PUBLIC NOTICE

US Army Corps of Engineers®
New England District

696 Virginia Road
Concord, MA 01742-2751

Date: January 31, 2012
Comment Period Ends: March 2, 2012
File Number: NAE-2005-1142
In Reply Refer To: Ruth M. Ladd
Or by e-mail: ruth.m.ladd@usace.army.mil

The District Engineer of the New England District, Corps of Engineers ("Corps") has received a draft instrument dated January 2012 for an In-Lieu Fee ("ILF") Program covering the State of New Hampshire. This is an existing ILF Program and the draft instrument which, when finalized, is intended to bring it into compliance with 33 CFR 332, Compensatory Mitigation for Losses of Aquatic Resources ("Mitigation Rule"). The Mitigation Rule was published in the Federal Register on April 10, 2008.

SPONSOR: New Hampshire Department of Environmental Services, Wetlands Bureau, 29 Hazen Road, Concord, NH 03301

If the draft instrument is deemed sufficient, the revised ILF program will be established through the development of a final ILF instrument to be signed by the sponsor, the Corps, and other agencies which choose to do so. The process will follow the Mitigation Rule.

The proposed revised ILF program would continue to provide an alternative to permittee-responsible mitigation if it is deemed appropriate during the review process to be used to compensate for proposed unavoidable impacts authorized under Section 404 of the Clean Water Act ("Section 404") and Section 10 of the Rivers and Harbors Act of 1899 ("Section 10"). The entire draft instrument, entitled **"New Hampshire Aquatic Resource Mitigation Fund, Draft In-Lieu Fee Program Instrument,"** is attached to this Public Notice.

The decision whether to authorize the sponsor to proceed to the next step of developing a final ILF instrument will be based on the District Engineer's ("DE") determination of the potential of the proposed revised ILF program to provide compensatory mitigation for activities authorized by Department of the Army permits.

The Corps of Engineers is soliciting comments from the public: federal, state, and local agencies and officials, Indian Tribes, and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to allow the sponsor to proceed to develop a final ILF instrument. Comments are also used to determine the need for a public hearing.

In order to properly evaluate the proposal, we are seeking public comment. Anyone wishing to comment is encouraged to do so. **Comments should be submitted in writing by March 2, 2012.** If you have any questions, please contact Ruth M. Ladd at (978) 318-8818 or (800) 343-4789.

The initial determinations made herein will be reviewed in light of facts submitted in response to this notice. All comments will be considered a matter of public record. Copies of comment letters will be forwarded to the sponsor and the Interagency Review Team consisting of representatives of the Corps, Environmental Protection Agency, US Fish and Wildlife Service, and National Marine Fisheries Service.

For more information on the New England District Corps of Engineers programs, visit our website at http://www.nae.usace.army.mil.

THIS NOTICE IS NOT AN AUTHORIZATION TO DO ANY WORK NOR DOES THE IN-LIEU FEE PROGRAM, IF APPROVED, PREJUDGE FUTURE DEVELOPMENT PROJECTS WITHIN THE SERVICE AREA.

JENNIFER L. MCCARTHY
Chief, Regulatory Division

If you would prefer not to continue receiving Public Notices, please contact Ms. Tina Chaisson at (978) 318-8058 or e-mail her at bettina.m.chaisson@usace.army.mil. You may also check here ( ) and return this portion of the Public Notice to: Bettina Chaisson, Regulatory Division, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751.

NAME: _____
ADDRESS: _____

New Hampshire Aquatic Resource Mitigation Fund
Draft In-Lieu Fee Program Instrument
January, 2012

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I. INTRODUCTION

This instrument will continue the operation of New Hampshire's In-Lieu Fee (ILF) program, the Aquatic Resource Mitigation Fund (ARM Fund) operated by the New Hampshire Department of Environmental Services Wetlands Bureau (NHDES) pursuant to 33 CFR Parts 325 and 332 known as the federal "Mitigation Rule." This agreement supersedes the following agreement governing NHDES operations:

- Memorandum of Understanding (MOU) Between NH Department of Environmental Services and the US Army Corps of Engineers, New England District which can be found at: http://des.nh.gov/organization/divisions/water/wetlands/documents/in_liew_fee_agree.pdf

Upon execution of this agreement, the MOU, as referenced above, becomes null and void and any requirements contained therein are no longer applicable. The signatories to this instrument recognize that cooperation between and among the US Army Corps of Engineers, New England District (Corps), US Environmental Protection Agency (USEPA), US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and NHDES is critical to the continued development of high-quality mitigation and are committed to continue efforts that have been on-going since adoption of the ARM Fund program in 2006.

The purpose of this instrument is to establish guidelines, responsibilities and standards for the establishment, use, operation and maintenance of the ARM Fund in a way that brings the existing mitigation program into compliance with the Federal Mitigation Rule. NHDES has required compensatory mitigation since 1990 and adopted specific rules in 2004 detailing mitigation thresholds and requirements. The New Hampshire Legislature passed a law in 2006 establishing the ARM Fund. Shortly after program adoption, a Memorandum of Understanding between NHDES and the Corps was signed which established the procedures and guidelines for coordinating compensatory mitigation requirements for permits issued by the Corps. The NHDES statute describes the operation of the program and the mechanism that allows NHDES to receive funds for wetland impacts and disburse deposits in a fashion to maximize environmental benefits from the pooled funds.

This instrument establishes the NHDES as the qualified ILF program sponsor and administrator for the ARM Fund program. The NHDES will work with the Corps to ensure that requirements for aquatic resource compensation are being met and acknowledges that ultimately it is solely responsible for providing compensatory mitigation for projects which have paid into the ARM Fund.

II. STATEMENT OF PROGRAM NEED

Compensation for unavoidable wetland impacts has been a part of the NHDES program since the mid 1980s and now serves as a critical program to address impacts under the federal Clean Water Act (CWA), Sections 401 and 404 which result in the discharge of dredged or filled materials within "waters of the U.S." and the federal Rivers and Harbors Act Section 10 for structures or work in or affecting navigable water in the U.S. as administered by the Corps. Under the Corps General Permit (GP) for New Hampshire, compensatory mitigation for proposed wetland dredge and fill impacts has been required for projects having more than 10,000 square feet of wetland impact, and for minor projects when deemed appropriate by the Corps, to comply with federal standards. In March 2004, the NHDES wetlands program first adopted a set of mitigation rules establishing the requirements for wetland compensation. Among other things, the rules specified ratios for wetland creation, restoration, enhancement and preservation of aquatic resources and adjacent upland buffers relative to the type of wetland lost through the proposed development. During the 2006 legislative session, the General Court enacted Senate Bill 140, known as Aquatic Resource Compensatory Mitigation. These provisions are codified at RSA 482-A:28 through RSA 482-A:33 and are found at: http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-L-482-A.htm. The law creating the ARM Fund ILF program became effective on August 18, 2006 and the NHDES adopted implementing rules effective on June 20, 2007. See Env-Wt 100-900 administrative rules at:

http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wt100-900.pdf

A regulatory program that includes an ILF program provides for greater protection of ecologically valuable parcels that are identified through scientific analysis, planning, and incorporation of priorities on a watershed scale. ILF projects offset impacts by identifying larger, more environmentally valuable parcels that can result in a suite of functions being restored and/or protected. The NHDES ARM Fund program recognizes the potential for long-term environmental results from wetland mitigation that considers watershed goals, assists conservation efforts in recognizing green infrastructure plans of a municipality or region, and has the ability to target important and vulnerable wetlands in a region.

Participation in the ARM Fund program is optional for wetland permit applicants. Since its adoption in August, 2006, 53 applicants have used this form of mitigation and these funds have been used for 18 projects that restore, enhance, and preserve aquatic resources and upland buffers. This program has been very successful for permit applicants and has resulted in many significant wetland preservation and restoration projects across the state. Appendix A provides a detailed list of projects funded by the ARM Fund as of June, 2011. By consolidating resources and utilizing scientific expertise, the program provides applicants an appropriate mitigation option for offsetting unavoidable impacts in a timely manner.

III. GOALS AND OBJECTIVES

The primary goal of the ARM Fund is to provide sustainable compensatory mitigation for functions of waters and wetlands of the U.S. that are lost due to authorized impacts. While restoration of wetland functions are preferred, due to the limited number of sustainable options, often preservation of upland buffers and enhancement are a large part of the compensatory mitigation program in New Hampshire.

This instrument addresses the procedures and guidelines for coordinating compensatory mitigation requirements for permits issued by the Corps in the State of New Hampshire under Section 401 and 404 of the Clean Water Act (33 USC 1344) and Section 10 of the Rivers and Harbors Act (33 USC 403) and the NHDES wetlands program (RSA 482-A). The ARM Fund may be utilized for permit actions involving (a) Corps General Permits, (b) NHDES permits, (c) Corps and NHDES individual permits, and (d) other cases as may be agreed upon by the NHDES and the Corps. The ILF program proposed in this Instrument shall be referred to as the "ARM Fund" for the convenience of the parties, but this Instrument shall not be deemed to establish or qualify as a trust under state or federal law.

The overall goal of the program is to advance the conservation goals and objectives as described specifically in Section VII, D.

IV. INTERAGENCY REVIEW TEAM

The Interagency Review Team (IRT) is chaired by the District Engineer (DE) of the Corps. Membership includes representatives of the USEPA, USFWS, and NMFS. The primary role of the IRT is to evaluate mitigation plans, assist the DE in the review of monitoring reports, recommend remedial measures, approve credit releases, and approve modifications to this instrument, including approving additions of projects proposed for funding by the ARM Fund. The IRT's role and responsibilities are more fully set forth in Sections 332.8 of the Federal Mitigation Rule. The IRT will work to reach consensus on its actions.

The parties to this agreement intend that the members of the IRT will review such documents and mitigation sites as each considers necessary to provide meaningful input, and provide any recommendations, concerns, or potential improvements concerning the implementation of the ARM Fund to the NHDES. Comments on the use of the ARM Fund to provide compensatory mitigation for individual permits and authorizations will be made during the permit review process for each permit.

V. QUALIFICATIONS OF SPONSOR

The mission of the NHDES is to help sustain a high quality of life for all citizens by protecting and restoring the environment and public health in New Hampshire. The protection and wise management of the state of New Hampshire's environment are important goals of the Department. The Department's responsibilities range from ensuring high levels of water quality for water supplies, ecological balance, and recreational benefits, to regulating the emissions of air pollutants, to fostering the proper management of municipal and industrial waste, to managing water resources for future generations.

The first ARM Fund payment was received in January 2007 and, after accounts sufficiently accumulated, one watershed region was advertised for grant proposals in 2009 and six were advertised in 2010. As of June 17, 2011, 56 projects have utilized the in-lieu fee option. A total of $6,256,607 of funds has accumulated in 11 watersheds with a total of 49.5 acres of wetlands loss from those 56 projects.

The funds have been used for wetland and stream restoration and enhancement projects including projects in which protective easements were placed on the properties to ensure their long term protection. Several projects involved solely the acquisition of the development rights through fee simple purchase or completion of a conservation easement. For the funded projects, the totals gained are noted in Table 1, which also shows the associated total of Corps credits achieved. Corps stream credits are unit-less but are based on linear feet, wetland credits gained are also unit-less but are based on acreage.

TABLE 1. Total Net Gain and Corps Credits from ARM Fund, 2007-2011.

Compensation Type	Total Net Gain	Corps Credit Gain
Wetland Restoration	1.91 acres	1.40
Tidal enhancement	0.08 acres	0.01
Stream restoration	1,974 lin.feet	987
Stream enhancement	26,322 lin. feet	5,908.26
Wetland Enhancement	83.95 acres	5.28
Preservation	3,445.5 acres	70.00

It should be noted that for the 14 projects awarded $2,079,011 funds in 2010, a total of an additional $6,573,928.00 was leveraged for the completion of these projects. This collaboration with other funding sources to achieve restoration, enhancement and protection of high priority sites has made the ARM Fund an integral funding source for many conservation projects. The success of projects is driven by assembling funds for project completion. Table 2 summarizes state permits issued, acres lost and acres mitigated through permittee-responsible mitigation and ARM Fund options. In light of the program's proven success over the past five years of operation, it is proposed that the program be continued and that NHDES remain as its sponsor.

The summary information on resource gain is quantitative and does not include information about the quality of the mitigation efforts. ARM Fund projects are difficult to summarize since there is usually a two year delay between when an applicant gets a permit and when a site is protected or restored. In addition, more state-authorized projects are still being done through the permittee-responsible option rather than through payment into the ARM Fund. The latter approach results in the compensation taking place in the same town as the impacts rather in the larger watershed. A description of each year's accomplishments is noted in annual reports. The 2010 report can be found at:
http://des.nh.gov/organization/divisions/water/wetlands/wmp/documents/arm_ann_report.pdf

TABLE 2. Summary of NH Wetland Permits, Acres Lost and Acres Mitigated.

	2007	2008	2009	2010
Number of NH Standard Permits	840	600	550	500
Total Acres Filled	100	61	73	70
Number of Permittee Resp. Projects	27 (48 acres)	38 (22 acres)	20 (42 acres)	21 (35 acres)
Number of ARM Fund Projects	9 (4 acres)	10 (5 acres)	14 (6 acres)	8 (15 acres)
Wetland Loss with No Mitigation	48 acres, 50%	34 acres, 55%	25 acres, 35%	20 acres, 30%
Preservation Done as Mitigation; Permittee Responsible and ARM Fund	1600 acres	1270 acres	2000 acres by permittee responsible/ 1077 acres by ARM Fund	770 acres by permittee responsible/ 326 acres by ARM Fund
Restoration and Enhancement as Mitigation; Permittee Responsible and ARM Fund	45 acres	4 acres	4 acres by permittee responsible/ 2 acres by ARM Fund	10 acres by permittee responsible/ 14.1 acres by ARM Fund

VI. NH IN-LIEU FEE PROGRAM DESCRIPTION AND OPERATION

A. Establishment and Operation

The New Hampshire ARM Fund has been created as one of several compensatory mitigation options available to applicants for impacts to wetlands and other aquatic resources. This mitigation option is available for use after avoidance and minimization of impacts to these aquatic resources has been achieved. State rules and federal regulations recognize that ILF programs may be the environmentally preferable option over other mitigation forms and establish that an ILF payment may be required as a condition of a permit approval. When required, the compensatory mitigation project must be commensurate with the amount and type of impact occurring and replace the lost functions and values at an equal or greater value.

NHDES has developed a more comprehensive approach to mitigation by using the New Hampshire Fish and Game (NHFG) Wildlife Action Plan (WAP) and other available plans to create an effective decision-making framework. The state WAP is a strategic blueprint that can guide wildlife and habitat conservation on public and private lands and waters. The WAP can be used as a guide for mitigation because its focus is on habitat and it contains a provision for public involvement and regular updating with new information. The most comprehensive of the habitat maps in the WAP can serve as a guide to the areas that should be avoided in infrastructure construction projects and areas that could contribute to conservation goals. The NH WAP identifies 123 species of greatest conservation needs and provides species profiles and habitat needs. Appendix B provides detailed information on the analysis developed for the WAP highest ranked wildlife habitats by ecological condition. The WAP can be found at:

http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm. In addition to the WAP, Appendix C cites other federally recognized, state-based plans used for important conservation information that can be useful in guiding mitigation decisions.

The NHDES mitigation program involves a strategic process of saving natural habitat by directing development away from sensitive areas and using ARM Fund payments in a targeted and effective way. This attempts to accomplish restoration, enhancement and preservation on a watershed or landscape scale that would not otherwise happen. The use of the WAP in the review criteria provides information that enables the allocation of ARM fund grants to important restoration and conservation ecosystems that will be resilient to climate change and to other development pressures. Use of this information can lead to decisions that provide stronger, long-term protection for whole watersheds and other natural systems for their multiple benefits.

Administrative Procedures

NHDES staff administers the ARM Fund grant program. A Site Selection Committee (SSC) assists in guiding the program operations and makes project funding recommendations. Members of the SSC include representatives from the following agencies and non-governmental organizations:

NH Department of Environmental Services
NH Fish & Game Department
NH Office of Energy and Planning
The Nature Conservancy
NH Department of Resource and Economic Development, Natural Heritage Bureau
NH Assoc. of Conservation Commissions
NH Assoc. of Natural Resource Scientists
Society for the Protection of NH Forests

The SSC determines its own rules and order of business and keeps minutes of its proceedings. Standard Operating Procedures have been developed to guide the Committee in its actions (See Appendix D). Committee members must disclose any interest in a proposed ARM Fund project or any adjacent properties affected by an ARM Fund project and recuse themselves from voting on those matters if they have a conflict of interest as defined in the SSC Conflict of Interest Policy (See Appendix E). This provision does not prevent a department or agency from officially supporting any specific request. SSC meeting minutes are public records maintained at the NHDES offices, and are open for inspection upon request submitted to NHDES and/or the Corps. No recommendation of the SSC is valid unless there is a motion supported by a majority of the members of the Committee.

The SSC uses criteria to evaluate each project so all projects within a service area can be compared with one another. The criteria include items that address the proximity of the proposed project to impacts (debits), proximity to other protected resources, ability to replace or protect functions lost by the projects that generated the funds, overall environmental benefit, proximity to WAP highest quality wildlife habitat, potential to improve or protect rare or endangered species and habitats, cost-effectiveness and partnership potential. The quality of the program, however, is dependent on good application submittals.

The SSC also evaluates proposals based on site suitability, likelihood of mitigation project success, maximizing the environmental benefit of ILF funds expended, relative value of the natural resource type(s) involved, and, in the case of preservation, the relative threat of degradation of the proposed site. Other criteria used to evaluate proposals, if the information is available, include whether the project has the ability to address multiple functions, supports a regional conservation initiative(s), is compatible with the surrounding landscape, or involves collaboration with multiple sources. These evaluation criteria are described in more detail below.

The Corps, in coordination with the IRT, reviews all projects proposed to be funded. Projects are advertised for public comment in a 30-day Public Notice. Proposals recommended for funding are forwarded to the IRT for final approval. The NH Wetlands Council, established by statute, provides state oversight of the ARM Fund program by assisting in rule-making and approves the annual report prepared

by the Program Administrator to be provided to the Corps, other federal agencies, and the legislature. The NH Council and the Corps reviews the recommendations provided by the SSC and IRT. The Corps and the NH Wetland Council must issue approval of the projects to be funded. The Governor and Executive Council must issue final approval for funds to be disbursed and has approved all projects submitted for funding as of January, 2012.

B. Geographic Service Areas

During the creation of the NHDES ARM Fund program, geographic service areas were selected roughly according to the US Geological Survey's Hydrologic Unit Code (HUC) 8-digit watershed scale. The watershed area map can be found at:
http://des.nh.gov/organization/divisions/water/wetlands/wmp/documents/huc8_map.pdf

At the time of program adoption, many stakeholders were consulted and meetings held to create the program framework. These discussions included local, state, and federal agencies as well as conservation organizations, business groups and wetland scientists to develop the program and draft administrative rules for its operation. The collective group determined that scaling the program at the HUC 8 watershed level would enable it to address several important criteria: the program would consider a watershed approach, planning efforts would generally follow HUC 8 watershed areas, and the areas would not be too small, so funds would be effectively collected in amounts that could be put towards good projects. In addition, it was the consensus of the group that the areas should not be too large, which could lead to funded projects too distant from the impact areas that generated the funds.

During the preparation of this Instrument, the HUC 8 watershed areas were reviewed by the SSC and other stakeholders. It was noted that 8 of the 16 watersheds had accumulated funds enough to warrant a release of funds through competitive grant processes, 3 had accumulated less than $100,000 and 5 had received no payments to date. With this in mind, the existing watershed areas were modified by combining areas that were similar in geographic area, climate, historic and current development practices. These grouped watersheds are called "service areas". While the geographic service area for the program as a whole is the State of New Hampshire, the service areas for permitted impacts will be broken into nine major river basin areas, organized as modified HUC 8 areas, as shown in Figure 1. As noted above, the proximity of proposed projects to impact areas is taken into consideration during project review, hereby minimizing the likelihood that impacts will be compensated for at a great distance. Mitigation will be performed in the same service area in which the impact occurs unless the Corps, in consultation with the IRT, has agreed to an alternative. In the event that the NHDES cannot provide the mitigation in the impacted service area through the granting process and the responsibility for satisfying the permit conditions has been accepted by the NHDES, then any additional mitigation requirements will be the responsibility of the NHDES.

C. Determination of Fees and Credits

1. Fees

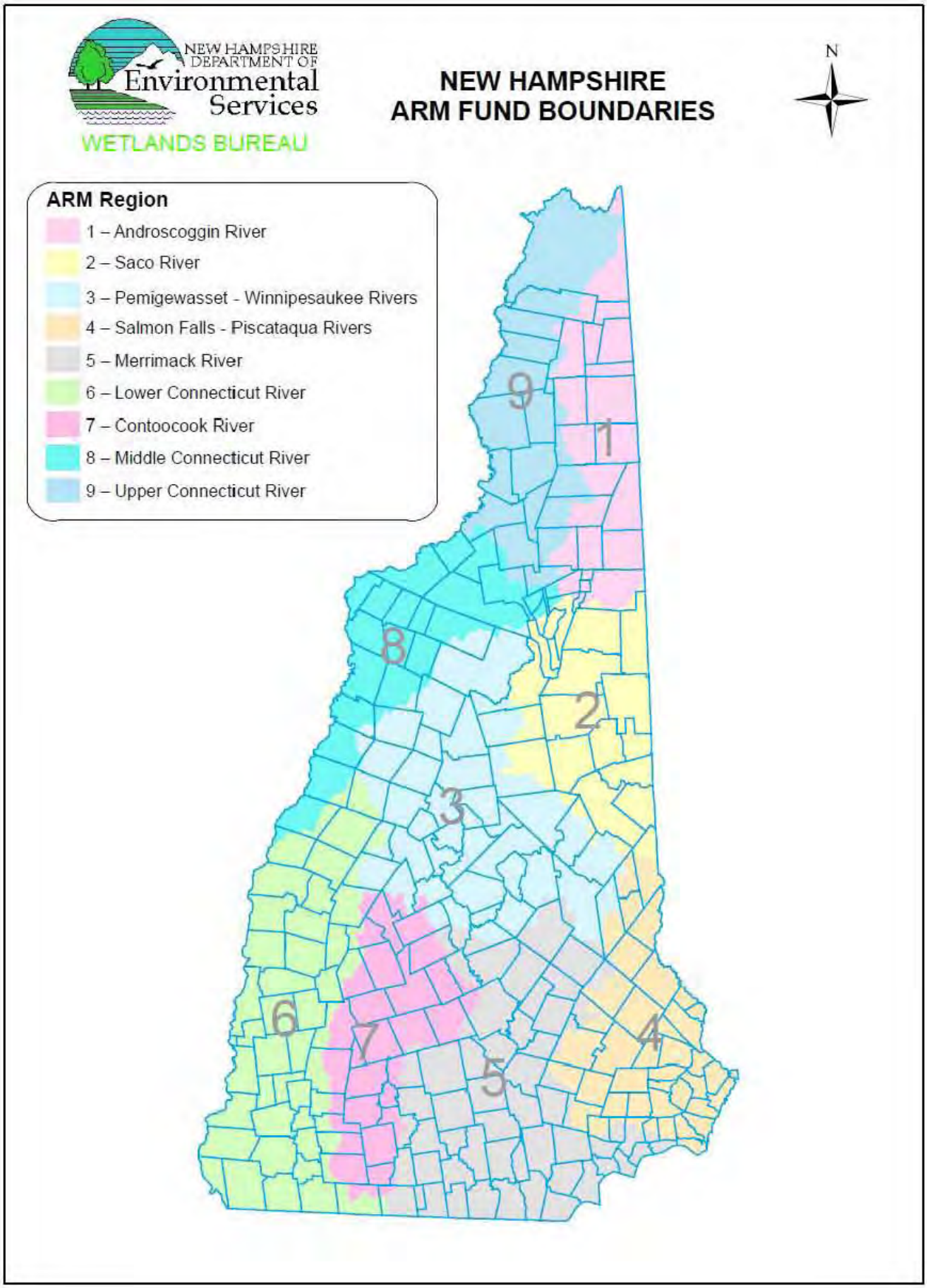
NHDES will generally determine the amount of an ARM Fund payment required from permittees. The payment for wetland impacts is calculated by NHDES summing the following items:

1) The cost that would have been incurred if a wetland of the same type were constructed pursuant to the ratios listed in Table 800-1 in the NHDES administrative rules Env-Wt 100-900, based on a price of $65,000 per acre set in 2006 of wetland created, adjusted according to the annual simple rate of interest on judgments established by RSA 336:1,II;
2) The area of wetlands that would need to be constructed, pursuant to the ratios listed in Table 800-1, times the cost of land where the impact is occurring as calculated by the assessed land values derived from the NH Department of Revenue Administration equalization survey (in which land values are divided by the number of acres in each municipality to yield a per acre

equalized land value); and

3) An administrative cost that is not less than 10% and not to exceed 20% of the sum of (1) and (2) above.

FIGURE 1. NHDES ARM Fund Service Area Boundaries as Revised in 2012.



The payment for stream or watercourse impacts is calculated by summing the following items:

1) The cost that would have been incurred if a stream of the same type were restored pursuant to the ratios adopted by the department, based on a price of $200 per linear foot of channel and/or bank impacts to be adjusted according to the annual simple rate of interest on judgments established by RSA 336:1, II; and
2) An administrative cost that is not less than 10% and not to exceed 20% of (1).

DES maintains an "ARM Fund Fact Sheet" for distribution to the general public, explaining the in-lieu fee program and specifically outlining the cost structure to participate in the program. This fact sheet can be found at: http://des.nh.gov/organization/commissioner/pip/factsheets/wet/documents/wb-17.pdf
In addition, the ARM Fund calculator can be accessed on the DES website for applicants to auto-calculate their payment in order to obtain an understanding of the potential mitigation costs for their project. The calculation tool for determining a payment amount can be accessed at the NHDES web site at: www.des.nh.gov.

Occasionally the Corps may deem it appropriate to require additional payment to adequately compensate for direct and secondary impacts of a project. If this occurs, these additional funds will be accepted in the ARM Fund for the applicant to achieve a state and federal permit.

2. Credits

Credits from ARM Fund projects will be calculated by the Corps using the New England District Mitigation Guidance document in effect as of December 31 of the year the grants are approved. The ratios as of January 1, 2011 are shown in Table 3.

TABLE 3. Recommended Compensatory Mitigation Ratios for Direct Permanent Impacts.

RESOURCE TYPE	Restoration (reestablish-ment)	Creation (establishment)	Enhancement (rehabilitation)	Preservation (protection/ management)
Emergent (ac) Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1	15:1
Scrub-shrub (ac) Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1	15:1
Forested (ac) Wetlands (ac)	2:1 to 3:1	3:1 to 4:1	5:1 to 10:1	15:1
Open Water (ac)	1:1	1:1	project specific	project specific
Submerged Aquatic Vegetation (ac)	5:1	project specific	project specific	N/A
Streams (lf)	2:1	N/A	3:1 to 5:1	10:1 to 15:1
Mudflat (ac)	2:1 to 3:1	2:1 to 3:1	project specific	project specific
Upland (ac)	>10:1	N/A	project specific	15:1

Credits for each funded project will be calculated by the Corps based on the amount of mitigation achieved, the total project cost, amount of ARM Funds applied to each project, and ratios in effect as of December 31 of the year the grants are approved. The method for calculating the credits involve the following:

1) Calculate the percentage of ARM funds to be utilized for the project;
2) Multiply the percentage with the amount of mitigation achieved to determine the amount of acreage to be credited from the ARM funds. Note that construction of restoration or enhancement, if any, will be fully credited before any credit is given for preservation;
3) Divide the amount of credits by the Corps ratio to determine final credit amount.

Where there are ranges, the Corps will determine the appropriate ratio for a specific project based on the functional benefits of the project. Credits will be released (this may not be the same as the release of funds) in accordance with the following schedule, which may be modified with approval from the IRT:

Preservation:

100% Upon receipt of the signed and recorded preservation document, evidence that the stewardship fund has been established or of a letter from the long-term steward stating that an endowment is not required to provide the long-term management as outlined in the long-term management agreement, and a long-term management agreement agreed to by NHDES and the Corps and signed by the long-term steward, fee owner, and Program Administrator.

Restoration/Creation/Enhancement (Rehabilitation) with associated preservation:

40% Upon receipt of the signed and recorded preservation document

60% Upon completion of construction and approval of the work by NHDES and the Corps, receipt of all required monitoring reports, and NHDES and the Corps determine that the site has successfully met the goals and performance measures and concur with the release.

Restoration/Creation/Enhancement (Rehabilitation) without associated preservation:

100% Upon completion of construction and approval of the work by NHDES and the Corps, receipt of all required monitoring reports, and NHDES and the Corps determine the site is successful in meeting the goals and performance measures and concur with the release.

3. Advance Credits

The number of advance credits available for each service area was determined by the number of estimated credits needed to compensate for impacts permitted over the last 5 years. Acres and linear feet are used as a surrogate for credits. While data differences limit the ability to compare area of loss for each wetland type across the state, it is possible to compare the number of permitted impacts for each service area, as shown in Table 4.

NHDES and the Corps will determine the credits required for authorized projects case-by-case using guidance and/or rules developed by each agency. A minimum of 30 advanced credits per watershed will be the base to finance the program. For simplicity, impact acres were rounded up to 50, 75, 150, or 200. Table 5 summarizes advance credits according to each service area. For stream credits there is not much information available on setting this amount so the minimum of 2,500 linear feet will be used for all service areas and this may need to be adjusted and the instrument amended if needed.

TABLE 4. Number of Permitted Impacts and Wetland Loss Per Service Area, 2006-2010.

ARM FUND SERVICE AREAS	TOTAL NUMBER OF PERMITTED IMPACTS	TOTAL ACREAGE OF WETLAND IMPACTS
Androscoggin River	31	32.5
Saco River	99	8.4
Pemigewasset to Winnipesaukee Rivers	417	48.9
Salmon Falls – Piscataqua Rivers	356	88.4
Merrimack River	624	161.7
Lower Connecticut River	265	37.5
Contoocook River	173	13.4
Middle Connecticut River	157	20.4
Upper Connecticut River	56	11.8

TABLE 5. Advance Credits According to Service Area.

SERVICE AREA	ADVANCED WETLAND CREDITS	ADVANCED STREAM CREDITS
Androscoggin River	50	2,500
Saco River	30	2,500
Pemigewasset to Winnipesaukee Rivers	50	2,500
Salmon Falls – Piscataqua Rivers	150	2,500
Merrimack River	200	2,500
Lower Connecticut River	50	2,500
Contoocook River	30	2,500
Middle Connecticut River	30	2,500
Upper Connecticut River	30	2,500

4. Credit Accounting

NHDES will establish and maintain an annual report ledger that tracks advance credits for each service area and the production of credits by the individual in-lieu fee projects as they are approved for release by

the Corps in coordination with the IRT.

NHDES will track, by service area, the debits, fees, other income received, the source of the income, and any interest earned by the program account. The ledgers will include a list of all permits for which in-lieu fee program funds were accepted, including the appropriate state and federal permit number, the service area in which the specific authorized impacts are located, the amount (acreage or linear) of authorized impacts, the aquatic resource type impacted (by Cowardin class and the Hydrogeomorphic (HGM) class, if available), the amount paid to the in-lieu fee program for each of the authorized impacts, and the date the funds were received from the permittee. A summary of the projects and payments made into the Fund will be updated upon receipt of a deposit and will be available on the NHDES web site for review as well as being posted by NHDES on the Regulatory In-lieu fee and Banking Information Tracking System (RIBITS) managed by the Corps of Engineers. This site is currently found at http://ribits.usace.army.mil and can be viewed by the public.

NHDES shall establish and maintain a report ledger for the ARM Fund Program that will track all program disbursements/expenditures. NHDES will also track funds obligated or committed, but not disbursed. The ledger will also include the service area in which the project is located, the amount of compensation being provided by method (i.e., restoration, establishment, enhancement, or preservation), the aquatic resource type represented (e.g., Cowardin Class and HGM Class for wetlands), the amount of compensatory mitigation being provided (acres and/or linear feet), and the number of credits released by the IRT.

D. Program Operations and Procedures

1. Financial Controls and Accounting Procedures

The NHDES receives the wetland and stream mitigation payments and deposits them into the NHDES ARM Fund bank account. The NHDES holds the funds collected in an interest-bearing account so as to earn interest while maximizing the safety and preservation of the funds in the account. All interest earned on these accounts is used for purposes of compensatory mitigation. The accounts are maintained by NHDES and funds are only used for program administration and the selection, design, acquisition, implementation and management of compensatory mitigation projects. NHDES maintains a running total of impacted and mitigated aquatic resources (debits and credits), by type and watershed, for which the ARM Fund was used as the form of mitigation for those impacts. Credit production, credit transactions, and financial transactions are tracked both on a watershed basis and separately for each individual mitigation project.

The NHDES coordinator is funded through that portion of the in-lieu fee monies that is collected for administrative purposes, including managing the account and tracking information according to service areas. Detailed information about the ARM Fund that is tracked by NHDES relates to the impacts (debits), approved projects using ARM Funds, projects completed or in progress and the credits the funds generate, and overall results of the program relative to compensation for the loss of wetland/aquatic resource functions.

2. Administrative costs

NHDES shall be entitled to deduct overhead costs in the amount of 10% to 20% of all fees entering the ARM Fund, at the time the funds are received, to defray such ordinary expenses involved in administering the program as: the administration of contractual agreements, record keeping, communications with partners, financial management and accounting, costs associated with coordinating project proposals as well as the management and presentation of proposals and coordination with those seeking proposal information.

It should be noted that the tasks involved in administering the ARM Fund program are not adequately

covered if the administrative fee is less than 10%. As the program has grown to include stream mitigation, the work has also grown to administer this additional component. In addition, more applicants are using the ARM Fund as their form of mitigation so the work has increased substantially. As a result, NHDES has found that a percentage between 10% and 20% is appropriate for funding the necessary staff to manage the program needs. In January of each year, NHDES will propose a percentage for the administrative fee to the Corps and will provide an explanation if it is an increase or decrease from the previous year. The Corps, in consultation with the IRT, will provide acceptance or rejection of the proposed percentage in writing. If it is a rejection, the rationale will be provided and the percentage will remain unchanged.

3. Provision of legal responsibility

Acceptance of a payment into the ARM Fund is an acknowledgement by the NHDES that NHDES, and not the applicant, is responsible for satisfying the compensatory mitigation requirements of the Section 404, Section 401, or Section 10 permit. Payment must occur prior to permit issuance to ensure mitigation obligations are fulfilled prior to the start of construction. NHDES will issue documentation on each project proposing to use the ARM Fund. This documentation shall include the permit number, permittee name, permit site location, and a statement indicating the number and resource type of credits that have been secured from the ARM Fund. Transfer of mitigation liability to the NHDES, including, but not limited to, the identification and selection of sites, property rights acquisition, mitigation plan design and development, construction, monitoring, preservation, and long-term management and maintenance of the required mitigation, occurs upon the DE's receipt of the acceptance documentation from NHDES. In satisfaction of the compensatory mitigation requirements, the NHDES shall provide compensatory mitigation of the type and in the amount and watershed specified in the issued permit, or as otherwise authorized on a case-by-case basis by the DE in consultation with the IRT.

Conditions contained within permit authorizations for projects using the ARM Fund shall stipulate the service area location and dollar amount to be paid. Additionally, the permit conditions shall state that no discharge authorized by the permit may be conducted until the Permittee is in possession of the acceptance documentation from the NHDES stating that the NHDES accepts full responsibility for the required mitigation.

4. Disbursal Procedures

Pursuant to RSA 482-A:32, the SSC has been established for the purpose of identifying projects to be funded. By creating the SSC, these partners are able to share their extensive knowledge of wetland science, priority areas or lands that contain significant natural resources, and specifics on land conservation transactions.

NHDES has developed a yearly schedule for proposal submittal and award time frames (Appendix F). NHDES will issue a Request for Proposals (RFP) each year in March for all of the 9 service areas in which funds have accumulated. An announcement for proposals will be broadly circulated in these service areas. In the RFP, NHDES will provide an impact (debit) ledger for each service area that notes the wetland type and functions and values lost by the projects that generated the funds. Stream impact projects will be noted separately in the announcement.

In the yearly RFP, NHDES shall require applicants to submit a Pre-Proposal describing the project for which they propose to apply for grant funding. The Pre-Proposal shall include, at a minimum, a map of the project location and a summary of the proposed project outlining how it meets NHDES core requirements. The pre-proposal form can be found at:
http://des.nh.gov/organization/divisions/water/wetlands/wmp/documents/arm-preproposal-form.doc

All Pre-Proposals shall be screened by NHDES, the SSC, and the Corps and those applicants whose proposed projects are determined to meet the core program requirements will be invited to submit a full

proposal. The pre-proposal submittal process enables an applicant to obtain an indication of the likelihood the project may receive funding or information on how to strengthen the application for formal submittal. Full proposals will require more detailed information including wetland evaluations, protection mechanisms, and proposed engineering designs, where applicable. The application information and packet is updated every year and can be found on the NHDES web page.

ARM Fund projects need to be in the same service area/watershed in which the impacts/debits occurred that generated the funds. In the event no proposals have been submitted for a service area for two grant proposal rounds, funds can be used for projects in adjacent service areas after consultation with the Corps and SSC. Once applications are submitted, the evaluation must take into consideration the impacts to aquatic resources mitigated via the ARM Fund, site suitability, baseline condition of the sites, the maximum return on expended funds, benefits to rare and endangered natural resources, the location and status of other mitigation projects, and acceptable plan and budget. A request exceeding the available funds would likely be rejected.

All full proposals submitted in each grant funding round will be put out on Public Notice by the Corps as required by the Mitigation Rule. Any pertinent comments received will be provided to NHDES and the SSC. The proposals will then be initially scored by the SSC and the Corps and scores will be tabulated in a spreadsheet. When possible, the SSC and the Corps will conduct field reviews of the application sites to allow for on-site recommendations and further exchange about the project with the applicant. A SSC meeting is held after the field visits to review, evaluate and rank projects to receive funds. The SSC's final recommendations will be presented to the NH Wetlands Council and Corps, in consultation with the IRT, for approval.

In New Hampshire, contracts that exceed $5,000 are required to be presented to the Governor and Executive Council (G&C) for approval. The grant provisions, budget, task schedule and other certificates are necessary for their review. This process may take up to 3 months to complete due to the various signatures needed from NHDES management, Attorney General's office, and the NH Department of Administrative Services.

ARM Fund assets may not be expended without prior written approval from the Corps and G&C except that NHDES may be reimbursed for reasonable expenses it incurs in administrating the program. Each account may be charged for reasonable and appropriate expenses associated with the fee acquisition of land and/or conservation easements, design and implementation of mitigation projects, including monitoring and remediation, and long-term stewardship (including funding of an escrow account, if appropriate) of projects. These expenses shall be included in the overall cost of each mitigation project. Project-specific expenses such as implementing a mitigation project, including the purchase price of the land, payment for a conservation easement, construction activities, appraisals, closing costs, and establishment of vegetation as well as the cost of long-term stewardship of a mitigation project may be debited from each account and paid to the entity responsible for the long-term management of the mitigation project and monitoring of a permanent easement. For projects involving construction or other work that would occur after site acquisition, financial assurances need to be provided by the project applicant or a percentage of the ARM Fund allocation for the project will be held in abeyance until the IRT determines that the project is successful following monitoring and any needed remediation.

E. Reports and Reporting Protocols

NHDES will provide a report to the Corps on a yearly basis describing the location of impacts/debits within each service area, amount of impacts permitted within each service area, Cowardin classification of the impacted areas, and information on the functions lost through the permitted impact. The NHDES will provide a New Hampshire fiscal year annual report to the Corps, to be submitted by October 1 of the following year, and include information on the following:

1. The permitted aquatic resource impacts that provided payment into the ARM Fund to

complete their mitigation requirements. The information will be reported according to service area and include:

- permit number (DES and Corps permit authorization numbers);
- date permit/authorization issued;
- acreage or linear feet by aquatic resource type(s),
- functions and values lost by the project;
- location/town; and
- date payment amount deposited into the ARM Fund.

2. The description of projects receiving ARM Fund monies with the following details:
   - a description of each project funded and information on the progress or completion of those projects;
   - acreage and type(s) of aquatic resources restored, enhanced, created, and/or protected in each service area;
   - the success of the project based on performance standards developed by DES for the specific project;
   - location;
   - itemized costs;
   - fee and/or easement holder;
   - date acquired;
   - date construction completed (if applicable);
   - status of monitoring (if applicable);
   - status of financial assurances (if applicable);
   - status of long-term management plan;
   - credits authorized to be released by the Corps in consultation with the IRT.

The reports will be made available to the public through the issuance by the Corps of a Public Notice and posting on the Corps website at http://www.nae.usace.army.mil.
Every five years, the Program Administrator, with assistance from the Corps, will produce a status and trends report summarizing the previous five years. The document will examine the goals for each service area and discuss how well the projects assisted with promoting those goals. Every ten years or as funds allow, the Program Administrator and others will reexamine and update the Compensation Planning Framework, including working with a broad range of stakeholders.

VII. COMPENSATION PLANNING FRAMEWORK

The NHDES has reported that, since the 18th century, about one-tenth of nontidal wetlands in the state have been destroyed (NHDES, 2004). For complex projects involving substantial unavoidable impacts or projects involving a sensitive wetland resource, the practice of creating, restoring, enhancing, and preserving wetlands has been an acceptable method of mitigation for state permits. NHDES has been accepting compensatory mitigation to offset certain types of impacts as far back as the mid-1990s. An evaluation of the success of wetland creation was conducted in 1997 to determine the effectiveness of this option (Evaluation of Wetland Mitigation in New Hampshire with Recommendations for Policy, Chase and Davis, 1997). The study noted poor siting involved in the placement of created wetlands, being next to roads, parking lots, or in areas completely surrounded by development. While sites may have been proven to provide some water quality improvement or flood storage, their usefulness to wildlife was questionable.

The study findings also noted that the ability to achieve successful wetland hydrology was often difficult. The majority of sites became infested with invasive species, and the elimination of upland forest for creation of wetland conditions was a questionable practice. The study findings also noted difficulties in finding sustainable restoration sites. As a result, the Department moved away from small wetland creation efforts and worked with the Corps and EPA on the development of improved requirements for more valuable compensation in the form of restoration and upland preservation.

Table 6 provides information on the reported impacts and amounts of mitigation provided through creation, restoration and upland buffer preservation from 2001-2006. Prior to adoption of the mitigation rules, projects with more than 20,000 sq.ft. of impact were required to provide compensatory mitigation. A review of the data indicates wetland loss averaged 150 acres per year from 2001-2006. In the years following the adoption of the new rules that included the decrease in the mitigation threshold, impacts decreased to an average of 75 acres per year (Table 7). It could also be concluded that, due to the mitigation requirement and the change in the threshold, applicants responded by minimizing impacts further, thus decreasing the total loss of wetlands in each of the following years. The data also concludes that the use of upland and wetland preservation continued to be the favored form of mitigation.

TABLE 6. Wetland Impacts and Mitigation, 2001-2006.

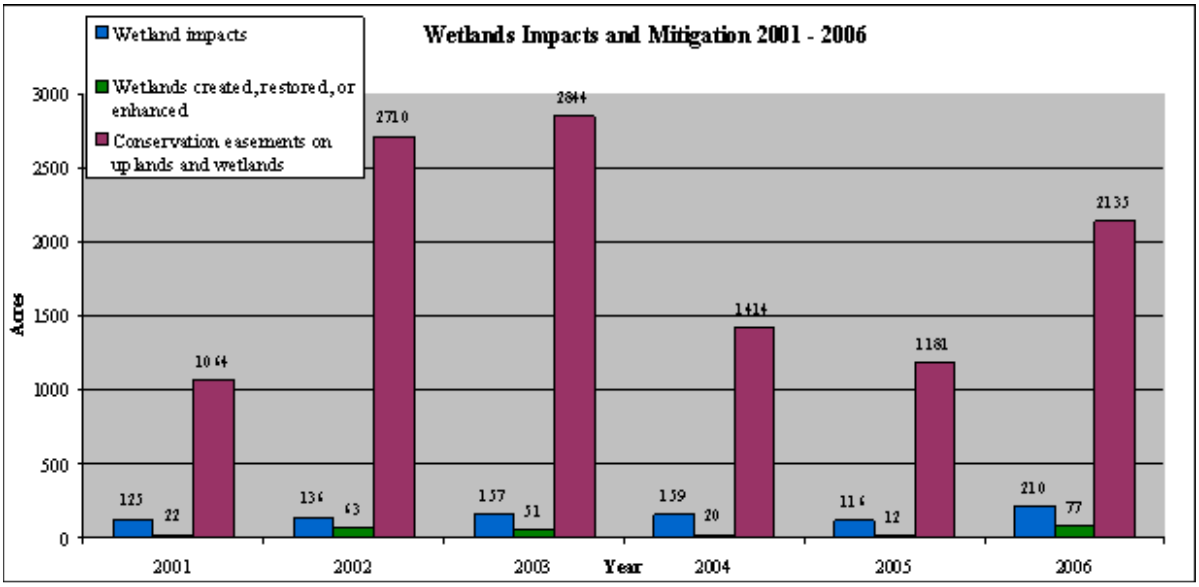
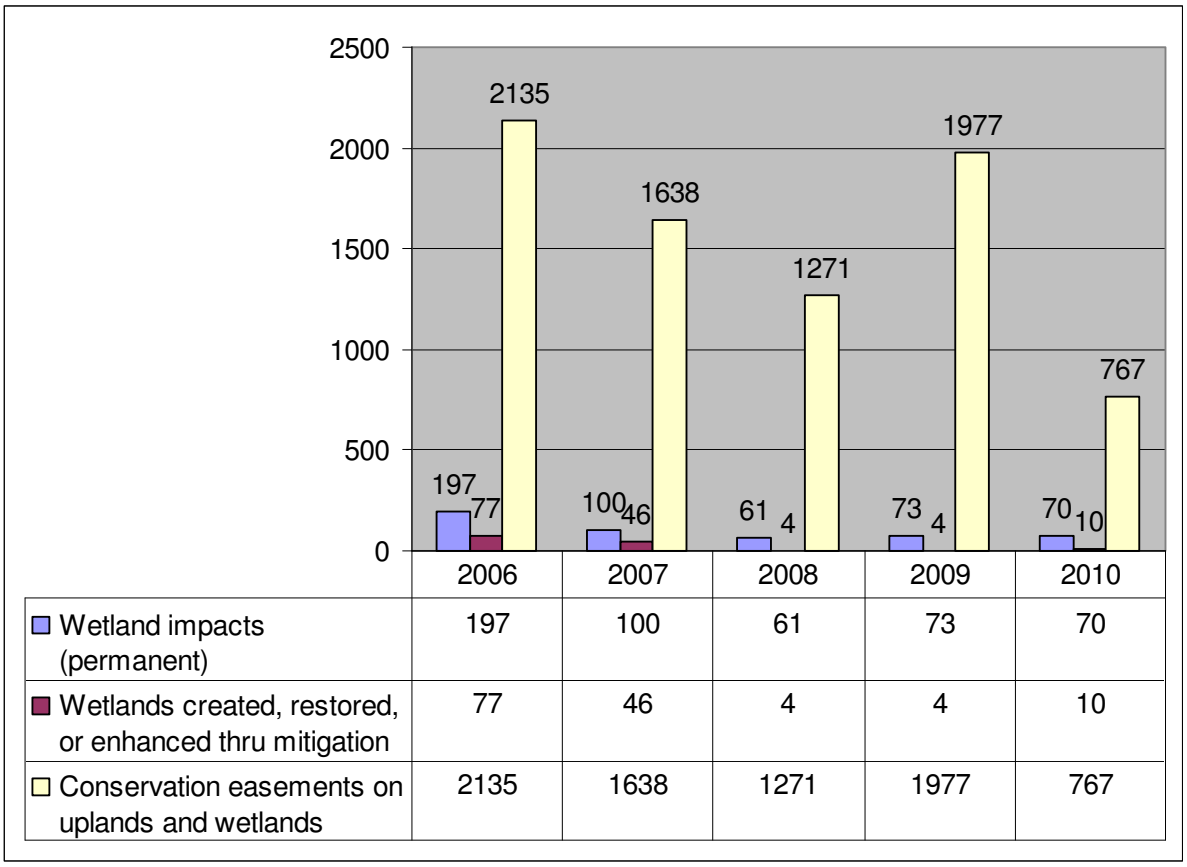


TABLE 7. Acreage of Wetland Loss, Restoration and Upland Preservation, 2006-2010.



	2006	2007	2008	2009	2010
Wetland impacts (permanent)	197	100	61	73	70
Wetlands created, restored, or enhanced thru mitigation	77	46	4	4	10
Conservation easements on uplands and wetlands	2135	1638	1271	1977	767

Restoration seeks to return wetland ecosystems to their approximate pre-disturbance conditions. In New Hampshire, past land uses that have created or contributed to disturbed, altered habitats include development, ditching and draining, livestock grazing, and the intentional planting of non-native vegetation. Identification of meaningful restoration opportunities is a priority of the program. As a mitigation option, good restoration sites are preferable but are often not available or are not sustainable in the long-term. In addition, New Hampshire has limited agricultural lands, areas typically conducive to restoration, so conversion from farm to wetlands is not widely accepted or encouraged. Several other attempts have been made to solicit restoration opportunities from communities, conservation organizations, and other groups but these efforts have not generated many good sites. Instead, an element of wetland enhancement may be possible to be carried out on sites that are predominantly preservation parcels. The enhancement may include revegetating wetland and upland buffer areas, eradication/management of invasive species, or water quality related improvements, but overall these measures are fairly limited.

Through an EPA grant completed in 2009, a model was developed to identify restoration opportunities for use by wetland applicants. The goal of the grant was to highlight potential sites for restoration or enhancement of lost aquatic resource services in four watersheds. Details and findings from the grant are found at: http://www.restorenhwetlands.com/ Due to funding limitations, implementation of the model on the remaining watersheds of the state could not go forward. Nevertheless, the available model results helped NHDES to recognize the importance of land conservation as compared with wetland creation after seeing so many failed attempts to create wetlands. The Department also recognized the limited opportunities for restoration. As a result, the program has been built on protecting high value aquatic resources and buffers to reduce cumulative impacts and ensure that the resources will remain intact for the long term. Protection of upland habitat adjacent to aquatic resources is essential for the protection of the functions and values of these resources. Funding projects that promote habitat diversity is key to the overall health of New Hampshire resources and key to a successful mitigation strategy. For preservation parcels, a review of whether the site is under threat from development or is in close proximity to other protected lands is essential to maintaining and protecting habitat connectivity.

The placement of land protection and wetland restoration projects in a landscape to optimize functional performance of wetlands on a regional scale is very important and often overlooked. This in-lieu fee instrument provides a flexible, ecologically based framework for allocating limited resources to restoring, to the maximum extent possible, and preserving valued wetland functions. Wetland management in New Hampshire, including protection and restoration, has been dominated by site-specific concerns. By developing plans for watersheds in the state, restoration and protection efforts may allow the benefits of wetland functions and values to be optimized throughout the landscape.

The Federal Mitigation Rule (33 CFR 332) requires that goal setting for, and prioritization of, aquatic resources also satisfy the criteria for the use of upland preservation as a form of mitigation. In the rule, preservation may be used to provide compensatory mitigation for activities when the following criteria, among others, are met:

a) The resources to be preserved provide important physical, chemical, or biological functions for the watershed;
b) The resources to be preserved contribute significantly to the ecological sustainability of the watershed;
c) Preservation is determined by the district engineer to be appropriate and practicable;
d) The resources are under threat of destruction or adverse modifications; and
e) The preserved site will be permanently protected through an appropriate real estate or other legal instrument (e.g., easement, title transfer to state resource agency or land trust).

The New Hampshire landscape is rich with a diverse range of habitats and wetland resources. The acreage of wetlands in New Hampshire ranges between 290,000 acres, estimated from the National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service (USFWS), and 576,386 acres, estimated from soil surveys by the Natural Resource Conservation Service (NRCS) of the U.S. Department of Agriculture. Accordingly, wetlands currently occupy between 5 percent and 10 percent of New Hampshire's landscape. An analysis of aerial photography by the Department indicates that there are approximately 7,500 acres of tidal wetlands, including 18.57 miles of coastal shoreline and 144.43 miles of tidal river shoreline, with the vast majority of New Hampshire's wetlands being nontidal.

The purpose of compensatory mitigation is to offset impacts to waters of the U.S. and state waters, including wetlands and streams. Therefore, priority is given to mitigation that replaces lost functions and values of waters, wetlands and streams. However, since restoration opportunities are limited, preservation of upland buffers and enhancement will often be part of mitigation efforts. The IRT agrees that the NHDES approach, using mainly the NHFG Wildlife Action Plan, results in an ecologically beneficial program which achieves overall watershed-based benefits but recognizes the need to continually encourage project proponents to look for restoration and enhancement opportunities within high-value sites. The WAP is a science-based conservation strategy that includes a common set of analytical methods to identify the biodiversity that needs to be conserved. The WAP also provides strategies and effectiveness measures for evaluating performance. Together this conservation approach and set of analytical methods follow an adaptive management framework of setting goals and priorities, developing strategies, taking action, measuring results and incorporating new and improved data. The New Hampshire ILF is based on a landscape-watershed approach. The discussion below outlines the framework for selecting, securing, and implementing aquatic resource and associated upland buffer restoration, creation, enhancement, and preservation under the ARM Fund Program.

A. Geographic Service Area

The ARM Fund is subdivided into nine major river basin regions based on a modified HUC 8 system, as depicted in Figure 3. The ARM Fund service areas are:

1. Androscoggin River

2. Saco River
3. Pemigewasset - Winnipesaukee Rivers
4. Salmon Falls to Piscataqua Rivers
5. Merrimack River
6. Lower Connecticut River
7. Contoocook River
8. Middle Connecticut River
9. Upper Connecticut River

B. Description of Threats to Aquatic Resources

The NHDES defines threats as proximate activities or processes that directly have caused, are causing, or may cause "stresses" to priority ecosystems, natural communities, and species, and thus their destruction, degradation and/or impairment. Wetlands are among New Hampshire's most important ecosystems as they provide critical wildlife habitat, flood control protection, and ensure water quality. Residential development, agriculture or direct impacts due to infrastructure projects severely decrease the condition and quality of our wetlands. Impacts directly in the 100 meter buffer zone surrounding the wetland, or the presence of paved roads in close proximity, are pervasive and can impact the wetland by further degrading its functions and values. The primary threats to aquatic resources identified by NHDES are described below.

Habitat Loss

The rapid increase in human population and rate of development in New Hampshire is placing significant stress on our aquatic resources and particularly native wildlife populations. Land that was once habitat for wildlife species is being converted into residential and commercial subdivisions, roads, and other uses. The development of land and related activities have impacts on both the quantity and quality of wildlife habitat.

Approximately 66 percent of New Hampshire's species of greatest conservation concern are wetland- or surface water-dependent. More specifically, the state has 34 rare wetland-dependent species, including 24 animals (e.g., bald eagle and Blanding's turtles) and 10 plants. The loss of habitat through the conversion of land from its natural state to a developed landscape represents the single greatest impact of increased human activity on native wildlife. All animal species require certain habitat features to survive. Development typically eliminates or significantly changes many important habitat features found in a wetland area, thus reducing or eliminating the habitat value of that area. A diverse wildlife population depends upon the natural diversity of native plants found in most undeveloped areas. Development often simplifies the vegetative community, making it more difficult for many native species to survive. Those species adapted to survive in habitats common in developed areas thrive, often at the expense of those found in natural areas.

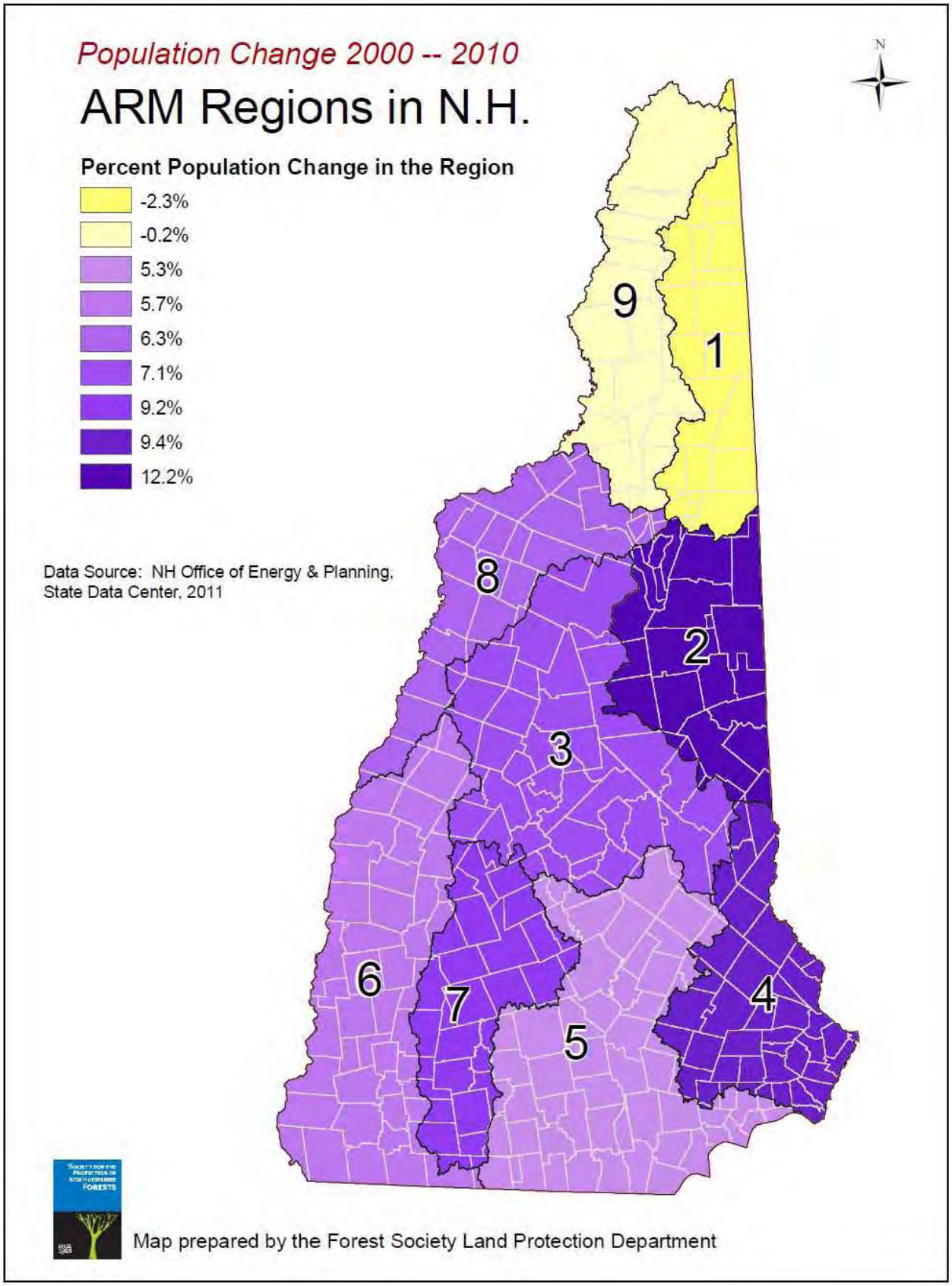
New Hampshire is the fastest growing New England state, with approximately 260,000 (20 percent) more people expected to move to the state between 2005 and 2030. To accommodate this growth, most of which is anticipated to occur in the southeastern third of the state, more lands abutting and containing wetlands are now being developed. Much farmland is being converted to subdivisions, buildings, and parking lots. As a result, there is increased fragmentation of wetlands and stream corridors due to roads and driveways and there is increasing concern for the secondary or indirect impacts that upland development activities have on the quality of wetlands and streams.

In 1970, the population of the state was less than 740,000. By 2010, New Hampshire's population had grown to more than 1.3 million, with the greatest densities increasing throughout the southern half of the state. Figure 2 displays the percent population change between 2000 and 2010. In several northern regions, population has decreased or had a modest increase, as depicted in Table 8. While the numerical change is high in the usual areas of the state as would be expected (regions 3, 4, and 5), there is a slight change in the increases when the percentage change is reviewed (regions 2, 4 and 7).

TABLE 8. NH Population According to Service Area, 2000-2010.

ARM REGION	POPULATION 2000	POPULATION 2010	POPULATION CHANGE 2000-2010
1	15,882	15,513	-369
2	26,037	29,208	3,171
3	106,963	114,558	7,595
4	254,228	278,247	24,019
5	601,001	632,664	31,663
6	124,956	132,088	7,132
7	56,479	61,683	5,204
8	36,578	38,895	2,317
9	13,426	13,400	-26
TOTALS	**1,235,550**	**1,316,256**	**80,706**

FIGURE 2. Percent of Population Change in New Hampshire, 2000-2010.



Another means of measuring habitat loss in terms of growth in a region is to review single family housing numbers. Since the mid-1990s, construction of single family housing has been on a steady rise. Single

family homes represent a large portion of land development in New Hampshire. It is a good predictor of total developed acres and is a concern because its low density affects more natural resources. Each single family home results in approximately 1.4 acres of land conversion. Table 9 provides the data detailing single family housing totals from 2000 to 2009. The greatest percent change in single family homes from 2000 - 2009 occurred in the central part of the state and along and between the state's major transportation corridors including Interstates 93 and 95 and Interstate 89, Figure 3.

While numerical change in the number of new single family homes has been high in the central and coastal areas of the state (regions 3, 4 and 5), the percent change is shifted to regions 2, 4 and 7. There has also been a shift in the percent change in new housing to regions 2, 3 and 7. Overall, the most intense activity in terms of population and development has been concentrated in the coastal communities of region 4 and this is predicted to continue.

TABLE 9. Single Family Housing (SFH) According to Service Area, 2000-2010.

ARM REGION	SFH 2000	SFH 2009	CHANGE IN SFH 2000-2010
1	4,881	5,088	207
2	14,093	16,517	2,424
3	44,603	51,784	7,181
4	64,989	75,075	10,086
5	141,695	159,396	17,701
6	35,908	39,644	3,736
7	21,616	24,985	3,369
8	11,568	12,999	1,431
9	5,748	6,353	605
TOTALS	**345,101**	**391,841**	**46,740**

New Hampshire's population is projected to increase by 180,000 persons in the years from 2010 through 2030. Roughly 70% of that growth will occur in the four southeastern counties, adding nearly 128,000 people to 33% of the state's land base. Figure 4 provides the projected numeric change in population from 2010-2030. Darker shading indicates higher values. The lower Merrimack River corridor connecting Concord, Manchester, and Nashua is projected to add the greatest population on a community-by-community basis.

FIGURE 3. Percent Change in Single Family Housing Construction, 2000-2009.

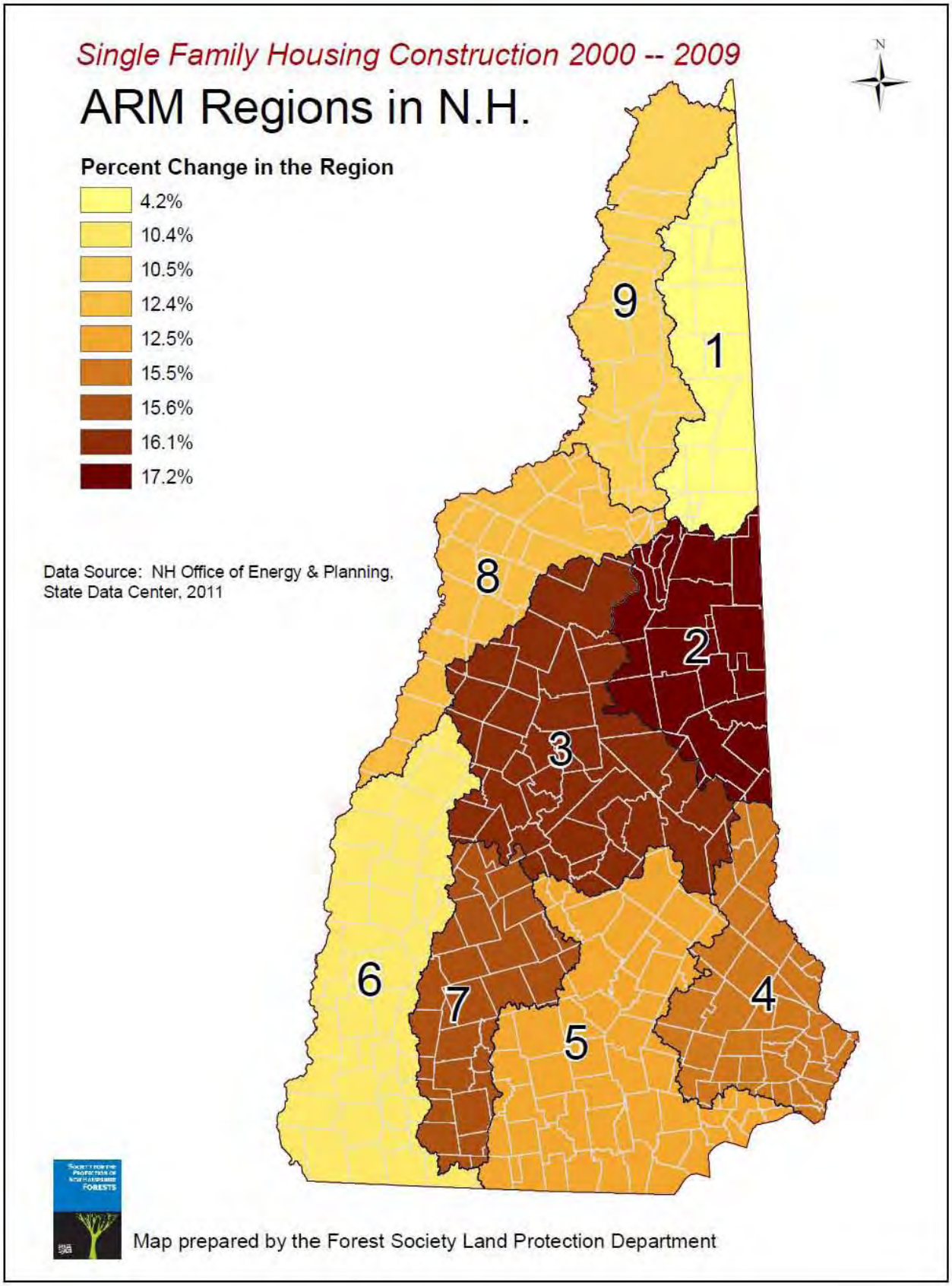
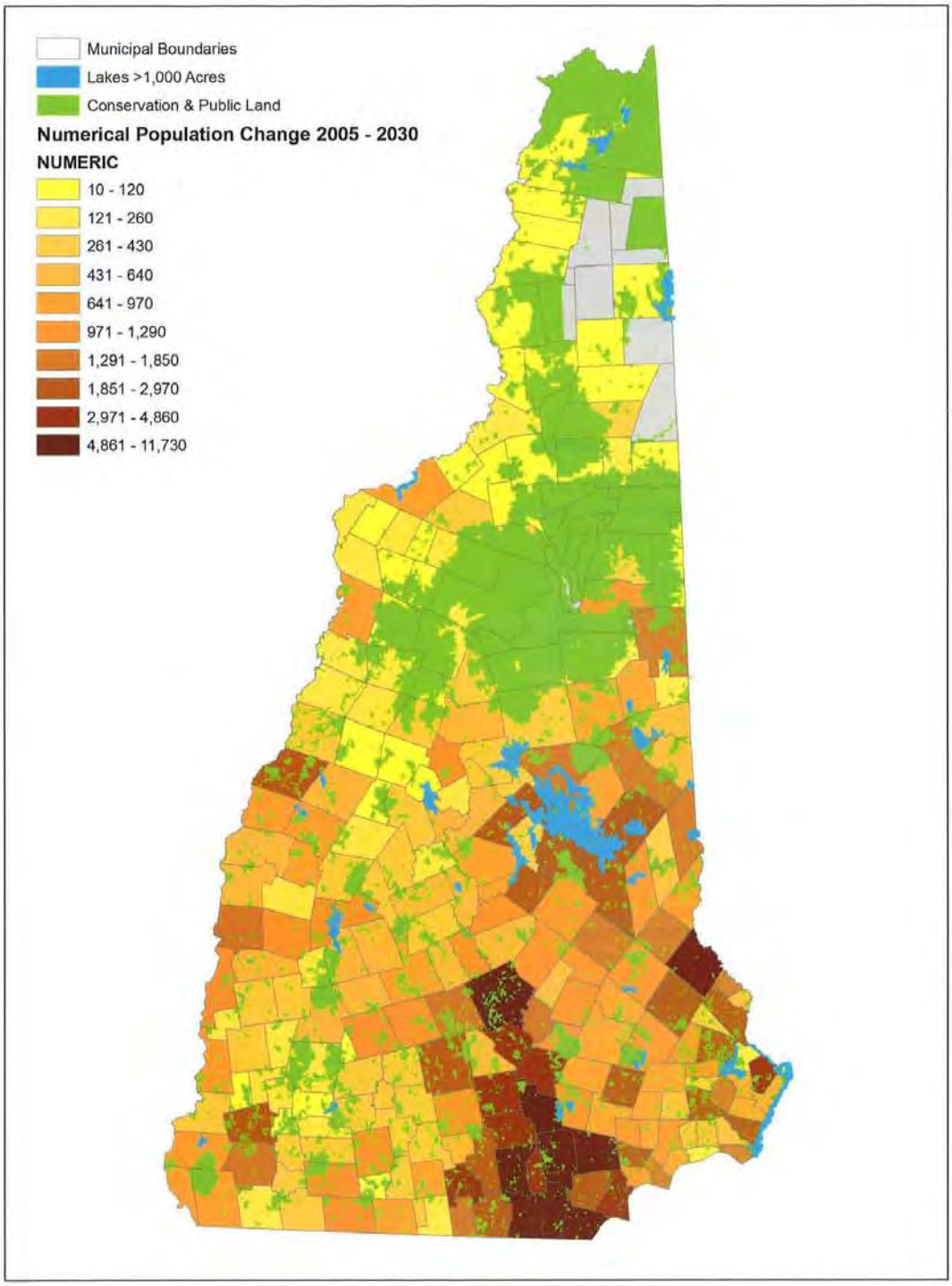


Figure 4. Projected Population Change, 2005-2030.



Habitat Fragmentation

Habitat fragmentation is a less obvious consequence of development, reducing both the quantity and quality of habitat. Fragmentation is a process whereby large tracts of the natural landscape are gradually developed and subdivided until numerous smaller patches remain. The patches are often too small and too far apart to support the basic survival and reproductive needs of many wildlife species during various stages of their life-cycle or in different times of the year. When a species' habitat is separated by distances that make movement from one patch to another impossible, the impacts on the genetic health of the population are significant and reduce a species' ability to reproduce and withstand stress. In addition, smaller habitat patches and the wildlife that depend on them are more vulnerable to the catastrophic effects of natural disturbances such as fire and ice storms. Fragmentation also results in higher populations of generalist predators, resulting in increased predation on those species that attempt to use the remaining habitat blocks.

Another example of negative impacts caused by fragmentation is on the viability of vernal pools. Vernal pool-breeding amphibians depend upon suitable wetland and upland terrestrial habitat, as well as the connectivity between them, for population persistence. Because vernal pools are under-reported on National Wetland Inventory (NWI) maps, the location and abundance of vernal pools in New Hampshire are not known. Vernal pools are small and easily overlooked (because they are seasonally dry), and thus more likely to be filled during development.

Habitat fragmentation can have a substantial influence on the ability of wildlife populations to persist. In addition to habitat fragmentation, ownership fragmentation or *parcelization* can have a substantial influence on our ability to maintain wildlife habitats in the Northeast. For a variety of reasons, the size of a tract of land owned by someone has an influence on ownership tenure and the likelihood that the owner will develop a habitat management plan. In general, as parcel size decreases, ownership turns over more frequently, and landowner involvement is less likely. Even if the landowner is motivated, management of small parcels can often be too expensive for a single owner to justify.

In the Northeast, the overwhelming majority of forestland is privately owned; public lands represent only 11% of the timberland of this region. Although the amount of forestland in private, non-industrial ownership has remained relatively constant since the 1950s, the number of individual owners has changed substantially, increasing to almost 2 million by the mid 1990s. Ownerships have become most fragmented in southern New Hampshire and among coastal areas. In rapidly developing southeastern New Hampshire, such as in the Rockingham County town of Exeter, almost 60% of the land area is in parcels of less than 50 acres; whereas farther north in the Carroll County town of Tamworth, approximately 65% of the parcels are at least 50 acres, and over 10% are in parcels of more than 500 acres.

Significant loss of vernal pool habitat can result in local extirpation of obligate vernal pool species such as the fairy shrimp, wood frog, spotted salamander, blue-spotted salamander, Jefferson salamander, and the state endangered marbled salamander. In addition, other species of concern such as the Blanding's turtle and spotted turtle feed in vernal pools and use them as staging areas during migration. Increasing population growth in the state and associated development will result in loss of vernal pools and disruption of dispersal capabilities (due to increased roads and road traffic) of species that rely on them.

Alterations in the Buffer Zone to Surface Waters

Human activity introduces changes to the surrounding environment that can have a negative impact on natural habitat. The area immediate surrounding a wetland or abutting a stream is important to its ecological condition. The NHDES is required by the Federal Clean Water Act to submit two surface water quality documents to the EPA every two years. Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report"), that describes the quality of the state's surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water. The second document is typically called the "303(d) List " which is so named because it is a requirement of Section 303(d) of the CWA. The 303(d) List includes surface waters that are:

1. Impaired or threatened by a pollutant or pollutant(s);

2. Not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources; and
3. Require development and implementation of a comprehensive water quality study (i.e., a Total Maximum Daily Load, TMDL study) designed to meet water quality standards.

The 303(d) list, among other things, describes the process used to make surface water quality attainment decisions for 305(b) reporting and 303(d) listing purposes. The Consolidated Assessment and Listing Methodology (CALM) is a term used to describe the process for placing waters on the 303(d) list and identifies designated uses for New Hampshire's surface waters. Review of the CALM, and specifically the list of impaired waters, can inform decisions as to the quality of and potential threats to aquatic resources. Permit applicants for stream crossings are required to show on a map the location of their project relative to impaired waters and note whether their project will contribute to the recognized impairment. This could ultimately result in an improvement to the water quality conditions through measures that may be required to address the listed impairment.

For a landscape level assessment, NHDES created a 125 m buffer surrounding surface waters and used the 2006 National Land Cover Data (NLCD) to identify landscape types within each wetlands buffer area. With this information, an estimate of the condition of the buffer can be reviewed through knowledge of the land cover types within that buffer. By combining information from the CALM and NLCD, the assessment can be obtained based on the on the idea that the condition of a wetlands buffer will be a major driver of the condition of the wetlands.

A review of impaired areas is also a potential source of restoration opportunities. Periodic updates of the methodology will result in even more accurate and reliable assessments and, therefore, better management of water resources in the future. The list of impaired or threatened waters can be found at: http://des.nh.gov/organization/divisions/water/wmb/swqa/2010/documents/all_impaired_waters_20100610.pdf

The Impact of Roads

New Hampshire's wetlands and streams are home to fish and other aquatic animals that travel the flowing waters to obtain food, spawn, and reach high quality habitat. Headwater streams and wetlands are of great significance in terms of the health and stability of the aquatic system. The species richness of birds, amphibians, reptiles, and plants has been found to be negatively correlated with the density of paved roads surrounding the wetland, with the sensitive distances varying from 500 to 2000 meters depending on the taxa and species. In addition, greater access to sensitive areas has also resulted in an increase in recreational impacts. Extensive use of All Terrain Vehicle's (ATVs) for recreation can disturb wildlife and severely damages wetland and coastal habitats.

Fish and other wildlife rely on the continuity and connectivity of rivers and streams. A waterway that is in danger of being fragmented by roads can result in harm to the larger ecosystem. Roads may be the single most destructive element of the habitat fragmentation process as they can:

- Disrupt or prevent passage across the disturbed area;
- Provide an entrance for exotic species or predators;
- Increase mortality; and
- Increase unnatural disturbances from sources such as pollution and fire.

The state's flowing waters, including its streams and rivers, carry nutrients, sediment, and organic materials to reaches downstream and ultimately to the Atlantic Ocean. Across the state, there are at least 17,000 road-stream crossings, some of which have created obstructions to the adequate passage of flow, sediment, and wildlife. These undersized or failed culverts are often hidden and largely ignored as long as traffic flow is able to be maintained. The design of a crossing, its size, shape, method of installation, and maintenance can have a substantial impact on the movement of various species. NHDES recently

adopted new stream crossing rules and standards for new and replacement culverts (Rules Env-Wt 900) and is undertaking a variety of efforts to address the impacts of inadequate crossings on river systems, habitat and public safety. The goals of this program are to provide for aquatic life passage during high and low flow conditions and to maximize the passage of high flows, particularly floodwaters, so that public safety is held paramount and losses to infrastructure and adjacent property are minimized.

Advances in electronic mapping techniques, database management, and monitoring, along with a new understanding of how to best design and build stream crossings, are also coming together to create a huge regional database of crossings. With funding from an EPA grant, NHDES staff is gathering raw data regarding the size, shape, construction, and setting for existing stream crossings and analyzing the data according to their geomorphic compatibility. The anticipated result is an understanding of culverts that may offer immediate opportunities for improvement to natural processes, channel stability, aquatic habitat, and public safety. In addition, The Nature Conservancy (TNC) has developed a document entitled "*The Active River Area – A Conservation Framework for Protecting Rivers and Streams, 2008"* that provides for an integrated and hierarchical approach to the assessment, protection, management and restoration of freshwater and riparian ecosystems. The approach outlined in this TNC document provides a helpful framework for ensuring healthy and sustainable river systems in the nine service areas that will be able support rich biodiversity as well as a range of social and economic benefits.

Changing Hydrologic Regimes

New Hampshire remains as the second-most forested state in the nation after Maine, but forest cover has been steadily diminishing. Large forest blocks are shrinking as development breaks up large forests into smaller ones. Some of the state's most productive forest soils are in the direct path of many land-based activities, resulting in a change to the quality and quantity of aquatic habitat. The quality and flow of rivers, streams and wetlands can be reduced by inadequate or inappropriately designed culverts, creation of new dams, and channel straightening or modification. Deforestation, water withdrawals, and tidal restrictions (primarily culverts associated with transportation corridors) are examples of other common activities that have caused increased sedimentation, modification of the stream channel habitat, flow and temperature regime alteration, eutrophication, and other chemical contamination.

Degradation and manipulation of stream ecosystems occurs early in the process of watershed urbanization. Currently there are more than 4,800 active and inactive dams in the State of New Hampshire. Many of these dams were built during the Industrial Revolution in the 19th and early 20th centuries, and they played central roles in New Hampshire's economic and societal growth during that period. But as technological and societal needs have changed, so, too, has the need for some dams. Dams create barriers to upstream and downstream migration, a critical movement between natal/spawning areas and later life history stages. These restrictions lead to both upstream and downstream changes in flow, temperature, and water clarity. Additionally they sever terrestrial-aquatic linkages critical for maintaining the flooding regime of riparian and floodplain communities and trap sediment important to maintaining coastal barrier systems.

Very few dams in New Hampshire are currently under consideration for removal. However, dam removal is a mitigation option that should be considered on its merits. When the costs associated with maintaining a dam outweigh its benefits, removal may be a wise decision, one that can result in significant environmental, economic and social benefits.

In January 2000, the New Hampshire River Restoration Task Force was formed with the common goal of exploring opportunities to selectively remove dams for a variety of reasons, most notably for the purposes of restoring rivers and eliminating public safety hazards. The Task Force is an initiative that includes diverse representation, including multiple state and federal agencies, conservation organizations, local interests and others. Through its work, the Task Force is enabling an efficient and effective process for considering and facilitating the removal of dams in New Hampshire.
http://des.nh.gov/organization/divisions/water/dam/damremoval/index.htm
A tool recently developed by The Nature Conservancy to assess connectivity of aquatic systems is being

incorporated into the Task Force activities. The goals of the connectivity project were:

- To support state resource agencies within the project area to strategically reconnect fragmented aquatic habitats by removing or bypassing key barriers to fish passage, thereby enhancing populations of fish including: diadromous fish, coldwater species, and other species of greatest conservation need; and

- The project is focused on collecting existing spatial data and defining consensus techniques for relative ranking of barriers for purposes of fisheries restoration projects.

Better land use planning coupled with the accumulating information on existing altered aquatic resources could have an overall benefit to aquatic resources in the years ahead.

Nutrients and Pollution

New Hampshire is home to over 1,000 lakes and ponds, 17,000 miles of rivers and streams, and 238 miles of ocean and estuarine coastline. Elevated nutrients in streams can result in excessive algal growth, decreased light penetration, low concentrations of dissolved oxygen, and loss of desirable flora and fauna either through displacement or mortality (fish kills are among the most apparent losses). Harmful algal blooms, such as red tide, have been increasing in area and extent in recent years.

Nitrogen is the limiting element in coastal systems, whereas phosphorus is the most limiting nutrient in freshwater systems. Major sources of nitrogen and other non-point source pollution in agricultural watersheds include animal wastes, human wastes (commonly from failing septic systems or inadequate wastewater treatment), fertilizers, pesticides, and herbicides. Municipal waste water discharges and fertilizers are also significant nutrient sources from urban areas. Atmospheric deposition of sulfur dioxide and nitrogen oxide is also a critical threat to aquatic ecosystems due to the effect these chemicals have on lowering the pH in aquatic systems. As the pH in a lake or stream decreases, aluminum levels increase and become directly toxic to aquatic species. Streams flowing over soil with low buffering capacity are more susceptible to damage from additional acidic inputs from atmospheric deposition because they lack any natural capacity to buffer these chemicals.

Whether it is needed for drinking, manufacturing, recreating, waste assimilation, or ecosystem health, water is the cornerstone of New Hampshire's beauty and prosperity. A report published in May 2007 looked at the economic impact of a potential decline in NH water quality and the links among and between visitor perceptions, usage and spending. The findings concluded that the postulated perceived declines in water clarity and purity would result in $51 million in lost sales, $18 million in lost income and an estimated 800 jobs lost. The full report can be found at:
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/whats_our_water_worth.pdf

Invasive Species/Pests and Pathogens

Introduced species compete with native species for food and habitat, reduce populations through predation, transmit diseases or parasites, dilute the native gene pool by hybridizing, and alter habitat. Introductions and expansions of nonindigenous species pose an increasing threat to aquatic systems and are usually extremely difficult if not impossible to undo. Terrestrial and aquatic systems have been invaded by diverse taxa including plants, fish, amphibians, reptiles, mammals, mollusks, crustaceans, and sponges. Although not all introductions result in established populations, some of the most problematic and invasive species have flourished. Exotic plant pathogens and pests can be introduced through international trade routes or carried by the nursery industry, such as the fungus that causes sudden oak death, and have the potential to heavily impact our oak woodlands and forests. The common reed *Phragmites australis* is a ubiquitous invader of disturbed coastal wetlands throughout the central Atlantic and New England. Tidal flow restrictions and eutrophication of coastal wetlands both encourage the invasion of this species which can out compete and displace many native marsh plants and ultimately, as biomass accumulates and marsh plants disappear, convert salt marsh habitats into upland environments.

Forest Land Conversion

Preserving our working forests and avoiding conversion of our forest lands to other purposes is a critical issue in New Hampshire. New Hampshire is currently 84 percent forested, and the forest products industry has been and will continue to be a key component of our state's economy. In addition, our tourism and outdoor recreation economies are heavily dependent on the health of our forests. Sustainable, managed forests in New Hampshire provide a broad range of benefits, including: the ability to absorb and store large amounts of carbon; renewable supply of wood for heating, lumber, and a variety of forest products; and recreational opportunities.

Changes in Climatological Patterns

Climatological patterns across New England are changing. In New Hampshire, documented changes include: warmer winters, reduced snowfall and snow-on-ground days, earlier spring runoff, sea-level rise, increased total rainfall, and more severe weather events that result in increased risk of flooding. These changes in New England's climate are projected to increase in severity in the future and, if left unchecked, have the potential to significantly change our economy and way of life by the end of this century by:

- Increasing the frequency and severity of heavy, damaging precipitation events and the associated major economic impacts of cleanup, repair, and lost productivity and economic activity.
- Increasing the frequency of short-term (i.e., one to three month) summer droughts from every two to three years to annually, resulting in increased water costs, and agricultural and forestry stress.
- Increasing coastal flooding, erosion, and property damage due to rising sea levels.
- Significantly increasing human health impacts due to extreme heat (e.g., more than 20 days per year projected over 100°F), increased air pollution, and vector-borne disease.

C. Historic Aquatic Resource Loss and Current Condition

New Hampshire is situated in the most northern of the thirteen original states and lies between latitude 42°40' and 45°18' north and longitude 70°37' west to 72°. It is about 180 miles from north to south at its furthest points and an average of 50 miles wide, although the extreme width is 93 miles. It is bounded on the north by Quebec province in Canada, on the east by Maine and the Atlantic Ocean, on the south by Massachusetts, and on the west by Vermont. The Connecticut River forms the state's western boundary.

Geographies sometimes speak of the state as the "Mother of Rivers." Five of the great streams of New England originate in New Hampshire's granite hills. The Connecticut River rises in the northern part, and for nearly one hundred miles of its winding course hems the shores of the state. The Pemigewasset River starts at Profile Lake in the Franconia mountains and joins the Winnipesaukee at Franklin to form the Merrimack. The Cocheco and Salmon Falls rivers join at Dover to form the Piscataqua. In addition, two of the principal rivers of Maine, the Androscoggin and the Saco, have their beginnings in northern New Hampshire.

Historical human disturbance can have lasting effects on community structure. As early as 1810, the state of New Hampshire began selling off its public land. In 1867, Governor Harriaman sold the White Mountains Region. Large logging companies purchased much of the New Hampshire timberland, and by 1890 there were 832 sawmills operating and 17 logging railroads crisscrossing the state. The Weeks Act enabled the lands cut over and burned over by logging operations to once again become a part of the public domain. In 1914, the first land parcels were acquired in the White Mountains under the Weeks Act. Today the White Mountain National Forest (WMNF) has grown to almost 800,000 acres in New Hampshire and western Maine. The area is one of the most popular in the country — with upwards of 6 million visitors annually. Protecting and ensuring the quality of water resources is a priority of the WMNF. The forest continuously restores and revitalizes its vast water resources, including: 12,000 acres of wetlands; 4,750 miles of streams; 67 lakes; and 35 watersheds.

In total, New Hampshire has 1,300 lakes or ponds and 17,000 miles of rivers and streams which provide year round fishing and recreation in scenic surroundings, as well as power for the State's many industries.

New Hampshire bodies of water cover one hundred and fifteen thousand acres and vary from small ponds to Lake Winnipesaukee, which is twenty-two miles long and eight miles wide.

As recently as 100 years ago there was large scale agriculture in the Northeast so nearly all the forest had been removed. Most of the forest we see today is second growth. In the 1900s to 1940s most of the forest was going through an early successional change. Currently New Hampshire remains the second-most forested state in the nation after Maine, but forests are on a continuous decline. In the Society for the Protection of New Hampshire Forest's recent publication, "*New Hampshire's Changing Landscape, 2010*", it is estimated that the state was at a high of forest cover with 87% in 1960 and is down to about 82% today.

In order to assess the current condition of aquatic resources in New Hampshire, and to approximate historic loss, a GIS-based Aquatic Resource Base Layer (ARBL) was developed. The ARBL expands on the USFWS' National Wetland Inventory (NWI) maps and uses other existing information to identify areas likely to support wetland habitats, functions and values.

The ARBL identifies areas in the state that are most likely to be capable of supporting aquatic resources. It also provides the opportunity to approximate the area which potentially has been converted from aquatic resource area to other land uses. Table 10 shows how the ARBL can be used to calculate the percent of aquatic resources in each service area and, by using current land cover data, can also be used to calculate how much of the potential aquatic resource area is currently in a developed or agricultural land use. This analysis can provide powerful insights into the likely extent of historic conversion. The remaining area of aquatic habitats, including their associated remaining functions and values are also identified in this analysis. These data appear to confirm that in the southern regions, such as in the coastal communities and Merrimack River region, there has been the greatest historic loss of aquatic resources, mostly due to land development activities associated with the population increasing, whereas regions along the Connecticut River experienced high losses due to agricultural use. Figure 5 provides the estimated percent loss of aquatic resources per service area and what percent remains in each area. In addition to the state overview, specific locations can be analyzed according to current and historic aquatic resource locations as well as land developed and in agricultural use. By combining this land use information with information about lands currently conserved, potential restoration or enhancement locations can be identified that have the greatest opportunity to be restored and most likely can be sustained in the long-term. Figure 6 displays this use of existing data. The 2006 National Land Cover Data (NLCD) was used to identify landscape types. The 2006 NLCD is based on Landsat Thematic Mapper Imagery (30m resolution) collected from June 1999 through October 2003. The NLCD landcover type "developed" consists of developed lands; commercial, highway, industrial and medium density residential. The NLCD landcover type "agriculture" includes those areas in current agricultural use and pasture.

Habitat condition was analyzed to develop statewide and regional rankings that identify the highest condition habitat relative to all areas of a given habitat type in the state. The goal is to provide a tool to help identify the most ecologically intact wildlife habitat areas. NHFG biologists developed condition filters to analyze which habitat patches are in the best relative ecological condition. These filters are composed of GIS data that indicate to what degree a particular patch of habitat has good biological diversity (particularly in terms of rare species), is connected to other similar patches in the landscape, and is negatively impacted by humans. There is a different filter for each habitat, but each filter includes biological, landscape, and human impact factors. These three types of data are combined into BIO, LAND and HUMAN scores as clarified below. The score for each group was weighted evenly to come up with a single condition score (COND). This is a relative score, based on all polygons of a given habitat type that occur in NH. Through this analysis, maps can be generated as illustrated in Figure 7 that identify aquatic resources, and the relative condition of these resources in the context of overall habitat quality as compared with conservation lands data for other parcels on the map. This analysis provides the opportunity to target important aquatic systems for protection. Where lower condition resources are located near high quality aquatic resources, restoration opportunities may exist or, at a minimum, would

be a good area to review for restoration or enhancement potential. In addition, connectivity between existing high quality habitat and conserved lands can be identified.

TABLE 10. Aquatic Resource Base Layer per Service Area.

ARM Service Area	Total Acres in Region	Land Acres (surface water subtracted from total)	Surface Water Acres	Acres of Aquatic Resource Base Layer (ARBL)	% of Service Area in ARBL
1	462,582	451,328	11,254	67,645	14.6
2	556,244	541,281	14,962	95,933	17.2
3	965,104	883,530	81,573	197,100	20.4
4	531,545	506,212	25,333	182,338	34.3
5	976,895	944,110	32,785	253,848	26.0
6	871,257	840,707	30,549	162,021	18.6
7	489,023	470,283	18,740	111,018	22.7
8	504,144	492,884	11,260	72,401	14.4
9	583,305	570,687	12,619	94,649	16.2
State Total	5,940,099	5,701,023	239,076	1,236,954	20.8

ARM Service Area	% of ARBL Developed	% of ARBL Agri-culture	% of Loss from Develop-ment and Agri-culture	Acres of Current Aquatic Resources	% of Region in Current Aquatic Resources	Acres of ARBL in Conservation/ Public land	% of ARBL in Conservation/ Public land
1	2.8	1.2	4.0	64,960	14.0	21,683	32.1
2	4.5	3.8	8.3	87,991	15.8	26,909	28.0
3	4.0	3.4	7.5	182,370	18.9	26,642	13.5
4	9.5	5.6	15.1	154,753	29.1	27,780	15.2
5	11.3	5.9	17.2	210,175	21.5	42,457	16.7
6	5.9	6.0	11.9	142,709	16.4	24,508	15.1
7	3.8	4.7	8.6	101,505	20.8	28,817	26.0
8	4.7	8.9	13.6	62,528	12.4	17,040	23.5
9	2.6	6.5	9.1	86,016	14.7	34,416	36.4
State Total	6.5	5.2	11.7	1,093,006	18.4	250,252	22.9

FIGURE 5. Current, Historic Loss and % Aquatic Resource Base Layer Per Service Area.

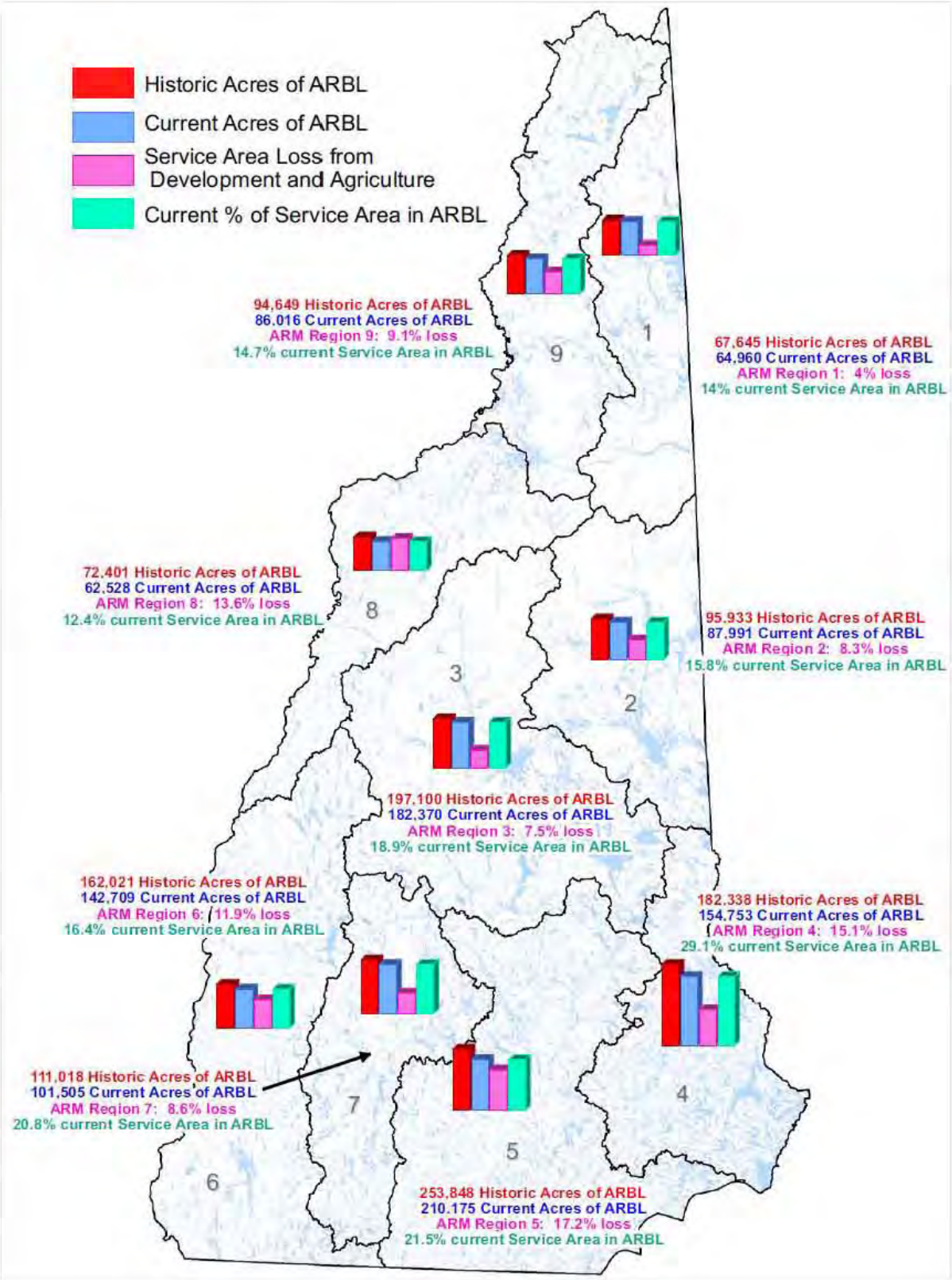

Historic Acres of ARBL
Current Acres of ARBL
Service Area Loss from Development and Agriculture
Current % of Service Area in ARBL
94,649 Historic Acres of ARBL
86,016 Current Acres of ARBL
ARM Region 9: 9.1% loss
14.7% current Service Area in ARBL
9
1
67,645 Historic Acres of ARBL
64,960 Current Acres of ARBL
ARM Region 1: 4% loss
14% current Service Area in ARBL
72,401 Historic Acres of ARBL
62,528 Current Acres of ARBL
ARM Region 8: 13.6% loss
12.4% current Service Area in ARBL
8
95,933 Historic Acres of ARBL
87,991 Current Acres of ARBL
ARM Region 2: 8.3% loss
15.8% current Service Area in ARBL
3
2
197,100 Historic Acres of ARBL
182,370 Current Acres of ARBL
ARM Region 3: 7.5% loss
18.9% current Service Area in ARBL
162,021 Historic Acres of ARBL
142,709 Current Acres of ARBL
ARM Region 6: 11.9% loss
16.4% current Service Area in ARBL
182,338 Historic Acres of ARBL
154,753 Current Acres of ARBL
ARM Region 4: 15.1% loss
29.1% current Service Area in ARBL
111,018 Historic Acres of ARBL
101,505 Current Acres of ARBL
ARM Region 7: 8.6% loss
20.8% current Service Area in ARBL
7
4
5
6
253,848 Historic Acres of ARBL
210,175 Current Acres of ARBL
ARM Region 5: 17.2% loss
21.5% current Service Area in ARBL

FIGURE 6. Example of Current and Historic Aquatic Resource Base Layer Areas, Land Cover and Conservation Lands.

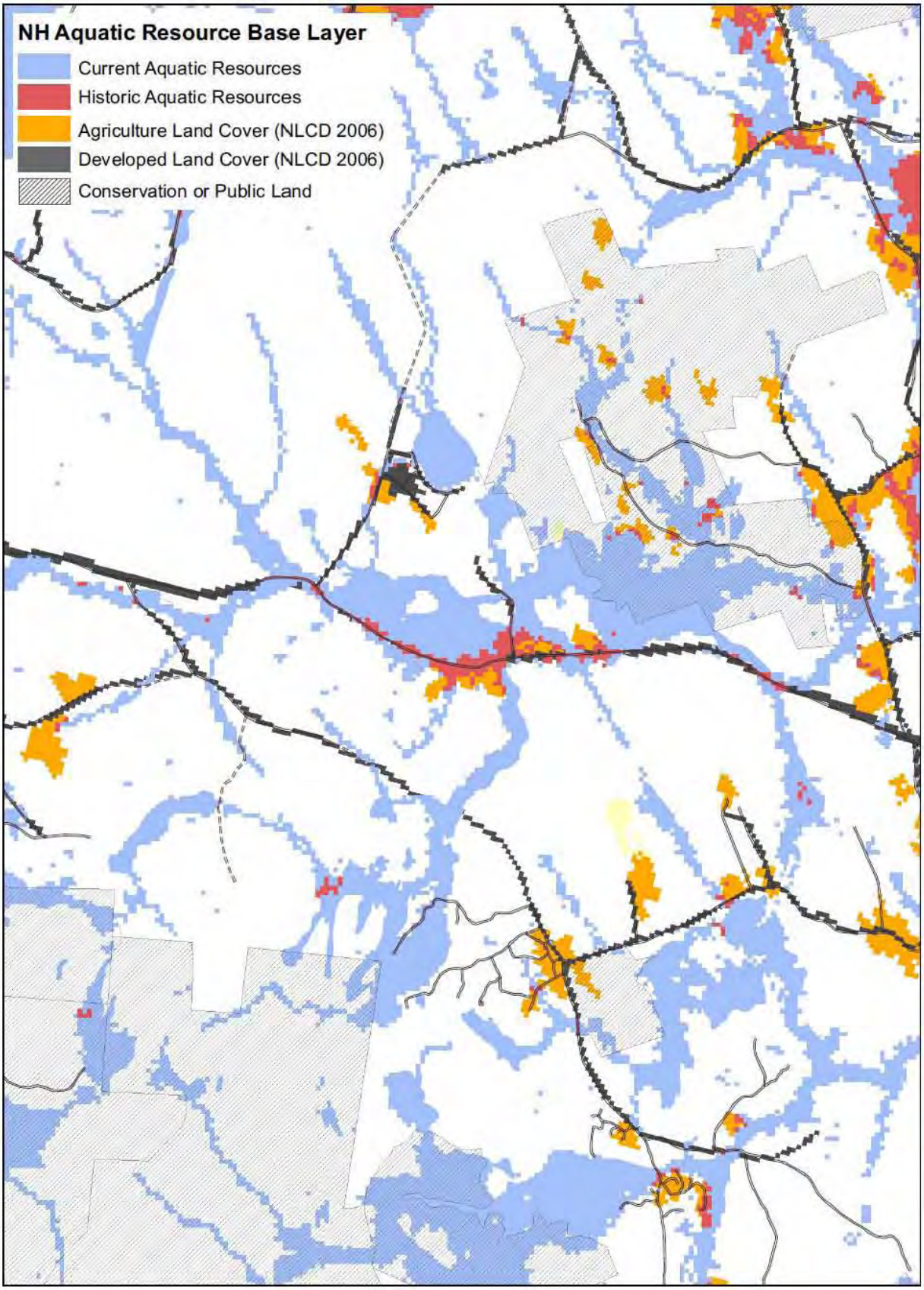
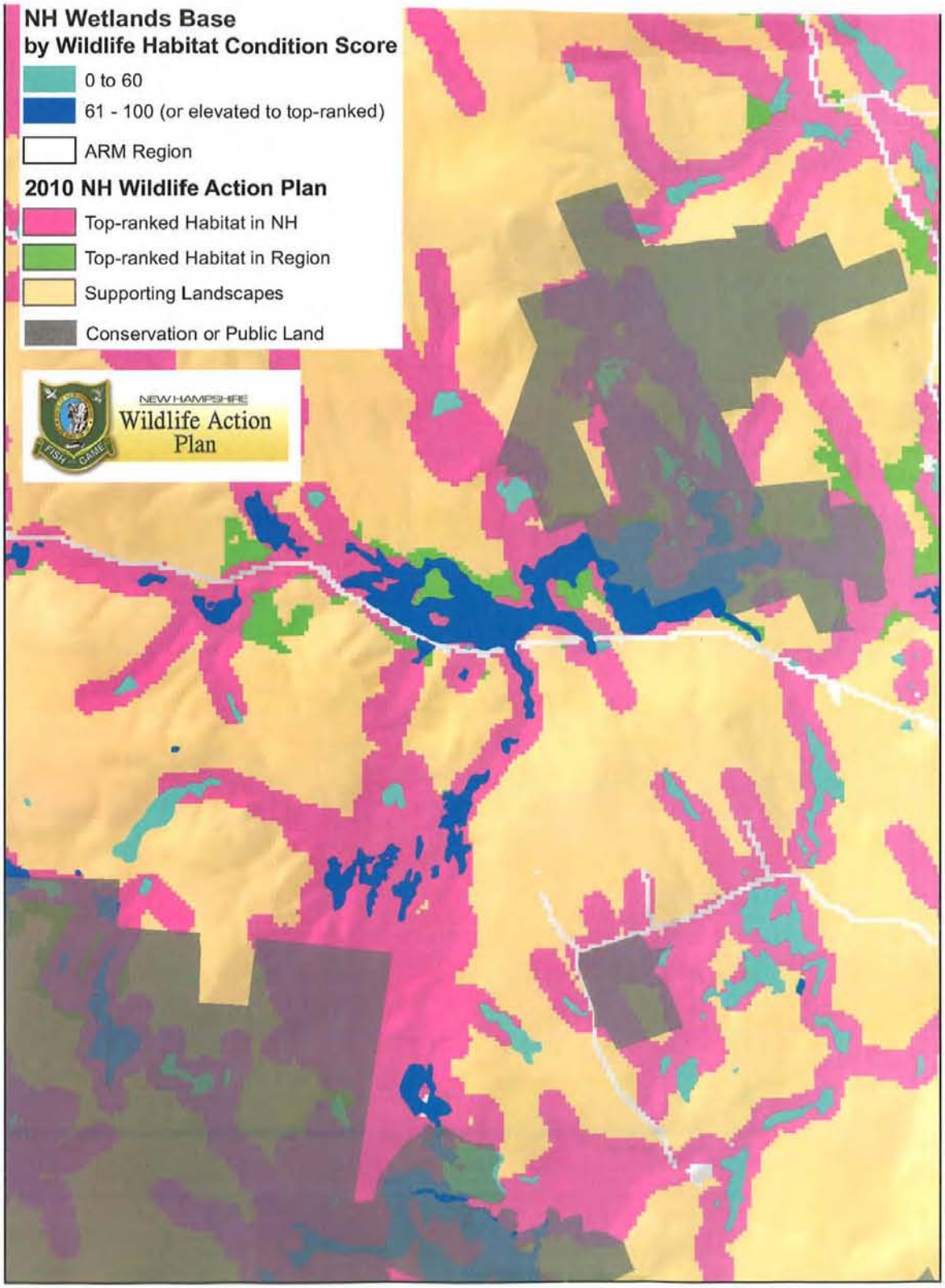


Figure 7. Example of Wetland Condition Relative to WAP Tiers.


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan

With the creation and implementation of state Wildlife Action Plans (WAPs), the need for consistent, current digital habitat maps has grown dramatically. The implementation of the WAPs within each state and across the Northeast region will be greatly enhanced through the development of current, consistent terrestrial and aquatic habitat geographic information systems (GIS) datasets. A project coordinated through the Northeast Regional Conservation Needs Program has compiled and standardized terrestrial and aquatic habitat classification systems with the ultimate goal of providing initial map products that will form the foundation for state and regional conservation in the Northeastern United States. The New Hampshire Terrestrial Map developed by the Northeast Regional Conservation Needs Grant Program is a result of this mapping effort and will be utilized in the future to standardize habitat resources (Figure 8).

The WAPs identify a variety of actions aimed at preventing wildlife from declining to the point of becoming endangered. By focusing on conserving the natural lands and clean waters that provide habitat for wildlife, the plans have important benefits for wildlife and people. Many of the conservation needs identified in the state wildlife action plans are best addressed at a landscape-scale – a scale that does not conform to state boundaries. In addition, many conservation actions can be developed or implemented in one area of the Northeast with the results applicable and of benefit to the entire region. By combining financial resources, the Northeast states have created an efficient and effective mechanism to address landscape-scale or regionally applicable issues. A recent effort directed by Mark G. Anderson of The Nature Conservancy involved summarizing the regional conservation status of each key habitat and species target by overlaying information on the location and condition of the target with information on conservation land ownership and management. The publication, *The Conservation Status of Key Habitats and Species of Greatest Conservation Need in the Eastern Region, 2011* suggest that management and protection efforts be undertaken through a regional approach. Because the wildlife action plans in most States identified loss of habitat due to degradation, conversion and fragmentation as the primary problem impacting species of greatest conservation need in their states, this report serves as a powerful first-step, and a solid platform, for developing collaboration and will bring into focus the regional context of the individual state wildlife reports.

For a detailed description of the process used to create the ARBL, and how the ecological condition was determined, refer to Appendix G. The compensation planning framework, including detailed maps of the ARBL for each service area and wetland condition analysis, can be found in Appendix H.

D. Statement of Aquatic Resource Goals and Objectives

The overall goal of the Compensation Planning Framework is to advance the conservation goals and objectives of NHDES, specifically:

a) Substantially increase the extent and quality of restoration, enhancement, creation, and protection of natural resources over that typically achieved by other forms of compensatory mitigation for activities that impact wetlands, and other waters of the state, which includes waters of the U.S.;

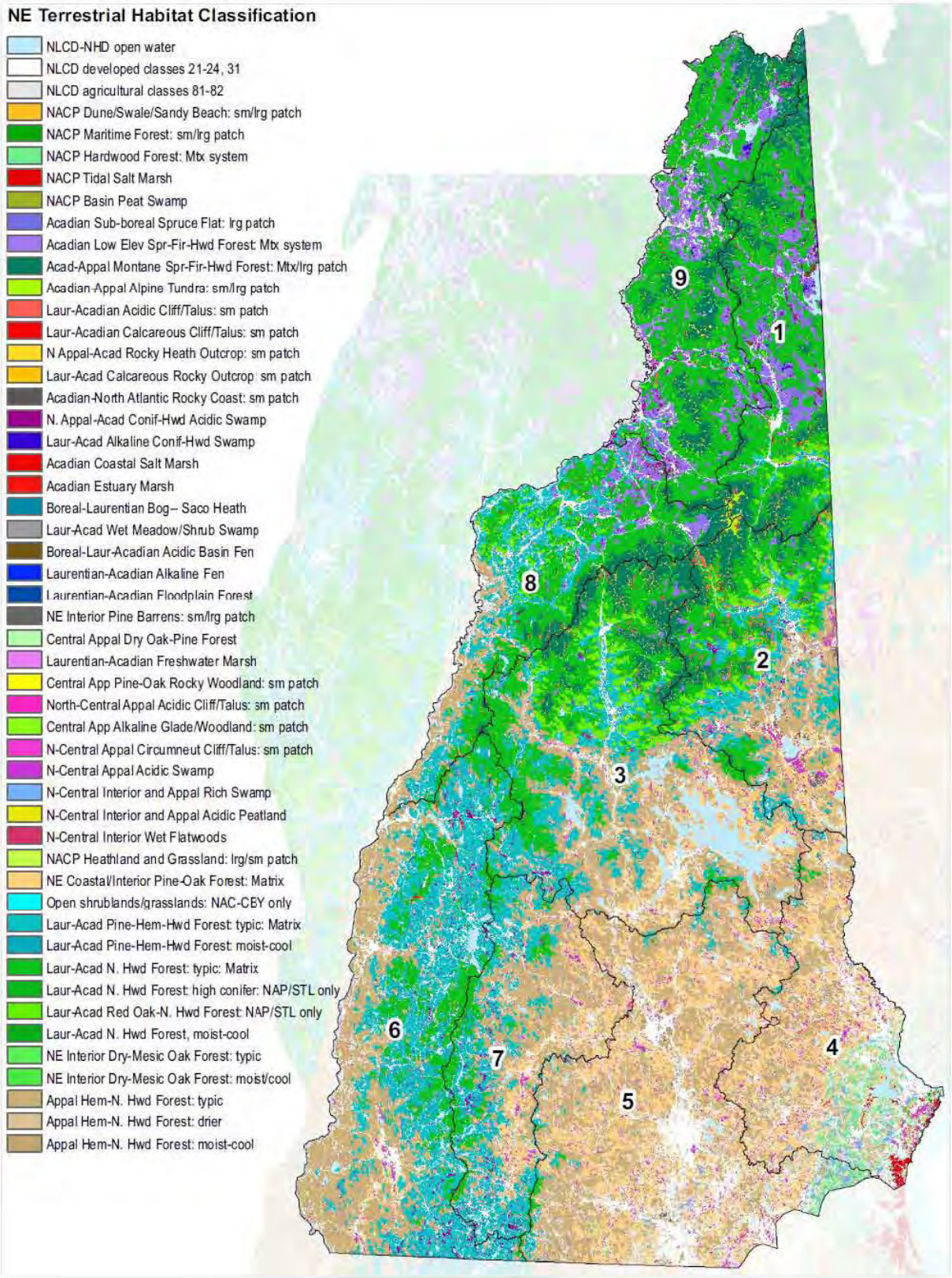
b) Achieve ecological success in the service areas by directing ILF funds to protect natural resource types and functions that are appropriate to the geographic service area, and by integrating ILF projects with other conservation activities whenever possible;

c) Identify and protect wetland systems of statewide significance through fee acquisition, conservation easements, or other tools for permanent conservation;

d) Provide effective and responsible levels of protection and restoration of New Hampshire's aquatic resources through an efficient regulatory program; and

e) Improve coordination among and between agencies with respect to wetland policies and regulatory programs to ensure efficiency in effort, consensus in outcome, and consideration of wetlands at the landscape scale.

FIGURE 8. Northeast Terrestrial Habitat Classification Map – State of New Hampshire.



E. Prioritization Strategy for Selecting and Implementing Mitigation Projects

ARM Fund projects are selected using a competitive award approach. Each year, requests for proposals are posted for municipalities, state agencies, non-profit conservation organizations and private individuals to submit a pre-proposal for eligible restoration and preservation projects. The pre-proposals are evaluated by the NHDES Program Administrator, the Corps and the SSC. Applicants whose proposed projects are determined to meet or exceed the ARM Fund core requirements are invited to submit full proposals. Full proposals are evaluated and ranked by the SSC using the prioritization criteria outlined below, which can be modified upon approval by NHDES and the Corps.

Although all projects within project types below are technically eligible for an ARM Fund application submittal, some projects may not be competitive based on established ranking criteria. Because the SSC is responsible for selecting projects that are likely to be sustainable in the long-term, projects should propose methodologies whereby success can be demonstrated elsewhere and that includes a monitoring plan that will be implemented long-term. To maximize the potential score, the following information is provided to applicants as guidance and should be considered for any project:

Land/Wetland Acquisition/Legal Protection Projects

- A rare resource (natural community or threatened/endangered plant/wildlife) will benefit.
- Area was identified in NH Wildlife Action Plan as being of statewide or regional significance.
- Project is adjacent to other conservation lands or provides linkage to other protected parcels.
- Aquatic resources and their associated buffers will be protected.
- Easement language will ensure permanent protection of resources.

Wetland Restoration/Creation

- Wetland restoration will enhance or restore functions lost in the HUC 10 watershed. Although wetland restoration is not required, applicants can maximize potential points by including it.
- Include a land protection component as part of project or project should occur on a property that has already been permanently protected. To receive maximum points, a land protection component must be part of the project proposal.
- Wetland restoration or creation is identified as a priority in a regional or statewide plan.
- A rare resource (natural community or threatened or endangered plant or wildlife) will benefit.
- Restoration plans should be detailed and illustrate a clear link to improving wetland functions.

Stream Restoration

- Stream restoration will enhance or restore functions lost in the HUC 10 watershed. Stream restoration is not required. However, applicants can maximize potential points by including it.
- Include a land protection component as part of project or project should occur on a property that has already been permanently protected. To receive maximum points, a land protection component must be part of the project proposal.
- Stream restoration is identified as a priority in a regional or statewide plan.
- A rare resource (natural community or threatened or endangered plant or wildlife) will benefit.
- Bank stabilization, if proposed, is required to improve the system ecologically, not just the human infrastructure.
- Bank stabilization projects where erosion appears natural or where the cause is unknown, are as a general matter, less likely to be funded.
- Restoration plans should be detailed and illustrate a clear link to improving aquatic functions.

Culvert or Dam Removal/Replacement

- Culvert or dam removal or replacement is identified as a priority in a regional or statewide plan. Because culvert and dam removal or replacements are often extremely expensive, there are numerous culverts and dams needing replacement or removal statewide, and there are limited funds in the ARM fund, the ARM committee is unlikely to recommend funding for these types of projects unless applicants demonstrate that project is exceptional and has numerous and significant ecological ramifications.
- Culvert or dam replacement or removal will enhance functions lost in the HUC 10 watershed. Wildlife habitat (including fish) is often the primary function enhanced by these projects but other functions may be enhanced occasionally.
- Include a land protection component as part of project or project should occur on a property that has already been permanently protected. To receive maximum points, a land protection component must be part of the project proposal.
- A rare resource (natural community or threatened or endangered plant or wildlife) will benefit.
- Aquatic organism passage is improved; preferably goes from non-passable to fully passable by all organisms.
- Number of stream miles connected is maximized. For example, a project that opens up 50 miles of barrier-free river is likely to be more competitive than a project site that has additional barriers just up and down river.
- Culvert replacement is not a part of a current or future planned development project requirement.

Invasive Species Management

- Invasive Species Management will enhance functions lost in the HUC 10 watershed. Application should clearly demonstrate which functions are being improved.
- Include a land protection component as part of project. To receive maximum points, a land protection component must be part of the project proposal or project should occur on a property that has already been permanently protected.
- Treatment methods are known and will not cause negative effects on aquatic resource.
- A long-term treatment plan, if needed, has been established. The ARM fund is unlikely to fund repeated treatments for a particular area.
- A monitoring plan has been established.
- A landscape plan for treatment is in place (not just for a single parcel).
- A rare resource (natural community or threatened or endangered plant or wildlife) will clearly directly benefit as a result of treatment.

Principal Considerations and Criteria

The principal considerations in the selection of a mitigation site include the following: the site has a high potential for wetland restoration or enhancement; the site includes high or unique natural resources as noted in the WAP; the site protects a drinking water supply; the site is under threat from degradation in the next 20 years and contains both aquatic resources and healthy upland buffers; the project replaces or protects the wetland types lost in the service area; and the site is connected to or in close proximity to protected lands held by a conservation organization and will help to maintain and preserve habitat connectivity. The specific criteria and percentage of the overall score that the SSC uses to evaluate and rank proposals include the following:

Potential to Replace or Protect Functions and Values

The potential a project has to replace or protect wetland functions lost within the service area, including those that have been identified by the Site Selection Committee as priorities for the application cycle.

Considerations and scores include:

a. The project will restore or retain 80% or more of the wetland functions and values lost through authorizations to use the ILF program in the service area; firm evidence was supplied by the applicant of the wetland functions & values to be provided by the project.
b. The project will restore or retain at least 50% but less than 80% of the wetland functions and values lost through authorizations to use the ILF program in the service area but firm evidence of the functions and values to be provided by the project was not supplied by the applicant.
c. The project will restore or retain at least 30% but less than 50% of the functions and values lost through authorizations to use the ILF program in the service area.
d. The project will restore or retain less than 30% of the wetland functions and values lost through authorizations to use the ILF program in the service area but that it:

1. Will provide or protect other important wetland functions and values; or

2. Is a component of a suite of projects to be funded during the current application cycle, which, when taken as a whole, will replace all functions and values lost through authorizations to use the ILF program in the service area.

Overall Environmental Significance of the Project

The overall environmental benefit to aquatic resources is assessed. Considerations include:

a. Project is located within a source water protection area, wellhead protection area, or overlays a high-yield stratified drift aquifer.
b. Project will benefit state or federally listed endangered, threatened or special concern species or exemplary natural communities have been documented to occur on the property.
c. Project is located in or in close proximity to NH WAP highest quality wildlife habitat.

Location of a project relative to the NH WAP highest quality wildlife habitat areas

The project's proximity and connectivity is characterized by the following considerations:
a. Project is adjacent to lands protected in perpetuity.
b. Project provides or contributes to a connection between lands that are currently unconnected and which are protected in perpetuity.
c. Project contributes to linkages or over-land connections among and between one or more aquatic resource areas.
d. Project lies within a large unfragmented block of land, relative to the HUC 10 watershed.
e. Project is located within the same sub-watershed (HUC 10) as the impact area(s).

Overall Mitigation Potential of the Project

Assesses the overall potential of the project to provide compensation for the lost functions and values.

a. Project will contribute to the protection of most or all of the aquatic resource(s).
b. Project will protect an upland buffer that protects an aquatic resource identified as a prime wetland by a municipality or recognized in a municipal or regional wetland or natural resource study.
c. Project will protect, at a minimum, a 100' upland buffer around the aquatic resource.
d. Project will protect most or all of the HUC 12 watershed of the aquatic resource.

Project Cost-Effectiveness and Partnership Potential

The extent to which the proposal is cost effective, has been identified as an important project, and has developed partnerships. Considerations include:

a. Project will provide a cash or in-kind donation match of at least 10%.
b. Project area is identified in a federal or state environmental priority plan other than the WAP.
c. Project is supported by the host municipality.

F. Stakeholder Involvement

The NHDES worked closely with a broad range of partners and experts from state, federal and regional agencies, NGOs, and academic institutions throughout the development of the ARM Fund program. The NHDES Program Administrator convened a group of public and private natural resource conservation, management, and planning experts in an initial stakeholder group meeting to launch development of this Compensation Planning Framework. The purpose of this initial meeting was to craft the key questions to be used and to be included in the Instrument and solicit information on data sources and other resources that are currently available. Following this initial meeting, NHDES conducted extensive outreach (by phone and email) to individual stakeholders in order to refine the questions, gather relevant data, and request technical assistance and expert input. NHDES held interim review meetings with a subset of the larger stakeholder group. The purpose of this meeting was to gather experts in conservation planning, GIS, and aquatic resources, to review the results of the ARBL and collect final feedback on the approach being used. The draft Instrument was then widely circulated to stakeholders for comment. Their input, including information they may provide, will be incorporated as appropriate into the final Instrument.

G. Long term Management and Financial Arrangements

Each applicant that receives funds from the ARM Fund shall be responsible for ensuring long-term protection of each project. The NHDES will ensure that all mitigation sites that are used to satisfy compensatory mitigation requirements will be protected in perpetuity. The appropriate mechanisms include conservation easements, deed restrictions, or fee simple ownership by a land conservation organization, although deed restrictions will be avoided to the extent possible and their use may result in a lower ranking during evaluation. NHDES will be named as holding an executory interest in the land unless circumstances deem this unnecessary. For any project calling for a transfer of easements or fee simple ownership, documentation showing that the proposed grantee is one of the following is required:

(1) A state natural resource agency such as the fish and game department or the department of resources and economic development;

(2) A municipality with a conservation commission in the town where the property is located and the conservation commission will be the responsible entity; or

(3) A conservation organization such as a state-wide, regional, or local organization with a conservation mission that can provide documentation from the United States Internal Revenue Service stating that it is an income tax exempt, publicly supported corporation, pursuant to 501(c)(3) of the United States Internal Revenue Code; and

For any proposal calling for a transfer of easements or fee simple ownership to a conservation organization, the following documentation is required of the conservation organization:

(1) Acceptance of the Land Trust Alliance (LTA) standards and practices as specified in "LTA Standards and Practices,", revised 2004 (or the current revision), or can show that it has adopted equivalent standards and practices; or

(2) A record of holding conservation easements and managing them consistent with the purposes of those easements.

NHDES has a record of working closely with existing conservation organizations that have many years of

experience in managing natural areas. In most cases, the applicants that request ARM Funds to protect a valuable parcel are local land trusts equipped with the staff and expertise in handling conservation easements. Most often they will become the conservation easement holder or will maintain ownership of land acquired with the funds. Furthermore, in the case of restoration sites, landowner permission is obtained to do the work and an attempt is made to acquire some protection over the area for long-term management purposes.

Preservation mechanisms shall be recorded in the County Registry of Deeds Office in the county in which the land lies. A copy of the recorded document, showing book and page numbers of the recorded location, shall be provided to the Corps office and placed on the RIBITS website. Preservation mechanisms shall be perpetual, preserve all natural areas, and prohibit all use of the property inconsistent with its use as mitigation property, including any activity that would materially alter the ecological integrity or functions and values of aquatic resources contained within the mitigation site. The goal is to preserve and protect in perpetuity the natural vegetation, soils and hydrology, natural habitat and the scenic and aesthetic character of the Property so that the Property retains its natural qualities and functions. These measures are to prevent any future development, construction, or use that will significantly impair or interfere with the conservation values of the Property.

All conservation easements executed under this program shall be in conformance with the standard NHDES ARM Fund program template unless otherwise authorized by the NHDES. The draft conservation easement or equivalent protection mechanism shall be submitted to the IRT for review. The language specifically stipulates restrictions in forested wetlands, provides for a minimum 100 foot no-cut buffer to significant wetlands, and recommends the harvest be carried out according to *"Good Forestry in the Granite State"* found at: http://extension.unh.edu/goodforestry/index.htm. If long-term stewardship responsibilities are transferred to a land conservation organization, funds shall also be transferred for the long-term management of the parcel. NHDES will enter into a long-term agreement with the steward that details stewardship requirements, including but not limited to such items as annual site visits, adaptive management strategies, control of invasive species and the maintenance of signs.

Copies of such recorded instruments shall be maintained by the NHDES program administrator and shall become part of the official project record. Each protection instrument shall contain a provision requiring notification to NHDES and the Corps if any action is taken to void or modify it. Such protection mechanisms should be in place prior to site closure or final credit release, as stipulated in each mitigation plan.

A compensatory mitigation proposal based on wetland restoration, enhancement or creation shall generally replace the types of wetlands to be impacted and the functions affected and shall include, where practicable, the provision for a contiguous upland buffer. The Corps and IRT must review and approve each mitigation plan.

It is recommended that the potential for occurrence of rare or special concern species, state or federally listed threatened or endangered species, species at the extremities of their ranges, migratory species, and exemplary natural communities be identified and evaluated in terms of the goals of the project.

To ensure long term success, the project must include a report describing how annual monitoring will be conducted following construction of the mitigation site(s), identifying the name of the qualified professional responsible for monitoring, proposed measures of success, and the remedial measures to be taken during construction and after completion of the project to promote success of the mitigation area. In the case an award is granted for work that has not been successful, an applicant cannot return to the ARM Fund for additional funds for the same project and no credits will be released. If an awardee determines that there is additional work that should be conducted that would add value to the project but for which inadequate funds have been awarded, additional funding may be considered by the SSC, Corps, and IRT.

VIII. DEFAULT AND CLOSURE PROCEDURES

Any delay or failure of the NHDES to comply with the terms of this agreement shall not constitute a default hereunder if and to the extent that such delay or failure is primarily caused by any act, event or conditions beyond the NHDES' reasonable control and that significantly adversely affects its ability to perform its obligations hereunder including: (i) acts of God, lightning, earthquake, fire, or landslide; (ii) condemnation or other taking by any governmental body; (iii) change in applicable law, regulation, rule, ordinance or permit condition, or the interpretation or enforcement thereof; (iv) any order, judgment, action or determination of any federal, state or local court, administrative agency or government body; or (v) the suspension or interruption of any permit, license, consent, authorization or approval. If the performance of the NHDES is affected by any such event, the NHDES shall give written notice thereof to the IRT as soon as is reasonably practicable.

The Corps or NHDES may terminate this Instrument by giving sixty (60) days written notice to the other party. Prior to termination, the NHDES shall provide an accounting of funds and shall complete payment on contracts for projects approved by the IRT, the Wetlands Council and G & C, and any expenses incurred on behalf of the account. Upon termination, after payment of all outstanding obligations, the remaining funds in the ARM Fund shall be paid to not more than five different entities if required by the Corps. In the event the program is closed, the NHDES is responsible for fulfilling any remaining obligations for credits sold, unless the obligation is specifically transferred to another entity as agreed upon by the Corps and NHDES. Funds remaining in an account after these obligations are satisfied should continue to be used for restoration, enhancement, or preservation of aquatic resources.

IX. SIGNATURES

U.S. ARMY CORPS OF ENGINEERS

By: _____ Date:_____
Its: Charles P. Samaris, District Engineer

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

By: _____ Date:_____
Its: Thomas S. Burack, Commissioner

APPENDIX A
AQUATIC RESOURCE MITIGATION FUND AWARDS 2009-2011

MERRIMACK RIVER WATERSHED:

1) 2009-2276 Stewart Property, Francestown – St. Anselm College in partnership with Town of Francestown. $49,000 for 2 acres of enhancement and 53 acres of preservation.

2) 2009-2275 Clay Pond Headwater Project, Hooksett – Town of Hooksett in partnership with Bear-Paw Regional Greenways. $200,000 for 730 acres of preservation.

3) 2009-2274 Oxbow Property, Canterbury - Concord Regional Solid Waste/Resource Recovery in partnership with the Society for the Protection of NH Forests. $300,000 for 294 acres of preservation.

4) 2009-2277 Nesenkeag Brook Headwaters Project, Londonderry – Town of Londonderry. Partial payment of $20,000 for review of hydrology and opportunities for enhancement.

UPPER CONNECTICUT RIVER WATERSHED:

1) 2010-1449 Potter Farm, Northumberland – The Nature Conservancy. $148,000 for 326 acres of preservation and 14 acres of enhancement of floodplain forest on the Connecticut River.

WINNIPESAUKEE RIVER WATERSHED:

1) 2010-1646 Tioga River Wildlife and Conservation Area, Belmont – Town of Belmont with assistance from Stoney Ridge Environmental. Partial payment of $30,000 to enhance 25 acres of habitat within the conservation easement land.

2) 2010-1647 Coffin Brook Road Floodplain Connectivity Improvement Project, Alton – Town of Alton with assistance from Stoney Ridge Environmental. Partial payment of $23,000 to enhance 30 acres of a floodplain wetland system.

CT RIVER TO ASHUELOT RIVER FROM VERNONS DAM TO MILLERS RIVER:

1) 2010-2618 Colony Project, Chesterfield – The Monadnock Conservancy. Partial payment of $83,467.00 to acquire conservation easement and perform limited restoration.

2) 2010-2619 Brown Farm, Swanzey – The Nature Conservancy. Payment of $94,533.00 with $5,000 as contingency funds to acquire the conservation easement and perform floodplain forest restoration.

PEMIGEWASSET RIVER WATERSHED:

1) 2010-2622 Strolling Woods, Franklin – NH Lakes Association. Partial payment of $113,500 to acquire conservation easement and perform water quality improvements to Webster Lake.

SALMON FALLS – PISCATAQUA RIVER WATERSHED:

1) 2010-2746 Sprucewood Forest, Durham – Trust for Public Lands. $500,000 for 176 acres preservation near Oyster River.

2) 2010-2749 Evans Mountain, Strafford – Town of Strafford/Bear – Paw Regional Greenways. $367,750.00 for 1,015 acres preservation and 3,400 sq.ft. of wetland restoration.

3) 2010-2740 Exeter River Water Quality Improvements and Buffer Preservation, Brentwood. $78,468 for 16 acres of river preservation and 0.3 acres enhancement to improve water quality and buffers along the river.

4) 2010-2747 Siemon Family Charitable Trust, Milton – NH Fish & Game Department. $29,300.00 to protect 366.1 acres of land – funds going toward transaction costs.

5) 2010-2742 Upper Oyster River Channel & Fish Passage Restoration, Barrington – Piscataqua Region Estuaries Partnership. Partial payment of $100,000 for culvert removal to improve 4 miles of perennial stream with potential 18 acres preservation adjacent to river.

6) 2010-2745 Odiorne Point State Park Maritime Cobble Beach and Coastal Salt Pond Marsh Restoration Project, Rye – Rockingham County Conservation District. Partial payment of $43,000 for 3.8 acres restoration and 6.45 acres enhancement at state park.

7) 2010-2739 Berry Brook Watershed Restoration through Stream Restoration, Buffer Development, and LID Retrofits, Dover – UNH Stormwater Center/City of Dover. Partial payment of $440,000 for 5 acres preservation, 1.83 acres wetland restoration, 1,500 linear feet of stream restoration in Berry Brook.

8) 2010-2741 River Road Marsh Restoration, New Castle – New Castle Conservation Commission/RCCD. $27,993 for 0.5 acres salt marsh restoration.

APPENDIX B
NHFG WAP DOCUMENTATION
ON HIGHEST RANKED WILDLIFE HABITAT
BY ECOLOGICAL CONDITION

WILDLIFE ACTION PLAN MAP ANALYSIS INFORMATION
New Hampshire Fish and Game Department: March 2010

Contents:
DETERMINING ECOLOGICAL CONDITION: Explanation of the condition analysis and ranking process that makes up the condition score for habitat polygons in Highest Ranked Wildlife Habitat by Ecological Condition Map.

ATTRIBUTES USED IN CONDITION FILTERS FOR SPECIFIC HABITATS: Specific factors for each habitat type that make up the condition score.

RANKING LEVELS FOR EACH HABITAT TYPE AND ADDED PRIORITY FEATURES: Percentages by area used toe rank each habitat type.

OCCURRENCES USED TO ELEVATE HABITAT RANK: Description of how select wildlife, plant and natural community occurrences elevated some habitat polygons to higher tiers.

DATA SOURCES FOR CONDITION ANALYSIS

DETERMINING ECOLOGICAL CONDITION

Habitat condition was analyzed to develop statewide and regional rankings that identify the highest condition habitat relative to all polygons of a given habitat type in the state. The goal is to provide regional planners and conservation professionals with a tool to help identify the most ecologically intact wildlife habitat areas.

Using the 16 habitat types mapped in the NH Wildlife Habitat Land Cover dataset, plus streams and rivers and lakes and ponds, NHFG biologists developed condition filters to analyze which habitat patches are in the best relative ecological condition in the state. These filters are composed of GIS data that indicate to what degree a particular patch of habitat has good biological diversity (particularly in terms of rare species), is connected to other similar patches in the landscape, and is negatively impacted by humans. There is a different filter for each habitat, but each filter includes biological, landscape, and human impact factors. These three types of data are combined into BIO, LAND and HUMAN scores and are shown in the attribute fields.

Each habitat type has different factors that may affect its condition, but there are some commonalities in each of the groupings. Biological factors included data such as rare species richness for animals, plants and exemplary natural communities, as well as vertebrate species richness and other biological factors. Landscape factors include area of habitat patch, proximity to the nearest similar habitat patch, diversity of ecological land units (TNC data on ecological potential which is similar to potential natural community diversity) within the patch, and other factors depending on the habitat type. Human impacts include data such as road density, wetlands permits, population density, pollution indices, dams and other similar factors. Pages 3-8 outline the data used for each habitat type; the metadata for each habitat layer provide additional details.

A set of available statewide data was collected for each of these three groups, with each individual score being on a 1-100 scale. Within each group, the scores for each data set were evenly weighted (except for the aquatic features). The score for each group was then weighted evenly to come up with a single condition score (COND). This score is a relative score, based on all polygons of given habitat types that

occur in NH. Habitat patches were assessed as full polygons except the five matrix forest types, which were assessed in raster format (see below).

Surface waters were assessed a little differently than terrestrial habitats. Streams and rivers were assessed in watershed units developed by the US Geological Survey, using the HUC 12 level. The condition filter developed had some factors unevenly weighted, but otherwise the process was the same as the other habitats. See the metadata for details.

In 2010, a significant improvement in the accuracy of scoring the relative condition of forest habitats was accomplished by evaluating all forests as a seamless matrix instead of by individual polygons. In the NH WAP, a matrix forest is a large contiguous area having the geo-physical conditions favorable to a particular suite of forest land cover classes. The matrix forest polygons in the WAP data represent a heterogeneous mix of landscape features. They are embedded with other small habitats (early succession/disturbance patches, forested wetland, cliffs, etc…). In consideration of the matrix forest as the most extensive and interconnected habitat type, in 2010 its relative condition assessment was determined by evaluating the entire matrix as a seamless raster. This assigns a condition score to each 30 meter pixel (0.22 acre) in the forest habitat data.

Using the same thresholds as the 2005 analysis, but a new set of condition attributes (page 5), pixels scoring Highest Ranked Habitat by Ecological Condition are selected for each of the forest matrix types. Pixels must be clustered into a patch of at least 100 acres to rank as highest in the state or biological region. In this method, only the portion of a forest patch meeting the condition threshold is assigned the highest rank rather than the entire polygon. Small clusters of highest-ranked pixels (less than 100 acres) were assigned Tier 3 Supporting landscapes. Clusters of lower-ranked pixels less than 100 acres but completely surrounded by highest-ranked pixels were elevated to the surrounding Tier.

Each of the 16 terrestrial habitat layers include the overall condition score and the three subscores (BIO, LAND, HUMAN) for each habitat polygon. Aquatics condition scores are in a separate dataset. Not all of the underlying data scores are included with the released GIS data due to proprietary issues.

RANKING HABITATS

Within each habitat type, the patches were ranked into one of four categories based on percentage of that habitat by area. The four rankings are; **Highest Ranked in the State by Ecological Condition**, **Highest Ranked in the Biological Region by Ecological Condition, Supporting Landscapes, and Not top ranked (all the rest).** The percentages are listed in the table on page 8. The top ranked habitats were assigned **Highest Ranked in the State by Ecological Condition**. Coastal and alpine habitats are so rare that all patches are included in this ranking.

Since NH is so ecologically diverse, the habitats were then ranked within their ecoregional subsection. Ecoregional subsections reflect broad regional patterns of geomorphology, stratigraphy, geologic origin, topography, regional climate, and dominant associations of potential natural vegetation. The Nature Conservancy has identified 9 ecoregions in New Hampshire. These were used to rank habitats as **Highest Ranked in the Biological Region by Ecological Condition**. The Nature Conservancy also developed watershed groupings which are like the ecoregional subsections but with abiotic features that influence aquatic biology and were used for wetland habitats and watersheds.

The condition of a habitat patch will deteriorate if the surrounding landscape is degraded. A third ranking, **Supporting Landscapes**, consists of the upland part of the watershed for surface waters, some very intact forest blocks, some known locations of exemplary natural communities, and additional forest areas as scored through the condition analysis.

In order to capture occurrences of specialist species with imperiled populations, a select set of wildlife Element Occurrences (areas known to support populations of rare species) from the Natural Heritage Bureau database was used either to elevate underlying habitat polygons to the highest rank in NH or to

buffer locations within an already high ranked matrix forest. The same was done for significant ecological features identified by NH Natural Heritage Bureau but elevating them to Supporting Landscape level. Both additions are incorporated in the WAPTIERS data layer. A description of the species, plants and natural communities add-ins begins on page 9.

For more details on this work, see the metadata for each habitat layer and the WAPTIERS layer.

ATTRIBUTES USED IN CONDITION FILTERS FOR SPECIFIC HABITATS
The following factors were quantified and combined to create a single score for each habitat polygon. These scores were used to rank habitat polygons or sections of forests. Habitats are listed alphabetically.

ALPINE
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Area (hectares)
Proximity index (proximity of similar habitat patches)
Variety of ecological land units (ELU30 = elevation, substrate, landform)(TNC)
Density of hiking trails in the unit (km/km2)
Average total deposition of mercury (wet + dry) by land cover type (Miller et al, 2005)
Average deposition index, rate of cation depletion per ha/per year (Miller et al, 2005)

APPALACHIAN OAK PINE FOREST – see Matrix Forests

COASTAL ISLANDS AND DUNES
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Average elevation (meters)
Vegetated (Y=yes or U=unknown)
Total size of island or unit (hectares)
Number of other islands within ½ kilometer
Average distance to mainland (meters)
Percent of island/unit that is wetland-NWI
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape
Percent already developed (2001 NH Land Cover from GRANIT)
Distance to nearest aquaculture operation (meters)
Average general shoreline sensitivity index value from ESI shoreline data

CLIFF
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Area (hectares)
Proximity index (proximity of similar habitat patches)
Recreational rock climbing (Y=yes, U=undetermined)
Distance to nearest hiking trail (meters)
Distance to nearest road (meters)

FLOODPLAIN FOREST

Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Area of buffer in hectares
% of 1-km buffer around complex that is wetland
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape
Percent of floodplain forest drainage area that is impounded
Distance to nearest dam (meters)

GRASSLANDS
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Area (hectares)
Proximity index (proximity of similar habitat patches)
Percent wetland (National Wetlands Inventory)
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape
Housing unit density in 2000 (houses per square mile)

MARSH AND SHRUB WETLAND COMPLEXES
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Number of marsh polygons in the complex
Area of largest marsh in the complex (hectares)
Number of dominant NWI vegetation classes in the complex
Road density within 250m of the complex
Distance to nearest road (meters)
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape

MATRIX FORESTS: Appalachian Oak Pine Forest, High Elevation Spruce Forest, Hemlock Hardwood Pine Forest, Lowland Spruce Forest, and Northern Hardwood Conifer Forest
Percent of predicted matrix forest polygon consistent with validated current forest cover types (Miller et al., 2005).
Vertebrate species richness (VT/NH GAP Analysis), maximum in 1 km radius
Richness of rare animal occurrences in 1 km radius, with occurrence records buffered by species dispersal distances
Richness of rare plant occurrences in predicted matrix forest polygons Richness of rare and exemplary natural communities in 1km radius
Richness of ecological land units (substrate, landform) in 1 km radius
Density of matrix (by forest type) in a 5km circle
Size of contiguous forest block within which forest habitat patch is located
NH Wildlife Connectivity Model, average landscape permeability for 16 species
Road density in the (km road/km2)
Population density in 2000 (people per square mile)
Housing units density in 2000 (houses per square mile)
Average total deposition of mercury (wet + dry) by land cover type (Miller et al, 2005)

Average deposition index, rate of cation depletion per ha/per year (Miller et al, 2005)

HIGH ELEVATION SPRUCE FOREST – see Matrix Forests
HEMLOCK HARDWOOD PINE FOREST – see Matrix Forests
LAKES AND PONDS
water bodies managed for wild trout
water bodies containing lake trout populations
Value based on rarity of fish species of concern present
NHB tracked species count (mussels, eagle, osprey, wood turtle, Cobblestone tiger beetle)
% watershed area in wetlands
% watershed area in open water
Road density in the area/unit (km/km2)
Developed & developable land incl. constrained areas (percent of total land area)
Percent of land area in agriculture
Change in population density 1990 to 2000

LOWLAND SPRUCE FOREST – see Matrix Forests

NORTHERN HARDWOOD CONIFER FOREST – see Matrix Forests

PEATLAND COMPLEXES
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Area of buffer in hectares
Percent of 250m buffer of complex that is forest, water or wetland
Distance to nearest human impact
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape

PINE BARRENS
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Percent of area classified by NHB as current pitch pine habitat
Area (hectares)
Proximity index (proximity of similar habitat patches)
Variety of ecological land units (ELU30 = elevation, substrate, landform)
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape
Population density in 2000 (persons per square mile)
Housing units density in 2000 (houses per square mile)
Average deposition index, rate of cation depletion per ha/per year (Miller et al, 2005)

RIDGE/TALUS SLOPES
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Area (hectares)
Proximity index (proximity of similar habitat patches)
Variety of ecological land units (ELU30 = elevation, substrate, landform)

Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape
Density of hiking trails in the unit (km/km2)
Distance to nearest hiking trail (meters)
Average total deposition of mercury (wet + dry) by land cover type (Miller et al, 2005)

RIVERS AND STREAMS (not updated in 2010, except for Element Occurrence add-ins)
Count of anadromous fish species
waterbodies managed for wild trout
waterbodies containing lake trout populations
Status of Eastern brook trout (EBT Joint Venture)
NHB tracked species count (mussels, eagle, osprey, wood turtle, Cobblestone tiger beetle)
Value based on rarity of fish species of concern present
Area of surface water in the unit (hectares)
Length of rivers in kilometers
Area of wetlands in hectares
Road density in the area/unit (km/km2)
Percent of land area that is agriculture
River kilometers not impounded / total river kilometers
Developed & developable land incl. constrained areas (percent of total land area)
Change in population density 1990 to 2000
Percent in conservation

SALT MARSH
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)
Species richness of selected animal species occurrences in polygon (2008)
Species richness of selected animal species occurrences within 1km area (hectares) (2008)
Proximity index (proximity of similar habitat patches)
Distance to nearest salt marsh area > 20 hectares in size (m)
Hectares of saltmarsh within one kilometer
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005) – affect of fragmentation on the landscape
Density of all DOT roads (km/km2)
Percent of polygon with invasive plants present
Percent impervious surface

HUC_12 SUBWATERSHEDS (not updated in 2010)
(*the only habitat for which the condition filters were NOT equally weighted, see metadata*)
Count of water bodies within the HUC_12 with wild trout occurrence(s)
Count of water bodies within the HUC_12 managed for lake trout
Eastern Brook Trout Joint Venture Status
Count of occurrences in HUC_12 for: Blanding's, Spotted and Wood Turtles; Common Loon, Bald Eagle, Osprey, Northern Leopard Frog, Cobblestone Tiger Beetle
Count of fish species element occurrences in the HUC_12, incl. 2005 Wildlife Sitings records
Presence of anadromous fish in any 1 or more water bodies within the HUC_12
Hectares of surface water in the HUC_12 (NH)
Total river kilometers in the HUC_12 (2006 IDSLINES 1:100,000 NHD from NHDES)
Total free-flowing river kilometers in the HUC_12 (2006 IDSLINES from NHDES)
Total hectares of palustrine wetland and estuarine marsh in the HUC_12 (NH)
Road Density in the HUC_12 (km/km2 by land area)
Percent of HUC_12 in agriculture or disturbed land cover (2001 NHLC)

RANKING LEVELS FOR EACH HABITAT TYPE AND ADDED PRIORITY FEATURES

Tier 1 = Habitats of Highest Relative Rank by Ecological Condition in New Hampshire
Tier 2 = Habitats of Highest Relative Rank by Ecological Condition in Biological Region
Tier 3 = Supporting Landscapes

Note that these designations are mutually exclusive. Habitat already ranked as Tier 1 counts towards the percentages for Tier 2, but only those not already Tier 1 will be designated as Tier 2. This is also the same for Tier 3.

HABITAT	TIER	% USED FOR EACH RANK
High-Elevation Spruce-fir	1	Top 15% in NH by area
	2	Top 100%
Lowland Spruce-fir	1	Top 15% in NH by area
	2	Top 15% in Subsection by area
	3	Top 30% in Subsection by area
Northern Harwood-Conifer	1	Top 15% in NH by area
	2	Top 15% in Subsection by area
	3	Top 30% in Subsection by area
Appalachian Oak-Pine	1	Top 15% in NH by area
	2	Top 15% in Subsection by area
	3	Top 30% in Subsection by area
Hemlock-Hardwood-Pine	1	Top 15% in NH by area
	2	Top 15% in Subsection by area
	3	Top 30% in Subsection by area
Pine Barrens	1	Top 10% in NH by area
	2	Top 50% in Subsection by area
Rocky Ridges/Talus Slopes	1	Top 10% in NH by area
	2	Top 50% in Subsection by area
Cliffs	1	Top 10% in NH by number of polygons
	2	Top 50% in Subsection by number of polygons
Grassland (may include agricultural fields, pasture lands, airports, golf courses, and other open lands)	1	Top 10% in NH by area. Condition only includes grasslands greater than 25 acres in size.
	2	Top 50% in Subsection by area
Wet Meadow/Shrub Wetland	1	Top 10% in NH by area
	2	Top 50% in Watershed Group by area
Peatland	1	Top 10% in NH by area
	2	Top 50% in Watershed Group by area
Floodplain Forest	1	Top 10% in NH by area
	2	100% in Watershed Group
Watersheds (HUC12s)	1	Top 15% in Watershed Group by area (entire HUC12 watershed)
	2	Top 30% in Watershed Group by area (only 100m buffer of water bodies in these HUC12)
Lakes/Ponds	1	TNC's Top 10 most intact lakes, by lake class (including a 200m buffer of these lakes)
Salt marsh	1	100%
Coastal Islands	1	100%

Dunes	1	100%
Alpine	1	100%
TNC top forest blocks	3	TNC forest blocks top-ranked in ELU Group and/or Ecoregion Subsection
Animal occurrences	1-3	Occurrences of selected endangered, threatened or special concern species. See below
Ecological features (NHB)	1-3	High Priority natural communities as ranked by NHNHB. See notes.

OCCURRENCES USED TO ELEVATE HABITAT RANK

Data for rare species and exemplary natural communities used in these analyses were subset as follows:

- For animals: restricted to endangered, threatened, special concern and S1-S2 species with precise location information (precision = "seconds") that were observed within the last 20 years
- For plants: restricted to populations with precise location information (precision = "seconds") that were observed within the last 20 years
- For natural communities: restricted to those observed within the last 40 years

For important background information on NH Natural Heritage Bureau data, see *Important Background Information for Interpreting Species Richness Counts based on NH Natural Heritage Bureau Data.*

Selected Rare Wildlife

Animal occurrence records were extracted from the NH Natural Heritage Bureau database and overlaid on the WAP habitat polygons. Only geographically precise data recorded within the last 20 years were used. For some species, known core populations, population models or reproductive data were used to refine locations to core populations. Except where noted, the presence of these species elevated the habitat patch to Tier 1: Highest Ranking by Ecological Condition in New Hampshire. Species whose populations were already well covered by the basic condition rankings were not included.

Criteria used to select species:

- Endangered or threatened in NH
- Limited populations known or likely to occur
- Isolated or restricted in NH
- Point specific sensitive information
- Provides critical habitat for state's population which is not already highly ranked

Selected Element Occurrences (EO) (1988-to-2009 and excluding "general" precision) and core populations included:

Birds:

Peregrine nest EOs (natural sites), Bald eagle nesting and wintering habitat (buffered), common nighthawk (non-urban EOs), pied-billed grebe, sedge wren, and American three-toed woodpecker elevated pertinent habitats.

Common loon productive nests (productivity .48 or greater) elevated Lakes and Ponds.

Northern harrier, upland sandpiper, grasshopper sparrow EOs were used to elevate Grasslands habitat.

Piping plover, roseate tern, common tern, least tern occur on tier 1 dunes or coastal islands.

(There are no breeding records of golden eagle in NH.)

Mammals:

New England cottontail: used a refined model delineating core population areas.

Known bat hibernacula with portions of forest block, and small-footed bat EOs, buffered.

American marten occur on high-elevation spruce-fir (already ranked minimum tier 2).

(There are no breeding records of Canada lynx or Eastern wolf in NH).

Reptiles and Amphibians:
- Supporting habitat of sensitive snake EOs.
- Eastern hognose snake and black racer (with 1km buffer).
- Marbled salamander (with 0.3 km buffer)
- Blanding's turtle core areas elevated to Tier 3, wetlands within core areas ranked tier 1.
- Spotted turtle EOs elevated marsh and peatland complexes.

Invertebrates:
- Karner blue butterfly, persius duskywing skipper, pine pinion moth, frosted elfin were used to elevate PINE BARREN habitat.
- Special concern pine barrens Lepidoptera elevated selected PINE BARRENS to tier 3
- Ringed boghaunter (500m buffer)
- (All White Mountain fritillary and White mountain arctic EOs are within tier 1 Alpine habitat.)

Aquatic Species:
- Cobblestone tiger beetle, American brook lamprey and bridle shiner EOs were used to elevate AQUATIC habitat. Listed fish and mussels elevated stream and 100m buffer to 1 km up and downstream, stopping at dams for mussels. Shortnose sturgeon EOs >20 years old so were not used.

The EO features listed above were used to elevate the underlying non-matrix forest habitat polygons to Tier 1 or are added as separate polygons encompassing multiple habitat types to Tier 1. If the EO only overlapped a matrix forest habitat, then a buffer was applied to the EO and elevated to Tier 1.

Selected Rare Plants And Natural Communities

Natural communities are recurring assemblages of plants and animals found in particular physical environments. Three characteristics distinguish natural communities: 1) plant species composition, 2) vegetation structure (e.g., forest, shrubland, or grassland), and 3) a specific combination of physical conditions (e.g., water, light, nutrient levels, and climate).

Exemplary natural communities are the best remaining examples of New Hampshire's natural community types. Exemplary status is assigned based on a combination of the rarity of the natural community type and the quality rank of a given occurrence. Quality ranks are a measure of the ecological integrity of a community relative to other examples of that particular type based on size, ecological condition, and landscape context. The NH Natural Heritage Bureau (NHNHB) provided spatial data identifying NHNHB-priority sites not covered by habitat polygons meeting "highest quality" tiers based on condition filters. NHNHB developed a simple method to identify high priority natural communities based on element rarity and occurrence condition. All natural community and natural community system EOs that met the following criteria were considered "high" priority for conservation (see NHNHB for details):

1) High quality: Any "A" ranked element occurrence, regardless of rarity.
2) Rare elements: Any "B" ranked element occurrence for rare (S1 or S2) community types.

Natural Communities were restricted to those documented during the last 20 years. All identified Natural Communities and systems were then intersected with associated WAP habitat polygons and used to elevate the rank of a previously unranked polygon from "no rank" to "Tier 3", regardless of its condition score. Where these overlapped a matrix forest, the feature was buffered before scoring it and adding it to the WAPTIERS data layer. Certain areas were identified by NHB as of exceptional ecological value based on an assemblage of EOs, and these were elevated to Tier 1. Natural community-WAP habitat associations were based on Appendix C of the Wildlife Action Plan.

DATA SOURCES FOR CONDITION ANALYSIS

Please refer to WAP spatial data notes (metadata folder) for complete source information.

1.) Rare animal, rare plant and natural community attributes assigned by NH Natural Heritage Bureau (October 2009).
2.) Digital data describing atmospheric deposition of mercury were provided by Ecosystems

Research Group, Ltd using the methods described in Miller et al. (2005). Digital data describing the risk of calcium and other base cation depletion and limitation in forested ecosystems provided by Ecosystems Research Group, Ltd. using methods described in Miller (2005).
3.) Wind power spatial data were provided by Massachusetts Technology Collaborative (2003). Developed by TrueWind Solutions, LLC under contract to AWS Scientific, Inc. as part of a project jointly funded by the Connecticut Clean Energy Fund, Mass. Technology Collaborative, and Northeast Utilities System.
4.) Integrated Fragmentation Effects Surface spatial data provided by The Nature Conservancy, NH (2005).
5.) Draft vertebrate distributions in 1993 VT/NH Gap Analysis (report 2001). University of Vermont (2005).
6.) Dams and drawdown spatial data provided by NH Dept. of Environmental Services (2005).
7.) Wetland permits 2000-2004 spatial data provided by NHDES Wetlands Bureau (2005).
8.) Hiking trails spatial data provided by Appalachian Mountain Club, 2005.
9.) Timber harvest identified from 1992 and 1998 USGS orthophotos, data provided by Univ. of Vermont, 2005.
10.) NHDOT roads spatial data obtained from GRANIT (www.granit.sr.unh.edu) at Complex Systems Research Center, University of New Hampshire. Accessed January 2009.

APPENDIX C
LIST OF AVAILABLE WATERSHED PLANNING DOCUMENTS

Stressed Basins Project http://des.nh.gov/organization/commissioner/gsu/nhhdp/stressed_basins.htm

State Water Plan
http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/200904water_plan.pdf

Water Resources Primer
http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter5.pdf

Climate Change in the Northeast
http://www.climatechoices.org/assets/documents/climatechoices/executive-summary-necia.pdf

Water Resource Projects Matrix
http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_appendixc.pdf

Great Bay National Estuarine Research Reserve http://www.greatbaypartnership.org/planning.html

DES Invasive Plant Atlas - Kevin Lucey http://nbii-nin.ciesin.columbia.edu/ipane/

DES Climate Change http://des.nh.gov/organization/divisions/air/tsb/tps/climate/categories/hot.htm

DES Impaired Waters List
http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm

DES Dam Removal and Restoration
http://des.nh.gov/organization/divisions/water/dam/damremoval/index.htm

The NH Climate Action Plan
http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/documents/nhcap_final.pdf

Ecologically important floodplain forests in the Connecticut River Watershed.
http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/connecticut/connecticutriver/ct-river-floodplain-forests-paper.pdf

EXISTING MANAGEMENT PLANS ACCORDING TO SERVICE AREAS

Watershed-based plans work toward quantifiable water quality goals to either restore impaired waters, or to meet long-term goals for high quality waters. For funding for Clean Water Act Section 319 funds, watershed-based plans must include required EPA elements. See Section 319 Guidance for Watershed-based Plans for more information on the EPA Section 319 funding criteria for watershed-based plans. Watershed-based plans determine the level of pollutant load reduction or habitat restoration required, specific locations where best management practices are needed, and how to measure water quality improvement.

UPPER ANDROSCOGGIN

North Country Comprehensive Economic Development Strategy 2008 - 2012
Northern Forest Sustainable Economy Initiative
Coos Economic Action Plan

SACO

Saco River Corridor Management Plan
Swift River Corridor Management Plan

Assessment and Concept Plans – Swift River at Conway Scenic Railroad Bridge - 2004 DES
Final Report for the Swift River Stabilization Project at the Conway Scenic Railroad Crossing - 2009 DES

PEMIGEWASSET RIVER TO WINNIPESAUKEE RIVER
Pemigewasset River Corridor Management Plan - 2001
Pemigewasset River Restoration Plan - 2004 DES
Baker River Restoration Project - 2004
Watershed Management Plan – Webster-Highland Lakes Watershed Partnership - 2007
Winnipesaukee River Watershed Wetland Restoration Strategy, February 2010

SALMON FALLS TO PISCATAQUA RIVER
Exeter River Corridor and Watershed Management Plan - 1999
Isinglass River Management Plan - 2008
Lamprey River Management Plan - 2007
Berry Brook Watershed Management Plan (Table of Contents) (Executive Summary) - DES 2008
Cains Brook and Mill Creek Watershed Management Plan - 2009
NH Estuaries Project Management Plan - 2005
Watershed Restoration and Implementation Plan for the Cocheco River - 2006
Cocheco River Watershed Environmental Water Quality Report - 2006
Exeter River Geomorphic Assessment and Watershed-based Plan - 2009
Exeter River Geomorphic Assessment and Watershed-based Plan, Middle Exeter River - 2010
Total Maximum Daily Load (TMDL) Study for Bacteria in Hampton/Seabrook Harbor, New Hampshire - 2004
Pawtuckaway Lake Watershed Based Plan - 2008
Salmon Falls Headwater Lakes Watershed Management Plan - 2010 DES
Willand Pond Engineering Review: Summary of Watershed Assessment and Alternative Analysis - 2009

- Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed
- Nitrogen Assessment for the Lamprey River Watershed September 7, 2010
- Independent Peer Review of Nutrient Criteria Proposal for the Great Bay Estuary, June 29, 2010
- 2009 State of the Estuaries Report October 16, 2009
- Amendment to the NH 2008 Section 303(d) List Related to Nitrogen and Eelgrass in the Great Bay Estuary August 13, 2009
- PREP Environmental Indicators Report June 30, 2009
- Numeric Nutrient Criteria for the Great Bay Estuary June 10, 2009
- Piscataqua Region 2010 Comprehensive Conservation & Management Plan September 20, 2010

MERRIMACK
Lower Merrimack River Corridor Management Plan - 2008

- References
- Appendix 1 - State and Federally Listed Threatened and Endangered Species
- Appendix 2 – Watershed Audit for the Town of Hudson
- Appendix 2 – Watershed Audit for the Town of Merrimack
- Appendix 2 – Watershed Audit for the City of Nashua

- Appendix 3 - Cross-Reference of Corridor Management Plan Action and Objectives

Piscataquog River Management Plan - 1999
Souhegan River Watershed Management Plan - 2006
River Management and Implementation Plan - 2007
Baboosic Lake Watershed Plan - 2008
Furnace Brook Watershed-Based Plan - 2010
Watershed Restoration Plan for Hodgson Brook - 2004
Total Maximum Daily Load (TMDL) Study for Bacteria in Little Harbor, New Hampshire - 2006
Comprehensive Environmental Inc. for the City of Manchester - 2009
Pennichuck Water Works Pennichuck Brook Watershed Restoration Plan - 2008 DES
Geomorphology-based Restoration Alternatives, Suncook, NH
Merrimack River Watershed Wetland Restoration Strategy, March 2009
http://www.restorenhwetlands.com/

LOWER CONNECTICUT RIVER
Cold River Management Plan - 2009

- Appendix A – Atlas of the Cold River and the Cold River Watershed
- Appendix F – Local Surface Water & Groundwater Resource Maps for the Town of Acworth
- Appendix F – Local Surface Water & Groundwater Resource Maps for the Town of Alstead
- Appendix F – Local Surface Water & Groundwater Resource Maps for the Town of Langdon
- Appendix F – Local Surface Water & Groundwater Resource Maps for the Town of Walpole

Restoration Master Plan for the Cold River, Warren Brook, and Bowers Brook - DES 2007

- Ashuelot River Corridor Management Plan - 2006
- Ashuelot River Corridor Management Implementation Plan – 2010

River Connectivity Restoration Priorities in High Quality Sub-watersheds in Southwest NH (Ashuelot Culvert Assessment) - 2010
Beaver Brook Restoration Plan - 2009
Granite State Rural Water Association - 2008
Every Acre Counts: The Newfound Watershed Masterplan - 2009

CONTOOCOOK (Wilmot, Henniker, Jaffrey, Sharon area)
Contoocook and North Branch Rivers Corridor Management Plan - 2011

MIDDLE CONNECTICUT RIVER
Fluvial Geomorphology Assessment of Northern Connecticut River Tributaries DES - 2006
Partridge Lake Watershed Based Plan - 2008

UPPER CONNECTICUT
Connecticut River Joint Commissions http://www.crjc.org/publications.htm
Connecticut River Recreation Management Plan - 2008
Water Resources – Connecticut River Management Plan - 2007
Final Report for Bog Brook Restoration Project - 2005
Lower Mohawk River Stream Restoration Planning in Colebrook, NH - 2007 - DES
Bank Stabilization Implementation and Assessment of the Connecticut River near Colebrook and Groveton, New Hampshire-narrative only - DES, 2006
Upper Connecticut River Watershed Wetland Restoration Strategy – February 2010

APPENDIX D
NEW HAMPSHIRE AQUATIC RESOURCE MITIGATION FUND
Site Selection Committee
Operating Guidelines

Purpose and Goal. The primary purpose of the New Hampshire Aquatic Resource Mitigation (ARM) Fund, Site Selection Committee (Committee) is to provide a mechanism for reviewing, evaluating, and selecting wetland restoration, upland preservation, wetland creation, and aquatic resource improvement proposals that have requested ARM funding. Selected projects are subject to approval by the US Army Corps of Engineers (Corps) and the NH Wetlands Council (Council). The Committee's goal is to select high priority projects that most effectively compensate for the loss of watershed aquatic resource functions and values due to multiple, small wetland impacts. The Committee shall consider completeness, planning, implementation, monitoring, and the outreach necessary in determining which coastal or freshwater wetlands, streams, water bodies, and/or upland wildlife habitat projects should be supported by the ARM Fund.

The following criteria from the NH Department of Environmental Services (NHDES) Wetlands Bureau administrative rules
(see http://des.nh.gov/organization/commissioner/legal/rulse/index.htm) shall be followed by the Committee:

(a) Pursuant to RSA 482-A:32, for each application funding cycle, the Committee shall rank each project for which a request for ARM funding is received and shall do so within 90 days after the application deadline for that cycle.
(b) The Committee shall base its rankings on a review of the applications and site walks led by NHDES.
(c) The Committee shall rank the project(s) that are located within the same service area as the impact areas for which fees were paid into the fund.
(d) The Committee shall select projects or a suite of projects that provide the greatest potential to replace or protect specific wetland functions and values lost by the impacts in the service area.
(e) The Committee shall select projects that meet or exceed the ratios listed in NHDES administrative rules, Table 800-1.
(f) Where project scores are comparable, preference shall be given to projects that provide the longer term, more beneficial protection for the project area and its buffer.
(g) The Committee shall only consider applications for ARM funds that include a realistic budget and time frame in which to accomplish the proposed project's stated objectives.
(h) The Committee shall select one or more of the highest ranked projects for each application cycle.
(i) If NHDES announces a service area account is ready to be spent and the submitted proposals do not address the priorities for the service area, then the funds deposited in that account will remain for another year and shall be announced as available in the following application cycle.
(j) Funds that remain in an account after the ARM fund applications have been selected for funding shall be carried over in that service area account for the next application cycle.
(k) Applications for ARM funds shall be evaluated based on the criteria and points specified in NHDES administrative rules, Env-Wt 807.18.

Membership. The Committee is composed of members who represent the NH DES, NH Fish & Game Department, NH Department of Resources and Economic Development, NH Office of Energy and Planning, and those nominated by the NH Association of Conservation Commissions, NH Association of Natural Resource Scientists, The Nature Conservancy, and the Society for the Protection of NH Forests. Committee member requirements include:
(a) Committee members must have relevant technical skills (wetland science, conservation biology, wildlife biology, engineering, hydraulics, hydrology, geomorphology, soil science, etc.), and demonstrated ability to accurately assess strengths and weaknesses of proposed projects and evaluate habitat restoration and preservation priorities statewide.

(b) Committee members are expected to represent the broad interests of wetland restoration and preservation priorities statewide, and maintain an interest in distributing funds and technical services for all intended uses.
(c) Committee members are not advocates for their own organizational interests with respect to project review and selection, and will carefully determine whether there is a conflict of interest with projects requesting funding and if so, shall disclose it to the Committee or according to the Conflict of Interest Policy adopted by this Committee.
(d) Committee members are expected to attend all Committee meetings. Substitutions are only permitted with permission from Committee Chair, and with commitment from the Committee member to adequately brief the substitute attendee so they can carry out their Committee functions fully.
(e) The NHDES Wetland Mitigation Coordinator (Coordinator) will attend all Committee meetings and be present for Council meeting discussions relative to the ARM fund. The Coordinator will provide support to the Committee and assist with the overall administration of the ARM fund.
(f) A chair and vice chair shall be appointed by the Committee. The vice chair shall perform all of the functions of the chair in his/her absence.

Quorum. A quorum of committee members must be present in order to convene a meeting and conduct the business of the committee, including casting votes as necessary. A quorum shall be defined as a minimum of 5 of the 8 standing committee members. In the event that a quorum of five or more committee members can not be achieved due to are conflict of interest recusals or other excused absences, the Chair may designate that a quorum has been reached if at least 4 standing committee members are present.

Responsibilities of the Department and Mitigation Coordinator. The responsibilities of DES and Coordinator are as follows:

(a) Provide DES Wetlands Bureau wetland permit applicants with a determination as to whether or not projects requiring compensatory mitigation are eligible for payment into the ARM fund and if so, provide a calculated payment amount.
(b) Develop and maintain an updated ledger of the projects that pay into the fund and maintain detailed information relative to the impact on aquatic resources.
(c) Announce the Request for Proposals for disbursal of funds on an annual basis. The announcement includes a pre-proposal submittal that will provide applicants initial feedback on the merits of the project without having to submit a full application.
(d) Provide an initial evaluation of the ARM fund pre- proposals received and provide applicants with a response as to being administratively complete. The response will include what information was lacking and date the materials need to be submitted for the full application deadline.
(e) Coordinate with the Committee Chair to plan site visits or meetings with sufficient advance notice and coordination with Committee members to ensure that Committee members are available to attend meetings.
(f) Represent decisions reached and recommendations on ARM fund applications to the ACE and Council for approval and disbursal of funds. There is no appeal process for decisions made.
(g) Provide a mechanism for monitoring and reporting on the status of funded projects.
(h) Develop an annual report about the funds received, status of administrative assessment, and progress of the funded project(s) (See Env-Wt 807.19).

Responsibilities of the Committee Chair: The responsibilities of the Committee Chair are as follows:

(a) Prepare for Committee meetings by helping the Coordinator determine meeting dates, compiling an agenda, and distributing applications for review.
(b) Review the conflict of interest policy and make decisions relative to any matter that comes before the Committee regarding conflict of interest.
(c) Conduct Committee meetings and assist the Coordinator in representing decisions reached and recommendations on ARM fund applications to the Corps and Council for approval and disbursal of

funds.
(d) Review the annual report prepared by Coordinator on the performance of the ARM fund program.

Responsibilities of the Committee: The responsibilities of the Committee are as follows:

(a) Develop selection criteria which shall be consistent with appropriate statutory and regulatory provisions and by which projects shall be reviewed, evaluated and selected for submittal to the Council for funding approval. If criteria require revision, the changes will be presented to NHDES for consideration and potential rule-making.
(b) Review and evaluate proposals for ARM funds. A super-majority equal to 2/3 of the Committee is needed to make or reverse a decision.
(c) Provide funding recommendations to the Council regarding ARM fund proposals. Selection of projects will be in accordance with the guidelines established herein. Funding recommendations can be in the form of direct cash contributions or contributions of in-kind services, or both, and are referred to herein collectively as funds or funding.

Review Procedures for ARM Fund Proposals:

(a) The Coordinator shall issue a Request for Proposals (RFP) to include a request for a pre-proposal submittal for any service area that has available funds. The request for pre-proposals shall allow a minimum of 60 business days for materials to be submitted.
(b) The Coordinator will notify the Council and the Corps about the RFP and provide information on the impacts for which the fees were paid into the watershed account that is ready for disbursal.
(c) The Coordinator will conduct a preliminary review of the pre-proposals to determine completeness and eligibility. The Coordinator will provide a summary to the Committee and the Corps of the reasons for disqualifying pre-proposals. Pre-proposals that do not qualify shall receive a letter from the Coordinator.
(d) The applicants that submit complete pre-proposals shall be invited to submit a full application and will be so notified by the Coordinator. The request for full applications shall allow a minimum of 90 days for materials to be submitted.
(e) If the Committee determines that a site visit is necessary, the Coordinator shall identify dates for the site visit(s). The Corps shall be invited to attend.
(f) The Coordinator shall prepare GIS data and materials relative to the applications that paid into the fund and proposals submitted for funding to be reviewed by the Committee at a review meeting.
(g) All Committee members must divulge their organizational interest in any projects proposed for consideration upon receipt of the pre-proposals. The value of Committee member knowledge of individual projects is important in evaluating each proposal, but Committee members also have the responsibility to divulge potential conflicts of interest and request to be recused from voting. In addition, Committee members have the right and responsibility to ask other Committee members perceived to be too closely tied to a particular proposal to recuse themselves from voting.
(h) Committee members will then review the applications individually and provide the Coordinator scores for incorporation into a spreadsheet that establishes proposed ranking of the proposals.
(i) The Committee will reconvene to review, evaluate and rank projects to receive ARM funds. A super majority, equal to 2/3 of a quorum of the Committee, is needed to modify the ranking established based upon the original scoring.
(j) The Coordinator and Chair, if available, shall present Committee recommendations to the Corps and Council for approval and disbursal of funds at a scheduled Council meeting.
(k) The Coordinator shall notify successful and unsuccessful applicants of Council decisions.
(l) The Coordinator is solely responsible for responding to requests for clarification from applicants regarding Committee discussions.
(m) The Coordinator has the responsibility to ensure that ARM funds and services are used in a timely manner.

APPENDIX E
AQUATIC RESOURCES MITIGATION SITE SELECTION COMMITTEE CONFLICT OF INTEREST GUIDELINES

Aquatic Resources Mitigation ("ARM") Site Selection Committee (the "Committee") is a statutory committee *See* New Hampshire RSA 482-A:32.

Members of the Committee are "Executive Branch Officials" as defined by RSA 21-G:21, II-a because the members are public employees, as defined by RSA 15-B:2, IX. As such, the members of the Committee are subject to the Executive Branch Code of Ethics, RSA 21-G:21 – 35. The purpose of this Guideline is to assist the Committee to perform its duties in compliance with its obligations to avoid conflicts of interest. A conflict of interest is defined to mean "a situation, circumstance, or financial interest which has the potential to cause a private interest to interfere with the proper exercise of a public duty." The ARM Site Selection Committee is responsible for identifying, evaluating, and recommending aquatic resource mitigation projects for funding through New Hampshire's In Lieu Fee mitigation program.

As defined by the NH General Court, the Committee includes representation from eight public agencies and private organizations. The Committee's membership was designed to ensure that a broad and complementary level of knowledge and expertise is available. During its deliberations, the Committee recognized that there will likely be instances where Committee members are involved with projects applying for ARM funding, as a principal applicant, a project collaborator, or in other ways that could constitute a real or perceived conflict of interest.

As a general proposition, conflict of interest issues arise when a Committee member has a direct financial or fiduciary relationship with an organization that submits a proposal for funding. A direct financial or fiduciary relationship includes, but is not limited to, employees and board members of the organization. The conflict of interest law is not triggered, however, by members of the Committee who are appointed by an organization, but do not otherwise have a financial or fiduciary relationship with that organization. Thus, the mere fact that a Committee member was appointed by, but does not otherwise have a financial or fiduciary relationship with, an entity that has a project before the Committee does not, by itself, create a conflict of interest. When the General Court established the Committee, it did so by populating it with employees of organizations that would likely be submitting proposals for funding consideration by the Committee. The legislature would not have directed that a Committee include persons with a direct interest in matters appearing before the Board Committee if those members could not fully participate on the Committee merely because of their status. Appointed members of the Committee must be devoted to the advancement of the public good and not the private interests from which the members come. In accepting a public office and the opportunity to shape public policy, the Committee members assume an obligation to adhere to the standards of conduct which the public rightfully expects of those holding positions of public trust.

There is a balance, however, between the Committee's advancement of the public good and the possibility that a person may use a public office to take advantage of the office for personal gain. The public will rightly cease to support those who appear to pursue their private interests at the expense of the public good. A conflict of interest arises when the pecuniary interest is immediate, definite, and capable of demonstration; not remote, uncertain, contingent and speculative. While engaged in Committee business, all members of the Committee shall be governed by Code of Ethics in RSA 21-G:21-35 (see http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-I-21-G.htm). Private sector members may not be, unless a policy such as this one is adopted. The Committee has established the following course of action to avoid, disclose, or otherwise address potential conflicts of interest that may arise during service as a member of the Committee.

1. Program Development and Administration.

All Committee members may fully participate in program development and implementation discussions, including but not necessarily limited to:

a. Development of criteria for evaluating aquatic resources mitigation proposals.

b. Determination of mitigation priorities, as they may evolve over time.

c. Development of application materials for soliciting aquatic resources mitigation proposals.

d. Discussion of program-wide issues such as whether to fully fund fewer projects or partially fund a greater number of projects.

2. Funding Proposal Review.

Committee members are generally expected to actively participate in the review and evaluation of funding proposals submitted in response to ARM RFPs, subject to the following Conflict of Interest considerations.

a. ***In a grant round where a Committee member's employer agency or organization has submitted a funding proposal***, the member shall immediately disclose the potential for a conflict of interest to the Chair of the Committee, explain how it may represent a conflict, recuse him/herself from ranking, scoring, or voting on proposals in that grant round if the conflict is confirmed by the Committee, and not be present for any such ranking, scoring, or voting on any or all proposals. The member would be able to participate in review and discussion of any proposals other than his/her own, so that the Committee is not deprived of that member's particular expertise during the review process, and with the expectation that the member will provide input based upon the public's interest and not personal interest conduct him/herself with the highest standard of integrity during such discussions.

b. ***In a grant round where a Committee member's employer agency or organization is not the applicant but is otherwise indirectly involved in a funding proposal***, each member is responsible to evaluate whether the issue before the Committee creates a situation, circumstance, or financial interest which has the potential to cause a private interest to interfere with the proper exercise of his or her public duty**.** If the member believes that such an issue exists, the member shall disclose the conflict of interest to the Chair of the Committee. The Committee would then determine an appropriate course of action, on a case-by-case basis. The member also has an independent duty to recuse him or herself if a conflict of interest exists. The potentially conflicted member would not participate in the Committee's subsequent discussion or determination of an appropriate course of action. Appropriate actions may include recusal from scoring, ranking, or voting, recusal from review and discussion of the affected proposal, or other actions. The Committee's intention is to maintain a high standard of integrity and transparency, while not unnecessarily depriving the Committee of a member's particular expertise during the proposal review process.

c. ***There may be other scenarios that could result in a real or perceived conflict of interest.*** In the event that a Committee member believes a real or potential conflict of interest associated with any member's involvement in an ARM Site Selection Committee activity, it shall be brought to the attention of the Committee Chair and the DES Committee staff member. The Committee shall then determine if a real or perceived conflict of interest exists and identify an appropriate course of action on a case-by-case basis.

APPENDIX F
YEARLY SCHEDULE/AWARD TIME FRAMES

Steps for ARM Fund Grant Round	**Approximate Yearly Dates**
Request for Proposals Announced	March 1
Pre-Proposal Deadline	April 29
Site Selection Committee Review	May 9
Notify Applicants for Full Submittal	May 16
Deadline for Complete Application	August 12
Issue Public Notice	August 20
GIS review by Site Selection Committee	September 7
Conduct Site Visits	September to October
SSC Meeting to Evaluate and Score Projects	October
IRT Meeting	November
Wetland Council Meeting	November or December
Announce Awards	December

APPENDIX G
AQUATIC RESOURCES BASE LAYER DOCUMENTATION

New Hampshire Aquatic Resources Base Layer Documentation

The Aquatic Resources Base Layer (ARBL) was prepared to assess aquatic resources in New Hampshire, and was guided by a similar GIS-based analysis of aquatic resources completed by the Maine Natural Areas Program. Individual components of the NH ARBL are described below:

1. NH Wetlands Basemap (data provided by NH Dept. of Environmental Services, July 2011)

The wetland complexes in this layer were constructed from the National Wetlands Inventory (NWI) base layer completed by US F&WS in the mid-1980's. This derived coverage was created by constructing wetland complexes from the individual NWI wetland polygons in accordance with the 2010 "Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire" (NH Method). Complexes bisected by large roads and rivers were split into separate wetland complexes. Once the complexes were created, an Assessment Unit ID (AUID) was assigned to each fresh water and estuarine wetland complex according to the primary hydrologic unit boundary at the subwatershed (12-digit) level that it resided in.

This base layer is intended to act as a starting point for anyone applying the NH Methods. The layer provides a unique code to each wetland complex in New Hampshire, for use in assessing water quality and other attributes of wetland complexes. Wetland complexes for New Hampshire built in accordance with the "New Hampshire Method for the Evaluation of Non-tidal Wetlands" (USDA). Further information is available in the report:
20100412_Building_wetland_AUIDs.doc, Water Quality Planning Section at the NH Department of Environmental Services, Watershed Management Bureau

2. National Hydrography Dataset (1:24,000-scale NH NHD, data provided by NH GRANIT, 2010)

Open water bodies were added from the two data layers: NHDwaterbody (lakes/ponds) and NHDarea (rivers). A 1.5 meter buffer was applied to perennial streams in the NHDflowline data to more closely represent ground conditions of small streams. These three data sources were combined and represent the "SURFACE WATER" category in the ARBL.

3. Active River Area and Wet flats (data provided by The Nature Conservancy, August 2011)

The Nature Conservancy provided data from their Active River Area model. The ARA provides a conceptual and spatially explicit basis for the assessment, protection, management, and restoration of freshwater and riparian ecosystems. Subcomponents of the ARA include: 1) material contribution zones, 2) meander belts, 3) riparian wetlands, 4) floodplains and 5) terraces. Two components were selected and used in the NH ARBL, wet flats and wet material contribution zones. Supplemental data, the TNC Ecological Land Units "wet flats" landform class, was used in the ARBL as non-riparian low lying areas. Further information is available in the report:
Documentation of the ARA Riparian Component 2009 Model, Arlene Olivero, TNC-ECS

4. Very poorly drained soils (data provided by NH GRANIT, March 2009)

The Natural Resources Conservation Service has made available statewide digital county soils survey data, with the exception of the area encompassed by the White Mountain National Forest. Soil units with a drainage class of "Very poorly drained" were selected and added to the ARBL, representing areas likely to support wetland.

Spatial data prepared using
ESRI® ArcGIS™ Desktop 10.0 Copyright © 2010 ESRI Inc
Statistics calculated using:
Geospatial Modelling Environment (ver 0.5.3 Beta), © Hawthorne L. Beyer 2011
www.spatialecology.com

APPENDIX H
COMPENSATION PLANNING FRAMEWORK
BY SERVICE AREA

NHDES relied on three major sources of information to evaluate wetlands that may provide opportunities for action such as land preservation, aquatic resource restoration or enhancement. The first layer of information involved incorporating ecological data from the WAP. The second source of data incorporated into the evaluation was data from the NHDES watershed program which analyzed the potential of wetlands to support aquatic life. Finally, data from significant natural resources identified through other sources (i.e., prime wetlands and NH Designated Rivers) was also included. A brief description of the methodology used to determine ecological condition is provided. The completion of predictive habitat maps and organizing other available data was a major undertaking that will benefit conservation, planning, and resource management organizations.

Determining Statewide WAP Condition

Habitat condition was analyzed to develop statewide and regional rankings that identify the highest condition habitat relative to all polygons of a given habitat type in the state. The goal is to provide regional planners and conservation professionals with a tool to help identify the most ecologically intact wildlife habitat areas so as to direct land preservation goals. Condition filters were developed by NHFG biologists to analyze which habitat patches are in the best relative ecological condition. These filters are composed of GIS data that indicate to what degree a particular patch of habitat has good biological diversity (particularly in terms of rare species), is connected to other similar patches in the landscape, and is negatively impacted by humans. There is a different filter for each habitat, but each filter includes biological, landscape, and human impact factors (see Appendix B for details). The score for each group was then weighted evenly to come up with a single condition score (COND). This is a relative score, based on all polygons of a given habitat types that occur in New Hampshire.

Biological Diversity (BIO score)
Species richness of rare animals within their dispersal distances from the polygon (2008)
Species richness of rare animals within polygon (2008)
Species richness of rare plants in polygon (2008)
Richness of rare and exemplary natural communities in polygon (2008)

Landscape Integrity (LAND score)
Number of marsh polygons in the complex
Area of largest marsh in the complex (hectares)
Number of dominant NWI vegetation classes in the complex
Density of matrix (by forest type) in a 5km circle
Size of contiguous forest block within which habitat patch is located
Average landscape permeability (NH Wildlife Connectivity Model)

Minimum Human Influence (HUMAN score)
Road density within 250m of the complex
Distance to nearest road (meters)
Housing unit density (US Census 2000)
Mean IFES score (Integrated Fragmentation Effects Surface; The Nature Conservancy; Zankel, 2005)

Habitat condition scores from the 2010 NH Wildlife Action Plan (WAP) were assigned to corresponding polygons in the NHDES Wetland base layer using the union function in ArcGIS™ 10.0 (© 2010 ESRI®, Redlands, CA). Non-forested wetland polygons were assigned conditions scores from the wet meadow/shrub wetland, peatland, or forest floodplain WAP habitats. Forested wetland polygons were assigned condition scores from the forest floodplain or matrix forest WAP habitats. Any NHDES wetland polygon that overlapped more than one WAP habitat was assigned the higher condition score.

As a result, the percentage of wetlands in each service area, ranked according to habitat condition scores are

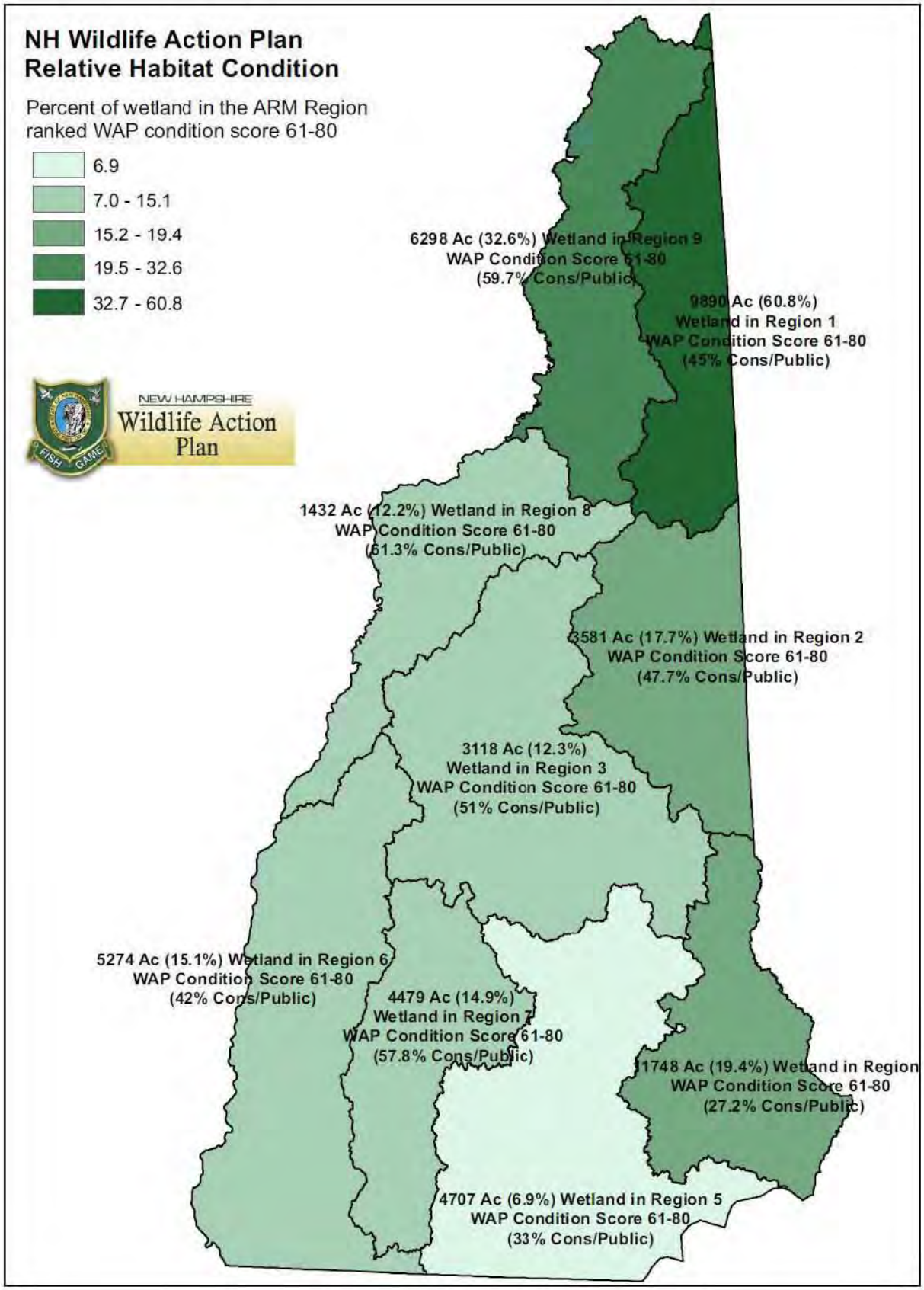
illustrated below. All of the scores are noted in the table and the highest scores are depicted in the figure. The percentage of the region in conservation or public lands is also noted to emphasize how much of the important habitat is currently protected. This information demonstrates an understanding of resource conservation issues and needs and can be used to encourage quality preservation projects and have the potential to incorporate strategies to restore marginal lands to higher value resources.

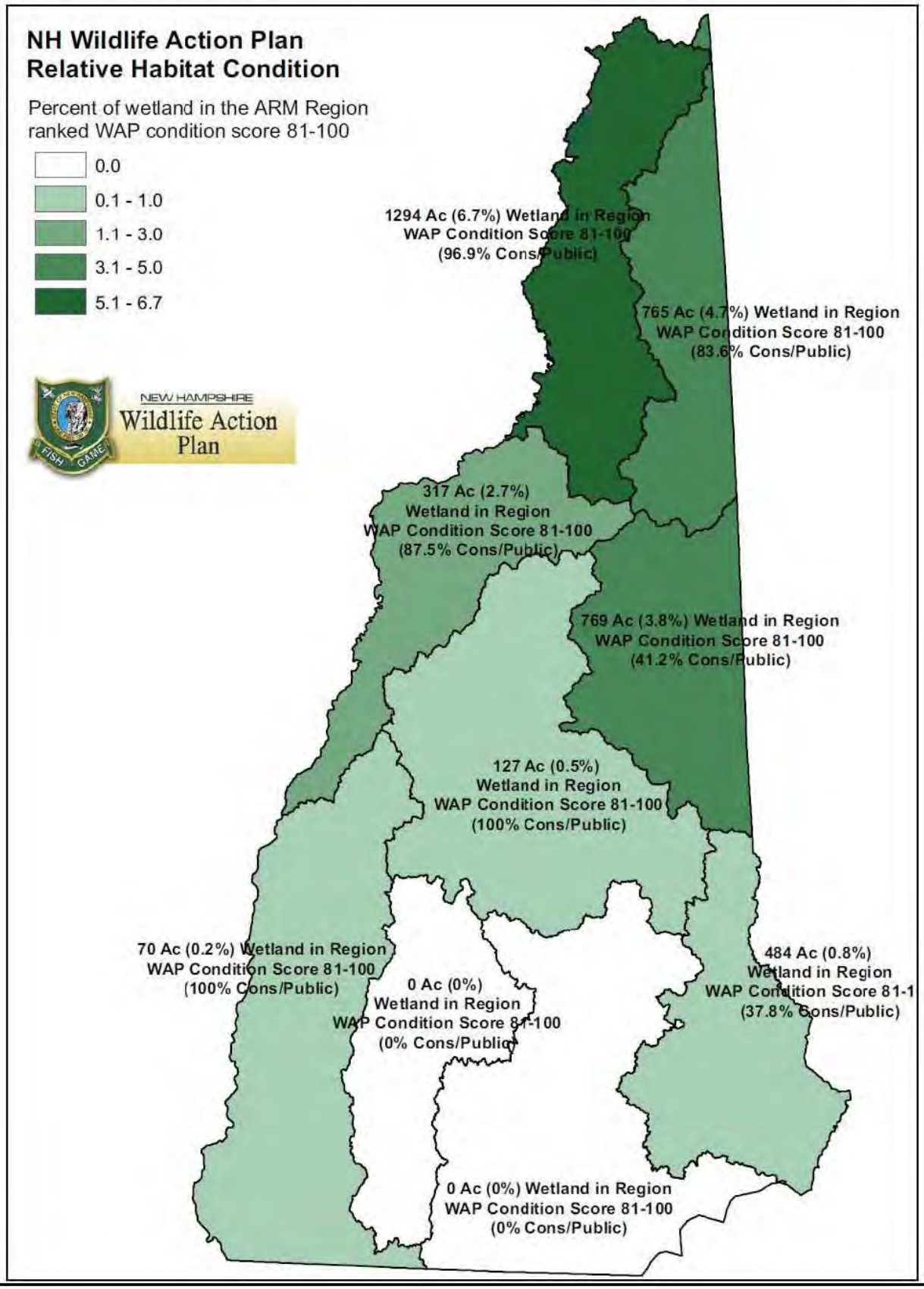
ARM Region	Total Acres in Region	Land Acres	Acres of NH Wetlands Base	% of Region in NH Wetlands Base
1	462,582	451,328	16,267.1	3.5
2	556,244	541,281	20,230.7	3.6
3	965,104	883,530	25,352.3	2.6
4	531,545	506,212	60,556.1	11.4
5	976,895	944,110	68,212.5	7.0
6	871,257	840,707	34,928.2	4.0
7	489,023	470,283	30,059.4	6.1
8	504,144	492,884	11,740.2	2.3
9	583,305	570,687	19,318.8	3.3

ARM Region	% of Wetland in WAP Condition 0 to 20	% of Wetland in WAP Condition 21 to 40	% of Wetland in WAP Condition 41 to 60	% of Wetland in WAP Condition 61 to 80	% of Wetland in WAP Condition 81 to 100
1	0.27	5.53	28.78	60.76	4.67
2	0.94	14.78	62.78	17.74	3.76
3	2.60	23.54	61.07	12.28	0.50
4	2.72	18.46	58.60	19.45	0.77
5	3.67	29.45	59.98	6.90	0.00
6	2.13	21.22	61.40	15.05	0.20
7	1.24	18.48	65.42	14.86	0.00
8	2.78	22.94	59.39	12.17	2.72
9	0.33	12.45	47.96	32.56	6.69

ARM Region	Acres of NH Wetlands Base	% of Region in NH Wetlands Base	Acres of Wetland in Conservation	% of Wetland in Conservation
1	16,267.1	3.5	6,508.4	40.0
2	20,230.7	3.6	6,213.8	30.7
3	25,352.3	2.6	5,633.0	22.2
4	60,556.1	11.4	11,690.8	19.3
5	68,212.5	7.0	15,679.9	23.0
6	34,928.2	4.0	7,222.5	20.7
7	30,059.4	6.1	9,873.0	32.8
8	11,740.2	2.3	3,148.1	26.8
9	19,318.8	3.3	7,690.0	39.8

ARM Region	% of Wetland WAP 0-20 Conserved	% of Wetland WAP 21-40 Conserved	% of Wetland WAP 41-60 Conserved	% of Wetland WAP 61-80 Conserved	% of Wetland WAP 81-100 Conserved
1	3.77	25.85	25.47	44.99	83.63
2	14.23	16.48	28.89	47.68	41.18
3	9.16	11.69	20.41	50.98	100.00
4	8.87	12.62	19.04	27.19	37.85
5	12.21	16.64	25.62	32.97	0.00
6	9.36	13.64	18.02	42.01	100.00
7	9.18	17.94	31.84	57.79	0.00
8	8.99	14.21	22.67	61.27	87.54
9	0.53	10.32	26.23	59.73	96.93


NH Wildlife Action Plan
Relative Habitat Condition
Percent of wetland in the ARM Region ranked WAP condition score 61-80
6.9
7.0 - 15.1
15.2 - 19.4
19.5 - 32.6
32.7 - 60.8
NEW HAMPSHIRE
Wildlife Action Plan
6298 Ac (32.6%) Wetland in Region 9
WAP Condition Score 61-80
(59.7% Cons/Public)
9890 Ac (60.8%)
Wetland in Region 1
WAP Condition Score 61-80
(45% Cons/Public)
1432 Ac (12.2%) Wetland in Region 8
WAP Condition Score 61-80
(61.3% Cons/Public)
3581 Ac (17.7%) Wetland in Region 2
WAP Condition Score 61-80
(47.7% Cons/Public)
3118 Ac (12.3%)
Wetland in Region 3
WAP Condition Score 61-80
(51% Cons/Public)
5274 Ac (15.1%) Wetland in Region 6
WAP Condition Score 61-80
(42% Cons/Public)
4479 Ac (14.9%)
Wetland in Region 7
WAP Condition Score 61-80
(57.8% Cons/Public)
11748 Ac (19.4%) Wetland in Region
WAP Condition Score 61-80
(27.2% Cons/Public)
4707 Ac (6.9%) Wetland in Region 5
WAP Condition Score 61-80
(33% Cons/Public)


NH Wildlife Action Plan
Relative Habitat Condition
Percent of wetland in the ARM Region ranked WAP condition score 81-100
0.0
0.1 - 1.0
1.1 - 3.0
3.1 - 5.0
5.1 - 6.7
NEW HAMPSHIRE
Wildlife Action Plan
1294 Ac (6.7%) Wetland in Region WAP Condition Score 81-100 (96.9% Cons/Public)
765 Ac (4.7%) Wetland in Region WAP Condition Score 81-100 (83.6% Cons/Public)
317 Ac (2.7%) Wetland in Region WAP Condition Score 81-100 (87.5% Cons/Public)
769 Ac (3.8%) Wetland in Region WAP Condition Score 81-100 (41.2% Cons/Public)
127 Ac (0.5%) Wetland in Region WAP Condition Score 81-100 (100% Cons/Public)
70 Ac (0.2%) Wetland in Region WAP Condition Score 81-100 (100% Cons/Public)
0 Ac (0%) Wetland in Region WAP Condition Score 81-100 (0% Cons/Public)
484 Ac (0.8%) Wetland in Region WAP Condition Score 81-1 (37.8% Cons/Public)
0 Ac (0%) Wetland in Region WAP Condition Score 81-100 (0% Cons/Public)

Statewide Wetland Assessment Score

The DES Watershed Management Bureau and Wetlands Bureau completed a Level 1 Landscape Assessment of the state's wetland resources. This effort was conducted to achieve goals outlined in the New Hampshire Water Monitoring Strategy (2005) and the EPA's Elements of a State Water Monitoring and Assessment Program for Wetlands (2006). The goal of the Level 1 Assessment was to conduct a landscape level assessment of the state's wetlands using a GIS model and to make preliminary determinations as to what wetlands were likely adequate to support aquatic life and to identify those that were potentially not supporting. The methodology in creating the assessment units are noted below.

Creation of Wetland Assessment units
National Wetlands Inventory (NWI) polygons were used as the base for identifying individual wetlands and aggregating them into assessment units. NWI polygons were aggregated due to the large number of individual units (N = 83,565). NWI polygons identified via Cowardin classification as lacustine/limnetic, palustrine/open water, marine/subtidal, estuarine/subtidal, and riverine were removed from the population as they are already identified as open water lake, riverine, or estuarine assessment units. The remaining NWI polygons were amalgamated into assessment units based on methods used by the New Hampshire Fish and Game Department's Wildlife Action Plan.

A 125m buffer was created around all NWI polygons. Overlapping buffers were then merged into a single buffer complex. These distances are intended to reflect the distance at which biological communities are likely overlapping and traveling between individual NWI polygons. The buffer complexes and base NWI polygons were then split if bisected by a road or a HUC 12 divide. The split due to roadways ties back to the ability of biological communities to move from wetland to wetland. The HUC12 split was largely an administrative action to allow categorization of the final product to be produced. After the splits, each complex was assigned a unique Assessment Unit ID (AUID) based upon the HUC 12's within which they resided. Finally the AUIDs were transferred from the buffer complexes to all of the NWI polygons within the complexes. The Cowardin classification information attached to each NWI polygon was retained thus allowing for the identification of each Cowardin type within each assessment unit.

Creation of AUID Buffers for Landscape Level Assessment
A 125m buffer was created around each wetland assessment unit. This second set of buffers did not include the area for its own wetland AUID but could include the area of a separate wetland AUID. That is, it you had two wetland AUIDs bisected by a roadway but otherwise right next to one another each wetland would be included in the landscape assessment for its neighbor but not for itself. It is these buffers that were evaluated based on landcover types and their corresponding impact on the ecologic communities that reside within the wetland proper. New Hampshire's Consolidated Assessment and Listing Methodology (CALM) (DES 2008) identifies designated uses for New Hampshire's surface waters. This landscape level assessment is based upon the aquatic life designated use and is intended to identify those wetlands that are likely or unlikely to provide suitable conditions for supporting a balanced, integrated and adaptive community of aquatic flora and fauna. The assessment is based on the idea that the condition of a wetlands buffer will be a major driver of the condition of the wetland. Further, we can systematically estimate the condition of the buffer by knowledge of the landcover types within that buffer. Due to the inherent roughness of a landscape level analysis and that no in-wetland measurements were conducted no definitive support categories were made. Based upon the results of the analysis the use support category "Potentially Supporting (PS)" or "Potentially Not Supporting (PNS)" will be assigned to each assessment unit.

Evaluation of Buffer Landcover Types
The 2006 National Land Cover Data (NLCD) was used to identify landscape types within each wetland buffer area. The 2006 NLCD is based on Landsat Thematic Mapper Imagery (30m resolution) collected from June 1999 through October 2003. The New Hampshire NLCD was imported into ArcView (9.2) and then used to determine what percent of the buffer is comprised of each of the NLCD landcover types. Once the analysis was complete on all 23,626 wetland assessment unit buffers, the resulting summary was converted to an Excel format for further analysis.

The Center for Watershed Protection's Stormwater Managers Resource Center (SMRC) has developed The

Simple Method for estimating stormwater runoff, pollutant loading, and the resulting impacts to the ecological integrity of 1st through 3rd order streams. Although this model was not designed specifically for wetlands it is reasonable to concur that the ecological integrity of wetlands will also degrade as impervious surface cover degrades supporting habitat and pollutant loadings increase. The SMRC Simple Method was used to estimate the impact of each landscape type and its corresponding impact on the ecologic health of the parent wetland. The Simple Method provides event mean concentration values for numerous pollutants and various landcover types. (Table 1)

Table 1. Event Mean Concentration Value by Landcover Type (Center for Watershed Protection)

Pollu-tant	Forest / Rural Open	Water Wet-land	Agricul-ture and Pasture	Commer -cial	High-way	Indus -trial	Medium Density Resi-dential	Urban Open
BOD	3.0	3.5	5.5	14	17	15.3	27	7
COD	36.5	11.5	53.0	60.6	103	85	98	43
TSS	77.5	11.5	142.5	67.3	141.5	110.3	85	82.5
TDS	415.0	12.0	415	174	294	202	144	415
TP	0.12	0.055	0.705	0.23	0.39	0.24	0.43	0.205
DP	0.035	0.025	0.09	0.11	0.22	0.43	0.2	0.07
TKN	0.825	0.695	1.64	1.31	1.8	2.08	2.57	1.25
NO2/ NO3	0.67	0.595	4.06	0.81	0.83	1.5	1.27	0.775
Pb	0.27	0.009	-	0.068	0.17	0.28	0.84	0.05
Cu	-	0.006	-	0.049	0.04	0.076	0.033	0.027
Zn	0.142	0.05	-	0.18	0.21	0.502	0.158	0.083
Cd	-	0.001	-	0.003	0.003	0.005	0.004	0.001
Fecal Colifo rm	300	300	3250	4736	600	1022	11954	3250
E. coli	-	-	-	-	-	-	38607	-

The landscape types used in the NLCD and the Simple Method did not correlate exactly so land use types were matched as closely as possible between the two datasets. In some cases landcover types were combined and in all cases landcover types were weighted by estimates of impervious surface cover (Table 2). The overall NLCD landcover type "developed" was correlated to the average of the SMRC landcover types that comprise developed lands; commercial, highway, industrial and medium density residential. A percent impervious surface value was then assigned to each NLCD landcover type based on information provided with the NLCD dataset that assigns a range of impervious surface cover for each landcover type. For purposes of calculating pollutant loads the highest value in each impervious surface cover range was used. Incorporating impervious surface coverage into the pollutant loading calculation will compensate for using the same average of SMRC landcover types for the low, medium, and high NLCD landcover classes.

Table 2. Translation of SMRC Landcover Types to NLCD Landcover Types

NLCD Landcover Type	SMRC Landcover Types and EMC's Assigned	Assigned % Impervious Surface
High Intensity Developed	AVERAGE (Commercial, Highway, Industrial, Med. Density)	100
Medium Intensity Developed	AVERAGE (Commercial, Highway, Industrial, Med. Density)	79
Low Intensity Developed	AVERAGE (Commercial, Highway, Industrial, Med. Density)	49
Open Space Developed	Urban Open	20
Cultivated	Agriculture and Pasture	15
Pasture/Hay	Agriculture and Pasture	15
Grassland	Agriculture and Pasture	15
Deciduous Forest	Forest/Rural Open	0
Evergreen Forest	Forest/Rural Open	0
Mixed Forest	Forest/Rural Open	0
Scrub/Shrub	Forest/Rural Open	0
Palustrine Forested Wetland	Water/Wetland	0
Palustrine Scrub/Shrub Wetland	Water/Wetland	0
Palustrine Emergent Wetland	Water/Wetland	0
Estuarine Emergent Wetland	Water/Wetland	0
Unconsolidated Shore	Water/Wetland	0
Bare Land	Water/Wetland	0
Water	Water/Wetland	0
Palustrine Aquatic Bed	Water/Wetland	0
Estuarine Aquatic Bed	Water/Wetland	0

For each NLCD landcover type an annual pollutant load was calculated (Formula 1).

Formula 1. Calculation of annual pollutant load using event mean concentrations and % impervious surface

$L = 0.226 * R * C * A$

Where:

L = Annual load in lbs (Table 1 values converted from mg/L to lbs)
R = Annual runoff
C = Pollutant Concentration
A = area (acres)
0.226 = unit conversion factor

A more detailed explanation of the Simple Method can be found at http://www.stormwatercenter.net/

Assuming the land use with the highest pollutant loading would correlate to the most degraded surrounding habitat and cause the most impairment, an initial scoring system was developed using the landscape type with the highest loading (Developed High Intensity = 100). A load ratio was then calculated by dividing the pollutant load for each NLCD landcover class by the pollutant load for Developed High Intensity and then multiplying by 100. This allows for all pollutant loads to be in relation to the land use with the highest pollutant load ratio and to be on a scale of 0 – 100.

An additional calculation was done to correct the load ratios for "natural" loadings which were assumed to be the pollutant loads associated with forested NLCD landscape types. This adjusts the pollutant load ratio for forested landscape types to zero and subtracts natural loadings for the remaining NLCD landscape types. The resulting adjusted load ratio was then assigned as the "score" for each landscape type (Table 3).

Table 3. Level 1 Assessment Scores

NLCD Landcover Type	Assessment Score	Impervious Cover Fraction	% Buffer Occupied by Landcover Type @ PNS Threshold
High Intensity Developed	100	1	10
Medium Intensity Developed	79.6	0.79	13
Low Intensity Developed	50.5	0.49	20
Open Space Developed	12.0	0.2	84
Cultivated	15.6	0.15	63
Pasture/Hay	15.6	0.15	63
Grassland	15.6	0.15	63
Deciduous Forest	0	0	-
Evergreen Forest	0	0	-
Mixed Forest	0	0	-
Scrub/Shrub	0	0	-
Palustrine Forested	0	0	-
Palustrine Scrub/Shrub	0	0	-
Palustrine Emergent	0	0	-
Estuarine Emergent	0	0	-
Unconsolidated Shore	0	0	-
Bare Land	0	0	-
Water	0	0	-
Palustrine Aquatic Bed	0	0	-
Estuarine Aquatic Bed	0	0	-

The following formula was used to calculate the overall Level 1 Assessment Score for each wetland AUID buffer area:

Level 1 Assessment Score = Σ %LCi * LCSi where:

%LCi = percent of the total area in a given land cover class

LCSi = Assessment score for given land cover class

In order to identify wetland assessment units as potentially supporting or potentially not supporting for the aquatic life designed use, a threshold was needed for the Level 1 assessment scores. Both the Center for Watershed Protection and DES have determined that once a watershed area exceeds 10% impervious surface cover, exceedences of water quality criteria are likely. Thus, if a wetland buffer is comprised of 10% or greater of the "high density developed" NLCD landcover class, that wetland assessment unit is very likely to have violation of water quality standards. Based upon the 10% threshold, any wetland assessment unit with a Level 1 score exceeding 10 will be listed as potentially not supporting. Table 3 indicates the percent of a given buffer that would need to be occupied by each NLCD landcover class to exceed the potentially not supporting threshold of 10.

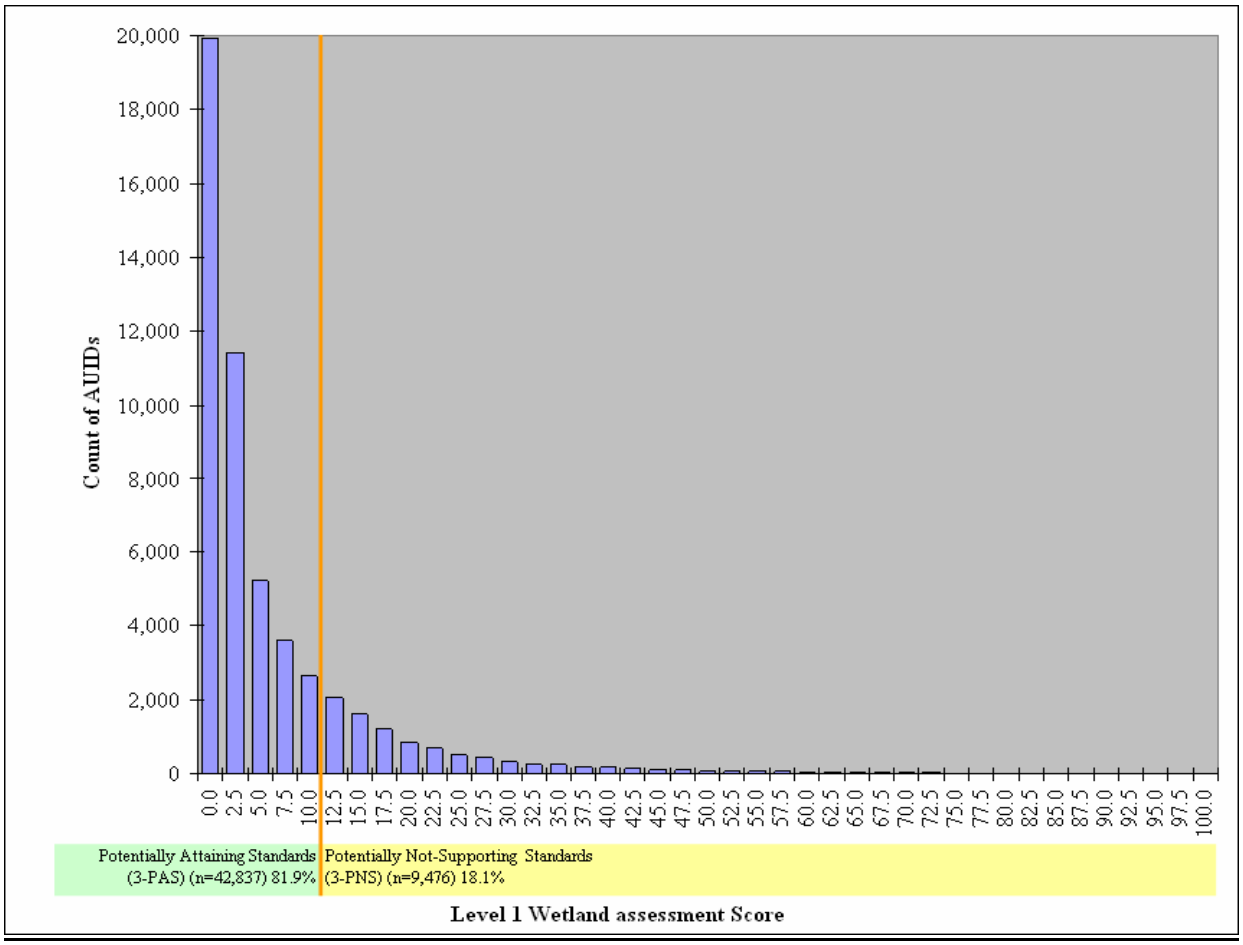
Level 1 Assessment Score <10	**AUID listed as Potentially Supporting**
Level 1 Assessment Score >10	**AUID listed as Potentially Not Supporting**

In 2010 the DES Watershed Management Bureau and Wetlands Bureau worked with UNH Cooperative extension to construct wetland complexes from the individual NWI wetland polygons in accordance with the 2010 "Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire" (NH Method). These new complexes were given assessment unit IDs to replace those of 2008. The new base layer was built to be the foundation of a comprehensive wetlands catalog for the state and to act as a starting point for anyone applying the NH Method. While the NH Method is just for freshwater wetlands, the complex creation methodology was applied to both fresh and marine wetlands independent of one another.

The state-wide distribution of wetlands and their assessment scores are noted below. In 2010, a total of 42,837 (81.9%) wetland assessment units were assessed as potentially supporting and 9,476 (18.1%) as potentially not supporting. The data were then queried to identify the predicted 10% most impacted scoring wetlands for the state. A map for each service area is presented to identify the location of wetlands that rank in the top 10% which may be areas of potential restoration of aquatic resource functions and values.

Statewide River Designation and Prime Wetlands

In addition to the above information available for each service area, New Hampshire has a process to nominate wetlands and rivers of exceptional quality. Under RSA 482-A:15 and DES administrative rules, individual municipalities may elect to designate wetlands as "prime-wetlands" if, after thorough analysis, it is determined that high-quality wetlands are present. Typically, a wetland receives this designation because of its large size, unspoiled character and ability to sustain populations of rare or threatened plant and animal species. Field and "desk top" data are used for the evaluation process. Once the prime wetland submission is considered complete and approved, DES will apply the law and rules that are applicable to any future projects that are within the prime wetland or the 100 foot prime wetland buffer.

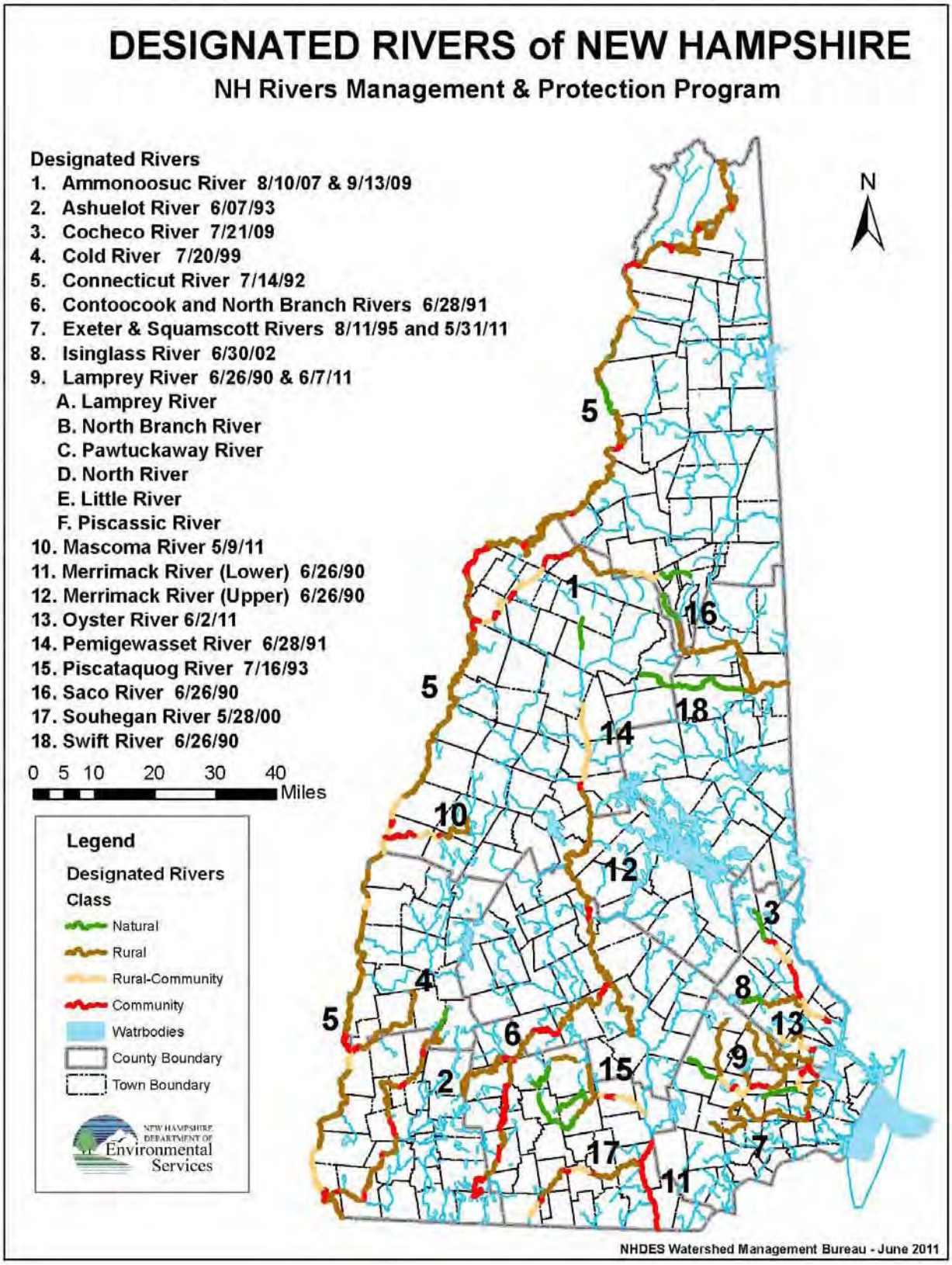


The NH River Management and Protection Program (RMPP) was established in 1988 with the passage of RSA 483 to protect certain rivers for their outstanding natural and cultural resources. The program is administered by the New Hampshire Department of Environmental Services (DES). For a river to be designated for protection, an interested individual or organization must nominate the river and have support by local municipal officials and residents of the riverfront communities. The designation must also be submitted to the DES Commissioner and, if and when approved, forwarded to the General Court for consideration. If the Legislature approves the nomination, looking closely at the level of local support and presence of important river values, and if the Governor signs the bill, RSA 483 is amended to designate the river for protection under the program.

After designation, a management plan is developed so that the outstanding qualities of the river may be protected for future generations. The plan is developed and implemented by a volunteer local river advisory committee that also coordinates activities affecting the river on a regional basis. A typical plan identifies management goals and recommends actions that may be taken to protect the resources identified in the nomination. At the state level, the Department of Environmental Services assists with the development and implementation of the management plan and enforces regulations concerning the quality and quantity of flow in protected river segments. A map of the current designated rivers in each service area is found below and information on each river is contained within the detailed framework for the nine service areas.

The following communities have designated prime wetlands:

The following rivers have been designated by the NHDES Rivers Management & Protection Program:



COMPENSATION PLANNING FRAMEWORK BY SERVICE AREA

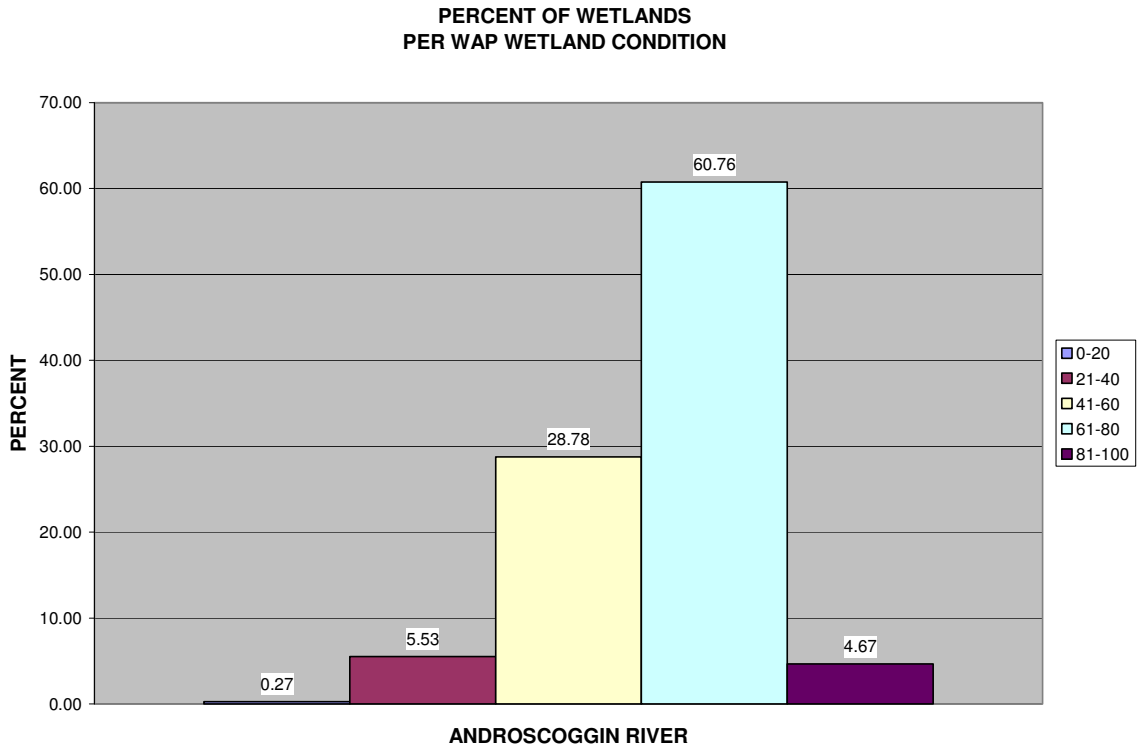
ANDROSCOGGIN RIVER

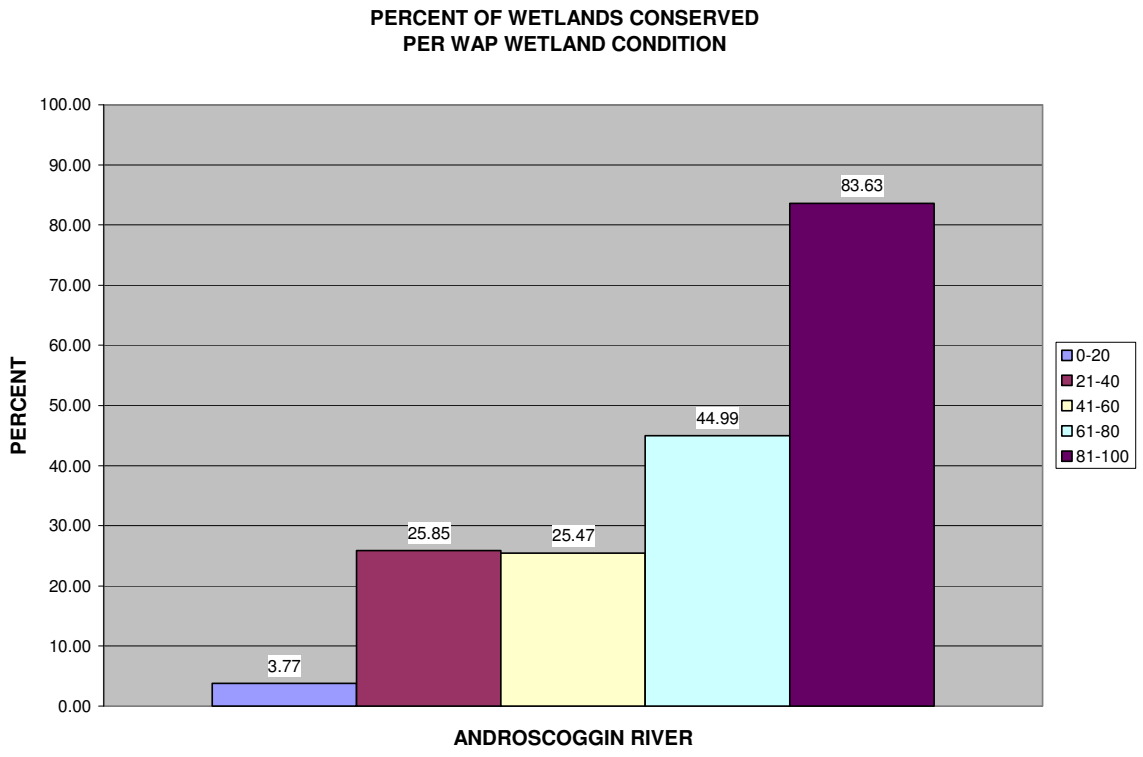
The Androscoggin River region is one of the least densely populated regions in the state. There was a loss in population over the last 10 years thus it experienced the lowest amount of growth and lowest percent change of single family housing in the state (0.4%). Portions of the service area are in the White Mountain National Forest (WMNF) which contributes to the low population and historic loss. The USFWS Lake Umbagog National Wildlife Refuge is also located in the area. Agricultural conversion over the years has been the lowest in this part of the state. This region is the smallest area per total acres, 462,582 acres with only 14 percent in aquatic resources currently. Historic loss is modest with a 4% change. Although there is a low overall total of current aquatic resources, 32.1% of the resources are conserved which is the second highest in the state. In terms of the quality of the wetlands in this region, there are mostly higher WAP wetland condition (61-80) resources and conservation measures have been directed towards the highest wet habitats with 84% currently conserved.

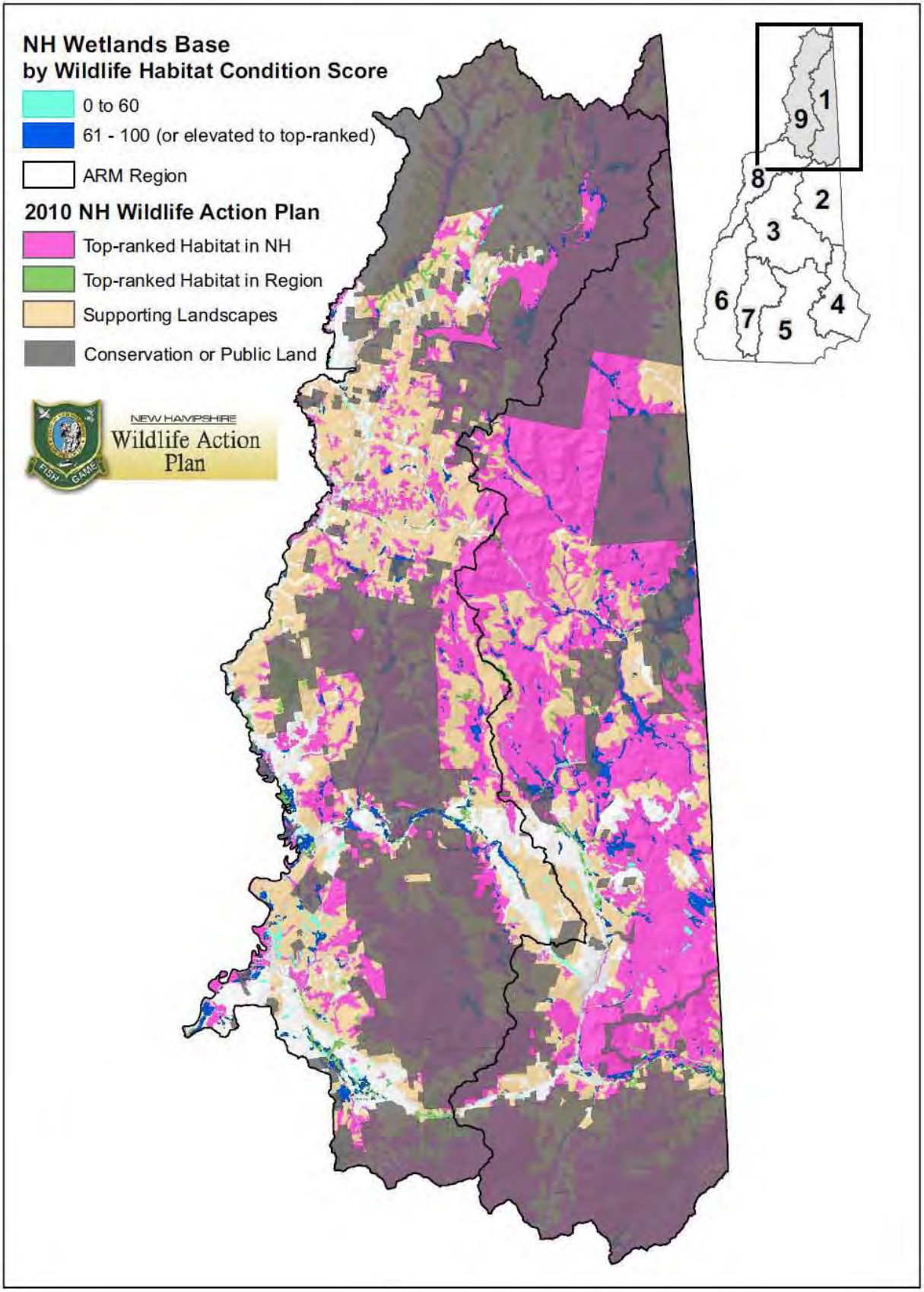
Based on the WAP analysis for quality of habitat, the Androscoggin River service area consists of potential top ranked habitat in New Hampshire with conservation lands located in the northerly and southerly portions of the area. The water quality standards indicated that the Androscoggin River and Dead River in Berlin and surrounding areas could be improved.

Aquatic Resource Objectives:

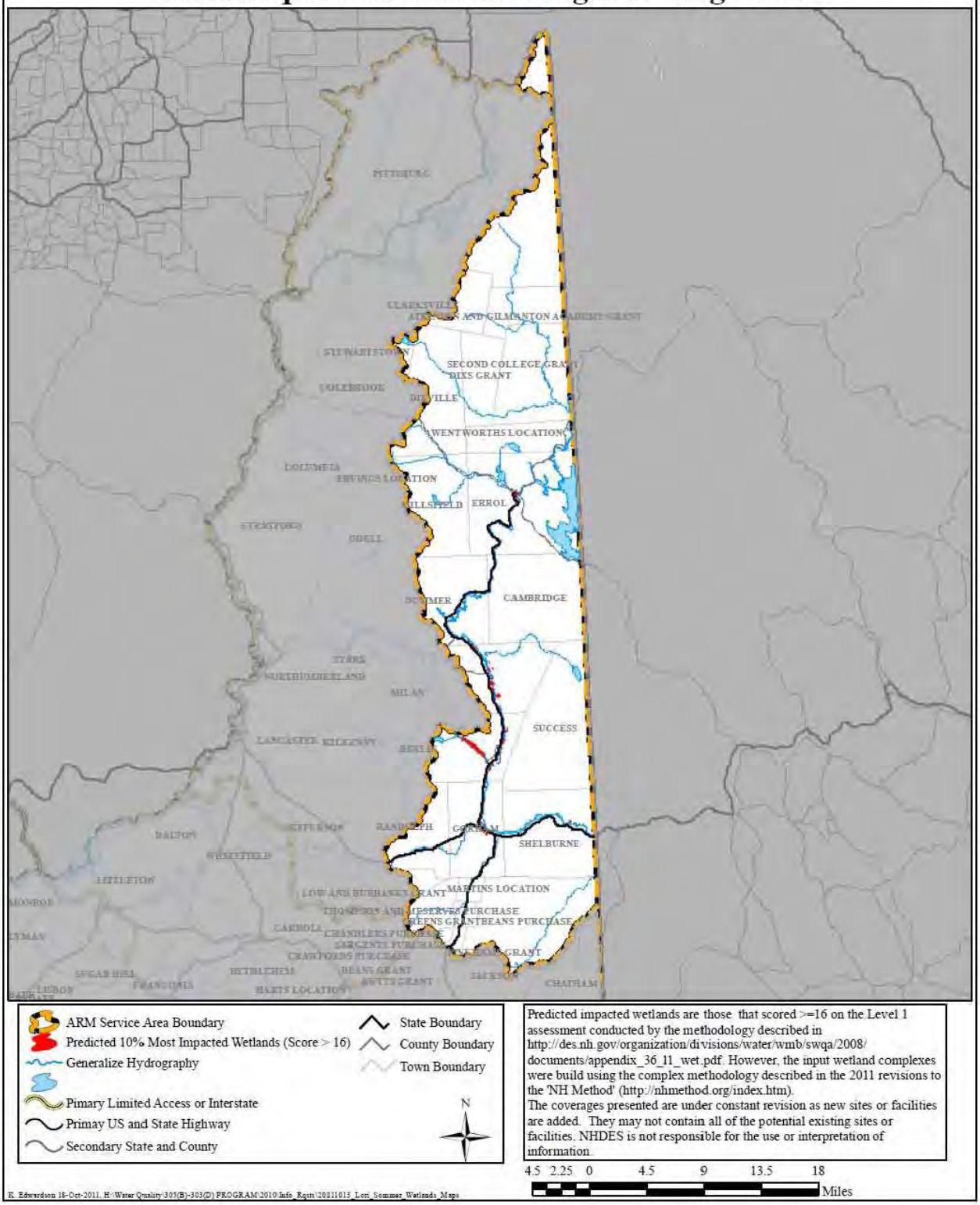
- Land protection in this area could target Tier 1 WAP areas along the river and north of the WMNF area in the area of the Mahoosuc Range.
- Conservation of WAP Tier 1 and 2 habitats could focus on providing connections between existing protected lands and preservation of areas of importance. These areas must be under some degree of threat from development and have limited protection status provided by existing laws or regulations.
- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Remove barriers (culverts and dams) in high quality stream reaches that contain native species.


PERCENT OF WETLANDS
PER WAP WETLAND CONDITION
PERCENT
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0.27
5.53
28.78
60.76
4.67
ANDROSCOGGIN RIVER
0-20
21-40
41-60
61-80
81-100


PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
3.77
25.85
25.47
44.99
83.63
ANDROSCOGGIN RIVER
0-20
21-40
41-60
61-80
81-100


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
1
2
3
4
5
6
7
8
9

Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #1



SACO RIVER

The Saco River region lacks a large population and saw a moderate increase in the percent of all population change with a 3.9% increase over the 2000-2010 time period. State Route 16 is in this region and population projections show this area to have upwards to a 24% increase in the coming decade. There was a slight increase in single family housing. Land acreage is 556,244 acres which consists of 15.8% in current aquatic resources. The region has a low amount of historic loss of 8.3% (7,942 acres) which may be attributed to the land protected in the WMNF. The Ossipee Pine Barrens is also in this service area. The Pine Barrens is an area of conservation focus due to this rare natural community and its importance to drinking water sources. This area is located in Ossipee, Freedom and Madison.

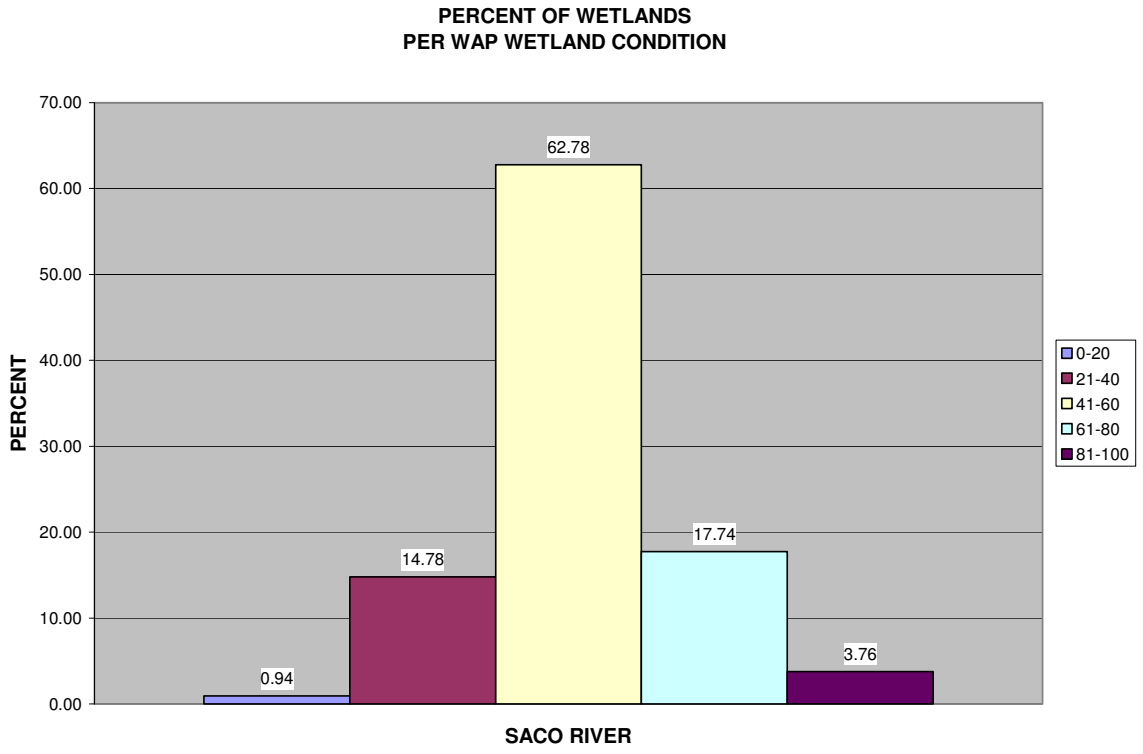
The current total of wetlands conserved includes 26,909 acres or 28% of the total in the region. The quality of the aquatic resources is mostly mid-WAP quality (41-60), and most of the resources conserved are of mid to high-WAP quality (61-100) with 88.86%. There are a good number of lower condition wetlands that are conserved which may be a source of potential restoration opportunities in these areas. The Saco River service area is predicted to experience continued development pressure associated with tourism therefore communities in this region need to continue reviewing local ordinances in order to encourage low impact development. This is particularly important for Conway and North Conway as well as areas along the Pine River as it flows to Pine River Pond. Municipalities can strengthen requirements in their local zoning and ordinances and require site-specific natural resource inventories and/or wildlife assessments. In addition, communities can require that development proposals demonstrate how they will conserve important habitat features.

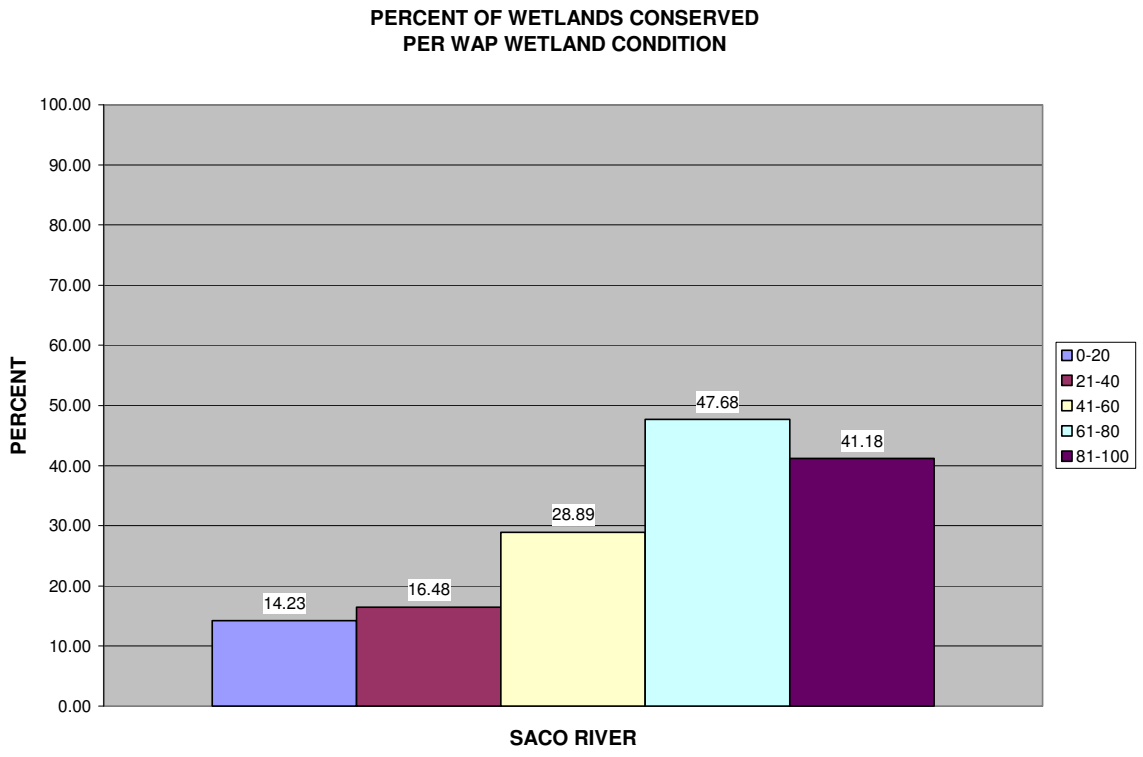
Two rivers in this service area are NH Designated Rivers: the Saco River and Swift River. The portions of these rivers are as follows:

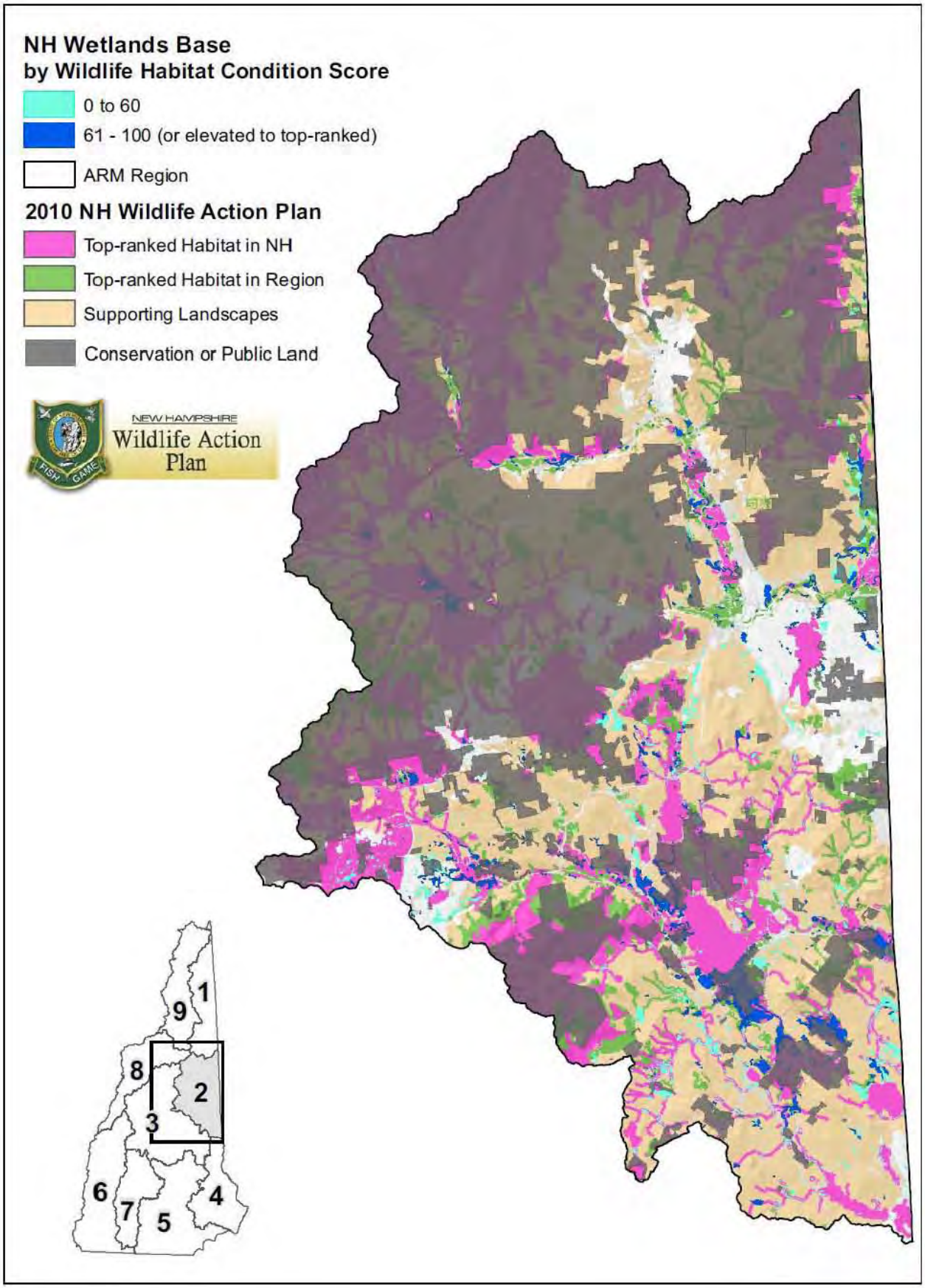
The Saco River runs from the base of Saco Lake dam in Crawford Notch State Park to the New Hampshire/Maine state line. Municipalities: Crawford Notch State Park, Harts Location, Bartlett, and Conway. http://des.nh.gov/organization/divisions/water/wmb/rivers/saco_river.htm
The Swift River flows from its headwaters in Livermore to its confluence with the Saco River in Conway. Municipalities: White Mountain National Forest, Livermore, Waterville Valley, Albany, and Conway. http://des.nh.gov/organization/divisions/water/wmb/rivers/swift_river.htm

Aquatic Resource Objectives:

- Encourage conservation of WAP Tier 1 and 2 habitats to connect existing protected lands and preserve areas of importance.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage preservation projects, particularly in areas of projected development expansion.
- Review development patterns and protect areas with forest cover, productive farm soils, and drinking water resources.
- Protect high quality streams and important areas of headwater streams that also need a strategic approach to protection and management of uses in the surrounding areas.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.


PERCENT OF WETLANDS
PER WAP WETLAND CONDITION
PERCENT
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0.94
14.78
62.78
17.74
3.76
SACO RIVER
0-20
21-40
41-60
61-80
81-100


PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
14.23
16.48
28.89
47.68
41.18
SACO RIVER
0-20
21-40
41-60
61-80
81-100


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
FISH
GAME
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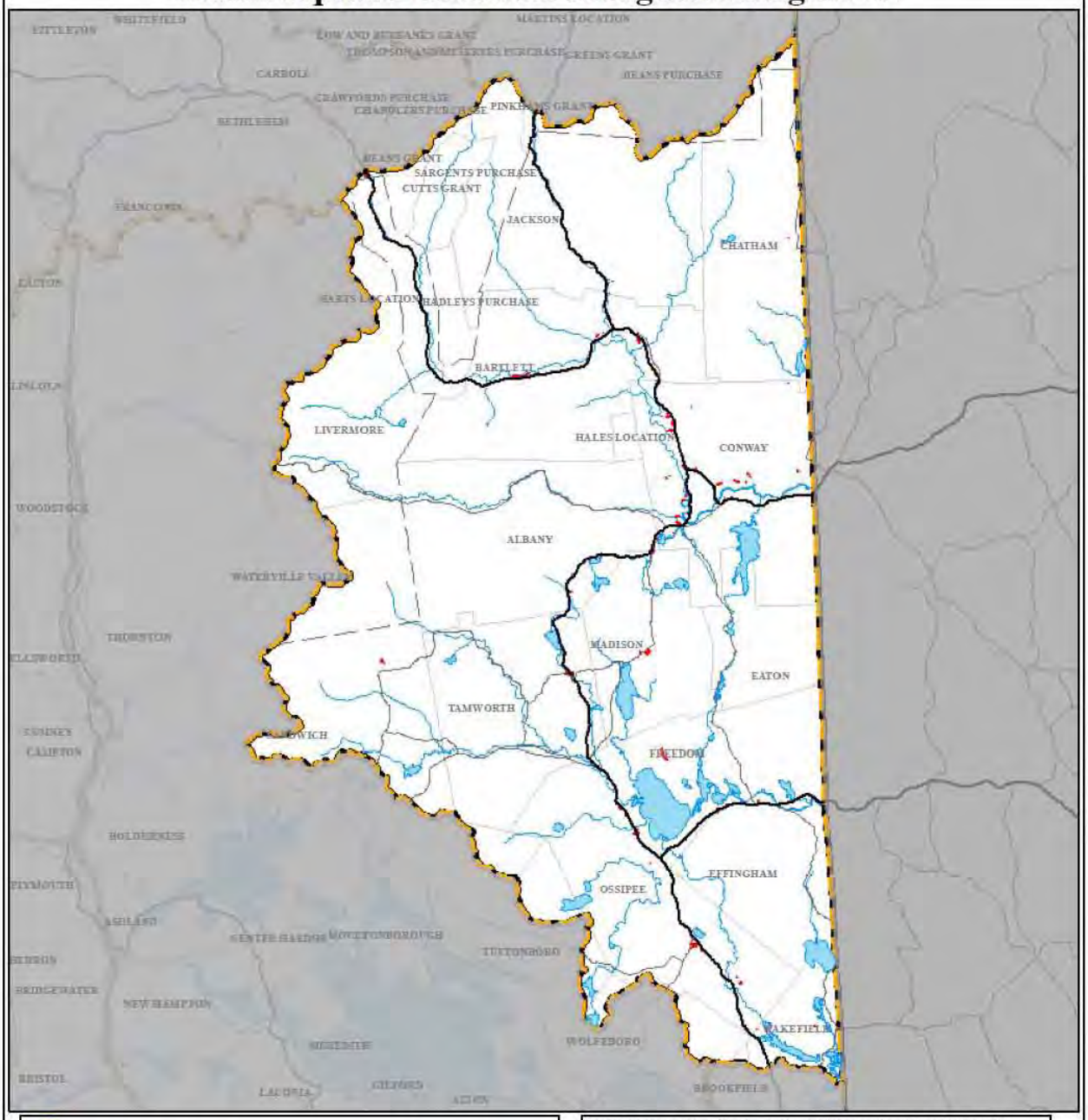
Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #2



ARM Service Area Boundary
Predicted 10% Most Impacted Wetlands (Score > 16)
Generalize Hydrography
Pimary Limited Access or Interstate
Primay US and State Highway
Secondary State and County
State Boundary
County Boundary
Town Boundary
N

Predicted impacted wetlands are those that scored >=16 on the Level 1 assessment conducted by the methodology described in http://des.nh.gov/organization/divisions/water/wmb/swqa/2008/documents/appendix_36_l1_wet.pdf. However, the input wetland complexes were build using the complex methodology described in the 2011 revisions to the 'NH Method' (http://nhmethod.org/index.htm).
The coverages presented are under constant revision as new sites or facilities are added. They may not contain all of the potential existing sites or facilities. NHDES is not responsible for the use or interpretation of information.

3 1.5 0 3 6 9 12 Miles

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PEMIGEWASSET RIVER TO WINNIPESAUKEE RIVER

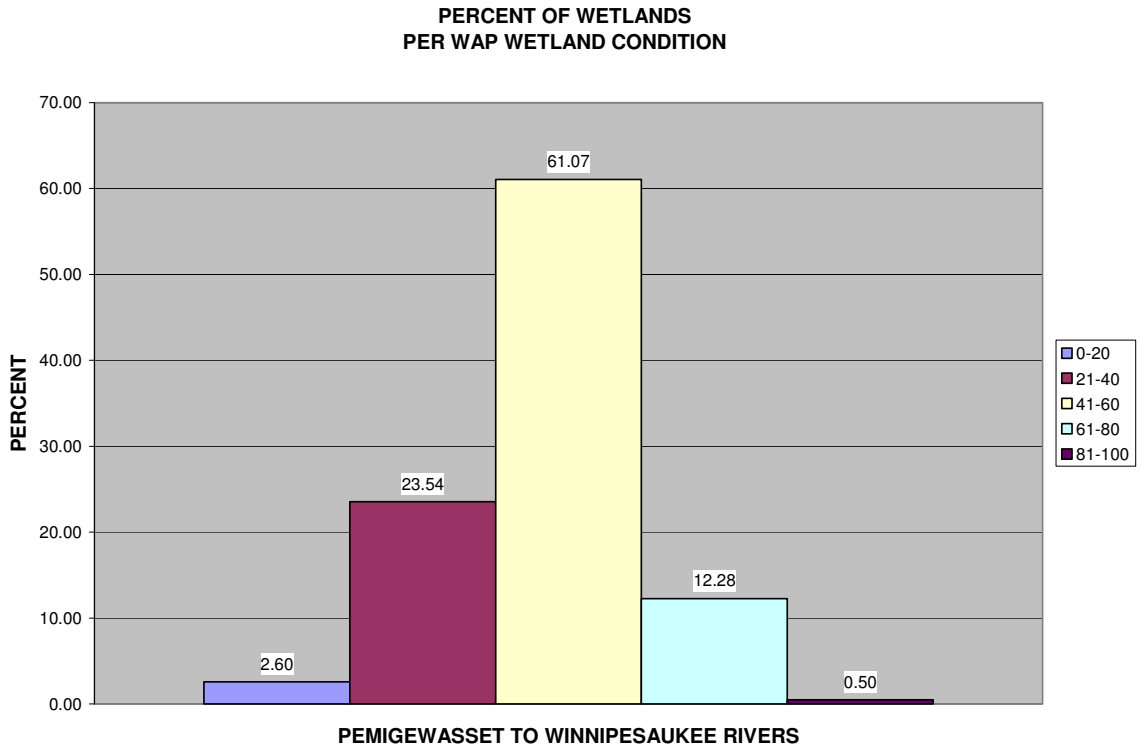
The population in this region increased fairly steadily over the 2000-2010 time period in an area of current high population density. This relates to an increase in single family home construction with it accounting for a 15.4% percent for the state. This region contains several large lakes (i.e., Lake Winnipesaukee, Squam Lake, Newfound Lake, and Winnisquam Lake) and a portion of the WMNF. Due to the popularity of the lakes region, the continued increase in development is likely. Conversely, this region experienced a low amount of agricultural conversion with only a 3.4% loss over 2000-2010. This is the second largest region with 965,104 acres of land with 18.9% of area in current aquatic resource habitat. The wetlands in the area are of mid-WAP quality (41-60) and the conservation focus has been on the highest WAP quality (81-100) areas. The large lakes mentioned above are highlighted as top-ranked habitat where the areas surrounding them are key in conserving or steering water quality improvement efforts. Top ranking habitat in the eastern portion of this service area contributes value to Lake Winnipesaukee and is currently limited in conservation efforts.

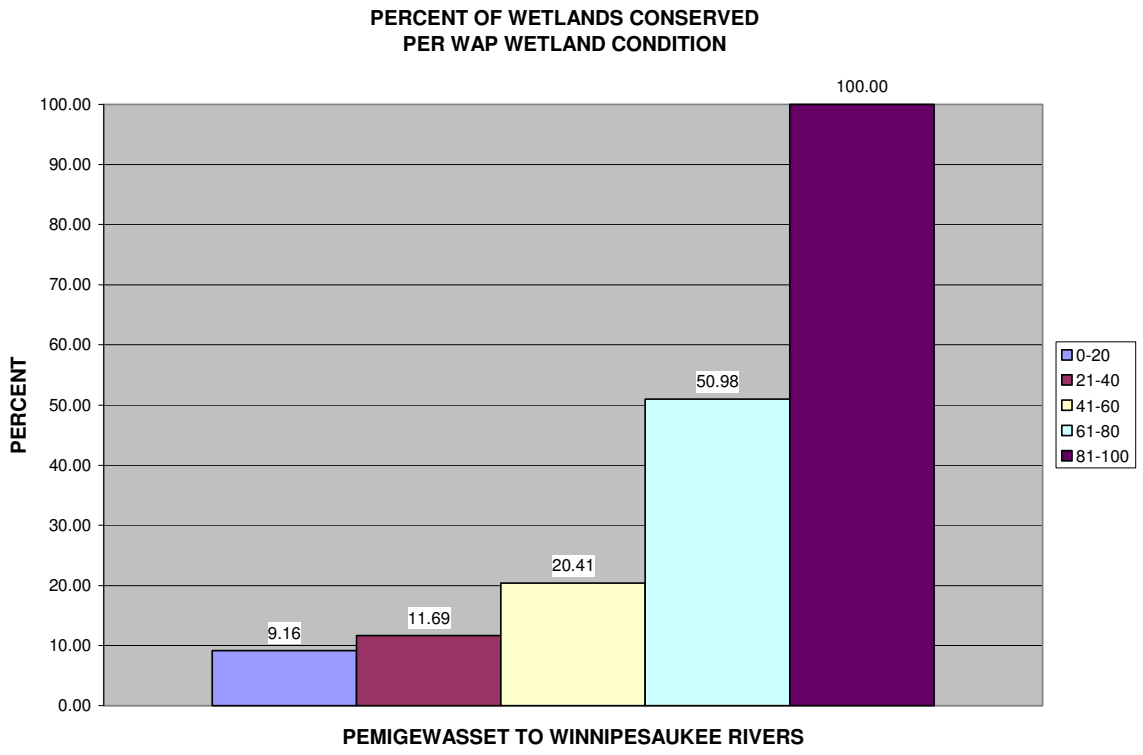
A thorough and systematic study of wetland restoration opportunities in this region was performed through a US EPA grant in 2010. NHDES working with its partners at the NH Fish and Game Department, the US Environmental Protection Agency and others, commissioned a study that built a GIS model of the watershed to identify wetlands that may be impacted by past land uses and which may benefit from environmental restoration. The resulting map information can be used by concerned citizens and community organizations to identify promising wetland restoration projects. The full report and information on the study can be requested through the NHDES program (http://des.nh.gov). In addition, municipalities can strengthen requirements in their local zoning and ordinances and require site-specific natural resource inventories and/or wildlife assessments. In addition, communities can require that development proposals demonstrate how they will conserve important habitat features. The review of development patterns should work to develop town plans for more sustainable growth which includes retaining forest cover, productive farm soils, and incorporates wise management and protection of drinking water resources.

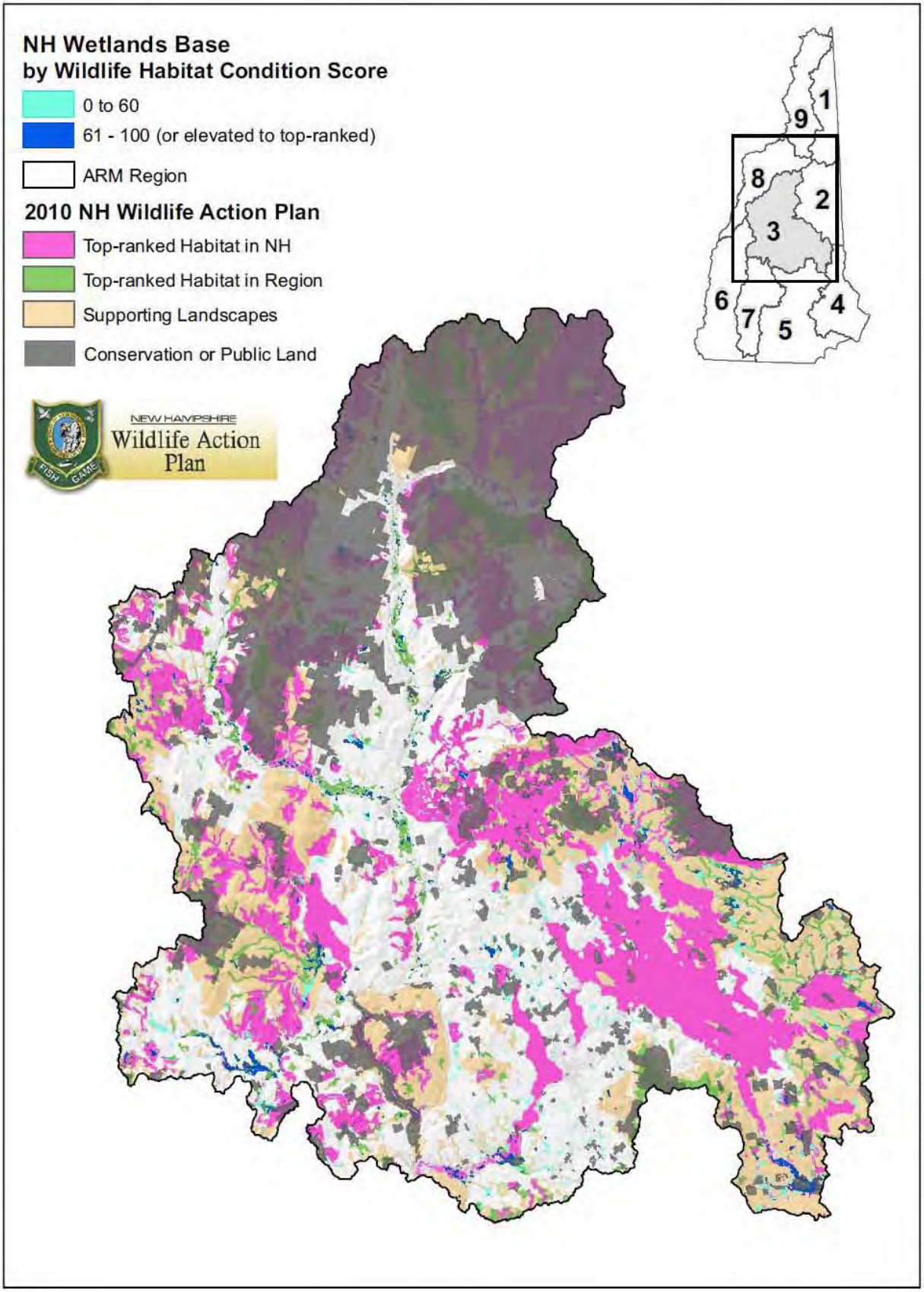
The Pemigewasset River has been a NH Designated River since 1991. It runs from the outlet of Profile Lake in Franconia Notch State Park to the southern boundary of Franconia Notch State Park and from the northernmost Thornton town line to the confluence with the Merrimack River in Franklin. Municipalities: Franconia Notch State Park, Franconia, Thornton, Campton, Plymouth, Holderness, Ashland, Bridgewater, New Hampton, Bristol, Hill, Sanbornton, and Franklin.
http://des.nh.gov/organization/divisions/water/wmb/rivers/pemi_river.htm

Aquatic Resource Objectives:

- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage preservation projects, particularly in areas of projected development expansion.
- Conservation of WAP Tier 1 and 2 habitats should be a focus to connect existing protected lands and preserve areas of importance.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Protect ecologically important floodplain forests in the Connecticut River Watershed. Major floodplain forest types across river size, gradient, and ecological sub-sections north to south should be protected and attempts to develop management plans would be important.
- Protect high quality streams and buffers. Important areas of headwater streams need a strategic approach to protection and management of uses in the surrounding areas.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.


PERCENT OF WETLANDS
PER WAP WETLAND CONDITION
PERCENT
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2.60
23.54
61.07
12.28
0.50
0-20
21-40
41-60
61-80
81-100
PEMIGEWASSET TO WINNIPESAUKEE RIVERS


PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
9.16
11.69
20.41
50.98
100.00
0-20
21-40
41-60
61-80
81-100
PEMIGEWASSET TO WINNIPESAUKEE RIVERS


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
1
9
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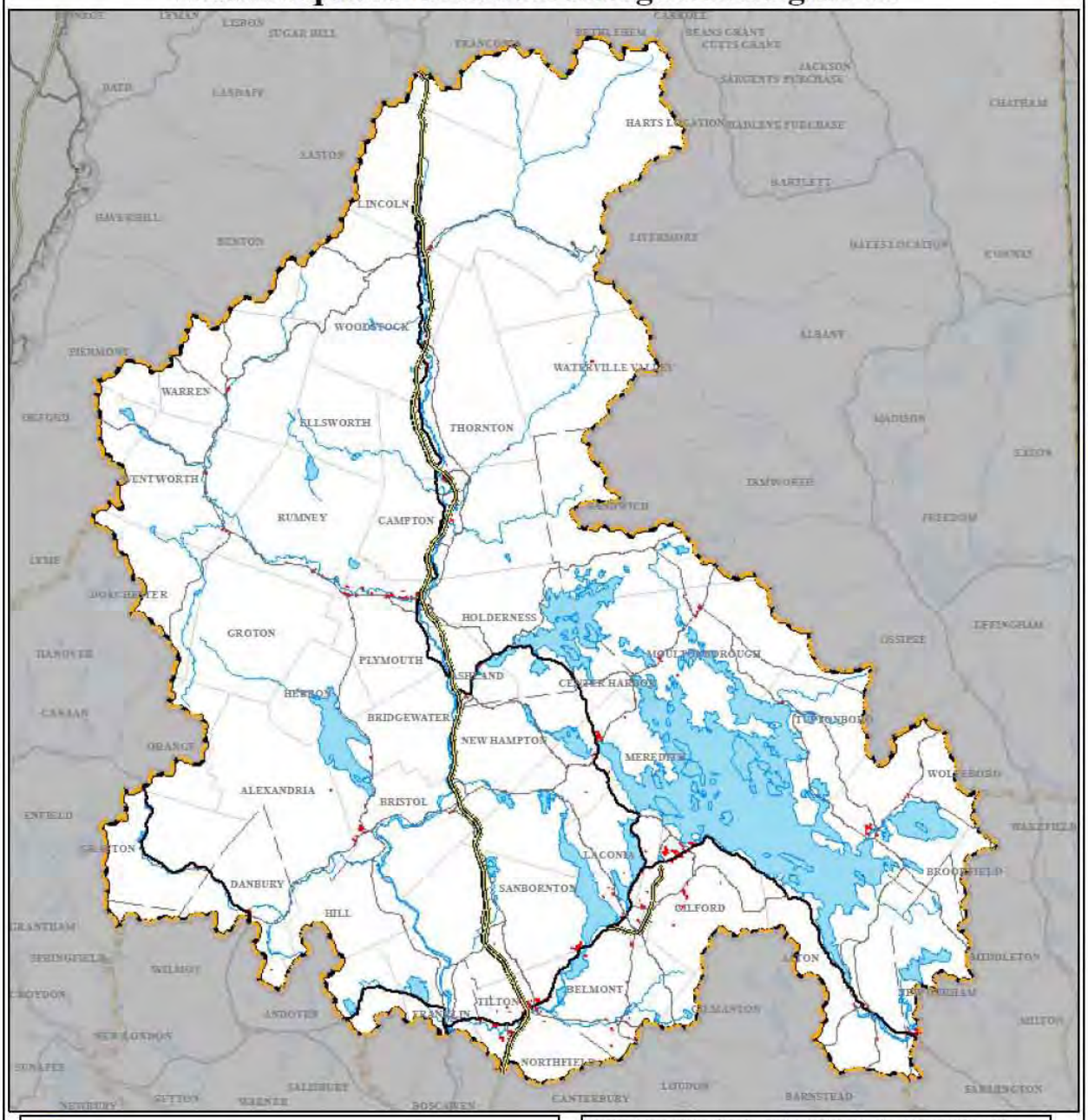
4

Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #3



Predicted impacted wetlands are those that scored >=16 on the Level 1 assessment conducted by the methodology described in http://des.nh.gov/organization/divisions/water/wmb/swqa/2008/documents/appendix_36_l1_wet.pdf. However, the input wetland complexes were build using the complex methodology described in the 2011 revisions to the 'NH Method' (http://nhmethod.org/index.htm).
The coverages presented are under constant revision as new sites or facilities are added. They may not contain all of the potential existing sites or facilities. NHDES is not responsible for the use or interpretation of information.

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SALMON FALLS TO PISCATAQUA RIVERS

Land development activities in coastal watersheds are creating uncontrolled stormwater runoff and increasing the danger to scarce and environmentally sensitive resources. Rising nutrient and bacteria levels threaten the natural and human environment while head-of-tide dams block fish migration. Troubling declines in seagrass beds in Great Bay may signal that a point of no return could lie ahead. Much depends on reversing these trends, and time is of the essence.

New Hampshire's coastal watersheds are, quite simply, irreplaceable. Representing only nine percent of the state, these 525,000 acres harbor our small coastline, sandy beaches and dunes, and rocky shores. The area provides essential habitat for more than 130 rare species, including many species of plants and wildlife that occur nowhere else in New Hampshire and more than 1,800 miles of rivers and streams, ranging from cold brook trout headwaters in the upper watershed to large, meandering tidal rivers near the coast. Two highly productive and important estuaries are located in this area, the Great Bay and Hampton-Seabrook, as are several sizeable salt marsh complexes. The area contains complex and diverse forest and wetland ecosystems that provide habitat, ecosystem services (such as water quality filtering and flood protection), timber supply, and other forest products. Finally, the area offers some of the state's best outdoor recreation opportunities for hiking, hunting, salt and freshwater fishing, boating, snowmobiling, bird-watching, bicycle riding, and unparalleled diverse scenery.

The Salmon Falls to the Piscataqua River region generally covers the entire NH coastal zone. This region saw the second highest increase in population growth and development of single family homes in the state from 2000-2010. The area is within Rockingham County which, combined with the Merrimack River service area, consists of about half of the entire population of the state. The area has one of the highest records of historic loss with 15.1%. The population growth in this area will continue steadily putting natural resources in this area at particular risk. There remains the highest amount of wetland acreage in the state, with 29.1% of the land area in this region remaining in ARBL. This is likely due to estuarine wetlands which are rarely impacted due to strict wetland regulations. The majority of the wetlands are of modest value with the majority having a 41-60 WAP condition score. The area has been concentrating conservation efforts on protecting wetland acres of the highest WAP condition score with over 60% of the wetlands protected with 61-100 WAP score.

A large majority of this service area is developed with conservation lands scattered throughout the area with little connectivity. Concentrated areas of fertile soils can be found in pockets in southern New Hampshire, and in the Seacoast region. This densely populated area puts agricultural soils and lands at the highest risk of conversion. To ensure a healthy environment into the future, it is essential that communities identify, retain, and protect the remaining undeveloped lands and waters that support the most important of these natural resource values and functions.

Beginning in 1995, the New Hampshire Estuaries Project (NHEP) embarked on a process to develop and systematically address the 98 Action Items outlined in the program's guiding document, the *Comprehensive Conservation and Management Plan*. The intent was to achieve the *Plan's* goals of improved water quality in New Hampshire's estuaries. The organization's name was changed in 2009 to the Piscataqua Region Estuaries Partnership (PREP) when the PREP focus areas was expanded to include 10 Maine communities. In 2005, the program moved from state government to the University of New Hampshire. In December 2007, the PREP Management Committee voted unanimously to expand the PREP's focus area to the entire Great Bay Estuary watershed, including the 24 percent of the watershed in Maine. The PREP is part of the U.S. Environmental Protection Agency's National Estuary Program, which is a joint local/state/federal program established under the Clean Water Act with the goal of protecting and enhancing nationally significant estuarine resources.

The PREP's Comprehensive Conservation and Management Plan for the region's estuaries was completed in 2000 and implementation has been ongoing. The Management Plan outlines key issues related to management of New Hampshire's estuaries and proposes strategies (Action Plans) that are expected to preserve, protect, and enhance the region's estuarine resources. The PREP's priorities were established by local stakeholders and include water quality improvements, shellfish resources, land protection, and habitat

restoration. Projects addressing these priorities are undertaken throughout the Piscataqua Region coastal watershed, which includes 52 communities.

Currently, PREP is implementing the 2010 Piscataqua Region Comprehensive Conservation and Management Plan (CCMP) found at: http://www.prep.unh.edu/plan.pdf which is an update of the 2000 CCMP that addresses current and emerging issues impacting the water quality and environmental health of estuaries in the Piscataqua Region. The 10-year plan includes seven goals, 35 objectives, and 82 action plans that were developed through an extensive 18-month process involving 159 stakeholders representing federal and state resource management agencies, nongovernment organizations, industry, and legislators. Action plans are categorized by critical theme areas, including water resources, land use and habitat protection, living resources and habitat restoration, and watershed stewardship.

The PREP is a member of the Partnership to Restore New Hampshire's Estuaries ("Partnership"), a recently-formed coalition launched to increase the pace and scale of restoration efforts to improve long-term sustainability of the state's estuaries. The Partnership's vision is to promote cooperative restoration and conservation activities in New Hampshire's coastal watersheds to improve the health, productivity, and resiliency of its two major estuaries – Great Bay and Hampton-Seabrook – so that fish, shellfish, crustaceans, eelgrass, waterfowl, piscivorous birds, and other native species flourish, and local communities recognize and derive societal benefits provided by healthy estuary ecosystems including clean water, vibrant fisheries, abundant recreation opportunities, beautiful scenery, stable shorelines, and diverse wildlife populations. More details are at: http://www.prep.unh.edu/programs/restore.htm

Another project developed for this region included an integrated ecosystem approach to identify multi-habitat restoration opportunities in the Great Bay estuary. The Great Bay Restoration Compendium developed a conceptual site selection model based on a comparison of historic and modern distribution and abundance data, current environmental conditions, and expert review. Restoration targets included oysters and softshell clams, salt marshes, eelgrass beds, and seven diadromous fish species. Spatial data showing the historical and present day distributions for multiple species and habitats were compiled and integrated into a geographic information system. A matrix of habitat interactions was developed to identify potential for synergy and subsequent restoration efficiency. Output from the site selection models was considered within this framework to identify ecosystem restoration landscapes. The final products of these efforts include a series of maps detailing multi-habitat restoration opportunities extending from upland freshwater fish habitat down to the bay bottom. Mitigation opportunity identification should focus on places identified in the following effort: http://www.prep.unh.edu/resources/pdf/great_bay_restoration-tnc-06.pdf

The Hampton-Seabrook Estuary Habitat Restoration Compendium (HSEHRC) is a compilation of information on the historic and current distributions of salt marsh and sand dune habitats and diadromous fishes within the Hampton-Seabrook Estuary watershed. These habitats and species groups were selected due to the important ecological role they play within the watershed and with effective restoration and conservation efforts will continue to play. Other ecologically important habitats and species, such as avifauna, shellfish and eelgrass beds, currently are or historically were present within the watershed. Shellfish and seagrass are recognized as important habitats within the Estuary, but were not included in the current report because a different analytical approach may be required for such dynamic and/or short-lived species.

The HSEHRC identifies restoration opportunities within the watershed derived from data on habitat change. Many other factors exist that are important in the identification and selection of restoration projects, including water quality and non-point source pollution, water withdrawal, harbor maintenance, recreational impacts, human history, and socioeconomic factors, among others. Although information regarding these factors is not explicitly included in this analysis, these factors must be considered and addressed as they may limit the potential for success in specific restoration efforts.

A series of maps detailing changes in the extent of sand dune and salt marsh habitats over time, the current and historic distribution of seven diadromous fish species, and restoration opportunities within the Hampton-Seabrook Estuary and watershed can be found at:
http://www.prep.unh.edu/resources/pdf/hampton_seabrook_estuary-unh-09.pdf

In 2009, the NHDES published a proposal for numeric nutrient criteria for the Great Bay Estuary. These criteria were developed over a four-year period through an open process that involved local experts from universities, state agencies, federal agencies, municipalities, and non-governmental organizations. The report found that total nitrogen concentrations in most of the estuary needed to be less than 0.3 mg N/L to prevent loss of eelgrass habitat and less than 0.45 mg N/L to prevent occurrences of low dissolved oxygen. Eelgrass habitat and dissolved oxygen are both critical for supporting aquatic life in the Great Bay Estuary.

Based on these criteria and an analysis of a compilation of data from at least seven different sources, NHDES concluded that 11 of the 18 subestuaries in the Great Bay Estuary did not meet surface water quality standards and specifically did not comply with Env-Wq 1703.14, the narrative standard for nutrients. These impairments were added to New Hampshire's 2008 303(d) list on August 14, 2009, approved by the U.S. Environmental Protection Agency (EPA) on September 30, 2009, and have subsequently been retained on the 2010 303(d) list. Nine of the 11 impaired subestuaries were the Great Bay, Little Bay, Upper Piscataqua River, and the tidal rivers that flow into these areas. The other two impaired subestuaries were Portsmouth Harbor and Little Harbor/Back Channel at the mouth of the estuary.

Under the Clean Water Act, if a waterbody is placed on the 303(d) list, a study must be completed to determine the existing loads of the pollutant and the load reductions that would be needed to meet the water quality standard. However, additional research by DES was needed to complete this study because critical information was not available. Nitrogen loads to the Great Bay Estuary were estimated previously, but only for the whole estuary, not for all of the smaller subestuaries that were added to the 303(d) list. The contribution from individual point sources of nitrogen and the variability in nitrogen loads over time had not been adequately quantified. There were no pre-existing models of the Great Bay Estuary that could be used to estimate the nitrogen loading thresholds to comply with the numeric nutrient criteria. Finally, the costs associated with nitrogen load reductions at individual wastewater treatment facilities were unknown.

Therefore NHDES developed models to estimate the existing nitrogen loads to each of the impaired subestuaries and to predict the watershed nitrogen load thresholds needed to meet the new criteria. The report of these findings should be considered in the future development plans and can be found at: http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/gb_nitro_load_analysis.pdf

The national Coastal and Estuarine Land Conservation Program (CELCP) was established in 2002 to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical or aesthetic values. The CELCP program's authorizing language gives priority to lands that have significant ecological values, and which can be effectively managed and protected. The program provides state and local governments with matching funds to purchase significant coastal and estuarine lands, or conservation easements on such lands, from willing sellers.

During the development of the NHCELCP, significant ecological values were interpreted to include those lands and waters that are most important for conserving living resources – native plants, animals, natural communities, and ecosystems--and water quality. The use of conservation focus areas and riparian habitats as priorities for NHCELCP focus areas occur in places where multiple important natural resource features co-occur to an extent that is significant from a watershed perspective. *The Land Conservation Plan for New Hampshire's Coastal Watersheds* was designed to address the ecological and conservation values of land in the coastal watershed and is intended as a land protection planning tool for municipalities and others, working to protect natural resources. In 2006, the New Hampshire Coastal Program developed *The Land Conservation Plan for New Hampshire's Coastal Watersheds* primarily through a partnership of The Nature Conservancy (TNC), Society for the Protection of New Hampshire Forests (SPNHF), Rockingham Planning Commission, and Strafford Regional Planning Commission. The partners were contracted by the New Hampshire Coastal Program and the Piscataqua Region Estuaries Partnership to develop the plan because, collectively, these organizations have considerable experience and expertise in conservation planning and strategy development and community engagement. http://www.rpc-nh.org/coastal-conservation.htm

The New Hampshire plan focuses on ecological and conservation values as the priorities for CELCP funding with recreational, historic and aesthetic values playing a supporting role and is recognized by many for conservation purposes.

http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/r-wd-06-43.pdf

The Salmon Falls to Piscataqua River service area has a number of rivers of significance. The following rivers in this service area are NH Designated Rivers:
Exeter River from the headwaters at the Route 102 bridge in Chester to its confluence with Great Brook in Exeter. The designated section of the river was extended in 2010 to include the tidal portion of the river, referred to as the Squamscott River. Municipalities: Chester, Sandown, Danville, Fremont, Raymond, Brentwood, and Exeter. http://des.nh.gov/organization/divisions/water/wmb/rivers/exeter_river.htm
Isinglass River from the outflow of Bow Lake Dam in Strafford to its confluence with the Cocheco River in Rochester. Municipalities: Strafford, Barrington, Rochester.
http://des.nh.gov/organization/divisions/water/wmb/rivers/ising_river.htm

Cocheco River from the headwaters at the outlet of March's Pond in New Durham to the head of tide at Central Avenue dam in Dover. Effective 7/21/09. Municipalities: New Durham, Farmington, Middleton, Rochester, Dover. http://des.nh.gov/organization/commissioner/pip/factsheets/rl/documents/rl-23.pdf

Lamprey River from the Epping/Lee town line to the Durham/Newmarket town line; with the North Branch, North, Little, Pawtuckaway and Piscassic Rivers designated in 2011. Municipalities: Lee, Durham, Newmarket, Newfields, Epping, Fremont, Raymond, Candia, Deerfield, Northwood, Nottingham.
http://des.nh.gov/organization/divisions/water/wmb/rivers/lamp_river.htm

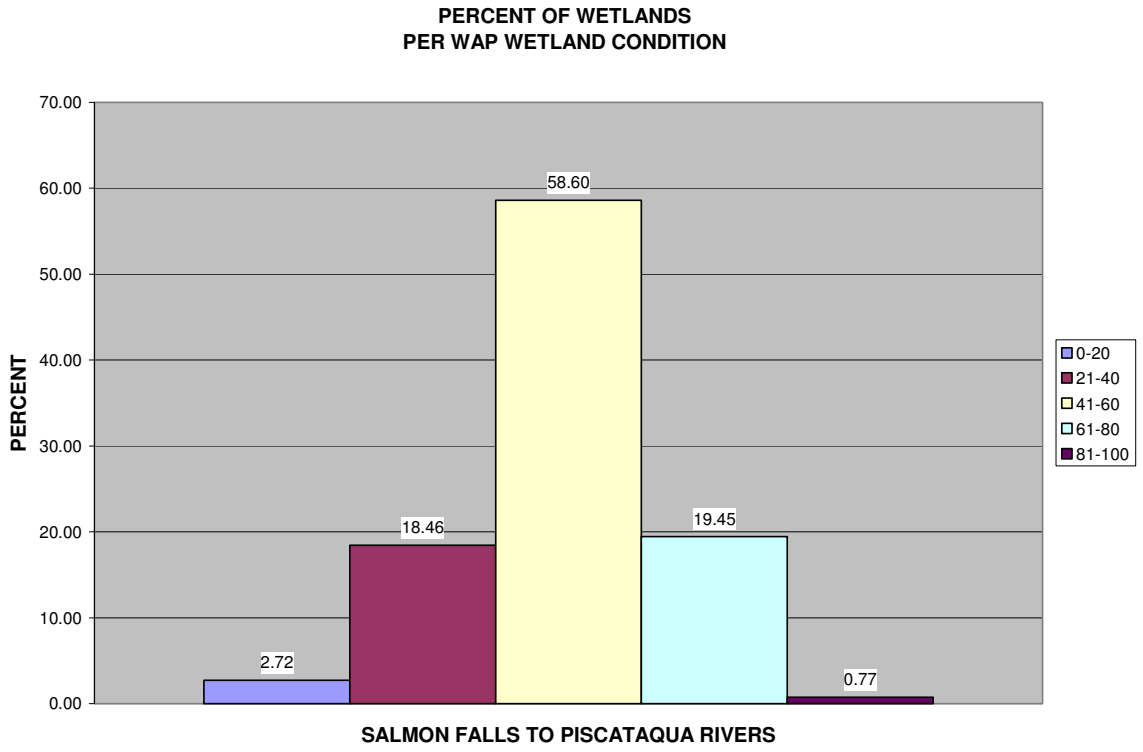
Oyster River from headwaters begin in in Barrington and the river runs east through the towns of Lee, Madbury and Durham where it meets Great Bay.
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/r-wd-10-24.pdf

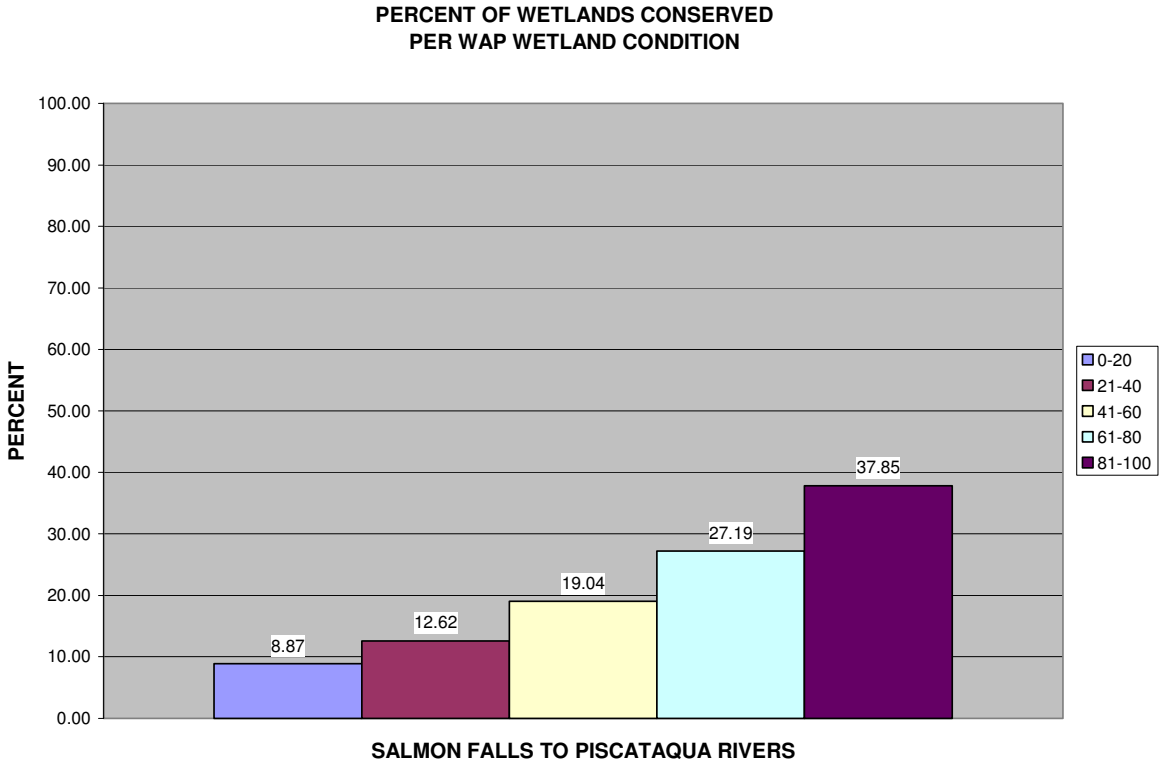
In addition to the DES Designated Rivers program, the National Wild and Scenic Rivers System was created by Congress in 1968 and was created to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. This program is administered by the National Park Service. The Act is notable for safeguarding the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection. One river in the program in the coastal watershed is the Lamprey River from the Bunker Pond Dam in the town of Epping to the confluence with the Piscassic River in the vicinity of the Durham-Newmarket town line. All 23.5 miles of the Lamprey River in the program was classified as such for its recreational value.

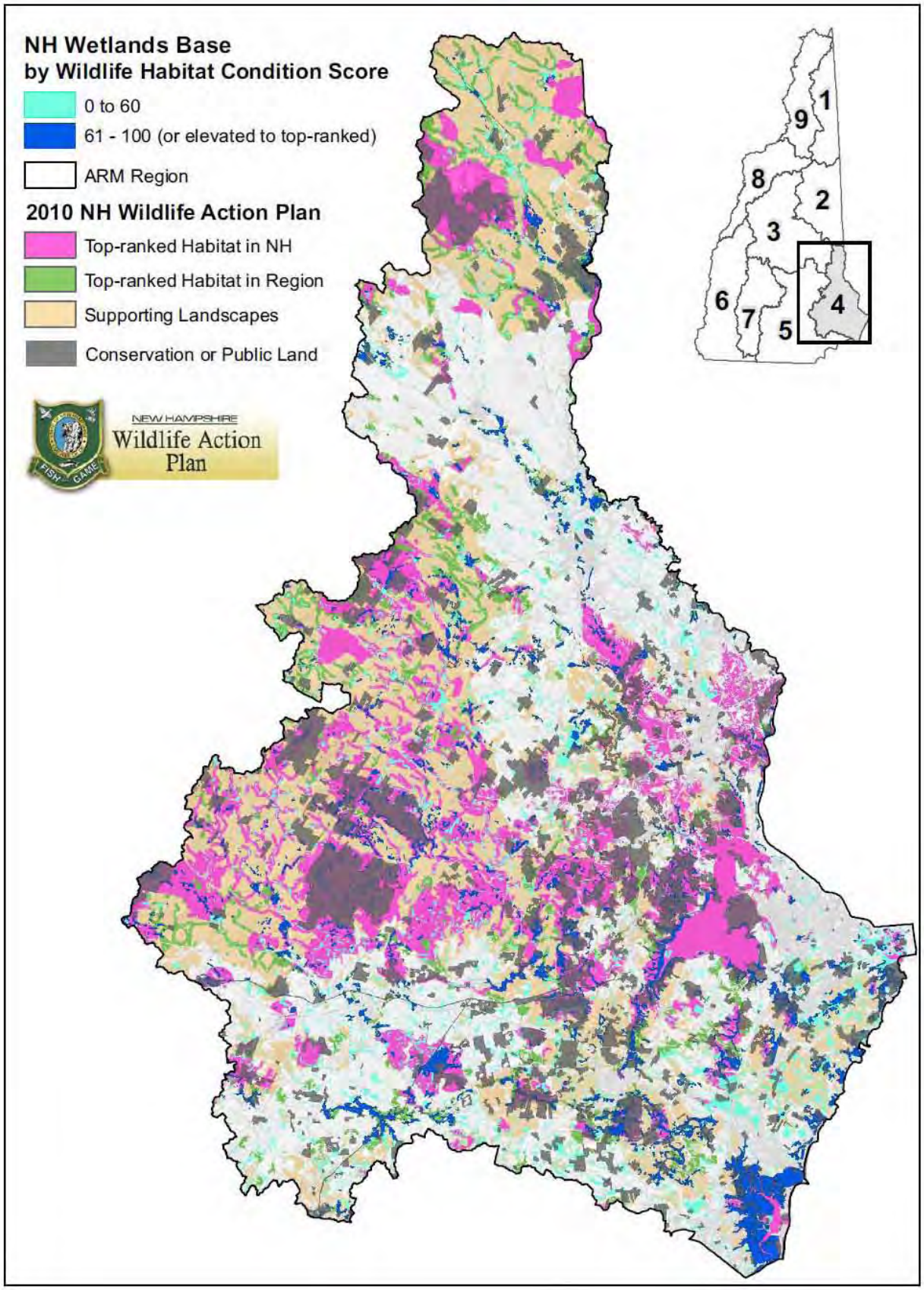
Aquatic Resource Objectives:

- Conserve or restore wetlands that maximize nitrogen pollution removal services.
- Implement best management practices that reduce nitrogen loading to the Great Bay.
- Permanent protection of Conservation Focus Areas identified in The Land Conservation Plan for New Hampshire's Coastal Watersheds, undeveloped lands adjacent to estuaries that will support coastal habitat resilience to climate change and sea level rise, and large buffers along streams and rivers.
- Encourage conservation of WAP Tier 1 and 2 habitats to connect existing protected lands and preserve areas of importance.
- Remove barriers (culverts and dams) to resident/diadromous fish, with an emphasis on current diadromous fish barriers and high quality stream reaches with rare resident fish populations (e.g., American brook lamprey, brook trout).
- Protect upland buffers associated with valuable vernal pools.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Encourage salt marsh restoration.
- Identify and protect coastal areas that may allow for salt marsh migration or other ways to adapt to climate change.
- Wetland protection/restoration that will support wetland-dependent rare species habitat requirements (e.g., saltmarsh sparrows, blanding's turtle, spotted turtles, wood turtles, ringed boghaunter, etc.)

- Restoration of native shellfish in areas closed to harvest.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.






NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
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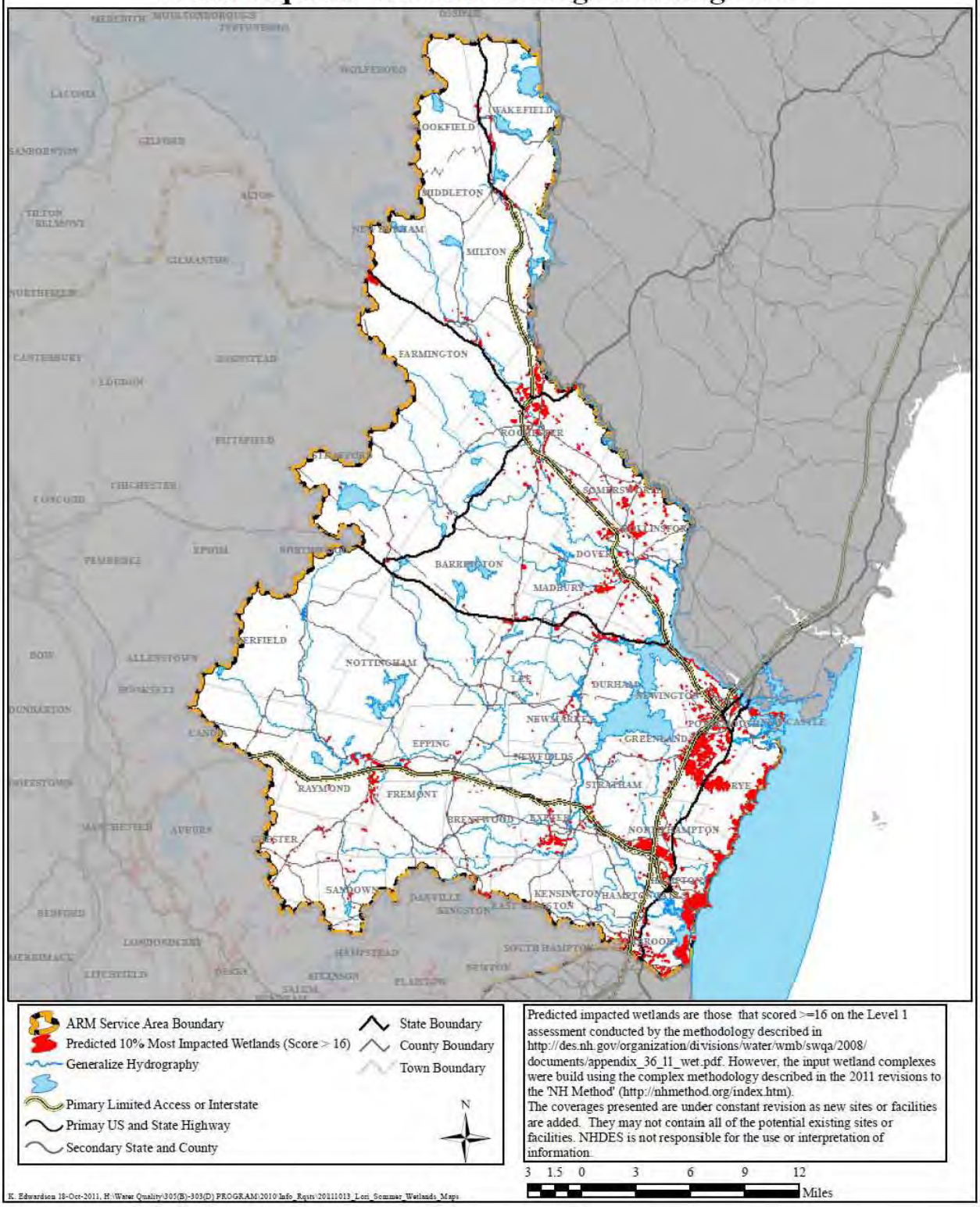
Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #4



MERRIMACK RIVER

The highest amount of population increase with the highest increase in single family housing development is within the Merrimack River service area. This area experienced a 39% increase in population over 2000-2010. Substantial land conversion occurred along and between the state's major transportation corridors, especially Interstate 93. This area was responsible for 37.9% of all single family development in the state and had the highest region with historic loss, 17.2%. The loss due to land conversion for development was twice as high as conversion to agriculture. This is the largest service area in the state with 976,895 acres. It has 21.5% of area remaining as wetlands which is the second highest area in the state. Only 16.7% of the aquatic resources in this region are currently conserved. Wetland protection has been of mid-quality wetlands (41-60) with no protection of high WAP condition areas (81-100).

A large majority of this service area is developed with conservation lands scattered throughout the area with little connectivity. Concentrated areas of fertile soils can be found in pockets in southern New Hampshire, and in the Seacoast region. This densely populated area puts agricultural soils and lands at the highest risk of conversion. Land conservation and water quality improvement projects that offset the impacts to wetlands associated with the widening of the major Interstate 93 between the Massachusetts border in Salem and the I-93/I-293 interchange in Manchester are integral to the future health of aquatic resources in this service area.

Highlighting the WAP Tier 1 areas for communities developing conservation plans should be a focus and connecting these lands a priority. Areas with dense development reveal low quality wetlands that may be restored for improved water quality functions. In addition, municipalities can strengthen requirements in their local zoning and ordinances and require site-specific natural resource inventories and/or wildlife assessments. Development proposals should need to demonstrate how they will conserve important habitat features. The review of development patterns should work to develop town plans for more sustainable growth which includes retaining forest cover, productive farm soils, and incorporates wise management and protection of drinking water resources.

In 2009, NHDES working with its partners at the NH Fish and Game Department, the US Environmental Protection Agency and others, commissioned a study of the Merrimack River Watershed. The study built a GIS model of the watershed to identify wetlands that may be impacted by past land uses and which may benefit from environmental restoration. The resulting map information can be used by concerned citizens and community organizations to identify promising wetland restoration projects The following website contains the results of this study, and it is hoped that the results will be helpful to those concerned about wetlands in the watershed who want to help protect and restore wetlands: http://www.restorenhwetlands.com/

Several rivers and portions of the Merrimack River have been approved as NH Designated Rivers. These include the following:

Lower Merrimack River from the Bedford/Merrimack town line to the New Hampshire/Massachusetts state line. Municipalities: Merrimack, Litchfield, Nashua and Hudson.
http://des.nh.gov/organization/divisions/water/wmb/rivers/merri_river_lower.htm

Upper Merrimack River from the confluence of the Winnipesaukee and Pemigewasset Rivers in Franklin to Garvins Falls in Bow. Municipalities: Franklin, Northfield, Boscawen, Canterbury, Concord, and Bow.
http://des.nh.gov/organization/divisions/water/wmb/rivers/merri_river_upper.htm

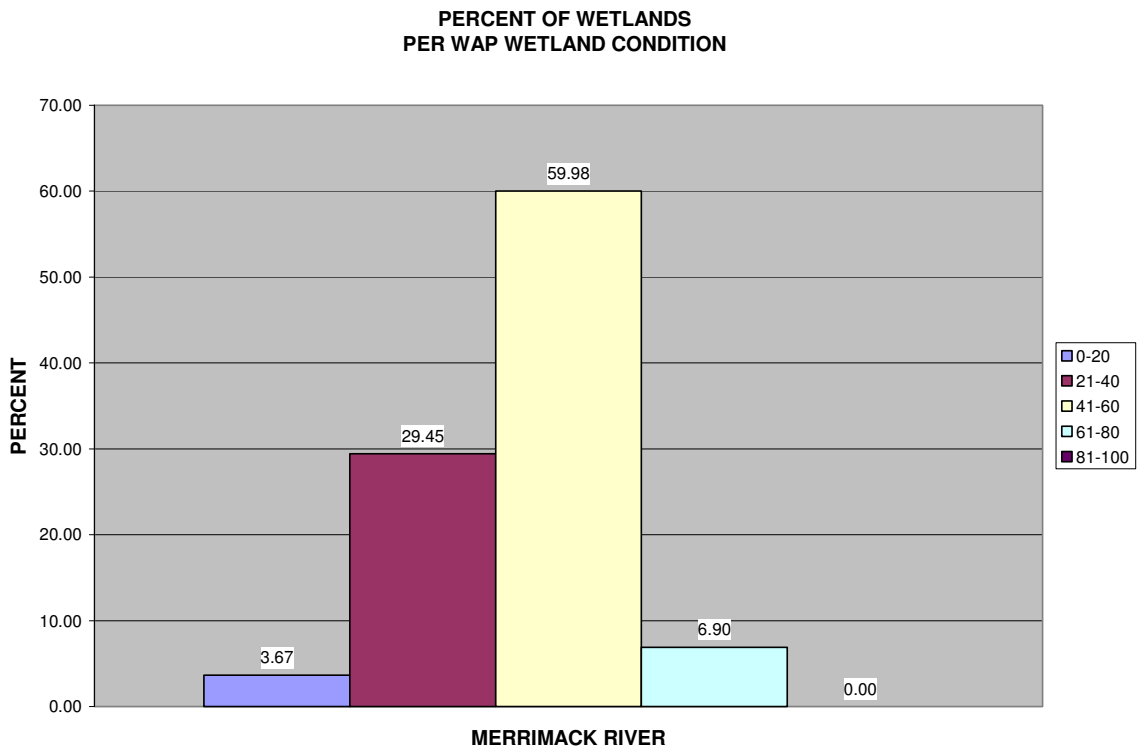
South, Middle and North Branches of Piscataquog River as noted below.
North Branch--From the outlet of Deering Lake Dam in Deering to the confluence with the South Branch in Goffstown (omitting Lake Horace and Everett Flood Control Area). South Branch--From the outlet of Pleasant Pond in Francestown to the river's mouth at Bass Island in Manchester. Middle Branch--From the outlet of Scobie Pond in Francestown to the confluence with the South Branch in New Boston.
Municipalities: Deering, Weare, New Boston, Francestown, Lyndeborough, Goffstown, and Manchester.
http://des.nh.gov/organization/divisions/water/wmb/rivers/piscat_river.htm

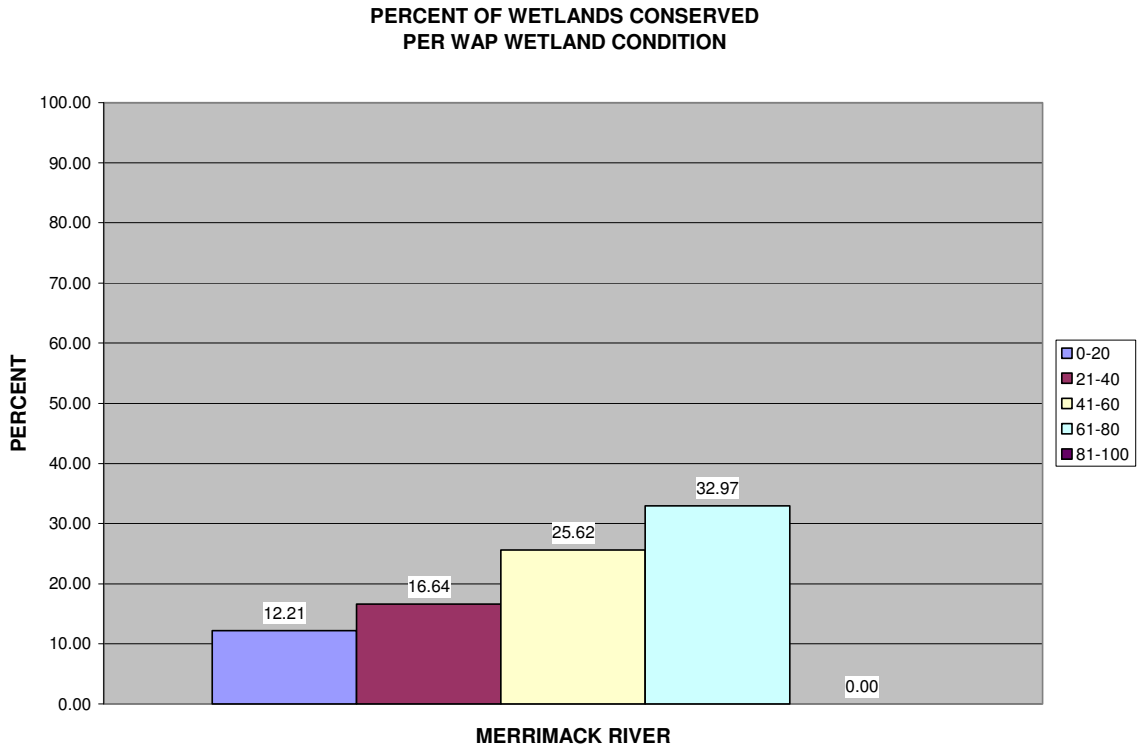
Souhegan River from the confluence of the south and west branches in New Ipswich to the confluence with

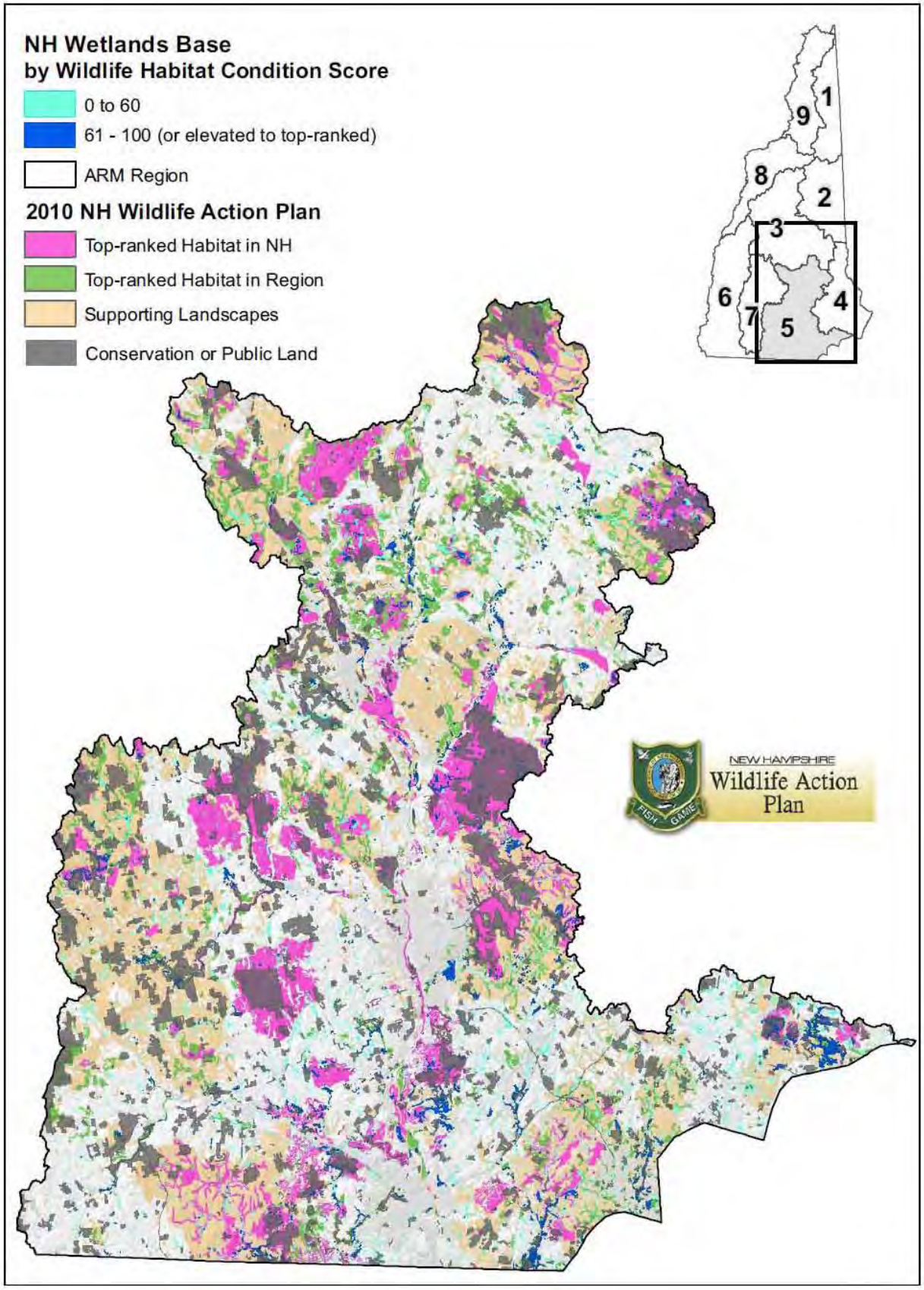
the Merrimack River in Merrimack. Municipalities: New Ipswich, Greenville, Wilton, Milford, Amherst, Merrimack. http://des.nh.gov/organization/divisions/water/wmb/rivers/souh_river.htm

Aquatic Resource Objectives:

- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage preservation projects, particularly in areas of projected development expansion.
- Encourage conservation of WAP Tier 1 and 2 habitats to connect existing protected lands and preserve areas of importance.
- Protect upland buffers associated with valuable vernal pools.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Remove barriers (culverts and dams) in high quality streams and important areas of headwater streams need a strategic approach to protection and management of uses in the surrounding areas.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.




PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
12.21
16.64
25.62
32.97
0.00
MERRIMACK RIVER
0-20
21-40
41-60
61-80
81-100


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
1
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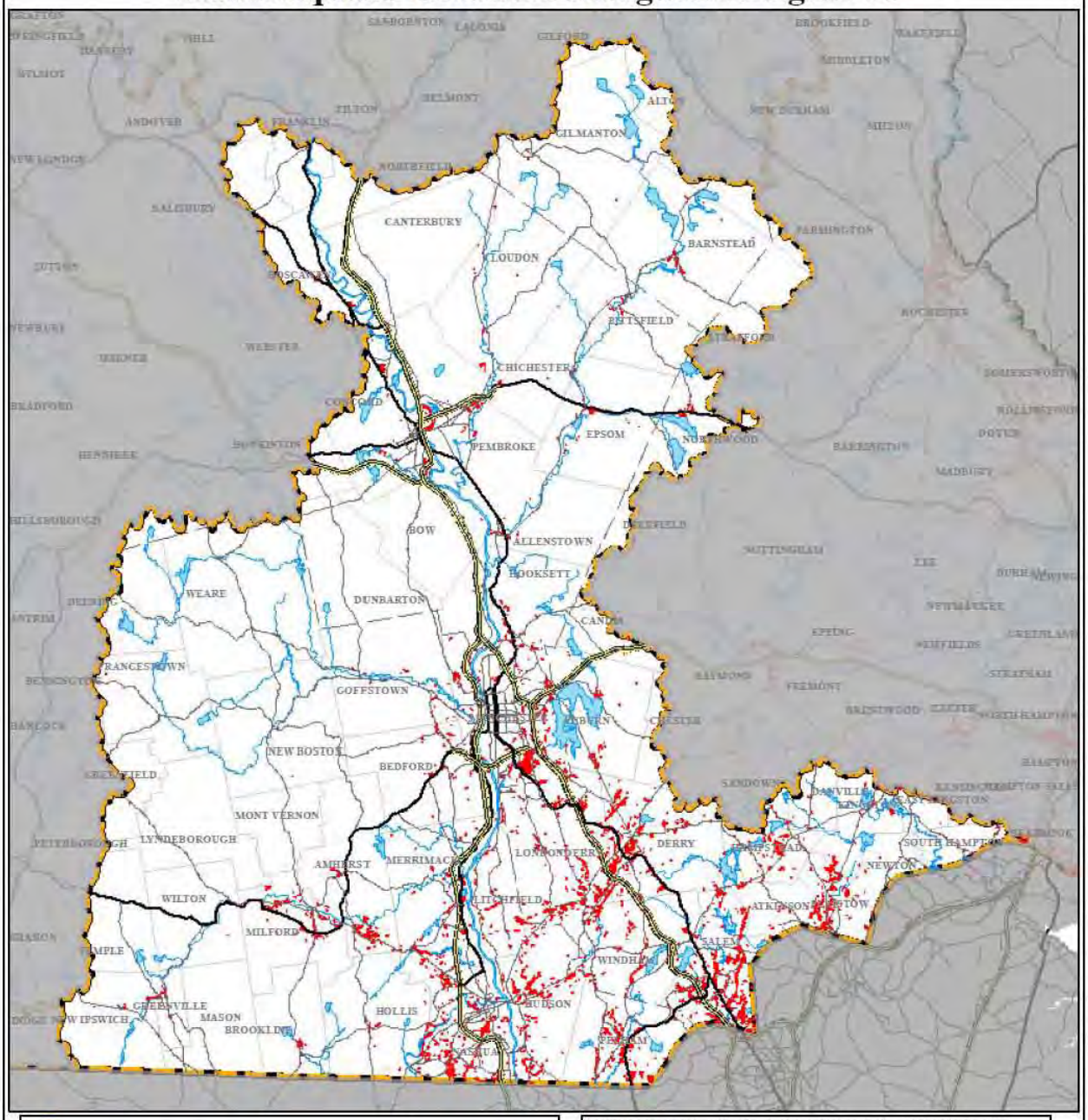
NEW HAMPSHIRE
Wildlife Action
Plan
FISH
GAME

Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #5



Predicted impacted wetlands are those that scored >=16 on the Level 1 assessment conducted by the methodology described in http://des.nh.gov/organization/divisions/water/wmb/swqa/2008/documents/appendix_36_l1_wet.pdf. However, the input wetland complexes were build using the complex methodology described in the 2011 revisions to the 'NH Method' (http://nhmethod.org/index.htm).
The coverages presented are under constant revision as new sites or facilities are added. They may not contain all of the potential existing sites or facilities. NHDES is not responsible for the use or interpretation of information.

K. Edwardson 18-Oct-2011, H:\Water Quality\303(B)-303(D) PROGRAM\2010\Info_Rqsts\20111013_Lori_Sommer_Wetlands_Maps

LOWER CONNECTICUT RIVER

The Lower Connecticut Service area has experienced moderately high population growth and single family housing development. It represented 80% of all single family construction over the 2000-2009 time period. The Lower Connecticut River area is an area with the greatest amount of excellent agricultural soils due to its unique geology. This is true for the three regions along the Connecticut River. The amount of conversion was moderately high and there were similar percentages of conversion from development (5.9%) and agriculture (6.0%). Due to this conversion, there has been a modest amount of historic loss, 11.9%. The majority of remaining wetlands are of mid range quality (41-60).

An effort to protect high WAP wetlands (81-100) is notable but overall land conservation efforts have protected only 15.1% of the aquatic resources that exist in this area which is the second lowest in the state (See Table 10). Resources along the Connecticut River with WAP Tier 1 and top ranked habitats should be a focus in this service area. Towns in the northern section are predicted to experience increased development and this area has limited protection of aquatic resources. Within the municipal boundaries of Keene and surrounding towns, conservation approaches highlighting water quality and wetland improvement along the Ashuelot River could achieve multiple results for this region. In addition, municipalities can strengthen requirements in their local zoning and ordinances and require site-specific natural resource inventories and/or wildlife assessments. Development proposals should need to demonstrate how they will conserve important habitat features. The review of development patterns should work to develop town plans for more sustainable growth which includes retaining forest cover, productive farm soils, and incorporates wise management and protection of drinking water resources.

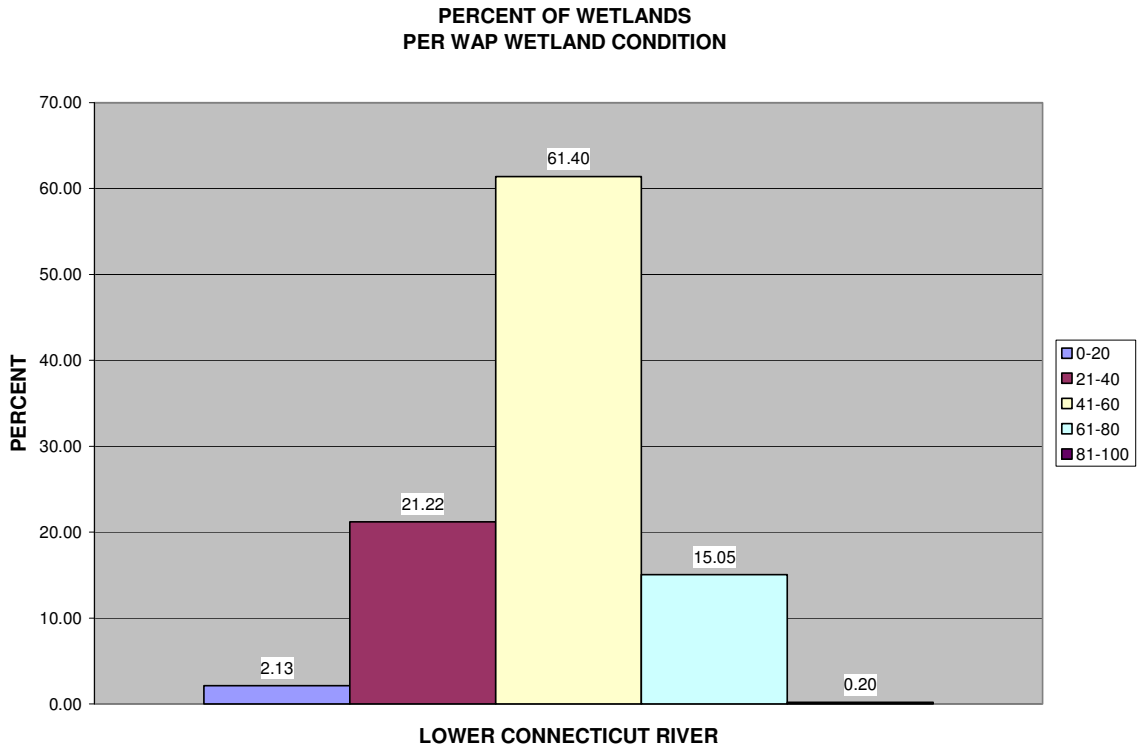
NH Designated Rivers by the DES River Management Program include the following:

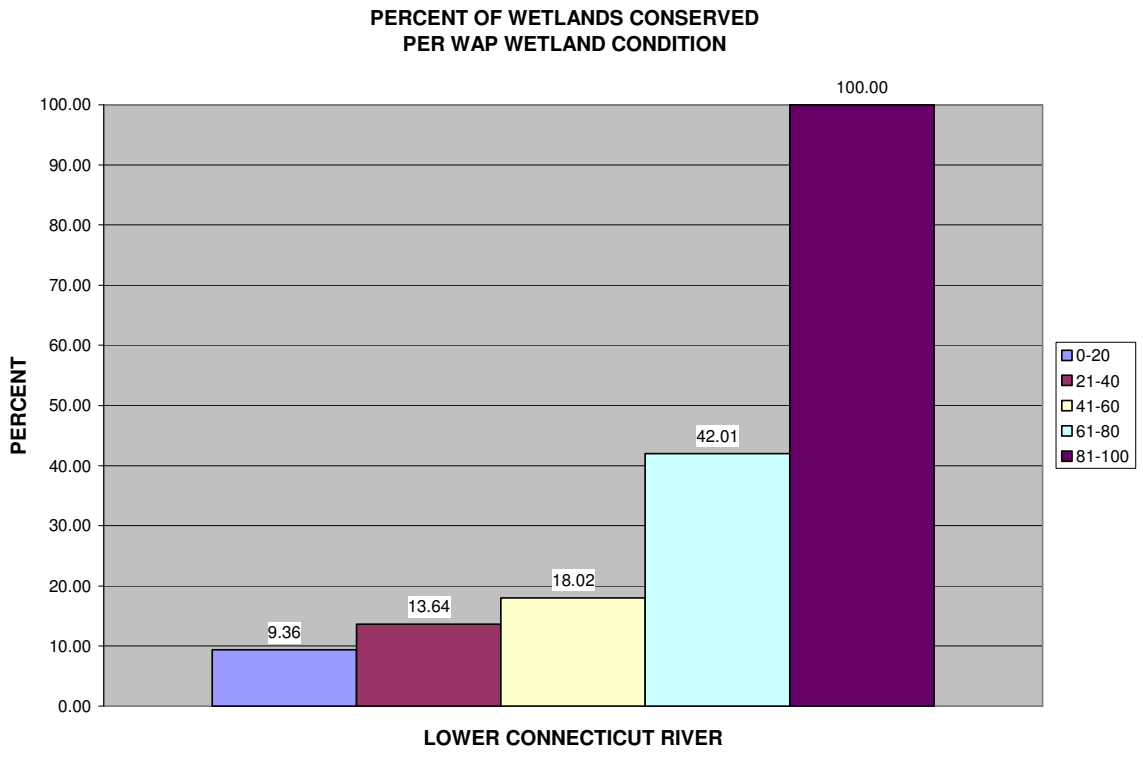
Cold River from the outlet of Crescent Lake Dam in Acworth to its confluence with the Connecticut River in Walpole. Effective 07/20/99. Municipalities: Acworth, Lempster, Langdon, Alstead, and Walpole.
http://des.nh.gov/organization/divisions/water/wmb/rivers/cold_river.htm

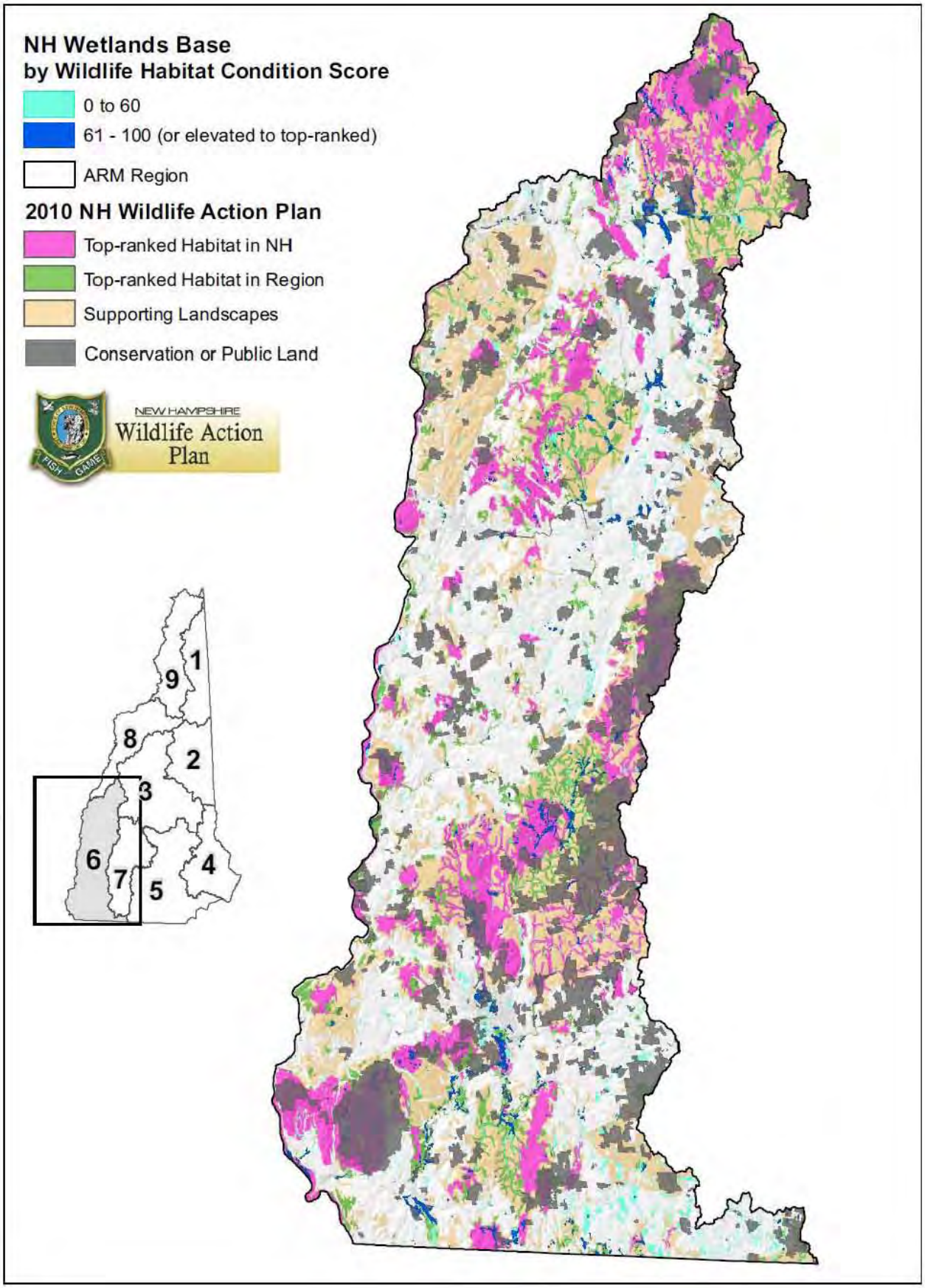
Ashuelot River f rom the dam at Butterfield Pond in Washington to the confluence with the Connecticut River in Hinsdale. Effective 6/7/93. Municipalities: Washington, Lempster, Marlow, Gilsum, Sullivan, Surry, Keene, Swanzey, Winchester, and Hinsdale.
http://des.nh.gov/organization/divisions/water/wmb/rivers/ash_river.htm

Aquatic Resource Objectives:

- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage preservation projects, particularly in areas of projected development expansion.
- Encourage conservation of WAP Tier 1and 2 habitats to connect existing protected lands and preserve areas of importance.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Protect ecologically important floodplain forests in the Connecticut River Watershed. Major floodplain forest types across river size, gradient, and ecological sub-sections north to south should be protected and attempts to develop management plans would be important.
- High quality streams and important areas of headwater streams need a strategic approach to protection and management of uses in the surrounding areas.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.


PERCENT OF WETLANDS
PER WAP WETLAND CONDITION
PERCENT
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2.13
21.22
61.40
15.05
0.20
LOWER CONNECTICUT RIVER
0-20
21-40
41-60
61-80
81-100


PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
9.36
13.64
18.02
42.01
100.00
LOWER CONNECTICUT RIVER
0-20
21-40
41-60
61-80
81-100


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
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Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #6

CONTOOCOOK RIVER

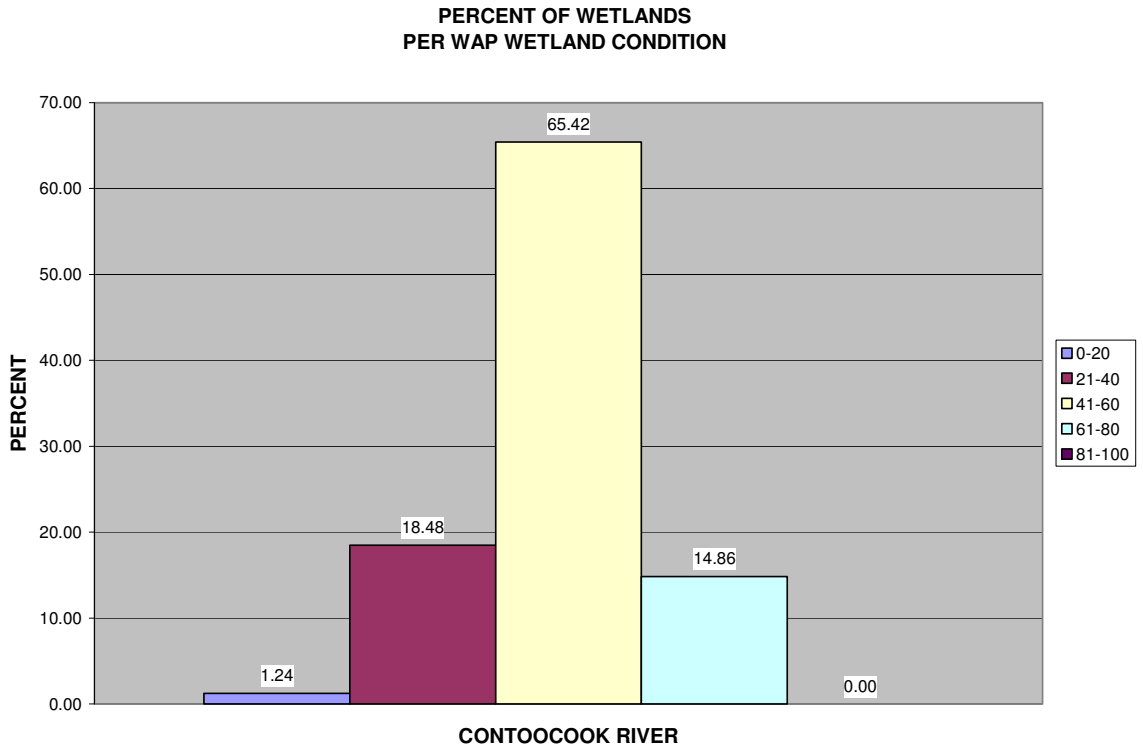
The Contoocook River is located along an expanding transportation corridor, Interstate 89. It is the second smallest region in land coverage with 489,023 acres. The area experienced mid-range population increases and single family housing development accounted for 7.2% of all single family construction in the state. Historic loss reported an 8.6% decrease which is fairly low. There is a relatively high amount of wetlands existing with mid-range WAP quality (41-60). Conservation efforts have been targeting middle level quality wetlands with no high WAP wetland condition (81-100) protected. Overall there is 26% of current ARBL in conservation/public lands.

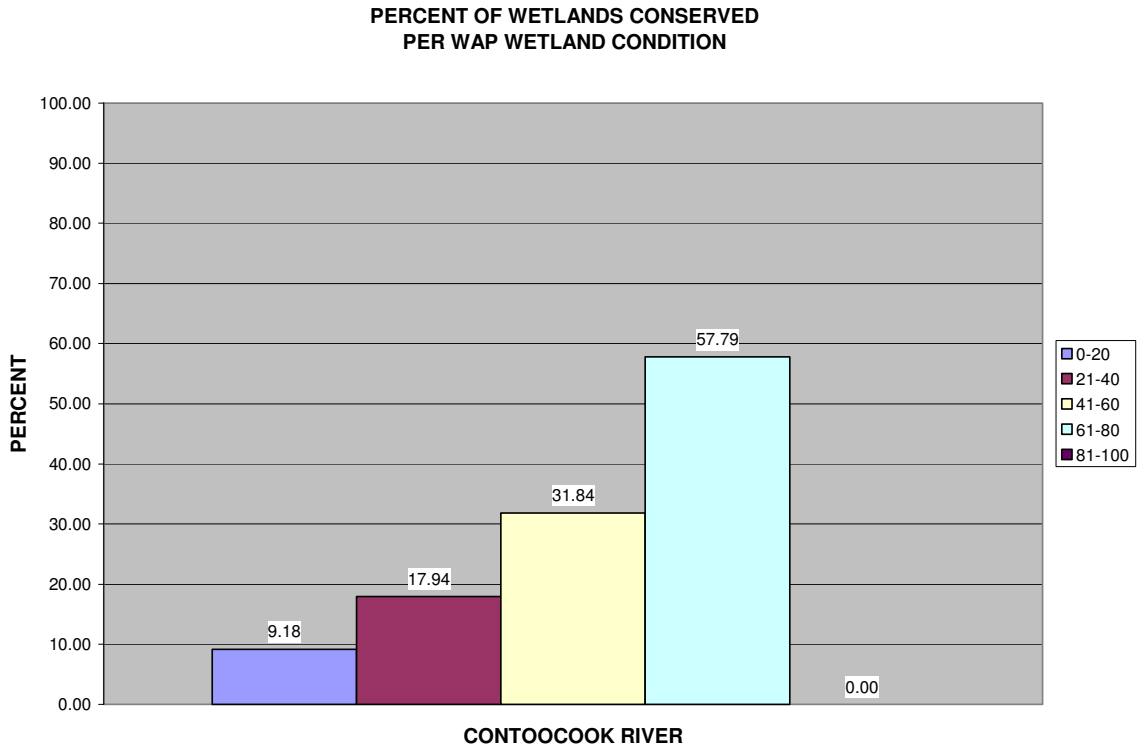
Protection of WAP Tier 1 habitats should be a focus to ensure high quality resources are maintained in this service area. Areas near the central western boundary of this region are of particular interest due to the amount of high quality habitats with high wetland condition. In addition, municipalities can strengthen requirements in their local zoning and ordinances and require site-specific natural resource inventories and/or wildlife assessments. Development proposals should need to demonstrate how they will conserve important habitat features. The review of development patterns should work to develop town plans for more sustainable growth which includes retaining forest cover, productive farm soils, and incorporates wise management and protection of drinking water resources.

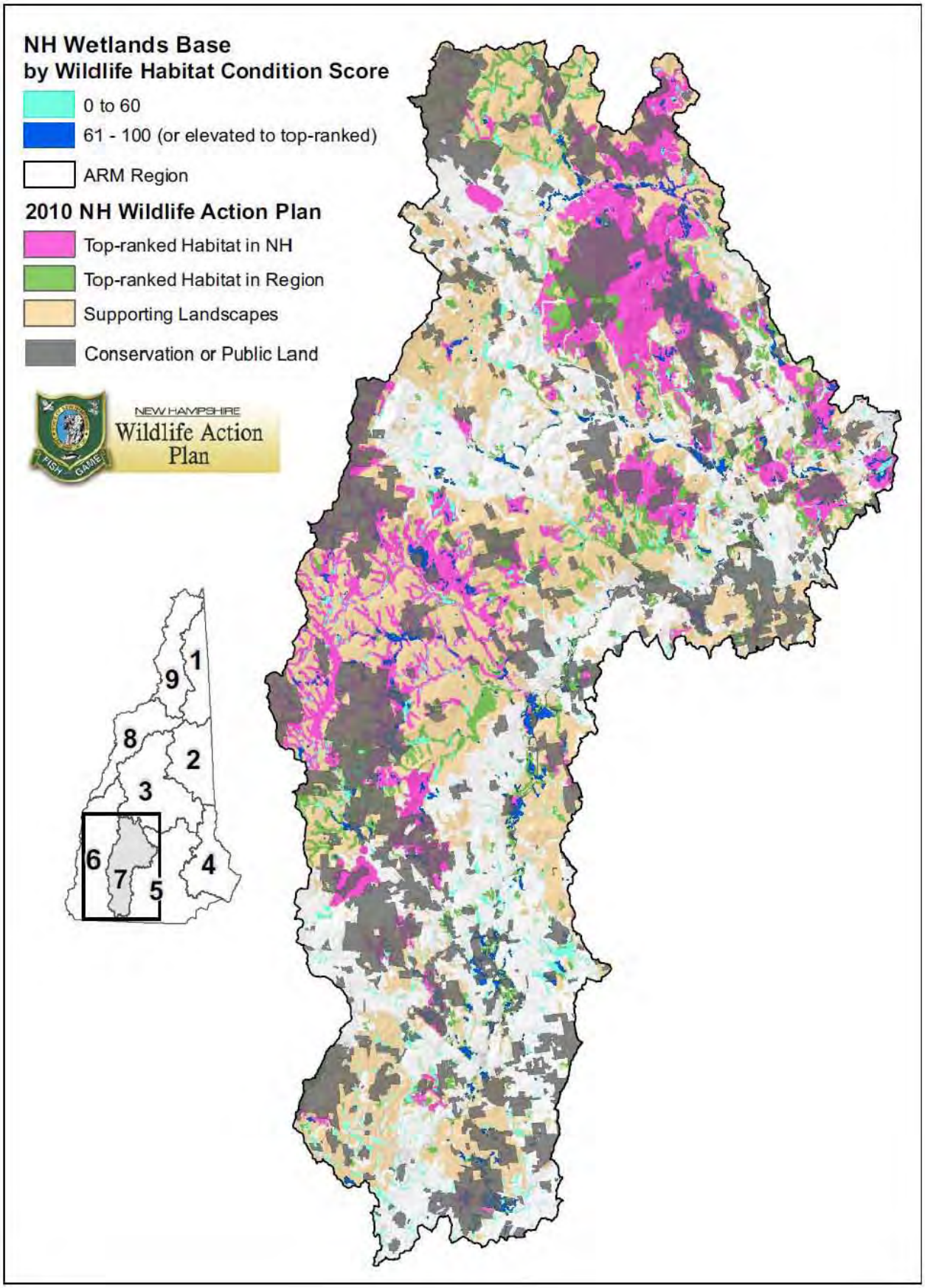
The Mainstem and North Branch of the Contoocook River are NH Designated Rivers from the outlet of Poole Pond in Rindge to the confluence with the Merrimack River at the Boscawen/Concord municipal boundary: North Branch - From the outlet of Rye Pond in Stoddard to the confluence of the Contoocook River in Hillsborough (effective 6/28/91). Municipalities: Rindge, Jaffrey, Peterborough, Hancock, Greenfield, Bennington, Stoddard, Antrim, Deering, Hillsborough, Henniker, Hopkinton, Concord, and Boscawen.
http://des.nh.gov/organization/divisions/water/wmb/rivers/cont_river.htm

Aquatic Resource Objectives:

- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage preservation projects, particularly in areas of projected development expansion.
- Encourage conservation of WAP Tier 1 and 2 habitats to connect existing protected lands and preserve areas of importance.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Remove barriers (culverts and dams) in high quality streams. Important areas of headwater streams need a strategic approach to protection and management of uses in the surrounding areas.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.


PERCENT OF WETLANDS
PER WAP WETLAND CONDITION
PERCENT
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
65.42
18.48
14.86
1.24
0.00
CONTOOCOOK RIVER
0-20
21-40
41-60
61-80
81-100


PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
57.79
31.84
17.94
9.18
0.00
CONTOOCOOK RIVER
0-20
21-40
41-60
61-80
81-100


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
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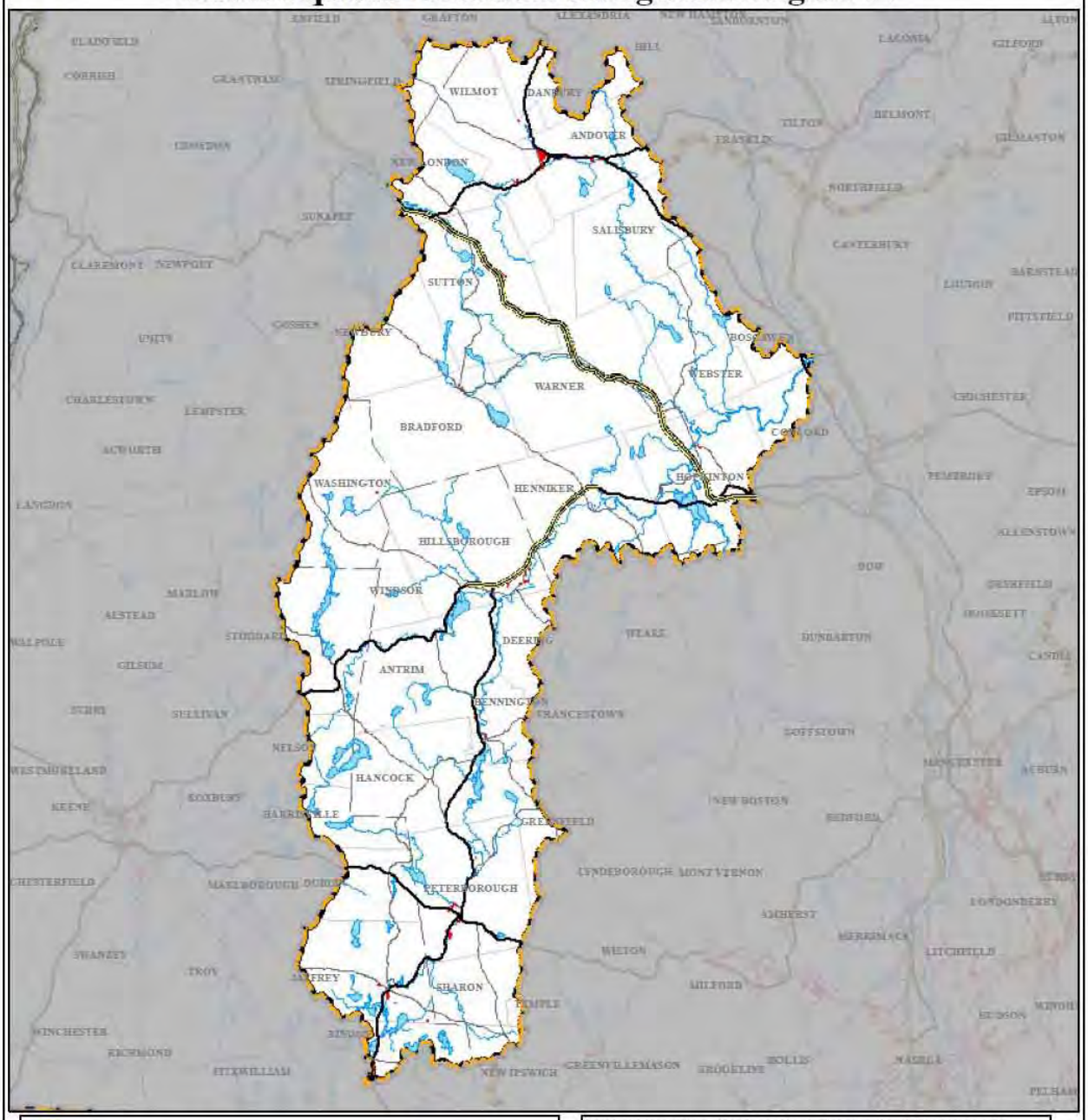
Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #7



MIDDLE CONNECTICUT RIVER

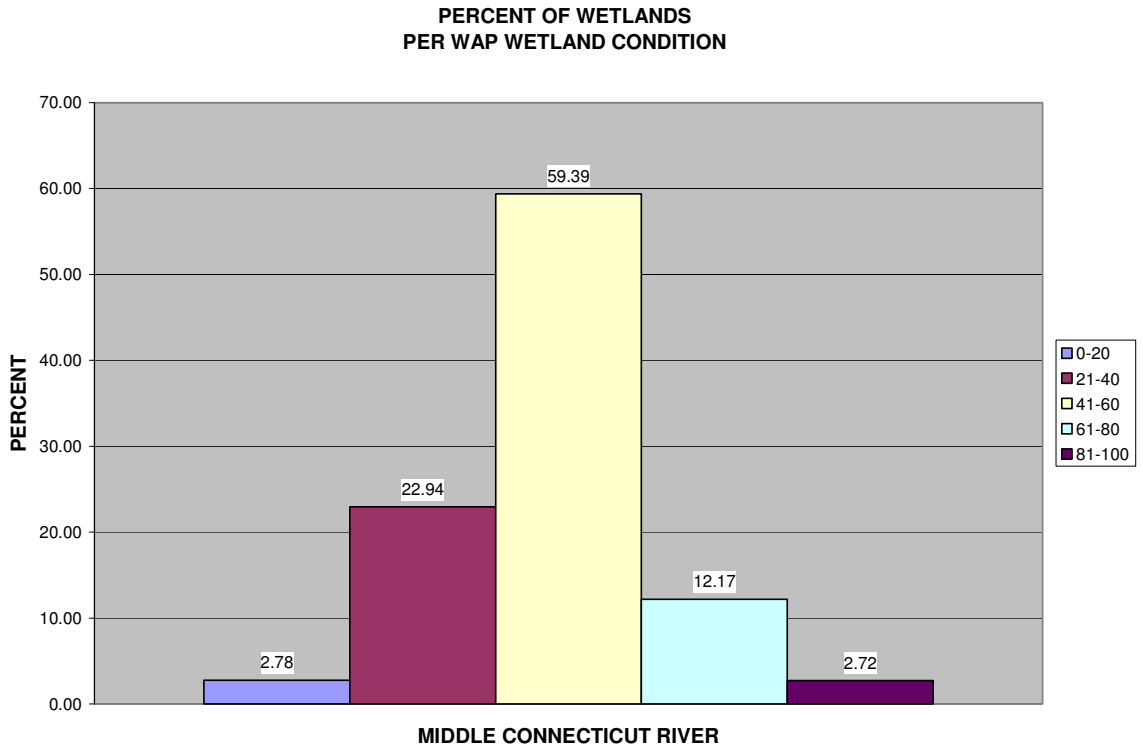
The Middle Connecticut River region has seen moderately low population and development increases. It is the region with the least amount of land in ARBL (14.4%) and the highest amount of ARBL loss to agricultural conversion, 8.9%. It consists of the lowest amount of wetlands for a region due to the high amount of historic loss, 13.6%. There is 23.5% of ARBL in conservation which is attributed to the WMNF. The focus of land conservation has been of high-WAP condition wetlands (61-100) with 87% conserved of 81-100 condition and 61.27% conserved of 61-80 WAP wetland condition.

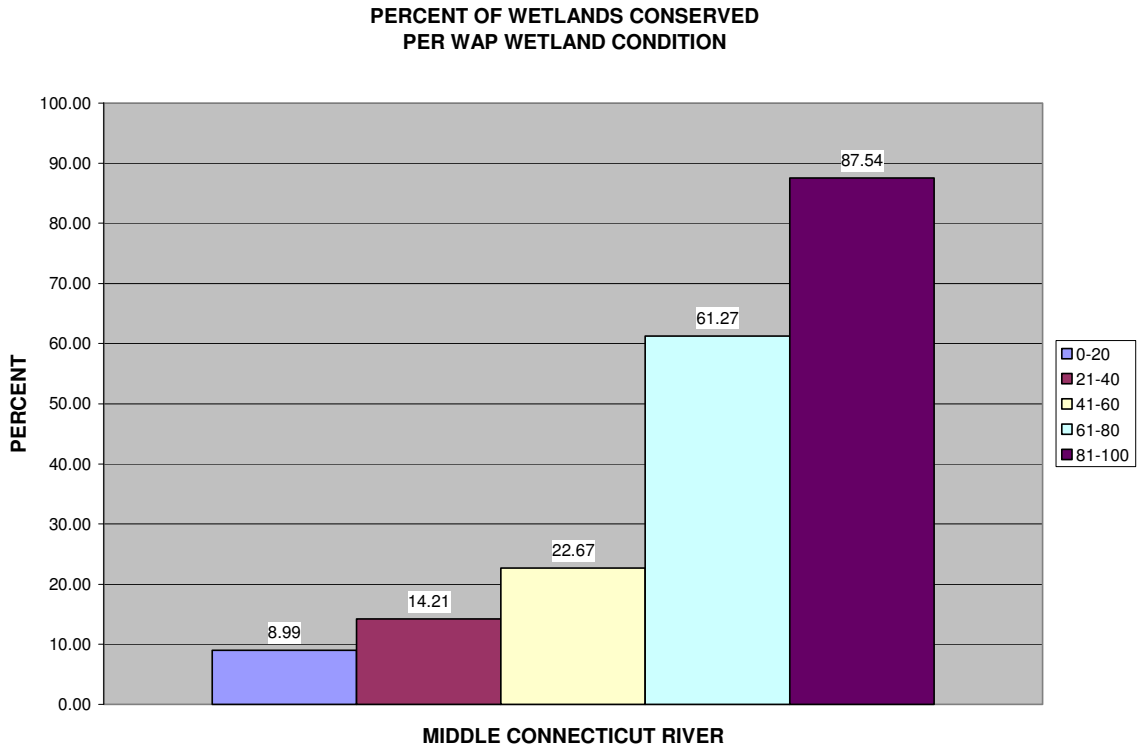
The Middle Connecticut River area is unique as it has protected lands along the border with the Pemigewasset River to Winnipesaukee River area, and some along the boundary of the Connecticut River. Due to the high agricultural conversion in this area, priority projects should focus on the protection of productive soils, riparian habitats and floodplain areas. In addition, municipalities can strengthen requirements in their local zoning and ordinances and require site-specific natural resource inventories and/or wildlife assessments. Development proposals should need to demonstrate how they will conserve important habitat features. The review of development patterns should work to develop town plans for more sustainable growth which includes retaining forest cover, productive farm soils, and incorporates wise management and protection of drinking water resources.

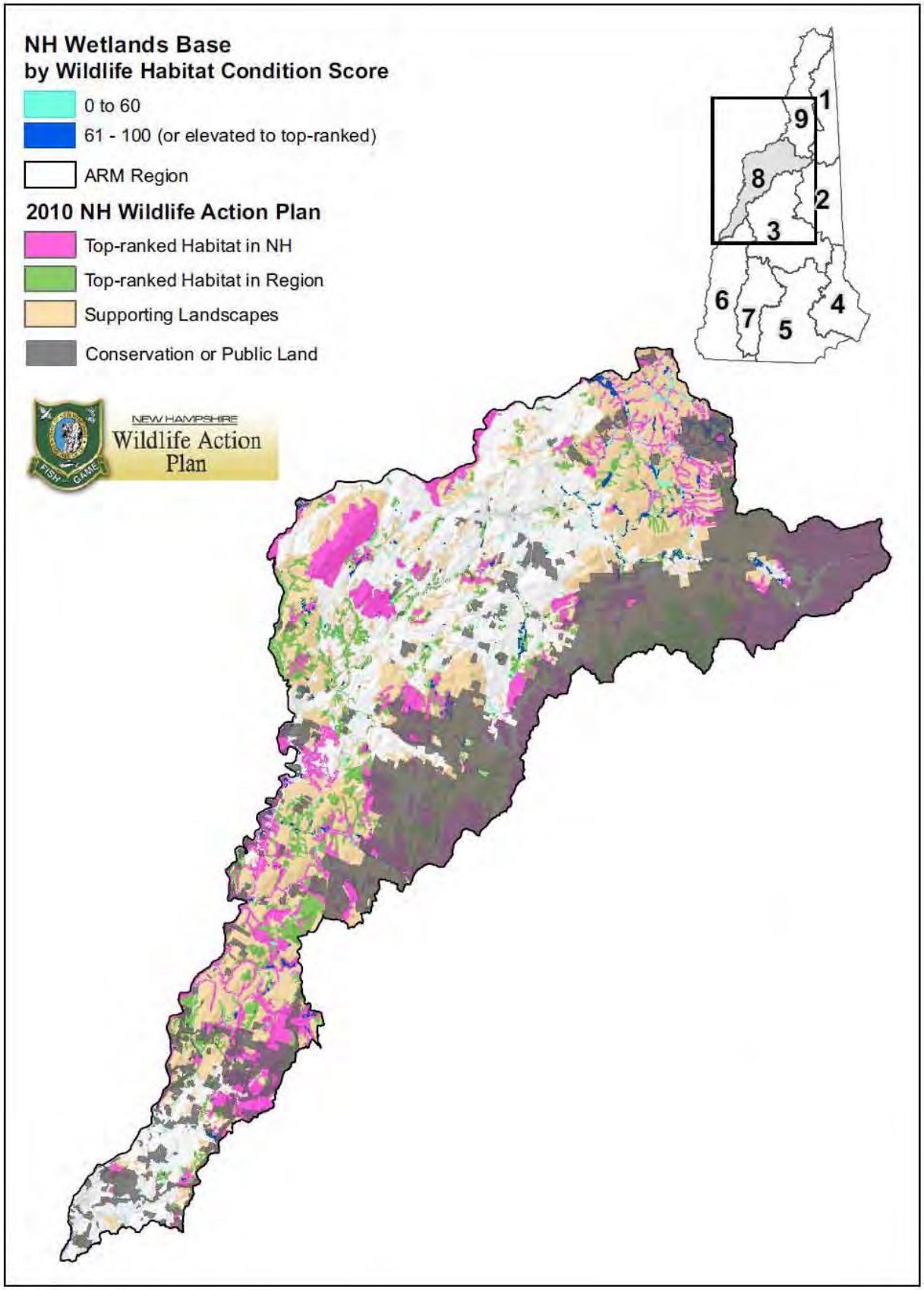
The Ammonoosuc River from the White Mountain National Forest boundary near Lower Falls in Carroll to the confluence with the Connecticut River in Haverhill is a NH Designated River. Municipalities: Carroll, Bethlehem, Littleton, Lisbon, Landaff, Bath, and Haverhill.
http://des.nh.gov/organization/commissioner/pip/factsheets/rl/documents/rl-20.pdf

Aquatic Resource Objectives:

- Encourage restoration of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage preservation projects, particularly in areas of projected development expansion.
- Encourage conservation of WAP Tier 1and 2 habitats to connect existing protected lands and preserve areas of importance.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Protect ecologically important floodplain forests in the Connecticut River Watershed. Major floodplain forest types across river size, gradient, and ecological sub-sections north to south should be protected and attempts to develop management plans would be important.
- High quality streams and important areas of headwater streams need a strategic approach to protection and management of uses in the surrounding areas.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.


PERCENT OF WETLANDS
PER WAP WETLAND CONDITION
PERCENT
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2.78
22.94
59.39
12.17
2.72
MIDDLE CONNECTICUT RIVER
0-20
21-40
41-60
61-80
81-100


PERCENT OF WETLANDS CONSERVED
PER WAP WETLAND CONDITION
PERCENT
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
8.99
14.21
22.67
61.27
87.54
MIDDLE CONNECTICUT RIVER
0-20
21-40
41-60
61-80
81-100


NH Wetlands Base
by Wildlife Habitat Condition Score
0 to 60
61 - 100 (or elevated to top-ranked)
ARM Region
2010 NH Wildlife Action Plan
Top-ranked Habitat in NH
Top-ranked Habitat in Region
Supporting Landscapes
Conservation or Public Land
NEW HAMPSHIRE
Wildlife Action
Plan
1
2
3
4
5
6
7
8
9

Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #8

UPPER CONNECTICUT RIVER

The Upper Connecticut River region has the lowest population according to 2010 census information. It is second to the Androscoggin River region with the lowest increase in population and single family housing growth. The region consists of 583,305 acres with only 14.7% currently in aquatic condition. The historic loss experienced is 9.1% with agricultural conversion high (6.5%) mainly due to the productive soils in this region along the Connecticut River. The percent of ARBL developed is the lowest in this service area with only 2.6% lost. The WMNF and the Nash Stream Forest envelop portions of this region which contributes to the low development. The amount of aquatic resources is relatively low for the region however, 36.4% of these resources are conserved, the highest amount of protected land for all regions in the state. The condition of most the aquatic resources is of medium quality (41-60) but the region has a high percentage of the WAP wetland condition resources (81-100) in conservation or public lands.

The WMNF contributes greatly to the majority of protected land in this service area. In the southwest region there exists the opportunity to focus conservation efforts within the higher WAP quality wetlands.

Three service areas comprise portions of the Connecticut River and are identified as the Upper, Middle and Lower Connecticut River. The Nature Conservancy, Connecticut River Program, developed a project report that highlights locations along the Connecticut River and its tributaries that have current and potential habitat for floodplain forest ecosystems. The report, Ecologically Important Floodplain Forests in the Connecticut River Watershed, describes major floodplain forest types across river size, gradient, and ecological sub-sections north to south. The paper can be found at: http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/connecticut/connecticutriver/ct-river-floodplain-forests-paper.pdf

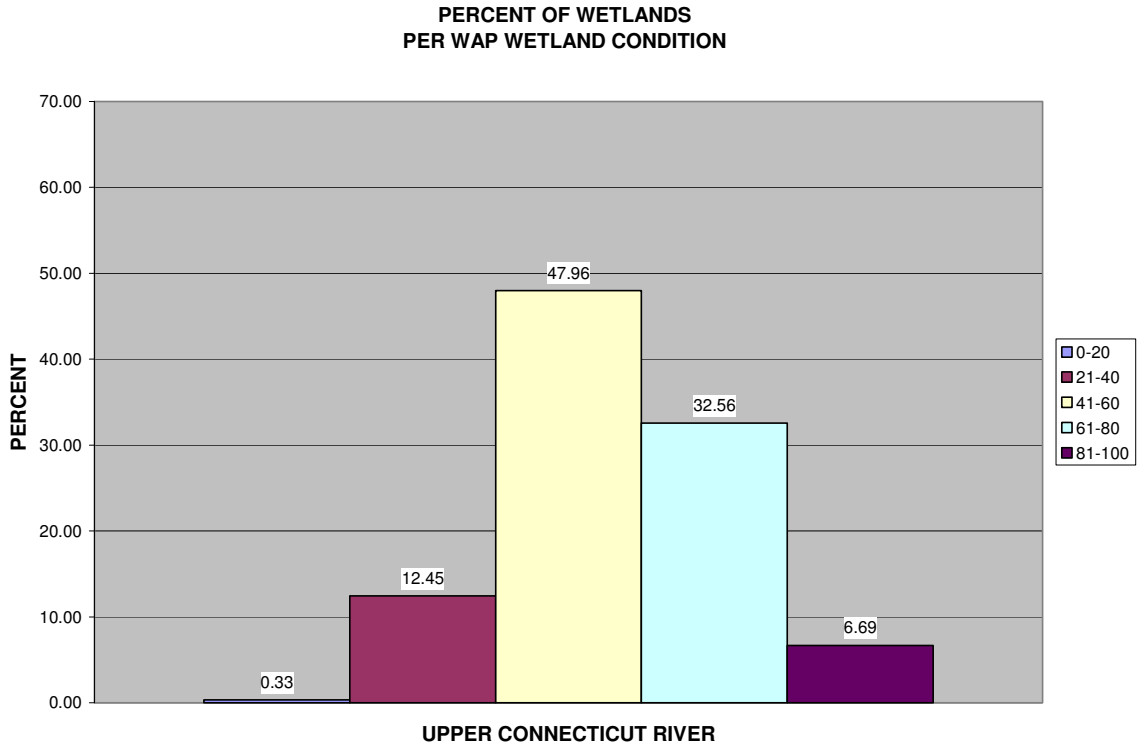
A thorough and systematic study of wetland restoration opportunities in the Upper Connecticut River region was performed through a US EPA grant in 2010. NHDES working with its partners at the NH Fish and Game Department, the US Environmental Protection Agency and others, commissioned a study that built a GIS model of the watershed to identify wetlands that may be impacted by past land uses and which may benefit from environmental restoration. The resulting map information can be used by concerned citizens and community organizations to identify promising wetland restoration projects. The full report and information on the study can be requested through the NHDES program (http://des.nh.gov).

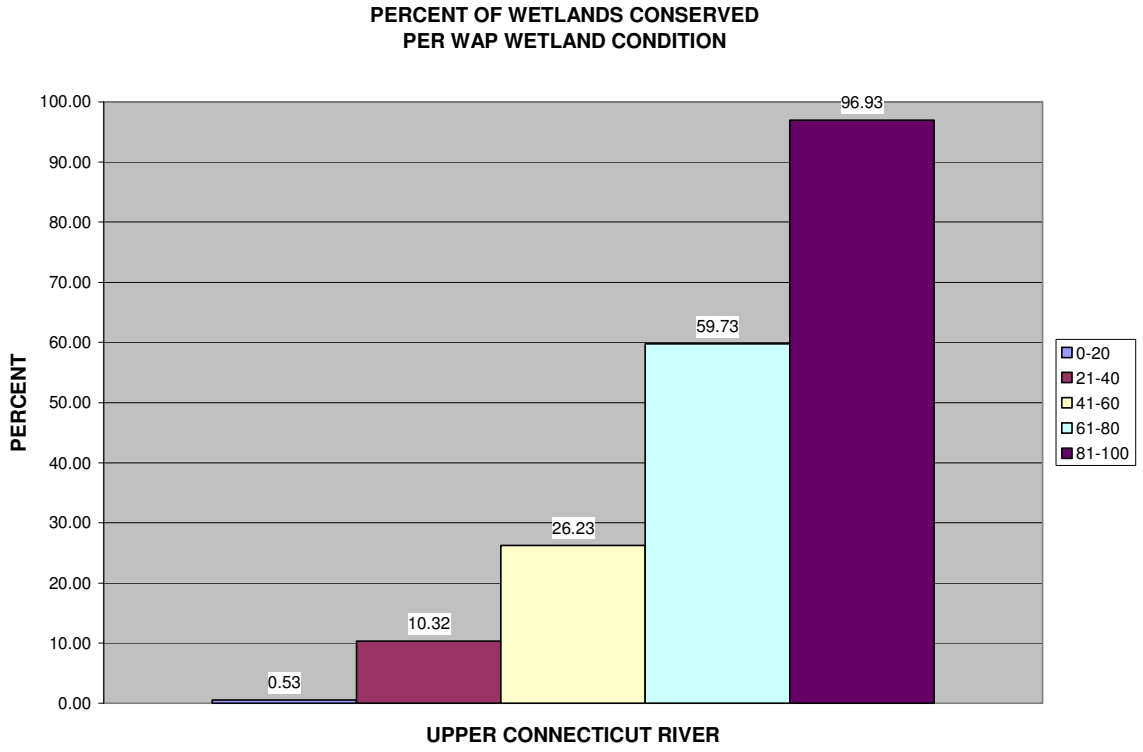
The portions of the Connecticut River that are NH Designated Rivers are from the outlet of Fourth Connecticut Lake to the New Hampshire/Massachusetts state line. Municipalities include: Pittsburg, Clarksville, Stewartstown, Colebrook, Columbia, Stratford, Northumberland, Lancaster, Dalton, Littleton, Monroe, Bath, Haverhill, Piermont, Orford, Lyme, Hanover, Lebanon, Plainfield, Cornish, Claremont, Charlestown, Walpole, Westmoreland, Chesterfield, and Hinsdale. More details can be found at: http://des.nh.gov/organization/divisions/water/wmb/rivers/conn_river.htm

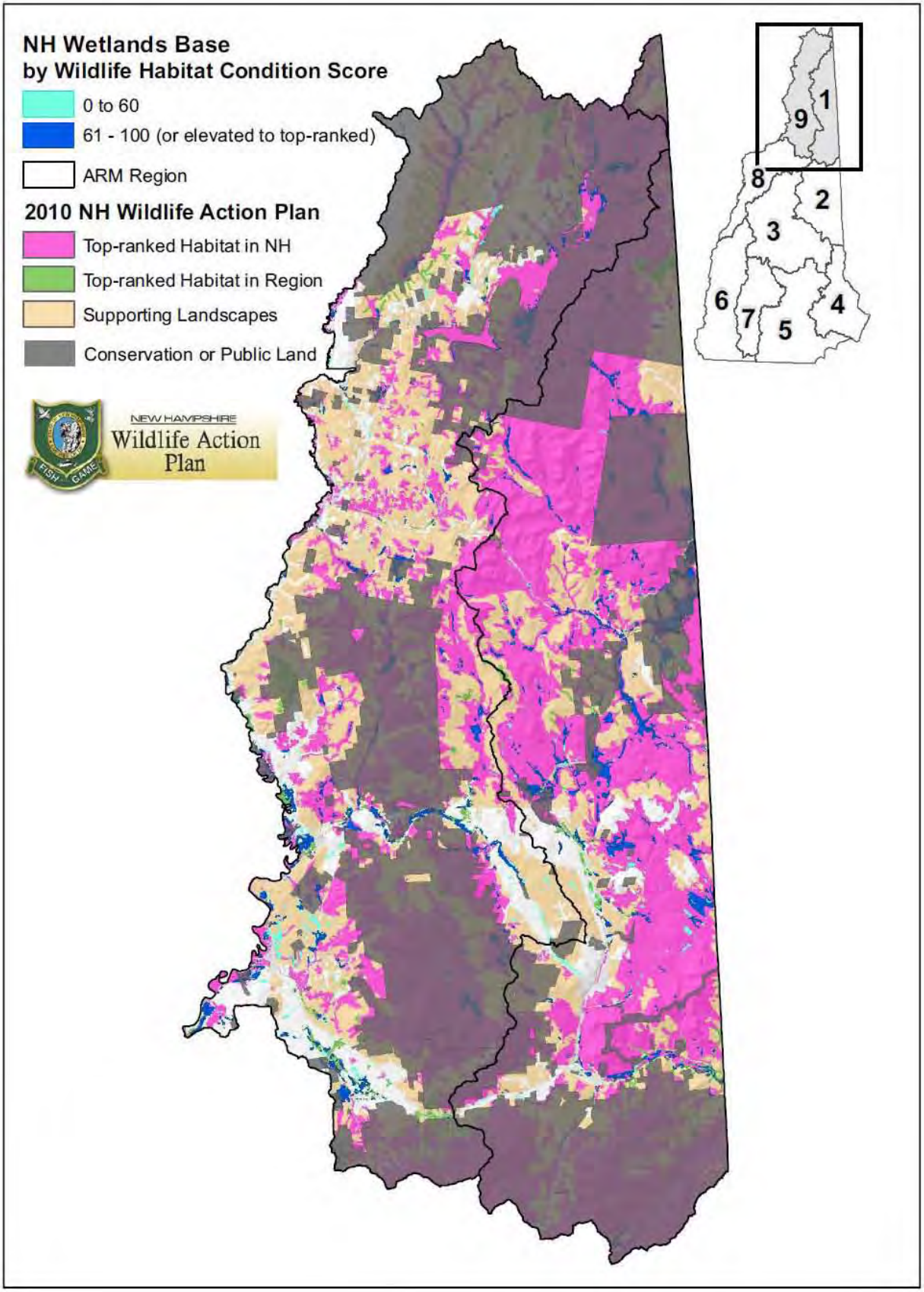
Aquatic Resource Objectives:

- Encourage review of lower habitat quality wetlands and streams that are adjacent to high quality wetlands for potential restoration opportunities and provide long-term preservation of the restored areas.
- Encourage conservation of WAP Tier 1 and 2 habitats to connect existing protected lands and preserve areas of importance.
- Review restoration or enhancement opportunities near high quality wetland habitats to improve aquatic resource functions and values.
- Ecologically important floodplain forests in the Connecticut River Watershed, describes major floodplain forest types across river size, gradient, and ecological sub-sections north to south. Attempts to develop management plans from this information would be important.
- Prevent establishment of new invasive and exotic species populations to maintain healthy populations of native flora and fauna.
- The majority of land along the Connecticut River is somewhat lacking protected lands which could potentially provide restoration or enhancement opportunities.
- Based on the wetland quality standards, significant areas of poor quality are in the area near Lancaster

north to Northumberland. The properties bordering the river are likely agricultural areas that would not need to abandon farming practices but there could possibly be improvement of the wildlife habitat function by improving the riparian buffer through plantings or floodplain restoration.



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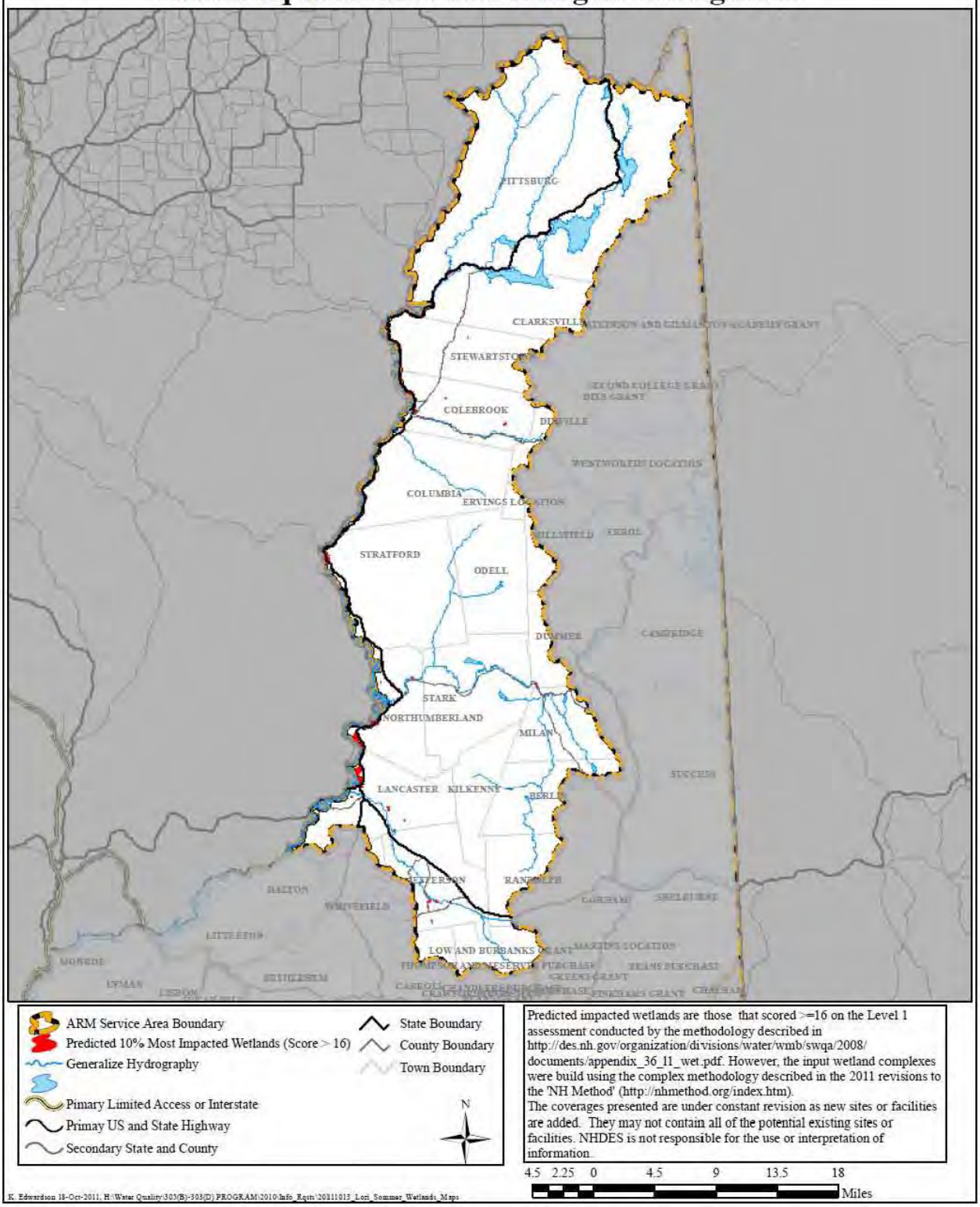
Predicted 10% Most Impacted Scoring Wetlands for the State within Aquatic Resource Mitigation Region #9