LAKE WAUKEWAN & LAKE WINONA
BUILD-OUT ANALYSIS

TO: Angela LaBreque, Town of Meredith
FROM: Evan Ma, FB Environmental Associates
SUBJECT: **Lake Waukewan & Lake Winona Build-out Analysis**
DATE: June 19, 2026
CC: Laura Diemer and Christine Bunyon, FB Environmental Associates

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To better protect the water quality and ecological integrity of Lake Waukewan and Lake Winona, the Town of Meredith, in partnership with the Waukewan Watershed Advisory Committee (WWAC), hired FB Environmental Associates (FBE) to perform a build-out analysis of the Lake Waukewan and Lake Winona watershed, as part of the development of the Lake Waukewan and Lake Winona Watershed Restoration Plan Update. The Lake Waukewan and Lake Winona watershed extends into the towns of Ashland, Holderness, New Hampton, Center Harbor, and Meredith, NH. A build-out analysis was previously conducted for the original Watershed Restoration Plan in 2015. The results from the 2015 and 2025 buildout analysis are presented and compared throughout this report.

A build-out analysis is a planning tool that identifies areas with development potential and projects future development based on a set of conditions (e.g., zoning regulations, environmental constraints) and assumptions (e.g., population growth rate). The results of the build-out analysis can be used for planning purposes to help guide future development activities in the watershed, as well as target specific areas for conservation. Note that the analyses presented herein provide a full build-out scenario based on Ashland, Holderness, New Hampton, Center Harbor, and Meredith's current zoning standards (which are subject to amendment) and should be viewed as estimates only. "Full build-out" is a theoretical condition which represents the period when all available land suitable for residential, commercial, and industrial uses has been developed to the maximum conditions permitted by local ordinances.

Approximately 1,425 parcels were identified as within or partially within the full watershed, ranging in size from less than one acre to 305 acres. The largest parcel completely within the watershed covers 191 acres. The build-out analysis showed that 50% (3,291 acres) of the full study area is buildable under current zoning regulations. FBE identified 957 existing buildings within the full watershed, and the build-out analysis projected that an additional 1,568 buildings could be constructed in the future resulting in a total of 2,525 buildings in the full watershed. Three iterations of the TimeScope Analysis were run using compound annual growth rates (CAGR) for 10- 20-, 30-year periods from 2010-2020 (0.24%), 2000-2020 (0.94%), and 1990-2020 (1.20%), respectively. Full build-out is projected to occur in 2425 at the 10-year CAGR, 2130 at the 20-year CAGR, and 2107 for the 30-year CAGR.

INTRODUCTION

Lake Waukewan, Lake Winona, and their watersheds are located within the towns of Ashland, Holderness, New Hampton, Center Harbor, and Meredith in the Lakes Region of New Hampshire. Most development can be found within the Meredith portion of the watershed, particularly in the neighborhoods to the south and east of Lake Waukewan. Lake Waukewan and Lake Winona are classified as oligotrophic lakes by the State of New Hampshire. Both lakes are listed on the NHDES 303(d) List of Impaired Waters for Primary Contact Recreation due to cyanobacteria and for Aquatic Life Integrity due to low dissolved oxygen and pH.

Concerned with protecting the water quality and ecological integrity of Lake Waukewan and Lake Winona, the Town of Meredith, in partnership with Waukewan Watershed Advisory Committee, hired FB Environmental Associates (FBE) to update the 2016 Watershed Restoration Plan for Lake Waukewan and Lake Winona, tracking progress to date and revising the plan to address nutrient loading to the lakes. As part of this plan, FBE performed a build-out analysis of the Lake Waukewan and Lake Winona watershed (hereafter "study area") (Figure 1). The results of the analysis provide estimates of the numbers of potential lots and new building units the study area may see developed at various points in the future. "Full build-out" refers to the time and circumstances whereby no more new building construction may occur, reaching the point at which lots have been subdivided to the minimum size allowed and there is no more "developable" land. Performing a build-out analysis shows a locality what land is available for development, how much development can occur, and at what densities, based on current rules and other constraints. A build-out is best used as a large-scale planning exercise to understand future development. Municipalities can use the analysis as a tool for planning future development patterns and understanding development impacts to water quality. However, large-scale planning models such as this build-out analysis require simplifying assumptions (described in Sections 2.2 and 2.7 below). As such, the results should be viewed holistically to better understand development trends and potential future outcomes.

Southern shore of Lake Waukewan. © FBE

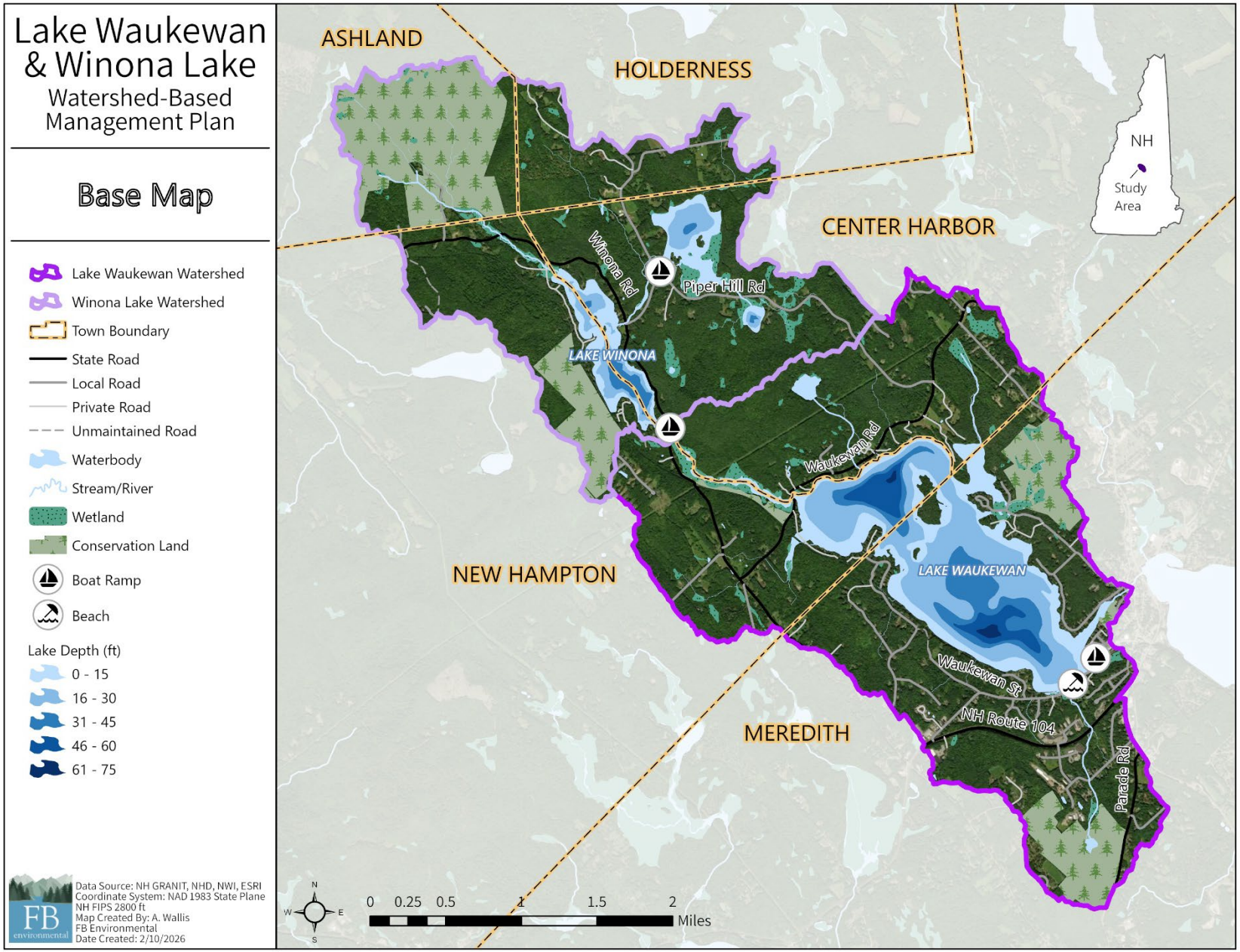

Figure 1. The Lake Waukewan and Winona watershed in Ashland, Holderness, New Hampton, Center Harbor, and Meredith, NH.

METHODS

COMMUNITY VIZ SOFTWARE

FBE conducted the build-out analysis using ESRI ArcMap v. 10.6 geographic information system (GIS) software and CommunityViz v. 5.2. CommunityViz is a GIS-based, decision-support tool designed to help planners and resource managers visualize, analyze, and communicate about important land use decisions. FBE utilized the software's 'Build-out Wizard' to calculate the development capacity of the study area (numerically and spatially), as well as the 'Time Scope Analysis' tool to project and visualize how future development might occur over time.

The build-out analysis was performed according to the following steps:

1. Collect data on existing conditions in the study area: existing buildings, zoning regulations, and population size(s).
2. Collect and/or create relevant GIS data (e.g., development constraints layers such as wetlands and steep slopes).
3. Analyze build-out potential using CommunityViz's Build-Out Wizard tool.

Determine potential dates at which full build-out is reached using Microsoft Excel, modeled from the CommunityViz's TimeScope Analysis Tool.

DISCLAIMER AND DATA LIMITATIONS

The data used in the analysis represented publicly available data sets obtained from New Hampshire's Statewide Geographic Information System Clearinghouse (NH GRANIT) and town records. Many of these data layers were created from remotely sensed data (e.g., aerial photography, digital orthophotos, and satellite images) and large, landscape-level mapping projects (e.g., Soil Units). As a result, the data layers are intended to be viewed at certain scales (generally 1:24,000 or 1:25,000) due to the level of accuracy of the source data. NH GRANIT maintains a continuing program to identify and correct errors in these data but make no claims as to the validity or reliability or to any implied uses of these datasets. As a result, the data presented herein should be used for planning purposes only. If greater data precision is required at the parcel level, this report should be supplemented with field surveys or other on-the-ground methods of data collection. There may also be minor data discrepancies throughout this document due to the variety of source materials and mapping standards used. The reader is encouraged to refer to the original referenced sources if specific data inconsistencies need to be resolved.

POPULATION AND GROWTH RATES

According to the US Census Bureau, Ashland, Center harbor, Holderness, New Hampton, and Meredith NH, have experienced steady population growth since the middle part of the last century (Table 1). Ashland's population has increased from 1,599 people in 1970 to 1,938 people in 2020 – a 0.39% compound annual growth rate (CAGR).

Center Harbor's population has increased from 540 people in 1970 to 1,040 people in 2020 – a 1.32% CAGR. Holderness' population has increased from 1,048 people in 1970 to 2,004 people in 2020 – a 1.30% CAGR. Meredith's population has increased from 2,904 people in 1970 to 6,662 people in 2020 – a 1.30% CAGR. New Hampton population has increased from 946 people in 1970 to 2,377 people in 2020 – a 1.86% CAGR. The watershed has experienced consistently higher population growth rates than the statewide average for the past 50-, 40-, 30-, and 20-year time frames, but experienced a smaller CAGR for the past 10 years than the state. FBE used CAGRs for 10-, 20-, and 30-year time periods to run three iterations of the TimeScope analysis for the study area (refer to Section 3.5).

Table 1. US Census Bureau population and growth rates for the towns of Ashland, Center Harbor, Holderness, New Hampton, and Meredith, NH, 1970-2020. Population estimates obtained from the NH Office of Strategic Initiatives.

Town Populations	1970	1980	1990	2000	2010	2020	50 Year CAGR (1970-2020)	40 Year CAGR (1980-2020)	30 Year CAGR (1990-2020)	20 Year CAGR (2000-2020)	10 Year CAGR (2010-2020)
New Hampshire (for reference)	*737,681*	*920,610*	*1,109,252*	*1,235,786*	*1,316,470*	*1,377,529*	1.26%	1.01%	0.72%	0.54%	0.45%
Ashland	1,599	1,807	1,915	1,955	2,076	1,938	0.39%	0.18%	0.04%	-0.04%	-0.69%
Center Harbor	540	808	996	996	1,096	1,040	1.32%	0.63%	0.14%	0.22%	-0.52%
Holderness	1,048	1,586	1,694	1,930	2,108	2,004	1.30%	0.59%	0.56%	0.19%	-0.50%
New Hampton	946	1,249	1,606	1,950	2,165	2,377	1.86%	1.62%	1.32%	0.99%	0.94%
Meredith	2,904	4,646	4,837	5,943	6,241	6,662	1.67%	0.91%	1.07%	0.57%	0.65%
Towns Combined	7,037	10,096	11,048	12,774	13,686	14,021	**1.39%**	**1.10%**	**1.20%**	**0.94%**	**0.24%**

EXISTING BUILDINGS

Existing buildings were manually identified based on the most recent ESRI World Imagery available within the watershed (9/1/2023). In areas where it was difficult to discern the presence of a dwelling (typically due to shadows or the presence of trees), ESRI World Imagery was cross-checked using 6-inch leaf-off orthomosaic imagery from 2021/2022 from the NH GRANIT server. Examination of aerial imagery resulted in the creation of a shapefile having 957 points representing principal structures within the study area (shown on Figure 4).

ZONING

Crucial to a build-out analysis is the feasibility of modeling zoning requirements (Table 2). Certain zoning requirements are too site-specific to be incorporated into the analysis (e.g., site specific exceptions to a zone's standard criteria). Given this, the analysis makes use of the following qualifications in determining build-out zoning restrictions:

- Future lots were made the smallest size allowable for the zoning district while also accounting for more restrictive overlay districts.
- Potential unit types (e.g., residential house, commercial building) were not specified.

Within the Lake Waukewan and Lake Winona watershed, there are a total of 20 zoning districts between the five towns: one each in Ashland, Holderness, and New Hampton, two in Center Harbor, and 15 in Meredith. Zone boundaries were obtained from the town zoning maps and verified with tax maps where necessary. These zones were assigned to each parcel within the study area. Parcel boundaries were obtained from the NH GRANIT state database for consistency.

Northern shore of Lake Waukewan. © FBE

Table 2. Zoning standards for the towns of Ashland, Center Harbor, Holderness, New Hampton, and Meredith, NH within the Lake Waukewan watershed. All zones within the Meredith portion of the watershed are within the Waukewan Watershed Overlay District.

Town	Zone	Front Setback *(ft)*	Side Setback *(ft)*	Rear Setback *(ft)*	Minimum Lot Size *(acres)*
Ashland	Rural Residential (RR)	35	25	25	0.92
Center Harbor	Agricultural and Rural District (AR) - Class 3	50	15	15	0.92
	Commercial and Light Industry (CI) - Class 3	50	15	15	0.92
Holderness	Rural Residential (RR)	35	35	35	1
New Hampton	General Residential (GR) + Waukewan Watershed Overlay District	35	20	20	2
Meredith	Business and Industrial District (BI) - Classes 1-3	30	25	25	2
	Central Business District (CB) - non-waterfront - Class 1	30	10	20	2
	Central Business District (CB) - non-waterfront - Class 2	30	10	20	2
	Central Business District (CB) - non-waterfront - Class 3	30	10	20	2, or by soil and slope if more restrictive
	Commercial District-Route 3 South (CS) - non-waterfront - Class 2	50	10	20	2
	Commercial District-Route 3 South (CS) - non-waterfront - Class 3	50	10	20	2, or by soil and slope if more restrictive
	Forestry and Rural District (FR) - non-waterfront - Class 3	40	30	40	3
	Residential District (R) - non-waterfront - Class 1	20	10	40	2
	Residential District (R) - non-waterfront - Class 2	30	10	40	2
	Residential District (R) - non-waterfront - Class 3	30	20	40	2, or by soil and slope if more restrictive
	Shoreline District (S) - waterfront - Class 1	65	20	30	2
	Shoreline District (S) - waterfront - Class 2	65	20	30	4
	Shoreline District (S) - waterfront - Class 3	65	20	30	4
	Shoreline District (S) - non-waterfront - Class 1	30	20	40	2
	Shoreline District (S) - non-waterfront - Class 2	30	20	40	2
	Shoreline District (S) - non-waterfront - Class 3	30	20	40	2

The development constraints considered above do not represent the full range of possible restrictions or resources that may be found in the field. For example, rare and/or state-listed species may be present but are not considered because data regarding their specific location(s) are not available, and in many cases may not become known until development is attempted. Small, unmapped wetlands and vernal pools may also be present and would further restrict development.

BUILD-OUT ASSUMPTIONS

To determine how many building units can be built on the available buildable land, various density and other design factors are considered based on the zoning requirements for the municipalities. However, build-out analyses require some simplifying assumptions. FBE used the assumptions described below in the build-out analysis.

- **Minimum lot size requirements** used were based on requirements for each zone per parcel (Table 2).
- **Building setbacks** were input based on the front and rear setbacks specified by the municipalities' zoning ordinances (Table 2). Setbacks are measured from building center points in CommunityViz. To account for this, building footprints need to be estimated to avoid buildings encroaching into setback distances. FBE estimated the dimensions of the minimum building footprint to be 35 feet x 35 feet. This number was added to the average front/rear setback for each zone to estimate the "Minimum Separation Distance" used in CommunityViz.
- **Wetland, stream, and waterbody setbacks** were applied on a per-town basis as noted in Table 3.

The build-out analysis models future development based on existing conditions and assumes that all land that could be subdivided will be subdivided, with the intention of modeling maximum theoretical future development based on what is possible under existing conditions.

Building density is difficult to predict with precision in a build-out analysis because the exact siting of construction and development occurs in a somewhat unpredictable fashion. A wide range of factors (in addition to those mentioned above) can decrease the permitted density: stormwater drainage facilities, parcel contiguity, ROWs, setbacks, road frontage, conservation restrictions, subdivision review, soils-based zoning, etc. A standard approach to account for these density losses is to apply an "**efficiency factor**" to the analysis, which is a simple multiplier that adjusts the "lot efficiency," the amount of land on a parcel that is available for construction once all constraints have been considered. Simply stated, an efficiency factor is used to account for information that can only be obtained upon on-the-ground inspection of particular parcels. Efficiency factors are entered as a percentage, where 100% means complete efficiency (no density lost) and 0% means no buildings are estimated for a zone. Based on professional experience, FBE used an efficiency factor of 66% for all zones.

Furthermore, it is likely that growth rates may vary within a community. For example, areas next to downtowns and lakefronts will likely be developed before more rural areas. The build-out does not specify the areas of a community that will be developed first. "Full build-out" portrays when all possible growth has occurred and does not provide a sequence of which areas are likely to be fully built out first.

PROJECTED BUILDINGS

The build-out analysis is comprised of a numeric and spatial build-out. A numeric build-out is completed first to obtain a number of total projected buildings based on minimum lot size and total area of buildable land. A spatial build-out is then run to place building points on the map, converting numeric building counts into points representing individual structures. The spatial build-out considers the size of projected buildings, geometry of lots, and setbacks to various spatial features incorporated into the build-out (e.g., lot lines, roads, natural features). For example, an oddly shaped lot may have enough total area for two buildings, but due to setback rules or minimum separation distances, it may only fit one unit. Along with development constraints and lot size, the spatial build-out also considers the minimum allowable separation distance between buildings or parcel shapes. During the placement of projected buildings into buildable areas, the user has control over whether the spatial build-out building points are distributed in a random or grid pattern, and if the points should follow existing roads. The grid pattern is best suited for new urban-type development, and the random layout is best for suburban-type development. For this analysis, the random layout was used.

RESULTS

PARCELS

Approximately 1,425 parcels were identified as within or partially within the full watershed, ranging in size from less than one acre to 305 acres. The largest parcel completely within the watershed covers 191 acres.

BUILDABLE AREA

The build-out analysis showed that 50% (3,291 acres) of the study area is still considered buildable under current zoning regulations (Figure 3, Table 4). Within the Lake Waukewan and Lake Winona watershed, 70%, 54%, and 61% of the land within Holderness, Center Harbor, and New Hampton is still buildable, while only 37% and 10% of the land within Meredith and Ashland is still buildable.

Table 4. Amount of buildable land within the Lake Waukewan and Lake Winona watershed by zone for each town. Total area does not include waterbodies (lakes and ponds).

Zone	Total Area *(acres)*	Buildable Area *(acres)*	Percent Buildable Area
Ashland	**713**	**68**	**10%**
Rural Residential (RR)	713	68	10%
Center Harbor	**2,174**	**1,185**	**54%**
Agricultural and Rural District (AR) - Class 3	2,098	1,146	55%
Commercial and Light Industry (CI) - Class 3	76	39	51%
Holderness	**592**	**415**	**70%**
Rural Residential (RR)	592	415	70%
New Hampton	**1,440**	**878**	**61%**
General Residential (GR) + Waukewan Watershed Overlay (WWO) District	1,440	878	61%
Meredith	**1,632**	**597**	**37%**
Business and Industrial District (BI) - Classes 1-3 - WWOD	215	131	61%
Central Business District (CB) - non-waterfront - Class 1 - WWOD	13	3	25%
Central Business District (CB) - non-waterfront - Class 2 - WWOD	1	0	0%
Central Business District (CB) - non-waterfront - Class 3 - WWOD	27	9	33%
Commercial District-Route 3 South (CS) – non-waterfront - Class 3 - WWOD	10	10	94%
Forestry and Rural District (FR) - non-waterfront - Class 3	270	157	58%
Residential District (R) - non-waterfront - Class 1	108	27	25%
Residential District (R) - non-waterfront - Class 2	70	1	1%
Residential District (R) - non-waterfront - Class 3	442	154	35%
*Residential District (R) & Business and Industrial District (BI) - Class 1	7	7	99%
*Residential District (R) & Business and Industrial District (BI) - Class 3	13	11	85%

Zone	Total Area *(acres)*	Buildable Area *(acres)*	Percent Buildable Area
*Residential District (R) & Forestry and Rural District (FR) - Class 3	216	17	8%
Shoreline District (S) - waterfront - Class 1 - Waukewan	11	0	0%
Shoreline District (S) - waterfront - Class 2 - Waukewan	12	0	0%
Shoreline District (S) - waterfront - Class 3 - Waukewan	95	17	18%
Shoreline District (S) - non-waterfront - Class 1	1	0	0%
Shoreline District (S) - non-waterfront - Class 2	17	10	59%
Shoreline District (S) - non-waterfront - Class 3	57	21	36%
*Shoreline District (S) & Forestry and Rural District (FR) - Class 3	1	0	0%
*Shoreline District (S) & Forestry and Rural District (FR) - waterfront - Class 3	42	22	53%
Total	**6,551**	**3,143**	**48%**

* The more restrictive setback and lot size regulations were used for parcels with two zones listed in the tax records.

PROJECTED BUILDINGS

FBE identified and digitized 957 existing principal buildings within the municipalities of the watershed. Based on the current input parameters, the build-out analysis projected an additional 1,568 buildings could be constructed in the future, resulting in a total of 2,525 buildings (Table 5, Figure 4). As most of Lake Waukewan's shoreline parcels are already developed, and Meredith has only 37% remaining buildable land within the watershed, most of the projected buildings fall within Center Harbor (857). The portion of Holderness within the watershed allows a very large increase in buildings compared to existing conditions, with a projected increase of 1,643% at full buildout. Additional roadways would need to be built throughout the watershed for these projected buildings to be accessible.

Table 5. Projected increase in buildings by zone within the Lake Waukewan and Lake Winona watershed.

Zone	No. Existing Buildings	No. Projected Buildings	Total No. Buildings	Percent Increase
Ashland	**1**	**49**	**50**	**4,900%**
Rural Residential (RR)	1	49	50	4,900%
Center Harbor	**189**	**752**	**941**	**398%**
Agricultural and Rural District (AR) - Class 3	162	737	737	455%
Commercial and Light Industry (CI) - Class 3	27	15	42	56%
Holderness	**14**	**230**	**244**	**1,643%**
Rural Residential (RR)	14	230	244	1,643%
New Hampton	**172**	**279**	**451**	**162%**
General Residential (GR) + Waukewan Watershed Overlay District	172	279	451	162%

Zone	No. Existing Buildings	No. Projected Buildings	Total No. Buildings	Percent Increase
Meredith	**581**	**153**	**734**	**26%**
Business and Industrial District (BI) - Classes 1-3	30	41	71	137%
Central Business District (CB) - non-waterfront - Class 1	5	1	6	20%
Central Business District (CB) - non-waterfront - Class 2	2	0	2	0%
Central Business District (CB) - non-waterfront - Class 3	12	1	13	8%
Commercial District-Route 3 South (CS) - non-waterfront - Class 3	1	2	3	200%
Forestry and Rural District (FR) - non-waterfront - Class 3	33	29	62	88%
Residential District (R) - non-waterfront - Class 1	148	3	151	2%
Residential District (R) - non-waterfront - Class 2	59	1	60	2%
Residential District (R) - non-waterfront - Class 3	113	47	160	42%
Residential District (R) & Business and Industrial District (BI) - Class 1	1	1	2	100%
Residential District (R) & Business and Industrial District (BI) - Class 3	1	4	5	400%
Residential District (R) & Forestry and Rural District (FR) - Class 3	12	2	14	17%
Shoreline District (S) - waterfront - Class 1	34	0	34	0%
Shoreline District (S) - waterfront - Class 2	23	0	23	0%
Shoreline District (S) - waterfront - Class 3	79	8	87	10%
Shoreline District (S) - non-waterfront - Class 1	2	0	2	0%
Shoreline District (S) - non-waterfront - Class 2	9	2	11	22%
Shoreline District (S) - non-waterfront - Class 3	15	8	23	53%
Shoreline District (S) & Forestry and Rural District (FR) - Class 3	1	0	1	0%
Shoreline District (S) & Forestry and Rural District (FR) - waterfront - Class 3	1	3	4	300%
Total	**957**	**1,463**	**2,420**	**153%**

COMPARISON TO THE 2015 BUILD-OUT ANALYSIS

A build-out analysis was first conducted in 2015 for the Lake Waukewan and Lake Winona watershed. The analysis only included data for the three largest towns in the watershed: Center Harbor, New Hampton, and Meredith, NH. In 2015, the Center Harbor, New Hampton, and Meredith portions of the watershed contained 2,729 acres of buildable land and 924 existing buildings (Table 6). Additionally, the side of the delineated Lake Waukewan watershed has decreased by 112 acres from the 2015 analysis to the 2025 analysis, likely attributed to recently collected LiDAR-derived topographic mapping in New Hampshire.

In the 2025 analysis, the total buildable area for only Center Harbor, New Hampton, and Meredith within the Lake Waukewan watershed amounts to 2,660 acres with 942 existing buildings (5% increase in number of buildings from 2015 to 2025). The 2015 build-out analysis projected 769 additional buildings can be supported within the study area under 2015 zoning regulations. In 2025, 1,184 buildings, 415

more, were projected, representing a 54% increase in projected buildout in these three towns. Generally, increases in buildable area may result from an increase in the level of detail of the input data layers used for the development constraints and/or changes in zoning regulations. The increase in projected buildings in this case is likely due to a change in zoning regulations within the watershed that greatly increased allowable building density in one town, as described below:

Both New Hampton and Meredith show a decrease in the number of projected buildings estimated by the build-out analysis from 2015 to 2025 (by 11% and 44% respectively) (Table 7). This decrease is expected; if zoning regulations remain the same, or change only slightly, as more homes are built, there will be fewer future buildings projected by the model. However, Center Harbor shows an increase of 368% in the number of projected buildings modeled in 2015 to 2025. In the 2015 build-out analysis, there was only one zoning district in Center Harbor (Agricultural and Rural), which had a minimum lot size of 5 acres. In the 2025 build-out analysis, Center Harbor had two zones, and both had minimum lot sizes of 40,000 square feet (0.92 acres). This reduction in minimum lot size allows for a greater density of development, and therefore a greater number of projected buildings, accounting for the large increase in the projected development compared to the 2015 build-out analysis.

Table 6. Comparison of the 2015 and 2025 Lake Waukewan and Lake Winona watershed build-out analyses. This comparison only includes the land areas within Center Harbor, New Hampton, and Meredith, as these were the only towns included in the 2015 analysis.

Lake Waukewan & Lake Winona Watershed	2015	2025	Percent Change
Watershed area (acres)	8,298	8,186	1% decrease
Buildable area (acres)	2,729	2,660	3% decrease
Existing Buildings	924	942	5% increase
Projected Buildings	769	1,184	54% increase

Table 7. Comparison of the projected buildings from the 2015 and 2025 Lake Waukewan and Lake Winona watershed build-out analysis. This comparison only includes the land areas within Center Harbor, New Hampton, and Meredith, as these were the only towns included in the 2015 analysis.

Projected Buildings	2015	2025	Percent Change
Center Harbor	183	752	311% increase
New Hampton	314	279	11% decrease
Meredith	272	153	44% decrease
Total	**769**	**1,184**	**54% increase**

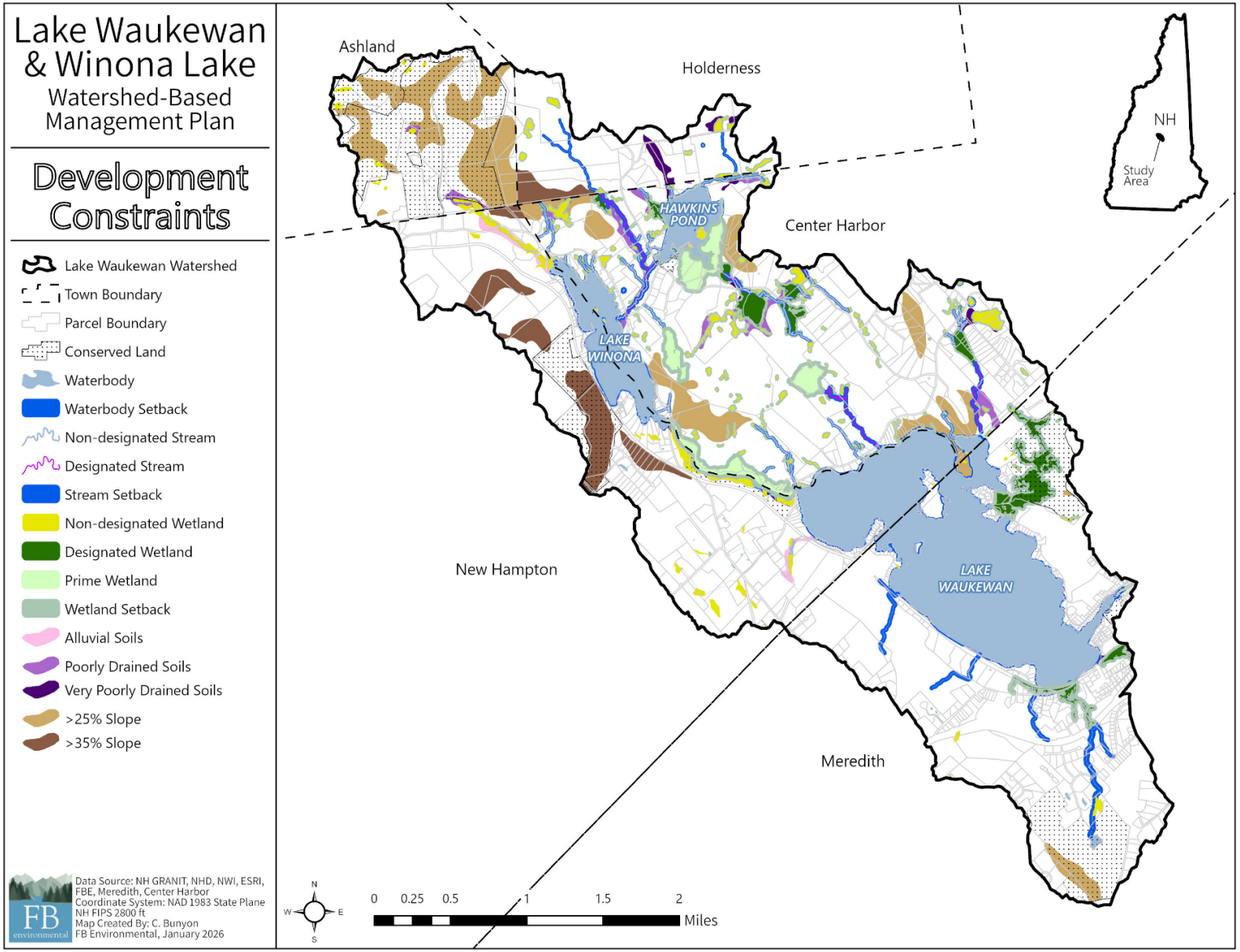

Figure 2. Development constraints in the Lake Waukewan and Lake Winona watershed. Note that two additional conservation parcels were identified and are not reflected on this map.

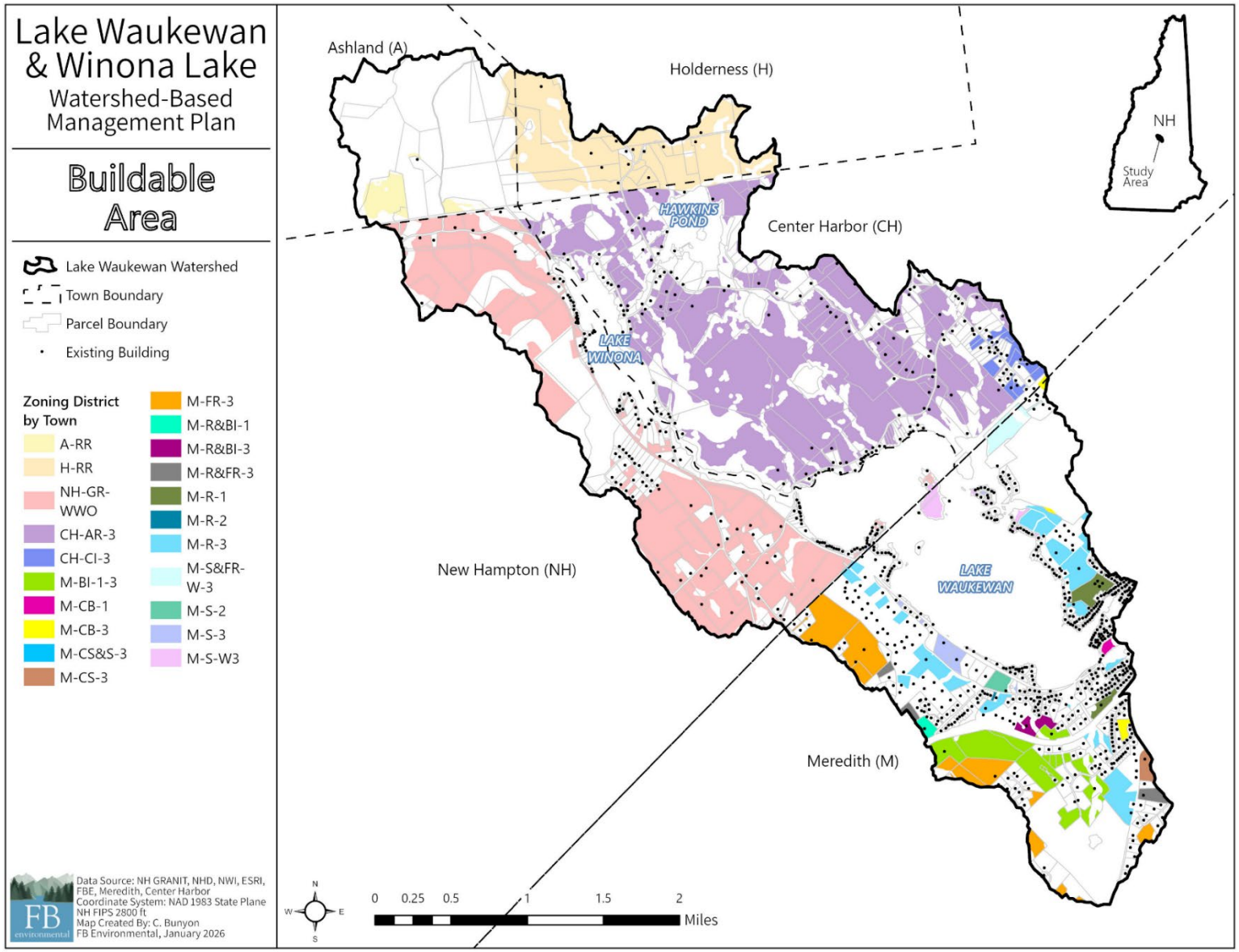

Figure 3. Buildable area by zoning district for each town within the Lake Waukewan and Lake Winona watershed. Refer to Appendix A for an acronym key. Note that two additional conservation parcels were identified and are not reflected on this map. Removing these parcels would reduce the buildable area in the CH-AR-3 zone by approximately 148 acres.

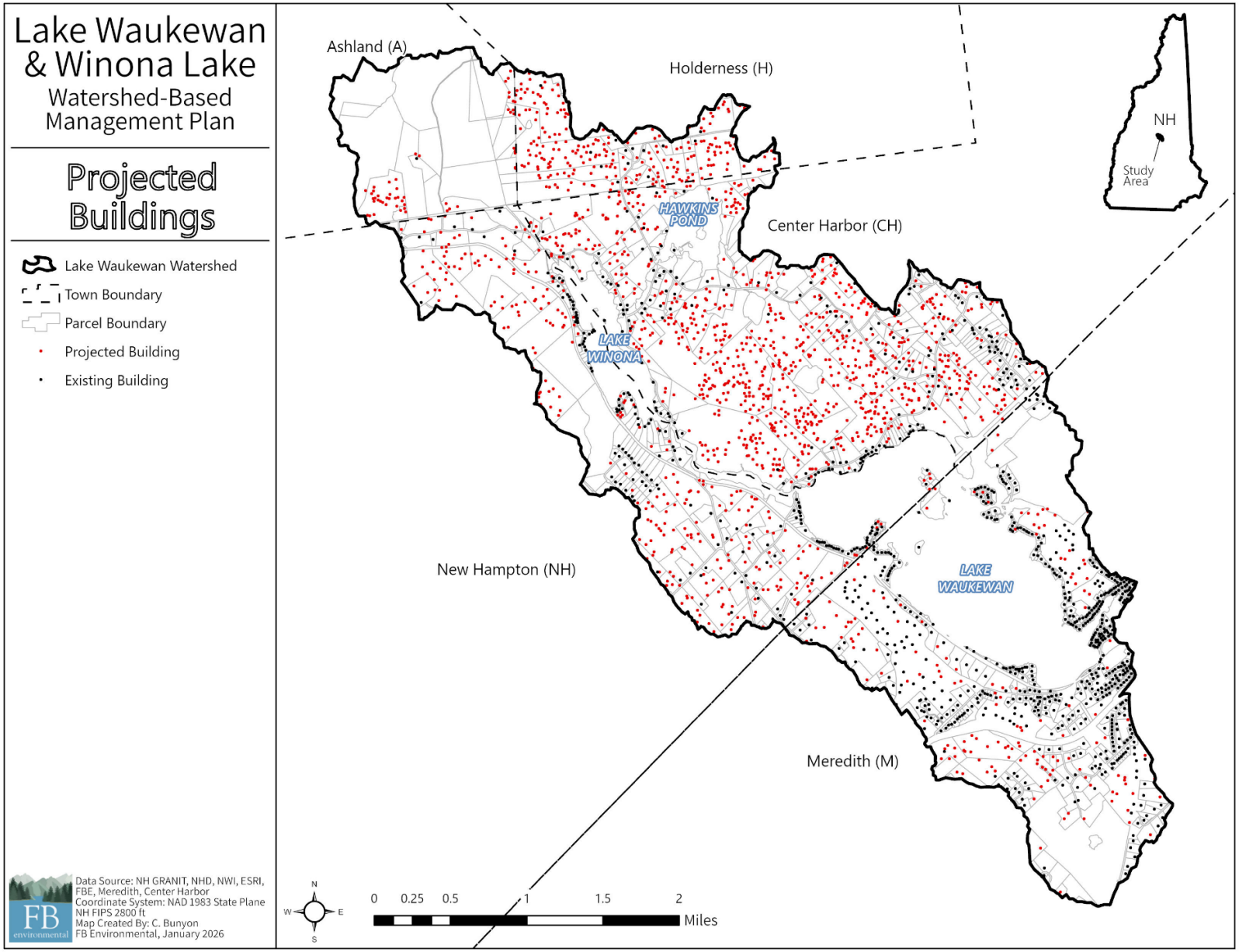

Figure 4. Existing and projected buildings within the Lake Waukewan and Lake Winona watershed. Note that two additional conservation parcels were identified and are not reflected on this map. Removing these parcels would remove 105 projected buildings from the map.

TIMESCOPE ANALYSIS

A TimeScope analysis is used to determine the year at which full build-out will occur by using compound annual growth rates (CAGR) for 10-, 20- and 30-year periods to project the rate of new development into the future (Table 1). These time periods and rates are 2010-2020 (0.24%), 2000-2020 (0.94%), and 1990-2020 (1.2%). FBE calculated the TimeScope analysis' full build-out year for each of the three iterations manually using Microsoft Excel.

Full build-out is projected to occur in 2425 at the 10-year CAGR, 2130 at the 20-year CAGR, and 2107 for the 30-year CAGR (Figure 5). Note that the growth rates used in the TimeScope Analysis are based on town-wide census statistics but have been applied here to a portion of the municipalities. If areas closer to the bay within each municipality develop faster than more inland areas, watershed full buildout conditions may occur sooner. Also note that the population growth rate in these municipalities is decreasing, so the 10-year estimate could be considered more likely than the 30-year estimate.

Using census data to project population increase and/or development has inherent limitations. For instance, the building rate may increase at a different rate than population, due to factors such as commercial versus residential development and trends in the number of people per household. As such, the TimeScope Analysis might over or underestimate the time required for the study area to reach full build-out. Numerous social and economic factors influence population change and development rates, including policies adopted by federal, state, and local governments, with a particular sensitivity to changes in zoning. The relationships among the various factors may be complex and therefore difficult to model.

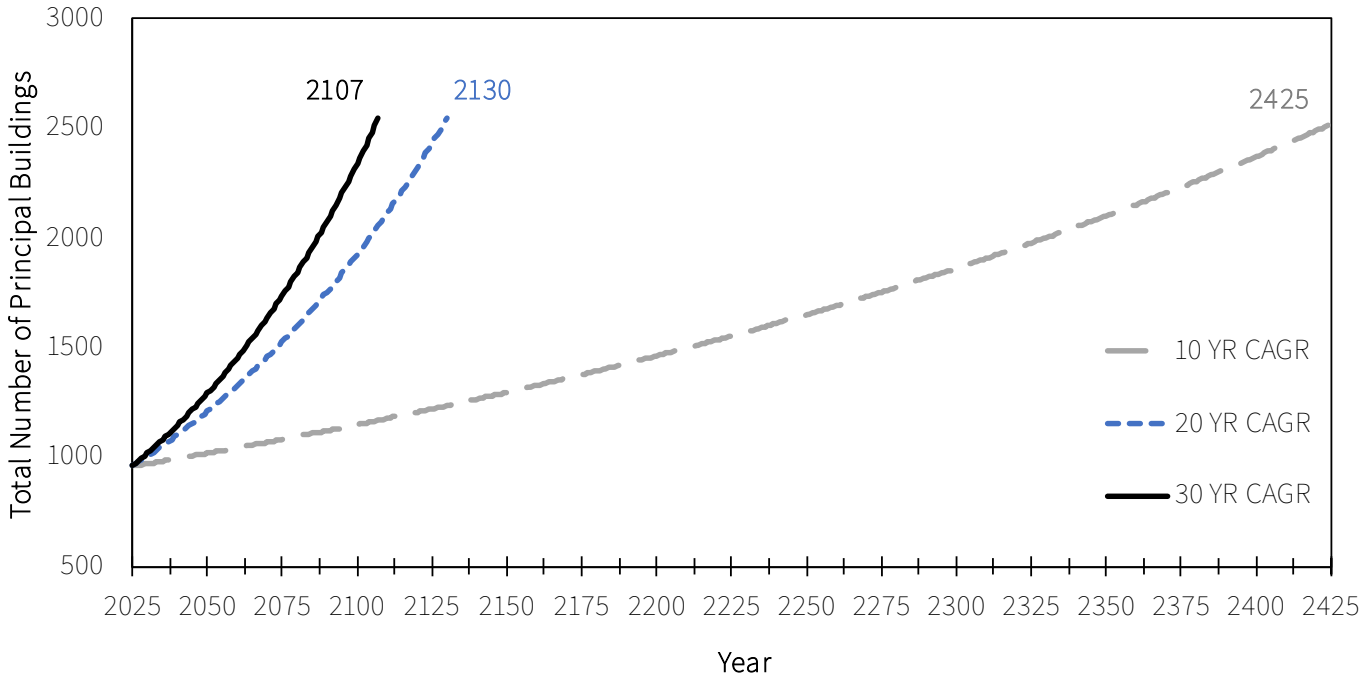

Figure 5. Full build-out time projections of the Lake Waukewan and Lake Winona watershed in Ashland, Holderness, New Hampton, Center Harbor, and Meredith, NH (based on compound annual growth rates reported in Table 1).

CONCLUSION

A build-out analysis can confirm where existing development along the lake shoreline or within the watershed is the densest and where future development may expand into if zoning regulations remain the same. These results help quantify the expected increased vulnerability to the lake due to pollutants, impervious surfaces, septic system malfunction or failure, or other watershed risks. Currently, existing buildings are the densest in Meredith, along the Lake Waukewan shoreline and to the south and east of the lake. Because Meredith has only 37% remaining buildable land within the watershed, most of the projected buildings are in Center Harbor and Holderness. Conservation lands, setbacks from natural resources and current overlay districts in the watershed will continue to restrict existing and future development. The build-out analysis will be combined with the watershed's Lake Loading Response Model to identify which areas of the watershed are expected to have the greatest pollutant loading in the future and their subsequent impact on water quality. This will help to guide future development and conservation activities in the watershed. For example, conservation measures around wetlands and headwater streams, in addition to the lakes and ponds, could aim to reduce future development in those critical areas. Increasing the minimum lot size, enacting greater setback from wetlands and streams, or encouraging cluster development (where development is grouped together to set aside remaining unfragmented land for conservation) are some of the tools that can be strategically used to shape development and protect the water quality of Lake Waukewan and Lake Winona. Although the spatial and numerical information provided herein are estimates and should be treated accordingly, the build-out analysis serves as a useful planning tool.

REFERENCES

Town	Zoning Ordinance	Zoning Map	Additional Resources
Ashland	Zoning Ordinance (March 11, 2025)	Zoning Ordinance (March 11, 2025)	NA
Center Harbor	Zoning Ordinance (December 7, 2021)	Zoning Map	Town Correspondences.
Holderness	Zoning Ordinance (March 2020)	Zoning Map (post 2021)	NA
Meredith	Zoning Ordinance (March 14, 2023)	Zoning Map-PDF (2024) Zoning Map-Interactive	Town Correspondences, Lake Waukewan Watershed District Overlay Map and Text.
New Hampton	Zoning Ordinance (March 2025)	Zoning Map (2006)	NA

APPENDIX A

Map acronyms for town zoning districts.

Town	Acronym	Zoning District
Ashland	A-RR	Rural Residential (RR)
Center Harbor	CH-AR-3	Agricultural and Rural District (AR) - Class 3
	CH-CI-3	Commercial and Light Industry (CI) - Class 3
Holderness	H-RR	Rural Residential (RR)
New Hampton	NH-GR-WWOD	General Residential (GR) + Waukewan Watershed Overlay District
Meredith	M-BI-1-3	Business and Industrial District (BI) - Classes 1-3
	M-CB-1	Central Business District (CB) - non-waterfront - Class 1
	M-CB-2	Central Business District (CB) - non-waterfront - Class 2
	M-CB-3	Central Business District (CB) - non-waterfront - Class 3
	M-CS-3	Commercial District-Route 3 South (CS) - non-waterfront - Class 3
	M-FR-3	Forestry and Rural District (FR) - non-waterfront - Class 3
	M-R-1	Residential District (R) - non-waterfront - Class 1
	M-R-2	Residential District (R) - non-waterfront - Class 2
	M-R-3	Residential District (R) - non-waterfront - Class 3
	M-R&BI-1	Residential District (R) & Business and Industrial District (BI) - Class 1
	M-R&BI-3	Residential District (R) & Business and Industrial District (BI) - Class 3
	M-R&FR-3	Residential District (R) & Forestry and Rural District (FR) - Class 3
	M-S-W1	Shoreline District (S) - waterfront - Class 1
	M-S-W2	Shoreline District (S) - waterfront - Class 2
	M-S-W3	Shoreline District (S) - waterfront - Class 3
	M-S-1	Shoreline District (S) - non-waterfront - Class 1
	M-S-2	Shoreline District (S) - non-waterfront - Class 2
	M-S-3	Shoreline District (S) - non-waterfront - Class 3
	M-S&FR-3	Shoreline District (S) & Forestry and Rural District (FR) - Class 3
	M-S&FR-W-3	Shoreline District (S) & Forestry and Rural District (FR) - waterfront - Class 3