established a 500-foot buffer around the Supply Pond and 300-foot buffer around the remaining ponds. In order to protect water quality in the watershed, however, the *Pennichuck Water Works Watershed Management Plan* recommends “to use a 400-foot buffer around all the chain ponds and a 200-foot buffer from the Ordinary High Water Mark around the tributaries and wetlands that are directly adjacent to the chain ponds.”<sup>2</sup> The Pennichuck Brook

<sup>1</sup> Connecticut River Joint Commissions, *Introduction to Riparian Buffers*, September 2000.

<sup>2</sup> Comprehensive Environmental, Inc., *Pennichuck Water Works Watershed Management Plan*, August 1998.



Watershed Council suggested that the 400-foot buffer be extended to include the chain ponds and all of the tributaries in the watershed (see Map 3).

Once the suggested 400-foot buffer was mapped, the watershed was analyzed to determine if there were areas that could be further protected through acquisition of land. All of the undeveloped and unprotected parcels in the watershed were identified. Any of these parcels that are adjacent to the suggested 400-foot buffer (shown in pink on Map 4) were labeled as potentially available for acquisition.

**Table 1: Established Riparian Buffers in the Pennichuck Brook Watershed**

Municipality or Entity	Pennichuck Ponds	Pennichuck Brook and Tributaries	Wetlands Adjacent to Pennichuck Ponds and Tributaries
Lands now or formerly owned by Pennichuck (Restrictive covenants)	±50 ft "Critical Area" includes wetlands, floodplains, shoreline, and adjacent steep slopes Natural state except road and utility crossings		
	500 ft buffer for Supply Pond critical area; 300 ft buffer for other ponds' critical areas	300 ft buffer for tributaries' critical areas	100 ft buffer for other wetlands
	Buffer areas natural state except limited clearing		
Nashua	225 ft undisturbed except for veg. swales ("Conservation zone"); 300 ft No fertilizers or pesticides	75 ft undisturbed except for veg. swales ("Conservation zone"); 150 ft No fertilizers or pesticides; stormwater treatment and infiltration requirement	
Hollis	100 ft no construction activity (or 14 other prohibited uses) for wetlands and hydric soils (exemptions for agriculture and forestry); most (all?) of Pennichuck Pond is bordered by wetlands		
Merrimack	250 ft Protected Shoreland (25 ft No fertilizer or clearing; 40 ft no building; 50 ft Primary Building Setback; 150 ft Natural Woodland Buffer; soils-based lot size and septic setbacks; no salt piles, waste facilities, junk yards); most is former Pennichuck land		
Amherst	Not in Amherst	100 ft naturally vegetated buffer for Public Water Protection Wetlands (includes certain wetlands in watershed); 25 ft for other wetlands: no filling or alteration of contours, except as determined by Planning Board (may require a mitigation plan), as for road/driveway crossings, forestry and agriculture acc to BMPs	
Milford	Not in Milford	50 ft no disturbance; 100 ft setback for leach fields; all zoned residential	25 ft no disturbance
Entire watershed (NH DES rule)	75 ft No privies, structures housing animals, septic systems, solid waste, wastewater		

Source: New Hampshire Department of Environmental Services, 2003



The following steps were taken to analyze the existing and proposed riparian buffers in the watershed:

1. **Assign a generalized land use category to each parcel.** Each parcel in the watershed was assigned a generalized land use category: agricultural, conservation, developed (which includes roads), water (hydric), and vacant. Tables 2A and 2B present the acreage and percentage of these land uses within each community and subwatershed in the watershed. This allowed for the selection of parcels by land use.

**Table 2A: Generalized Land Uses by Municipality**

Municipality	Agriculture		Conservation		Developed		Water		Vacant		Total Area in Watershed (acres)
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Amherst	0	0%	4	0%	874	48%	13	1%	921	51%	1,813
Hollis	1,218	16%	1,103	14%	2,839	37%	98	1%	2,371	31%	7,629
Merrimack	0	0%	81	2%	1,870	55%	106	3%	1,364	40%	3,421
Milford	11	1%	93	7%	338	26%	0	0%	867	66%	1,309
Nashua	11	0%	673	19%	2,345	67%	176	5%	318	9%	3,522
<b>Total</b>	<b>1,240</b>	<b>7%</b>	<b>1,954</b>	<b>11%</b>	<b>8,266</b>	<b>47%</b>	<b>393</b>	<b>2%</b>	<b>5,841</b>	<b>33%</b>	<b>17,694</b>

Source: NRPC GIS, 2003.

**Table 2B: Generalized Land Uses by Subwatershed**

Subwatershed	Agriculture		Conservation		Developed		Water		Vacant		Total Area in Watershed (acres)
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Muddy Brook	638	23%	632	22%	789	28%	11	0%	765	27%	2,834
Pennichuck Brook (N)	17	0%	444	8%	3,421	60%	299	5%	1,549	27%	5,730
Pennichuck Brook (S)	298	19%	339	22%	501	32%	65	4%	351	23%	1,554
Witches Brook (N)	72	2%	114	2%	2,555	54%	19	0%	1,995	42%	4,755
Witches Brook (S)	215	8%	425	15%	1,000	35%	0	0%	1,181	42%	2,821
<b>Total</b>	<b>1,240</b>	<b>7%</b>	<b>1,954</b>	<b>11%</b>	<b>8,266</b>	<b>47%</b>	<b>393</b>	<b>2%</b>	<b>5,841</b>	<b>33%</b>	<b>17,694</b>

Source: NRPC GIS, 2003

2. **Research and map established riparian buffers.** The established riparian buffer dimensions differed by municipality and land use as shown in Table 1. The buffer criteria were analyzed and applied to all parcels based on the land uses identified in the previous step. All applicable buffers, for each land use, were then merged into one GIS coverage to create a map of the established riparian buffers in the watershed (see Map 2).



3. **Map the suggested 400-foot riparian buffer.** The suggested 400-foot buffer was placed around every chain pond and tributary in the watershed (see Map 3). Tables 3A and 3B summarize the area of the suggested 400-foot buffer in each municipality and subwatershed, respectively.

**Table 3A: Area of Suggested 400-foot Buffer by Municipality**

Municipality	Suggested 400-foot Buffer (acres)	Area of Municipality in Watershed (acres)
Amherst	360	1,813
Hollis	1,371	7,629
Merrimack	602	3,421
Milford	9	1,309
Nashua	607	3,522
<b>Total Acres</b>	<b>2,949</b>	<b>17,694</b>

Source: NRPC GIS, 2003

**Table 3B: Area of Suggested 400-foot Buffer by Subwatershed**

Subwatershed	Suggested 400-foot Buffer (acres)	Area of Subwatershed in Watershed (acres)
Muddy Brook	563	2,834
Pennichuck Brook (N)	981	5,730
Pennichuck Brook (S)	315	1,554
Witches Brook (N)	759	4,755
Witches Brook (S)	331	2,821
<b>Total</b>	<b>2,949</b>	<b>17,694</b>

Source: NRPC GIS, 2003

4. **Remove conservation and developed parcels.** Parcels that were identified as conservation or developed land were removed from consideration for potential acquisition.
5. **Analyze remaining land for potential acquisition.** Map 4 was analyzed to identify parcels that were undeveloped, unprotected and adjacent to the suggested 400-foot buffer. These parcels are considered potentially available for acquisition or other protective measures. Tables 4A and 4B analyze the area of the suggested 400-foot buffer that is adjacent to undeveloped, unprotected land. Tables 5A and 5B analyze the total area of the undeveloped, unprotected land that is adjacent to the suggested 400-foot buffer.

The area of the suggested 400-foot buffer that is adjacent to undeveloped, unprotected land in the municipalities and the subwatersheds is summarized in Tables 4A and 4B. A total of 503 acres of the suggested 400-foot buffer are adjacent to vacant lands with the majority located in the Town of Hollis, with a total of 244 acres. Witches Brook North, which is located in the Towns of Milford, Amherst, Merrimack and Hollis, contains the largest area of the suggested 400-foot buffer with 159 acres. Map 4 displays the areas where the suggested 400-foot buffer intersects these vacant parcels.

Tables 5A and 5B summarize the total area of the undeveloped, unprotected parcels that are adjacent to the suggested 400-foot buffer. 2,846 acres of vacant land in the watershed are adjacent to the suggested 400-foot buffer, with a majority of the parcels found in the Witches Brook North subwatershed which is located in the Towns of Milford, Amherst, Hollis and Merrimack. As indicated on Map 4, a large portion of these vacant parcels are located in the Town of Merrimack, north of the ponds.

**Table 4A: Area of Suggested 400-foot Buffer Adjacent to Undeveloped, Unprotected Parcels by Municipality**

Municipality	Area of Suggested 400' buffer Adjacent to Undeveloped, Unprotected Parcels (acres)	Total Area of Municipality in Watershed (acres)
Amherst	113	1,813
Hollis	244	7,629
Merrimack	116	3,421
Milford	8	1,309
Nashua	22	3,522
<b>Total</b>	<b>503</b>	<b>17,694</b>

Source: NRPC GIS, 2003

**Table 4B: Area of Suggested 400-foot Buffer Adjacent to Undeveloped, Unprotected Parcels by Subwatershed**

Subwatershed	Area of Suggested 400' buffer Adjacent to Undeveloped, Unprotected Parcels (acres)	Total Area of Subwatershed in Watershed (acres)
Muddy Brook	115	2,834
Pennichuck Brook (N)	127	5,730
Pennichuck Brook (S)	28	1,554
Witches Brook (N)	159	4,755
Witches Brook (S)	74	2,821
<b>Total</b>	<b>503</b>	<b>17,694</b>

Source: NRPC GIS, 2003

**Tables 5A: Area of Undeveloped, Unprotected Parcels Adjacent to Suggested 400-foot Buffer by Municipality**

Municipality	Total Area of the Parcels Adjacent to Suggested 400' Buffer (acres)	Total Area of Municipality in Watershed (acres)
Amherst	564	1,813
Hollis	1,429	7,629
Merrimack	739	3,421
Milford	42	1,309
Nashua	72	3,522
<b>Total</b>	<b>2,846</b>	<b>17,694</b>

Source: NRPC GIS, 2003



**Table 5B: Area of Undeveloped, Unprotected Parcels Adjacent to Suggested 400-foot Buffer by Subwatershed**

Subwatershed	Total Area of the Parcels Adjacent to Suggested 400' Buffer (acres)	Total Area of Subwatershed (acres)
Muddy Brook	807	2,834
Pennichuck Brook (N)	752	5,730
Pennichuck Brook (S)	168	1,554
Witches Brook (N)	833	4,755
Witches Brook (S)	286	2,821
<b>Total</b>	<b>2,846</b>	<b>17,694</b>

Source: NRPC GIS, 2003

### TASK 3. IMPERVIOUS SURFACE ANALYSIS

In the third task, the amount of impervious surface in the watershed was identified. Impervious surfaces such as roofs, roads, parking lots and driveways increase the rate by which pollutants accumulate and run off into water bodies during storm events. This runoff can potentially degrade water quality. The rate and flow of runoff is exacerbated with increased imperviousness and intensity of land use. A study by the Center for Watershed Protection (CWP) suggests that a watershed may be considered “impacted” when there is 11-25% impervious cover (see Figure 2). According to CWP’s study, at this percentage, streams may show signs of degradation due to watershed urbanization.<sup>3</sup> The definitions of the three categories used to gauge the health of a watershed based on impervious cover is in Appendix B.

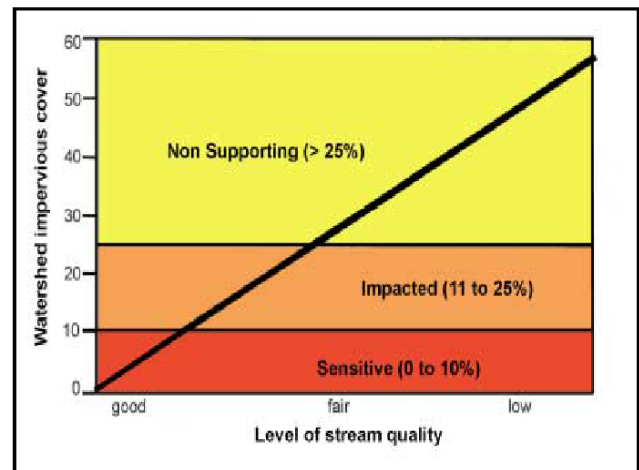


Figure 2: Impervious Cover Model

Source: Center for Watershed Protection, [www.cwp.org](http://www.cwp.org)

The Center for Watershed Protection developed a methodology which uses multipliers to estimate the amount of impervious area for various land uses in a watershed (see Table 6). Each multiplier indicates an estimate of the amount of impervious surface occupied by each type of land use. Using these multipliers, the amount of impervious surface in the Pennichuck Brook watershed was calculated in two ways: 1) based on actual data collected in the field along the NH Route 101A corridor; and 2) based on estimates for existing land uses in the remainder of the watershed (see Map 5). These two areas are depicted in Figure 3.

<sup>3</sup> Note: The definitions of these watershed indicators are based on CWP estimates and are not indicative of water quality monitoring results in the Pennichuck Brook watershed.

**Table 6: Impervious Area Coefficient by Land Use Category**

Land Use Category	Impervious Area Coefficient (% of Total Area)
Vacant	0.0%
Conservation Land	0.0%
Agriculture	1.9%
Open Urban Land	8.6%
2 Acre Lot Residential	10.6%
1 Acre Lot Residential	14.3%
1/2 Acre Lot Residential	21.2%
1/4 Acre Lot Residential	27.8%
1/8 Acre Lot Residential	32.6%
Townhome Residential	40.9%
Multifamily Residential	44.4%
Institutional	34.4%
Industrial	53.4%
Commercial	72.2%
Road	100%
Water	0.0%

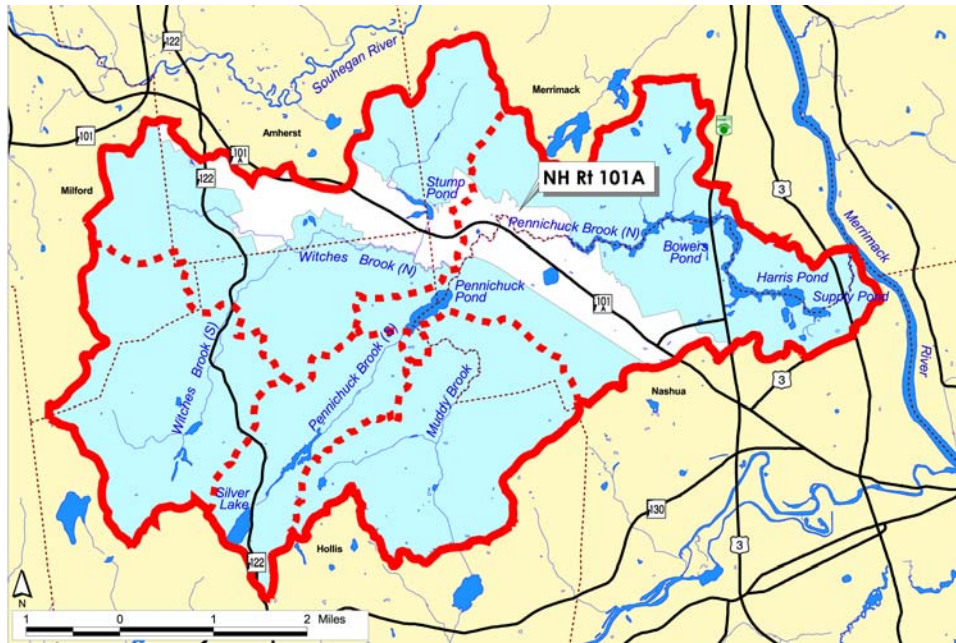
Source: Center for Watershed Protection, [www.cwp.org](http://www.cwp.org)

In 2002, NRPC completed the *NH Route 101A Corridor Study and Master Plan*. The study area, depicted in Figure 3, contains approximately 2,207 acres of urbanized area in the Pennichuck Brook watershed. The study includes data collected for each parcel located within 1,500 feet of the centerline of the NH Route 101A corridor. The accuracy of the data enabled the GIS staff to calculate the actual impervious surface cover for the corridor. This level of detail does not exist for the area outside of the corridor, however, so it was estimated based on existing and permitted land uses.





**Figure 3: NH Route 101A Corridor Area**



Source: NRPC GIS, 2003

Using the coefficients for various land uses presented in Table 6, the data was calculated separately for the NH Route 101A corridor (see Tables 7A and 7B) and the remainder of the watershed (see Appendix C and D). The two data sources were then combined to create a total impervious surface percentage for the watershed (see Map 6). The combined results are presented in Tables 8A and 8B.

Task 3 includes the following steps:

- 1. Calculate impervious surface in the NH Route 101A corridor study area.** Using the detailed information collected for the parcels along the NH Route 101A corridor, the area of impervious surface was calculated for the corridor. Tables 7A and 7B present the area of impervious surface by municipality and subwatershed for the portion of NH Route 101A corridor within the watershed.

**Table 7A: Area of Existing Impervious Surface along the NH Route 101A Corridor by Municipality**

Municipality	Total Area in Corridor (acres)	Total Area of Road in NH Route 101A Corridor (acres)	Area of Existing Impervious Surface (acres)	% Existing Impervious Surface
Amherst	790	37	117	15%
Hollis	90	2	2	2%
Merrimack	436	33	96	22%
Nashua	891	69	387	43%
<b>Total</b>	<b>2,207</b>	<b>141</b>	<b>602</b>	<b>27%</b>

Source: NRPC GIS, 2003

**Table 7B: Area of Existing Impervious Surface along the NH Route 101A Corridor by Subwatershed**

Subwatershed	Total Area in Corridor (acres)	Total Area of Road in NH Route 101A Corridor (acres)	Area of Existing Impervious Surface (acres)	% Existing Impervious Surface
Pennichuck Brook (N)	1,154	87	448	39%
Witches Brook (N)	1,053	54	154	15%
<b>Total</b>	<b>2,207</b>	<b>141</b>	<b>602</b>	<b>27%</b>

Source: NRPC GIS, 2003

- 2. Refine land use categories for the remainder of the watershed.** The purpose of refining the land use categories was to identify the specific use on each parcel in order to utilize the methodology created by the Center for Watershed Protection. The land use categories identified in Table 6 were then assigned to each parcel.
- 3. Calculate the impervious surface percentage for the remainder of the watershed.** Using the multipliers developed by the Center for Watershed Protection in Table 6, the area of impervious surface on each parcel in the remainder of the watershed was identified. The results were calculated by municipality and subwatershed (see Appendix C and D).
- 4. Calculate total existing impervious surface for the entire watershed.** The area of impervious surface calculated for the NH Route 101A corridor and for the remainder of the watershed were combined to identify the total area of existing impervious surface for the entire watershed. Tables 8A and 8B present the total area of existing impervious surface by municipality and subwatershed. The area of existing impervious surface is illustrated on Map 6.

**Table 8A: Area of Existing Impervious Surface by Municipality**

Municipality	Total Area in Watershed (acres)	Area of Existing Impervious Surface (acres)	% Existing Impervious Surface
Amherst	1,813	279	15%
Hollis	7,629	535	7%
Merrimack	3,421	627	18%
Milford	1,309	57	4%
Nashua	3,522	1,014	28%
<b>Total</b>	<b>17,694</b>	<b>2,512</b>	<b>14%</b>

Source: NRPC GIS, 2003

**Table 8B: Area of Existing Impervious Surface by Subwatershed**

Subwatershed	Total Area in Watershed (acres)	Area of Existing Impervious Surface (acres)	% Existing Impervious Surface
Muddy Brook	2,834	163	6%
Pennichuck Brook (N)	5,730	1,471	26%
Pennichuck Brook (S)	1,554	103	7%
Witches Brook (N)	4,755	604	13%
Witches Brook (S)	2,821	173	6%
<b>Total</b>	<b>17,694</b>	<b>2,512</b>	<b>14%</b>

Source: NRPC GIS, 2003

The results of this analysis are summarized by subwatershed and municipality in Tables 8A and 8B. Table 8A indicates that approximately 2,512 acres, or 14%, of the watershed, is currently impervious. Map 6 indicates that the more impervious surfaces are concentrated along the NH Route 101A corridor and in the City of Nashua in general.

As shown in Appendices C and D, several land uses in the watershed are contributing greatly to the existing area of impervious surface: buildings, commercial and industrial uses, multifamily and townhomes, and roads. The two subwatersheds that are affected the most by these land uses are Pennichuck Brook North and Witches Brook North, with 26% and 13% of impervious surface respectively (see Appendix C). In the Pennichuck Brook North subwatershed industrial buildings and roads are the two main land uses contributing to impervious surfaces. In the Witches Brook North subwatershed, 2-acre residences and roads are the two major land uses contributing to the total amount of imperviousness.

According to the Center for Watershed Protection's impervious cover model (see Figure 3 and Appendix B), watersheds with 11-25% imperviousness can be considered impacted and may "show clear signs of degradation." Based on the current level of imperviousness, 14%, the Pennichuck Brook watershed, could be placed in the "impacted" category of the CWP's impervious cover model. The model also indicates that watersheds that are greater than 25% impervious may be considered "non-supporting." As indicated in Table 8B, the existing area of impervious surface in the Pennichuck Brook North subwatershed is 1,471 acres or 26% impervious, placing it in the "non-supporting" category because it has over 25% impervious surface cover.



## TASK 4. BUILDOUT ANALYSIS

A buildout analysis of the watershed was completed in Task 4. A buildout analysis is a statistical assessment of the quantity of new development that could be constructed based on a community's existing land use regulations and physical development constraints. The results of a buildout analysis can be used to estimate the future area of impervious surface in a watershed (see Map 10). Map 9 illustrates the amount of potential new development in the Pennichuck Brook watershed.

Task 4 includes the following steps:

1. **Identify undeveloped land.** Parcels that are undeveloped were identified and verified by examining aerial photography and field review, as required.
2. **Remove undevelopable land.** The portions of parcels constrained by wetlands, steep slopes (>25%), floodplains, and existing covenants and established zoning buffers (see Table 1) were classified as un-buildable and subtracted from the area of undeveloped land.
3. **Remove small parcels.** Lots less than or equal to the minimum lot size requirement designated by each community's zoning ordinance were considered undevelopable and subtracted from the total area of undeveloped land.
4. **Remove 5% for subdivision regulations.** Five percent (5%) of the remaining area of undeveloped land was subtracted to account for design issues and required rights-of-ways in a subdivision. The result is the "net developable area."
5. **Divide by minimum lot size.** The net developable area was divided by the minimum lot size designated by each community's zoning ordinance (see Map 7). The result is the maximum build-out potential by number of lots (see Map 9). This is expressed at the municipal and subwatershed levels, as indicated in Appendices F and G.
6. **Calculate potential future area of impervious surface.** Each potential new parcel was multiplied by the Center for Watershed Protection's impervious surface coefficient for the associated land use designation/zoning category. The total potential area of impervious surface was then added to the existing area of impervious surface to yield the total potential future area of impervious surface at build-out. The results are summarized in Tables 9A and 9B and illustrated on Map 10.

The results of the build-out analysis, summarized in Tables 9A and 9B, indicate that an additional 3,287 acres of impervious surface could be developed in the watershed. This will increase the impervious surface coverage in the watershed from 14% to 19%.

Table 9B shows that the additional impervious surface could potentially cover nearly one-third (31%) of the Pennichuck Brook North watershed. As shown on Map 10, the majority of this additional impervious surface is located north of the ponds in the Town of Merrimack. Table 9B also shows that, due to this potential additional impervious surface, three of the five subwatersheds could be considered "impacted," according to the CWP impervious cover model, because they could be between 11-25% impervious at buildout.

As shown on Map 9, the majority of the development in the watershed is estimated to be in existing rural areas such as the eastern section of the Town of Hollis, the eastern part of the Town of Milford that is in the watershed, and the area south of NH Route 101A in the Town of Amherst. The Town of Hollis has



the most amount of land remaining for potential new lots in the watershed. 978 additional lots could be built in the part of Hollis that is within the watershed, for a total of 2,046 lots at buildout. According to current zoning regulations in the Town of Hollis, 99% (972 lots) of these would be 2-acre residential lots. In fact, Map 8 indicates that future land uses in the entire Pennichuck Brook watershed will be dominated by 2-acre lots, for a potential total of 2,707 new 2-acre lots at buildout.

The Town of Merrimack has the second highest amount of new lots with a potential for 871 additional lots, for a total of 2,046 lots at buildout in the part of Merrimack that is in the watershed. The majority of these, 64% or 554 lots, will be developed as industrial lots according to current zoning regulations. Appendices H and I summarize the total number of current, potential new, and total future lots by land use for each municipality and subwatershed in the Pennichuck Brook watershed.

**Table 9A: Total Area of Potential Future Impervious Surface by Municipality**

Municipality	Total Area in Watershed (acres)	Existing Area of Impervious Surface (acres)	Potential Area of Additional Impervious Surface (acres)	Total Area of Future Impervious Surface (acres)	Existing % Impervious Surface	Potential Future % Impervious Surface
Amherst	1,813	279	63	342	15%	19%
Hollis	7,629	535	306	841	7%	11%
Merrimack	3,421	627	249	876	18%	26%
Milford	1,309	57	96	153	4%	12%
Nashua	3,522	1,014	61	1,075	28%	31%
<b>Total</b>	<b>17,694</b>	<b>2,512</b>	<b>775</b>	<b>3,287</b>	<b>14%</b>	<b>19%</b>

Source: NRPC GIS, 2003

**Table 9B: Total Area of Potential Future Impervious Surface by Subwatershed**

Subwatershed	Total Area in Watershed (acres)	Existing Area of Impervious Surface (acres)	Potential Area of Additional Impervious Surface (acres)	Total Area of Future Impervious Surface (acres)	Existing % Impervious Surface	Potential Future % Impervious Surface
Muddy Brook	2,834	163	125	288	6%	10%
Pennichuck Brook (N)	5,730	1,471	285	1,756	26%	31%
Pennichuck Brook (S)	1,554	103	65	168	7%	11%
Witches Brook (N)	4,755	603	177	780	13%	16%
Witches Brook (S)	2,821	172	123	295	6%	10%
<b>Total</b>	<b>17,694</b>	<b>2,512</b>	<b>775</b>	<b>3,287</b>	<b>14%</b>	<b>19%</b>

Source: NRPC GIS, 2003