YORK WATERSHED BUILD OUT SCENARIOS

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York Watershed Build-Out Methodology

The York Watershed Build Out was designed to provide some baseline information related to potential residential growth within the watershed. It is important to understand that this model developed a numeric value for potential new units, not where or when those units will be developed. This is a basic build out methodology meant to provide a first pass at understanding the implications of current zoning regulations. Indicators were developed to identify potential growth impacts under a number of scenarios and the base scenario of the current zoning.

DATA COLLECTION

The project began with gathering a large number of datasets from the four individual towns, the state of Maine, Beginning with Habitat, Maine Historic Preservation, and other local and state agencies. In order for the data to be useful for the project, it all had to be clipped to the watershed boundary and projected into the same projection system. Due to the scale and area of the data, Maine State Plane West, NAD83, with a unit of US Feet was chosen as the preferred projection.

In order to enhance the analysis of the project, a new impervious surfaces layer was developed using the current aerial photography to digitize paved areas and building footprints for the watershed. York had building footprints which were good but out of date. New building footprints were added where buildings were visible on the aerial photography. The roofline and pavement edge was digitized where there were parking lots. The roads were approximated by buffering the road centerlines (after editing the road centerlines to match the photos).
See Appendix A for all the data layers developed and gathered.

DATA CONSOLIDATION

In order to develop a build out analysis across town boundaries for the entire watershed it was necessary to pull together the parcel and zoning data for all four towns. First parcel data was merged together into a single Watershed parcels data layer. Then gaps and slivers had to be cleaned up so that each polygon was complete, and did not create any topological errors, such as overlaps and gaps between boundaries. The data had to be joined to exports of each town's assessing data in order to determine current land

use, lot size, ownership, and presence of a building or buildings. Finally, both the base land use zoning and shoreland zoning had to be consolidated.
This step was very time consuming due to a lack of consistent quality and formatting between the towns. If there is a desire to update this data over time, it would be advisable that the towns work together to set up a data standard and common boundaries for the parcel and zoning data.

DESIGNATING CURRENT LAND USE AND DEVELOPMENT POTENTIAL FOR EACH PARCEL

Each parcel was evaluated for its current land use and development potential. The first step was to determine if the lot had a building that was either a commercial or residential building. This was done by selecting parcels with a greater than $10,000 building value (assuming that there can be small outbuildings that have value but do not constitute a residential or commercial structure. Then the building footprints were used to cross check the data.

Land use was determined from the assessing data where it was available. When it was not available, parcels were reviewed by looking at owner name and presence of a building. Finally, when there was a still a question, the parcel was reviewed in Google Street Map in order to visually inspect and determine land use. The land use codes from the different communities was consolidated to match state standards and finally simplified for this application.

Each parcel was assigned the zone which covered the majority of the parcel. The minimum lot size and allowable imperviousness were derived from the zoning data. The area of overlap of the shoreland zoning data was determined for each parcel in order to refine the build out potential.

Each parcel was then determined to have further development potential (this included properties that were vacant or had a building but were greater than 2x the minimum lots size). Lots were considered to have no further development potential if they have a building and are less than 2x the minimum lot size or have been set aside for conservation, open space, recreation, and utilities or are owned by a governmental agency.

Developable area for existing zoning was calculated for parcels with potential for future development by subtracting the wetland area, the Watershed Overlay zone area, and the minimum lot size multiplied by the number of housing units on the lot. In the other scenarios further areas were subtracted from the development potential;

- Water Buffers – subtracted the expanded water buffers of 250 ft. from all lakes and rivers and 75 ft. from all streams.
- Marsh Migration – subtracted the modeled marsh migration under a 6 ft. sea level rise and a 250 ft. buffer.

CALCULATING POTENTIAL NEW UNITS

For each parcel that had development potential, the total new units was calculated using the following rules:

- If there is development potential for 1-2 new lots, then the Developable Area was divided by the minimum lot size and the Watershed overlay area was divided by 10 acres. The assumption is that when a lot is being split rather than subdivided all the land goes to lots consumption and the buyer will be able to meet shoreland zoning regulations and build a single family home within the shoreland zone if necessary.
- If there is development potential for 3 or more lots (constituting a subdivision) and the shoreland zoning covers less than 50% of the lot, then the Developable Area was multiplied by 0.85 and divided by the minimum lots size for the zone and the Watershed Overlay area was divided by 10 acres to determine how many new lots can be fit on the parcel. We only use 85% of the developable area in order to account for odd shaped lots and road development.
- If there is development potential for 3 or more lots (constituting a subdivision) and the shoreland zoning covers greater than 50% of the lot, then the Developable Area was multiplied by 0.85 and divided by the minimum lots size for the zone and the Watershed Overlay area was divided by 10 acres to determine how many new lots can be fit on the parcel. We then divide the potential units by 2 in order to account for the imposition of shoreland zoning restrictions on larger scale housing development.
  *in all cases division is always rounded down to represent actual

Potential new units was calculated for three different scenarios:

- Current Zoning
- Marsh Migration (subtracting wetlands, the area of marsh migration and a 250 ft buffer beyond that)
- Increased Water Buffers (subtracting wetlands and 250 ft around all lakes and rivers and 75 ft along all the streams)

CALCULATING CURRENT AND FUTURE IMPERVIOUSNESS

Current Impervious calculations were developed through the impervious layer developed for this project which included building footprints and paved areas. Each building was also assigned a closest distance to a road centerline and an assumed impervious driveway was added to the calculation of the distance assigned multiplied by a 12 ft wide driveway.

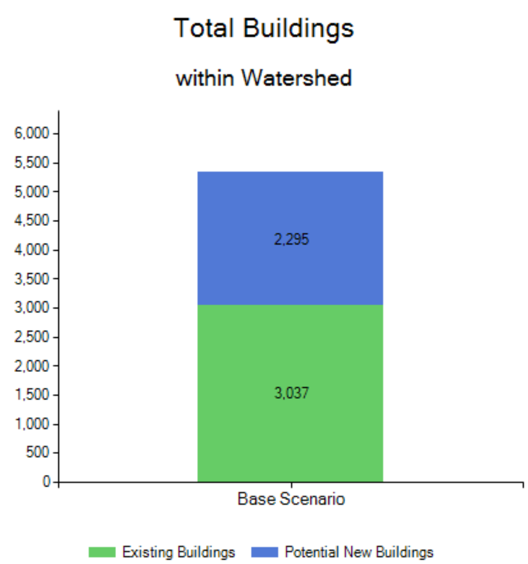
Future impervious calculations were created for each parcel with development potential. In this case assumptions were made about the amount of impervious for various size lots using the following rules:

- If the Minimum Lot Size is greater than 80,000 sf then it is assumed that new lots will include 5,500 sf of building, driveway, and road.
- If the Minimum Lot size is between 40,000 sf and 80,000 sf then it is assumed that new lots will create 4,000 sf of building, driveway, and road
- If the Minimum Lot Size is less than 40,000 sf then it is assumed that the new lots will create 2,500 sf of building, driveway, and road.

INDICATORS

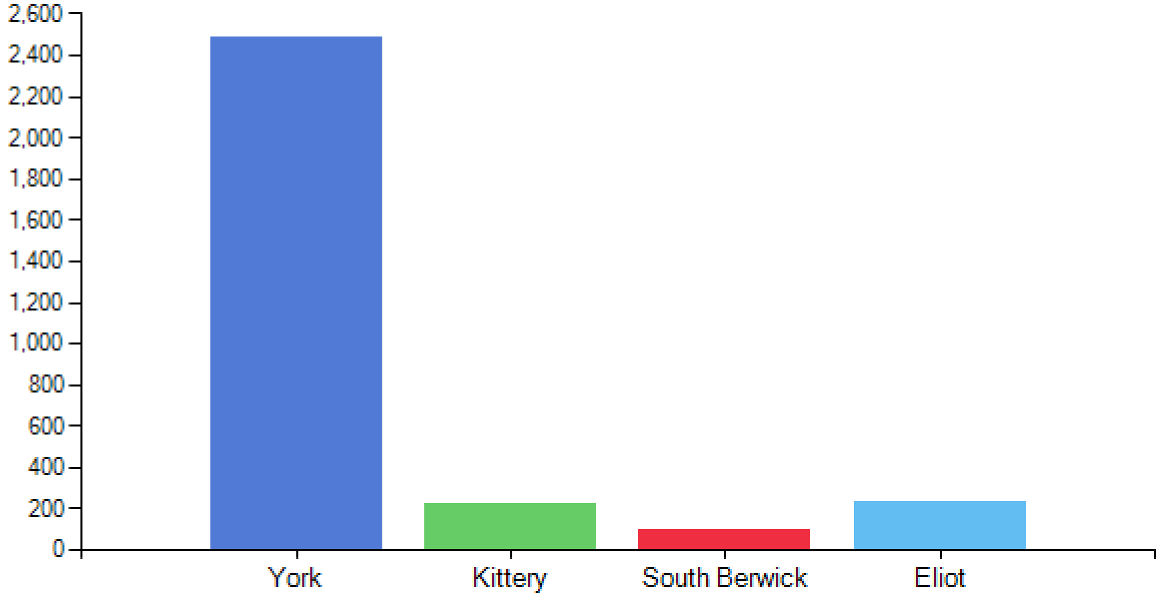
CURRENT ZONING SCENARIO

Indicators for the current zoning scenario, identify potential new growth under current zoning conditions.
Existing and Potential new units are calculated for the entire watershed, each town, sub watersheds, and undeveloped blocks. Where parcels fall into more than one sub watershed or undeveloped block, the development potential was added to whichever individual polygon made up the majority of area. These values are shown in the following charts.



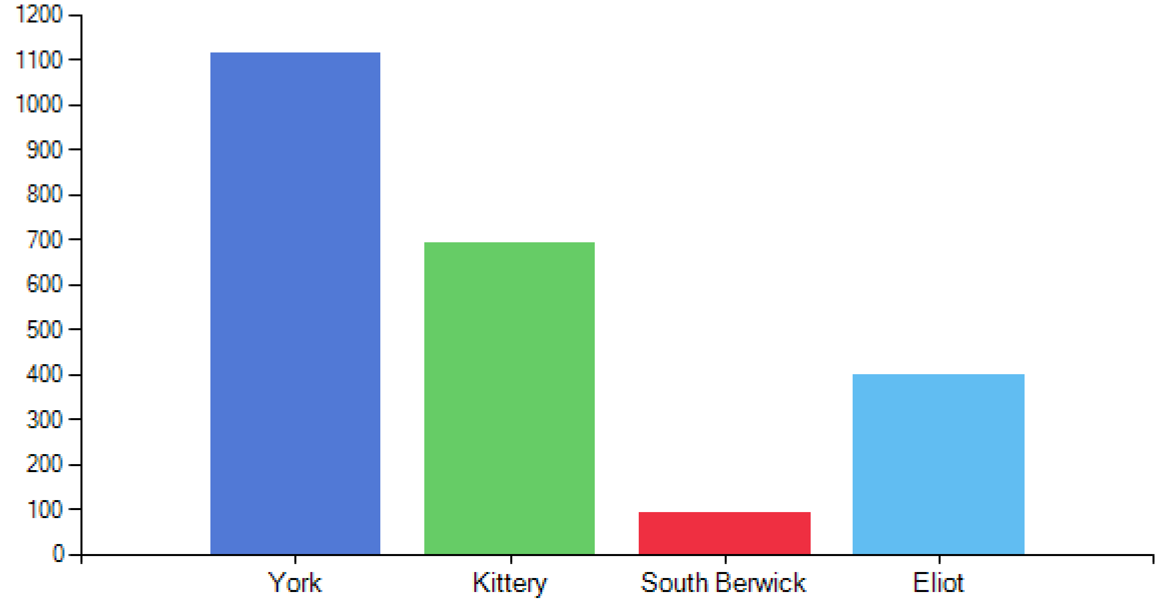
Existing Buildings

by Town



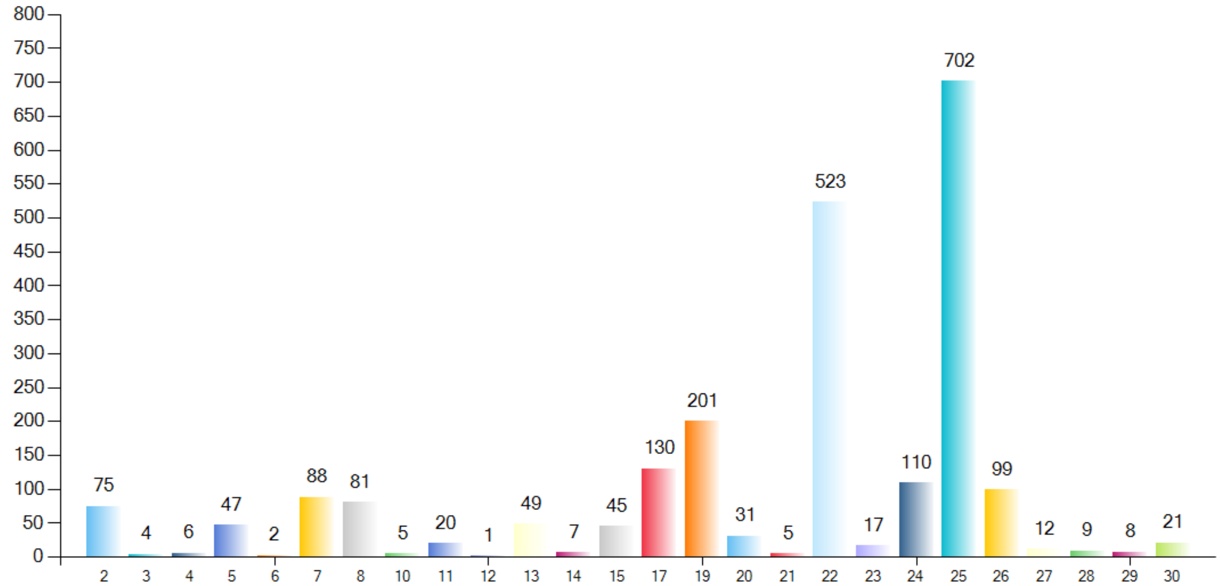
Potential New Buildings

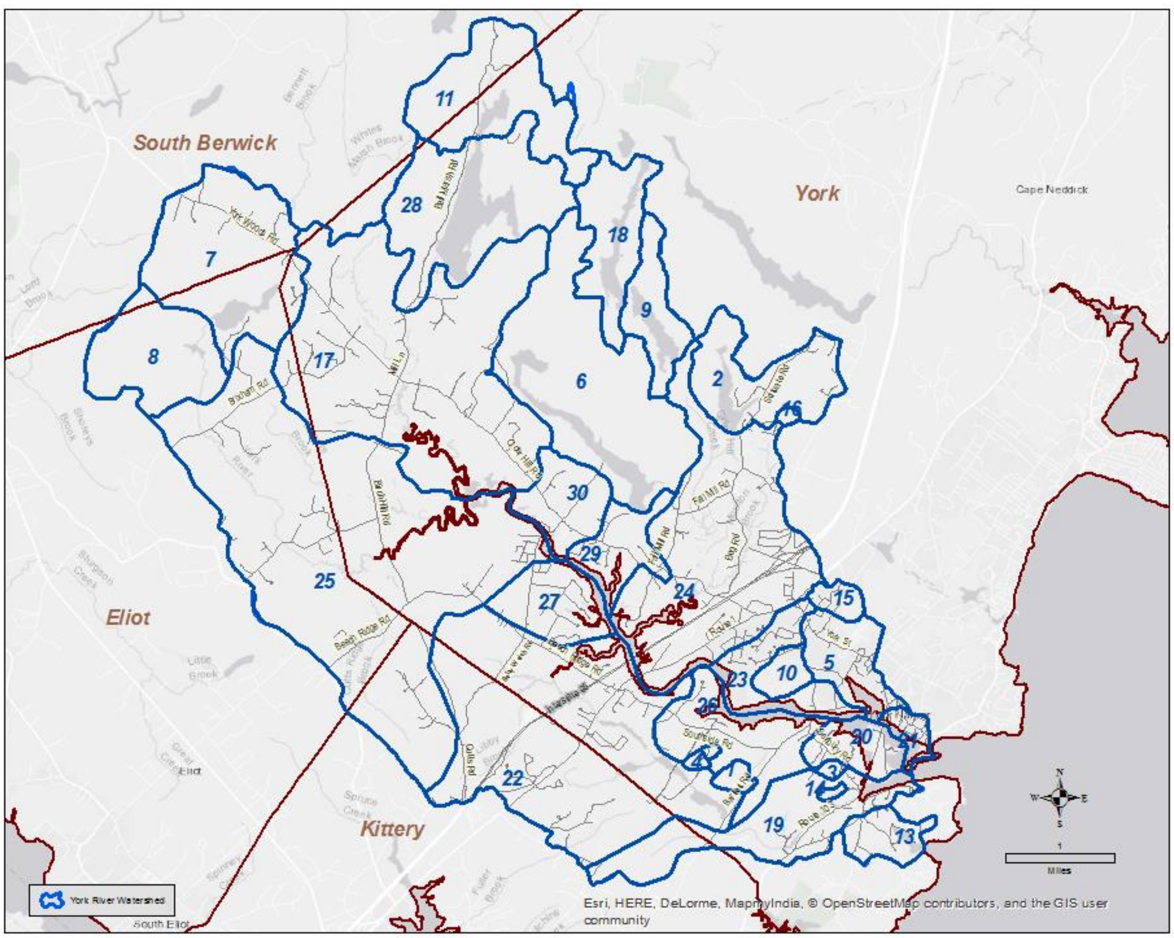
by Town



Potential New Buildings

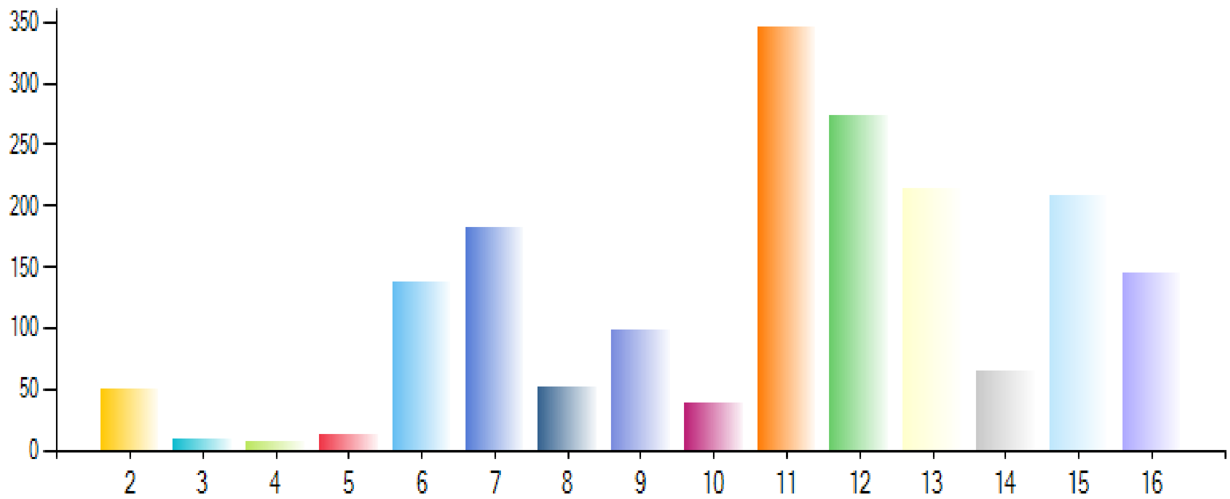
by Subwatershed

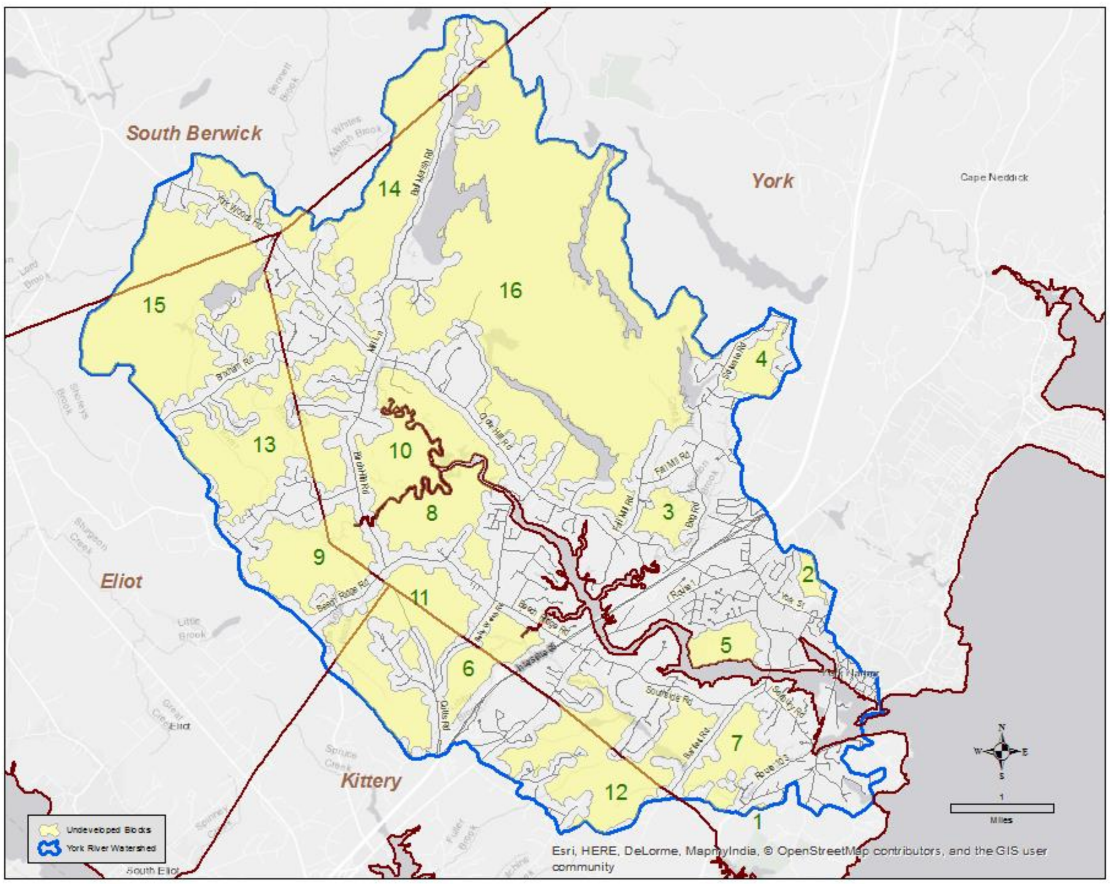


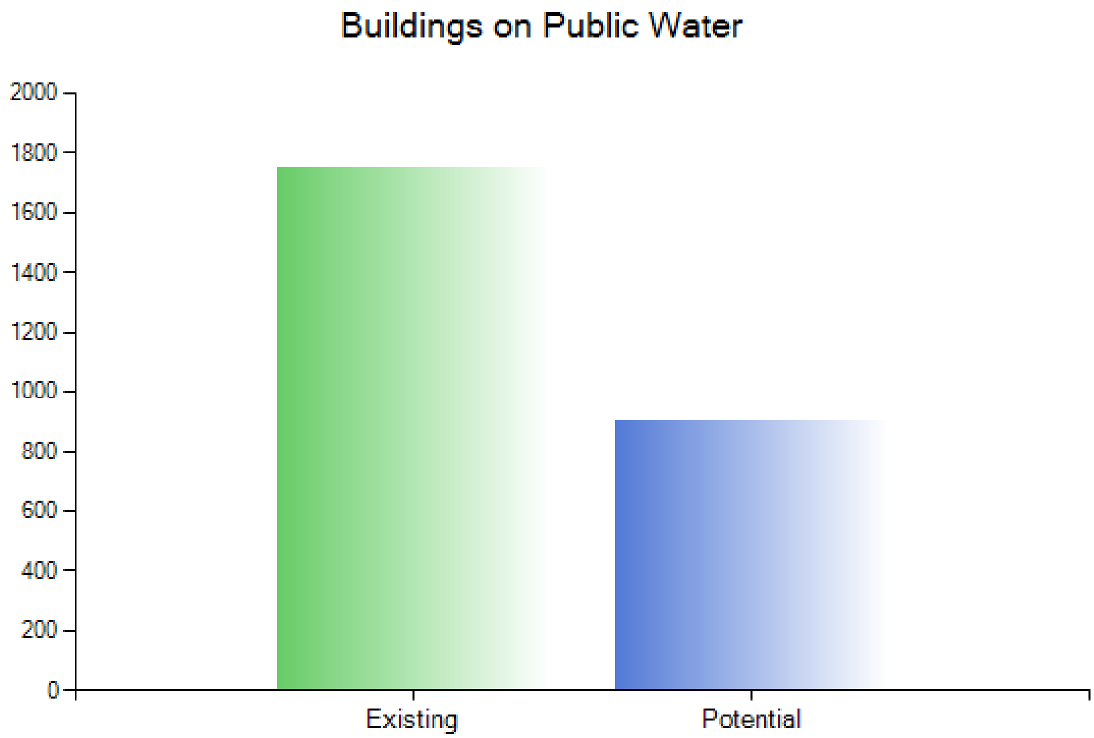


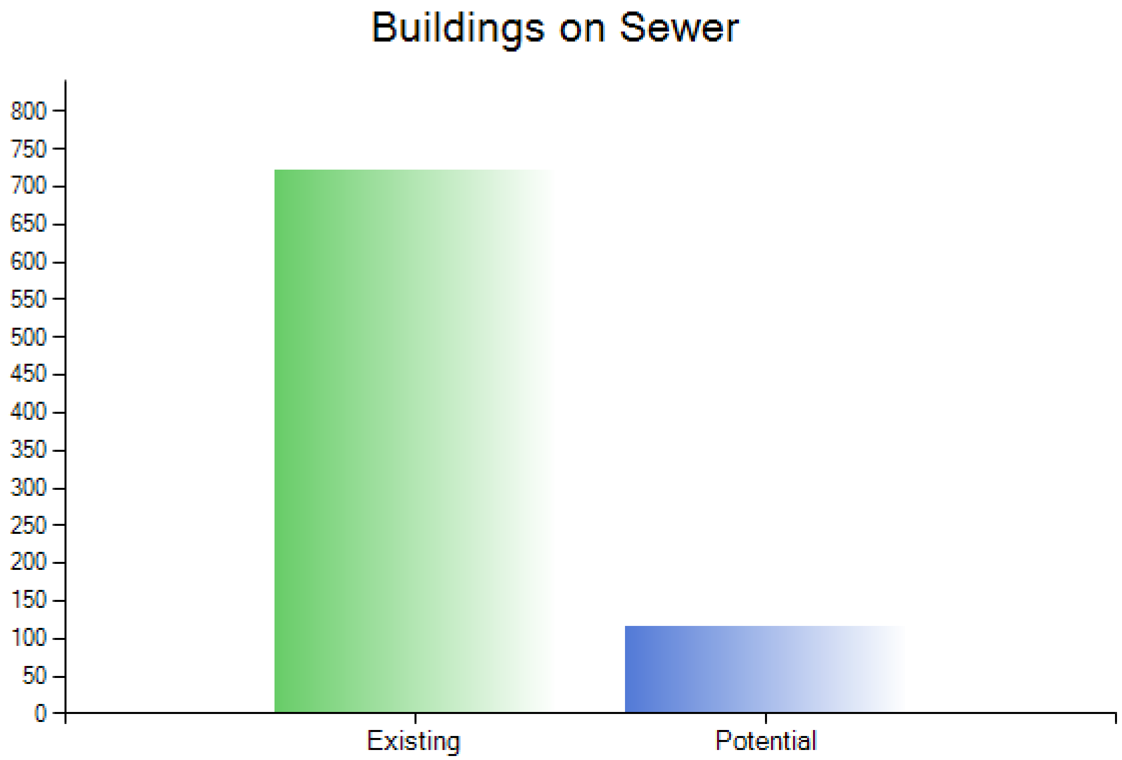
Potential New Buildings

by Undeveloped Blocks






Buildings on Public Water
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Existing
Potential


Buildings on Sewer
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
Existing
Potential

Overall development within the watershed analyzed by town is shown below:

Town	Watershed Acres	Watershed %	Existing Building	%Total Existing Buildings	Existing Density DU/Acre	Potential Buildings	% Potential Buildings	Total Buildings	% Buildings	Potential Density DU/Acre	Conservation (acres)
York	15172	71%	2489	82%	0.16	1116	49%	3605	68%	0.24	4344
Kittery	1981	9%	225	7%	0.11	690	30%	915	17%	0.46	322
South Berwick	1099	5%	93	3%	0.08	90	4%	183	3%	0.17	531
Eliot	3032	14%	230	8%	0.08	399	17%	629	12%	0.21	387
Total Watershed	21284		3037		0.14	2295		5332		0.25	5584

As discussed in an earlier section, current impervious was determined by digitizing existing pavement and building rooflines, buffering road centerlines, and estimating driveway areas. Future impervious was estimated by assuming a set amount of imperviousness created for various lot sizes. The results are shown below.

Impervious by Zoning	Town	% Current Impervious	% Future Impervious
GEN-1	York	4%	5%
GEN-2	York	2%	2%
GEN-3	York	13%	16%
RT 1-1	York	7%	8%
RT 1-2	York	11%	12%
RT 1-3	York	29%	30%
RES-1A	York	5%	8%
RES-1B	York	11%	12%
BUS-1	York	20%	21%
RR-S	Kittery	4%	7%
RR-N	Kittery	4%	8%
MU	Kittery	7%	10%
R3	South Berwick	2%	3%
R5	South Berwick	4%	5%
R4	Eliot	2%	3%

Subwatershed	Acreage	% Current Impervious	% Future Impervious
1	48.4	1%	1%
2	582.6	3%	5%
3	21.9	7%	10%
4	18.8	7%	10%
5	349.7	16%	17%
6	1,513.5	0%	0%
7	1.131.4	2%	3%
8	641.4	0%	2%
9	325.8	0%	0%
10	111.0	4%	5%
11	808.2	1%	1%
12	10.1	6%	7%
13	192.5	8%	10%
14	15.4	3%	7%
15	83.6	9%	14%
16	17.1	2%	2%
17	2,664.0	3%	4%
18	483.7	0%	0%
19	749.1	5%	8%
20	236.3	7%	8%
21	95.6	20%	21%
22	2,484.5	5%	8%
23	358.8	11%	11%
24	1,814.0	10%	10%
25	3,815.5	2%	5%
26	568.9	5%	6%
27	382.7	7%	7%
28	1,081.0	1%	1%
29	305.7	6%	6%
30	345.85	4%	5%
Total Watershed		4%	5%

Finally the impacts to various habitat layers were approximated by selecting the parcels which intersect each habitat layer and adding up the potential new units which could be developed on those parcels. Since we do not know where the housing would be developed on any particular lot, this calculation is an exaggeration of the impact of future development on habitat due to the fact that all development on a parcel was included even if the habitat only occupies a portion of that parcel. These values should really only provide a sense for the relative impacts of future development on the resources.

Layer	Specific Habitats	Acres	# of Parcels Intersecting Habitat	Potential New Buildings on Intersected Parcels
Undeveloped Blocks		11,160	962	1,842
Focus Areas				
	Brave Boat Harbor/Gerrish Island	60	28	20
	York River Headwaters	8,750	1,375	1,060
	Mt.. Agamenticus	7,170	609	380
Rare/Endangerd Plant				
	Central HardwoodOakForest (A)	11,210	1,400	890
	RedOak/White Pine (BC)	250	13	10
	Tidal Marsh System/Salt Hay Marsh (B/BC)	400	71	140
	Excellent to Good Viability Sites (A&B)	40	10	10
	Good to Fair Viability Sites (BC & C)	70	27	40
Habitat				
	Alewife	340	146	270
	Inland Waterfowl/Wading Birds	2,870	564	1,130
	WildBrookTroutHabitat	2,552	688	1,210
	Shorebird (Hbitat & Buffer)	60	8	10
	Shellfish (Bue Mussel, Hard & Soft Shell Clam, European Oyster)	190	43	10
	SVP Buffer	30	16	120
	Tidal Waterfowl/Wading Birds	2,490	274	280
	Endngered Fish	300	1	0
	DWA	460	17	60
Rare/Endangered Animals				
	Threatened Species (Ringed Boghaunter)	100	24	20
	Species of Special Concern (Saltmarsh Sparrow, Northern Spring Salamander, SpicebushSwallowtail, Salt Marsh Tiger Beetle, Great Blue Heron, Scarlet Bluet)	1,090	91	210
	Endangered Species (New England Cottontail)	700	375	270
	Rare Species (Unnamed)	1,140	315	236

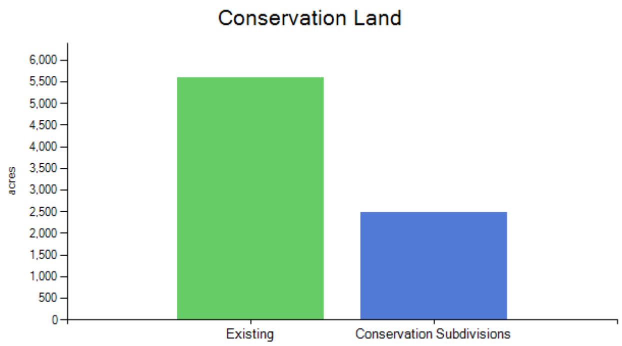
CONSERVATION SUBDIVISION SCENARIO

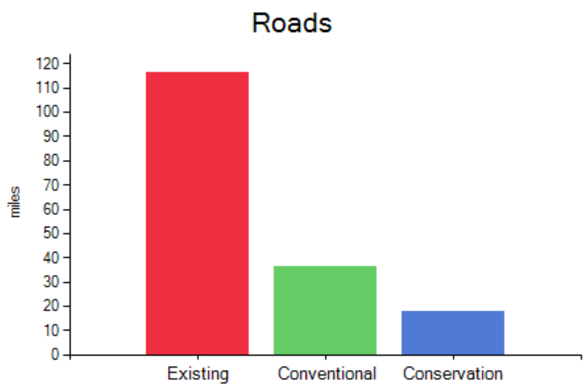
Using the existing zoning scenario as a basis for density, we developed indicators to measure the impact of all future development being in the form of conservation subdivisions. In this instance, development seeks to minimize impacts to habitat and visually important resources. Development is clustered, thus the same number of lots are developed on smaller lots with the requirement that a specified portion of the land be preserved. In this case, since we did not have an actual ordinance to measure the impacts of, we created conditions which included:

- 50% of land would be conserved
- Density would be equivalent to existing zoning (same number of proposed new lots)
- Road frontage would be 50% of existing road frontage requirements

Given these conditions, the following graphs show some of the impacts of this versus conventional subdivision development.

Conservation areas were calculated by taking 50% of the land area of any parcel which would fall under subdivision restrictions in future development (> 3 lots). Roads were calculated by taking the same parcels and multiplying the potential new development by 115 ft (this was determined by looking at a random sampling of existing subdivisions and calculating the per lot length of road created). For the conservation subdivision it was assumed that the road creation would be ½ as much as under conventional subdivisions.





MARSH MIGRATION SCENARIO

In the marsh migration scenario, the overlap area of the predicted marsh migration areas assuming a 6 ft sea level rise were buffered by 250 ft to afford these areas protection. This entire area was excluded from the developable land. This eliminated the potential for 180 buildings across the watershed, which is about 8% of the total development potential within the watershed. See the story map for impacts to specific parcels.

EXPANDED WATER BUFFERS

In this scenario, shoreland zoning is expanded to include 250 ft from all ponds and rivers and 75 ft from all streams. This area is then excluded from development. This eliminated approximately 200 buildings across the watershed, which is about 8% of the total development potential within the watershed. See the story map for impacts to specific parcels.

CONCLUSIONS AND FUTURE RECOMMENDATIONS

Under all the scenarios, it becomes apparent that the greatest development potential in the watershed is along the southern shore of the York River out to the edge of the Watershed, which includes portions of York and Kittery. It is interesting to note that the percentage of future development in Kittery accounts for 30% of the total new growth while Kittery only accounts for 9% of the entire watershed.

Incorporating increased water quality protections through either the Marsh Migration areas or shoreland zoning would not have a large impact on development potential across the whole watershed. It might be worth looking at how to transfer development rights from those areas, compensating for the impacts which would be felt by individual land owners. Developing a watershed wide Conservation Subdivision ordinance would also achieve the benefit of balancing development potential and protection for basic water quality and habitats.

Maintaining the build out data over time is problematic due to the fact that the parcel data will need to be updated. Each community updates their parcel data at different times and the data is not standardized, so that makes it difficult to update the build out information over time. The same is true of the zoning and shoreland zoning data.

In terms of the build out, the current results are intended to guide thinking about various options, providing the ability to look at where the most development is likely to occur. Having developed the build out, it will be possible to look at the impact of various specific policies as the communities work with them. For instance, if the communities wanted to look at developing a watershed wide Conservation Subdivision ordinance, the build out model could be used to compare impacts given certain options like 40% vs 50% conservation or setting a minimum lot size or road frontage requirements.

Appendix A – Data Layers

Type	Name	Source
Municipal Data		
	BoatLaunch	Me IF&W, clipped to watershed
	Bridges	ME DOT, clipped to watershed
	Buildings	Town of York, Spatial Alternatives
	ConservedLands	Multiple sources, ME IF&W, individual towns, land trusts, local knowledge
	Impervious2017	Town of York Building footprints. Spatial Alternatives developed road pavement, parking areas, and buildings for all other towns and updated York buildings
	Libraries	MeGIS, clipped to Watershed
	PublicWells	ME DPW, clipped to watershed
	Roads	MeGIS, clipped to Watershed
	Schools	MeGIS, clipped to Watershed
	Shoreland Zoning	Individual Towns, edits and attributes added by Spatial Alternatives
	TreeGrowthFarmParcels	developed by Spatial Alternatives, data from individual towns
	YorkWatershedParcels	Individual Towns, edits and attributes added by Spatial Alternatives
	Zoning	Individual Towns, edits and attributes added by Spatial Alternatives
	York Historic Districts	Town of York
Natural Resources		
	Aquifers	Maine Geologic Survey, clipped to watershed
	DrainageDivide	USGS, MEGS, ME DEP, Spatial Alternatives, clipped to watershed
	GreatPond250buffer	Beginning with Habitat, clipped to watershed
	NHDFlowline	USGS, National Hydrography Dataset, clipped to watershed
	NHDWaterbody	USGS, National Hydrography Dataset, clipped to watershed
	NWI	USF&W National Wetland Inventory, clipped to watershed
	OceanRiver250buffer	Beginning with Habitat, clipped to watershed
	Ponds250buffer	Beginning with Habitat, clipped to watershed
	Streams75buffer	Beginning with Habitat, clipped to watershed
	WatershedBoundary	USGS, National Hydrography Dataset, clipped to watershed

Type	Name	Source
Habitat		
	Alewife Habitat, Sturgeon, Cod, Smelt, Bass Habitat	MEDMR, USFWS, clipped to watershed
	BlockConnectors	Beginning with Habitat, clipped to watershed
	DWA	Beginning with Habitat, clipped to watershed
	EndangeredFish	Beginning with Habitat, clipped to watershed
	ETSC_BWH	Beginning with Habitat, clipped to watershed
	FocusAreas	Beginning with Habitat, clipped to watershed
	GOMTop25	Beginning with Habitat, clipped to watershed
	Iwwh	Beginning with Habitat, clipped to watershed
	MarshMigration	MNAP, clipped to watershed
	RareAnimalHabitat	MEIF&W, clipped to watershed
	RiparianPriorityConnections	Beginning with Habitat, clipped to watershed
	Shellfish	Beginning with Habitat, clipped to watershed
	Shorebird	Beginning with Habitat, clipped to watershed
	SVPBuffer	Beginning with Habitat, clipped to watershed
	TidalMarshes	MNAP, clipped to watershed
	Twwh	Beginning with Habitat, clipped to watershed
	UndevelopedBlocks	Beginning with Habitat, clipped to watershed
	WildBrookTroutHabitat	MEIF&W, clipped to watershed
Historic	HistoricProperties	Maine Historic Preservation, clipped to watershed
	NHRPCulturalResPoints	National Historic Register, clipped to watershed
	York NR Properties	National Historic Register, clipped to watershed
	Prehistoric Sites	Maine Historic Preservation, clipped to watershed
	Archaeological Sites	Maine Historic Preservation, clipped to watershed