New Hampshire Department of Environmental Services Wetland Restoration Assessment Model

The New Hampshire Department of Environmental Services (NHDES) Wetland Restoration Assessment Model (WRAM) determines where restoration will produce the largest functional benefit with the lowest risk of failure by applying a GIS-based process to score wetlands for potential functional uplift, sustainability, and landscape suitability. NHDES's in-lieu fee (ILF) program has used the results to guide its allocation of ILF funds to favor projects that locate restoration in priority areas. The WRAM tool serves as a model approach for wetland programs seeking a low-cost GIS-based method for prioritizing compensatory mitigation sites due to its emphasis on achieving functional uplift and sustainability at restoration sites. The tool is particularly transferable to other states in the northeast that share much of the same GIS data as NHDES.

OVERVIEW

Lead developer(s): New Hampshire Department of Environmental Services (NHDES).[1]

Year developed: 2009.[1]

Geographic area: The Merrimack Watershed (Figure 1).[1]

Resource types: Wetlands.[1]

Restoration/conservation: Restoration (reestablishment and rehabilitation), preservation/protection, and acquisition without preservation/protection.[2]

Stakeholders: Applicants to NHDES's Aquatic Resource Mitigation (ARM) ILF program; other members of the public interested in incorporating priority areas into their restoration project planning.[2]

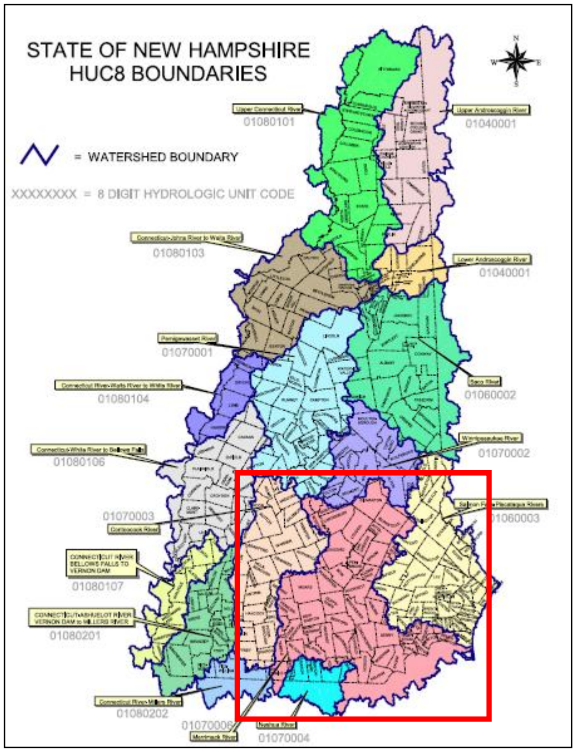

Figure 1. The NHDES Site Prioritization Model identifies priority candidate sites within the Merrimack watershed (located within the red box).

Current status: WRAM output maps and the list of prioritized sites are currently available for incorporation into project planning. For example, WRAM outputs are applied to guide selection of mitigation sites as part of NHDES's in-lieu fee (ILF) program.[2]

PRIORITIZATION ANALYSIS

Input data QA/QC: NHDES applied comprehensive GIS data quality standards to all datasets used in the analysis. These included using only GIS data of known origin, obtaining the most updated version of each dataset from its original source, and using only datasets properly documented to Federal Geographic Data Committee (FGDC) standards.[2]

Landscape prioritization tool(s):

Site Identification (Site ID) Model: Starting with a composite layer of existing wetlands, the Site ID Model identified a set of 951 candidate sites for input into the Site Prioritization Model using a simple screening process involving the following steps:[1]

1. Some portion of the wetland must be assigned one or more of the following Cowardin classifications in the National Wetland Inventory (NWI): "partially drained/ditched," "diked/impounded," or "excavated."
2. Any portion of the wetland must intersect any of the following land cover classifications from New Hampshire Land Cover Classification (NHLCC) data: barren lands, orchard, other agricultural, hay/pasture or row crop, disturbed land, or other cleared lands.
3. Candidate sites less than five acres in size were excluded because the literature suggests that restoration is most likely to be successful when working in wetlands at least five acres in size. The Technical Advisory Group (TAG), composed of personnel from state agencies, the regional planning commission, and nonprofits, then further refined the candidate site list, removing and adding sites at their discretion.

Prioritization objectives assessed:

- Feasibility of restoration

Table 1. The site identification tool identifies suitable sites for wetland restoration based on the factors and data sources listed below.[1]

Factor used in analysis	Data source(s)
Must have a Cowardin classification of "partially drained/ditched," "diked/impounded," or "excavated"	NWI
Must have a land cover classification of "barren lands," "orchard," "other agricultural," "hay/pasture or row crop," "disturbed land," or "other cleared lands"	NHLCC (2001)
Must be larger than five acres in size	NWI

Site Prioritization Model: The NHDES WRAM calculated a final "prioritization score" for each of the 951 candidate sites by summing the Net Functional Benefit Score (weighted 70%), the Restoration Sustainability Score (weighted 20%), and the Landscape Position Score (weighted 10%). Based on its score relative to other sites, each candidate site was then ranked as "high priority," "priority," or "other candidate site."

Prioritization objectives assessed:

- Habitat quality
- Flood mitigation

- Groundwater supply
- Water quality
- Sustainability of restoration

Factor used in analysis	Data source(s)
Restoration Sustainability Score	See below
Landscape Position Score	See below
Restoration Sustainability Score	See below

Net Functional Benefit Score: Net Functional Benefit score was calculated based on the "NH Method," a well established tool used to evaluate 14 functions and values based on a set of parameters for each.[2,3] Of these 14 functions and values, the TAG selected those that could be readily measured using available GIS data to obtain five total parameters for this Net Functional Benefit analysis: ecological integrity, significant habitat, sediment trapping and nutrient potential, flood protection, and groundwater use potential. Each of these parameters was scored 0.1-1.0 using various parameter-specific GIS methods (see below) to obtain "existing condition" scores for each candidate site, each of which also ranged from 0.1-1.0. To calculate a "restored condition" score for each function/value, parameters determined by wetland ecologists to be amenable to restoration received a score of 1.0 and these parameters were added for each function/value. The Net Functional Benefit was calculated as the difference between the existing and restored condition scores, with additional weightings applied to account for additional functional benefits attributable to the size and density (number of NWI classes) of the site.[1]

Prioritization objectives assessed:

- Habitat quality
- Flood mitigation
- Groundwater supply
- Water quality

Table 2. NHDES calculated the Net Functional Benefit score based on the following factors and data.[1]

Factor used in analysis	Data source(s)
Significant habitat tool	See below
Ecological integrity tool	See below
Sediment trapping and nutrient potential tool	See below
Flood protection tool	See below
Groundwater use potential tool	See below
Size of candidate site	NWI
Density of candidate site (i.e., number of wetland classes present in the system	NWI

Restoration Sustainability Score: This tool prioritized sustainability of restoration for National Wetland Inventory (NWI) wetlands by scoring wetland sites higher for restoration sustainability where they were located in unfragmented landscapes, were located within conservation management areas, and had lower HUMAN2 score (Table 3). Sites with lower restoration sustainability scores are less likely to be sustainable over the long-term (e.g., those near urban areas), while those scoring higher are more likely to retain improvements in function over time (e.g., those located within conservation areas).

Prioritization objectives assessed:

- Sustainability of restoration

Table 3. NHDES assesses sustainability of restoration sites based on the following factors and data sources.[1]

Factor used in analysis	Data source(s)
Percentage of site located within unfragmented landscape	NHFG WAP unfragmented blocks classification
Magnitude of the site's HUMAN2 score	NHFG WAP peatlands, marshed250, and floodplain500 classifications; NH GRANIT
Is located within a conservation management area	Conservation/public lands database M-Status (1-3A) attribute

NHGRANIT = New Hampshire Geographically Referenced Analysis and Information Transfer System; NHFG WAP = New Hampshire Wildlife Action Plan

<u>Landscape Position Score:</u> NHDES's Technical Advisory Group included this tool in the analysis to reflect the importance of landscape position in selecting restoration sites. This tool rated wetland polygons higher that met the criteria listed in Table 4.

Prioritization objectives assessed:

- Habitat quality
- Flood mitigation

Table 4. NHDES evaluated sites for landscape position based on the factors and data sources listed below.[1]

Factor used in analysis	Data source(s)
Is located in or within 1000 ft of existing conservation easement or publicly owned tract of land	NH GRANIT
Is located in headwaters of its containing watershed (i.e., in the top 20% elevation for its containing subwatershed)	NH GRANIT

<u>Ecological integrity tool:</u> Ecological integrity is used as a measure of how well a wetland is buffered from human activity by the surrounding upland area. Sites with high ecological integrity scores are relatively undisturbed by human activity and provide suitable habitat for plant and animal communities. WRAM evaluates ecological integrity based on the 12 factors listed in Table 5.[1]

Prioritization objectives assessed:

- Habitat quality

Table 5. WRAM uses the following factors and associated data sources to assess ecological integrity.[1]

Factor used in analysis	Data source(s)
Percentage of candidate site with very poorly	NRCS soils data

drained soils and/or open water	
Dominant land use of the candidate site	NHLCC (2001)
Water quality of the watercourse, pond, or lake associated with the wetland	NHDES CALM
Ratio of the number of occupied buildings within 500 ft of the wetland edge	US Census
Percentage of original wetland filled	NHDES wetland permits
Percentage of wetland edge bordered by a buffer of woodland or idle land at least 500 ft in width (i.e., area of forest/idle land within 500 ft).	NHLCA (2001)
Percentage of wetland plant community actively altered by mowing, grazing, farming, or other activities (i.e., agricultural land within wetland site)	NHLCA; CWS GIS layer (combination of NRCS poorly and very poorly drained soils and NWI wetlands).
Percentage of wetland actively drained for agriculture or other purposes	NWI (modifiers 'x' and 'd')
Public road and/or railroad crossings per 500 ft of wetland	NHDOT Roads database
Long-term stability of the site	NHDES Dam; NWI (modifiers 'h,' 'x,' and 'b')

CWS = Composite Wetland System; NHLCA = New Hampshire Land Cover Assessment; NWI = National Wetland Inventory; NHDOT = New Hampshire Department of Transportation; NHDES CALM = Consolidated Assessment and Listing Methodology

Significant habitat tool: WRAM used two functional valuations from the NH method – Wetland Wildlife Habitat and Finfish Habitat – to assess individual NWI wetlands in terms of significant habitat. Eight wetland wildlife habitat factors were used (e.g., permanent shallow water, percentage wetland edge bordered by upland, etc.) as well as four finfish habitat factors (e.g., barriers to anadromous fish in streams associated with the wetland). In addition, the TAG uses Natural Heritage Bureau Exemplary Natural Plant Community data and habitat information from the 2006 Wildlife Action Plan (WAP) as factors in the analysis. These factors and associated data sources are provided in .[1]

Prioritization objectives assessed:

- Habitat quality

Table 6. WRAM uses the following factors and data sources used to assess significant habitat.[1]

Factor used in analysis	Data source(s)
Wetland Wildlife Habitat factors	
Score for ecological integrity	Data sources used to score the ecological integrity parameter (above)
Area of permanent shallow open water (less than 6.6 ft deep) associated with the wetland	NWI
Water quality associated with the watercourse, lake, or pond associated with the wetland	NHDES CALM
Wetland diversity found on the site	NWI

Dominant wetland class found on the site	NWI
Interspersion of vegetation class found on the site	NWI
Wetland juxtaposition (i.e., connectivity to other wetlands by a perennial stream or lake)	NWI
Percentage of wetland edge bordered by upland wildlife habitat (brush, woodland, active farmland, or idle land).	2001 NHLCA land use
Finfish Habitat factors	
Amount of forested land in watershed upslope of restoration site	USGS DEM; 2001 NHLCA forested land cover
Water quality associated with the watercourse, lake, or pond associated with the wetland	NHDES CALM
Barrier(s) to anadromous fish (dams, beaver dams, and road crossings) along the stream associated with the wetland	NH DES dams data; NHD and GRANIT Road Network culvert data; NWI modifiers ‘b’ and ‘h’.
Stream bank width	NHD Flowline stream order data
Natural Heritage Bureau Exemplary Natural Plant Communities	
Exemplary natural plant communities	NH Natural Heritage Bureau GIS database of exemplary natural plant communities
NHFG Wildlife Action Plan	
Sites located in a high ranking habitat	NHFG WAP GIS data for high ranking habitats; CWS GIS layer (combination of NRCS poorly and very poorly drained soils and NWI wetlands).
Is located within an unfragmented landscape	NHFG WAP GIS data for unfragmented landscapes; CWS GIS layer (combination of NRCS poorly and very poorly drained soils and NWI wetlands).

<u>Flood protection tool:</u> Flood protection is determined as the potential for a site to act as a natural flood control buffer. Factors used to assess flood protection are storage (e.g. the amount of water that the wetland can hold), the outlet flow rate, the percentage of the site located within a FEMA floodplain, and the dominant wetland class (Table 7).[1]

Prioritization objectives assessed:[1]

- Flood mitigation

Table 7. WRAM uses the following factors and associated data sources to assess flood protection.[1]

Factor used in analysis	Data source(s)
Upslope watershed area	USGS DEM
Wetland Control Length (i.e., restriction of outlet flow from wetland based on proximity to bridges, dams, and roads)	NHD waterbodies and flowlines
Flood zone area	FEMA/GRANIT
Dominant wetland class	NWI

Groundwater use potential tool: In WRAM, groundwater use potential represents the potential impact on ground water for each of the restoration sites and is modeled based on the factors listed in Table 8:[1]

Prioritization objectives assessed:[1]

- Groundwater supply

Table 8. WRAM uses the following factors and associated data sources to assess groundwater.[1]

Factor used in analysis	**Data source(s)**
Distance from existing public or private water supply wells	N/A
Distance from potential public or private water supply	N/A
Groundwater quality	NHDES CALM
Downstream distance between potential restoration sites and aquifers	N/A
Proximity to contaminated site	Mapped NHDES potential contamination sites (CSITE/CAREA layer).

Sediment trapping and nutrient potential tool: The NHDES WRAM Sediment Trapping and Nutrient Attenuation Tool scores each NWI wetland in terms of its ability to improve water quality. This is based on the opportunity to capture pollutants (e.g., average slope of contributing watershed), potential to capture sediment (e.g., riparian buffer width of the site), potential for nutrient attenuation (e.g., dominant wetland class) and sediment loading potential (e.g., soil erodibility of upslope drainage). Factors and data used by WRAM to calculate water quality improvement for a wetland site are listed in Table 9.[1]

Prioritization objectives assessed:

- Water quality

Table 9. WRAM uses the following factors and associated data sources to assess water quality.[1]

Factor used in analysis		**Data source(s)**
Opportunity to capture pollutants	Average slope of contributing watershed	N/A
	Potential sources for sediments and nutrients	N/A
Potential for capture of sediment	Floodwater storage potential	N/A
	Riparian buffer width of the site	N/A
	Dominant wetland class	N/A
	Area of impounded water	N/A
Potential for nutrient attenuation	Potential for sediment trapping	N/A
	Dominant wetland class	N/A
	Level 1 Assessment Unit (AU) score	NHDES

Sediment loading potential	Land use of upslope drainage	N/A
	Soil erodibility of upslope drainage	N/A

Validation of the landscape prioritization tool(s): NHDES does not validate its landscape prioritization outputs using rapid assessment/intensive methods because these methods are too costly and landscape prioritization tools are more accessible to stakeholders than rapid assessment/intensive methods.[2]

Prioritization products: NHDES published its Merrimack watershed prioritization methods and results in a final technical report titled "Merrimack River Watershed Wetland Restoration Strategy." The report is available online at: http://www.restorenhwetlands.com/pdf/finalreport/WatershedReport_final.pdf. Prioritization scores and ranking for each of the 951 candidate sites are provided as an appendix to the WRAM report (Figure 2).

Appendix D: Model Outputs

Candidate Site	Site Acreage	NWI Classes	Average Site Elevation	Site Watershed Acres	Percent Unfragmented	HUC-10 Watershed Name	Existing FVI Score	Restored FVI Score	Normalized & Weighted NFB	Weighted FVI Score	Sustainability Score	Landscape Position Score	Total Prioritization Score	Category
1	5.7	1	123.2	2297.7	0.22	Merrimack River-Nashua River to Shawsheen River	2.4	3.2	2.4	2.4	4.5	0.0	6.9	Other
2	8.0	1	141.8	14.5	0.69	Merrimack River-Nashua River to Shawsheen River	3.2	3.6	1.5	1.5	5.4	0.0	6.8	Other
3	7.5	1	247.1	79.8	0.62	Merrimack River-Nashua River to Shawsheen River	2.7	3.3	2.7	2.7	5.7	0.0	8.4	Other
4	11.8	5	126.3	980.8	0.50	Merrimack River-Nashua River to Shawsheen River	3.0	3.3	2.5	2.5	4.6	5.0	12.1	Priority
5	101.6	14	134.9	676.3	0.79	Merrimack River-Nashua River to Shawsheen River	3.1	3.7	70.0	70.0	6.9	10.0	86.9	High Priority
6	24.1	5	123.8	1069.5	0.79	Merrimack River-Nashua River to Shawsheen River	2.6	3.4	12.8	12.8	6.6	5.0	24.4	High Priority
7	13.3	3	120.6	3490.7	0.36	Merrimack River-Nashua River to Shawsheen River	3.0	3.2	1.5	1.5	2.9	5.0	9.4	Other
8	21.8	2	145.3	122.9	0.63	Merrimack River-Nashua River to Shawsheen River	3.4	3.8	5.6	5.6	5.7	5.0	16.3	High Priority
9	15.5	5	189.8	195.1	0.52	Merrimack River-Nashua River to Shawsheen River	2.8	3.4	7.1	7.1	4.5	5.0	16.7	High Priority
10	7.6	2	132.8	75.0	0.66	Merrimack River-Nashua River to Shawsheen River	2.7	3.5	3.8	3.8	5.3	5.0	14.1	Priority
11	37.3	4	124.6	131.2	0.78	Merrimack River-Nashua River to Shawsheen River	3.7	4.1	10.4	10.4	6.0	5.0	21.4	High Priority
12	8.0	5	189.5	352.6	0.05	Merrimack River-Nashua River to Shawsheen River	2.5	3.2	3.9	3.9	1.4	5.0	10.3	Other
13	5.6	1	201.8	19.1	0.00	Merrimack River-Nashua River to Shawsheen River	2.6	3.5	2.8	2.8	1.5	0.0	4.3	Other
14	35.1	5	163.5	281.1	0.89	Merrimack River-Nashua River to Shawsheen River	2.7	3.4	17.1	17.1	8.3	5.0	30.4	High Priority
15	19.4	4	188.2	417.8	0.59	Merrimack River-Nashua River to Shawsheen River	2.4	3.1	8.9	8.9	5.0	5.0	18.9	High Priority
16	22.2	3	123.6	77.2	0.81	Merrimack River-Nashua River to Shawsheen River	3.6	4.0	5.8	5.8	6.1	5.0	16.9	High Priority
17	7.1	3	125.7	2833.0	0.00	Merrimack River-Nashua River to Shawsheen River	2.7	3.3	2.6	2.6	0.5	0.0	3.1	Other
18	5.0	3	948.2	317.6	0.74	Souhegan River	2.8	3.4	1.7	1.7	14.2	5.0	20.9	High Priority
19	6.1	3	116.6	690.6	0.43	Merrimack River-Nashua River to Shawsheen River	2.9	3.2	1.3	1.3	3.5	0.0	4.8	Other
20	7.2	1	123.7	31.3	0.61	Merrimack River-Nashua River to Shawsheen River	3.2	4.1	3.2	3.2	4.8	5.0	13.0	Priority
21	24.6	4	145.6	1610.1	0.00	Merrimack River-Nashua River to Shawsheen River	3.0	3.4	6.2	6.2	0.4	0.0	6.6	Other
22	11.2	1	180.3	790.3	0.96	Merrimack River-Nashua River to Shawsheen River	3.2	3.4	1.0	1.0	11.3	5.0	17.3	High Priority
23	13.9	3	326.7	111.8	1.00	Merrimack River-Nashua River to Shawsheen River	3.5	3.6	1.2	1.2	9.4	5.0	15.7	Priority
24	14.1	2	123.7	651.0	0.41	Merrimack River-Nashua River to Shawsheen River	2.4	3.0	5.3	5.3	3.3	5.0	13.7	Priority
25	8.0	2	150.0	2227.6	1.00	Merrimack River-Nashua River to Shawsheen River	3.0	3.3	1.5	1.5	9.5	5.0	16.0	Priority
26	5.7	2	134.7	925.2	0.56	Merrimack River-Nashua River to Shawsheen River	2.7	3.5	2.8	2.8	5.4	5.0	13.2	Priority
27	6.7	1	179.0	12.5	0.00	Merrimack River-Nashua River to Shawsheen River	3.0	3.6	2.2	2.2	1.5	0.0	3.6	Other
28	10.0	4	943.6	1068.1	0.90	Souhegan River	2.9	3.5	3.6	3.6	15.3	5.0	23.9	High Priority
29	5.8	1	143.7	261.8	0.49	Merrimack River-Nashua River to Shawsheen River	2.6	3.5	3.0	3.0	4.4	5.0	12.4	Priority
30	17.1	4	153.9	1173.3	0.38	Merrimack River-Nashua River to Shawsheen River	2.9	3.3	4.9	4.9	3.7	5.0	13.6	Priority
31	15.1	2	136.6	729.0	0.60	Merrimack River-Nashua River to Shawsheen River	3.1	3.5	3.6	3.6	5.3	0.0	9.0	Other
32	5.1	1	212.9	135.8	1.00	Merrimack River-Nashua River to Shawsheen River	2.6	3.1	1.7	1.7	8.6	5.0	15.3	Priority
33	5.1	2	154.8	2195.1	0.00	Merrimack River-Nashua River to Shawsheen River	2.4	3.2	2.4	2.4	0.4	0.0	2.8	Other
34	11.3	3	124.2	200.2	0.80	Merrimack River-Nashua River to Shawsheen River	2.2	2.9	5.2	5.2	6.8	5.0	17.0	High Priority
35	6.3	1	249.0	50.7	0.00	Merrimack River-Nashua River to Shawsheen River	2.4	3.2	2.6	2.6	1.5	0.0	4.1	Other
36	10.7	1	163.5	1054.6	0.62	Merrimack River-Nashua River to Shawsheen River	2.6	3.6	5.8	5.8	5.6	5.0	16.4	High Priority
37	6.2	1	235.5	32.3	0.00	Merrimack River-Nashua River to Shawsheen River	3.0	3.4	1.4	1.4	1.5	0.0	2.8	Other
38	30.3	6	153.5	407.7	0.89	Merrimack River-Nashua River to Shawsheen River	2.8	3.3	10.5	10.5	7.5	5.0	23.0	High Priority
39	27.2	1	145.6	533.6	0.89	Merrimack River-Nashua River to Shawsheen River	3.0	3.4	6.5	6.5	7.3	0.0	13.7	Priority
40	23.1	5	133.7	110.9	0.53	Merrimack River-Nashua River to Shawsheen River	3.9	4.2	4.0	4.0	4.5	5.0	13.5	Priority
41	5.6	1	140.0	35.8	0.05	Merrimack River-Nashua River to Shawsheen River	3.2	3.9	2.0	2.0	1.0	0.0	3.1	Other
42	21.3	4	210.9	731.7	0.92	Merrimack River-Nashua River to Shawsheen River	2.9	3.4	6.9	6.9	11.5	10.0	28.4	High Priority
43	14.4	6	932.8	644.5	0.73	Souhegan River	2.4	3.3	8.8	8.8	6.5	5.0	20.3	High Priority
44	7.0	2	154.8	130.8	1.00	Merrimack River-Nashua River to Shawsheen River	3.5	3.6	0.6	0.6	10.1	5.0	15.7	Priority
45	9.9	1	163.8	91.6	1.00	Merrimack River-Nashua River to Shawsheen River	3.5	4.0	2.5	2.5	11.2	5.0	18.7	High Priority

Figure 2. In the Merrimac River Watershed report, the NHDES Site Prioritization Tool output is a table listing various statistics for each candidate site, including scores for NFB, sustainability, and landscape position as well as a total prioritization score and category (e.g., “priority,” “high priority”)

IMPLEMENTATION

Regulatory/non-regulatory programs:

- Section 404 wetland compensatory mitigation:
  - Because the tool prioritizes the functional uplift expected to be achieved for specific functions, it can be used to inform site selection for compensatory mitigation for specific functions. For example, by prioritizing functional uplift, the tool could be used to help states enhance economic, water quality, and wildlife functions through compensatory mitigation.[2]
  - NHDES's Aquatic Resource Mitigation (ARM) Fund ILF program. NHDES encourages non-profit and local communities seeking funds through the ARM ILF to use these outputs to plan their project site selection. One way that NHDES does this is by favoring ARM proposals that target sites identified as priorities by the WRAM tool.[2,4]

Transferability:

- The WRAM is a particularly good model for states in the northeast that share much of the same GIS data as NHDES.[2]

Data gaps:

- A lack of forested wetland data provided in New Hampshire's State Wildlife Action Plan. The net functional benefit, restoration sustainability, and landscape position tools are all limited by their dependence on NWI and NHD data to serve as base maps. NWI and NHD are not comprehensive data sources.[2]

Barriers:

- Technical capacity.[2]
- Functional capacity.[2]
- Political will.[2]
- Funding.[2]
- Because property rights is such a sensitive issue in New Hampshire, NHDES does not specifically identify anyone's property using the tool and is very thorough in obtaining permission from landowners before accessing private property.[2]

Future goals:

- Over the next five years, NHDES would like to see applicants to the ILF program increasingly use the WRAM tool to identify areas for wetland restoration to ensure that quality projects are funded.[2]
- One obstacle to meeting this goal might be that potential users may lack data visualization resources (e.g., ArcGIS) to view the results of WRAM.[2]
- Another obstacle is that priorities may not necessarily be accepted by everyone. For example, land trusts using the results may have conflicting missions and, for some, aquatic resources are less of a priority.[2]
- Funding is NHDES's fundamental requirement for meeting future goals, with associated needs being training, data, time, and staff.[2]

[1] Vanasse Hangen Brustlin, Inc. 2009. Merrimack River Watershed Restoration Strategy. Prepared for New Hampshire Department of Environmental Services.

[2] Interview on 8/19/2011 with Collis Adams and Lori Sommer, NHDES Wetlands Bureau.

[3] Further information for the "NH Method" can be found in *Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire* (Ammann and Lindley-Stone, 1991).

[4] However, for the purpose of ILF project selection, WRAM will soon be replaced with another model specifically designed to identify priorities for the ILF program. Compared to WRAM, the ILF model will be less a series of operations in ArcGIS and more a desktop GIS approach to processing information. NHDES is currently collaborating with other agencies/organizations, including New Hampshire Fish and Game (NHFG) and The Nature Conservancy (TNC), among others, to develop the ILF model.