Site Study Pepperell: Bemis Wellhead Protection/Gulf Brook

About this site: The Bemis wellhead site (1) is the location of one of Pepperell's five town wells. There are currently only two operating wells, due to contamination at the other three sites. Bemis wellhead is one that is functioning with negligible PFAS contamination. It is an insufficient supply during times of drought. Gulf Brook (2) runs adjacent to the wellhead property, and is a tributary of the Wild & Scenic Nissitissit River. The Bemis wellhead is within a Wellhead Protection Zone.

Community concerns about Bemis Wellhead Protection/Gulf Brook

Meeting attendees were concerned about a proposed 21-lot subdivision in zone 2 which is adjacent to the Bermis Road Conservation Area. Development near to one of the two operating town wells raises questions of impact on the water supply.

The pumping at the well site is causing low flows in nearby Gulf Brook negatively impacting water quality and wildlife habitat, including coldwater fish species such as brook trout.

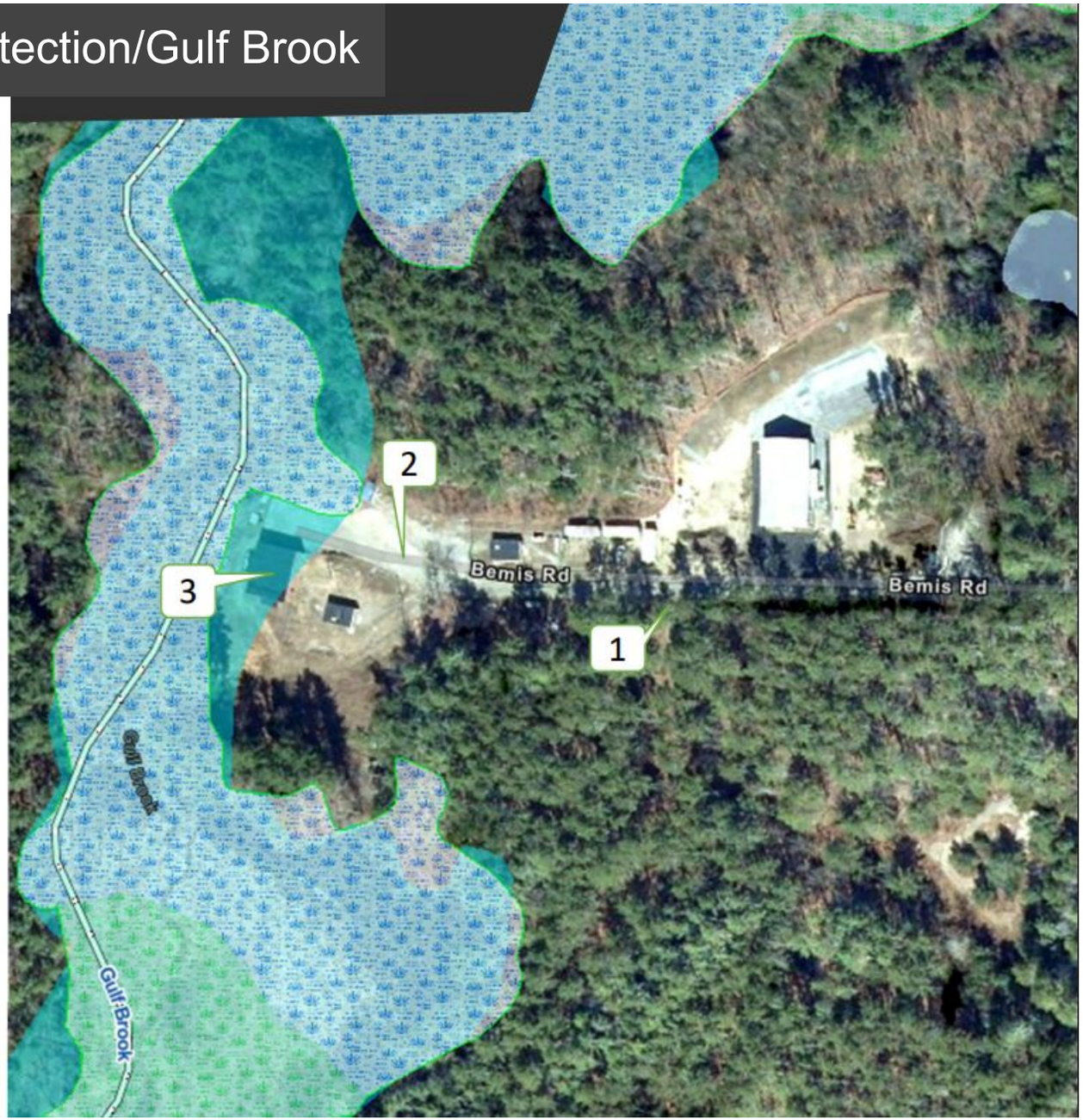
Nature-based Solutions Recommended for Pepperell: Bemis Wellhead Protection/Gulf Brook

Bemis Wellhead Protection/Gulf Brook

Data Viewer Link
https://arcg.is/iKKTq0

Recommended NbS
NbS #s correspond to Project Templates referenced on pages 3, 6, & 7 of Site Study

1. Forest along Bemis Road
   - DL DW #3 Forest/shrubland health management or restoration
   - B DL #8 Pollinator hedgerow buffer
   - DW #40 Tree protection bylaw
   - #50 Analysis and study projects
2. Driveway
   - D F #17 Pervious parking and walking areas
3. Unused Structure
   - B DL #60 Habitat enhancements
   - B DL #58 Invasive species management



Map Key

Bright blue overlay is the FEMA 100 year floodplain

Pink overlay is FEMA 500 year floodplain

Recommended NbS Key

- F Flooding NbS
- D Drought NbS
- RT Rising temps NbS
- DW Degraded water NbS
- DL Degraded landscape NbS
- B Loss of biodiversity NbS

NbS Narrative/NbS Project Templates for Pepperell: Bemis Wellhead Protection/Gulf Brook

NbS Recommendations

- The unused building structure behind the Bemis Wellhead should be removed, and the impervious areas replaced with a permeable variety to the degree possible.
- Habitat enhancements and native plantings would be impactful here, and there are some opportunities for land acquisition.
- Groundwater pumping is reducing flow in this area of the stream. The Gulf Brook area west of the old pump building dries out in the summer, which results in fish kills. We recommend planning a volunteer day in collaboration with Trout Unlimited; if water flow is maintained in strategic locations through changes to the pumping system, this would assist fish movement upstream or downstream.
- The health of the forest needs to be restored, along with the shrubland along Bemis Road. We recommend planting a pollinator hedgerow buffer, adopting a tree protection bylaw, and conducting a study & analysis project in this area.
- In the driveway, there is a need for pervious parking and walking areas.

NbS Project Templates for Site Specific NbS Recommendations on previous page

Resource 1 - How to Use Templates

Resource 2 - Next Steps in Planning & Permitting

The following template numbers correspond to the NbS recommendations on the page 2 Map.

#3 Forest Management Restoration

#8 Pollinator Hedgerow Buffer

#17 Pervious Parking- Walking Areas

#40 Tree Protection Bylaw

#50 Analysis and Study Projects

#58 Invasive Species Management

#60 Habitat Enhancements

View Pepperell Map Atlas **for maps on land covers, soil function and storage, water resources, ecological priority sites, and more.**

Soils Information for Pepperell: Bemis Wellhead Protection/Gulf Brook

Pepperell

With a position low in the watershed, Pepperell's farmland and suburban residential lands have major potential for better management for increased soil function that would mitigate stormwater issues and benefit the several towns downstream.

Of the five focus communities, Pepperell is "lowest" in the watershed and receives stormwater impact from a vast upland land area. The Nashua River runs along the town's southeastern border and then through the center of town before continuing north. The rich alluvial soils of this riverside community are home to significant acreage of farmland with interspersed residential neighborhoods that constitute a large portion of Pepperell's "degraded soils with high regeneration potential". Compared with other focus communities like Fitchburg and Leominster, Pepperell has a low amount of "highly degraded" soil that would need intensive intervention to replicate lost soil function. The town's acreage of High Functioning soil is below the watershed-wide average, but is still significant and protection of these lands is important for watershed health. These high-functioning soils are evenly mixed with "moderate-low function" soil throughout the town.

Sites Considered for Nature-based Solutions

At least two of the sites being considered for stormwater mitigation are on soils with "high regeneration potential" and these sites could be priorities for implementing and tracking the performance of soil-regeneration measures. The Unkety Brook site has been identified as prone to flooding but is within a subbasin that is mostly in neighboring Dunstable.

Priority Actions for Protecting/Enhancing Soil Health in Pepperell

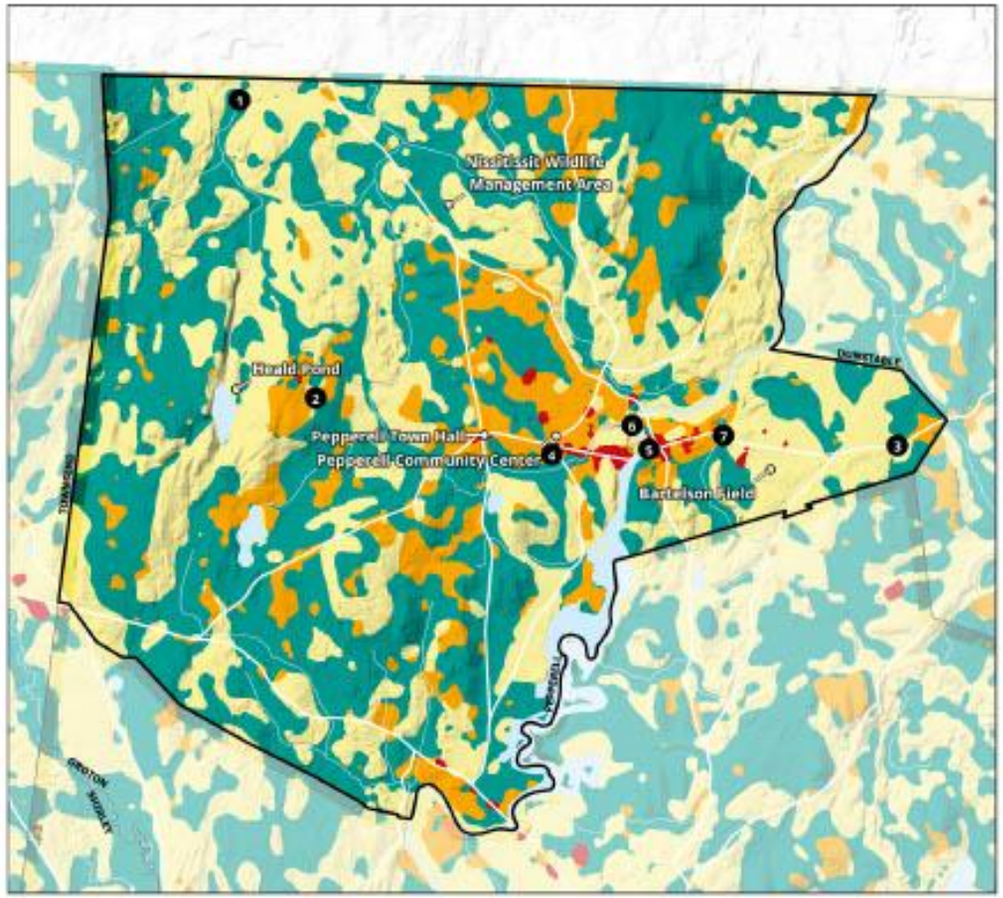
Better management of turf, lawns, gardens, and farms.

Example Nature-based Solutions:

- Education and outreach to key landowners and farmers about smart soil practices
- Pocket forests to transform biodiversity
- Planting and earthworks to restore connectivity and hydrology
- Front yard pollinator meadows
- Dual use solar
- Planning and zoning to preserve and enhance ecosystem function

#	SITE	PREDOMINANT SOIL FUNCTIONS FOR RESILIENCE			
		Highly Degraded	High Regeneration Potential	Moderate-Low Function	High Function
1	Bemis Wellhead Protection Zone/Gulf Brook		◆	◆	◆
2	Heald Orchard/Heald Pond		◆		◆
3	Unkety Brook		◆	◆	◆
4	Fitzpatrick School Parking	◆	◆		
5	Railroad Square	◆	◆		
6	Mill Street/Varnum Brook			◆	
7	Reedy Meadow off Lowell Rd.		◆	◆	◆

Soil Functions for Resilience



	Pepperell
High Performance Soils & High Carbon Soils	6,811 ac (45.9%)
Average Function Soils	6,039 ac (40.7%)
Degraded Soils with High Regeneration Potential	1,893 ac (12.8%)
Highly Degraded Soils	101 ac (0.7%)

○ Landmarks

❶ Sites Considered for Nature-based Solutions

[Read full Nashua River Watershed-wide Healthy Soils Report](#) (PDF 25MB)

Nature-based Solutions Opportunity Table Pepperell: Bemis Wellhead Protection/Gulf Brook

Value	BEST	BETTER	GOOD
Feasibility	high	mid	low
Ownership	Municipal		

Best Value = An improvement to a resource that provides significant lasting resiliency and strengthens or serves related resources

Better Value = Makes significant improvements to resiliency with long lasting effect

Good Value= Improves the habitat value, or resiliency of a site or feature

Feasibility is based on property ownership or technical access

NbS Template#	Nature-based Solution Description	Bemis Wellhead Protection/Gulf Brook
	Natural Environment Restructuring	
1	River / pond bank revegetation	
2	Grassland meadow management restoration	
3	Forest / shrubland heath management or restoration	**high**
4	Wetland management restoration	
5	New wetland or floodplain construction / expansion	
7	Stream flow alteration	
8	Pollinator hedgerow buffer	**high**
10	Soil management or restoration	

NbS Templat #	Nature-based Solution Description	Bemis Wellhead Protection/Gulf Brook
	Built Environment Restructuring	
11	Stormwater treatment wetlands	
12	Daylighting of streams	
13	Upstream BMPs rain-garden, bio-swale, etc.	**mid**
14	Shade-habitat/ Infiltration tree plantings	
15	MSCS culvert improvement	
17	Pervious parking walking areas	**high**
19	Lighting modifications / upgrades	
20	Species crossing protections	
21	Beaver deceiver / promoter	
22	High-performance soil specifications	**mid***
23	PV Parking Awnings + Rooftops	

* see Healthy Soils Report

Nature-based Solutions Opportunity Table Pepperell: Bemis Wellhead Protection/Gulf Brook, cont'd.

Value	BEST	BETTER	GOOD
Feasibility	high	mid	low
Ownership	Municipal		

Best Value = An improvement to a resource that provides significant lasting resiliency and strengthens or serves related resources

Better Value = Makes significant improvements to resiliency with long lasting effect

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Feasibility is based on property ownership or technical access

NbS #Template	Nature-based Solution Description	Bemis Wellhead Protection/Gulf Brook
	Ecological Awareness & Access Projects	
24	Outdoor classroom/ Nature-play	
25	Food production and forage	
26	Apply Indigenous knowledge	
27	Soft trail	
28	Paved pervious trail UANT	
29	Soil protection-puncheon-boardwalk	
30	Pedestrian safety and bike access	
	Architectural Projects to Consider	
49	Nature-based recreational opportunities	

NbS Template#	Nature-based Solution Description	Bemis Wellhead Protection/Gulf Brook
	Value Added Features on Projects	
50	Analysis and study projects	**mid**
52	Educational Interpretation	
53	Furnishings / gathering space	
55	Advocacy group/ Stewards	**mid**
56	Volunteer opportunities	
58	Invasive species management	**mid**
59	Species monitoring protocol	
60	Habitat enhancements	**mid**

MVP site visit to Bemis Wellhead Protection/Gulf Brook site.

Photo left by Sherry Anders; photo right by Ralph Baker

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To view the interactive online Plan, please visit nashuariverwatershed.org/Climate Resilience