



# Restoring Mill Pond East Washington, NH 2009



**Town of Washington,  
New Hampshire**

# Acknowledgements

The success of this project would not have been possible without the contributions of numerous Washington residents:

Project Leaders:

Ed Thayer  
Jed Schwartz  
Richard Cook

Contributing Landowners:

Richard and Lynn Cook  
Mark and Mary Lou Cummings  
John Eccard  
George Eccard  
Peter France  
Sandy Robinson  
Jed and Nan Schwartz  
Ed and Jane Thayer

The project would not have begun without the work of Margaret Foss of the NH Department of Environmental Services, who lead the water quality research and investigations that characterized the problem in sufficient detail for the Town to take the actions described in this report.

Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 319 funds from the U.S. Environmental Protection Agency.

*Cover Photos:*

Top: A swan decoy floats in the East Mill Pond, discouraging ducks and geese from landing in the pond, and reducing the bacteria load.

Bottom: Sheep at Purling Beck Farm benefit from solar powered fencing and water pump that provides access to drinking water without direct access to the brook.

*All Photos by Jed Schwartz and Ed Thayer*

# Summary

In picturesque East Washington village, a popular town swimming beach at Mill Pond had been closed several times due to high bacteria counts. In 2006, Mill Pond was listed as “impaired” by the New Hampshire Department of Environmental Services (DES) due to the high bacteria levels.

A 2006 study by DES found that the bacteria were coming mostly from birds and livestock in the 6,912 acre Mill Pond watershed. The study identified a commercial dairy farm and several smaller livestock operations as likely sources of bacteria.

A group of town residents and officials concerned about the quality of the pond got together in 2007 to develop a watershed plan to address these concerns, as well as a significant sediment problem emanating from gravel road drainage along the pond’s southern shoreline.

The Town of Washington applied to DES for a Watershed Restoration Grant to implement the proposed watershed plan, which was awarded on May 21, 2007 in the amount of \$48,546.

The Watershed Plan was implemented in 2008 and 2009 with the following results:

- 22,070 linear feet of livestock fencing was installed to keep livestock out of waterbodies.
- 117.9 acres of pasture was closed to livestock to protect sensitive waterbodies.
- 4.7 acres of grassy buffers were installed to provide filtration of runoff to Purling Beck Brook.
- 6.5 tons of sediment per year eliminated.
- 7 pounds of phosphorus per year eliminated.
- 24 pounds of nitrogen per year eliminated.

## Watershed Plan

In *Total Maximum Daily Load (TMDL) Study for Bacteria in Mill Pond Town Beach, Washington, NH*, DES determined that a 70 percent reduction in bacteria was needed for the Pond to meet the state water quality standard of a geometric mean of no more than 47 colonies of *E.coli* per 100 ml. Based on a microbial source tracking analysis of the DNA in bacteria samples, the study found the following breakdown of bacteria sources:

Birds	40%
Livestock	33%
Humans	7%
Wildlife	3%
Unknown	17%

Field reconnaissance in the watershed found one commercial dairy farm and several small livestock operations with sheep, horses, or cows. The DES report recommended fencing livestock out of water courses, providing alternative watering systems, and providing controlled stream crossings for livestock. Following community meetings and dialogue started by the selectmen and the conservation commission, the Town developed an implementation plan to install livestock best management practices (BMPs) at all locations, to install BMPs that deter waterfowl from nesting near ponds and watercourses, and to address sediment deposition (see Figure 1) by designing stormwater BMPs along Purling Beck Road.



**Figure 1 -- Sediment accumulation in Mill Pond.**

# Livestock and Wildlife BMPs

Each livestock operation was surveyed and mapped as shown on Figure 2. Over 22,000 thousand feet of stream and pond frontage were fenced with solar powered water pumps installed to maintain water access for livestock. Two stream crossings were installed as shown in Figures 7 and 9.

The commercial dairy operation created approximately 45,000 square feet of grassy buffer strips to reduce waterfowl access to Purling Beck Brook, a tributary of Mill Pond. To address the waterfowl problem in Mill Pond, swan decoys were deployed during the unfrozen months, as shown on the top cover photo. A map of BMP locations is provided in Figure 2; a list of BMPs keyed to the letters on the map is provided in Table 1. BMP photos are provided in Figures 3-9.

**Table 1**  
**Livestock BMPs**

Map Letter	Site Name	BMP Installed	Cost
A	Eccard	Closed Pasture	Farm - In Kind
B&C	Eccard	Grassy Buffer	\$762.00
		Livestock Fencing,	\$2618.00
		Solar Water Pump	\$2807.00
D	Thayer	Livestock Fencing,	\$200.00
		Solar Water Pump,	\$800.00
		Stream Crossing	\$2500.00
E	Robinson/France	Livestock Fencing,	\$1496.00
		Solar Water Pump	\$1747.00
		Stream Crossing	\$1729.00
F	Cook	Livestock Fencing,	\$454.00
		Solar Water Pump	\$1277.00
G	Schwartz	Livestock Fencing,	\$1490.00
		Solar Water Pump	\$1337.00
H	Cummings	Livestock Fencing, Solar	\$1237.00
		Water Pump	\$2865.00
I	Robinson/France	Closed Pasture	\$1200.00
J	Cook	Livestock Fencing	\$500.00
K	Robinson/France	Livestock Fencing,	\$496.00
		Solar Water Pump	\$1747.00

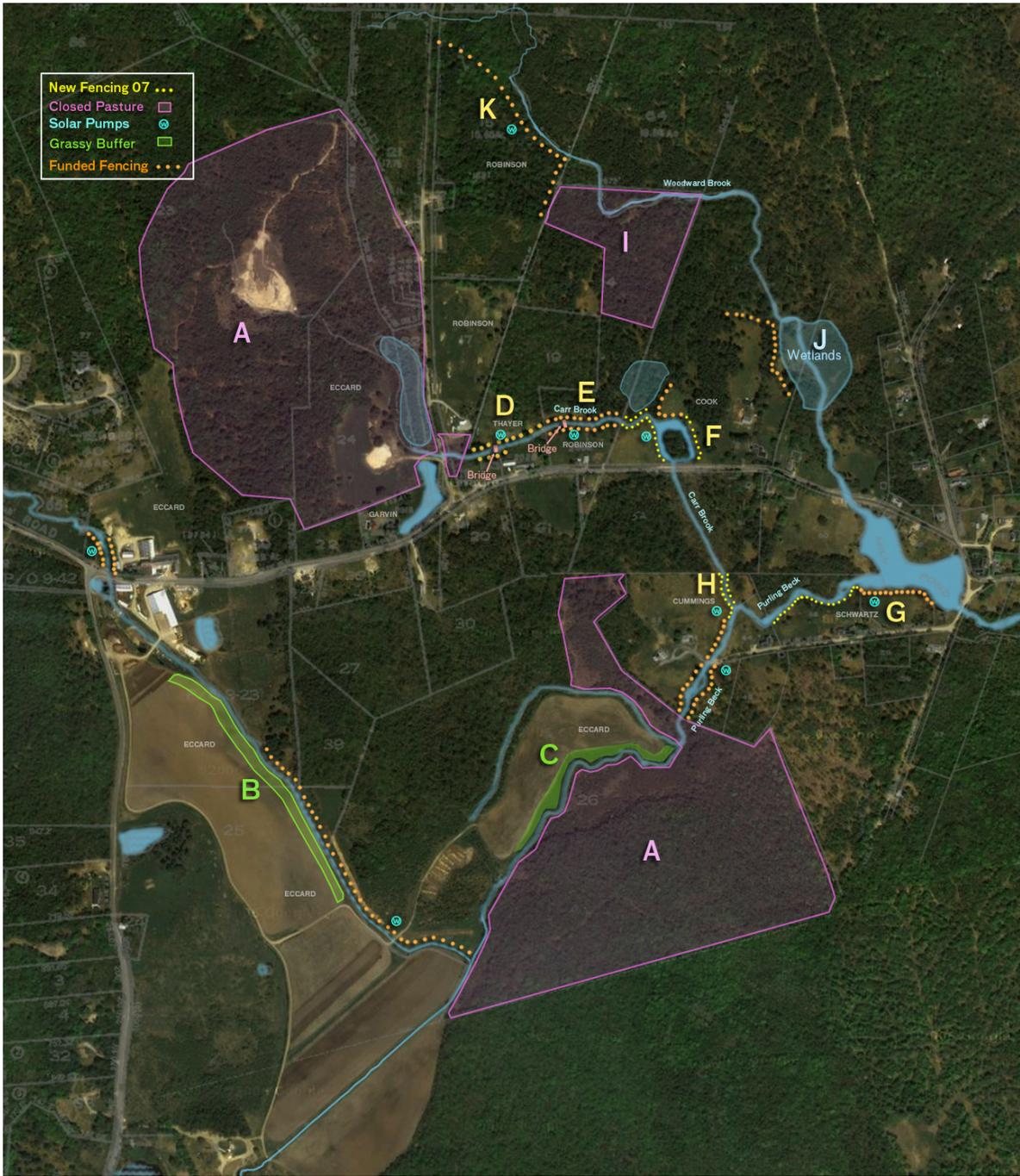


Figure 2 -- BMP Locations (see Table 1 for key)



**Figure 3 -- Solar pump provides water for livestock; fencing keeps livestock out of farm pond at Cook farm.**



**Figure 4 -- Beef cattle grazing in fenced pasture at Cummings farm...(see Figure 5).**



**Figure 5 -- Solar pump and livestock fencing at Cummings farm.**



**Figure 6 -- Solar pump, fencing, and stock tank allow watering of livestock without direct access to the brook at Eccardt Farm.**



**Figure 7 -- Stream crossing and fencing keep livestock from the brook at Robinson/France farm.**



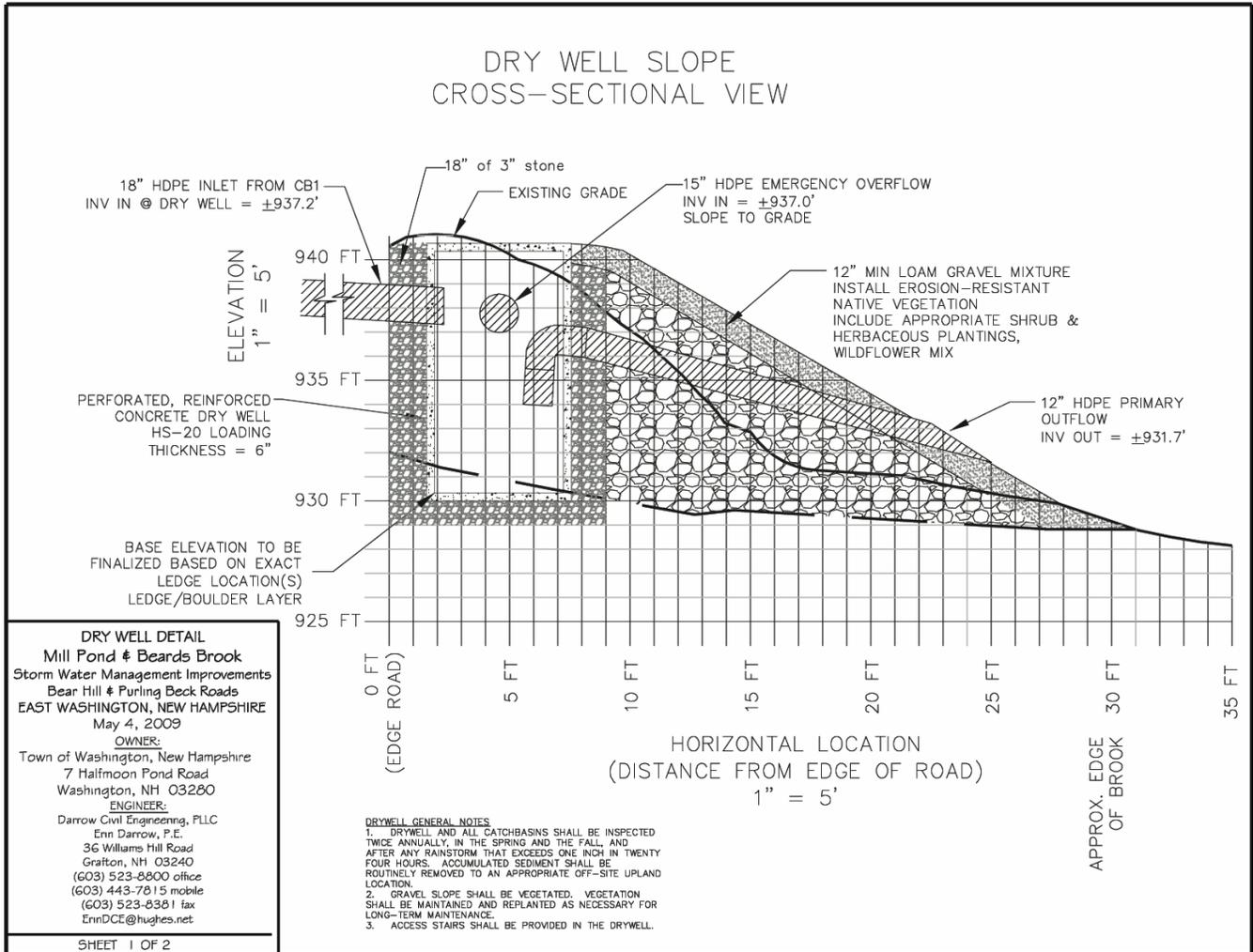
**Figure 8 -- Fencing and a solar pump at Schwartz farm.**



**Figure 9 -- Livestock crossing and fencing keep animals out of the brook at Thayer farm.**

# Stormwater BMP

Darrow Civil Engineering of Grafton, NH designed the Purling Beck drainage system, which replaced the piped outlet to Mill Pond with a dry well on a small piece of town-owned land just downstream of the Mill Pond dam. Figure 10 shows the installed design of the BMP.



**Figure 10 -- Stormwater infiltration BMP design at Purling Beck Road**

The Town excavated 14 cubic yards of sediment from the pond and will track accumulated sediment in the dry well annually. The modeled rate of sediment reduction is 5 tons per year.

The engineer plans to lead classroom excursions to the Mill Pond to incorporate this local stewardship effort into the school curriculum.

## Water Quality Data

The Mill Pond joined the DES Volunteer Lake Assessment Program in 2008 to provide more consistent water quality monitoring of the pond. This effort requires volunteers to sample the pond at least three times during the summer months for dissolved oxygen, nutrients, and bacteria. While several years of data will be required to ascertain water quality trends, the bacteria sampling conducted in 2009 was encouraging in that neither of the samples collected exceeded state standards (88 col/100 ml) for swimming beaches. Figures 11 and 12 show sampling data from 2008 and 2009, respectively.

NH Department of Environmental Services Volunteer Lake Assessment Program																
Current Year Chemical and Biological Data																
BEARDS BROOK - EAST WASHINGTON DAM																
WASHINGTON																
October-21-2008																
Stationid	Statname	Depthzone	Startdate	Activityid	Category	ANC	CH-a	Cond	PH	Secchi		TP	Turb	CI	EC	
										NVS	VS					
MLLEWASB	MILL POND-BEACH		06/29/2008	2008-2104	SAMPLE									D512(C)	290	
MLLEWASD	MILL POND-DEEP SPOT	COMP	06/29/2008	2008-2108	SAMPLE		=2.305									
			08/24/2008	2008-4934	SAMPLE		=17.924									
			09/21/2008	2008-5706	SAMPLE		=0.712									
			06/29/2008	2008-2103	SAMPLE	4.1		=40.44	6.41	=1.9	0.029	=2.15				
MLLEWASD	MILL POND-DEEP SPOT	EPI	08/24/2008	2008-4929	SAMPLE	7.3		=58.52	6.45	>2.25	0.02	=1.79				
			06/29/2008	2008-2105	SAMPLE			=62.74	6.53		0.036	=1.95		380		
MLLEWASI	MILL POND-ISLAND POND INLET		08/24/2008	2008-4930	SAMPLE			=71.98	6.83		0.015	=0.57		20		
			09/21/2008	2008-5703	SAMPLE			=68.97	6.8		0.0087	=0.68		10		
			06/29/2008	2008-2107	SAMPLE			=54.44	6.53		0.028	=1.51				
MLLEWASO	MILL POND-OUTLET		08/24/2008	2008-4933	SAMPLE			=52.82	6.56		0.017	=1.15		20		
			09/21/2008	2008-5705	SAMPLE			=55.49	6.52		0.011	=0.93				
			06/29/2008	2008-2106	SAMPLE			=21.25	6.34		0.017	=1.31		270		
MLLEWASW	MILL POND-WOODWARD BROOK		08/24/2008	2008-4931	SAMPLE			=26.35	6.35		0.012	=1.37		110		
			09/21/2008	2008-5704	SAMPLE			=25.04	6.2		0.0091	=0.86		40		

Figure 11 -- VLAP Monitoring results, 2008

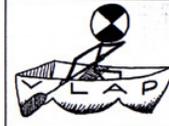
NH Department of Environmental Services Volunteer Lake Assessment Program

Current Year Chemical and Biological Data

BEARDS BROOK - EAST WASHINGTON DAM

WASHINGTON

October-06-2009



Stationid	Statname	Depthzone	Startdate	Activityid	Category	TP	ANC	Chl-a	Cond	PH	Secchi	Turb	EC
MLEWASB	MILL POND-BEACH		06/05/2009	2009-1095	SAMPLE						NVS		50
			09/10/2009	2009-5733	SAMPLE								9
MLEWASD	MILL POND-DEEP SPOT	COMP	06/05/2009	2009-1100	SAMPLE			=1.8256					
			08/06/2009	2009-4228	SAMPLE			=0.8256					
			09/10/2009	2009-5734	SAMPLE			=4.5653					
		EPI	06/05/2009	2009-1092	SAMPLE	0.017	7.1		=52.77	6.35	>1.75	=1.21	
			2009-1094	SAMPLE					=52.91	6.49		=1.13	
			08/06/2009	2009-4223	SAMPLE	0.026	5		=39.45	6.42	=0.75	=1.55	
			09/10/2009	2009-5729	SAMPLE	0.036	9.3		=53.37	6.58	>1.5	=4.68	
MLEWASI	MILL POND-ISLAND POND INLET		06/05/2009	2009-1096	SAMPLE	0.013			=65.81	6.91		=0.83	150
				2009-1097	DUPLICATE				=65.53	6.93		=0.93	
			08/06/2009	2009-4226	SAMPLE	0.018			=42.61	6.69		=0.8	50
			09/10/2009	2009-5730	SAMPLE	0.017			=64.46	7.02		=1.17	20
MLEWASO	MILL POND-OUTLET		06/05/2009	2009-1099	SAMPLE	0.015			=48.96	6.57		=1.04	
			08/06/2009	2009-4225	SAMPLE	0.018							
			09/10/2009	2009-5732	SAMPLE	0.018			=51.62	6.67		=1.43	
MLEWASW	MILL POND-WOODWARD BROOK		06/05/2009	2009-1098	SAMPLE	0.013			=26	6.37		=1.36	30
			08/06/2009	2009-4227	SAMPLE	0.015			=20.8	6.37		=0.88	10
			09/10/2009	2009-5731	SAMPLE	0.016			=27.35	6.43		=2.05	<10

Figure 12 -- VLAP Monitoring results, 2009