Fraggle Rock Environmental
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February 29, 2024

BCM Environmental and Land Law, PLLC
3 Maple Street
Concord, New Hampshire 03301
Attn: Amy Manzelli, Esq.

RE: Environmental/Ecological Comments
NHDES Standard Dredge and Fill Wetlands Permit Application – December 2023
NHDES File #: 2023-03259
Granite State Landfill, Dalton and Bethlehem, New Hampshire

Dear Attorney Manzelli,

The proposed Granite State Landfill (GSL) on Douglas Drive, off of NH Route 116 in Dalton, New Hampshire is of significant environmental concern and should not be approved by the State of New Hampshire. Fraggle Rock Environmental reviewed the Standard Wetland Permit Application (NHDES File #: 2023-03259) by Granite State Landfill submitted to the New Hampshire Department of Environmental Services (NHDES) received by December 14, 2023 with focus on ecological and environmental aspects of the project. Our review was based on information available to us and does not include the most recent supplement information submitted to NHDES by GSL. Due to the vast nature of the project and proposed impacts we foresee providing additional comments and concerns as we undertake further analysis, including of the additional information provided to make the application complete, and as the applicant may provide further additional information. The following were found to be of significant concern based on our review up to this point.

Contamination of Drinking Water:
The GSL poses significant risks to public drinking water supply as surface waters and shallow groundwater from the proposed site drains to the Ammonoosuc River which provides drinking water to thousands[1], and drains to the Connecticut River which provides drinking water to millions.[3]

The project proposes wetland impacts within 700 ft of the Ammonoosuc River. As described in the Ammonoosuc River Corridor Management Plan, June 2013, “several community water systems depend

upon the Ammonoosuc for water supply, either through direct withdrawal from the river or from nearby wells."[1] The plan continues to explain that "Woodsville Water & Light serves approximately 2,000 users with a direct withdrawal from the river", the "Lisbon Water Department's Caswell Wellfield serves approximately 1050 individuals", the "Carrow water works serves approximately 875 individuals with wells adjacent to the river.", and the "Rosebrook Water serves approximately 1050 individuals with wells adjacent to the river."[1] Furthermore, "Littleton Water and Light's Brickyard Road well is used as a back-up source for the town" adjacent to the Ammonoosuc River.[1] Additionally, "[m]any private wells at homes and businesses are also near the river."[1] In summary, the Ammonoosuc provides substantial drinking water supply to thousands of individuals along the Ammonoosuc River, and therefore maintaining clean, healthy water is of utmost importance.

The Ammonoosuc River, as described by NHDES in the Ammonoosuc River Environmental Fact Sheet, "begins at the Lake of the Clouds… and flows approximately 60 miles west… to its confluence with the Connecticut River." The Connecticut River supplies drinking water to millions according to the Vermont Department of Environmental Conservation.[3]

In section I.III of 'Attachment A' in Section 6.1 the Standard Wetland Permit Application packet (NHDES File #: 2023-03259), the "Groundwater, which was determined to flow in a westerly to southwesterly direction". Additionally, in the 'Wetland Functions & Values' report in Section 9.0 of the Standard Wetlands Permit Application packet, the applicant asserts that "[g]roundwater observations indicate that groundwater movement is in a west to southwesterly direction largely paralleling surface water drainage patterns" and that groundwater recharge/discharge was "considered a principal function with 22 wetlands." **These remarks indicate that both shallow groundwater and surface water from the site drains in the direction of the Ammonoosuc River. This indicates any potential contamination in surface or groundwater will flow to the Ammonoosuc River.**

Perfluoroalkyl and polyfluoroalkyl substances (PFAS), are widely used chemicals used in many man-made products that then make their way into landfills. According to the EPA, in their 'Effluent Guidelines Program Plan 15' from January 2023, the "EPA evaluated discharge data from over 200 landfills from across the country and found PFAS present in the leachate at over 95 percent of the landfills."[4] Additionally, NHDES states that "[h]undreds of waste sites in New Hampshire have sampled for and detected PFAS in groundwater, with the majority of those sites detecting PFAS at levels that are greater than applicable regulatory standards."[5] According to the EPA, current research indicates exposure to certain levels of PFAS can lead to reproductive issues, developmental delays in children, increased risk in cancers, reduction of the body's immune system response, interference with hormones, and increased cholesterol levels or risk of obesity.[6]

In section I.III of 'Attachment A' in Section 6.1 the Standard Wetland Permit Application packet (NHDES File #: 2023-03259), the applicant describes that "surface water runoff from the landfill will be collected and treated by a series of drainage swales and stormwater management structures" which will be "directed to these downgradient wetland and stream systems," and then, as described above, drain towards and likely to the Ammonoosuc River. Drainage swales and stormwater management structures will not adequately remove PFAS from landfill surface water runoff, posing significant potential harm to the entire Ammonoosuc River watershed.

Furthermore, in Section 6.1 in Attachment A of the GSL Wetlands Permit Application packet, the applicant states "no public water supply wells are located within or immediately adjacent to the project area, nor are surface water drinking water supplies are known to exist within the catchment area." However, according to the limits of the catchment area (Shown in Section 9.3) the catchment area contains and drains to the Ammonoosuc River which as described above provides public drinking water supply to thousands. This statement is misleading as the catchment area drains to the Ammonoosuc River which is a water supply.

In summary, the proximity of the proposed GSL to the Ammonoosuc River that provides drinking water to thousands, and flows into the Connecticut River that provides drinking water to millions, is both egregious and unethical. Research shows that PFAS is not adequately contained by landfills nor treated well enough to ensure the nearby waterways will remain uncontaminated. **The applicant has not provided adequate proof that runoff from the landfill nor leachate will be free of PFAS, a forever chemical, shown to cause significant impact to wildlife and humans.**

Threat to Wildlife and Threatened and Endangered Species:
According to the NHDES The Ammonoosuc River Fact Sheet, "[s]everal threatened or endangered wildlife species are found in the Ammonoosuc River watershed," including the following species[2]:

- **bald eagle** (*Haliaeetus leucocephalus*, state-threatened)
- **peregrine falcon** (*Falco peregrinus anatum*, state-threatened)
- **American marten** (*Martes americana*, state-threatened)
- **upland sandpiper** (*Bartramia longicauda*, state-threatened)
- **brook floater** (*Alasmidonta varicosa*, state-endangered)
- **dwarf wedge mussel** *(Alasmidonta heterodon*, federally endangered)
- **resident osprey** (*Pandion haliaetus,* species of concern)
- **northern bog lemming** (*Synaptomys borealis sphagnicola*, species of concern)

In addition to threatened and endangered wildlife, the NH Natural Heritage Inventory lists "20 state-endangered plant species as occurring along the Ammonoosuc River," including the following[2]:

- **Boott's rattle snakeroot** (*Prenanthes boottii*)
- **chestnut sedge** *(Carex castanea)*
- **Robbins' cinquefoil** *(Potentilla robbinsiana)*
- **green dragon** *(Arisaema dracontium)*
- **Kalm's brome** *(Bromus kalmii)*
- **bristly rose** *(Rosa acicularis)*
- **wavy blue grass** *(Poa laxa)*
- **hairy-eared rockcress** *(Arabis pycnocarpa)*

As well as 15 state threatened plant species.[2]

Furthermore, in Section 10 of the GSL Wetland Permit Application packet, the Natural Heritage Bureau DataCheck (NHB23-3333) submitted on 12/12/2023 found the potential for two rare natural communities (northern white cedar balsam fir swamp and northern white cedar seepage), two state endangered plant

species (greater yellow lady's slipper and marsh horsetail) and the state threatened common loon to be within the vicinity of the project area. Impacts to the **northern white cedar balsam fir swamp** and **northern white cedar seepage** and the **greater yellow lady's slipper** and **marsh horsetail** may occur as these were not evaluated by the applicant.

The Fish and Wildlife Service Endangered Species Project Review (Project code 2023-0019103, dated 11/21/23) found the Canada lynx (federally threatened), northern long-eared bat (federally endangered), and monarch butterfly (candidate) may occur within the boundary of the project or be affected by the project. In section 10.5 of the GSL Wetland Permit packet, in the 'Canada lynx – Winter Tracking Survey' no lynx tracks, scat, or signs were observed, however it was found that the following species made significant use of the site: snowshoe hare, coyotes (*Canis lantrans*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), ruffed grouse (*Bonasa umbellus*). According to the US Fish and Wildlife Service, the Canada lynx is "highly specialized to hunt snowshoe hare," found to be abundant in the survey.[7] Additionally, Canada lynx will eat small mammals such as grouse, also observed in the survey.[7] **This shows the site has significant habitat for the Canada lynx, a threatened species and development of the site will impact the Canada lynx.** Additionally impacts to the northern long-eared bat and monarch butterfly may occur as part of this project as these were not evaluated by the applicant.

In addition to the direct impact on species found or documented to be present on site, the project has the potential to significantly impact the dozens of species that call the Ammonoosuc River Corridor their home through contamination of waterways, alteration of terrain, or degradation of habitat. According to the NHDES Wildlife Action Plan maps, the project parcel contains prioritized habitat blocks, wildlife terrestrial corridors, areas of highest ranked habitat in NH, areas of highest ranked habitat in the region, and areas of supporting Landscape. **The proposed project will have significant impacts to wildlife and supporting habitats.**

Destruction of Wetlands and Vernal Pools:

The proposed GSL will impact 11.52 acres of wetlands including 11.03 acres of permanent wetlands impact.

Town	Sheet	Linear (ft)	Permanent (sqft)	Temporary (sqft)	After-the-fact (existing) (sqft)
Bethlehem	33-I	0	1622	2674	2270
	34-I	0	2346	6057	19346
	35-I	222	2725	111	767
	36-I	0	290	0	0
Bethlehem Sub- Total		222	6,983 (0.16 ac)	8,842 (0.20 ac)	22,383 (0.51 ac)
BETHLEHEM TOTAL		**222**	**38,208 (0.88 acres)**		

Table 1: Total wetland impact proposed for GSL in Bethlehem per GSL wetland permit plans.

Town	Sheet	Linear (ft)	Permanent (sqft)	Temporary (sqft)	After-the-fact (existing) (sqft)
Dalton	1	0	0	0	1120
	2-I	0	0	0	8912
	8-I	0	1928	1353	0
	9-I	0	1627	24	0
	13-I	932	37270	0	331
	19-I	0	6648	50	0
	20-I	0	44573	0	0
	21-I	0	205329	298	0
	22-I	0	101528	852	0
	23-I	711*	7233	3927	0
	27-I	0	26077	0	0
	31-I	0	2081	408	0
	32-I	0	1901	3585	0
	33-I	0	589	1965	4150
Dalton Sub-Total		1,643	436,784 (10.03 ac)	12,462 (0.28 ac)	14,513 (0.33 ac)
DALTON TOTAL		**1,643**	**463,759 (10.65 acres)**		

Table 2: Total wetland impacts proposed for GSL in Dalton per GSL wetland permit plans. *discrepancy of wetland impact in plans/notes

	Linear (ft)	Permanent (sqft)	Temporary (sqft)	After-the-fact (existing) (sqft)
Project Sub-Total	**1,865**	443,767 **(10.19 ac)**	21,304 **(0.49 ac)**	36,896 **(0.85 ac)**
PROJECT TOTAL	**1,865**	**501,967 (11.52 acres)**		

Table 3: Total wetland impacts proposed as part of the GSL project per the GSL wetland permit plans.

In Section 11 of the application within Section 2.1 of the GSL Wetland Permit Application packet the applicant states they propose to **impact a total of 501,967 (11.52 acres) of wetlands and vernal pools (5) on site** which may increase during review of the project. In section 2 of the application within the project description the applicant states "the proposed wetland impacts have been minimized by evaluating a number of on- and off-site alternatives". However, the applicant cannot claim that wetland impacts were minimized on site because the entire site was not field wetland delineated. In 'Section 8: Wetland Classification & Impacts' of the GSL Wetland Permit Application packet, the applicant described that area outside of the "core candidate land" was delineated using "existing topographic base plans, NWI maps, aerial photography and a reconnaissance level field review". This does not seem appropriate, as areas outside of the predetermined "core candidate land" may allow for minimized wetland impacts or impacts of lower functioning wetlands. **The "core candidate land" should not be chosen until all wetlands have been assessed/delineated on site. As the entire site was not field delineated it is impossible to determine if the proposed landfill has minimized all wetland and vernal pool impacts.** It is also

impossible to determine if the proposed landfill location has minimized impacts to high functioning wetlands.

Furthermore, in Section 3 of the 'Avoidance and Minimization Written Narrative' in Section 7.2 of the Standard Wetland Permit Application packet the applicant described that alternative sites in NH were assessed. Yet, they fail to describe if nearby alternatives were analyzed, such as the nearby land owned by the same owner as the project parcel: J. W. Chipping. As shown in the 'Abutter Plan' in Section 5.1 of the GSL Wetlands Permit Application J. W. Chipping owns many abutting parcels that do not appear to be adequately assessed for their potential to minimize or avoid wetland impacts or increase the distance from the proposed landfill and the Ammonoosuc River.

For example, Section 8 states that the "property owner maintains a quarry along Douglas Drive and has retained development rights for a proposed future industrial park, thus precluding landfill development and the need for further field wetland evaluation of this area" and in Section 7.3 in the 'Siting, Evaluation and Minimization' report, an alternative landfill location Area C is excluded as a candidate for the landfill as the "property owner is considering an industrial park at this location and is not in favor of pursuing a landfill footprint in Area C." **Potential unpermitted future uses for the property should not prevent this area from being included in alternative analyses.** Wetlands should be fully delineated in area C, as would be required if an industrial park was constructed here as well, and this area should be included in additional alternative analyses. Potential for an entrance to the site from the north/west appears possible and may minimize impact area, however due to areas of no review this cannot be determined. In Section 7.2 of the GSL Wetland Permit Application packet the 'Avoidance and Minimization Written Narrative' asks, "Does the proposed project require access through wetlands to reach a buildable lot or portion thereof?" The applicant answers yes. The applicant has not conclusively shown that there are no other access points to the parcel. In addition to the areas marked as assessed in Section 7.3 in the 'Siting, Evaluation and Minimization' report, additional portions of the site were not reviewed at all. **As described above, a large portion of the site was not wetland field delineated or reviewed in detail and therefore the on-site alternative analysis is incomplete and not conclusive.**

In addition to not all wetlands being delineated, not all wetlands were assessed as part of the Wetlands Functional Assessment in Section 9. Per NHDES Rule Env-Wt 311.03(b)(10) "For minor and major projects, a functional assessment of all wetlands on the project site…" shall be included in the complete application package for a standard permit. **The submitted Wetland Functions and Values report in Section 9 is therefore incomplete and cannot adequately determine that the project avoids or minimizes impacts to high functioning wetlands.** All wetlands should be field delineated as noted above and analyzed for suitable wetlands functions and values.

Also, in Section 9 of the GSL Wetlands Permit Application packet in the 'Wetland Functions & Values' report, the applicant describes that some wetlands provide no functions or values. **It seems very unlikely that the wetlands do not provide a single function or value**, such as wildlife habitat if it's in undeveloped lands or floodflow alteration if it is along a roadway.

The project proposes to impact 5 vernal pools (7,550 sq. ft.) and supporting terrestrial habitat (vernal pool buffer impacts not quantified), as shown in the Vernal Pool Assessment report within Section 10 of

the GSL Wetlands Permit Application packet. As described in the report, spotted salamanders and wood frog egg masses were documented during the reviews in 2019 through 2020. Impacts have occurred in and along vernal pools already, as noted in Section 3.0 of the report. **The project will directly impact vernal pool habitat and amphibian species.** Mitigating the loss of vernal pool habitat is challenging and often fails to adequately replicate naturally occurring functions.

In summary, we believe the project has not minimized wetland impacts or vernal pool impacts, and has not minimized impacts to high functioning wetlands. The entire parcel was not wetland field delineated or fully reviewed in the functional assessment. Therefore, the review is incomplete and inadequate. The project proposes significant threat and impact to wetlands, vernal pools, and adjacent terrestrial habitat, posing significant risk to wildlife, the environment, and human populations. Due to the immense proposed wetland impacts and potential risks to the environment, the application should be denied.

In addition to significant environmental concern, we found the following errors or concern with the GSL Wetlands Permit Application itself.

1. In Section 1 of the GSL Wetlands Permit Application the applicant states that the property does not contain a PRA (priority resource area), however in the same section the applicant states that the NHB Datacheck (NHB23-3333) documents occurrences of protected species; the common loon, the marsh horsetail, and the greater yellow lady's slipper. Per Env-Wt 103.66(a) "Priority resource area means a jurisdictional area that has documented occurrences of protected species or habitat".
    a. Additionally, when asked if the property contains protected species or habitat in Section 1 of the GSL Wetlands Permit the applicant lists the common loon, the marsh horsetail, and the greater yellow lady's slipper and excludes two rare/sensitive habitats included in the NHB letter NHB23-3333 dated 12/12/23. The following rare/sensitive natural communities were excluded:
        - **Northern white cedar - balsam fir swamp**
        - **Northern white cedar seepage forest**
2. Dalton Tax Map 406, Lot 2.3, Lot 2.4, and Lot 2.5 are not included in the project location (Section 3 of the Standard Wetland Permit Application, Section 2.1 of the Application packet). However, review of the wetland impact plans in section 14.3 shows existing impacts in Sheet 31-I, 32-I, 33-I, 34-I, 35-I and 36-I to be permitted as **after-the-fact wetland impacts** within these excluded parcels.
3. In Section 9, Part 3 nearby waterways are evaluated for impairments. It is noted in the figure narrative that they "understand all waterbodies in New Hampshire have been designated as impaired for fish/shellfish consumption due to mercury, and therefore these mercury impairments are not shown individually on this figure." However, if **impaired waters require a 1-mile buffer, the buffer is missing from the Hatch/Alder Brook and from the unnamed brook along West Forest Road/West Side Road**. One-mile buffers from these waterways will be within project boundaries.

a. Furthermore, the Forest Lake Buffer area was trimmed to be contained within the adjacent watershed, however this seems incorrect as the **Forest Lake Buffer should be consistent regardless of watershed boundaries**.
b. Also, it is important to note that all impaired waters are of poor water quality. Waters are denoted as "marginal" on Figure 9-3.2 which is misleading. **Waters are of poor quality**.

4. In Section 8: 'Wetland Classification & Impacts' of the NHDES Standard Wetlands Permit Application, multiple features are missing in the legend. There are light blue lines in the east and red lines throughout the property that are unlabeled. Additionally, features are labeled as "NWI Wetlands, Typical" in the east. However, almost all **NWI mapped wetlands are missing from this plan**. All wetlands should be field delineated, surveyed, and added to the plan.
5. Impact numbers are incorrect. For example, on Plan sheet 23-I the linear ft of impact for Impact 23-7 is listed as 390 ft. in the summary table, however, it is keyed out as 400 ft in the plan note.

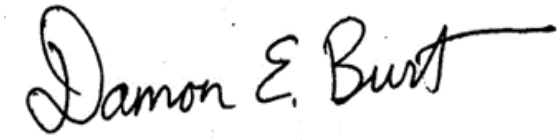
Summary:

1) Shallow groundwater and surface water from the site drains in the direction of the Ammonoosuc River. This indicates any potential contamination, including PFAS, in surface or shallow groundwater will flow to the Ammonoosuc River.
2) Perfluoroalkyl and polyfluoroalkyl substances (PFAS), a potential contaminate of the landfill, can lead to reproductive issues, developmental delays in children, increased risk in cancers, reducing the body's immune system response, interference with hormones, and increased cholesterol levels or risk of obesity.[6]
3) The applicant has not provided adequate proof that runoff from the landfill nor leachate will be free of PFAS, a forever chemical, shown to cause significant impact to wildlife and humans.
4) The GSL is proposed in close proximity to the Ammonoosuc River that provides drinking water to thousands, and flows into the Connecticut River that provides drinking water to millions.
5) The Ammonoosuc River corridor is home to at least 43 threatened or endangered wildlife and plant species.
6) Two rare natural communities (northern white cedar balsam fir swamp and northern white cedar seepage), two state endangered plant species (greater yellow lady's slipper and marsh horsetail), the state threatened common loon, Canada lynx (federally threatened), northern long-eared bat (federally endangered), and monarch butterfly (federal candidate) have been documented within or near the project area and will be threatened by the proposed project.
7) The project proposes to impact a total of 501,967 square feet (11.52 acres) of wetlands and vernal pools (5) on site.
8) The project will directly impact five vernal pools, significantly impacting amphibian species.
9) The site was not fully wetland delineated or fully assessed in the wetland functional assessment, therefore wetland impacts cannot have been minimized and the Wetlands Functions and Values report is incomplete and inadequate.
10) Potential unpermitted future uses for the property should not prevent areas from being included in the alternative analyses.
11) The "core candidate land" should not be chosen until all wetlands have been assessed and delineated on site.

Conclusion:

The GSL NHDES Wetlands Application remains incomplete and misleading. The site was not entirely wetland delineated and was not fully assessed in the Wetland Functions and Values assessment. Therefore, the project's wetland impacts cannot have been avoided, minimized, or adequately assessed in the alternatives analyses. The project poses significant impacts to wetlands (11.52 Acres), vernal pools (destruction of 5 vernal pools), and impact to wildlife (state and federal species and natural communities). This project will degrade drinking water, groundwater and surrounding wetlands. Therefore, the Wetland Permit for GSL should be denied by the NHDES.

Sincerely,



Damon E. Burt
NH Certified Wetland Scientist
Certified Professional in Erosion and Sediment Control
Fraggle Rock Environmental, LLC
FREnvironmental@gmail.com

[1]Ammonoosuc River Local Advisory Committee Corridor Management Plan, June 5, 2013

[2]The Ammonoosuc River, New Hampshire Department of Environmental Services Environmental Fact Sheet WD-R&L-20, 2019

[3] Connecticut River. VT Department of Environmental Services. https://dec.vermont.gov/watershed/restoring/connecticut#:~:text=Decades%20of%20work%2C%20financial%20investment,410%20mile%20long%20natural%20treasure.

[4] U.S. Environmental Protection Agency. Effluent Guidelines Program Plan 15. EPA-821-R-22-004. January 2023.

[5] Waste Site Remediation. New Hampshire PFAS Response. NHDES. https://www.pfas.des.nh.gov/response-areas/waste-site-remediation

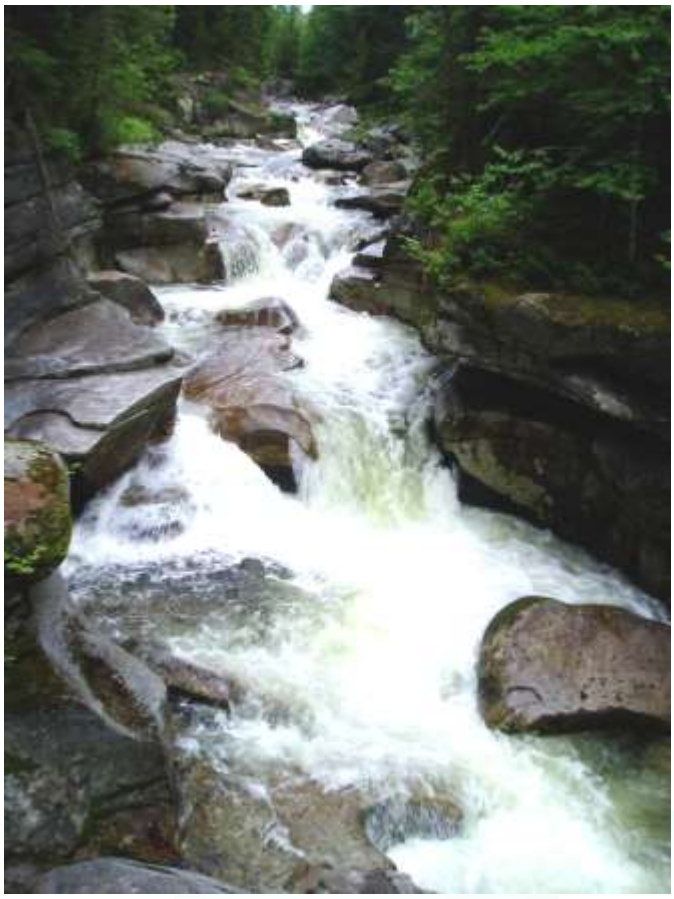
[6] 'Our Current Understanding of the Human Health and Environmental Risks of PFAS'. EPA. June 7, 2023. https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas

[7]Canada Lynx (*Lynx canadensis*). U.S. Fish and Wildlife Service – Maine Field Office Threatened and Endangered Species. https://www.fws.gov/sites/default/files/documents/Canada%20lynx_fact%20sheet.pdf

APPENDIX INDEX:

Appendix A

Ammonoosuc River Local Advisory Committee Corridor Management Plan



AMMONOOSUC RIVER LOCAL ADVISORY COMMITTEE

CORRIDOR MANAGEMENT PLAN

JUNE 2013

WITH ASSISTANCE FROM
NORTH COUNTRY COUNCIL
AND THE UPPER CONNECTICUT RIVER MITIGATION AND ENHANCEMENT FUND

Cover Photos:
Field Geology Services, 2009

Founded in 1973, North Country Council (NCC) is a nonprofit regional planning agency serving 51 communities and 25 unincorporated places in the northern third of New Hampshire.

It is the mission of North Country Council to encourage effective community and regional planning for the development of economic opportunity and the conservation of natural, cultural and economic resources. This is accomplished by providing information, regional advocacy, technical assistance, community education, and direct service to the region, its organizations, and political subdivisions.

Learn more about the Council and its work at NCCouncil.org.

Ammonoosuc River
Corridor Management Plan

Adopted by the Ammonoosuc River Local Advisory Committee
June 5, 2013

Town representatives
on the Ammonoosuc River Local Advisory Committee
at time of adoption:

Leslie Bergum, Carroll
Marilyn Booth, Landaff
William Harris, Haverhill
Steve Jesseman, Lisbon
Marilyn Johnson, Bethlehem
Michael King, Haverhill
Connie McDade, Littleton
Rosalind Page, Lisbon
Errol Peters, Landaff
Charles Ryan, Littleton
Richard Walling, Bath
Jessica Willis, Littleton

Developed by
Ammonoosuc River Local Advisory Committee
with assistance from
North Country Council
and the Upper Connecticut River Mitigation and Enhancement Fund

ACKNOWLEDGEMENTS

Many people assisted the Ammonoosuc River Local Advisory Committee and North Country Council staff with the development of this plan by helping with research, providing information related to their area of expertise, and reviewing drafts. We recognize that this list may not be complete, but some of the many people whose assistance we want to recognize are:

John Magee, Lindsay Webb and Dianne Timmins, NH Fish and Game Department

Tracie Sales, Jacquie Colburn, Amy Spagula and Ted Walsh, NH Department of Environmental Services

Violet Hopkins, Curator, Littleton Area Historical Society

Roberta Lavoie, Volunteer, Littleton Area Historical Society

Gwen Howe, Volunteer, Littleton Public Library

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APPENDICES TO THE CORRIDOR PLAN

Ammonoosuc River Geomorphic Assessment, Floodplain Conservation, and River Corridor Planning, Dr. John Field, Field Geology Services, October 2011

Ammonoosuc River Geomorphology Based River Corridor Planning Guide, Dr. John Field, Field Geology Services, October 2011

These reports can be downloaded from North Country Council's Ammonoosuc Corridor Plan page (www.nccouncil.org/ncc.php?page=33) or click on title above.

SECTION 1. INTRODUCTION

1.1. Designation of the Ammonoosuc River to N.H. Rivers Management and Protection Program

The 2013 Ammonoosuc River Corridor Management Plan represents a major milestone in a nine year journey undertaken by the residents of the seven corridor towns together to identify, prioritize and plan for the management of the river and its resources. The first corridor-wide project was the Ammonoosuc River Corridor Study undertaken by Lobdell Associates under the direction of an advisory committee with appointees from each of the seven towns. One of the outcomes of the Study was the recommendation to nominate the river to the New Hampshire Rivers Management and Protection Program pursuant to N.H. Rev. Stat. Ann. Chapter 483 (Ammonoosuc River Corridor Study, Phase 1 Report, October 2004). The Study also provided much of the information required for the nomination application. With Ray Lobdell of Lobdell Associates again in the lead, the nomination for the 49.6 miles of the river from the White Mountain National Forest property line at Lower Falls to the confluence with the Connecticut River was compiled and submitted to NH Department of Environmental Services (NHDES) in 2006. The designation was supported by all seven towns and approved by the Legislature in 2007.

Under the Rivers Management and Protection Program, the NHDES Commissioner appoints a local river management advisory committee comprised of nominees submitted by the selectboards of each river corridor community. In early 2008, the first major decision made by the Ammonoosuc River Local Advisory Committee (LAC) after getting organized was to nominate the remainder of the Ammonoosuc River mainstem, the “Upper Reach,” from the Lake of the Clouds to Lower Falls, to the Program as well. The designation of this final segment was approved by the Legislature in 2009.

Lake of the Clouds
Photo by Leslie Bergum, 2008

1.2. Development of the Plan

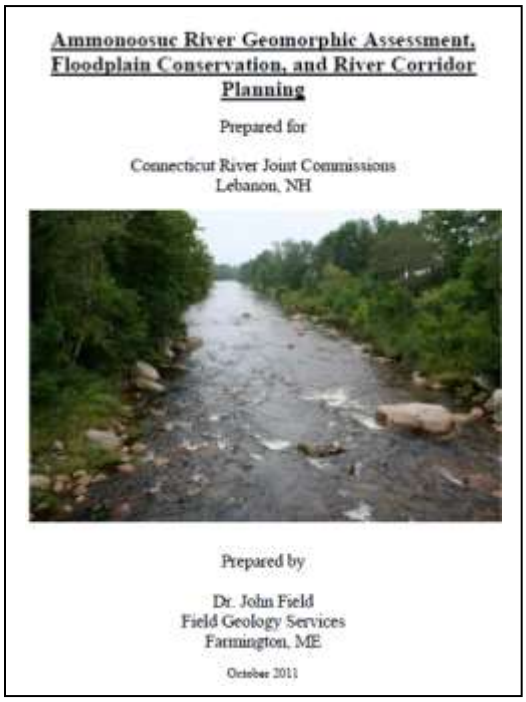
State law (N.H. Rev. Stat. Ann. 483:8-a) assigns four duties to the local river management advisory committees:

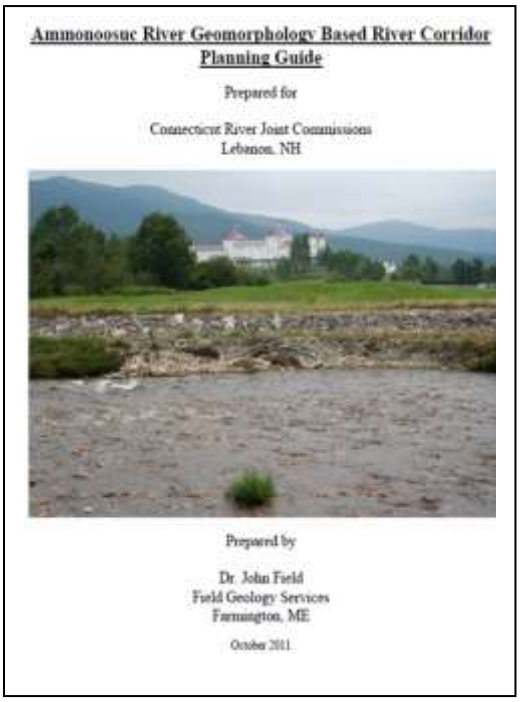
> (a) To advise the commissioner, the advisory committee, the municipalities through which the designated river or segment flows, and municipalities within tributary drainage areas on matters pertaining to the management of the river or segment and tributary drainage areas. Municipal officials, boards, and agencies shall inform such committees of actions which they are considering in managing and regulating activities within designated river corridors.
> (b) To consider and comment on any federal, state, or local governmental plans to approve, license, fund or construct facilities that would alter the resource values and characteristics for which the river or segment is designated.
> (c) To develop or assist in the development and adoption of local river corridor management plans under RSA 483:10. The local planning board, or, in the absence of a planning board, the local governing body, may adopt such plans pursuant to RSA 675:6 as an adjunct to the local master plan adopted under RSA 674:4. No such plan shall have any regulatory effect unless implemented through properly adopted ordinances.
> (d) To report biennially to the advisory committee and the commissioner, and annually to municipalities on the status of compliance with federal and state laws and regulations, local ordinances, and plans relevant to the designated river or segment, its corridor, and tributary drainage areas.

To obtain the resources needed to develop a local river corridor management plan, the Ammonoosuc River LAC took the following steps in 2008 and 2009:

- Collaborated with NHDES and the Connecticut River Joint Commissions to arrange for a fluvial geomorphology study of the Ammonoosuc River.
- Arranged for North Country Council to apply for an Upper Connecticut River Mitigation and Enhancement Fund grant to facilitate the planning process and assist with development of the plan document.
- Appointed a Corridor Management Plan Subcommittee.

Connecticut River Joint Commissions contracted with Field Geology Services of Farmington, Maine to conduct the fluvial geomorphology assessment of the river. The purpose of the assessment was to identify flood erosion hazards and areas of channel instability, as well as the causes for channel adjustments. The field work was conducted by Dr. John Field and Nicholas Miller over the summer of 2009. A series of informational meetings was organized by the Ammonoosuc River LAC, both a regional meeting and one in each corridor town, at the beginning of the project to exchange information with the public and local officials, and again at the end to report on results. The Ammonoosuc River Geomorphic Assessment, Floodplain Conservation, and River Corridor Planning, and accompanying Ammonoosuc River Geomorphology Based River Corridor Planning Guide, both by Dr. John Field, Field Geology Services, October 2011, provide an important foundation of the Local Advisory Committee's recommendations and are an integral part of this plan.





The Corridor Management Plan Subcommittee also began work in the summer of 2009. With the assistance of North Country Council staff, the Subcommittee guided the development of goal statements and identification of priority issues to be addressed in this first plan for the Ammonoosuc River corridor. Next, Subcommittee members volunteered to individually research several of the priority issues according to their individual interest/and or knowledge, summarize pertinent background information and related issues, and develop draft recommendations for discussion purposes. The following individuals contributed material for "issue papers" for the draft Plan:

Leslie Bergum
Marilyn Johnson
Joan Karpf
Connie McDade
Rick Walling
Jessica Willis
Tara Bamford (NCC)

This information was then compiled into the plan document by Tara Bamford, North Country Council, edited as needed and formatted.

It is recognized that each issue is related to several others, however the Subcommittee felt that this topical organization of the plan would provide the user easy access to the Local Advisory Committee's guidance on a particular topic. Like the various reaches of the river, the reader will note varying styles in different sections of the plan as a result of this collaborative approach.

After obtaining input from the public, local officials, and state experts on the management of river resources, the plan was revised accordingly and adopted by the Ammonoosuc River LAC on June 5, 2013.

The Ammonoosuc River LAC views this plan as a “living document,” meaning it will be reviewed and revised on an ongoing basis as feedback is received, circumstances change, and more is learned. Riparian landowners, recreational enthusiasts and citizens have invaluable first-hand knowledge of the river and its resources which is crucial to the River’s Local Advisory Committee. Ongoing educational and outreach programs will provide the opportunity for dialog, regarding mutual interests and concerns.

This Plan will provide guidance for the future activities of the Ammonoosuc River LAC and for the LAC review of proposed activities of others which may affect the river and its resources. It is hoped that the plan will also be of assistance to local officials, businesses, residents and visitors with an interest in learning how to be good stewards of the Ammonoosuc River and its economic, natural, scenic, and recreational values. Maintaining the high quality of its water and abundant natural and recreational resources will take the care and attention of each community along the river, education of residents and visitors, and cooperation of many agencies and partners.

SECTION 2. GOALS

The Ammonoosuc River Local Advisory Committee's Corridor Management Plan aims to balance land use with river protection, and provides recommendations for ways to ensure growth and development can continue to occur in each corridor community without degradation to this shared asset. The Local Advisory Committee has identified protection of the water quality and quantity, the aquatic life zone, the wildlife habitat, and the shoreline natural plant communities to be high priorities. The development of this Plan was guided by the premise that keeping the river healthy depends, not only on stewardship of the river corridor, but also on being mindful about the impact the watershed has on the river.

The goals below are not listed in priority order, nor is each associated with any one specific section of the plan. Like the river ecosystem itself, most plan elements are interrelated in some way.

Specific Goals:

1. Monitor and improve water quality as necessary to support healthy aquatic habitat.

2. Establish and maintain the instream flow volume necessary for drinking water supply, recreation and habitat.

3. Ensure that the natural resource base is maintained for future generations.

4. Protect and restore vegetated buffers to the river and its wetlands and tributaries.

5. Manage growth and development in the watershed in a manner that will maintain and improve the water quality in the river.

6. Ensure a vibrant economy by maintaining the unique character of the river corridor and its communities.

7. Support agriculture and forestry utilizing best management practices.

8. Plan future land use to be compatible with the flooding and movement of the river.

Floodplain hayfield
Photo by Field Geology Services, 2009

9. Enhance recreational opportunities on the river while minimizing the adverse impacts of recreation.

10. Strive for improved enforcement of regulations.

11. Consider other local and regional resource protection objectives when prioritizing river protection initiatives.

12. Educate the public on the value of stewardship of the river and its resources.

Snowmobile bridge over the Ammonoosuc River
Photo by Field Geology Services, 2009

13. Partner with other organizations, agencies and local boards to pool resources (e.g., grant opportunities, data, manpower, knowledge).

14. Incorporate the corridor management plan into each town's master plan.

15. Monitor the implementation of the corridor management plan on an ongoing basis and respond as appropriate.

16. Strive to keep the corridor management plan up-to-date regarding emerging issues.

SECTION 3. PRIORITY ISSUES AND OPPORTUNITIES

3.1 Population Growth and Development

Background

The Ammonoosuc River valley is a desirable area to live in, both year-round and seasonally, and can be expected to continue to grow in terms of developed area, year-round and seasonal populations, and visitors.

According to U.S. Census population change data for 1980 to 2010, during that thirty-year period the towns of Littleton and Lisbon experienced population increases of 6.7% and 5.1% respectively. The towns of Haverhill, Bethlehem, Bath and Landaff experienced much higher rates with 36.3%, 41.6% and 41.5% and 56% respectively. Bretton Woods and Twin Mountain, villages of the town of Carroll, tend to be populated mostly by second homeowners; the 17.9% increase in year-round population from 1980 to 2010 does not reflect the impacts associated with visitors to the over five hundred seasonal dwelling units in that community.

According to the NH Department of Environmental Services (NHDES), population growth in the Ammonoosuc River valley has been exceeding projections (The Ammonoosuc River, NHDES Fact Sheet WD-R&L-20, 2009). A rough build-out analysis estimated there to be 3,500 possible lots (average lot size of 6.7 acres) along the river available for development. According to existing regulations, future subdivision was estimated to have the potential to double the developed area in the river corridor (The Ammonoosuc River, NHDES Fact Sheet WD-R&L-20, 2009).

Issues

- As in the rest of northern New England, development in the Ammonoosuc River watershed has concentrated on the level well drained floodplain soils, and grown from colonial settlements adjacent to the water-power provided by the region's brooks. However, human activity in the buffer zone and the floodplain of a river can have a detrimental effect on the

river's health, function and aesthetic value, as well as consequences for plant and wildlife species that depend on the river. Human activity can deliver both point and nonpoint pollution into the river. In addition, the impact of light and noise on aquatic species is a growing concern and not yet well understood.

- The Ammonoosuc River corridor runs through seven separate municipalities, each with its own authority to plan for future growth and development, and to adopt and administer ordinances and regulations to implement those plans. Most of the land in the Ammonoosuc River corridor is privately owned, meaning that within this array of local land use plans, thousands of individual land use decisions will ultimately shape the character of the river corridor.

Recommendations

- ☐ Work closely with local planning boards and developers to identify the areas most appropriate for population growth and development, and the best practices for protecting water resources from negative impacts associated with that development.

- ☐ Hold developers accountable to current and future protection standards and sustainable building practices (enabling the river to meander in order to remain in equilibrium and avoid erosion hazards for example). Development can happen with the protection of the river as a priority.

- ☐ Assist developers, homeowners and towns to work with NHDES and others to benefit from preventive planning/maintenance by avoiding costly mitigation efforts.

3.2 Water Supply

Background

Photo by Field Geology Services, 2009

Several community water systems depend upon the Ammonoosuc for water supply, either through direct withdrawal from the river or from nearby wells:

- Woodsville Water & Light serves approximately 2,000 users with a direct withdrawal from the river.
- Lisbon Water Department's Caswell Wellfield serves approximately 1050 individuals. The wellhead protection area extends to both sides of the river.
- Carroll Water Works serves approximately 875 individuals from wells adjacent to the river – the wellhead protection area is adjacent to the river and encompasses a portion of the river.
- Rosebrook Water serves approximately 1050 individuals with wells adjacent to the river – the wellhead protection area lies on both sides of the river.

In addition, Littleton Water and Light's Brickyard Road well is used as a back-up source for the town.

Several businesses and residential and tourist facilities also depend upon wells that are adjacent to the mainstem and so interact with the river via groundwater, including:

Twin Rivers Campground, Bath
Ammonoosuc Inn, Lisbon
Lisbon Village Country Club
The New Whistle Stop, Lisbon
Evergreen Sports Center, Lisbon
Littleton-Lisbon KOA
Redimix Concrete, Littleton
Zealand Campground, Carroll

Many private wells at homes and businesses are also near the river.

Unlike some parts of southern New Hampshire where some communities are beginning to face water quantity challenges due to population growth, adequate quantities of clean water for drinking and other uses continue to be available for residents and businesses in most areas of the Ammonoosuc River watershed. With ongoing water quality protection and infrastructure maintenance and improvements, it is expected that this will be true for many years to come.

Issues

- NH Department of Environmental Services (NHDES) produced drinking water source assessments for each public water supply. These identify potential contamination threats, susceptibility to contamination threats, and recommended protection measures. Some of the land uses of concern noted in 2002 relative to the use of the Ammonoosuc River as a water supply, due to their proximity to the river, were:
  - highways
  - areas where pesticides are applied
  - agriculture land cover
  - livestock
  - septic systems
  - wastewater facilities
  - combined sewer overflows

- In addition, numerous potential contamination sources such as underground storage tanks, hazardous waste generators, salt piles, and junkyards, were identified.

- Many potential contamination sources have yet to be identified, e.g., buried junk cars in gullies.

- Most public water supplies do not have adequate protection in place. Several regulatory and nonregulatory tools are available. A Source Protection Plan is the process for identifying, prioritizing and addressing contamination threats; however, due to lack of funding, many of these are out-of-date and/or incomplete.

Oil sheen on the Ammonoosuc
Photo by Field Geology Services, 2009

- Tannins, although not a health threat, are of concern due to the yellow/brown tint they give the water. Local water supply managers have observed tannins increasing in the river as clearcutting has increased and undesired material is left to rot.

Tannins in the Ammonoosuc
Photo by Bill Harris

- Water suppliers are not consistently being alerted to potential contamination events in a timely manner. In some cases protocols are not in place and in others they are not being followed. For example, there was an unacceptable delay between the time when the storage building containing golf course chemicals at Bretton Woods was flooded in 2011 as a result of an ice jam and when Woodsville Water & Light was notified. A similar situation occurs when the Littleton WWTF overflows.

- Inadequate vegetated buffers between farm fields and the river lead to increased nitrate levels in the water following a rain. Manure also continues to be stockpiled in the floodplain. Pesticides are utilized in many of these floodplain fields as well.

- State road crews are sometimes seen not following best management practices when working near the river.

Recommendations

- ☐ The Ammonoosuc River LAC, towns, water suppliers, and NHDES should work together to:
  - Update the inventory of potential contamination sources throughout the watershed.
  - Promote best management practices for agriculture, logging, and handling of potentially hazardous materials.
  - Explore regulatory and nonregulatory tools for water supply protection.
- ☐ Improve state agency communication and cooperation on water quality protection issues, e.g., provide NHDES training to NHDOT road crews.

- ☐ Facilitate review of communications protocol following potential contamination event, strengthen where needed, and conduct periodic exercises.

- ☐ Educate homeowners on the importance of keeping contaminants out of the groundwater that feeds their own and their neighbor's wells.

For More Information

- "Protection of Groundwater and Surface Water Resources," Innovative Land Use Planning Techniques Handbook, NHDES, NH Association of Regional Planning Commissions, NHOEP, and NHMA, October 2008.

3.3 Water Quality

Background

The importance of water quality protection cannot be underestimated. James R. Jackson's 1905 History of Littleton, New Hampshire, Vol. II Topical History, reports on the 1901-1902 typhoid fever epidemic in Littleton. After years of amended legislation to control the increasing degradation of water quality in the United States, the Clean Water Act became law in 1972 providing protection for all surface waters. These mandates specified technological controls for industry and municipalities to mitigate impacts from their waste streams, required states to identify areas affected by nonpoint pollution sources, mandated adoption of various land use planning processes, addressed the issue of ocean dumping, divided pollutants into various classes, and set standards. As a result, states adopted programs to fulfill the various requirements of the Clean Water Act and monitor the states' waters. The Act requires each state to submit two surface water quality reports every two years to the US Environmental Protection Agency. The first report, commonly called the "305(b) Report," describes the quality of its surface waters; the second report, called the "303(d) List," identifies those surface waters that are impaired or threatened, not expected to meet water quality standards within a reasonable time, or require the development or implementation of a study. These reports can be found on the NH Department of Environmental Services (NHDES) website.

The New Hampshire Water Quality Standards are specific provisions established to ensure that the physical, chemical and biological integrity of the state's waters are maintained and protected. The standards provide for the protection and propagation of all aquatic wildlife and ensure the level of water quality necessary to protect the existing recreational activities on state waters. The state compares existing water quality to the standards through their monitoring programs including the Volunteer River Assessment Program (VRAP) and the Ambient and Biomonitoring Program.

The Ammonoosuc River has been designated as a Class B water by the New Hampshire General Court. Class B water is of the second highest quality. These waters are considered acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies. Since the 1971 implementation of the Clean Water Act, money from the federal and state governments was spent to upgrade the sewage treatment plants and other points of pollution along the Ammonoosuc River.

Except for low pH, with only isolated instances, monitoring on the Ammonoosuc River has shown that the river meets the standards for "fishable and swimmable." Low pH tends to occur in the state's mountain headwater streams where the granite bedrock provides little buffering capacity for acid rain.

Issues

In 2012, the NHDES released its most recent assessment of water quality of the river (combined 305(b) Report and 303(d) List). Overall the Ammonoosuc River is very high quality.

- Several sampling locations on the Ammonoosuc River show lower than accepted EPA pH levels which is most likely due to acid rain combined with local geology.
- High pH of unknown cause exceeding the water quality standard have been recorded at Streeter Pond Road Bridge.
- E. coli was detected in Littleton along with high aluminum levels. (In areas where buffering capability is low, acid rain releases aluminum from the soil to the river.)
- In addition, low dissolved oxygen was noted behind the Woodsville Dam in Bath.

It should be noted that the List only represents known impairments and threats. Waters presented on the List may also be threatened or impaired by other pollutants or non-pollutants. Also, at this time in New Hampshire, fish/shellfish consumption advisories due to mercury contamination are in effect for all surface waters.

Since 2006, the VRAP has been testing the water quality of the Ammonoosuc River. Tests include pH, turbidity, temperature, conductivity and dissolved oxygen. In recent years testing was expanded to include phosphorus, E. coli, chloride and total nitrogen. Although most areas along the river show pH levels below N.H. surface water quality standards, with the exception of dissolved oxygen at one headwater site, all other tests fell within recommended Class B standards in 2012.

- Water quality can change dramatically based on river flow, storm frequency, dilution and channel characteristics.

Historically, the overall health of the river has improved, however, the limited periodic testing may not accurately reflect the quality trends of the river. Repeated testing over time will create a picture of the fluctuating conditions and help determine where improvements, restoration or preservation may benefit the river and the communities it supports. In addition, coordination with NHDES has enabled the use of some submersible multiparameter dataloggers in recent years which can capture readings of, e.g., dissolved oxygen, every 15 minutes over a period of days to gain an understanding of fluctuations.

Recommendations

- ☐ Continue and expand the existing water quality monitoring and stream assessment programs and purchase additional testing equipment when needed.

- ☐ Towns should continue to support the water quality monitoring program through the Ammonoosuc River LAC.

Sampling Stations for the Ammonoosuc River, NHDES VRAP, 2010

Station ID & AUID	Class	Waterbody Name	Location	Town	Elevation *(Rounded to the Nearest 100 Feet)*
29-AMM NHRIV801030401-01	**B**	**Ammonoosuc River**	Jefferson/Clinton Road & Base Road	Crawfords Purchase	2000
01-DRT NHRIV801030402-04	**B**	**Dartmouth Brook**	Base Road	Carroll	1600
27-AMM NHRIV801030402-04	**B**	**Ammonoosuc River**	Mt. Washington Hotel Historic Marker	Carroll	1600
26-AMM NHRIV801030402-04	**B**	**Ammonoosuc River**	Route 302 Bridge - Fabyan/Base Station Road	Carroll	1600
25-AMM NHRIV801030402-04	**B**	**Ammonoosuc River**	Route 302 Bridge Lower Falls	Carroll	1500
24-AMM NHRIV801030402-07-01	**B**	**Ammonoosuc River**	Route 3 Bridge Twin Mountain	Carroll	1400
22-AMM NHRIV801030403-01	**B**	**Ammonoosuc River**	Route 302 Bridge Pierce Bridge	Bethlehem	1200
20-AMM NHRIV801030403-03	**B**	**Ammonoosuc River**	Prospect Street Bridge	Bethlehem	1000
16D-AMM NHRIV801030403-07	**B**	**Ammonoosuc River**	End of Railroad Street	Littleton	1100
15J-AMM NHRIV801030403-11	**B**	**Ammonoosuc River**	Cottage St Bridge/Veterans Memorial Bridge	Littleton	900
15-DEL NHRIV801030403-13	**B**	**Dells Brook**	Dells Brook Upstream of Dells Pond	Littleton	900
13-AMM NHRIV801030403-16	**B**	**Ammonoosuc River**	Streeter Pond Road Bridge	Lisbon	700
10-AMM NHIMP801030503-02	**B**	**Ammonoosuc River**	School Street Bridge	Lisbon	600
07-AMM NHRIV801030506-04	**B**	**Ammonoosuc River**	Railroad Bridge	Bath	600
04-AMM NHIMP801030506-02	**B**	**Ammonoosuc River**	Bath Covered Bridge	Bath	500
03-AMM NHRIV801030506-10	**B**	**Ammonoosuc River**	Railroad Bridge off Route 302	Bath	500

Notes: 1. Not all of these sites are sampled each year.

2. 22-AMM and 03-AMM are trend stations that have been established by NHDES.

(Source: NH Department of Environmental Services, New Hampshire Volunteer River Assessment Program, 2010 Ammonoosuc River Water Quality Report, February 2011)

- ☐ Recruit new volunteers by developing outreach materials and opportunities.
- ☐ Provide training for new volunteers.
- ☐ Identify additional sampling sites and data needs to better locate unknown sources of contaminants.
- ☐ Implement the recommendations from the VRAP annual reports to improve the program.
- ☐ Expand the biological monitoring of the river.
- ☐ Increase outreach on the program to residents; make the water quality reports widely available.
- ☐ Continue to work with NHDES to expand the use of submersible multiparameter dataloggers in the VRAP monitoring.

For More Information

For additional information on water quality in the Ammonoosuc River, see:

- NHDES Volunteer River Assessment Program at des.nh.gov/organization/divisions/water/wmb/vrap/ammonoosuc/index.htm
- NHDES Surface Water Quality Assessment Program reports at des.nh.gov/organization/divisions/water/wmb/swqa/index.htm

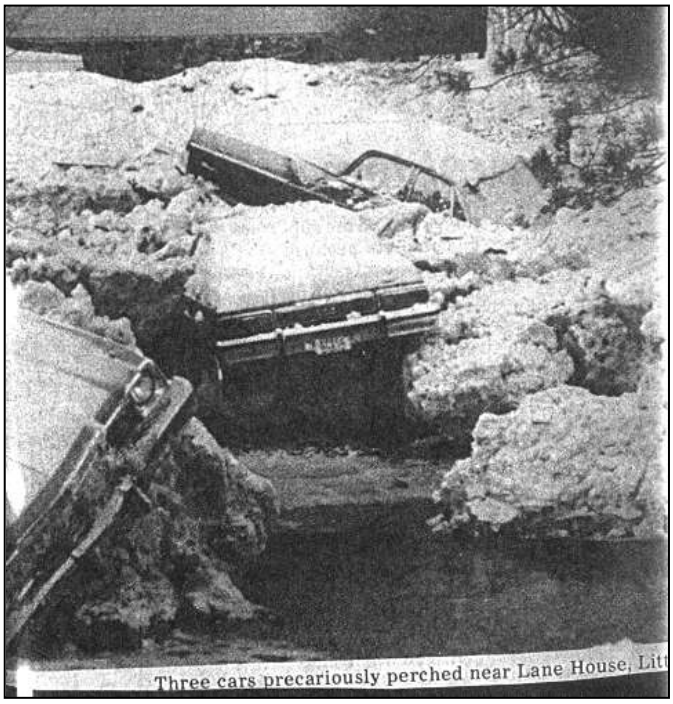
3.4 Floodplains and Fluvial Erosion Hazards

Background

Historically, flooding has been one of the most common natural hazards in New Hampshire. Floodplains in their natural undisturbed state have the capacity to store floodwater, reduce the rate of flow, and prevent channel instability. Over the course of time, straightening stretches of the river, filling wetlands, constructing bridges, installing inadequate culverts for drainage, and putting developments with impervious surfaces in floodplain areas have resulted in water rising to higher levels during heavy rainfall.

The federal government began purchasing land for stream flow protection following passage of the Weeks Act of 1911. The Act allowed lands acquired for this purpose to be preserved and maintained as national forests. Subsequently, the White Mountain National Forest in New Hampshire was established in 1918 to protect the watershed.

The Ammonoosuc River at annual ice out has had the tendency to flood downstream in Lisbon, Landaff, Bath, and Woodsville. In one such flooding event ice blocks carried automobiles downstream from the Lane House in Littleton. Following passage of the 1960 Flood Control Act, the U.S. Army Corps of Engineers in conjunction with the Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, N.H., started providing guidance to communities with ice jam problems.



Flooding in Downtown Littleton, 1981
Courtesy of Littleton Area Historical Society

Management of the floodplain at the community level was implemented by adoption of zoning ordinances, subdivision regulations, and building codes. The National Flood Insurance Program was established in 1968 to enable property owners to buy flood insurance in participating communities that adopted floodplain ordinances. In the 1970s, the Federal Emergency Management Agency (FEMA) started developing and maintaining floodplain mapping. Current maps for New Hampshire, known as “DFIRMs” or Digital Flood Insurance Rate Maps are available through UNH Complex Systems Research Center’s GRANIT. The maps show “100 year” floodplains, where modelling shows that floods have a 1 in 100 (1%) probability of occurring in a given year, “500 year” floodplains, where the probability is 1 in 500 (0.2%), and floodways, which

are the river channels themselves. The National Flood Insurance Program restricts activity in the floodway, and requires floodproofing or elevation above the 100 year flood.

Dr. John Field conducted a fluvial geomorphology study to map features of the entire Ammonoosuc River in 2009, funded by the New Hampshire Department of Environmental Services. His study, done in geomorphic "reach" stretches, assessed the stream channel and associated floodplain in the river. The information regarding channel migration and stream bank erosion was provided to the Ammonoosuc River Local Advisory Committee. The recurring theme expressed in Dr. John Field's report, Ammonoosuc River Geomorphology Based River Corridor Planning Guide , October 2011, is that the river channel is always trying to return to equilibrium. His study showed that the river deals best with stressors such as climate change and impacts of development when it is in a balanced state. Some of humans' past activities along the river have been associated with unwanted consequences. Dr. Field identified activities that should be avoided. Straightening the river, deforestation and denudation of ground cover along the shoreland, and loss of floodplain storage areas were identified as forerunners of bank erosion. As expected, the subsequent increase in flow velocity, in turn, increases the capacity of the river to transport sediment load. Unintended and unanticipated consequences occur, including loss of aquatic and shoreland habitats, flooding events, and occurrence of ice jams in shallow and/or constricted stretches of the river. Dr. Field's report provides in-depth information about the vertical and lateral constraints that affect the river's ability to make adjustments. His report offers practical measures to be undertaken to alleviate problems, including a comprehensive list of elective restoration projects on a town-by-town basis. Dr. Field urged protection of some of the still existing undeveloped shorelands that are located adjacent to highly developed areas to offset the floodplain problems that have been created by past activities. A series of public meetings/discussions was held for riparian corridor landowners, town government planners, and other interested parties. The erosion hazard mitigation mapping will be used as a basis for planning as well as for aquatic habitat and stream restoration projects.

Issues

Courtesy of Littleton Area Historical Society

- There has been a gradual loss of open space due to increased development, during a time when New Hampshire has been experiencing greater climate variability. This trend has been accompanied by a net loss of wetlands to absorb the sudden increases in water flow, and decreases in storage areas for the overflow. Deforestation in critical areas, losses of vegetative buffers, and changes in land use have subjected the watershed to increases in erosion and sedimentation.

- Flooding and bank erosion are contributing to the spread of some invasive plant species. In addition, invasive plants are contributing to bank erosion in some areas where they have outcompeted native species better suited for bank stabilization.

- Hazard mitigation and emergency operations plans addressing, e.g., downbursts, hurricanes, dam failure, and transport of hazardous materials, should be kept up to date and implemented. Risk assessment, planning, pre-emptive corrective measures, and restoration projects should be done at the community level throughout the watershed to offset flooding and other hazards, locally and downstream. Timing of action is key to human safety, to the prevention of property damage, to the protection of community infrastructure, and to budgetary cost containment. It is better to deal with problems at the outset than wait.

Tropical Storm Irene floodwaters at Mount Washington Hotel entrance, 8/29/2011 Photo by Linda Dowling

Recommendations

- ☐ Floodplain and fluvial erosion hazard areas should be a key part of multihazard mitigation planning and implemented through land use planning.

- ☐ The results of Dr. John Field's studies of the Ammonoosuc River should be incorporated in local land use planning and implemented through both public and private activities. Some examples:
  - Implement pre-emptive mitigation.
  - Conduct restoration projects to protect the river corridor: plant stream buffers, stabilize stream banks, restore areas of sediment accumulation (aggradation) and areas of incised channel reaches.
  - Encourage meander of the river in remaining open areas.
  - Remove floodplain constraints and/or replace structures.
  - Use erosion and sediment controls.

- ☐ The Ammonoosuc River LAC should continue to work toward river restoration and separation of human activities from flood and erosion hazards through such activities as:
  - Listing important floodplain areas for possible land conservation.
  - Identifying floodplain areas of concern adjacent to major highways.
  - Reviewing floodplain zoning regulations in the river corridor towns.
  - Encouraging use of Best Management Practices in all activities.
  - Identifying new areas in need of floodbank restoration projects.
  - Inventorying invasive shoreline and aquatic plants for the NH Department of Environmental Services (NHDES).
  - Setting up educational programs for riparian landowners and recreational land users.

For More Information

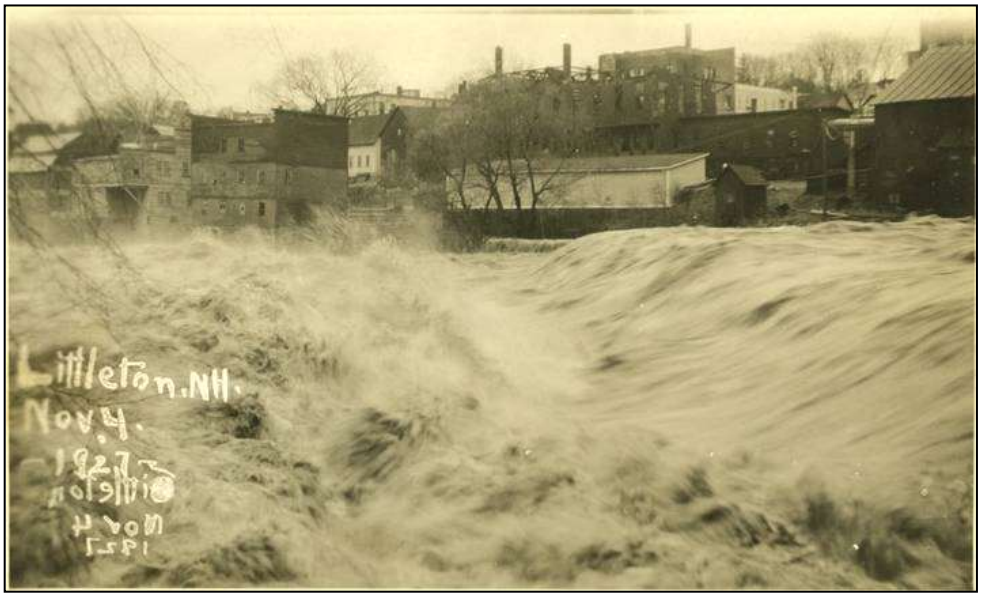
- "Flood Hazard Area Zoning," Innovative Land Use Planning Techniques Handbook, NHDES, NH Association of Regional Planning Commissions, NHOEP, and NHMA, October 2008.

- For one approach to incorporating fluvial erosion hazard area information into town planning and zoning see Fluvial Erosion Hazard Area Zoning, NHDES, September 2010.

- For another approach from our neighbors in Vermont, see VANR's Municipal Guide to Fluvial Erosion Hazard Mitigation, May 2010.

3.5 Stormwater Management

Background



1927 Floods in Downtown Littleton
Courtesy of Littleton Area Historical Society

The Ammonoosuc River watershed, as a network of water interconnectivity, is important to life zones and ultimately to the well-being of people living in the communities along the river. Locations that have extensive impervious surfaces, bank erosion, high-density development, and agricultural areas devoid of vegetative buffers warrant extra surveillance to determine if there are stormwater problems in-the-making that would be amenable to restoration programs. Experience has shown that being proactive in looking after water quality in the Ammonoosuc River is more effective and less costly than after-the-fact remedial actions. Stormwater Management Plans and Best Management Practices (BMP) are standards expected of developers.

Littleton Meadows, Google Earth

Oversight of projects from inception to completion by a qualified person and enforcement of infractions are measures of equal importance. A recent trend has been to set up stormwater upkeep maintenance plans for businesses prior to construction. In 2003 the N.H. Department of Environmental Services (NHDES) funded the business community of Littleton to do the Ammonoosuc River Drainage System Mapping and Modelling Project for box store development along the river in *The Meadows*. It was a prototype endeavour to do mapping of the watershed, matching the data to contingency planning for protection of the water from everyday hazards and unforseen hazardous materials threat. It was a cooperative effort by community leaders, educators, Antioch's COSEED (Community-based School Environmental Education),

the Appalachian Mountain Club and Littleton High School students, using GPS and GIS technology. This cooperative effort provides a great example for addressing issues on other sites in the corridor through collaboration.

Issues

- The quality of water for human consumption (i.e. drinking water in Woodsville, Lisbon, and private wells) is dependent on protection of water at its source (the Ammonoosuc River and the aquifer) and on having effective stormwater management.

Photo by Connie McDade

- Wetlands act like a sponge, soaking up stormwater and releasing it more slowly. The loss of wetlands can result in reduction of infiltration, increased pollution of surface and groundwater from polluted runoff, and peak flood levels and velocity. Additional impacts to the hydrologic cycle occur when the groundwater is not recharged.

- Lack of vegetated buffers along some agricultural lands and runoff from impervious surfaces has opened up the river to erosion and sedimentation.

- The conclusion by scientists is that we need to change the way water is managed. Water conservation needs to be partnered with stormwater management to reduce humans' overall disruption of the water cycle and reduce the amount of wastewater in the waters receiving the stormwater.

Recommendations

- ☐ Opportunities for municipalities to improve stormwater management include:

- building smaller roads with no curbs and gutters outside the urban area; using swales for road runoff, pervious pavement, and detention ponds in problem areas; urban tree planting
- locate snow storage areas away from the river
- installation of oil traps in parking areas for box stores and on tarmacs where autos for sale are lined up
- use and store hazardous substances in covered impervious areas away from the river

☐ Continue monitoring of water quality by Volunteer River Assessment Program team (VRAP)

☐ Towns should ensure that subdivision and site plan regulations require stormwater best management practices during construction and post construction, and that approvals are followed up with enforcement to ensure that stormwater infrastructure is properly maintained.

☐ To ensure that projects are in compliance with the terms and conditions of state and local permits, Planning Boards should require developers to provide funds to be put in an escrow account to enable assigning a qualified professional to do project oversight from inception to finish.

☐ Towns should periodically review community maintenance practices, e.g., street sweeping, erosion control, drainage, snow removal and storage.

☐ Towns should adopt local wetland and shoreland ordinances.

☐ Continue educational programs for developers, builders, and landowners about the Shoreland Water Quality Protection Act, including impervious surface limits, waterfront buffer rules, stormwater management within 250’ of the river.

☐ Workshops are needed for town officials and farmers about N.H. Rivers Management and Protection Program regulations within 1/4 mile of the river that deal with new solid waste treatment plants, new landfills, sludge and fertilizer application.

☐ Identify remaining combined sewer overflows where stormwater enters sewage treatment plants along the river during heavy precipitation.

☐ Reduce stormwater runoff by using water conservation measures such as:
- retention of water on home sites by storing and/or delaying runoff with green roof garden, back yard harvesting of roof water by rain barrel and roof diverters, rain gardens
- avoiding watering lawns, replacing extent of traditional lawns with natural surrounds, adding natural surrounds to golf courses

- low-flush toilets, efficient water tank design
- use of permeable products in the yard, increase moisture absorption into the water table by addition of one foot of topsoil on top of cleared land for development; plant native trees and shrubbery

☐ Continue to learn about low impact development (LID) techniques and new technologies and assist with outreach to towns and developers.

For More Information

- "Permanent (Post Construction) Stormwater Management," Innovative Land Use Planning Techniques Handbook, NHDES, NH Association of Regional Planning Commissions, NHOEP, and NHMA, October 2008.

- NHDES Fact Sheet WD-WMB-17 Low Impact Development and Stormwater Management http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/index.htm

3.6 Erosion and Sedimentation from Human Activities

Background

It is a goal of the Ammonoosuc River LAC to promote activities which will reduce erosion and sedimentation on the banks of the Ammonoosuc caused by earlier human activities, mitigate the resultant flooding, and prevent erosion caused by future human activities.

Tropical Storm Irene floodwaters carrying silt
Photo by Leslie Bergum, 2011

Erosion is the loss of soil by the actions of water, ice, gravity or wind through the detachment and transportation of soil particles. Sedimentation, the end product of erosion, is the settling of the detached soil particles transported by water. The organic and mineral particles carried in the runoff from riverbanks cause turbidity which can slow stream flow and affect water quality by raising the temperature of the water and lowering its dissolved oxygen. When these particles, which carry pollutants as well as nutrients, settle in the streambed, they can change the river's aquatic habitat.

Nature, since the glacial age, and humans during the past two centuries, have influenced riverbank erosion and sedimentation in the Ammonoosuc. " Human development in the watershed has created restraints in some locations" not allowing the river to adjust back to equilibrium. "If constraints can be avoided in remaining areas of the undeveloped flood plain," adjustment will allow the river to re-establish equilibrium (from Dr. John Field). Dr. Field also shared the following information during his work with the Ammonoosuc River LAC: "The percentage of floodplain that is blocked and storage area lost determines impact to the river channel." The increase in flow velocity during heavy precipitation events is associated with bank erosion, especially in areas that lack a vegetated buffer. Wetlands and forested surrounds aid in absorption of drainage runoff. A buffer zone of vegetative cover protects the river from aggregates of soil, waste, nitrate fertilizer and other chemicals of agricultural land use. The effects of this increased bank erosion can be seen in a few landslides at the river's edge, and one particularly large landslide at a bend in the river. The resulting sedimentation can be seen where it has accumulated at constricted areas, at river bends, and at tributary confluences.

Sediments hilling in the dam area cause problems for Woodsville's water plant operators. Photo by Bill Harris.

Natural causes are stormwater runoff, tributary inflows, ice build-up and wind-induced wave activity. Human activities have been deforestation, farming, dam building and straightening the river's natural meandering channels to accommodate log drives, road and railroad construction. More recent activities have been increased development activities along the river and in the floodplain, excavation in adjacent gravel and clay pits, and recreational dredging for gold. In addition, some attempts to stop erosion in one locality have caused erosion and flooding farther down the river.

Ice on the Lisbon Soccer Field, Photo by Tara Bamford, NCC

Riverbank erosion is a serious problem that we must consider in this era of changing weather patterns and increasing human activity along the Ammonoosuc. Dr. John Field, who conducted a geomorphic assessment of the Ammonoosuc in 2009/10, stated: "It's clear that most of the Ammonoosuc River offers excellent habitat and is in beautiful condition, with little severe erosion."

He did, however, note that there are problems where serious erosion and flooding occur. These are illustrated on the fluvial erosion hazard maps indicating areas of low, moderate, high and very high zones of erosion. The highest zones are where the river runs along Route 302 and near centers of development. These increase as the Ammonoosuc nears its confluence with the Connecticut River. The most extensive erosion and flooding occur in the Bath/Haverhill area.

Riverbank erosion on the Ammonoosuc
Photo by Field Geology Services, 2009

Issues

- Water quality fit for human consumption and recreation, an adequate stream flow, a good aquatic and wildlife habitat, and protection of valuable land from further erosion and flooding are the goals. Slowing the process of erosion and sedimentation, if not eliminating it completely, is essential to maintaining each of these. Dr. Field's geomorphic study of the Ammonoosuc, which describes how the river has attempted to reach its equilibrium in the watershed by changing its channels, provides knowledge for this, as well as for remediation of present problems. The study will provide a basis for area organizations to work with landowners to help the river find its equilibrium and reduce property damage.

Bank erosion at the Lisbon Soccer Field
Photo by Tara Bamford, NCC, June 2010

- Vegetated riparian buffers are essential to controlling erosion. They stabilize the riverbank soil, filter sediments and provide shade to maintain the cooler temperatures critical to aquatic life. New Hampshire's Shoreland Water Quality Protection Act (RSA 483-B) establishes a protected zone of 250 feet from the river reference line in which certain restrictions apply to impervious surfaces. Other restrictions apply to types of business, septic system setbacks, lot sizes, dwelling units and alteration of terrain. This protected zone contains a waterfront buffer and a natural woodland buffer from the river reference line. No primary structures are allowed in the 50 foot waterfront buffer and tree coverage is managed with a grid and point system. Within these buffer zones proscriptions and restrictions apply to vegetated areas.

Recommendations

- ☐ Although RSA 483-B is periodically amended by the Legislature, planning and zoning boards in communities along the Ammonoosuc should be familiar with it and include its provisions in their master plans and ordinances. Information and publications such as an illustrated *Summary of the Standards* are available from the NH Department of Environmental Services (NHDES), the responsible agency. The Connecticut River Joint Commissions also has an excellent series of brochures, including *River Dynamics and Erosion, Introduction to Riparian Buffers, Buffers for Habitat, Backyard Buffers, Planting Riparian Buffers* and a detailed list of native ground covers which could be included in a packet for distribution to riparian landowners by the Ammonoosuc River LAC, conservation commissions and to planning boards for developers. Also available and applicable to the Ammonoosuc is the Coos and Grafton Counties Conservation Districts' informative brochure, *Living With The River: A Landowner's Guide to Erosion Control on the Connecticut River.*

- ☐ The Ammonoosuc River LAC and conservation commissions should work with towns to ensure that road agents, developers, construction companies, gravel and sand pit owners, and loggers observe best management practices published by various organizations, including the University of New Hampshire's Cooperative Extension Service, as well as to understand state laws and the NHDES permit regulations relative to their activities.

- ☐ Working with the Ammonoosuc Conservation Trust and other conservation organizations, the Ammonoosuc River LAC and conservation commissions should encourage landowners to consider the benefits of conservation easements on riparian lands.

- ☐ Conservation commissions should check with their planning and zoning boards to see if they are aware of and using the publication *Innovative Land Use Planning Techniques: A Handbook For Sustainable Development* (October 2008) compiled by New Hampshire's regional planning commissions for NHDES.

For More Information

- "Erosion and Sediment Control During Construction." Innovative Land Use Planning Techniques Handbook, NHDES, NH Association of Regional Planning Commissions, NHOEP, and NHMA, October 2008.

- My Healthy Stream – A Handbook for Streamside Owners, Jack E. Williams, Michael P. Dombeck, and Christopher A. Wood, Trout Unlimited and Aldo Leopold Foundation, 2012.

3.7 Pollution from Human Activities and Special Land Uses

Background

Point and nonpoint sources of pollution can have a major effect on the health of the river. Point source pollution is defined as specific pollutant or discharge points that can be identified and physically located. Since the Clean Water Act of 1971, most discharges require a permit and have to be treated prior to discharge. No discharges are allowed into Class A waters and no new discharges that contain phosphorus are allowed into lakes and ponds. There are four active permits for discharges to the Ammonoosuc River: Bethlehem Village District, Pinetree Power, Littleton Wastewater Treatment Facility, and Lisbon Wastewater Treatment Facility.

Issues

- The major source of pollution today comes from nonpoint sources, such as runoff from roads, parking lots, golf courses and other impervious surfaces; short-term land uses that disturb the soil such as construction sites; logging and farming; and seepage from landfills, auto salvage yards and hazardous waste storage areas.

- Farming is not a significant source of nonpoint pollution in the corridor since less than 8% of corridor land is in agricultural use. Logging operations are more likely to impact water quality, e.g., through sedimentation and tannins, as close to 70% of the corridor is forested area. Timber harvesting operations must file a Notice of Intent to Cut with the town, and a Forestry Notification with NHDES if impacting surface waters or wetlands. NHDES regulations requiring best management practices, and DRED basal area and slash laws are in place to protect surface waters, but harvesting may sometimes fall out of compliance due to lack of funding for inspections leaving erosion and sediment problems unchecked.

Pigtails containing contaminants seeping from the bank along the Ammonoosuc
Photo by Field Geology Services, 2009

- Construction projects of over 100,000 square feet of contiguous land require a site specific permit from the NH Department of Environmental Services (NHDES) which ensures that measures are being taken to provide erosion control and prevent sedimentation of surface waters. Site preparation and the construction of roads, driveways and parking lots are short-lived impacts but may cause severe erosion or sedimentation if preventive measures are not established or maintained during the project. Although land development has slowed during the recent recession, the Towns of Bethlehem, Carroll and Littleton have still had significant building growth over the past few years.

- Seepage from junkyards and landfills can also be sources of nonpoint pollution. Landfills in proximity to an aquifer and/or the river are being phased out due to health concerns that seepage from the liner may leach out salts, dissolved organic carbon and nitrogen, and heavy metals, which may drain into the aquifer and eventually into the river. Although there are four towns within the corridor with solid waste sites, Bethlehem is the only town with a facility that is open. NHDES lists one junkyard within the river corridor located in Littleton.

- Highway maintenance may also be a source of surface water pollution, specifically the salt and sand mixture used to de-ice the roadways. Although the state has started a road salt reduction initiative program, it has no laws to regulate the use of salt. To protect groundwater, NHDES recommends putting snow dumps near flowing surface waters (at least 25 feet from the high water mark to keep debris out of the water). Snow dumping sites may create concentrated salts and other pollutants that may seep into nearby surface waters.

- NHDES has an inventoried hazardous waste generators which may be potential sites of pollution if not maintained properly. These sites include underground storage tanks, above ground storage tanks, remediation sites and businesses such as gas stations, auto repair shops and industries. All tanks greater than 1,100 gallons are regulated by NHDES. As of January 1, 1999 all tanks greater than 20 years old were required to be removed. Although underground tanks of less than 1,100 gallons and residential fuel oil tanks located in the basement present a potential threat to water quality, they are not regulated by NHDES. Remediation sites are locations of known contamination or leakage of hazardous waste.

- Stormwater runoff from impermeable surfaces can be the most serious source of pollution because it carries high levels and a broad range of contaminants, and is generally discharged directly into surface waters without treatment. As towns grow along the river corridor, impermeable surfaces and stormwater drainage systems increase bringing a greater potential for surface water contamination.

- There has been a recent concern regarding pharmaceuticals being detected in groundwater, streams, rivers and lakes at very low concentrations. The sources of these pollutants are both improperly disposed of medicines and human waste. There is concern about potential impacts on human health and other species. Most water and wastewater utilities do not

specifically test for pharmaceuticals in the water supply at this time. Over the next few years, the EPA is requiring that all water systems serving more than 10,000 people and a representative sample of water systems serving fewer than 10,000 people collect water samples from their water sources and analyze them for ten common pharmaceuticals. Although pharmaceuticals are not regulated under drinking water regulations, EPA continues to evaluate the occurrence of these compounds in the environment and associated human and aquatic life health effects.

Recommendations

- ☐ Address existing contamination sources.
  - Update the NCC/NHDES inventory of potential contamination sources along the river. These include failing septic systems, underground fuel storage tanks, uses associated with hazardous waste, large impervious surfaces, storm water runoff, and agricultural activities without adequate vegetated buffers.
  - Target hot spots that need attention presently and prioritize protection area.
  - Monitor known and potential contamination sources.
  - Review building permits as one source of information on land use changes in the corridor.

- ☐ Educate municipalities and residents on pollution prevention.
  - Educate the public about the importance of a healthy septic system and provide them with guidance on proper maintenance.
  - Educate homeowners, businesses and local officials about the importance of proper disposal of hazardous wastes.
  - Encourage towns to establish comprehensive hazardous materials management programs to prevent contamination along the river.
  - Educate local land use boards on the importance of effective storm water management and provide them with guidance in BMPs and establishing regulations.
  - Educate the public about everyday hazards and contaminants: advise discretionary use of herbicides and pesticides; abstain from discharge of household chemicals and medications into sewer/septic system.
  - Provide educational programs for winter and summer maintenance crews of towns, including private contractors.
  - Include information on the importance of vegetative buffers in farm newsletters.
  - Publicize Shoreland Act provisions, e.g., no sludge applied to fields within 1, 320 feet of the river, no pesticides within 50 feet unless applied by a licensed applicator.

- ☐ Assist towns in updating and implementing land use regulations.
  - Review existing town regulations and ordinances to see if there are protective measures in place, e.g., requirements for vegetated buffers and stormwater management.

- Compile model ordinances that may be suggested to towns that would improve the protection in their section of the river.
- Attend local land use meetings that are addressing applications for development along the river to make recommendations regarding protective measures and BMPs.

☐ Support periodic hazardous waste and medication collections for proper removal.

☐ Investigate funding options for implementing protection strategies.

☐ Continue ongoing monitoring and reporting to the NHDES by the VRAP water quality testing team.

For More Information

- Innovative Land Use Planning Techniques Handbook, NHDES, NH Association of Regional Planning Commissions, NHOEP, and NHMA, October 2008.
- Other NHDES Publications available on the NHDES website des.nh.gov/organization/divisions/water/publications.htm.

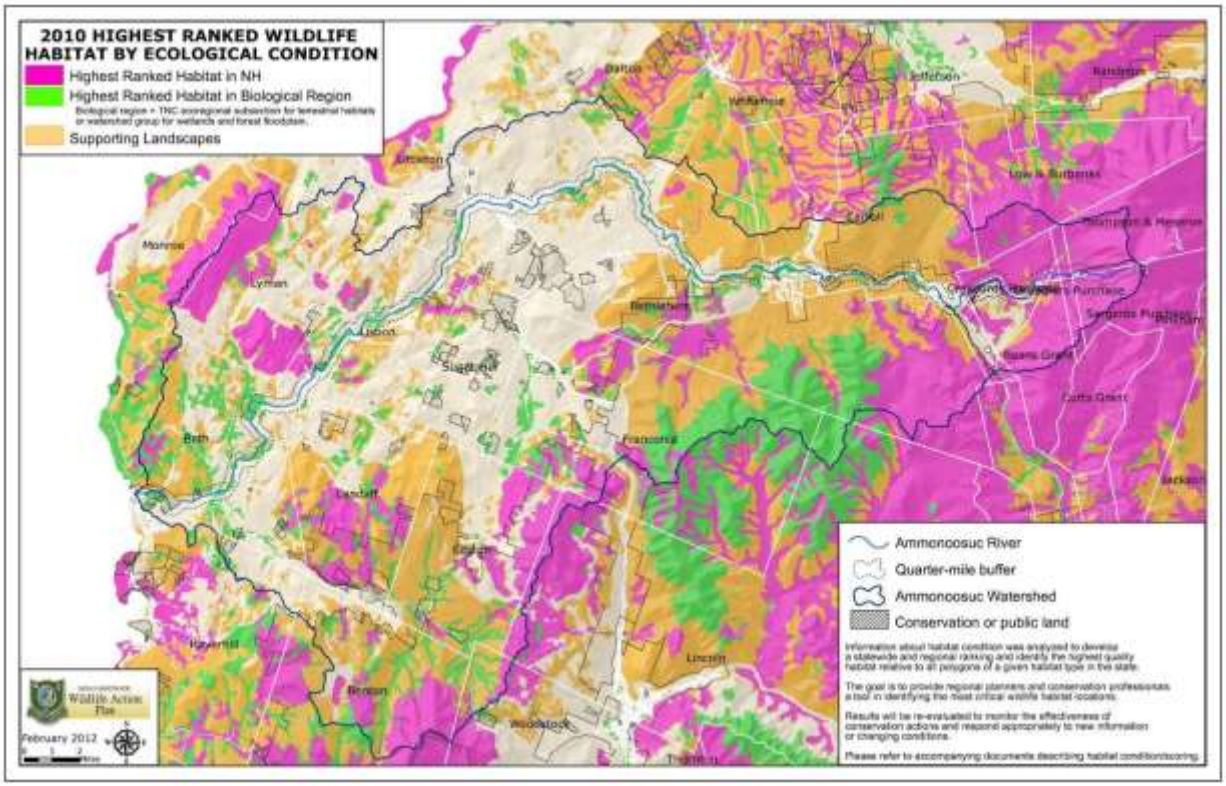
3.8 Wildlife and Fish

Background

Photo by Nancy McCarthy

Wildlife

The Ammonoosuc River supports an extremely diverse habitat comprised of forest, wetlands, and open space that is home to a variety of wildlife. Its floodplains, wetlands, and large sections of unfragmented lands are critical habitat areas that offer important and often irreplaceable wildlife benefits. The Ammonoosuc River was listed as a high priority area in the Connecticut River watershed for contiguous habitat (Silvio O. Conte National Fish and Wildlife Refuge Final Action Plan and Environmental Impact Statement). The NH Fish and Game Wildlife Action Plan indicates this rich area of the river corridor as some of the highest ranked wildlife habitat in the state.



The NH Fish and Game has identified several deer wintering areas and over 140 bird species within the Ammonoosuc corridor. Some of these bird species, such as the bald eagle, osprey and hawks, can be seen in the spring and fall as they migrate to and from their breeding grounds. Bald eagles are occasionally seen throughout the winter months utilizing the large river corridors with open water in search of food. According to Chris Martin, Senior Biologist with N.H. Audubon, an osprey nest was reported adjacent to the river in Bath. Each year for several years now the nest has produced two young.

Osprey nest in the Ammonoosuc corridor
Photo by: Robert Landry, 2009

Large sections of unfragmented land in the Upper Reach section of the river are especially important for moose, black bear, bobcat, state-threatened American pine marten, and federally threatened/state endangered Canada lynx. Recent sightings of the lynx have been documented in Coos County in upper areas of the Connecticut River watershed. The NH Natural Heritage Bureau reports the presence of five threatened or endangered wildlife species in the Ammonoosuc River watershed. The northern bog lemming (NH's rarest mammal) is specifically associated with the Upper Reach segment of the river. Other species on NH Natural Heritage Bureau's Rare Animal List for New Hamspshire that are present in the watershed include the bald eagle (state threatened species), peregrine falcon (state threatened species), and osprey (special concern).

The Ammonoosuc River originates in the alpine habitat at an elevation of 5,018 feet above sea level. In this habitat type, unique plant communities' extreme climate and isolation lead to rare, sometimes site-specific, species, such as the White Mountain fritillary butterfly.

In the spring of 2010 an early emergence of bats was present in the headwater drainage areas of the Ammonoosuc River. Many bats were observed flying during the day in the Mount Washington Cog Railway and Bretton Woods Resort area. Bats were found dead and specimens (little brown bat species) collected confirmed the presence of White Nosed Syndrome. The USFS White Mountain National Forest conducted bat survey work in August and September of 2010 to try and identify the presence of an unknown hibernaculum in the Ammonoosuc Ravine area. Various natural resource agencies are collaborating on continued bat surveys in the Ammonoosuc headwaters area to monitor bat populations.

Fish

The Ammonoosuc River provides habitat for at least 17 resident cold and warm water fish species: Atlantic salmon, blacknose dace, brook trout, brown trout, burbot, common shiner, creek chub,

common white sucker, eastern chain pickerel, fallfish, longnose dace, longnose sucker, northern brown bullhead, rainbow trout, slimy sculpin, tessellated darter and yellow perch.

The Ammonoosuc River has been identified by the US Fish and Wildlife Service as an important cold water fishery. Atlantic salmon fry had been stocked into this river as part of the federal Atlantic Salmon Restoration Program from the mid-1990s to 2011. The program was a major cooperative effort between USF&W, National Marine Fisheries Service, US Forest Service, Atlantic Salmon Commission, N.H. Fish & Game, private organizations, and many volunteers. The termination of the Connecticut River Salmon Program was primarily due to low adult return rates, as well as the destruction of the White River National Fish Hatchery by Tropical Storm Irene. This facility was the sole provider of Atlantic salmon for the Connecticut River Restoration Program.

Studying trout populations in the Ammonoosuc watershed
Photo by Rick Walling, 2011

The Ammonoosuc River is stocked annually with rainbow, brook and brown trout of varied age cohorts. According to the NH Fish & Game, the Ammonoosuc River is suitable for wild, self-sustaining populations of brook trout. Brook trout is one of the most highly sought fish in New Hampshire and is included in the NH Wildlife Action Plan as a "Species of Greatest Conservation Need." Critical habitat found within the corridor includes deep pools, such as Lower Falls in Carroll and the ledges in Bath; smaller pocket pools and spring seeps are scattered throughout the system, which provide cool water refuge necessary for summer survival of cold water species. Additionally, the many tributaries of the Ammonoosuc River provide critical habitat for cool water refuge and spawning for trout and salmon which very often takes place in the tributaries to larger rivers. The Eastern Brook Trout Joint Venture (EBTJV) is a Fish Habitat Partner under the National Fish Habitat Partnership. It is made up of a diverse group of partners, including state fish and wildlife agencies, federal resource agencies, academic institutions and private sector conservation organizations that are all working toward conserving Eastern brook trout and their habitats across their native range. This group reviewed available brook trout habitat and population data from Georgia to Maine and developed a preliminary presence/absence model using various

habitat parameters and conservation strategies by state that would protect, enhance, and restore the brook trout populations that resided there. NH Fish & Game has documented naturally reproducing populations of wild brook trout in this watershed and the EBTJV model classifies the Upper Reach and many tributaries throughout the Ammonoosuc River Watershed as intact, which makes them high priority waters.

A multi-year biological assessment project on the Ammonoosuc River tributaries began in the summer of 2011. It is a collaborative effort between NH Fish & Game, Trout Unlimited, EBTJV, and many volunteers. The project includes habitat, fish, and macro-invertebrate surveys on both the mainstem and its tributaries. The data, once collected and analyzed, will serve as a tremendous resource to the Ammonoosuc River Local Advisory Committee, local municipalities, groups, and anyone interested in the health of the Ammonoosuc River Watershed. This data will be utilized collaboratively by NH Fish & Game and the EBTJV to document brook trout presence within their entire native range, as well as prioritize areas for protection, enhancement and restoration of Eastern brook trout habitat.

Issues

- New Hampshire's Wildlife Action Plan (2005) identified several issues affecting habitats within the Ammonoosuc River watershed including:
  - climate change
  - acid deposition
  - recreational activities
  - human development
  - transportation infrastructure
  - land fragmentation
  - nonpoint source pollution

(See Wildlife Action Plan Critical Habitats and Threats, Appendix 3.8.)

- Continued development in the river corridor with increases in commercial and residential use presents potential issues for both wildlife and aquatic resources. There is growing concern about the impact these changes will have on wildlife and aquatic life. Poor water quality, habitat loss and fragmentation will have the greatest impact on wildlife that require large areas for movement and have specific travel corridors. It is a fundamental tenet of conservation biology that organisms need to move around to some extent. Some organisms need to move vast distances, while others need not move much at all. Studies conducted on brook trout in New Hampshire and elsewhere have clearly demonstrated that some individual trout move very long distances to find cool water and to spawn. For this species, it is absolutely vital that they can access their required habitats. They tend to spawn in tributaries to large rivers (although they also spawn in the large rivers), so migratory barriers such as culverts and dams can impact wild brook trout populations.

- Undeveloped corridors of land that connect habitat areas allow wildlife movement. Riparian areas also offer some of the most reliable sources of early and late season food sources for wildlife. Loss of this critical resource could result in competition for food and adequate cover. The impact of human activity on wildlife extends beyond the area of actual development. It can affect an entire area where habitat value has been meaningfully reduced.

- Development also affects the quality and quantity of aquatic resources. Roads may be the single most destructive element of habitat fragmentation. Culverts can present issues for fish passage and movement of aquatic life. Additionally, undersized culverts are more likely to be damaged during floods, often leading to the deposition of road fill into the streams; this can be one of the greatest impacts to aquatic habitats. Impervious surfaces have been shown to lead to direct and indirect impacts to aquatic ecosystems. The more impervious surfaces in a watershed, the more stormwater runoff there is from developed areas, and traditional peak flood flows occur faster and higher than what would naturally occur. Runoff typically is warmer, and can be polluted with oil and grease, fertilizers, pathogens, household chemicals, and trash; all of which can have negative effects on water quality and therefore can have an impact on all aquatic life forms. Because the peak flows can be higher due to impervious surfaces, sediment transport in streams and rivers can be altered such that there is greater bank erosion than naturally occurs.

- When vegetative buffers along rivers and tributaries are lost, sunlight can further warm water beyond a threshold at which native species, especially coldwater ones like brook trout, can survive and reproduce. Riparian buffers serve a number of important functions. First, they tend to be travel corridors for terrestrial wildlife. Second, decades of research have shown that riparian buffers help filter out contaminants before they can get to the stream/river. The value of this cannot be overstated. Third, they provide shade to the stream/river such that water temperatures are

High water on the Ammonoosuc carrying heavy silt load after Tropical Storm Irene
Photo by Rick Walling, 2011

cooler when a solid riparian buffer is present. Fourth, they provide a critical food source to the stream/river in the form of insects and spiders, especially in mid-summer when macroinvertebrates in the stream/river tend to be hard for fish to obtain. Fifth, they provide organic matter to the stream/river. Large trees, and even small sticks, are part of a healthy stream/river, and are especially important to brook trout, which utilize instream wood directly by hiding under it or within wood jams. Large instream wood helps form pools, a habitat that is vital to brook trout and other fish species, and also allows for the accumulations of leaves, especially in wood jams. The leaves that fall into the stream/river in autumn form the basis of the food web in flowing waters. The leaves are colonized by bacteria and fungi, which obtain nutrients directly from the water, and are in turn eaten by macroinvertebrates that shred leaves (specifically to eat the bacteria and fungi), which are then eaten by fish and then other animals such as mink and people. Sixth, they provide the base for stream bank stability. Intact buffers slow erosion rates by reducing direct runoff through their diverse plant/root composition.

- Water quantity can also affect aquatic species on both ends of the spectrum, drought and low flow conditions, as well as flood and high water conditions. Manmade dams and even dams created by beavers can affect water quantity and natural flow rates. Aquatic organisms are well adapted to natural flows, including severe floods and droughts. They are not, however, adapted to withstand flows heavily altered by human activities. In heavily developed watersheds, it is common for peak flood flows to be higher and occur more frequently than under natural conditions, and droughts tend to be much more severe in duration and flow. A large amount of research has documented these problems and also that fish species respond negatively to altered flows, with certain species, such as brook trout, being very sensitive to flow alteration. Species that are specifically adapted for riverine conditions are also very sensitive to flow alteration and many examples exist in which entire populations of fish species have been extirpated from streams with severely altered flows.

- Unintended spread of invasive species is a more recent problem in the Ammonoosuc watershed and has the potential to greatly impact aquatic habitat by impairing water quality and crowding out species needed by wildlife. The Upper Reach has remained free of Japanese Knotweed; the mainstem south from Littleton has notable areas of spread to Lisbon and Bath. Purple loosestrife continues to spread along road way ditches adjacent to the Ammonoosuc River.

- Poorly designed culverts and unmaintained culverts can prohibit free movement of aquatic life (fish, amphibians, invertebrates) and stream substrate.

Recommendations

- ☐ Encourage towns to develop natural resource inventories to collect and compile existing information on local resources into one document and map set, and natural resource

protection plans to identify approach to resource protection most appropriate for the community.

- ☐ Include wildlife, fish and habitat in conservation planning efforts, using existing resources such as natural resource inventories, open-space plans, conservation plans, etc.
- ☐ Encourage landowners and conservation groups to consider connectivity relative to the various habitat needs of aquatic species when protecting, maintaining and restoring habitat.
- ☐ Encourage landowners to work with NH Fish and Game Department and UNH Cooperative Extension County Foresters to conduct habitat management on lands to maintain habitat diversity.
- ☐ Protect, restore and maintain vegetative buffers along river and stream corridors to help maintain water quality.
- ☐ Public and private landowners, road crews, utilities and recreationists should be encouraged to follow best management practices for invasive species management.
- ☐ Provide education to residents within Ammonoosuc River watershed about the importance of maintaining habitat for terrestrial and aquatic species.
- ☐ Strive to reduce human alteration of natural flows; consider the impacts of proposed flow alterations on a wide range of aquatic organisms.
- ☐ Replace existing culverts with bottomless archway culverts or bridge design to facilitate free upstream and downstream movement. Develop maintenance schedules to monitor culverts before they become a problem.

For More Information

- NH Wildlife Action Plan, NH Fish and Game, http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm
- NH Natural Heritage Bureau, http://www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/
- Trout Unlimited, http://www.tu.org
- Ammonoosuc Chapter of Trout Unlimited, http://www.ammotu.org
- Eastern Brook Trout Joint Venture, http://www.easternbrooktrout.org

3.9 Plant Habitat

Background

The species present along the Ammonoosuc River corridor are the result of climate, elevation, hydrology, soils, and human impacts. The entire corridor is within the humid temperate ecosystem but the corridor is within two separate ecological subunits along its length, according to the US Geological Survey. The lower section is in the New Hampshire Upland subsection and the northern (upper) portion in the White Mountain subsection. While most species are found in both sections, the White Mountains area is dominated by large areas of spruce-fir forests and northern hardwood forests while the lower portion of the corridor is a transitional area of coniferous and hardwoods forests. For example, coniferous forests in Bath consist primarily of white pine while those in Carroll are comprised of balsam fir and red spruce. Hardwoods in the northern section may have a predominance of yellow birch while in the lower end the northern extent of red oak can be seen in Landaff and Bath. Wetland plant communities in both sections are dominated by palustrine forested communities.

Mountain Avens (Geum peckii)
Photo by Leslie Bergum

Literally hundreds of plant species may be found in the corridor. Representative species include: balsam fir, white spruce, red spruce, black spruce, arbor vitae, white pine, eastern hemlock, tamarack, red oak, red maple, sugar maple, yellow birch, beech, moosewood, white birch, aspens, shadbush, ash, poplar, white cedar, along with alder, willows, dogwoods, elderberry, winterberry, blueberry, cherry, and large and varied number of herbaceous weed, grass, and wildflowers.

Wetlands, including river and stream banks, provide a unique habitat that is suitable for hundreds of species of sedges, rushes, grasses, ferns, and woody species. Wetlands offer a diversity of species not found elsewhere in the corridor.

The alpine zone which occurs above treeline at approximately 4,900 feet elevation, is an area that due to its extreme climate and isolation leads to many rare species. High winds, precipitation, cloud cover and fog result in low annual temperatures and a short growing season. This area where the river arises is a special habitat with some species that are unique to this location.

Moss Plant, also known as Moss Heather (Harrimanella hypnoides) Photo by David Govatski

Endangered or Threatened Species

The following tables indicate state-listed endangered or threatened plant species that are supported by the river and river corridor environment. The species location and species status in New Hampshire are listed and noted as follows: endangered [E], threatened [T] species. The Plant Habitat Tables in Appendix 3.9 list the type of habitat in which each plant species might be found in the watershed.

Plant Species	Location	Threatened/ Endangered
Dwarf Birch	Chandlers Purchase, Thompson & Meserve	E
Harsh Bluepoint	Sargents Purchase	E
Pickering's Bluepoint	Sargents Purchase	T
Black Sedge	Sargents, Crawfords, Chandlers, and Beans Purchase, Thompson and Meserve, Carroll	E
Bigelow's Sedge	Sargents, Beans and Chandlers Purchase, Thompson and Meserve	T
Diapensia	Sargents, Beans and Chandlers Purchase, Thompson and Meserve	T
Hornemann's Willowherb	Sargents Purchase, Beans Purchase, Thompson and Meserve	T

Mountain Avens	Sargents Purchase, Beans Purchase, Thompson and Meserve	T
Moss Plant	Sargents Purchase, Thompson and Meserve	E
Plant Species	**Location**	**Threatened/ Endangered**
Sweet Alpine Grass	Sargents Purchase, Thompson and Meserve	T
Lily-leaved Twayblade	Sargents Purchase, Carroll	T
Heart-leaved Twayblade	Sargents Purchase, Beans Purchase, Carroll, Thompson and Meserve	T
Alpine Azalea	Sargents Purchase, Chandlers Purchase, Thompson and Meserve	T
Spiked Woodrush	Sargents Purchase, Thompson and Meserve	T
Boott's Rattlesnake Root	Sargents Purchase, Chandlers Purchase, Thompson and Meserve	E
Mountain Heath	Sargents Purchase, Thompson and Meserve	T
Wavy Bluegrass	Sargents Purchase, Thompson and Meserve	E
Lapland Rosebay	Sargents Purchase, Chandlers Purchase, Thompson and Meserve	T
Baked Appleberry	Sargents Purchase, Chandlers Purchase	T
Silver Willow	Sargents Purchase	E
Tea-leaved Willow	Sargents Purchase, Thompson and Meserve	T
Bearberry Willow	Sargents Purchase, Chandlers Purchase, Thompson and Meserve	T
Alpine Brook Saxifrage	Sargents Purchase, Thompson and Meserve	E
Peat Moss	Sargents Purchase, Crawford Purchase	T

Alpine Blueberry	Sargents Purchase, Beans Purchase, Thompson and Meserve	T
Mountain Hairgrass	Sargents Purchase, Thompson and Meserve	T
Plant Species	**Location**	**Threatened/ Endangered**
Alpine Marsh Violet	Sargents Purchase, Chandlers Purchase, Thompson and Meserve	E
Hidden Sedge	Carroll, Bethlehem	E
Meadow Horsetail	Carroll	T
Millet Grass	Carroll	T
Thin-leaved Alpine Pondweed	Carroll	T
Wapato	Carroll	T
White Bluegrass	Carroll	T
Kidney-leaved Violet	Carroll, Bethlehem	T
Jack Pine	Bethlehem	T
Goldies Fern	Bethlehem	T
Green Adders-mouth	Carroll, Bethlehem, Landaff	T
Cileated Aster	Bethlehem, Littleton	T
Cileated Willow-herb	Bethlehem, Littleton, Bath	T
Bailey's Sedge	Littleton	T
Garber's Sedge	Littleton	E
Grass of Parnassus	Littleton	T
Pursh's Goldenrod	Littleton	T
Three-leaved Black Snakeroot	Littleton	T
Golden-fruited Sedge	Littleton, Landaff	T
Bebb's Sedge	Littleton, Haverhill	T
Large Yellow Lady Slipper	Landaff	T
Chestnut Sedge	Lisbon	E
Kalm's Lobelia	Bath, Haverhill	T
Climbing Fumitory	Bath	T
Dwarf Ragwort	Bath	T
Great St. John's-wort	Bath	T
Gregarious Black Snakeroot	Bath	T
Hairy Rock	Bath	E
Houghton's Umbrella-sedge	Bath	T
Incurved Umbrella-sedge	Bath	T

Loesel Twayblade	Bath	T
Siberian Chives	Bath	T
Hackberry	Haverhill	T
Bosc's Pigweed	Haverhill	T
Green Dragon	Haverhill	E

Natural Communities

The following table indicates vegetative communities supported by the river and the river corridor environment which have been identified as "exemplary natural ecological communities" by the New Hampshire Natural Heritage Inventory, and their respective locations. An “exemplary” natural community means a viable occurrence of a rare natural community type or a high quality example of a more common natural community type as designated by the Natural Heritage Bureau based on community size, ecological condition, and landscape context. See the Plant Habitat Tables in Appendix 3.9 for a list of plant species associated with each community.

Exemplary Natural Ecological Community	**Location**
Wet Alpine/subalpine bog	Chandlers Purchase, Thompson & Meserve, Sargents Purchase
Acidic Riverside seep	Carroll, Bretton Woods area at Lower Falls
Moderate-gradient sandy-cobbly riverbank system	Carroll
Sugar Maple-ironwood-short husk floodplain forest	Carroll
Sugar Maple/false nettle-sensitive fern floodplain	Carroll
Red spruce swamp	Bethlehem, Landaff
Poor level fen/bog system	Bethlehem
Northern medium sedge meadow marsh	Bethlehem
Northern hardwood-black ash-conifer swamp	Bethlehem
Montane sloping fen system	Bethlehem
Montane heath woodland	Bethlehem
Medium level fen system	Bethlehem
Sugar Maple-beech-yellow birch forest	Bethlehem
Spruce-birch-mountain maple wooded talus	Bethlehem
Red spruce-heath-cinquefoil rocky ridge	Bethlehem
Montane lichen talus barren	Bethlehem
Montane acidic cliff	Bethlehem
Lowland spruce-fir forest	Bethlehem

Black spruce-larch swamp	Bethlehem, Landaff
Rich mesic forest	Littleton, Landaff
Northern white cedar-balsam fir swamp	Littleton, Bath
Rich slopping fern system	Littleton
Hemlock-spruce northern hardwood forest	Landaff, Bath
High gradient rocky riverbank system	Landaff, Bath
Herbaceous riverbank/floodplain	Landaff
Exemplary Natural Ecological Community	**Location**
Red maple -black ash -swamp saxifrage swamp	Landaff
acidic riverbank outcrop	Bath, Haverhill
Red pine rocky ridge	Haverhill
Rich maple-oak-hickory terrace forest	Haverhill
Silver maple-wood nettle-ostrich fern floodplain forest	Haverhill

The information listed above was obtained from the NH Natural Heritage Bureau. More information on the NH Natural Heritage Bureau can be found in Appendix 3.9.

Issues

- Much of the area has not been surveyed for rare species.
- Identification and protection of rare species are dependent upon awareness and stewardship by private landowners and those working on the land.
- Invasives are becoming an increasing concern as these are plants that outcompete native species and in most cases do not provide the same habitat benefits of those they replace.
- Increasing development and growth leads to increasing impacts on natural communities, not only due to the development itself, but also due to increasing numbers of people recreating in the outdoors.
- Human impacts on the climate are expected by many to reduce the habitat available for alpine species.

Recommendations

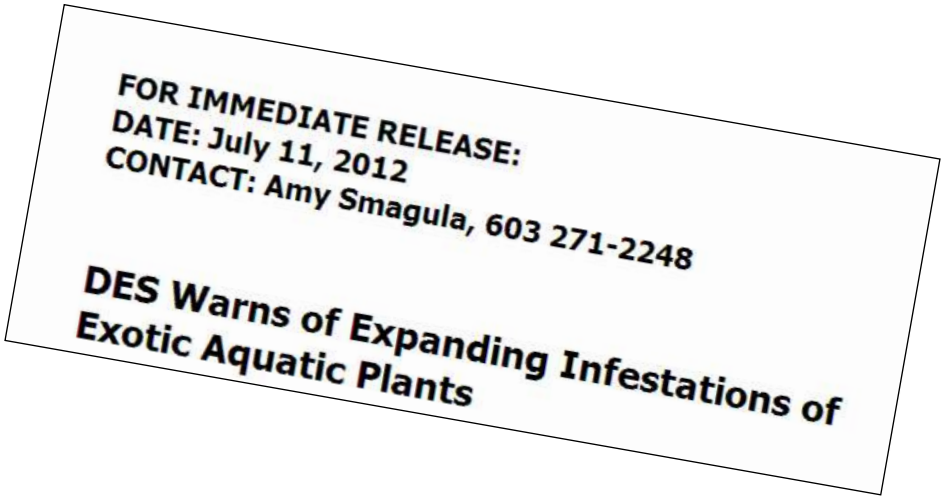
- ☐ Increase landowner education - promote surveys to identify rare species and important natural communities, and stewardship of important habitat areas.

- ☐ Promote consideration of rare species in forest management plans.
- ☐ Increase the identification and eradication of invasive species.
- ☐ Support increased education of recreationists by public agencies and nonprofits on topics such as the age and fragility of alpine plants and the importance of leashing dogs when near important plant and wildlife habitat.

For More Information

- ➢ Natural Heritage Bureau, DRED Division of Forests and Lands, http://www.nhdfl.org/natural-heritage-and-habitats/

3.10 Invasive Plants


FOR IMMEDIATE RELEASE:
DATE: July 11, 2012
CONTACT: Amy Smagula, 603 271-2248

DES Warns of Expanding Infestations of Exotic Aquatic Plants

Background

Invasive species are species that are not native to the ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112, February 3, 1999). Invasive species typically possess certain traits that give them an advantage over many native species. The most common traits include:

- production of many offspring
- early and rapid development
- adaptability and tolerance of a broad range of environmental conditions
- absence of natural controls to keep them in check

(NH Department of Agriculture Invasive Species Committee on-line fact sheet)

These traits allow invasive species to be highly competitive and, in many cases, suppress native species. Studies have shown that invasives can reduce natural diversity, impact endangered or threatened species, reduce wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop production, damage personal property, and cause health problems (NH Department of Agriculture Invasive Species Committee on-line fact sheet). Some invasive plant species can also reduce or alter flow and cause bank erosion.

Terrestrial Invasives

Terrestrial invasives are those found along riverbanks, in the moist soils of forests, wetlands, seeps, floodplains and at the edges of woods and trails. Two invasive species that have taken hold in colonies throughout the Ammonoosuc River corridor are Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria)*. Both grow in a variety of soils and habitats, including stream and river shores. Other invasive species which grow in streams and riverbanks, floodplain forests and marshes are: yellow flag iris (*Iris pseudacorus*), coltsfoot (*Tussilago farfara)*, ornamental jewelweed (*Impatiens glandulifera*), common reed (*Phragmites australis*) Japanese stiltgrass *(Microstegium vinimeum), c*yprus spurge (*Euphorbia cyparissias),* true forget-me-not (*Myosotis scorpioides*), garlic mustard (*Alliaria petiolata*), goutweed or bishop's weed (*Aegopodium podagraria*) and celandine (*Chelidonium majus*). Poison ivy, while not considered an exotic invasive, is spreading rapidly in and around riverside recreation areas.

Aquatic Invasives

The four sub-categories of aquatic invasives are :

- Emergent
- Submergent
- Floating
- Algae

Like terrestrial invasives, exotic aquatic plants threaten native vegetation. They can also impact recreation and lower property values. By changing the chemistry of a river's water and thus its ecology, trout streams may be altered so that they no longer attract May and Caddis flies which provide food for trout. By choking surface waters they can impede personal water craft, deprive the water of oxygen, and affect the aesthetic and economic value of riverside properties.

Issues

- As of this writing, the NH Department of Environmental Services (NHDES) Limnologist/Exotic Species Program Coordinator states that to her knowledge there are no invasive aquatic plants or algae within the Ammonoosuc River. But because some of the more dangerous have been identified in neighboring states and in some other New Hampshire rivers and lakes, it is essential to be on the lookout for evidence of their invasion. Didymo (Didymosphenia geminata), commonly known as "rock snot", is the only form of algae threatening the Ammonoosuc. A low-nutrient diatom which anchors itself to rocks and spreads rapidly by its secretions, Didymo is especially dangerous because the Ammonoosuc offers its classic habitat of a cold, flowing stream with a pH lower than 7.5. Although introduced only in 2006 and noticed in 2007, it is now already widespread in New Hampshire. By clinging to fishermen's waders, other footwear, clothing, canoes and kayaks, as well as anything else that has been in infected water, it is easily introduced elsewhere.

- Three emergent aquatic invasives considered to be of most danger to the Ammonoosuc are: Purple Loosestrife, Common Reed, and Yellow Iris. Although these have roots in the river bank, clumps may break off with erosion and take root in the stream. The Common Reed has also been documented to grow from the banks out into river systems, forming peninsulas and small island areas.

Purple Loosestrife, Photo by Amy Spagula NHDES

Phragmites or Common Reed, Photo by Amy Spagula NHDES

Yellow Iris
Photo by Amy Spagula NHDES

- Among submerged invasives the two most threatening to the Ammonoosuc are Eurasian water-milfoil (*Myriophyllum spicatum*) and variable milfoil (*Myriophyllum heterophyllum*). They spread quickly, out-producing native species and are coming into New Hampshire, mainly on boat bottoms from Maine and Vermont. Others, already in some southern rivers and lakes, are hydrilla (*Hydrilla verticillata*), Brazilian elodea (*Egeria densa*), fanwort (*Cabomba caroliniana*).

Eurasian Water Milfoil
Photo by Amy Spagula NHDES

Variable Milfoil, Photo by Amy Spagula NHDES

Others, already in some southern rivers and lakes, are hydrilla (*Hydrilla verticillata*), Brazilian elodea (*Egeria densa*), fanwort (*Cabomba caroliniana*).

Fanwort, Photo by Amy Spagula NHDES

Hydrilla, Photo by Any Spagula NHDES

- The most dangerous floating invasive is water chestnut (*Trapa natans*), introduced from Massachusetts forty years ago and already in the Connecticut River. The plant can anchor to the bottom with a seed and thin stem, but most of the biomass of the plant floats at the water's surface. The seeds are very spiny and harmful if stepped on. They can also persist in the sediment and remain viable for 10-12 years.

Water Chestnut, Photo by Amy Spagula NHDES

- Terrestrial invasive plants are already a problem along much of the Ammonoosuc River. Since they are by definition opportunistic and able to outcompete native plants when an area is disturbed, they often replace native vegetation on the riverbank after an event causing bank erosion. Since they do not tend to stabilize the soil as well as a mix of native species, the result is often an increase in riverbank erosion. An example of this is shown on the photo below of knotweed along the Ammonoosuc River.

Photo by Field Geology Services, 2009

Recommendations

- ☐ Inventory and monitoring of native and nonnative plant species found in the river corridor to enable timely identification of new occurrences of invasive plants. Enlisting volunteers to receive training from and work with experts from NHDES Exotic Species Program, NH Rivers Council or other specialists could serve to increase public education as well. Training of the VRAP volunteers to identify aquatic invasives would provide the opportunity for them to note new infestation when collecting water quality samples.

- ☐ Rapid response to aquatic invasives through a program of early detection by teams of volunteers followed by control/eradication efforts coordinated and led by state agency professionals or contractors.

- ☐ Education to riparian landowners and school children through talks and distribution of publications on invasive species available from NHDES.

- ☐ Outreach education for fishermen, boaters and swimmers to teach and remind them before entering the Ammonoosuc to check their equipment for any materials from invasive species and, if found, how to properly clean their equipment and dispose of the invasive material.

- ☐ Public education regarding the fact that if recreationists have been in a contaminated watershed, it is necessary to properly clean everything regardless of a visual inspection as a contaminant can be microscopic.

For More Information

- The USDA National Invasive Species Information Center provides a clearinghouse for information about invasive species at www.invasivespeciesinfo.gov/unitedstates/nh.shtml .
- Information specific to New Hampshire's exotic aquatic species can also be found at des.nh.gov/organization/divisions/water/wmb/exoticspecies/index.htm
- NH Department of Environmental Services Fact Sheet WD-BB-61 FAQs about Rock Snot in New Hampshire http://des.nh.gov/organization/commissioner/pip/factsheets/bb/index.htm

3.11 Water Quantity

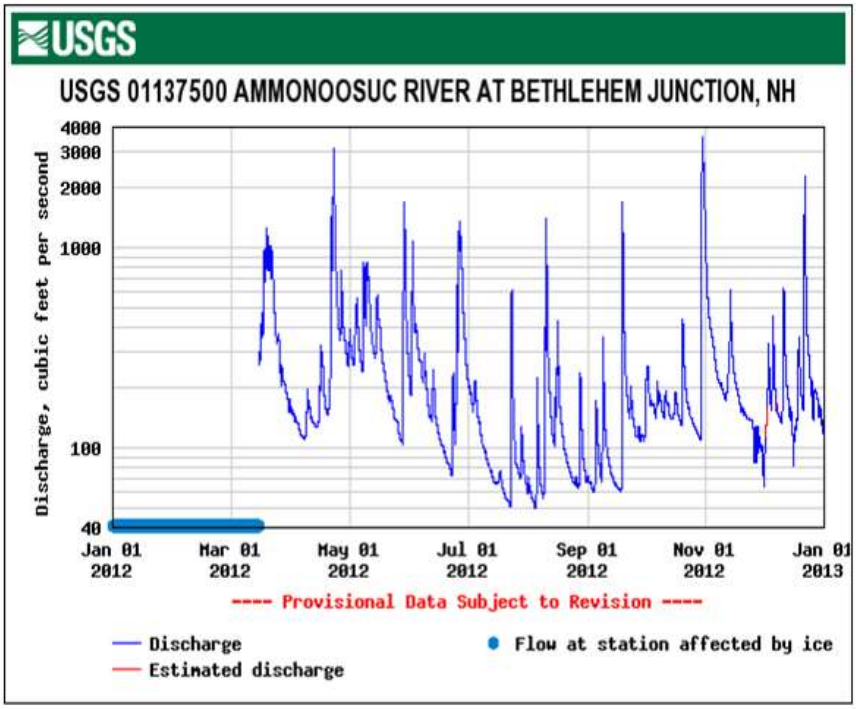
Background

Stream flow varies dramatically on the Ammonoosuc due to climate, precipitation patterns, and watershed characteristics. Currently, the USGS maintains a stream flow gauging station on the Ammonoosuc River at one location in Bethlehem. Another station was operated in Bath between 1936 and 1970. River flow data from each USGS gauge are shown below.

Ammonoosuc River Flow Data

Location	***Bath***	***Bethlehem***
Years of Data	1936-1970	1939-2002
Drainage Area (sq.miles)	395	88
Annual Mean (cfs)	639	207
Highest Annual Mean (cfs)	1,004	323
Lowest Annual Mean (cfs)	413	131
Minimum Daily Dis. (cfs)	-	16
Highest Daily Mean (cfs)	-	6,300
Maximum Peak Flow (cfs)	27,900	11,300

As shown, recorded flows vary greatly from year to year and between peak flows and mean flows. Spring is the normal period of high mean river flows due to snowmelt and rainfall.



In New Hampshire, all facilities that use more than 20,000 gallons of water per day, averaged over a seven-day period, must register with NH Department of Environmental Services (NHDES). There are several registered facilities that withdraw water directly from the Ammonoosuc mainstem:

Woodsville Water & Light, Municipal Water Supply	Haverhill
CHI Operations, Inc., Woodsville Hydroelectric Power	Haverhill
Bath Electric Power Co., Hydroelectric Power	Bath
Lisbon Wastewater Treatment Facility	Lisbon
Littleton Wastewater Treatment Facility	Littleton
Pine Tree Power Co. Biomass Electric Generation	Bethlehem
Bretton Woods Ski Area	Carroll
Mt. Washington Hotel golf course	Carroll

Several other facilities withdraw water from nearby wells and from wells or tributaries throughout the watershed.

Issues

- Aquatic species require certain volumes and patterns of flow.
- River-based recreation, aesthetics/property values, and tourism are dependent on a certain minimum flow volume.
- Aging infrastructure is making leak detection and metering important tools for reducing waste.
- Additional education is needed to address water waste such as single-family swimming pools, daily laundering of towels for multi-night guests, sprinklers that go off on a timer rather than as needed.
- Funding to maintain stream gages is often threatened when federal budgets are cut.

Policies and Recommendations

- ☐ State and federal agencies should work to maintain and restore stream gages in key points throughout the watershed.
- ☐ The Ammonoosuc LAC should, whenever possible, inform the corridor towns and residents about the stream gages and the value they have for monitoring water levels and flooding events.

- ☐ Proposed large withdrawals in the watershed which have the potential to impact the volume and/or pattern of flow in the river need to be carefully evaluated for their impacts on aquatic species, recreation, aesthetics/property values and the tourism economy.

- ☐ Collaborate with state efforts to increase awareness of areas where both residential and nonresidential water usage can be reduced; use the area's scenic beauty as an awareness campaign tool.

- ☐ Regulators should incorporate more flexibility to utilize new technology and approaches, e.g., appropriate uses for grey water, stormwater credits for rain gardens and rain barrels.

- ☐ Water conservation technology should be required for large users such as irrigation and snow-making.

For More Information

- ➢ The US Geological Survey data regarding flows on the Ammonoosuc River can be found at http://waterdata.usgs.gov/usa/nwis/uv?site_no=01137500 **.**

3.12 Dams

Lisbon Dam Powerhouse and canal
Photo by Field Geology Services, 2009

Background

Most of the Ammonoosuc River is free flowing. Of the fourteen dams that have been documented on the Ammonoosuc River, only five remain intact. The remainder are in ruins with most having been old stone and timber dams used for generating power for early mills.

Four of the remaining dams are being managed for hydroelectric power – Woodsville Dam, Ammonoosuc River Dam (in Bath), Lower Lisbon Dam, and Apthorp Dam in Littleton. Removal of the fifth remaining dam - Bethlehem - has been considered by NH Fish & Game to have potential benefits to fish habitat, but it is privately owned.

Two dams – Woodsville and Apthorp – are classified by NHDES Dam Bureau as “Significant Hazard” structures, meaning that, due to their location and size, failure or misoperation would result in one or more of the following: major economic loss to structures or property, structural damage to a state highway, or major environmental or public health impacts. The other three dams are classified as “Low Hazard” structures. Inspection frequency is based on these classifications to ensure that repairs needed to maintain safe operation are identified.

Issues

- These dams do not act as flood control structures; however, there are small impacts to flow characteristics since water is diverted for short distances at these hydro sites. Additionally, the dams' old impoundments are shallow and contain sediment. This undoubtedly causes a slight warming of the waters in the summer months behind the dams.

- Energy costs and the desire to reduce dependency on foreign sources and on fossil fuels has led to increased interest in hydropower.

- Without proper consideration for fish passage, dams can disrupt the connectivity between essential components of habitat.

Recommendations

- ☐ Carefully consider the impacts of new and existing hydropower projects on aquatic life and the geomorphology of the river.

- ☐ Ensure that adequate provisions are made for fish passage.

- ☐ Evaluate the benefits and impacts of removing inactive dams.

3.13 Recreation

Background

Photo by Leslie Bergum

The Ammonoosuc River arises in the pristine setting of Lakes of the Clouds on Mt. Washington. It descends through the White Mountain National Forest, flowing alongside the Ammonoosuc Ravine Trail, a drop of 2,500 feet from its source to the Cog Railway Base Station. It cascades over the Upper Falls, famous for high rocks and whirlpools. Young people get drawn there by the natural features and by stories about the deaths at the falls. The area is well marked with warnings that there is no safe way to jump off the 25' high rocks into the pools below due to unseen projectiles and unpredictable deadly forces, arising from the dark depths below. The river drops 30’ at Lower Falls, a less dangerous area frequented mainly by families, who are also forewarned by signs that caution is needed.

The upper stretch is too steep and rocky to navigate by boat. Navigation of the river can only be done in stretches with portages to get around impassable falls and four dams encountered along the course of the river. It is one of the finest whitewater rivers in New Hampshire; enthusiasts come to take it on in the spring. The river flows downstream in a series of very strong rapids; large boulders in the channel become giant boulders in the difficult pitches. It goes through a gorge as Class IV rapids. By Alder Brook the river is steep and comes to a series of drops, called the Railroad Rapids. After passing under the Railroad Bridge, the river loops around the end of the former Littleton Airport. The whitewater experience is only recommended for those with the skills and experience required. Novices and intermediately skilled people can put in at the quiet stretches, where the water is smooth and easy paddling. Recreational

use requires being informed about the extent of the river so as not to put in at a quiet stretch that in short order becomes a series of rapids and drops.

Over the summer, except after heavy rainfall associated with storms, the water level is low and navigation is restricted to kayaking. A canoe can be paddled in more placid sections of the river, before the water level goes down.

Photo by Leslie Bergum

Native brook trout, as well as stocked rainbow trout and brown trout, make the river a popular destination for fisherman.

The Ammonoosuc River flows through natural, rural, community, and rural-community areas. By the time it reaches downstream, it passes by agricultural lands, where the river is mostly quiet with riffles. Gold panning is done in the lower Ammonoosuc River by the confluence with the Wild Ammonoosuc River. Bird watching and photography are popular pastimes with delight to those who happen to see a Great Blue Heron, Osprey, or Bald Eagle. There are three picturesque covered bridges along the river. The Ammonoosuc Rail Trail, popular with ATVers, mountain bikers, and snowmobilers, is 19 miles long and goes next to the river between Littleton and Woodsville. There are limited public access areas to the river but visitors are allowed to park at any suitable place along the way that will accommodate their vehicle. There are town trails and picnic areas including the publicly owned recreation areas of the White Mt. National Forest Zealand Trails in Carroll, Bretzfelder Park and Town Forest in Bethlehem, Dells Park, Kilburn Crags, and Pine Hill in Littleton, Bath Covered Bridge Picnic area and many state and federal snowmobile trails in towns. The Ammonoosuc River watershed offers a playground for all seasons of economic benefit to the state. Licensing of sportsmen engaged in fishing and hunting, gear for outdoor enthusiasts, and accommodations and meals for visitors all contribute to the local and state economy.

Ammonoosuc Rail Trail in Lisbon, Photo by Tara Bamford, NCC, 2012

Swimming at the Ledges in Littleton, Photo by Connie McDade

Issues

Outdoor recreation is fundamental to life in New Hampshire for residents and visitors alike. Public access to the river is limited for swimming, fishing and boating. Established trails adjacent to the river, such as Littleton's Riverwalk, are popular for walking and bird watching. Biking, ATV riding, and snowmobiling make use of the old railroad bed that parallels the river between some of the river corridor towns. Pros and cons have been discussed about proposals for the rails to trails initiative. Stewardship coalition between volunteers, landowners and people, who engage in recreation on established trails by the river, is essential to maintaining the existing recreational opportunities. The following factors need to be taken into account:

- Boating and swimming safety
- Illegal camping
- Public access
- Inadvertent transfer of invasive species "Rock Snot" Didymo present on a wet item that has not been properly treated from a body of water where it is present into a Didymo-free body of water, including but not limited to fishing gear, felt-bottom wader shoes, life preservers, water toys, bathing suit, canoe and kayak bottom, and even the hair of a dog
- Fishermen cleaning their fish in a swimming area
- Habitat impacts from motorized gold dredging and enforcement of permits
- Power equipment for gold dredging causes turbidity, undermines the riverbank, and gets fuel in the water.
- Gold dredging regulations – permit is issued to the person rather than being site specific
- Trash, oil, fuel along riparian trail stopping points
- Erosion from ATVs and mountain bikes
- Erosion observed by river bend's proximity to highway
- Fluctuation in water release from dams, water levels affecting recreation
- Salt from winter snow plowing and snow storage; nitrate from fertilizers used by farmers
- Absence of vegetative buffer next to some agricultural soils

Current NH Department of Environmental Services (NHDES) permits for motorized gold dredging are not site specific but instead go with the person. This makes it difficult for local officials and others to assist NHDES staff with enforcement since there is no way to know if an individual has a permit or not. This continues to be an area of concern in the region as some undercutting of banks and unpermitted activity has been known to occur. Landowner permission is required for both motorized dredging and nonmotorized extraction (panning). Signs at access points noting landowner permission and permit requirements would assist landowners.

Recommendations

- ☐ Identify and map public access and parking locations.

- ☐ Increase compliance with NHDES gold dredging regulations, including:
  - Signage in gold dredging areas to alert participants that NHDES Wetland Bureau permitting (Recreational Mineral Dredging Application) is required for motorized activity. The applicant has to get written permission from the landowner before the application is submitted for the permit. The permit is issued specific to the name of the person applying.
  - Closely monitor and regulate motorized activities.
  - Keep a log book on hot spots where mechanized dredging is done.

- ☐ Increase public education, through such means as:
  - Flyers about the river made widely available, including through business groups and places with tourist brochures.
  - Hold summer program series for landowners and tourists
  - Work with partners to post and maintain signs for fishermen and boaters at access points about precautions to prevent spread of Didymo (wash items with soap and water at home; rinse well. Dry items for 48 hours before going into another river or lake.)
  - Publicize information on the economic importance of recreation to the State.
  - Identify areas containing old trash and tires for a clean-up day.

- ☐ Vegetative buffers should be restored and maintained between trails and the river.
  - Identify roadside areas of erosion in need of bank stabilization
  - Inventory areas with inadequate vegetated buffers.

- ☐ Ensure that the importance of flow management to recreational use is considered when dam permits are sought, renewed and enforced.

3.14 Historic and Cultural Resources

Bath Covered Bridge, Photo by Field Geology Services, 2009

The Ammonoosuc River corridor has played a major role in the history of the area. Before the first white settlers, the Abenaki Indians fished and camped along the river, netting fish in the narrow river bends, such as Salmon Hole. Ammonoosuc is an Abenaki word for 'fish place,' a very appropriate designation even today. With an abundance of fertile soils and varied landscapes The Ammonoosuc Valley has provided a welcoming environment for millennia, providing more than the simple necessities of life. At the close of the Ice Age, the waters of proglacial Lake Hitchcock covered much of what is now the lower part of the valley. In this area the lake may have persisted only between 15000 and 13000 BP, probably preceding human entrance into the area. With the draining of Lake Hitchcock, the area began the process of taking on the appearance as we know it today.

Relatively few prehistoric Native American sites are officially recorded within the corridor; however, this is almost certainly a result of limited investigation rather than a lack of use of the area prehistorically. The earliest inhabitants of North American are referred to as Paleoindians and entered this area with the end of the last ice age. No Paleoindian sites are recorded in corridor. However, several Paleoindian sites have been reported on the Israel River drainage to the north, indicating that the region was occupied as early as about 11,000 years ago. Throughout this period the region was utilized by a low density, dispersed and highly mobile population. Through the later stages of prehistoric times populations increased and became more regionalized. Stone tool technology and gathering and hunting continued to provide sustenance but groups were less wide ranging. The first pottery appears in the area a little over 3000 years ago. Horticultural produce did not become an important part of the diet until late in prehistoric times. Early historic accounts document the presence of Native Americans within the corridor.

The first European settlers to the valley found their way via the Connecticut River in the mid-eighteenth century. Frontiersman and settlers made their way up the Ammonoosuc River from its confluence with the Connecticut and also came overland to the Littleton area from 15 Mile Falls on the Connecticut River. The first hunters began moving up the valley around 1750. The area saw no major engagements directly associated with the French and Indian War, although Rogers Rangers stopped at the mouth of the Ammonoosuc on their way back from the destruction of St. Francis, Quebec in 1759 before proceeding down the Connecticut. Following the end of the French and Indian War charters for many of the towns were granted by the King of England in the 1760's. In 1792, Timothy Nash, a moose hunter, crossed the great mountain gap known today as Crawford Notch and opened an invaluable trade route between the Atlantic coast and the upper Ammonoosuc valley.

The greater part of the pioneers were people of limited means and made their living as hunters, blacksmiths, farmers and lumbermen. The early economy grew, industries were developed to support farming and lumbering. In the late eighteenth century, dams were built on the Ammonoosuc in Bath, Lisbon, and Littleton to power gristmills, sawmills, and shingle mills. Later starch mills, tanneries, smelting mills, bobbin mills, and peg mills were constructed, all relying on water power either on the Ammonoosuc or its larger tributaries. Historic documents mention large charcoal kilns erected in the area which gave employment to about 300 men.

As early as 1803, room and board was offered to travelers at the site now called Fabyan's in the Town of Carroll. This heralded the later development with the opening of the summer hotels through the nineteenth and into the twentieth centuries. The last of the grand hotels constructed in the area, the Mount Washington Hotel built in 1902, is located on the Ammonoosuc River and in front of the mountain from which it takes its name, still attracts visitors to the area.

The coming of the railroad in the mid nineteenth century caused an increase in the variety and types of mills along the river, including shoe and boot factories, piano parts, leather, board, and bobbin/peg mills with ties to the textile industry in southern New England. Subsistence agriculture was replaced by commercial farming with a variety of produce being shipped south. With increasing technology, the dams and mills increased in size and capacity along the river, using it for power and as an available resource for disposing of domestic and industrial waste. In 1870, at the now abandoned Willowdale Village in Littleton (at the Lisbon/Littleton town line), a waterwheel was constructed that produced 92 horsepower and powered 2 lumber mills.

Old mill foundation by the river
Photo by Field Geology Services, 2009

The railroad brought ever increasing numbers of tourists to the upper Ammonoosuc area and changed growth patterns and population migration. However, soon after the Civil War, many New Englanders migrated to the fertile soils in Ohio and beyond, abandoning the stony hill farms above the river valley. The beginning of the twentieth century again saw changes in economic and land use patterns. Trains came to depend on an ever increasing number of tourists from Boston and New York, who came to spend summers in the large hotels throughout the White Mountains.

The Ammonoosuc River offers many cultural resources of local and statewide importance representing all of the important historic periods, from the early settlers to the rise of tourism in the twentieth century. The river corridor has 8 known archeological sites (prehistoric and historic), 8 structures on or formerly on the National Historic Register, 6 historic bridges, 15 historic sites, and many additional identified locally important resources. Each of the 6 historic villages along the river is different and reflects a variety of historic periods, from the colonial Upper Bath Village to downtown Littleton with its nineteenth century water-powered factories built right on the river's banks, to Bethlehem and Carroll's old hotels catering to nineteenth and twentieth century tourists. Several historic markers identify sites including a site used by Rogers Rangers during the French and Indian Wars, an eighteenth century coal kiln which can still be seen and was used by colonists in the making of local pig iron, the ruins of Willowdale Village which burned and was never rebuilt, Woodsville, a railroad junction with over 30 passenger trains a day at its peak, the Crawford Family marker, the family for which the notch was named, The Mount Washington Hotel marker, and the Bretton Woods Monetary Conference.

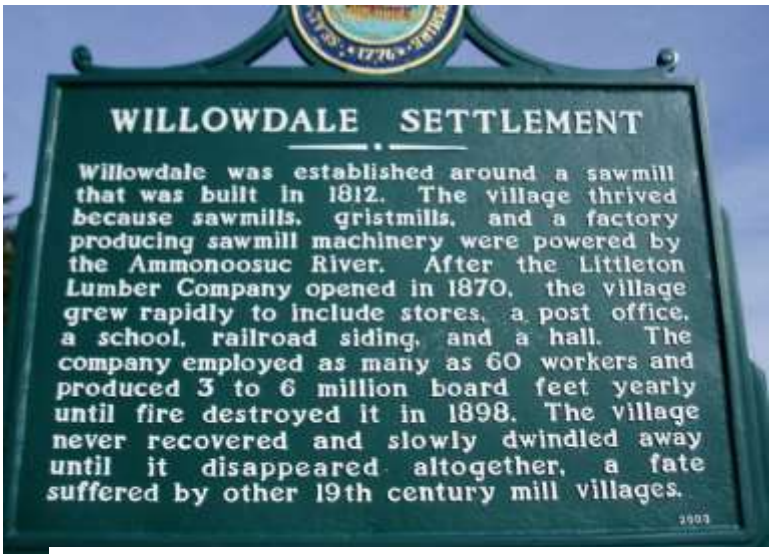


Photo by Field Geology Services, 2009

The villages along the river are making efforts to preserve and enhance their unique historic past by restoring covered bridges, railroad stations, and mills and other historic buildings. Factories thrived along the river and electric turbines were installed to produce electricity for the villages of Woodsville, Bath, Lisbon, and Littleton. Factories along the river began a slow decline as electricity replaced water power, trucks replaced the need to be near a railroad line, competition from the south increased, and laws were passed at both the state and federal level to improve water quality.

Modernization included road improvements to accommodate the automobile and tractor trailers. Routes 302 and 3 brought traffic to and from the area from all directions, as the railroads began to lose popularity. In the 1980's and 90's the interstate highway system reached the North Country with I-93 passing through Littleton and I-91 in Vermont, running parallel to the Connecticut River.

Historic Sites and Resources

While no detailed inventory of historic or archeological sites has been done along the entire corridor, the following is based on a review of local histories, field observation, and various state and federal resources.

National Register of Historic Places

Woodsville - Woodsville Opera Building (listed 1980)
Woodsville - Haverhill--Bath Covered Bridge (listed 1977)
Bath - Brick Store (listed 1976)
Bath - Bath Covered Bridge (listed 1976)
Bath - Goodall-Woods Law Office (listed 1985)
Bath - Jeremiah Hutchins Tavern (listed 1980)
Bath - Swiftwater Covered Bridge (listed 1976)
Lisbon - Lisbon Inn (listed 1980)
Littleton - Lane House (listed 1980)
Littleton - Littleton Opera House (listed 1973)
Littleton -Thayer's Hotel (listed 1982)
Littleton - US Post Office and Courthouse (listed 1986)
Bethlehem - Felsengarten (listed 1973)
Bethlehem - Burt--Cheney Farm (listed 1982)
Bethlehem - The Rocks Estate (listed 1984)
Carroll - Crawford House Artist's Studio (listed 1985)
Carroll (Bretton Woods) - Mount Washington Hotel (listed 1978)
Sargent's Purchase - Tip -Top House (listed 1982)

New Hampshire Register of Historic Places

Lisbon, Lisbon Station (listed 2008)
Littleton, Littleton Community House and Annex (listed 2007)
Bethlehem, Colonial Theater (listed 2002)
Bethlehem, Burch House (listed 2002)
Bethlehem, Mt. Washington Cemetery (listed 2006)

State & Federal Historic Districts

Haverhill, Commercial/Railroad Area (Woodsville HD) (1997)
Haverhill, Connecticut Street Historic Area (1997)
Haverhill, Woodsville-Bath Covered Bridge Neighborhood (1994)
Haverhill, Bath, Haverhill-Bath Project Area (n/a)
Bath, Bath Lower Village Historic District (1992)
Bath, Bath Upper Village Historic District (2006
Bath, Simmonds Brook Agricultural Historic District (1992)
Lisbon, Landaff Road Rural Historic Area (1993)
Lisbon, Lisbon Village Historic District (1992)
Lisbon, Route 302 Agricultural Historic Area (1992)
Lisbon, Savageville Historic Area (1993)

Littleton, Beacon Street Bridge Project Area (1992)
Bethlehem, Pierce Bridge Area (1998)
Carroll, Twin Mountain Project Area (1998)

Historic Bridges Over the Ammonoosuc River

Haverhill/Bath, Haverhill-Bath Covered Bridge
Bath, Bath Covered Bridge
Bath, Bath Railroad Bridge
Bethlehem, Pierce Bridge
Bethlehem, Prospect Street Bridge

Haverhill-Bath Covered Bridge
Photo by Field Geology Services, 2009

Historic Sites, Markers, & Memorials

Haverhill, Veteran Memorial VFW Woodsville
Haverhill, Haverhill/Bath Covered Bridge
Bath, Lone Elm Tea Room
Bath, Bath Village Covered Bridge
Bath, Mercy's Rock*
Bath, Bath Village War Memorial
Bath, Bath Upper Village
Bath, Simonds Brook Agricultural Area
Landaff, The Acre Residential Area
Lisbon, Young-Cobleigh Tavern
Lisbon, Lisbon Village Area
Lisbon, Original Village Marker
Lisbon, The Old Coal Kiln*
Littleton, Soldiers Memorial
Littleton, Willowdale Settlement *
Carroll, Bretton Woods, Mount Washington Hotel*
Carroll, Bretton Woods, Monetary Conference*
Carroll, Crawford Family*
* NH Historic Marker

A review of the State of New Hampshire site files found no prehistoric archeological sites listed within the corridor. Prehistoric sites are known to occur in this area and a number of areas have been identified as sensitive for prehistoric site location. In addition, towns have identified other locally important cultural and historic structures and sites near the river, some of which are listed below.

Examples of Locally Identified Historic Sites

Bath Church
Bath, Route 302 cemetery
Bath, Mercy's Rock
Bath, Payson Mansion (Colonial Inn)
Bath, The Narrows
Bath Town Building
Lisbon Town Hall/Opera House

Lisbon Village Dam
Lisbon, Parker Block
Lisbon Railroad Station
Lisbon Library
Littleton, Main Street Buildings
Littleton, Kilburn House
Littleton, Railroad Station
Littleton, Edson Berry House
Littleton, Meadow Street Cemetery
Carroll, St. Patrick's Church
Carroll, Twin River Farm and Bobbin Mill
Carroll, Bretton Woods Choir Camp
Carroll, Old Farm Site
Carroll, Brown Co. Logging RR Spur
Carroll, Charcoal Kilns
Carroll, Crawford Cemetery off Base Road
Carroll, Fabyan's Cabin
Carroll, Stickney Memorial Chapel

Crawford Cemetery, Photo by Leslie Bergum

Sources: Ammonoosuc River Nominations; Town Master Plans

Notes:
1. This is not intended to be an exhaustive list of local historic sites.
2. Sites previously mentioned not repeated.

Issues

- Lack of professional investigation, identification and evaluation of local cultural resources, especially prehistoric resources
- Lack of oversight and monitoring regulated activities
- Destruction of cultural resources through farming, development, and natural processes
- Underutilization of historic structures and settings

Recommendations

- ☐ Explore opportunities for heritage tourism.
- ☐ State agencies and regulated activities should consider impacts on community character, and take steps to protect stonewalls, historic bridges, naturally vegetated riverbanks, and scenic roads.

- ☐ Towns should maintain the vitality of historically compact village and town centers.
- ☐ Initiate efforts to identify, record, and protect significant cultural resources for listing in the National Register of Historic Places.
- ☐ Identify and target local historic structures and inform/educate owners of tax advantages of preservation.
- ☐ Identify and stabilize cultural resources in danger of bank erosion.
- ☐ Landowners should be encouraged to voluntarily protect cultural resources.
- ☐ Provide educational outreach touting the importance of cultural resources.

3.15 Existing Regulations

State Regulations

NH Department of Environmental Services (NHDES) issues permits for activities in the shoreland or affecting wetlands or streams. These include:

- Wetlands permits
- Shoreland permits
- Alteration of terrain permits

Wetlands

The Wetland Rules describe the purpose of the state's wetland permit program as:

> The purpose of this chapter is to protect the public trust and other interests of the state of New Hampshire, by:
> (a) Establishing requirements for the design and construction of structures in order to prevent unreasonable encroachment on surface waters of the State;
> (b) Preserving the integrity of the surface waters of the state by requiring all structures to be constructed so as to insure safe navigation, minimize alterations in prevailing currents, minimize the reduction of water area available for public use, avoid impacts that would be deleterious to fish and wildlife habitat, and avoid impacts that might cause erosion to abutting properties; and
> (c) Ensuring that all projects are constructed using the least impacting alternatives, in a manner that meets the requirements of RSA 483-B and shoreline and bank alteration or stabilization requirements. (Env-Wt 401.1)

Requirements vary according to the location and size of the proposed project. It is important to note that New Hampshire's wetland program does not prohibit filling wetlands, i.e., it is not a "no net loss" program.

Shoreland

In addition to the Ammonoosuc River itself, all lakes, ponds and impoundments greater than 10 acres, and all 4th order and greater tributary streams and rivers are subject to the Shoreland Water Quality Protection Act. Permits are required for new construction or expansion of impervious surfaces and for excavation or filling. The requirements vary according to the location and size of the project.

Alteration of Terrain

From the NHDES website:

> New Hampshire Alteration of Terrain permits are issued by the DES Alteration of Terrain (AoT) Bureau. This permit protects New Hampshire surface waters, drinking water supplies and groundwater by controlling soil erosion and managing stormwater runoff from developed areas. An AoT permit is required whenever a project proposes to disturb more than 100,000 square feet of contiguous terrain (50,000 square feet, if any portion of the project is within the protected shoreland), or disturbs an area having a grade of 25 percent or greater within 50 feet of any surface water. In addition to these larger disturbances, the AoT Permit by Rule applies to smaller sites.
>
> This permitting program applies to earth-moving operations, such as industrial, commercial, and residential developments as well as sand pits, gravel pits, and rock quarries. Permits are issued by DES after a technical review of the application, which includes the project plans and supporting documents.

Local Land Use Regulations

Land use and land use density are primarily regulated at the local level by municipal ordinances and regulations discussed below. Since they often govern the patterns of development in a river corridor, they can have a tremendous impact. The table on pages 78-79 summarizes the land use regulations for the towns along the river and includes a breakdown of some of the regulatory components that impact the corridor.

Local land use regulations in New Hampshire are of three types: Zoning Ordinances, Subdivision Regulations, and Site Plan Review Regulations, as discussed below.

Zoning

All of the towns in the corridor have zoning ordinances which were adopted by town meeting vote and administered by a zoning officer and a Board of Adjustment. Zoning ordinances typically regulate land use, e.g. residential, commercial, industrial; density; setbacks; building height, etc., but they vary a great deal in the uses and densities allowed. Instead of a single zoning ordinance, Haverhill*** has a series of special purpose zoning ordinances: floodplain, wetland and aquifer, personal wireless, and airport. Minimum lot sizes range from no minimum in Haverhill and many

Littleton zones to 3 acres in most towns, with smaller lot sizes only where municipal sewer and water are available.

***Two of Haverhill's villages have their own zoning ordinances.

While all towns except Haverhill and Littleton have road frontage requirements, only Bath has river shoreline minimum requirements. Other than Haverhill, only Bath has conservation overlay districts that have special regulations for protecting critical natural resources such as wetlands, aquifers, steep slopes, and floodplains. In fact, although all seven towns have flood hazard ordinances, only Bath's ordinance prohibits development in the floodplain. The other town's ordinances are primarily to comply with the federal flood insurance regulations which focus on flood-proofing and reducing flood damages. They do not prohibit development or loss of flood storage capacity.

The town of Littleton has a vegetative buffer ordinance which is 100 feet wide, but it only applies to a very short section of the riverbank on one side of the river (the west side, from the I-93 bridge to a point 3600 feet up from the Lisbon town line). No other towns have any buffer protection.

Cluster developments are mentioned in all ordinances but are generally applicable to only certain districts or by special exception and generally allow the same overall density as a conventional subdivision but on smaller lots to allow for the creation of open space. Overall, cluster is not popular with either the communities or the developers and is little used.

Subdivision Regulations

Subdivision regulations are adopted and administered by the planning board and govern the process of dividing land. While overall building density is based on zoning requirements, the inability to construct roads to town standards and have sufficient area on a lot for a state-approved septic system often reduces density from that allowed by the zoning ordinance. Road standards include such things as road width, maximum grades, and surface materials.

Each of the seven towns has subdivision regulations and they are similar. Only two of the towns address erosion and sediment control or other environmental issues in great detail.

Site Plan Review Regulations

Site plan regulations are also adopted and administered by the planning board and allow for the review of multi-family and non-residential uses, such as industrial and commercial, for such things as traffic, parking, lighting, impermeable surfaces, stormwater drainage, erosion control, and safety. Haverhill does not have site plan regulations and Littleton abolished site plan review regulations in 1989. Thus the towns with the most commercial and industrial growth have no site development regulations for such things as drainage, parking, impermeable surfaces, erosion and sediment control. Only one town has any limits on the amount of impermeable surface allowed on lots within the corridor and most towns do not have stormwater regulations that deal either with increased runoff from development or non-point pollution prevention.

Excavations, a specific type of commercial use, are regulated under a separate state statute and five towns have adopted local regulations, although enforcement of required restoration is limited.

Local Land Management Tools in Effect

Municipal Tools	**Unincorp. Places**	**Carroll**	**Bethlehem**	**Littleton**	**Lisbon**	**Landaff**	**Bath**	**Haverhill**
1. Master Plan is in effect	Yes (2006)	Yes (1986)	Yes (2004)	Yes (2004)	Yes (2005)	Yes (2007)	Yes (2007)	Yes (2008)
2. River is mentioned in master plan	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Scenic/ historic resources mention in master plan/ zoning	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Zoning is in effect	Yes (1991)	Yes (2010)	Yes (2011)	Yes (2011)	Yes (2002)	Yes (2006)	Yes (2007)	Partial
5. Subdivision regulations are in effect	Yes	Yes (1995)	Yes (1995)	Yes (2010)	Yes (2002)	Yes (2002)	Yes (2004)	Yes (2008)
6. Site plan review is in effect		Yes	Yes	Voluntary	Yes	No	No	No
7. Excavation regulations are in effect	Yes	Yes	Yes	No	No	Yes	Yes	Yes
8. Shoreland protection regulations	Yes	No	No	No	No	No	Yes	No
8.a. Building setback required from waterways (50’ setback - state law)	Yes - 100'	No	No	No	No	No	Yes - 120'	No
8.b. Development prohibited in flood hazard area? (100 year floodplain)	No	No	No	No	No	No	Yes	No
8.c. Riparian buffer protected?		No	No	Partial	No	No	No	No

Municipal Tools	Unincorp. Places	Carroll	Bethlehem	Littleton	Lisbon	Landaff	Bath	Haverhill
8.d. Overlay district for rivers & streams?		No	No	Yes *	Yes	No	No	No
8.e. Minimum frontage required for shore lots? (150' min. if no sewer-state law)	Yes - 200'	No	No	No	No		Yes - 150'	No
9. Wetlands Regulations	Partial	No	No	No	No	No	Yes	Yes
9.a. Uses regulated in wetlands?	Partial	No	No	No	No	No	Yes	Yes
9.b. Uses regulated in buffer around wetlands?	Partial	No	No	No	No		No	Yes - 75'
10. Groundwater protection regulations	Yes	No	Yes	Yes	No		Yes	Yes
10.a. Uses regulated over aquifers?	Yes	Yes	Yes	No	No	No	Yes	Yes
10.b. Well-head protection area regulations?	No	Yes	No	No	Yes		Yes	No
10.c. On-site sewage disposal buffer for , water supplies?	Yes	No	No	No	No		Yes - 200'	No
11. Ag. soils protection regulations		No	No	No	No	No	No	No
12. Natural Resources Inventory	No	Yes	Yes	Yes	No	Yes	Yes	No

Adapted from Appendix G. Connecticut River Management Plan: Water Resources, Riverbend Region, 2009

**Littleton overlay district for rivers and streams:* Conservation of water, plants, & wildlife; Emergency procedures necessary for safety or protection of property (erosion or safety threat); Usual & necessary maintenance; Recreation & nature trails; Overhead or underground utility crossings; Wetland mitigation measures; Storm water drainage practices.

Issues

- Inconsistent regulations at the local level make it difficult to manage the river in a coordinated way
- Inconsistent regulations can result in development being concentrated in locations where regulations are the weakest without regard for suitability of site in terms of water resource impacts.
- Enforcement of state and federal regulations is underfunded.
- Enforcement of local regulations is often uncomfortable for local officials who need the support of the community to keep their jobs or to be reelected, and can also be costly for the community.
- Communities often do not have the staff for inspection of sites to ensure required water quality protection infrastructure is being properly maintained. In some cases development approvals are silent on long term maintenance and upkeep.

Recommendations

- ☐ Town should inform residents about possible applicable state regulations as early in the project planning process as possible, e.g., by providing information with applications for local approvals in person and on town websites.
- ☐ Both the state and municipalities should enforce existing regulations, fairly and consistently.
- ☐ To ensure that permit conditions are implemented, the state should fund NHDES permitting programs at a level which will enable inspections to be performed after projects are completed.
- ☐ Penalties should be increased substantially for repeat offenses.
- ☐ Responsible agencies should ensure that funding is sufficient to monitor maintenance plans that are included in a permit.
- ☐ Responsible agencies should ensure that BMPs are followed during permitted activities, and monitor ongoing actions that require BMPs to be followed.
- ☐ DRED should be encouraged to establish contact with local advisory groups.

3.16 Local Advisory Committee Role in Permit Reviews

Background

The Ammonoosuc River Local Advisory Committee (LAC) has the responsibility to review and advise the NH Department of Environmental Services (NHDES) on permit applications for proposed activities within 1/4 mile of the Ammonoosuc River under RSA 483:12-a (I-a) as follows:

Programs Established Under the Following Statutes

- Groundwater Protection Act (RSA485-C)
- Water Pollution and Waste Disposal (RSA 485-A)
- Dams, Mills and Flowage (RSA 482)
- Hazardous Waste Management (RSA 147-A)
- Solid Waste Management (RSA 149-M)

Types of Permit Applications Reviewed by Ammonoosuc River LAC

- Alteration of Terrain (AoT) Permit (RSA 485-A:17)
- Shoreland Permit (RSA 483-B)
- Wetland Bureau Permits (RSA 482-A:3)
- 401 Water Quality Programs

In February 2010 the LAC worked with state officials to expedite approval to remove this tree from the river to protect the Haverhill-Bath Covered Bridge. Photo by Rick Walling

Course of Action for Standard Review of Applications

Ammonoosuc River LAC members are required to review the application material and consider the characteristics of the site such as wetlands, slope gradient, geological features, vegetation and forest type. A site visit, with the owner's permission if appropriate, is advisable. Each application is unique and not all of the factors listed below apply to each one, however the

following are some of the factors that may be considered, along with any questions provided by NHDES:

Water Resources

- Proximity to aquifer, surface water- groundwater relationship
- Public and private water supplies
- Wetlands, vernal pools, stream crossings
- Flood hazard and erosion hazard areas
- Shoreland Water Quality Protection Act (SWQPA) Requirements
- Presence or Absence of Riparian Vegetative Buffer Areas by Agricultural Lands
- Best Management Practices (BMP) for oversight of project during construction and post construction to protect water resources.
- Stormwater management plans, including river bank stabilization measures to prevent erosion, and surface runoffs into the river, culvert type and placement
- Local wastewater requirements
- Impervious surface for access and parking and proximity to water resources, consideration of permeable materials
- Plan for winter maintenance and snow removal
- Large water withdrawals
- Water temperature impacts
- Known existing water quality or quantity issues

Other River-Related Resources of Interest

- Fisheries and important wildlife habitat areas, e.g., known deeryards and crossings, bird nesting and resting places, rare plants and animals
- Established recreation areas, informal and formal public access
- Locally identified priorities, e.g., identified in local Natural Resources Inventory
- Historic/Archaeological Sites, scenic views, and designated scenic roads

Additional information may be requested. If there are any remaining questions, Ammonoosuc River LAC has the option to invite the applicant to provide further information at their next meeting. Mitigation of potential impacts is suggested where appropriate.

Issues

- Reviewing an application is a multi-step process that requires due diligence. The timeframe to comment on applications for state permits is often not always adequate for the task. The application is sometimes not received in a timely fashion and has to be requested. There is no guarantee that request for an extension of time to comment will be granted. Several factors make it especially important for the Ammonoosuc River LAC to provide comments to the NHDES reviewer before the deadline:

- In many cases, although towns can require it, there is no oversight of the project by an outside knowledgeable professional, during construction and post construction.
- There is a lack of enforcement of infractions at both the local and state level.

➢ Legislative pressure to diminish the Shoreland Act has led to an even shorter timeline as well as a requirement for landowner permission for site visits.

Recommendations

☐ Ammonoosuc River LAC members should review proposed projects as early in the planning stages as possible so that applicants will have the benefit of LAC suggestions for reducing or mitigating impacts prior to developing final applications for local and state approvals. Towns can help facilitate this by:
- Providing planning and zoning board agendas to their local Ammonoosuc River LAC liaison.
- Including parcel map and lot or street address on planning and zoning board agendas.
- Inform applicants of the Ammonoosuc River LAC's role and the LAC availability to review and/or discuss preliminary plans.

☐ DES must assist in the timely delivery of information relevant to permitted actions, including encouraging applicants to meet with, or at least provide information to, LACs as early in the permitting process as possible.

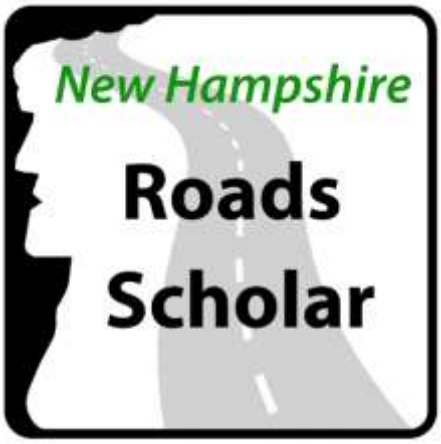
☐ There is currently a move to consolidate and streamline the DES permitting process. Local groups, such as the LACs and Conservation Commissions, should be included in the process in the pre-permitting stage to ensure that there is sufficient time to incorporate input from these groups in the project design.

3.17 Public Education

Education is one of the fundamental keys to ensuring the implementation of this River Corridor Management Plan. Communities that understand the importance of the watershed ecosystem as it relates to their basic needs, their economy and the environment are more willing to advocate for the restoration, maintenance and protection of its resources. Providing educational and stewardship programs and increasing public awareness of the Ammonoosuc River and its resources will ensure the success of this Plan.

The focus groups for this educational outreach should include but not be limited to:

- ☐ Landowners
- ☐ Residents
- ☐ Visitors
- ☐ Developers
- ☐ Students
- ☐ DOT/town road crews and utilities
- ☐ Business
- ☐ Land use boards



Methods of establishing public awareness should include but not be limited to:

- ☐ Create a website.
- ☐ Print and distribute brochures on different topics.
- ☐ Film a video of the river highlighting historical landmarks and recreational areas.
- ☐ Design a curriculum for use by students that is age appropriate aimed to inform students of the river resources and the importance of their protection.
- ☐ Build a portable display of river information that can easily be transported to local events.
- ☐ Conduct informational workshops.
- ☐ Construct informational kiosks along the river to highlight important natural and historic areas.
- ☐ Post signs along the river informing the public of its designation into the Rivers Management and Protection Program.
- ☐ Partner with various organizations such as snowmobile clubs, the Appalachian Mountain Club, historical societies, schools, libraries, and UNH Extension to combine efforts to teach the public about the river.
- ☐ Organize activities involving river maintenance including clean-ups and invasive species identification and eradication programs.
- ☐ Use local newspapers to publicize and promote issues and activities surrounding the river.
- ☐ Create a scrapbook of local news clippings that cover events that relate to the river to be used as an educational tool.

- ☐ Attend local land use board meetings to keep officials abreast of the applicable federal, state and local regulations that protect the corridor.
- ☐ Utilize existing brochures and fact sheets from NH Department of Environmental Services (NHDES).

Educational topics should be age appropriate and directed to the interest and relevance of the audience. Suggested topics, according to groups, should include but not be limited to:

Residents

- ☐ Water Quality: protecting surface water and the aquifer.
- ☐ Care and Maintenance of Septic Systems
- ☐ Proper application of fertilizers and pesticides
- ☐ Riparian Buffers : what to plant to keep it healthy
- ☐ Invasive species: what to look for and how to stop the spread.
- ☐ Proper disposal of pharmaceuticals.
- ☐ Maintenance of large woody material in streams and rivers.
- ☐ Regulations applicable to landowners.

Visitors

- ☐ Historical Resources along the corridor.
- ☐ “Leave No Trace” principles.
- ☐ Erosion Prevention , Stay on the Trail.
- ☐ Recreational highlights
- ☐ Invasive Species: transportation on fishing gear.
- ☐ Wildlife Habitats

Businesses

- ☐ Natural Resources and the economy
- ☐ Water Quantity
- ☐ Invasive Species: Transportation on equipment
- ☐ Fertilizer and pesticide runoff from farms and golf courses.

Students

- ☐ History within the corridor
- ☐ Wildlife Habitats
- ☐ Invasive species
- ☐ Water Quality testing

Developers/ Land Use Boards

- ☐ Shoreland Water Quality Protection Act
- ☐ NHDES Alteration of Terrain Program
- ☐ EPA Storm water Regulations
- ☐ Floodplains and Fluvial Erosion Hazards
- ☐ Development Management
- ☐ Water Quantity
- ☐ Non- point source pollution affects on water quality and habit

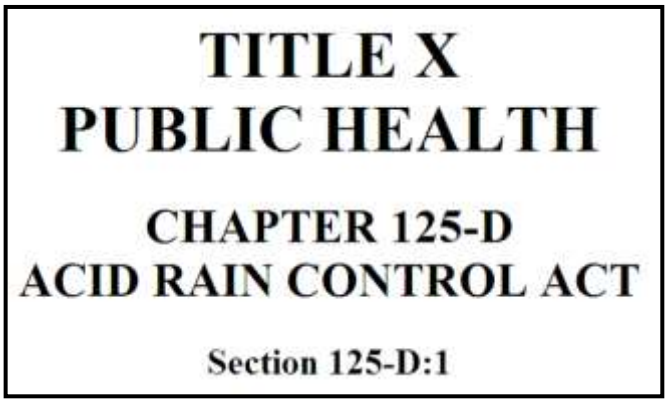
DOT/Town Road Crews & Utilities

- ☐ Storm water management
- ☐ Culverts: size matters
- ☐ Road Salts and Non Point Pollution.
- ☐ Bridge Erosion
- ☐ Ice Jams and Roads flooding
- ☐ Invasive species

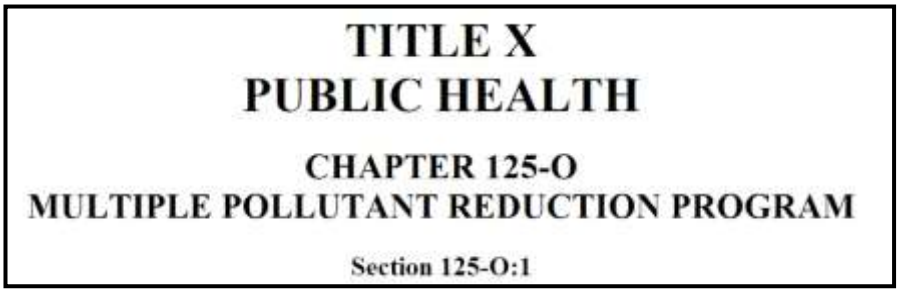
3.18 Influences from Outside the Watershed

In addition to local activities affecting the river, there are many outside factors not under the influence of the Ammonoosuc River LAC, the state, or municipalities. Nevertheless, it remains important to know about these forces as well, and, once they are identified, to keep track of them. For example, acid rain, mercury contamination, and climate changes each takes a toll on the riparian ecosystem and are expected to continue to do so in the foreseeable future.

In 1985 the General Court of New Hampshire found that acid deposition of sulfur and nitrogen containing compounds, commonly referred to as "acid rain" was occurring in the state and was posing a significant adverse threat to the natural environment by degrading natural ecosystems, including fish and wildlife (RSA 125-D:1). Through burning, fossil fuels enter into the atmosphere and cause rain, snow and fog to be more acidic. This acidic precipitation reaches the surface water either directly or through runoff and snow melt. Both the increased acidity and the associated increase in the concentration of metals in the water can reduce species diversity and the abundance of aquatic life. Results of VRAP water testing of the Ammonoosuc show a majority of acidic ph measurements. Continued testing will further determine the source of these results.



Under RSA 125-O:1, the New Hampshire General Court specifically found mercury to be an airborne pollutant that is a significant cause of negative environmental impacts. This heavy metal reaches the surface water and accumulates in the tissues of animals and fish. Mercury contamination in freshwater fish is widespread and significant enough to warrant fish consumption advisories in N.H. Exposure in humans can lead to a variety of negative health effects, especially to women of child bearing years, young children and infants. In addition, fish-consuming wildlife such as loons, eagles and otters are also at risk. Fishing is a popular recreation activity along the Ammonoosuc River for both residents and visitors.



Climate records from the Northeast reveal an increase in average annual temperatures over the past decade. This change in climate has been associated with more intense rain and snow events and fewer extremely low minimum temperature events. These changes are predicted to have

potentially serious effects on the habitat of New Hampshire's cold water fish such as brook, brown, and rainbow trout. Climate change can potentially change the temperature and level of the water, both important factors for fish survival. Although adult fish may be able to tolerate warmer water temperatures, their ability to reproduce will decline. Data indicate that, along with higher water temperatures, climate change may bring about lower water levels and reduced stream flows leading to reduced food availability. In addition, lower water levels reduce the availability of winter habitat as well as suffocate and desiccate fish eggs. Survival of cold water fish is not only important to the species, but also the fishing economy in New Hampshire. There would be a significant loss in revenue from the loss of cold water fishing.

Appendix to Section 3.8 Wildlife and Fish

WILDLIFE ACTION PLAN CRITICAL HABITATS AND THREATS
Source: NH Wildlife Action Plan Chapter 3 (New Hampshire's Wildlife Habitat Conditions)

WAP CRITICAL HABITATS	THREATS
Small Scale Habitats	
Alpine	Climate change and acid deposition
Caves and Mines	Recreational activities such as spelunking and geochaching
Cliffs	Recreational activities such as hiking and rock climbing
Floodplain Forest	Human development and Transportation infrastructure
Grasslands	Development and certain agricultural practices, such as mowing during breeding seasons
Lakes	Acid deposition and non-point source pollution are likely to become more problematic over time.
Marsh & Shrub Wetlands	Land fragmentation, transportation infrastructure, development of surrounding uplands and invasive species
Peatlands	Development, altered hydrology, non-point source pollutants, and unsustainable forest harvesting.
Riverine	No critical threats to Southern Upland Watersheds have been identified. However, acid deposition and non-point source pollution are likely to become more problematic over time.
Rocky Ridge and Talus Slope	Hiking and climbing
Vernal Pools	Human development and transportation infrastructure, wetland filling, altered hydrology, and loss or degradation of surrounding upland habitats.
Forest block habitats (matrix forests)	
Hemlock-Hardwood-Pine	Hemlock-hardwood-pine forests are one of New Hampshire's most at-risk habitats. The most challenging issues facing hemlock-hardwood-pine forests are human development, introduced species and altered natural disturbance.
High Elevation Spruce-Fir	Acid deposition
Lowland Spruce-Fir	Development, timber harvest, non-point source pollutants and altered natural disturbance regimes.
Northern Hardwood-Conifer	Development and acid deposition.

Recommendations: For each critical habitat, use the NH WAP Chapter 3, Habitat Condition and WAP Species and Habitat Appendices (A & B) to identify conservation and management recommendations.

Appendix to Section 3.9 Plant Habitat

THE NATURAL HERITAGE BUREAU

The Natural Heritage Bureau is mandated by the Native Plant Protection Act of 1987 (NH RSA 217-A) to determine protective measures and requirements necessary for the survival of native plant species in the state, to investigate the condition and degree of rarity of plant species, and to distribute information regarding the condition and protection of these species and their habitats.

The Natural Heritage Bureau provides information to facilitate informed land use decision making. It is not a regulatory agency; instead, it works with landowners and land managers to help protect the State's natural heritage and to meet their land use needs.

The NH Natural Heritage Bureau is a bureau in the Division of Forests & Lands. Its mission is to find, track, and facilitate the protection of New Hampshire's rare plants and exemplary natural communities (which are essentially different types of forests, wetlands, grasslands, etc.). They currently study more than 630 plant and animal species and 190 natural communities. The database contains information about more than 6,000 plant, animal, and natural community occurrences throughout the state.

Most of New Hampshire's rare plants are listed as Endangered (in danger of extinction in the state) or Threatened (likely to become Endangered) under the NH Native Plant Protection Act of 1987 (NH RSA 217-A). The most recent revision of the list came into effect on June 25, 2005. A subset of these species is also listed under the federal Endangered Species Act of 1973 (42 USCA 4321-4370c). State and federal listing represents a political recognition of rarity, so some species that are biologically rare (as indicated by the State and Global Ranks) may not be listed as Threatened or Endangered.

[The most recent version of the Natural Heritage Bureau's lists of rare plant species that occur in New Hampshire, grouped by habitat types in which they may be found, can be downloaded from http://www.nccouncil.org/images/NCC/Planthabitatlists_2008_web.pdf .]

Known Sites

There has not been a comprehensive search of the state for rare species, so the Natural Heritage Bureau is frequently finding or learning about previously unknown populations. Further, many populations have not been checked since they were originally found, sometimes more than 50 years ago, so they do not know the status of these populations. In the more extensive data, they have therefore separated known sites into two sub-categories: those last seen more than 20 years ago, and those reported within the last 20 years. This distinction helps show the state of our knowledge about a given species and the need for additional research. Those additional data are available through the NH Natural Heritage Bureau.

Appendix B

NHDES The Ammonoosuc River Fact Sheet

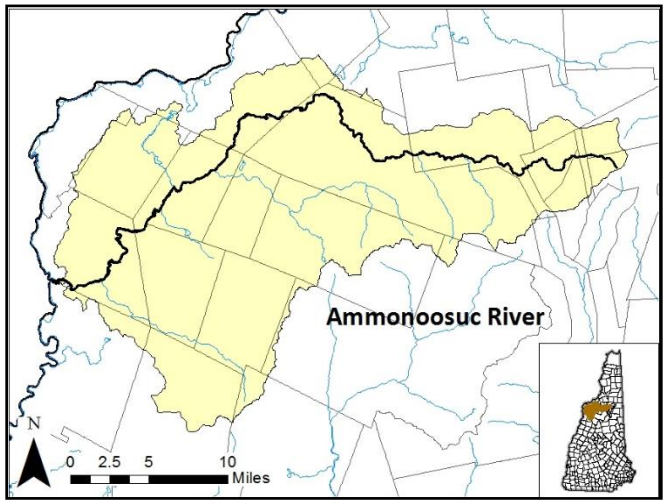
ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WD-R&L-20 2019

The Ammonoosuc River



The Ammonoosuc River begins at the Lake of the Clouds on the western slopes of Mount Washington and flows approximately 60 miles west through the town of Carroll to Bethlehem Junction, north to Littleton, and southwest through Lisbon, Landaff and Bath, to its confluence with the Connecticut River at Woodsville, in the town of Haverhill. The lower portion of the river, from the White Mountain National Forest boundary in Carroll to the Connecticut River, was designated into the New Hampshire Rivers Management and Protection Program in 2007. The upper reaches, within the national forest, were added to the program in 2009. The Ammonoosuc River watershed drains an area of approximately 400 square miles. The entire Ammonoosuc River offers a spectacular and varied scenic and cultural vista, which makes it highly valued by the surrounding communities, making local planning and protection efforts a priority.

The Ammonoosuc River corridor contains a number of historical sites including historic buildings and archeological sites. Due to the watershed's largely undeveloped landscape, proximity to the White Mountain National Forest, and highly diverse natural communities, the river corridor also boasts a large variety of wildlife and plant species. Several recreation areas along the Ammonoosuc River allow access to the river for fishing, boating, hiking and other activities.

History

Ammonoosuc is an Abenaki word for "fish place." Before the first European settlers, the Abenaki fished and camped along the river, netting fish in the narrow river bends such as Salmon Hole. Six archaeological sites containing evidence of the presence of Native American populations have been documented in the river corridor.

Several historic buildings dating from the mid-1700s to the mid-1800s are located within the Ammonoosuc River corridor. Notably, seven buildings are listed on the National Register of Historic Places, including the Bath Brick Store, the Bath Foodall-Woods Law Office, the Bath Jeremiah Hutchins Tavern, the Lisbon Inn, Littleton's Lane House, the Littleton Opera House, and Littleton's post office. Additionally, the Cog Railway, built in 1869, still operates today and is one of New Hampshire's most recognizable tourist attractions.

Geology

The Ammonoosuc River watershed lies within the Connecticut River watershed and was once part of the great Glacial Lake Hitchcock. The Connecticut River watershed is internationally renowned as a glacial geology

research site for the study of sediment deposition that occurred in Glacial Lake Hitchcock as the ice sheet receded. Glacial till and glacial outwash deposits were the two major types of material deposited in this area. Outwash deposits are important economically for mining purposes, and also serve as major groundwater-recharge areas.

Wildlife, Habitat and Vegetation

The Ammonoosuc River supports an extremely diverse habitat comprised of forest, wetlands and open space that is home to a variety of wildlife. Its floodplains, wetlands and large sections of unfragmented lands are critical habitat areas that offer important wildlife benefits. Several threatened or endangered wildlife species are found in the Ammonoosuc River watershed, including the state-threatened bald eagle, peregrine falcon, and American marten. The river is also home to the state-endangered upland sandpiper and brook floater (mollusk), in addition to the federally endangered dwarf wedge mussel. The resident osprey and northern bog lemming are species of special concern. The Ammonoosuc River originates in the alpine habitat at an elevation of 5,018 feet above sea level. In this habitat, unique plant communities, extreme climate, and isolation lead to rare, sometimes site-specific, species such as the state-endangered White Mountain fritillary butterfly. The Ammonoosuc River also provides habitat for at least 15 resident cold and warm water fish species.

Many exemplary natural ecological communities exist within the Ammonoosuc River corridor, with most related to special forested or forested wetland environments. The New Hampshire Natural Heritage Inventory lists 20 state-endangered plant species as occurring along the Ammonoosuc River. Among these are Boott's rattlesnake-root, chestnut sedge, Robbins' cinquefoil, green dragon, Kalm's brome, bristly rose, wavy blue grass, and hairy-eared rockcress. In addition, there are 15 known plant species that are listed at the state level as threatened.

Recreation

The Ammonoosuc River is a high quality fishery for both cold and warm water species and, according to the New Hampshire Fish and Game Department, is suitable for wild, self-sustaining populations of brook trout. The river has been stocked with Atlantic salmon as well as rainbow, brook and brown trout.

The Appalachian Mountain Club's *New Hampshire/Vermont River Guide* and the *New England Whitewater Guide* identify the Ammonoosuc River as offering a wide variety of opportunities for canoe and kayak paddlers of all skill levels. Public access for fishing, kayaking, canoeing and swimming can be found in many places.

Publicly owned recreation areas include the White Mountain National Forest Zealand Mountain trails in Carroll, the town park in Lisbon, Dells Park in Littleton, the Bath Covered Bridge Picnic Area, and many state and federal snowmobile trails. These areas offer a mix of recreational opportunities including hiking, nature study, picnicking, swimming, boating, team athletics, and snowmobiling. The Mount Washington Resort and Bretton Woods ski area offer opportunities for alpine and cross country skiing as well as horseback riding and hiking.

Land Use

Overall, the landscape is largely undeveloped; however, the Ammonoosuc River valley has experienced a substantial increase in the number of commercial and residential uses in recent years with population growth exceeding projections. Interstate 93 and Route 302, which parallels the river for most of its length, make the area easily accessible for large and small-scale commercial development. There is growing concern about the impact of development on the highly valued river corridor as much of the land has been zoned for development.

For More Information

For further information about the New Hampshire Rivers Management and Protection Program, visit the NHDES website and search for RMPP or contact the Rivers Coordinator, 29 Hazen Drive; PO Box 95; Concord, NH 03302-0095; (603) 271-2959; riversprogram@des.nh.gov.

Appendix C

EPA Effluent Guidelines Program Plan 15

United States
Environmental Protection
Agency

Effluent Guidelines Program Plan 15

January 2023

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U.S. Environmental Protection Agency
Office of Water (4303T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

EPA-821-R-22-004

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1. EXECUTIVE SUMMARY

Under the Clean Water Act (CWA), EPA publishes Effluent Limitations Guidelines and Standards (ELGs), which are national industry-specific wastewater regulations based on the performance of demonstrated wastewater treatment technologies (i.e., "technology-based limitations"). The effluent limitations guidelines apply to discharges from industrial facilities to water bodies (referred to as "direct discharges"). Pretreatment standards apply to discharges from industrial facilities to publicly owned treatment works (POTWs) (referred to as "indirect discharges"). CWA Section 304(m) contains provisions requiring EPA to annually review the guidelines and standards and revise them if appropriate. The CWA also requires EPA to biennially publish a plan that establishes a schedule for annual reviews, revisions, and promulgation of any guidelines not previously established for industrial categories. This Effluent Guidelines Program Plan 15 (Plan 15) fulfills these CWA requirements and thus furthers the national work toward restoring and maintaining the chemical, physical, and biological integrity of the nation's waters.

Through its Effluent Guidelines Program Plans, EPA seeks to provide transparent decision-making with the benefit of stakeholder input throughout the planning process. EPA published and requested public comments on Preliminary Effluent Guidelines Program Plan 15 (Preliminary Plan 15) on September 14, 2021 (86 FR 51155). Plan 15 provides a summary of the comments received on Preliminary Plan 15 as well as updates on EPA's reviews of industrial wastewater discharges and treatment technologies. Plan 15 also presents EPA's 2021 annual review of effluent guidelines and pretreatment standards, including the initial results from its preliminary review of the Plastics Molding and Forming (40 CFR part 463), Leather Tanning (40 CFR part 425), and Paint Formulating (40 CFR part 446) Categories. With this Plan 15, EPA continues to focus on and evaluate the extent and nature of per- and polyfluoroalkyl substances (PFAS) discharges and assess opportunities for limiting those discharges from multiple industrial categories, as outlined in EPA's 2021 PFAS Strategic Roadmap.

Plan 15 announces that EPA, pending resource availability, intends to initiate one new rulemaking and several new studies. After collecting and analyzing data, as described throughout this Plan, EPA has determined that revisions to the effluent limitations guidelines and pretreatment standards for the Landfills Category (40 CFR part 445) are warranted, considering PFAS found in landfill leachate. EPA also intends to expand the detailed study of the Textile Mills Category (40 CFR part 410) to gather information on the use and treatment of PFAS in this industry and associated PFAS discharges. For this expanded study, EPA intends to use a mandatory questionnaire issued to a nationally representative sample of textile mills. Plan 15 also announces EPA's intent to initiate a POTW Influent Study of PFAS, which will focus on collecting nationwide data on industrial discharges of PFAS to POTWs, including categories recently reviewed. EPA intends to undertake this study to both verify sources of PFAS wastewater and to discover new PFAS wastewater sources. Finally, Plan 15 announces EPA's intent to undertake a detailed study of the Concentrated Animal Feeding Operations (CAFOs) Category (40 CFR part 412), which will focus on collecting further information to enable the Agency to make an informed, reasoned decision whether to undertake rulemaking to revise the ELG for CAFOs.

Plan 15 also announces that EPA is not pursuing further action for the Electrical and Electronic Components (E&EC) Category (40 CFR part 469) at this time but will continue monitoring this category for PFAS discharge data through the POTW Influent Study. EPA will also continue to monitor PFAS use and discharges from the Pulp, Paper, and Paperboard Category (40 CFR part 430) and airports.

Finally, Plan 15 provides updates of four ongoing rulemakings:

- Steam Electric Power Generating Category rulemaking (see Section 7.1 for additional details) to strengthen certain wastewater pollution discharge limitations for coal power plants that use steam to generate electricity.
- Meat and Poultry Products Category rulemaking to address nutrient discharges (see Section 7.2 for additional details).
- Organic Chemicals, Plastics & Synthetic Fibers Category rulemaking to address PFAS discharges (see Section 7.3 for additional details).
- Metal Finishing Category and Electroplating Category rulemakings to address PFAS discharges (see Section 7.4 for additional details).

The Agency intends to undertake the actions outlined in this Plan and summarized above. The commencement and pace of these activities will depend on the agency's Fiscal Year 2023 appropriations and operating plan.

2. BACKGROUND

This section explains how the Effluent Guidelines Program fits into EPA's National Water Program, provides an overview of the Effluent Guidelines Program, and summarizes EPA's procedures for revising and developing ELGs (i.e., the effluent guidelines planning process).

2.1 The Clean Water Act and the Effluent Guidelines Program

The CWA focuses on two types of controls for point source discharges of pollutants to waters of the United States: (1) technology-based controls, based on ELGs or, in the absence of applicable ELGs, best professional judgement (BPJ) of permit writers, and (2) water-quality-based controls, based on applicable water quality standards.

The CWA directs EPA to promulgate technology-based ELGs that reflect pollutant reductions achievable by facilities in categories or subcategories of industrial point sources through implementation of available treatment technologies.[1] ELGs apply to pollutants discharged from industrial facilities to surface water (direct discharges) and to publicly owned treatment works (POTWs) (indirect discharges). EPA's technology-based standards ensure that industrial facilities with similar characteristics will, at a minimum, meet similar effluent limitations or pretreatment standards that represent the performance of the "best" pollution control technologies, regardless of their location or the nature of the receiving water or POTW into which they discharge.

The CWA also gives states the primary responsibility for establishing, reviewing, and revising water quality standards. Effluent guidelines are not specifically designed to ensure that regulated discharges meet the water quality standards of the receiving water body. For this reason, although technology-based ELGs in discharge permits may be as stringent as or even more stringent than necessary to meet water quality standards, where this is not the case, the CWA requires EPA and authorized states to establish water-quality-based effluent limitations as stringent as necessary to meet water quality standards.[2] Thus, water-quality-based limitations may require industrial facilities to meet standards that are more stringent than those in the ELGs.

To date, EPA has promulgated ELGs for 59 industrial categories. See EPA's Industrial Effluent Guidelines webpage for more information.[3] These ELGs apply to between 35,000 and 45,000 U.S. direct dischargers, as well as to another 129,000 facilities that discharge to POTWs. Based on pollutant reduction estimates from each ELG, EPA estimates that the regulations altogether prevent the discharge of over 700 billion pounds of pollutants annually.[4]

2.2 Effluent Limitations Guidelines and Pretreatment Standards Overview

EPA promulgates ELGs that include technology-based limitations for conventional, toxic, and nonconventional pollutants in accordance with six statutorily prescribed levels of control (Table 2-1).

[1] See 33 U.S.C. 1311(b) and 1314(b).

[2] See 33 U.S.C. 1311(b)(1)(C).

[3] See https://www.epa.gov/eg/industrial-effluent-guidelines.

[4] Based on the difference between discharges from each point source category before ELG promulgation and the estimated (lower) volume of discharges from each point source category after promulgation (from review of ELG development documents).

The limitations are based on the performance of specific technologies, but the regulations do not require a specific control technology to achieve the limitations. For more information, see EPA's Learn about Effluent Guidelines webpage.[5]

The CWA specifies different levels of control based on the type of pollutant (i.e., conventional, toxic, or nonconventional). CWA Section 304(a)(4) designates the following as conventional pollutants: biochemical oxygen demand (BOD_5), total suspended solids, fecal coliform, pH, and any additional pollutants defined by the Administrator as conventional. The Administrator designated oil and grease as an additional conventional pollutant on July 30, 1979.[6] At the direction of Congress, EPA has identified 65 pollutants and classes of pollutants as toxic, among which EPA has designated 126 specific substances as priority toxic pollutants.[7] All other pollutants are considered nonconventional.

Table 2-1. Statutorily Prescribed Levels of Control

Level of Control	CWA Statutory Reference	Description
Best Practicable Control Technology (BPT)	CWA Sections 301(b)(1)(A) and 304(b)(1), 33 U.S.C. 1311(b)(1)(A) and 1314(b)(1)	EPA develops effluent limitations based on BPT for conventional, toxic, and nonconventional pollutants. EPA establishes BPT effluent limitations based on the average of the best performance of facilities within an industry of various ages, sizes, processes, or other common characteristics. Where existing performance is uniformly inadequate, BPT may reflect higher levels of control than currently in place in an industrial category if the agency determines that the technology can be practically applied.
Best Conventional Pollutant Control Technology (BCT)	CWA Sections 301(b)(2)(E) and 304(b)(4), 33 U.S.C. 1311(b)(2)(E) and 1314(b)(4)	BCT addresses conventional pollutants from existing industrial point sources. EPA establishes BCT limitations by considering the factors specified in Section 304(b)(4)(B), including a two-part "cost-reasonableness" test. This methodology was published in a Federal Register notice on July 9, 1986 (51 FR 24974).
Best Available Technology Economically Achievable (BAT)	CWA Sections 301(b)(2)(A) and 304(b)(2), 33 U.S.C. 1311(b)(2)(A) and 1314(b)(2)	EPA develops effluent limitations based on BAT for toxic and nonconventional pollutants. BAT represents the best available economically achievable performance of plants in an industrial subcategory or category. Factors considered in establishing BAT include the age of equipment and facilities involved, the process employed, the engineering aspects of control techniques or process changes, the cost of achieving such effluent reduction, non-water-quality environmental impacts (including energy requirements), and such other factors as the Administrator deems appropriate (33 U.S.C. 1314(b)(2)(B)). BAT limitations may be based on end-of-pipe wastewater treatment or effluent reductions attainable through changes in a facility's processes and operations.
Standards of Performance for New Sources (NSPS)	CWA Section 306, 33 U.S.C. 1316	EPA develops effluent limitations based on NSPS for conventional, toxic, and nonconventional pollutants. NSPS reflect effluent reductions based on the best available demonstrated control technology (33 U.S.C. 1316(a)(1)). In establishing or revising NSPS, EPA considers the cost of achieving such effluent reduction and any non-water-quality, environmental impact, and energy requirements (33 U.S.C. 1316(b)(1)(B)).

[5] See https://www.epa.gov/eg/learn-about-effluent-guidelines.

[6] 44 FR 44501.

[7] Appendix A to part 423, reprinted after 40 CFR part 423.17.

Table 2-1. Statutorily Prescribed Levels of Control

Level of Control	CWA Statutory Reference	Description
Pretreatment Standards for Existing Sources (PSES)	CWA Section 307(b), 33 U.S.C. 1317(b)	EPA develops PSES for nonconventional and toxic pollutants. PSES are national, uniform, technology-based standards that apply to indirect dischargers. They are designed to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs (33 U.S.C. 1317(b)(1)). EPA considers the same factors for PSES as it does for BAT limitations (33 U.S.C. 1314(b)(2)(B)).
Pretreatment Standards for New Sources (PSNS)	CWA Section 307(c), 33 U.S.C. 1317(c)	EPA develops PSNS for nonconventional and toxic pollutants. PSNS are national, uniform, technology-based standards that apply to new indirect dischargers. Like PSES, they are designed to prevent the discharges of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. PSNS are issued at the same time as NSPS (33 U.S.C. 1317(c)). EPA considers the same factors in promulgating PSNS as it considers in promulgating NSPS (33 U.S.C. 1316(a)(1)).

EPA and states implement ELGs for point sources that discharge pollutants into surface waters through National Pollutant Discharge Elimination System (NPDES) permits.[8] POTWs, states, and EPA enforce pretreatment standards for point sources that discharge to POTWs.[9]

2.3 Effluent Guidelines Review and Planning Process

The CWA contains multiple provisions requiring EPA to review and revise the limitations, standards, and guidelines that apply to new and existing industrial facilities for both direct and indirect dischargers.

For existing direct dischargers, i.e., those that discharge into waters of the United States, the CWA requires EPA to review effluent limitations "at least every five years and, if appropriate, revise" those limitations.[10] The CWA also requires EPA to publish regulations providing guidelines for effluent limitations "and, at least annually thereafter, revise, if appropriate, such regulations."[11] Historically, EPA has combined rulemakings for effluent limitations and guidelines into a single rulemaking and referred to the resulting rule as an "ELG." Similarly, EPA consolidates its review of effluent limitations required under Section 301(d) and its review of effluent limitations guidelines under Section 304(b) into an annual review of the 59 promulgated ELGs.[12]

[8] See CWA Sections 301(a), 301(b), and 402; 33 U.S.C. 1311(a), 1311(b), and 1342.

[9] See CWA Sections 307(b) and 307(c); 33 U.S.C. 1317(b) and 1317(c).

[10] See CWA Section 301(d); 33 U.S.C. 1311(d).

[11] See CWA Section 304(b); 33 U.S.C. 1314(b). See also *Our Children's Earth v. EPA*, 527 F.3d 842, 848-49 (9th Cir. 2008) ("Sections 304(b) and (m) require an annual review of "guidelines for effluent limitations" applicable to direct dischargers and revision "if appropriate").

[12] See *Our Children's Earth v. EPA*, 527 F.3d 842, 849 (9th Cir. 2008) (discussing EPA's processes of combining the reviews required under Sections 301(d) and 304(b)).

For indirect dischargers, i.e., those that discharge to POTWs, the CWA requires EPA "from time to time" to publish proposed regulations establishing pretreatment standards.[13] The CWA also requires EPA to "review at least annually . . . and, if appropriate, revise guidelines for pretreatment."[14]

For new sources, both direct and indirect, the CWA requires EPA to "publish (and from time to time thereafter, revise) a list of categories of sources, which shall, at the minimum, include . . ." and "propose and publish regulations establishing Federal standards of performance for new sources within such category."[15] The CWA further provides that, "[t]he Administrator shall, from time to time, as technology and alternatives change, revise such standards following the procedure required by this subsection for promulgation of such standards."[16]

In the 1987 Amendments to the CWA, Congress added a provision that requires EPA to biennially publish in the Federal Register a "plan" that "establish[es] a schedule for the annual review and revision of promulgated effluent guidelines," identifies certain categories of sources for which ELGs have not previously been published, and establishes a schedule for promulgating ELGs for certain categories of sources for which such guidelines have not previously been published.[17] The biennial planning requirement was enacted after the CWA provisions regarding review and revision of effluent limitations and ELGs and informs EPA's obligations under those provisions. When read together, these provisions require EPA to annually review ELGs and revise those guidelines, if appropriate, and to biennially publish a plan as described above.

While the CWA requires EPA to annually "review" effluent limitations guidelines and pretreatment standards,[18] it does not require EPA to make a "yes" or "no" determination every year on whether to revise the guidelines and standards. See Effluent Guidelines Program Plan 14 (Plan 14, U.S. EPA, 2021a) Section 2.3 for further discussion of EPA's annual obligations. Further, where EPA initiates rulemaking revising ELGs, the CWA confers discretion on EPA as to the timing for that rulemaking (U.S. EPA, 2022o).

To increase transparency and stakeholder awareness, EPA's biennial plans include information on its review of existing ELGs and pretreatment standards, as well as industries reviewed for potential development of new ELGs or pretreatment standards.

Plan 15 describes ongoing planning activities, including projects EPA initiated as part of its 2021 annual review and details EPA's effluent guidelines planning efforts, including preliminary category reviews, category studies, and ELG rulemakings. For additional details, see *EPA's 2021 Annual Review of Industrial Wastewater Discharges* (U.S., EPA, 2022a) and *2021 Preliminary Review of Industrial Point Source Categories* (U.S. EPA, 2022b).

[13] See CWA Section 307(b); 33 U.S.C. 1317(b).
[14] See CWA Section 304(g); 33 U.S.C. 1314(g).
[15] See CWA Section 306(b)(1); 33 U.S.C. 1316(b)(1).
[16] See CWA Section 306(b)(1)(B); 33 U.S.C. 1316(b)(1)(B).
[17] See CWA Section 304(m); 33 U.S.C. 1314(m).
[18] See CWA Sections 304(b), 304(m)(1)(A), and 304(g); 33 U.S.C. 1314(b), 1314(m)(1)(A), 1314(g).

3. SUMMARY OF PUBLIC COMMENTS RECEIVED ON PRELIMINARY EFFLUENT GUIDELINES PROGRAM PLAN 15

On September 14, 2021, EPA published Preliminary Plan 15 for a 30-day public comment period (86 FR 51155). EPA received over 34,000 public comment letters on Preliminary Plan 15, the majority of which were submitted as part of four different mass-mail campaigns that supported the agency's review of and actions on PFAS and the meat and poultry industry. Apart from the mass-mail campaigns, EPA received 67 public comments.

EPA received comments on most of the topics presented in Preliminary Plan 15. Table 3-1 includes a summary of the major comments discussed in the public submissions and is generally organized by topic. See EPA's *Response to Comments for the Effluent Guidelines Program Plan 15* for all comment responses (U.S. EPA, 2022c).

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
ELG Planning	• EPA should prioritize the ELG program and reconsider its approach for reviewing and revising ELGs. • EPA needs to annually review industrial discharges and revise ELGs to meet the goals of the CWA. Despite progress made by the agency, less than half of waterways assessed for impairments have been determined to be safe and clean. • Over two thirds of the industrial regulations are 30 years old. EPA has not applied upgrades in treatment technologies to lower limits for the categories after many were originally established in the 1970s and 1980s. EPA should streamline its approaches by applying data and knowledge collected about current technologies when considering wastewater treatment upgrades (or issues) common among multiple industries (e.g., nutrients). • EPA should manage pollutants at the source, reducing burdens on POTWs that receive industrial discharges. • EPA ELG planning tools should be more transparent. In its analyses, EPA should consider toxicity of contaminants in its rankings analyses in addition to reviewing EPA's Contaminant Candidate List (CCL). • ELG planning should consider innovative approaches for complying with NPDES requirements and further advancing the goals of the CWA. • EPA should establish the strongest possible standards to protect waters, which are essential to communities (e.g., drinking water and business development). • Commenters generally agree with the limitations outlined by EPA on the 2020 cross-category concentration analysis, though one commenter noted that evaluating loads is also flawed because it does not consider permit limits or water quality at the industry level. • EPA should annually review and publish summaries of industry technology updates, characterization data, and clarifications on applicability to help with implementation of ELGs, specifically older regulations. • Commenters support the use of membrane technologies, both economical and versatile, in combination with chemical/physical treatment and/or biological treatment.	Env. Organization (6) Federal Agency (1) Industry Trade Assoc. (5) State Govt. (1)
Environmental Justice	• EPA should consider multiple environmental justice indicators in its annual reviews and look beyond EJScreen, as that tool does not provide a risk analysis and does not consider multiple environmental indicators at one time. EPA should consider the following in its proposed analyses: expanding the geographic proximity from wastewater discharge point, considering cumulative impacts (both environmental and from multiple dischargers in an area), measuring impaired water bodies, evaluating compliance within a geographic location, evaluating water bodies for downstream impacts, assessing impacts of fish consumption advisories on tribal and low-income communities, and considering impacts on Indigenous communities and sacred lands and waters. • EPA's proposed environmental justice methodology may not capture all environmental justice and inequity considerations. • EPA should consider environmental justice in the planning process and in regulation development. • Commenters stated specific environmental justice concerns with refineries, facilities discharging PFAS, fertilizer manufacturing facilities, slaughterhouses, and CAFOs. • EPA should consider prioritizing industries that are not currently regulated and are located in communities with environmental justice concerns.	Env. Organization (8) Federal Agency (1) Industry Trade Assoc. (2) Private Citizen (2) State Govt. (1)

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
PFAS – General	• Commenters stated PFAS are extremely persistent in the environment and the human body, and many have been linked at very low doses to serious health harms. • Recent action by EPA falls short of what is needed to sufficiently address industrial discharges of PFAS both in terms of scope and urgency. Commenters urged EPA to curb industrial releases of the toxic "forever chemicals" known as PFAS. • EPA should promulgate PFAS ELGs and pretreatment standards for multiple industry sectors at once and include all those that contribute to PFAS discharges. • EPA should set deadlines for the development of new standards to address industrial discharges of PFAS. • Commenters support the U.S. House of Representative's bipartisan legislation that requires EPA to set PFAS standards for nine industry categories within four years. • EPA should finalize a PFAS Road Map that shifts responsibility for PFAS discharges to polluters. EPA is encouraged to: require the disclosure of PFAS and use of technology to control discharges, set a PFAS drinking water standard, quickly set nationwide standards to restrict industrial releases of PFAS, designate PFAS as hazardous substances, end needless uses of PFAS, and ensure that PFAS wastes are properly disposed. • Commenters support EPA actions in issuing a regulatory determination under the Safe Drinking Water Act for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), proposing to expand monitoring of PFAS in drinking water, developing new analytical methods, providing more funding for local communities, restoring scientific integrity to EPA's review of PFAS, taking steps to close PFAS loopholes, and demanding more data from polluters. • Commenters varied in their opinion on the classification of PFAS. Some stated that PFAS are too broad of a class to promulgate regulations collectively, while others stated that PFAS must be addressed as a class, not as one chemical at a time. Some commenters encouraged EPA to delineate exact which chemical is being regulated and transition to using CAS Registry numbers when referring to compounds in the PFAS family. • Some commenters noted that PFAS burdens environmental justice communities. • EPA should conduct PFAS-specific screening across all industrial categories and incorporate Toxics Release Inventory (TRI) data into the analysis to reduce data gaps due to the lack of a part 136 PFAS surface water analytical method. • EPA should develop PFAS discharge prioritization guidance for states. • EPA must push state agencies to incorporate technology-based limits into state issued permits through case-by-case analyses, as required by the CWA, and provide guidance to states for conducting these analyses. • Some commenters stated that legacy and current use of PFAS should be addressed in analyses and in the development of regulations. • EPA should clarify whether stormwater practices and PFAS concentrations in stormwater were limiting factors in the agency's analysis. • EPA should include reverse osmosis and granulated activated carbon in technology-based regulations for PFAS.	Env. Organization (7) Federal Agency (3) Industry (4) Industry Trade Assoc. (4) Private Citizen (6) State Govt. (1)

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
PFAS – Analytical Methods	• EPA should validate and finalize Draft Method 1633 and develop methods to detect total organic precursors (TOP) and total organic fluorine (TOF). • In addition to Draft Method 1633, EPA should develop recommended sampling techniques/guidance. • PFAS data analyzed by EPA for Preliminary Plan 15 predates a draft method; one commenter was unaware of any other ELG that has been developed based on sampling data absent a single reference analytical method. • Once an analytical method is developed, it will take time to build laboratory capacity. Commenters are unaware of other ELGs that have faced this capacity issue. • Commenters noted that EPA should consider whether or not analytical methods are available for the specific chemical being regulated, as EPA's Draft Method 1633 is only applicable to 40 PFAS.	Env. Organization (2) Industry (1) Industry Trade Assoc. (2) Private Citizen (1)
PFAS – Organic Chemicals, Plastics and Synthetic Fibers (OCPSF)	• Some commenters support the revision of the OCPSF ELG and agree that it is warranted. • EPA's announced rulemaking should consider the wide variety of facilities and operations captured in the category and specifically define impacted facilities. • Some commenters stated that PFAS formulators, including those not currently regulated, should be considered when developing ELG. • One state commented that their sampling program has not identified OCPSF facilities as sources of discharges to POTWs or surface waters. However, there are data that suggest that some facilities may have PFAS discharges associated with the storage of aqueous film-forming foam (AFFF). This state also stated that there are 29 chemical manufacturers in the state that are not categorically covered under OCSPF; some are sources of PFAS, and these manufacturers should be considered as part of the rulemaking. • One commenter stated that EPA should review the wastewater characterization data and identify any pretreatment in order to effectively characterize treatment. EPA should also consider collecting paired influent-effluent data across treatment technologies. • One commenter stated that EPA should further study PFAS formulators and agreed that these facilities should not be regulated at this time.	Env. Organization (2) Industry (1) Industry Trade Assoc. (2) State Govt. (1)
PFAS – Metal Finishing and Electroplating	• Commenters supported the proposed rulemaking for the Metal Finishing Category and stated that EPA should consider specific regulatory language (e.g., a subcategory or paragraph) for chromium electroplating and chromium anodizing. • EPA should also consider expanding the scope to identify the presence of PFAS at all metal finishers, including electroplaters. • One commenter stated that the EPA PFAS report should be updated to include perfluorononanoic acid (PFNA) data from the Region 5 PFAS Electroplater Study for chromium electroplating and chromium anodizing operations.	Env. Organization (3) Industry (1) State Govt. (1)

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
PFAS – Textile Mills	• One commenter stated that textile mills are known dischargers of PFAS. • EPA should issue Section 308 letters to require data collection for PFAS in discharges. • EPA should make data collected in the study publicly available on EPA's website and publish a separate detailed study report on its findings.	Env. Organization (1) Industry (1) Industry Trade Assoc. (1)
PFAS – Landfills	• The Landfill ELG should include pretreatment standards, as leachate is a significant source of PFAS and other compounds released to POTWs. • EPA's study should cover active and closed landfills. • The current methods EPA is evaluating for the treatment of PFAS from leachate have not been proven to be viable for full-scale implementation (or economically feasible). • Landfills are not the users of PFAS; they are the receivers. As such, industry believes that there are opportunities for them to minimize discharges of PFAS. However, industry maintains that the most effective approach to controlling PFAS would be to eliminate it at the source. Minimization techniques should be evaluated as part of the detailed study. • EPA's review of landfills should account for different landfill profiles and, therefore, different wastewater characterization. • Two commenters stated that they welcome the opportunity to share information on the data requested as part of Preliminary Plan 15. • One commenter expressed interest in collaborating with EPA to conduct further research and study leaching characteristics and evaluate applicable treatment technologies.	Env. Organization (2) Industry (3) Industry Trade Assoc. (1) State Govt. (1)
PFAS – Other Industries	*Pulp, Paper, and Paperboard* • A commenter stated that EPA should continue its study on the use and discharge of PFAS at pulp and paper mills. • States expressed concern about indirect discharges of PFAS from legacy PFAS (e.g., in recycled fibers) even though the industry will phase out direct application of PFAS in new products in 2024. • Pulp and paper sites have contaminated ground water and soils that contribute to impacted ground and surface water (via old paper sludge land application sites). • EPA should consider working with the U.S. Food and Drug Administration to evaluate PFAS in the food packaging industry. • EPA should consider monitoring PFAS in paper mill intake water to determine if it is a relevant source of PFAS. • One commenter stated that the pulp and paper industry phased out the use of long-chain PFOA and PFOS approximately 10 years ago and has almost completed its transition of intentional short-chain PFAS in its manufacturing process.	Env. Organization (2) Industry (2) Industry Trade Assoc. (2) State Govt. (2)

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
	Leather Tanning and Finishing • EPA should consider PFAS limitations for this category due to data indicating contaminated ground water and stormwater associated with these sites. *Plastics Molding and Forming* • EPA should prioritize this industry sector in its ongoing PFAS research, collect data from the industry, and determine if updated ELG are necessary to address PFAS. *Paint Formulating* • EPA should collect data from the industry to determine if updated ELG are necessary to address PFAS. • A commenter also noted that because paints are flammable, sites may be outfitted with AFFF. *E&EC* • The use of PFAS in electronics is well documented. EPA should complete its detailed study and should update the public in Plan 15. *Airports/AFFF* • EPA should continue studying the use of AFFF at airports and consider expanding the scope of facilities identified as having a stockpile of AFFF. • EPA should include more firefighting solutions other than PFAS-free firefighting foam. • One state commented that no new ELG for airports were required at this time because it found no current impairments resulting from PFAS storage, loading, or use at airports in Wyoming.	
Petroleum Refining	• A commenter stated that EPA should complete a thorough review of the petroleum refining ELG, including an assessment of BAT and limits for other pollutants discharged by the industry. • Over the course of a multi-year review, EPA failed to consider or answer the questions needed to determine if revision to the existing ELG is warranted. • Current ammonia discharge monitoring report (DMR) data suggest that the ammonia limits (established in 1974) no longer represent BAT. • EPA should promulgate concentration- or mass-based limitations so that larger refineries are held to similar standards as smaller refineries. • EPA should consider nitrates, selenium, mercury, nickel, and PFAS (including legacy contamination from the use of AFFF).	Env. Organization (1)
Oil and Gas/ Centralized	• EPA should continue to study Oil and Gas Extraction/Centralized Waste Treatment ELG, specifically for PFAS as there is evidence that PFAS are used in oil and gas production and potentially oil recovery operations and that centralized waste treatment facilities are a source of PFAS to POTWs.	Env. Organization (2) State Govt. (1)

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
Waste Treatment	• EPA should set national standards for produced water in order to help states set appropriate standards and ensure water quality. • One commenter expressed support for EPA's decision not to make changes to Section 437 (to allow for more flexibility for increased discharge of produced water to centralized waste treatment facilities). • EPA should engage with stakeholders on a more robust study of produced water discharges to determine if revised ELGs are needed.	
Fertilizer Mfg.	• EPA should review the Fertilizer Manufacturing ELG. EPA has overlooked details about discharges that impact communities with environmental justice concerns and pollute climate, air, and surface water in its decision not to continue review of the category as announced in the Preliminary Plan 15. • EPA should develop ELGs for three categories of fertilizer manufacturing plants: manufacture of nitrogen fertilizer ingredients, manufacture of phosphorus fertilizer ingredients, and plants that mix nitrogen and phosphorus ingredients with others for finished fertilizer products. • One commenter stated that EPA's most recent review was insufficient to determine whether the existing ELG and pretreatment standards are appropriate. • EPA's cross-category concentration analysis was not grounded in CWA requirements; EPA should have compared fertilizer manufacturing concentrations to actual permit limits required by the ELG. • One commenter stated that pollutants from fertilizer manufacturing and the application of fertilizer products impact human health and the environment.	Env. Organization (1)
Steam Electric	• EPA should consider limitations, or mitigation strategies, for bromides to help protect sources of drinking water. • EPA must set zero discharge requirements for bottom ash transport water and flue gas desulfurization wastewater. • EPA should target the discharges associated with legacy wastewater. • One commenter stated that EPA should propose revised standards sooner than the announced Fall 2022 timeline. • One commenter agreed with EPA's 2020 rulemaking decision not to establish membrane technology as BAT and supports the 2020 Rule. • One state commented that it does not show any impairments from steam electric power plants; therefore, they do not support a revised rulemaking and welcome the opportunity to meet with EPA to discuss.	Env. Organization (3) Industry Trade Assoc. (2) State Govt. (2)

Table 3-1. Summary of Public Comments Received on Preliminary Plan 15

Topic	Summary	Commenter Types (Count by Type)
Meat and Poultry Products (MPP)	• One commenter stated that it is collaborating with EPA to update and clearly define the list of facilities that are captured under the applicability of the ELG as part of the detailed study effort referenced in Plan 14 (86 FR 1960). • EPA should strengthen the ELG for MPP as soon as possible, as available technology for these wastewaters has improved. • One commenter indicated that the MPP industry has caused interference and pass through at POTWs. • EPA can use existing DMR data, information on BAT nutrient removal technologies from industry (or best performers), and information on nutrient removal technologies from POTWs to revise MPP ELG.	Env. Organization (3) Industry Trade Assoc. (3) Private Citizen (1) State Govt. (2)
Concentrated Animal Feeding Operations (CAFOs)	• One commenter urged EPA to review the ELG for the CAFOs industry based on assertions that: EPA has factual evidence that demonstrates the inadequacy of the current ELG, current wastewater management practices are no longer BAT, and EPA's current rankings methodology (based solely on DMR data) does not accurately characterize pollutant impacts.	Env. Organization (1)

4. SUMMARY OF ANNUAL REVIEW ACTIVITIES

This section presents EPA's 2021 annual review activities. These review activities include review of discharge monitoring report (DMR) data and ranking of pollutant load discharged across all existing ELGs, comprised of industries with existing ELGs and some industries that are not currently regulated by ELGs. EPA has taken the following actions as part of its 2021 annual review:

- Conducted a rankings analysis (as a follow-on of the cross-category concentration analysis conducted for the 2020 annual review and described in Preliminary Plan 15) of point source categories based on pollutant load data reported on 2019 DMRs (see Section 5.1). EPA used 2019 DMR data for the 2021 annual review because they were the most recent and complete set of industrial wastewater discharge data available when the rankings analysis began.
- Conducted preliminary category reviews of three point source categories to assess discharges of PFAS and other regulated and unregulated pollutants to determine whether the categories warrant further review and study: Leather Tanning and Finishing (40 CFR part 425), Paint Formulating (40 CFR part 446), and Plastics Molding and Forming (40 CFR part 463) (see Sections 5.2 through 5.4). EPA used 2020 DMR and Toxics Release Inventory (TRI) data for these preliminary category reviews because they were the most recent and complete set of industrial wastewater discharge data available when the category reviews began.
- Continued to screen, prioritize, and further review specific industrial wastewater treatment technologies that may be more broadly evaluated as technology options in future studies and rulemakings (see Section 5.5).
- Continued to compile wastewater treatment technology information in the Industrial Wastewater Treatment Technology (IWTT) Database and populate the information into the IWTT web application for public use (see Section 5.6.1).

In Preliminary Plan 15, EPA announced that it was initiating a detailed study for one point source category: Landfills (40 CFR part 445). See Section 6.3.3 for information on EPA's next steps regarding this category.

EPA also explained in Preliminary Plan 15 that it was considering how best to incorporate equity and environmental justice considerations into the ELG planning process. As a component of the preliminary reviews for the Leather Tanning and Finishing, Paint Formulating, and Plastics Molding and Forming Categories, EPA compiled publicly available socioeconomic data for census block groups where facilities discharging to surface water or POTWs are located to evaluate the impact of potential discharges and help further prioritize the categories for review and study. Specifically, EPA evaluated the following indicators: the percentile of people of color, low income, life expectancy at birth, unemployment rate, less than high school education, and linguistically isolated relative to the U.S. median value (50th percentile). For an entire category, EPA calculated the percentage of facilities located in census block groups that had one or more socioeconomic indicators greater than the national 80th percentile, consistent with the EJScreen methodology for highlighting communities that may require closer attention. See EPA's *2021 Preliminary Review of Industrial Point Source Categories* for more details on the specific analyses performed as part of the preliminary category reviews (U.S. EPA, 2022b). Section 5.7 describes this methodology in more detail.

As required by the CWA, EPA reviewed all point source categories as part of its annual review. Given EPA's current priorities and available resources, the agency will continue to focus on the categories identified in EPA's PFAS Strategic Roadmap that are likely discharging PFAS, in addition to the other point source categories discussed in this Plan. Categories not discussed in detail in Plan 15 are not priorities for further study or rulemaking at this time. EPA will continue to review all point source categories while preparing the next plan.

The 2021 annual review and the information presented here in Plan 15 build on EPA's previous annual reviews, including the 2020 annual review and ELG planning process described in Preliminary Plan 15 (U.S. EPA, 2021b). EPA will present its 2022 annual review as part of Preliminary Plan 16 and expects to expand its rankings analyses to include additional metrics such as size of the industry, average volume of wastewater discharged, age of regulations, current ELG requirements and technology basis, presence of PFAS in industrial wastewater discharges, discharges to impaired waters, and demographics data associated with the location of industrial dischargers.

EPA also received petitions for rulemaking that in part request changes to the ELG for CAFOs and Plastic Manufacturers and is carefully reviewing those petitions.[19,20]

[19] Food & Water Watch, et al. "Petition to Revise the Clean Water Act Regulations for Concentrated Animal Feeding Operations." Submitted 8 March 2017. Food & Water Watch filed a mandamus action in the U.S. Court of Appeals for the Ninth Circuit asking the court to order EPA to respond to the petition. As of the time of signature of Plan 15, EPA and Food & Water Watch have entered into the Court's mediation program to address the mandamus action.

[20] Center for Biological Diversity, et al. "Petition to Revise the Clean Water Act Effluent Limitations Guidelines and Standards for the Petro-Plastics Industry Under the 40 CFR part 419 Petroleum Refining Industrial Category (Cracking and Petrochemicals Subparts) and part 414 Organic Chemicals, Plastics, and Synthetic Fibers Industrial Category." Submitted 23 July 2019.

5. REVIEWS OF INDUSTRIAL WASTEWATER DISCHARGES AND TREATMENT TECHNOLOGIES

This section describes EPA's ongoing ELG program planning activities and analyses to identify industrial categories for potential new or revised ELGs and summarizes the sources and limitations of the data used to complete the reviews. This section also presents findings and next steps for the associated planning activities.

5.1 DMR Pollutant Load Rankings Analysis

As part of its 2021 annual review of the ELGs, EPA used DMR data to rank categories by total annual pollutant load discharged. This rankings analysis provides a mechanism for prioritizing specific point source categories for further review. The following subsections discuss the data sources and methodology of the DMR pollutant load rankings analysis, describe factors that EPA considered in its review, and summarize the results of the review. For additional details on the DMR pollutant load rankings analysis, see *EPA's 2021 Annual Review of Industrial Wastewater Discharges* (U.S. EPA, 2022a).

5.1.1 Data, Methodology, and Analysis Considerations

For this analysis, EPA evaluated available industrial wastewater discharge data reported on facilities' 2019 DMRs, which was the most current DMR data set available at the time the rankings analysis was conducted. Facilities that discharge wastewater to "waters of the United States" pursuant to a National Pollutant Discharge Elimination System (NPDES) permit are required to report monitoring data via DMRs for pollutants listed in their NPDES permits. Facilities send DMRs electronically to their respective NPDES permitting authorities (state or EPA). The DMR data are stored in EPA's centralized program database, Integrated Compliance Information System National Pollutant Discharge Elimination System (ICIS-NPDES). ICIS-NPDES captures pollutant-specific permit limits, monitoring requirements, and DMR data, including, but not limited to, facility, outfall, and monitoring-period-specific pollutant discharge concentrations, quantities, and wastewater flows. EPA's Water Pollutant Loading Tool compiles the ICIS-NPDES data into a web-based platform that calculates and presents facility pollutant discharges in pounds per year or by monitoring period, as described in Section 3 of the *Technical Users Background Document for the Discharge Monitoring Report (DMR) Pollutant Loading Tool* (U.S. EPA, 2012) and summarized in *EPA's 2021 Annual Review of Industrial Wastewater Discharges* (U.S. EPA, 2022a).

As a first step, EPA downloaded data from the Water Pollutant Loading Tool[21] and established a crosswalk to relate individual facility and subsequent parameter-level data to the most appropriate point source category or potential point source category, primarily based on the facility's reported Standard Industrial Classification (SIC) or North American Industry Classification System (NAICS) code and the reported parameter. These links enabled EPA to analyze discharges within and across point source categories.

[21] Water Pollutant Loading Tool Resources: https://echo.epa.gov/trends/loading-tool/resources (see "Effluent Guidelines (ELG) Crosswalks (used only for Top Industrial Dischargers of Toxic Pollutants)"). EPA uses the "NPDES ID and Parameter Code to Point Source Category" crosswalk for its annual review analyses.

EPA then downloaded the following 2019 DMR data for each facility from the Water Pollutant Loading Tool into a static database to preserve the integrity of the data and facilitate subsequent analyses (ERG, 2021a):

- NPDES permit number.
- Parameter name and code.
- Pollutant name and code.
- Average concentration in milligrams per liter (mg/L).
- Maximum concentration (mg/L).
- Total load discharged for 2019 in pounds per year (lb/year).
- Wastewater flow for 2019 (million gallons per day).

EPA used 2019 data for this review because they comprised the most recent and complete set of industrial wastewater discharge data available when EPA began the review.

Using the point source category crosswalk, EPA linked all records to a point source category using the NPDES permit number and the parameter and then summed the annual load across pollutants to the facility level and, subsequently, to the point source category level. EPA then ranked point source categories from highest to lowest pounds of discharge in 2019. Section 5.1.3 of this report presents the results of the 2021 rankings analysis (based on the 2019 DMR data).

5.1.2 Data Quality Review and Corrections

For this analysis, EPA evaluated completeness, accuracy, and reasonableness of the downloaded 2019 data as follows.

Completeness. EPA assessed completeness of the data sets by comparing the volume of the 2019 downloaded ICIS-NPDES data to data from a similar analysis conducted in 2017 to ensure that there was no discrepancy that would indicate an incomplete download of the data. EPA identified a 1 percent increase in the total count of facilities reporting data, as new facilities or pollutants are typically added each year as permits are developed or revised.

Accuracy and reasonableness. For the top ten point source categories in the pollutant load rankings,[22] EPA identified outliers (where a few facilities form most of the point source category load) and determined if any of the data were a result of data entry errors (e.g., unit errors, such as data entered as "2.7 grams" instead of "2.7 milligrams").

For identified facility outliers, EPA used the Enforcement and Compliance History Online (ECHO) effluent charts[23] to investigate and determine if the outlier data resulted from reporting errors. These effluent charts graph facilities' submitted monitoring data from all years, allowing EPA to identify whether the data are consistent over time. EPA identified potential data errors where the facility effluent

[22] Note that EPA did not review data from facilities in categories where ELGs were promulgated or revised in the past seven years.

[23] ECHO: https://echo.epa.gov.

data were unexpectedly different from year to year and/or month to month (higher or lower) by an order of magnitude or more and reported these potential errors through its Integrated Error Correction Process (IECP), via the error report feature built into ECHO's website. In instances where the IECP confirmed the error, EPA recalculated the annual pollutant loads and reran the rankings. For additional details on the identified outliers and data corrections, see EPA's *2021 Annual Review of Industrial Point Source Categories* (U.S. EPA, 2022a).

5.1.3 Results of the DMR Pollutant Load Rankings Analysis

Table 5-1 presents the 2021 annual review discharge rankings using 2019 DMR data. The rankings include the 2019 aggregated annual loads for each point source category (ranked from highest to lowest), the percentage of the total load the point source category comprises, and the number of facilities in each point source category that reported data greater than zero in 2019.

The rankings analysis provides a mechanism for EPA to review discharges from industrial categories and potentially prioritize specific point source categories for further review. EPA's recommendation to further prioritize categories also considers other aspects such as stakeholder input and Administration priorities. As described in this Plan, EPA continues to focus on and evaluate the extent and nature of PFAS discharges and assess opportunities for limiting those discharges from multiple industrial categories, as outlined in EPA's PFAS Strategic Roadmap. Specifically, as identified in the agency's PFAS Strategic Roadmap, EPA conducted a preliminary review of three point source categories to assess discharges of PFAS and other regulated and unregulated pollutants to determine whether the categories warrant further review and study: Leather Tanning and Finishing (40 CFR part 425), Paint Formulating (40 CFR part 446), and Plastics Molding and Forming (40 CFR part 463) (see Sections 5.2 through 5.4). For the three preliminary category reviews, EPA used 2020 DMR and TRI data, as these data were publicly available during the agency's review (see Section 1 of EPA's *2021 Preliminary Review of Industrial Point Source Categories* for a description of the data sources, uses, and limitations (U.S. EPA, 2022b)).

The results of the pollutant load rankings analysis, presented in Table 5-1, did not present any findings that altered EPA's decision on prioritization for industrial category reviews targeting PFAS at this time. EPA may choose to prioritize reviews of these categories differently in the future.

Table 5-1. 2021 Annual Review Discharge Ranking Results

40 CFR Part	Point Source Category Name	2019 DMR Annual Loads (lb/year)	Percentage of Total Load	Cumulative Percentage of Total Load	Facilities Reporting Discharges Greater than Zero
414	Organic Chemicals, Plastics, and Synthetic Fibers[a]	120,000,000,000[b]	72%	72%	609
423	Steam Electric Power Generating[a]	14,600,000,000	9%	81%	808
N/A	Drinking Water Treatment	5,830,000,000	3%	84%	2,022
435	Oil and Gas Extraction	3,130,000,000[b]	2%	86%	489
419	Petroleum Refining	3,040,000,000	2%	88%	642
433	Metal Finishing[a]	2,510,000,000[b]	2%	90%	638

Table 5-1. 2021 Annual Review Discharge Ranking Results

40 CFR Part	Point Source Category Name	2019 DMR Annual Loads (lb/year)	Percentage of Total Load	Cumulative Percentage of Total Load	Facilities Reporting Discharges Greater than Zero
434	Coal Mining	2,380,000,000	1%	91%	1,674
415	Inorganic Chemicals Manufacturing	2,310,000,000	1%	92%	229
436	Mineral Mining and Processing	2,020,000,000	1%	94%	1,324
430	Pulp, Paper, and Paperboard[a]	1,640,000,000	1%	95%	233
420	Iron and Steel Manufacturing	1,320,000,000	1%	95%	145
432	Meat and Poultry Products[a]	1,030,000,000[b]	1%	96%	296
445	Landfills[a]	690,000,000	<1%	96%	247
438	Metal Products and Machinery	674,000,000	<1%	97%	836
405	Dairy Products Processing	590,000,000	<1%	97%	118
440	Ore Mining and Dressing	537,000,000	<1%	97%	91
449	Airport Deicing	496,000,000	<1%	98%	79
N/A	Miscellaneous Foods and Beverages	463,000,000	<1%	98%	159
444	Waste Combustors	379,000,000	<1%	98%	25
460	Hospital	360,000,000	<1%	98%	237
463	Plastics Molding and Forming[a]	345,000,000	<1%	99%	120
451	Concentrated Aquatic Animal Production	278,000,000	<1%	99%	306
454	Gum and Wood Chemicals Manufacturing	247,000,000	<1%	99%	12
408	Canned and Preserved Seafood Processing	225,000,000	<1%	99%	99
407	Canned and Preserved Fruits and Vegetables Processing	145,000,000	<1%	99%	81
N/A	Unassigned Waste Facility	131,000,000	<1%	99%	178
N/A	Food Service Establishments	121,000,000	<1%	99%	172
429	Timber Products Processing	117,000,000	<1%	99%	271
455	Pesticide Chemicals	109,000,000	<1%	99%	31
437	Centralized Waste Treatment	103,000,000	<1%	100%	15
421	Nonferrous Metals Manufacturing	101,000,000	<1%	100%	56
418	Fertilizer Manufacturing	89,400,000	<1%	100%	59
422	Phosphate Manufacturing	85,900,000	<1%	100%	18
409	Sugar Processing	84,600,000	<1%	100%	34
411	Cement Manufacturing	80,000,000	<1%	100%	507
442	Transportation Equipment Cleaning	75,900,000	<1%	100%	127
N/A	Independent and Stand-alone Labs	51,600,000	<1%	100%	37
439	Pharmaceutical Manufacturing	43,400,000	<1%	100%	56
464	Metal Molding and Casting (Foundries)	35,200,000	<1%	100%	48
406	Grain Mills	33,000,000	<1%	100%	32
410	Textile Mills[a]	27,600,000	<1%	100%	58

Table 5-1. 2021 Annual Review Discharge Ranking Results

40 CFR Part	Point Source Category Name	2019 DMR Annual Loads (lb/year)	Percentage of Total Load	Cumulative Percentage of Total Load	Facilities Reporting Discharges Greater than Zero
443	Paving and Roofing Materials (Tars and Asphalt)	20,800,000	<1%	100%	91
457	Explosives Manufacturing	14,600,000	<1%	100%	15
428	Rubber Manufacturing	14,100,000	<1%	100%	82
N/A	Printing & Publishing	8,640,000	<1%	100%	12
426	Glass Manufacturing	7,050,000	<1%	100%	42
469	Electrical and Electronic Components	6,020,000	<1%	100%	9
471	Nonferrous Metals Forming and Metal Powders	5,970,000	<1%	100%	56
450	Construction and Development	5,170,000	<1%	100%	182
424	Ferroalloy Manufacturing	4,380,000	<1%	100%	11
467	Aluminum Forming	3,350,000	<1%	100%	21
425	Leather Tanning and Finishing[a]	2,520,000	<1%	100%	3
417	Soap and Detergent Manufacturing	1,710,000	<1%	100%	14
468	Copper Forming	759,000	<1%	100%	18
458	Carbon Black Manufacturing	639,000	<1%	100%	8
412	Concentrated Animal Feeding Operations[a]	325,000	<1%	100%	18
N/A	Industrial Laundries	177,000	<1%	100%	3
446	Paint Formulating[a]	131,000	<1%	100%	20
427	Asbestos Manufacturing	53,300	<1%	100%	1
461	Battery Manufacturing	47,100	<1%	100%	7
447	Ink Formulating	33,900	<1%	100%	5
N/A	Tobacco Products	19,200	<1%	100%	2
465	Coil Coating	1,250	<1%	100%	3
459	Photographic	6.90	<1%	100%	1
Total		**167,000,000,000**	-	-	-

a – EPA is currently monitoring, reviewing, or studying this category or conducting a rulemaking for this category.

b – 2019 DMR Annual Load may be overestimated due to outliers in the underlying data. EPA submitted the outliers via the error report feature built into ECHO's website but has not identified a correction at this time.

5.2 Leather Tanning and Finishing Point Source Category (40 CFR part 425)

EPA announced the Leather Tanning and Finishing Category (40 CFR part 425) for preliminary review in EPA's PFAS Strategic Roadmap. EPA initiated a preliminary review of this category to gather additional information on discharges associated with PFAS, among other pollutants.

Leather tanning and finishing refers to processes that convert animal hides or skins into leather. In 1982, EPA promulgated ELG for this industry, which cover wastewater generated from beamhouse, tanyard, and retan and wet-finish process steps. EPA established production-based limitations for direct dischargers and concentration-based limitations for indirect discharges for nine subcategories (U.S. EPA, 1982). The ELG include limitations for BOD_5, oil and grease, total suspended solids (TSS), total chromium, pH, and sulfide. As part of this preliminary category review, EPA evaluated U.S. census data and 2020 DMR and TRI data to assess the size of the industry and corresponding pollutant loads. The census data showed that the number of leather tanning and finishing facilities has been decreasing steadily since 2000 and that most tanneries are small operations with fewer than 20 employees.

PFAS are used in leather manufacturing to improve the efficiency of the tanning process. PFAS can also be applied to leather to provide water and oil repellence, stain resistance, and oil release (Glüge et al., 2020). PFAS discharges were not reported from this industry in either 2020 DMR or TRI data because the category is not currently required to report discharges in NPDES permits or based on current TRI reporting criteria. Therefore, EPA evaluated the available PFAS data from the Michigan Department of Environment, Great Lakes, and Energy (MI EGLE),[24] which collected PFAS data as part of a state sampling effort separate from NPDES permit (i.e., DMR) and TRI reporting requirements. The MI EGLE data set captured four leather tanning facilities in the sampling effort. Three out of four leather tanning facilities in Michigan had detectable quantities of PFAS in their effluent. The highest concentration detected was 83 ppt of PFOS. MI EGLE did not identify leather tanneries as a high priority source of PFAS or PFOA compared to other industries identified during their ongoing study; however, they did identify some inactive tanneries that used PFAS in the past as contaminated sites (MI EGLE, 2020a; U.S. EPA, 2022d).

Three leather tanning facilities reported DMR data in 2020; one facility accounted for over 90 percent of the DMR discharges. Because EPA determined that one facility contributed to the majority of the loads, EPA did not prioritize DMR data for further pollutant-specific reviews. Over 99 percent of the total 2020 TRI loads were reported as indirect releases to POTWs. The top pollutant contributing to over 90 percent of the indirect load was ammonia.

Ammonia accounts for 93 percent of the 2020 TRI indirect loads. Research indicates that ammonia is generated during two steps in the leather tanning process: (1) the soaking and unhairing step (during which the proteins removed can convert to ammonia) and (2) the deliming step (where ammonia comes from the addition of ammonia salts, ammonium chloride, and ammonium sulfate). Because facilities report total estimated releases to TRI (i.e., total pounds per year) and there are no corresponding concentration data available in TRI, EPA reviewed the ammonia concentrations collected as part of the

[24] See the MI EGLE Industrial Pretreatment Program (IPP) PFAS Initiative website for more information.

1982 rulemaking. In 1982, EPA collected effluent samples from 31 tanneries across all nine subparts; ammonia concentrations ranged from 1 mg/L to 680 mg/L.

The regulation of ammonia was considered during the 1982 rulemaking, specifically the potential substitution of Epsom salts for ammonia during the deliming process. EPA did not promulgate pretreatment standards in 1982 because this substitution was determined to be cost prohibitive. As part of this review, EPA compared the 1982 ammonia concentrations to inhibition thresholds for ammonia at POTWs. An inhibition threshold is a concentration range at which a pollutant in a POTW's wastewater or sludge causes operational problems for biological treatment processes. Based on the available documentation, ammonia concentrations observed during the 1982 rulemaking were generally lower than 2004 inhibition thresholds for ammonia based on activated sludge (480 mg/L) and anaerobic digestion (1,500 mg/L to 8,000 mg/L), suggesting that ammonia discharges are not causing impacts to POTW operations (U.S. EPA, 2022b).

EPA evaluated facilities for environmental justice concerns including whether they are located in census block groups (i.e., communities) that have higher demographic metrics than the national average (50th percentile). The 2-factor demographic index considers the average of people of color and low-income populations, and the 5-factor index considers low income, education less than a high school degree, linguistic isolation, unemployment, and life expectancy. The communities surrounding leather tanning and finishing facilities are on average at the 53rd percentile for the 2-factor demographic index and at the 70th percentile for the 5-factor index. Four facilities are in census block groups in the 80th percentile or higher for one or both indices, and overall, these facilities are in communities with higher-than-average demographic indicators.

EPA is not prioritizing the Leather Tanning and Finishing Category for further review or ELG revision at this time. EPA recommends that state and local permitting authorities consider applying water-quality-based effluent limitations, as appropriate, to address any potential issues with direct discharging facilities within this category. During this review, EPA has not identified any data that suggest discharges from leather tanning facilities to POTWs are impacting POTW operations at this time. The PFAS data EPA reviewed are limited; however, EPA expects to review additional data in the coming years as a result of the POTW Influent Study (Section 6.3.5), updated TRI reporting requirements for PFAS, and NPDES permit monitoring requirements for federally-issued permits.[25] These data will help EPA identify any significant sources of these chemicals in future reviews.

5.3 Paint Formulating Point Source Category (40 CFR part 446)

EPA announced the Paint Formulating Category (40 CFR part 446) for preliminary review in EPA's PFAS Strategic Roadmap. The PFAS Strategic Roadmap identifies the ELG program as a potential method for restricting PFAS discharges from industrial wastewater sources as a key action (U.S. EPA, 2021d). EPA initiated a preliminary review of the Paint Formulating Point Source Category to gather additional information on discharges associated with PFAS, among other pollutants.

[25] See EPA's April 2022 memorandum and December 2022 memorandum, detailing the agency's intention to address PFAS discharges in NPDES permits and through the pretreatment program and monitoring programs. In addition to reducing PFAS discharges, this will also provide data to inform ELG planning and actions.

In 1975, EPA promulgated ELG for this industry, which captured the discharges resulting from the production of paint and coatings. EPA organized the ELG into three subcategories based on the base and the technique used for equipment washing (U.S. EPA, 1975):

- Subcategory A. Oil-Base Solvent Wash Paint Manufacture.
- Subcategory B. Oil-Base Caustic Wash Paint Manufacture.
- Subcategory C. Water-Base Paint Manufacture.

EPA established zero discharge regulations for BPT, BAT, NSPS, and PSNS for Subcategory A and reserved[26] PSES for Subcategory A. EPA reserved the Subcategory B regulation and planned to reevaluate Subcategory C for promulgation at a later date. Resin manufacture is covered under 40 CFR part 414: Organic Chemicals, Plastics, and Synthetic Fibers.

As part of this preliminary category review, EPA evaluated 2019 U.S. Census data and 2020 DMR and TRI data to learn more about the size of the industry, discharge practices, and corresponding pollutant loads. The count of facilities from the 2019 U.S. Census and 2020 DMR and TRI data suggests that the proportion of direct and indirect discharges within the industry remains similar to 1975 and that most discharges of process wastewater are indirect discharges (U.S. EPA, 2022b). Census data suggest that much of the industry is comprised of small establishments (i.e., less than 20 employees).

EPA's limited literature search identified that PFAS are used in paint, coating, and varnish manufacturing. A 2022 Organization for Economic Cooperation and Development (OECD) report, *Per- and Polyfluoroalkyl Substances and Alternatives in Coatings, Paints and Varnishes (CPVs), Report on the Commercial Availability and Current Uses*, identified that the majority of PFAS in coatings, paints, and varnishes are fluoropolymers and, to a lesser degree, short-chain PFAS used in household paints. The PFAS function as levelling, wetting, and anti-blocking agents and provide protective properties for increased durability and weatherability, as well as repellency for anti-stick and anticorrosive applications (OECD, 2022; Glüge et al., 2020). These properties allow paints to apply smoothly and evenly and prevent damage to the surfaces they cover and the paints themselves. Several resources indicated that there are viable PFAS alternatives for paint including polyurethane, polyethylene, and polyvinylchloride (OECD, 2022). EPA did not identify any PFAS discharge data from this industry in either 2020 DMR or TRI because these facilities are not currently required to report discharges in NPDES permits or based on current TRI reporting criteria. Therefore, EPA evaluated the available PFAS data from MI EGLE,[27] which collected PFAS data as part of a state sampling effort separate from NPDES permit (i.e., DMR) and TRI reporting requirements (U.S. EPA, 2022d). Based on state-provided data, EPA found six facilities with available PFAS discharge data, four of which had detectable quantities of PFAS in their effluent. PFOS and PFOA had the highest average concentrations at 6.05 ppt and 0.15 ppt, respectively. EPA expects that the POTW Influent Study (Section 6.3.5) which EPA intends to initiate will provide further information on any PFAS discharges from indirect dischargers in this industry.

[26] "Reserved" refers to a placeholder within the Code of Federal Regulations. The agency may "reserve" certain ELGs to indicate that it may develop ELGs at a later date.

[27] See the MI EGLE Industrial Pretreatment Program (IPP) PFAS Initiative website for more information.

To understand current discharges of non-PFAS pollutants, EPA reviewed 2020 DMR and TRI data for the Paint Formulating Category. From the 2020 DMR data, EPA identified 18 facilities with NPDES permits. EPA found that all effluent limits in the 18 discharge permits were associated with stormwater or other noncontact process wastewater outfalls, which is to be expected as the regulations for Subcategory A (Oil-Base Solvent Wash Paint Manufacture) require zero discharge of pollutants from process wastewater. EPA reviewed pollutants reported to 2020 TRI, which provides available data on indirect discharges. EPA focused the review on solvents and metals, which make up the majority of the indirect discharges reported to TRI. Solvents are used as a volatile vehicle that film-forming binders and pigments are dissolved into, and they provide different properties to paints. Metals in the paint industry are used as biological inhibitors, driers, and pigments. From the review of TRI data, EPA found:

- Solvents such as glycols, and others, have been used historically and are currently used in the paint formulating industry.
- Zinc is a prominent metal discharged from the paint industry, as it was during the 1975 review.
- Lead have been phased out of the industry since the 1975 review (U.S. EPA, 1975).

EPA evaluated facilities for environmental justice concerns including whether they are located in census block groups (i.e., communities) that have higher demographic metrics than the national average (50th percentile). The 2-factor demographic index considers the average of people of color and low-income populations, and the 5-factor index considers low income, education less than a high school degree, linguistic isolation, unemployment, and life expectancy. Paint formulating facilities are located in communities that are on average at the 51st percentile for the 2-factor demographic index and at the 59th percentile for the 5-factor demographic index. These facilities have similar demographic indicators to the national average.

EPA is not prioritizing the Paint Formulating Category for further review or ELG revision at this time. Based on the available data, revisions to the ELG are unlikely to result in significant pollutant discharge reductions relative to the other point source categories discussed in this Plan. EPA recommends that state and local permitting authorities consider applying water-quality-based effluent limits, as appropriate, to address any potential issues with solvents, or other pollutants in discharges from this category. EPA intends to continue to monitor the use, discharge, and treatment of PFAS from paint formulating facilities as part of the POTW Influent PFAS Study (Section 6.3.5), updated TRI reporting requirements for PFAS, and NPDES permit monitoring requirements for federally-issued permits and state-issued permits as more states include monitoring for PFAS in permits.[28] These data will help EPA identify any significant sources of these chemicals in future reviews and understand the subcategorization of current facility discharges, in particular indirect discharges.

[28] See EPA's April 2022 memorandum and December 2022 memorandum, detailing EPA's intention to address PFAS discharges in NPDES permits and through the pretreatment program and monitoring programs. In addition to reducing PFAS discharges, this will also provide data to inform ELG planning and actions.

5.4 Plastics Molding and Forming Point Source Category (40 CFR part 463)

EPA announced the Plastics Molding and Forming Category (40 CFR part 463) for preliminary review in EPA's PFAS Strategic Roadmap. EPA initiated a preliminary review of the Plastics Molding and Forming Category to gather additional information on discharges associated with PFAS, among other pollutants.

In 1984, EPA promulgated ELG for this industry, which capture processes that blend, mold, form, or otherwise process plastic materials into intermediate or final plastic products. Specifically, the ELG cover process water that contacts plastic material, product, or the surfaces of shaping equipment used to mold or form plastic materials. EPA organized the ELG into three subcategories based on the pollutant characteristics of the process water (U.S. EPA, 1984):

- Subcategory A. Contact Cooling and Heating Water. This includes process water that comes into contact with plastic materials or plastic products during heat transferring processes.
- Subcategory B. Cleaning Water. This includes process water used to clean the surface of an intermediate or final plastic product, including water used in the detergent wash cycle or rinse cycles. It also includes water that comes into contact with shaping equipment surfaces (i.e., molds and mandrels) that have been in contact with plastic material for the purpose of cleaning equipment surfaces.
- Subcategory C. Finishing Water. This includes process water used to finish plastic products such as carry-away waste plastic materials or product lubrication. It includes water used to machine or assemble intermediate or final plastic products.

EPA established BPT, BAT, and NSPS for BOD_5, oil and grease, TSS, and pH and reserved[29] PSES and PSNS regulations for phthalates (U.S. EPA, 1984). The applicability of the Plastics Molding and Forming Point Source Category (40 CFR part 463.1) overlaps with others, including the Metal Finishing (40 CFR part 433), Electroplating (40 CFR part 413), and Organic Chemicals, Plastics, and Synthetic Fibers (40 CFR part 414).

As part of this preliminary category review, EPA evaluated U.S. census data and 2020 DMR and TRI data to learn more about the size of the industry and corresponding pollutant loads. EPA did not identify any PFAS discharge data in DMR or TRI because the category is not currently required to report discharges in NPDES permits or based on current TRI reporting criteria. Therefore, EPA evaluated available PFAS data from MI EGLE[30] and Wisconsin Department of Natural Resources[31], which collected PFAS data as part of a state sampling effort separate from NPDES permit (i.e., DMR) and TRI reporting requirements (U.S. EPA, 2022d; U.S. EPA, 2022e). EPA also met with one manufacturer to further understand PFAS discharges associated with the industry (U.S. EPA, 2022f).

PFAS are used in the plastics molding and forming industry for their hydrophobic and oleophobic properties and low surface tension, which are desirable in plastics (Glüge et al., 2020). These properties

[29] "Reserved" refers to a placeholder within the Code of Federal Regulations. The agency may "reserve" certain ELGs to indicate that it may develop ELGs at a later date.

[30] See the MI EGLE Industrial Pretreatment Program (IPP) PFAS Initiative website for more information.

[31] See the Wisconsin DNR PFAS initiatives website for more information.

may help with improving polymer extrusion and reducing imperfections on the mold. Based on the state-provided data, EPA found five facilities with available PFAS discharge data, three of which had detectable quantities of PFAS in their effluent. PFOS, PFOA, and perfluorohexanoic acid (PFHxA) had the highest average concentrations at 13 ppt, 4 ppt, and 1 ppt, respectively.

EPA reviewed the top-ranking DMR and TRI pollutants in the 2020 data. Based on an initial review of the 2020 DMR data, EPA found that 98 percent of the annual loads were associated with stormwater (which is covered under general permits for stormwater associated with industrial activity) and not captured in the applicability of this ELG. Excluding stormwater discharges, EPA identified the following pollutants for review:

- Regulated pollutants: TSS, oil and grease, BOD_5, bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and dimethyl phthalate.
- Unregulated pollutants: chemical oxygen demand (COD), total organic carbon (TOC), nitrogen compounds, and N,N-Dimethylformamide.

As part of its review, EPA found:

- Reported average concentrations of TSS, oil and grease, and BOD_5 were an order of magnitude below the current ELG.
- Bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and dimethyl phthalate regulations are reserved under the current ELG; bis(2-ethylhexyl) phthalate discharges are similar to those reported in 1984, and phthalate discharges reported on 2020 DMRs are lower than the existing regulations for other categories.
- COD, TOC, and ammonia concentrations were found to be generally lower than 1984 observations.
- The extent of the use of N,N-Dimethylformamide is not currently known, but the data suggest that only a small subset of facilities release this pollutant. For these reasons, EPA did not review discharges of this pollutants further.

EPA evaluated facilities for environmental justice concerns including whether they are located in census block groups (i.e., communities) that have higher demographic metrics than the national average (50^{th} percentile). The 2-factor demographic index considers the average of people of color and low-income populations, and the 5-factor index considers low income, education less than a high school degree, linguistic isolation, unemployment, and life expectancy. Communities surrounding plastics molding and forming facilities are on average at the 43^{rd} percentile for the 2-factor demographic index and at the 55^{th} percentile for the 5-factor demographic index. Plastics molding and forming facilities overall have demographic indicators similar to the national average.

EPA is not prioritizing the Plastics Molding and Forming Category for further review or ELG revision at this time. Based on the available data, revisions to the ELG are unlikely to result in significant pollutant discharge reductions relative to the other point source categories discussed in this Plan. EPA recommends that state and local permitting authorities consider applying water-quality-based effluent limits, as appropriate, to address any potential issues with phthalates or other pollutants in discharges

from this category. EPA intends to continue to monitor discharges from this category, specifically for PFAS. The PFAS data EPA reviewed are limited; however, EPA expects to review additional data in the coming years as a result of the POTW Influent Study (Section 6.3.5), updated TRI reporting requirements for PFAS, and NPDES permit monitoring requirements for federally-issued permits and state permits as more states include monitoring for PFAS in permits.[32] These data will help EPA identify any significant sources of these chemicals in future reviews.

5.5 Industrial Wastewater Treatment Technologies Reviews

EPA continued its industrial wastewater treatment technology review, initially described in *Preliminary Effluent Guidelines Program Plan 14* (Preliminary Plan 14) (see Section 3.6 of Preliminary Plan 14, U.S. EPA, 2019a). As described in Preliminary Plan 15, EPA summarized its key findings to date for four treatment technologies in the memorandum "Key Findings for EPA's Industrial Wastewater Treatment Technology Reviews" (ERG, 2021b) and in the preliminary review for suspended growth systems (activated sludge) and membranes (ERG, 2021c; ERG, 2021d). As part of ongoing treatment technology reviews, EPA is currently reviewing ion exchange and granular activated carbon and the corresponding applications for industrial wastewater discharges.

5.6 ELG Planning Tools

EPA continued to maintain the IWTT Database and the ELG Database. These databases, described in more detail below, are used to supplement EPA's ongoing category reviews by:

- Identifying pollutants with ELGs for specific point source categories.
- Comparing current discharge concentrations to effluent data in IWTT and long-term average data, limitation data, and technology bases in the ELG Database.

See EPA's *2021 Preliminary Review of Industrial Point Source Categories* for a description of the specific analyses performed as part of the preliminary category reviews (U.S. EPA, 2022b).

5.6.1 Industrial Wastewater Treatment Technology Database

IWTT is an online database that contains wastewater treatment technology performance data from 34 industrial point source categories and removal performance data for 205 individual pollutant parameters. As part of maintaining the IWTT database, EPA continually collects industrial wastewater treatment performance information to populate the database and makes the information available to the public through the IWTT web application.[33] As described in Preliminary Plan 15, EPA identified and screened additional references across a broad range of industries from key technical conferences on wastewater treatment, including the 2019 and 2020 Water Environment Federation's Technical Exhibit and Conference (WEFTEC). EPA also screened references identified through the *Multi-Industry Per- and Polyfluoroalkyl (PFAS) Study – 2021 Preliminary Report* (U.S. EPA, 2021c). During the 2022 annual reviews, EPA intends to populate IWTT with these references. EPA also intends to continue to review

[32] See EPA's April 2022 memorandum and December 2022 memorandum, detailing EPA's intention to address PFAS discharges in NPDES permits and through the pretreatment program and monitoring programs. In addition to reducing PFAS discharges, this will also provide data to inform ELG planning and actions.

[33] See https://www.epa.gov/eg/industrial-wastewater-treatment-technology-database-iwtt.

and identify references from conferences, including 2021 and 2022 WEFTEC and the 2022 International Water Conference. IWTT currently contains performance data for 58 different treatment technologies, some of which may be components of a larger treatment system.

5.6.2 Effluent Limitations Guidelines and Standards Database

As discussed in Plan 14, EPA has compiled information on its ELGs for the 59 different point source categories[34] into a consolidated ELG Database in order to reference and query ELGs, long-term average data, and technology bases as part of ongoing category reviews. EPA has now made the information publicly available through the ELG Database web application. Users of this tool can search for information within and across ELGs. The database captures information from the CFR[35] as well as from the technical development documents supporting promulgated rules. The ELG Database includes the following information:

- Regulations promulgated (e.g., BPT, BAT, BCT, NSPS, PSES, PSNS).
- Applicability of the ELGs, including definitions of any regulated subcategories.
- Wastestreams or process operations associated with each regulation.
- Pollutant limitations.
- CFR references to best management practices, monitoring requirements, and narrative limitations.
- Rule history, including promulgation and revision dates.
- Technology bases for the underlying regulations.

5.7 Environmental Justice

As part of Preliminary Plan 15, EPA solicited public comment on how best to incorporate equity and environmental justice considerations into the ELG planning process. Specifically, EPA proposed using EJScreen, the agency's mapping and screening tool that combines demographic and environmental indicator information, to assess the proximity and potential impact of industrial discharges on underserved and underrepresented populations.

As part of the preliminary category reviews completed and discussed in this Plan (see Sections 5.2 through 5.4), EPA developed a methodology that evaluates demographic data within census block groups, corresponding to the geographic locations of facilities within point source categories. The methodology maps facilities within a category and indicates which categories are at the 80th percentile or greater for a selected demographic metric:

- Standard two-metric (people of color and low income).
- Five-metric (low income, education, linguistic isolation, unemployment, and life expectancy).

[34] See EPA's Industrial Effluent Guidelines webpage for a list of the 59 point source categories.
[35] See the eCFR.

EPA may explore using additional metrics to evaluate environmental justice concerns in future category reviews, including impairment status (and impairment cause(s)) under Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS); facility contacts, Resource Conservation and Recovery Act (RCRA) permit status, greenhouse gas releases, and demographic percentiles. EPA may also consider whether a facility is located in a disadvantaged community based on the Climate and Economic Justice Screening Tool (CEJST) methodology and the count of disadvantaged categories for each facility (e.g., climate change, clean energy/energy efficiency, clean transit). The results for each preliminary category review are presented in EPA's *2021 Preliminary Review of Industrial Point Source Categories* (U.S. EPA, 2022b).

6. ONGOING ELG STUDIES

This section summarizes the status of EPA's ongoing ELG studies.

6.1 Electrical and Electronic Components Point Source Category (40 CFR part 469)

The purpose of this detailed study was to determine if the Electrical and Electronic Components (E&EC) ELG (40 CFR part 469) warrant further review or possible revision. As part of the 2015 annual review, EPA initiated a preliminary review of the E&EC Category in response to stakeholder comments received during a 2014 National Association of Clean Water Agencies (NACWA) conference regarding the applicability of the ELG to the manufacture of sapphire crystals. Additional information collected during the 2016 annual review focused on 40 CFR 469 Subpart A (Semiconductors). Following this review, EPA determined that further review of the category was appropriate and began a detailed study related to Subparts A, B (Electronic Crystals), C (Cathode Ray Tubes), and D (Luminescent Materials) to further characterize the industry profile.

As part of this study, 34 different permitting authorities (EPA regions, state, and local) from 19 states provided information. The study identified 104 facilities permitted according to requirements in CFR part 469. As when the rule was originally issued, the general distribution of facilities subject to each subpart remained the same, with most being permitted under Subpart A, followed by Subpart B, and only a few for Subparts C and D. While manufacturing activities have remained similar, manufacturing technologies have evolved to produce ever smaller and more complex devices that are faster and more energy efficient. This has required a corresponding evolution in the equipment, chemicals, and components used in the manufacturing process.

Over 95 percent of the permitted facilities are indirect dischargers sending their wastewater to a local or regional wastewater treatment facility. For the most part, the discharges from these indirect facilities are a small fraction of the total received by the wastewater treatment facility, although for a few of the larger facilities the discharge can account for 10 to 20 percent of the incoming flow. While most facilities are indirect dischargers, many also have a solvent management plan to collect and ship their organic solvents off site for processing to keep them from being discharged in their wastewater.

The composition of the wastestream has changed through the years as technologies have changed. In 1983, when the current ELG rule was written, chlorinated solvents and strong acids for the etching process were used in this industry. Over the years the chlorinated solvents have been replaced, and the industry is no longer using the original regulated solvents. At present, over 70 different elements (some added an atom at a time) from the periodic table are used by the industry as a whole, but the specific number and composition varies from facility to facility. Strong acids remain, but etching is achieved through the use of cold plasmas generated from a variety of gases. PFAS have been used for some time, with PFOA and PFOS being recently phased out and other PFAS replacing them. PFAS as a class of chemicals is difficult to eliminate from the production process as their chemical and physical properties are difficult to replicate with non-PFAS compounds.

The wastewater treatment systems being utilized are similar to those available in 1983—pH adjustment, chemical precipitation, filtration, and activated carbon finishing. Each facility also employs ultrapurification processes to produce high-quality water to meet their exacting requirements. A growing

number of E&EC facilities also utilize this equipment to conserve water, reclaiming water used in their production process that originally would have been discharged after a single use. This wastewater is considerably cleaner than that supplied by the local drinking water provider and easier to purify.

The ELG regulation (40 CFR part 469), in conjunction with locally employed discharge limits, has for the most part been effective in limiting the discharge of pollutants from these facilities. While the regulation could be modified to remove subsections that are no longer relevant and clarify certain sections that can be confusing for permit writers, the review of monitoring data from these facilities (U.S. EPA, 2022p) does not demonstrate a need to revise the existing regulation at this time. EPA intends to continue to monitor discharges of PFAS from this category. The PFAS data EPA reviewed are limited; however, EPA expects to review additional data in the coming years as a result of the POTW Influent Study (Section 6.3.5), updated TRI reporting requirements for PFAS, and NPDES permit monitoring requirements for federally-issued permits and state permits as more states include monitoring for PFAS in permits.[36] These data will help EPA identify any significant sources of these chemicals in future reviews.

6.2 Concentrated Animal Feeding Operations Point Source Category (40 CFR part 412)

CAFOs are facilities that confine and maintain large numbers of animals for specified periods of time (40 CFR 122.23 defines CAFOs in precise terms). The CAFOs ELG regulate two parts of CAFOs: the "production area" and the "land application area." The production area is the area that includes the animal confinement area, manure storage areas, raw materials storage area, and waste containment areas (40 CFR 122.23(b)(8)). The land application area is the land under the control of a CAFO owner or operator to which manure, litter, and process wastewater from the production area is or may be applied (40 CFR 122.23(b)(3)).

The existing CAFOs ELG impose substantial and detailed requirements on both the production area and land application area. The ELG requirements for the production area prohibit the discharge of manure, litter, and process wastewater from the production area to waters of the United States, with only one exception (40 CFR 412.31(a)). Under this exception, the ELG allow discharges from the production area where those discharges are caused by precipitation and where the production area is designed to contain all manure, litter, and process wastewater from a 25-year, 24-hour rainfall event (40 CFR 412.31(a)(1) defines this exemption in precise terms).[37]

The ELG requirements for the land application area prohibit discharges unless those discharges qualify as "agricultural stormwater," which the CWA expressly excludes from regulation (33 USC 502(14)). EPA interprets "agricultural stormwater" to include any precipitation-related discharges of manure, litter, and process wastewater from the land application areas if the manure, litter, and process wastewater has been applied to the land application area in accordance with a site-specific "nutrient management plan" that ensures appropriate agricultural utilization of the nutrients in the manure, litter,

[36] See EPA's April 2022 memorandum and December 2022 memorandum, detailing EPA's intention to address PFAS discharges in NPDES permits and through the pretreatment program and monitoring programs. In addition to reducing PFAS discharges, this will also provide data to inform ELG planning and actions.

[37] The ELG allow CAFOs to request site-specific alternatives to the containment requirements if those alternatives result in discharge amounts that are equal to or less than the containment requirements (40 CFR 412.31(a)(2) defines these alternative requirements in precise terms).

or process wastewater (40 CFR 122.23(e)). A nutrient management plan addresses the form, source, amount, timing, and method of application of nutrients on each field to achieve crop production goals while minimizing the transport of nutrients to surface waters (40 CFR 412.4(c)(1)). The application rates for manure, litter, and process wastewater must be established in accordance with technical standards established by each state (see 40 CFR 123.36; 412.4(c)(2)). The ELG also require CAFOs to comply with certain recordkeeping and reporting requirements related to both the production area and the land application area (40 CFR 412.4(b), (c)).

EPA has concluded that it needs to gather additional information to inform a decision as to whether rulemaking to revise the ELG is warranted. See Appendix A for discussion of the agency's rationale for this decision and the information EPA plans to gather as part of its detailed study.

6.3 PFAS Industrial Sources and Discharge Studies

As part of the statutorily required ELG planning process, EPA's Office of Water examined readily available public information about PFAS discharges. The Preliminary Plan 14 and a supporting report, *The EPA's Review of Per- and Polyfluoroalkyl Substances (PFAS) in Industrial Wastewater Discharge*, both published in October 2019, describe the review activities and findings of the initial examination and identify several industries with facilities that are likely to be discharging PFAS in their wastewater (U.S. EPA, 2019a; U.S. EPA, 2019b). In 2019, EPA determined that further data collection and study were necessary to inform decisions about how best to address industrial PFAS discharges and initiated the Multi-Industry PFAS Study. The Multi-Industry PFAS Study focused on data collection and review of PFAS manufacture, use, control, and discharge by specific point source categories that EPA determined were likely to be discharging PFAS in their wastewater. The objectives of the Multi-Industry PFAS Study were to: 1) examine specific industrial categories and facilities manufacturing, using, or discharging PFAS; 2) collect, compile, and review information and data on PFAS in industrial discharges; 3) use compiled data to characterize PFAS types and concentrations discharged in industrial wastewater; and 4) assess availability and feasibility of control practices and treatment technologies capable of reducing or eliminating PFAS in wastewater discharges.

In September 2021, EPA published the *Multi-Industry PFAS Study – Preliminary 2021 Report* which discussed information and data EPA collected on PFAS manufacture, use, control, and discharge by five point source categories: OCPSF; Metal Finishing; Pulp, Paper, and Paperboard; Textile Mills; and airports (U.S. EPA, 2021c). In Preliminary Plan 15, also published in September 2021, EPA announced the following actions based on the information and data collected during the Multi-Industry PFAS Study (U.S. EPA, 2021b):

- Initiate rulemaking to revise limitations for the OCPSF Point Source Category to address PFAS discharges from PFAS manufacturers.
- Initiate rulemaking to revise limitations for the Metal Finishing and Electroplating Point Source Categories to address PFAS discharges from chromium finishing operations.
- Initiate detailed studies of PFAS discharges from the Textile Mills and Landfills Point Source Categories.

- Continue to monitor the anticipated reduction of PFAS use and discharge by pulp and paper mills and airports through the ELGs annual review process.

Sections 6.3.1 to 6.3.4 discuss information and data EPA has collected and reviewed since September 2021 on PFAS use, control, and discharge from textile mills, landfills, pulp and paper mills, and airports, respectively. Section 6.3.5 discusses a new study EPA intends to initiate to continue studying PFAS discharges to POTWs. See Section 7 for additional information on ongoing rulemakings to address PFAS discharges from the OCPSF and Metal Finishing and Electroplating Categories.

6.3.1 Airports

Based on information and data EPA collected as part of the Multi-Industry PFAS Study, EPA documented that aqueous film forming foam (AFFF) has been, and continues to be, used by airports in the United States to prevent, extinguish, and control flammable liquid-based fires. There are different types of firefighting foams, not all of which contain PFAS, but all historically and currently manufactured AFFF products contain PFAS as an active ingredient. EPA determined that 14 CFR part 139 airports[38] are currently required by the Federal Aviation Administration (FAA) to use only firefighting foams that conform to military specification (MILSPEC) MIL-PRF-24385: "Fire Extinguishing Agent, Aqueous Film-Forming Foam" and that no fluorine-free foams currently meet this standard. Therefore, the 500+ FAA-certified airports in the United States will continue to use PFAS-containing firefighting foam formulations until a fluorine-free foam is approved for use. EPA determined these airports may have historically generated and discharged PFAS-containing wastewater (i.e., water contaminated with AFFF) from live-fire firefighting training, firefighting equipment testing, and emergency response activities. EPA announced in Preliminary Plan 15 that it would continue to review airports to further understand the potential for discharge of PFAS-containing wastewater from facilities that use AFFF and to monitor the industry's anticipated phase out of AFFF.

While developing ELG Plan 15, EPA collected additional data on AFFF use and wastewater management from 14 CFR part 139 airports from the FAA. EPA met with the FAA in March 2022 to discuss updates related to the FAA's efforts to reduce, and eventually eliminate, use and release of PFAS-containing AFFF (U.S. EPA, 2022g). In recent years, both the FAA and the United States Department of Defense (DOD) have taken voluntary actions to curb the release of AFFF during nonemergency exercises (i.e., training and testing), replace legacy AFFF firefighting foams which contain long-chain PFAS, and fund development of fluorine-free foams.

As part of the FAA's guidance on minimizing potential environmental impact from AFFF during testing and firefighting training, the FAA recommends 14 CFR part 139 airports install testing devices for firefighting equipment that eliminate release of AFFF during mandatory periodic testing of firefighting foam system performance, and the FAA is no longer requiring these airports to use AFFF during live firefighting testing. As of March 2022, the FAA has approved and is funding four different types of testing devices for firefighting equipment that do not require dispensing AFFF when airports conduct periodic equipment testing and training: Eco-Logic System from E-One, NoFoam System, Oshkosh Eco

[38] Regulation at 14 CFR part 139 requires the FAA to issue airport operating certifications to airports that: 1) serve scheduled and unscheduled air carrier aircraft with more than 30 seats; 2) serve scheduled air carrier operations in aircraft with more than nine seats but less than 31 seats; or 3) the FAA Administrator requires to have a certificate. Most commercial service airports are 14 CFR part 139 certified.

EFP (Electronic Foam Proportioning) System, and Rosenbauer FIXMIX 2.0E Input-Based Proportioning Test System (FAA, 2021a). The FAA extended the program funding the testing devices for firefighting equipment at 14 CFR part 139 airports until November 2023, an additional two years beyond the original program end date (FAA, 2021b). As of March 2022, the FAA has stated that more than half of the 518 certified airports have adopted these procedures and equipment, eliminating the release of AFFF except for during actual emergency response (U.S. EPA, 2022g). See Table 6-1 for a breakdown of system type and airport count.

Table 6-1. System Type and Airport Count

System Type	14 CFR part 139 Airport Count
Eco-Logic System from E-One	156
NoFoam System	92
Oshkosh ECO EFP System & Oshkosh ECO EFP vehicles retrofitted	91
Rosenbauer FIXMIX 2.0E Input-Based Proportioning Test System	33
Total 14 CFR part 139 Airports (as of May 2022)	**518**

In April 2020, the DOD amended MILSPEC MIL-PRF-24385 to specify that AFFF with the lowest demonstratable concentrations of PFOS and PFOA should be used in the interim before a suitable PFAS-free foam is available for use. As of June 2022, all firefighting foam formulations that meet MILSPEC MIL-PRF-24385 contain less than 800 parts-per-billion of PFAS. The DOD has issued guidance and best management practices to control and capture AFFF releases in the event of an actual emergency response. The DOD is developing guidance to address cleanup and disposal of existing AFFF stockpiles and residuals in firefighting equipment (U.S. EPA, 2022g).

The FAA, the DOD, and firefighting foam manufacturers are collaboratively researching PFAS-free foam alternatives to identify formulations that are more environmentally friendly and that provide an equivalent level of performance as the current MILSPEC MIL-PRF-24385. As of July 2022, the FAA has studied 36 fluorine-free foams (11 commercially available, 25 manufacturer prototypes) and conducted more than 500 fire suppression tests at the FAA Technical Center as part of their MILSPEC development and firefighting foam research program (U.S. EPA, 2022g). On July 2022, the FAA released its report on evaluating commercially available fluorine-free foams, which do not contain PFAS, to determine if any fluorine-free foam can be considered a suitable replacement for AFFF for use on aviation fuel fires. The FAA's full findings can be found in the *Fluorine-free Foam Testing* report which concludes that none of the fluorine-free foam candidates consistently had an equivalent extinguishing performance to AFFF (FAA, 2022).

Only the DOD is authorized to update MILSPECs. On June 2, 2022, the DOD published draft MILSPEC MIL-PRF-XX727 ("Fire Extinguishing Agent, Fluorine-Free Foam (F3) Liquid Concentrate, For Land-Based, Fresh Water Applications") for PFAS-free firefighting foam, a significant step in the process for meeting the deadline of publishing a new fluorine-free foam MILSPEC by January 31, 2023,

as required by the 2020 National Defense Authorization Act (NDAA).[39] The FAA plans to adopt and require use of PFAS-free firefighting foams compliant with the new MILSPEC once it is published. The FAA expects that it will take 14 CFR part 139 airports approximately two to five years to transition from procurement and use of AFFF to the new PFAS-free firefighting foams. The FAA is targeting completion of this transition by January 2025, or as soon as possible thereafter. The FAA notes that there will be a lot of competition between military sites, airports, and industrial facilities for the limited initial supply of PFAS-free firefighting foam product. Figure 6-1, provided to EPA by the FAA, illustrates the DOD and FAA schedule to replace AFFF with PFAS-free foams along with relevant NDAA deadlines.

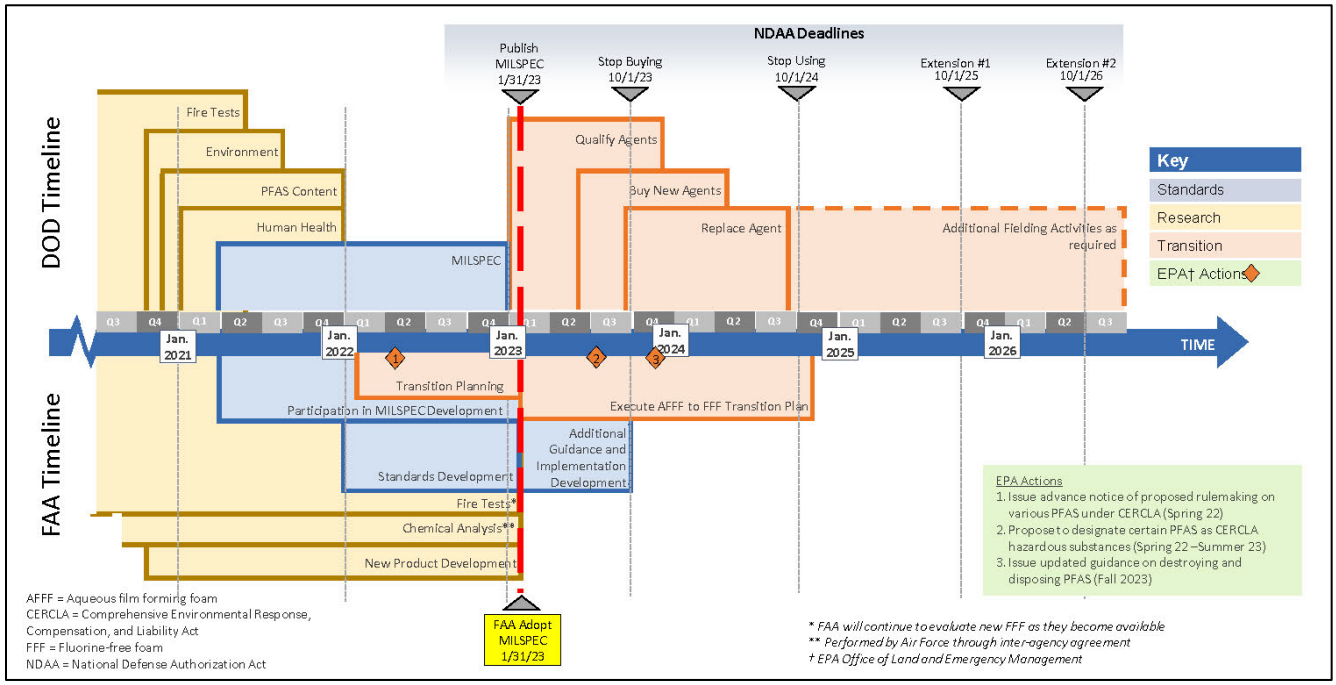

Figure 6-1. DOD and FAA Schedule for Replacing AFFF

At this time, the FAA has not determined whether to require exclusive use of fluorine-free firefighting foams or to permit 14 CFR part 139 airports to use existing AFFF stockpiles once a final fluorine-free firefighting foam MILSPEC is published and adopted. The FAA states that this will be heavily dependent on how many foams meet the new MILSPEC, and there could be supply issues if there is only one qualifying foam. Similarly, the FAA does not plan on issuing guidance to address cleanup and disposal of existing AFFF stockpiles and residuals in firefighting equipment (U.S. EPA, 2022g).

Based on this information, EPA is not prioritizing a rulemaking on this category at this time. EPA will continue to review airports to further understand the potential for discharge of PFAS-containing wastewater from facilities that use AFFF and to monitor the industry's transition to fluorine-free foam. EPA intends to provide updates on these activities in subsequent ELG program plans.

[39] The 2020 NDAA requires the Secretary of the Navy to publish new specifications for PFAS-free firefighting foams by January 2023, the DOD to cease procurement of PFAS-containing products by October 2023, and the DOD to cease use of AFFF at all military installations by October 2024, with limited exceptions.

6.3.2 Textile Mills Point Source Category (40 CFR part 410)

Based on information and data EPA collected as part of the Multi-Industry PFAS Study, EPA-documented PFAS have been, and continue to be, used by textile mills in the United States to impart outdoor gear, clothing, household fabrics, carpets, and other textile products with water, oil, soil, and heat resistance; to improve cleanability of oil- and water-based stains; as a wetting or antifoaming agent when dyeing and bleaching; and as a breathable moisture barrier to wind and rain. EPA determined that most textile mills are not monitoring PFAS; however, limited discharge sampling data available indicated that PFAS may be present (U.S. EPA, 2021c). EPA announced in Preliminary Plan 15 that it would initiate a detailed study of wastewater discharges from the Textile Mills Point Source Category to continue collecting and reviewing information and data on wastewater discharges of PFAS from textile mills that historically or currently use PFAS.

Since September 2021, EPA has collected additional data on PFAS use and discharge from textile mills from technical literature, textile manufacturing companies, EPA regions, and state and local wastewater regulatory authorities. New information and data collected and reviewed by EPA since publication of Preliminary Plan 15 is summarized below.

EPA conducted outreach to six state agencies or local wastewater treatment coordinators to discuss available data on use, control, discharge of PFAS from textile mills to state waters and POTWs, and to obtain state-level lists of permitted textile mills (U.S. EPA, 2022d; U.S. EPA, 2022e; U.S. EPA, 2022h; U.S. EPA, 2022i; U.S. EPA, 2022j; U.S. EPA, 2022k). EPA met with W.L. Gore & Associates in December 2021 to discuss PFAS use and discharges associated with performance textile manufacturing. EPA determined that the company's textile mills use PFAS chemistry in the manufacture of textile products, but all wastewater generated from these processes is captured and transferred offsite for incineration (i.e., zero discharge of these process wastewaters) (U.S. EPA, 2022f). EPA attempted to meet with representatives of two industry trade associations – the National Council of Textile Organization (NCTO) and the Carpet and Rug Institute (CRI) – and their member companies to collect, on a voluntary basis, information on the use and discharge of PFAS by textile mills; however, EPA has been unsuccessful in arranging such a meeting.

EPA assessed the number and location of textile mills, characterized their manufacturing and discharge practices, and identified pollutant control practices and technologies currently in place using national EPA data sets (e.g., ECHO, DMR, TRI), state-submitted lists of permitted textile mills, and Davison's 2022 Textile Blue Book (an industry directory for textile mills, dyers, finishers, and suppliers) (Davison's Publishing, 2022). Based on these data sources, EPA estimates the national population of textile mills, dyers, and finishers in the United States is over 2,100 facilities.

To supplement limited available data, in November 2021 EPA used the authority granted in CWA Section 308 to require nine textile manufacturing companies complete a survey to obtain information related to PFAS use and import, PFAS in industrial wastewater discharges, wastewater treatment of PFAS-containing industrial wastewater, and other information necessary for EPA's study of the category. EPA sent the request to Brookwood Companies, Elevate Textiles, Milliken & Co., Mohawk Industries, Mount Vernon Mills, Sage Automotive Interiors, Shaw Industries Group, Tex Tech Industries, and W.L. Gore & Associates on November 30, 2021. EPA received timely responses from

these nine companies by February 2022, providing information on 92 of their facilities. An anonymized summary of the responses is below:[40]

- 19 of 92 textile mills (21 percent) reported that they used PFAS in textile manufacturing in 2020, and responses led EPA to conclude that two additional facilities likely used PFAS in their textile manufacturing. Responses indicated that side-chain fluorinated polymers and/or fluoropolymer coatings are used for oil, water, and stain resistance.
- 18 of the 19 textile mills (95 percent) that reported PFAS use also reported either permanent closure by 2026 or the intention to reduce or eliminate PFAS use by the end of 2026, through product replacement or using alternative surface treatment technologies.
- Most textile mills that reported using PFAS generate and discharge wastewater from the associated operations. Only two of these textile mills treat their effluent wastewater and operate wastewater treatment systems demonstrated to be effective at removing or eliminating PFAS in wastewater (e.g., granulated activated carbon).
- More than half of the textile mills that responded to the data request discharge their process wastewater to a POTW. The existing ELG for the Textile Mills Point Source Category do not establish pretreatment standards for any pollutant.

EPA continued to evaluate the available data on types and concentrations of PFAS in wastewater discharged from textile mills. As described in Preliminary Plan 15, EPA previously identified a state permitting authority data source containing PFAS monitoring data for textile mill effluent (MI EGLE, 2020b). EPA has since collected analytical data from four additional data sources that meet EPA's acceptance criteria for inclusion in analyses for characterizing PFAS discharges in industrial wastewater discharges:[41]

- Michigan EGLE 2022 PFAS monitoring results for direct and indirect discharging facilities (U.S. EPA, 2022d).
- North Carolina Department of Environmental Quality 2019 PFAS monitoring order for one textile mill (NC DEQ, 2022).
- Merrimack, New Hampshire, Wastewater Treatment Facility PFAS monitoring results for one textile mill (U.S. EPA, 2022k).
- PFAS monitoring results submitted by five textile mills as part of the response to EPA's November 2021 PFAS data request.

EPA included 358 PFAS sample results representing 10 facilities from the combined five data sources in its analysis characterizing PFAS in textile mill effluent. Table 6-2 presents the average, minimum, and maximum concentrations for each PFAS observed in effluent from the 10 textile mills. As illustrated in the table, EPA estimated the average concentrations for short-chain perfluoroalkyl carboxylic acids

[40] The sampled population is not statistically representative of the industry. EPA selected companies likely to be using PFAS and discharging process wastewater to complete the PFAS data request.

[41] EPA's acceptance criteria are presented in the memorandum "Development of the PFAS Wastewater Characterization Analytical Database" (ERG, 2022a).

(PFCAs) and short-chain fluorotelomers were generally higher relative to perfluoroalkane sulfonic acids (PFSAs) and long-chain PFCAs. Average PFAS concentrations in textile mill wastewater are lower than average PFAS concentrations observed in effluent from PFAS manufacturers, chromium finishing facilities, and landfills.

Table 6-2. Textile Mills Effluent PFAS Concentrations

PFAS Subgroup	Analyte[a,b]	Facilities with Data	Quantified Detections/Total Sample Results	Concentration Range (ppt)[c]	Average Concentration (ppt)[c]
Perfluoroalkyl carboxylic acids (PFCAs)	Perfluorobutanoic acid (PFBA)	7	8/14	ND – 343	32.7
	Perfluoropentanoic acid (PFPeA)	7	9/14	ND – 1360	176
	Perfluorohexanoic acid (PFHxA)	7	10/14	ND – 2340	227
	Perfluoroheptanoic acid (PFHpA)	7	10/14	ND – 383	66.1
	Perfluorooctanoic acid (PFOA)	10	17/29	ND – 1400	80.5
	Perfluorononanoic acid (PFNA)	7	10/14	ND – 65.9	6.27
	Perfluorodecanoic acid (PFDA)	7	10/14	ND – 96.1	6.10
	Perfluoroundecanoic acid (PFUnA)	7	5/14	ND – 22.6	1.36
	Perfluorododecanoic acid (PFDoA)	7	4/14	ND – 19.4	0.757
	Perfluorotridecanoic acid (PFTrA)	7	1/14	ND – 0.307	0.0439
	Perfluorotetradecanoic acid (PFTeA)	7	0/14	ND	ND
	Perfluorohexadecanoic acid (PFHxDA)	4	0/4	ND	ND
	Perfluorooctadecanoic acid (PFODA)	4	0/4	ND	ND
Perfluoroalkane sulfonic acids (PFSAs)	Perfluorobutane sulfonic acid (PFBS)	7	3/14	ND – 3	0.362
	Perfluoropentane sulfonic acid (PFPeS)	7	1/14	ND – 1.2	0.171
	Perfluorohexane sulfonic acid (PFHxS)	7	5/14	ND – 386	11.5
	Perfluoroheptane sulfonic acid (PFHpS)	7	3/14	ND – 7.32	0.383
	Perfluorooctane sulfonic acid (PFOS)	10	17/29	ND – 600	39.4
	Perfluorononane sulfonic acid (PFNS)	7	0/14	ND	ND
	Perfluorodecane sulfonic acid (PFDS)	7	0/14	ND	ND
Perfluoroalkane sulfonamides (FASAs)	Perfluorooctane sulfonamide (PFOSA)	3	5/10	ND – 10.3	1.21
Fluorotelomer sulfonic acids (FTSAs)	4:2 fluorotelomer sulfonic acid (4:2 FTSA)	2	0/7	ND	ND
	6:2 fluorotelomer sulfonic acid (6:2 FTSA)	2	7/7	84 – 264	188
	8:2 fluorotelomer sulfonic acid (8:2 FTSA)	2	3/7	ND – 5.48	0.643
N-Alkyl perfluoroalkane sulfonamido acetic acids (FASAAs)	N-methyl perfluorooctane sulfonamido acetic acid (NMeFOSAA)	3	3/10	ND – 20.7	7.61
	N-ethyl perfluorooctane sulfonamido acetic acid (NEtFOSAA)	3	8/10	ND – 98.8	19.0

Table 6-2. Textile Mills Effluent PFAS Concentrations

PFAS Subgroup	Analyte[a,b]	Facilities with Data	Quantified Detections/Total Sample Results	Concentration Range (ppt)[c]	Average Concentration (ppt)[c]
Per- and polyfluoroalkyl ether carboxylic acids (PFECAs)	Hexafluoropropylene oxide dimer acid (HFPO-DA)	1	0/1	ND	ND

Sources: ERG, 2022b.

Abbreviations: ND – nondetection; ppt – parts-per-trillion (equivalent to nanograms per liter).

a – This table presents data for all PFAS listed in the draft EPA Method 1633 analyte list for which sample results are available and meet EPA's acceptance criteria. EPA also collected data for perfluorododecane sulfonic acid (PFDoS).

b –The table identifies short-chain PFCAs (≤7 carbons) and short-chain PFSAs (≤5 carbons) in blue text, while long-chain PFCAs (≥8 carbons) and long-chain PFSAs (≥6 carbons) are designated in red text.

c – In this analysis, EPA treated all nondetection results as zero for the purpose of estimating concentrations. All concentration values were rounded to three significant figures.

EPA intends to expand this detailed study, pending resource availability, to allow for additional data collection and outreach for this industry through the use of a mandatory, nationally representative questionnaire.

6.3.3 Landfills Point Source Category (40 CFR part 445)

As described in Preliminary Plan 15, EPA initiated a detailed study of wastewater discharges from the Landfills Point Source Category (40 CFR part 445), focusing on PFAS discharges in landfill leachates. This was a result of the Landfills preliminary category review based on public comments received on Preliminary ELG Plan 14 identifying landfill leachate effluent as a source of PFAS discharges to surface waters and POTWs. The goals of this study were to understand the total number and location of landfills discharging leachate across the United States, characterize PFAS in leachate effluent from regulated landfills, and identify current wastewater treatment technologies and management practices at regulated landfills. EPA used information collected from the study to evaluate whether the ELG for the Landfills Point Source Category should be revised.

Since September 2021, EPA has collected publicly available information to construct a picture of the industry's facilities, discharge practices, and control practices/technologies currently in place, including their effectiveness for PFAS removal. EPA also collected information to begin determining whether pollutants in landfill leachate pass through, interfere with, or are otherwise incompatible with POTW operations; to identify documented environmental or human health impacts associated with landfill discharges and exposure to PFAS, and to determine the proximity of landfill leachate discharges to CWA Section 303(d) impaired waters and communities with environmental and demographic characteristics of concern. EPA evaluated information from the following EPA data sources:

- ECHO database.
- RCRAInfo database.
- ICIS-NPDES Permit database.
- DMR data available via EPA's Water Pollutant Loading Tool.
- Landfill Methane Outreach Program (LMOP).
- TRI database.

EPA Office of Water conducted outreach and engagement with other EPA offices, EPA regional offices, states, trade associations representing public and privately held landfills, and the Environmental Research and Education Foundation (EREF). EPA conducted outreach to six state agencies to discuss impacts of landfill leachate discharges on PFAS management in state waters and POTWs, and to obtain state level lists of permitted landfills (U.S. EPA, 2022d; U.S. EPA, 2022e; U.S. EPA, 2022h; U.S. EPA, 2022i; U.S. EPA, 2022j; U.S. EPA, 2022l).

EPA also engaged with industry stakeholders including the National Waste and Recycling Association (NWRA), the Solid Waste Association of North America (SWANA), and the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) to understand their perspectives and provide them with an opportunity to share insights on the industry. EPA additionally met with two privately-owned landfill operating companies in the United States, Waste Management and Republic Services, to further understand their operations and PFAS management practices.

EPA also collected analytical data from over 200 RCRA Subtitle D Non-Hazardous Waste Landfills to characterize PFAS concentrations and species distributions in landfill leachate and gathered information from published literature, including journal articles and federal and state reports.

The following summarizes the study findings to date:

- In the 2000 Landfills ELG technical development document, EPA estimated there were 1,662 landfills that collect landfill-generated wastewater, comprising approximately 16 percent of landfills nationwide. A majority of the landfills subject to ELG (81 percent) are RCRA Subtitle D Non-Hazardous Waste Landfills (EPA, 2000).
- In 2000, EPA established BPT, BAT, BCT, and NSPS limitations for landfills that directly discharge wastewater to surface waters; EPA did not establish pretreatment standards (PSES and PSNS) for landfills that indirectly discharge via POTWs (see 65 FR 3048, January 19, 2000).
- Landfills are essential utilities and the ultimate destination of many discarded consumer and industrial products containing PFAS. PFAS presence in landfill leachate is caused by the use and disposal of products manufactured with PFAS.
- EPA evaluated discharge data from over 200 landfills from across the country and found PFAS present in the leachate at over 95 percent of the landfills. PFAS detections included 63 different PFAS with average concentrations for an individual compound as high as 14,000 parts-per-trillion (ppt) (ERG, 2022c).
- Landfill leachate, while a challenging matrix, is likely able to be treated by typical PFAS treatment technologies such as granular activated carbon, ion exchange, and reverse osmosis.
- EPA estimates that approximately 13,200,000 individuals live within one mile of a landfill. In these communities, the average median income is $48,100 and on average 31 percent of the population belongs to a minority group. EPA calculated the state percentiles of all landfill-proximal census block groups for demographic and environmental indicators available through EJScreen. The median percentile for all indicators exceeded the state average except for the percentage of the population under five years old and for ozone levels. At least two environmental indicators exceed the 80th percentile in 45 percent of these communities.

Based on information and data collected through the Landfill Leachate Detailed Study, the development of effluent guidelines and pretreatment standards for landfills that discharge their leachate is warranted. Therefore, EPA intends to revise the existing Landfills Point Source Category (40 CFR part 445) ELG to address PFAS discharge from these landfills pending resource availability. Once EPA develops the schedule for this rulemaking, it will be published in EPA's Regulatory Agenda.

6.3.4 Pulp, Paper and Paperboard Point Source Category (40 CFR part 430)

As described in EPA's Multi-Industry PFAS Study, PFAS have been, and continue to be, used by pulp, paper, and paperboard facilities in the United States as a coating or additive to provide water, oil, and grease resistance to food contact papers and other specialty paper products. EPA collected data from one trade association and eight major companies from this category. Based on these data, EPA determined

that only a small subset of facilities were actively applying PFAS, the production of paper products containing PFAS at these facilities was less than 0.1 percent of the industry's overall production, and the industry is planning to eliminate use of PFAS by end of 2023.

EPA announced in Preliminary Plan 15 that it would continue to review the Pulp, Paper, and Paperboard Point Source Category to further understand the potential for wastewater discharges of PFAS from facilities that historically or currently use PFAS and to monitor the industry's anticipated phase-out of PFAS. While developing ELG Plan 15, EPA has collected additional data on PFAS use and discharge from pulp, paper, and paperboard facilities from the United States Food and Drug Administration (FDA), a trade association, paper manufacturing companies, and state regulatory authorities. New information and data collected by EPA since publication of Preliminary Plan 15 are summarized below.

In April 2022, EPA met with the FDA to discuss use of PFAS as food contact substances. All food contact substances must be authorized by the FDA prior to marketing and typically come through the Food Contact Substance Notification Program, under which the FDA reviews available migration, exposure, and human health risk data to ensure a food contact substance is safe for its intended use prior to approving it for use on the market. Manufacturers of chemicals authorized as a food contact substances are permitted to market and sell these chemicals to food contact paper and packaging producers, who use them in products with food contact applications. Since the 1960s, the FDA has authorized several PFAS for use as food contact substances including certain long-chain PFAS (PFOA and PFOS have never been authorized) and more recently short-chain fluorotelomer PFAS and polyfluorinated polymers. FDA provided EPA with a list of all effective Food Contact Notifications containing PFAS that the FDA had authorized, as of July 2022, as grease-proofing agents used in food contact paper and paperboard. EPA determined that, as of July 2022, FDA had authorized 35 effective Food Contact Notifications containing PFAS submitted by ten manufacturing companies; however, the manufacturers had voluntarily ceased nearly half of these Food Contact Notifications for introduction into interstate commerce and delivery (FDA, 2022). FDA states that three manufacturers have agreed to a complete market phase-out of PFAS containing or degrading to 6:2 FTOH by December 31, 2023. The market phase-out is a response to FDA research that raised questions about human health risks for 6:2 FTOH.[42] While companies are permitted to use other authorized PFAS-based food contact substances, the FDA expects that most manufacturers will seek to replace PFAS with authorized nonfluorinated replacements in response to public pressure and consumer demand for PFAS-free chemistries in food contact paper and packaging (U.S. EPA, 2022m). These expectations are consistent with EPA's findings that pulp, paper, and paperboard companies plan to eliminate PFAS use by end of 2023 and transition to non-PFAS chemistries for oil and grease resistance in food contact paper and packaging.

EPA continued to conduct outreach and collect data on PFAS use and phase-out from this industry. In March 2022, the American Forest and Paper Association (AF&PA), a national trade association for the forest, pulp, and paper industry whose 39 member companies represent about 87 percent of pulp, paper, and paper-based packaging and tissue production capacity in the United States, inquired to its member companies regarding ongoing PFAS use in pulp, paper, and paperboard manufacture and transition to PFAS-free chemicals. These data indicated that most AF&PA member companies that previously

[42] Additional information on authorized uses of PFAS in food contact applications and this voluntary phase-out is available on the FDA's website at https://www.fda.gov/food/chemical-contaminants-food/authorized-uses-pfas-food-contact-applications

reported PFAS use in calendar year 2020 have since ceased all PFAS use at their pulp, paper, and paperboard facilities. As of July 2022, EPA is aware of five pulp and paper mills in the United States, all operated by Ahlstrom-Munksjö, that continue to use PFAS. All five of these facilities are expected to complete phase-out of all PFAS-based production by the end of 2023. PFAS use by AF&PA member companies remains limited to food contact substances authorized by the FDA. EPA determined that all companies that have joined AF&PA since September 2021 do not intentionally add PFOA, PFOS, or any other PFAS in pulp, paper, or paperboard products (U.S. EPA, 2022n).

To respond to public comments on Preliminary Plan 15, EPA gathered information regarding whether the recycle of PFAS-treated paper products may result in the transfer, and ultimately discharge, of PFAS in wastewater. Based on AF&PA data, EPA estimates that 78 percent of the approximately 340 pulp and paper mills operating in the United States use recovered fiber in the manufacture of pulp, paper, and paperboard products. However, the service life of PFAS-treated food contact paper and packaging is brief and the recycle rates for these products is low. EPA determined less than 15 percent of the United States population had access to recycling for direct contact foodservice paper and packaging in 2021 and, therefore, most food contact paper and packaging is thrown in the trash at the point of use (U.S. EPA, 2022n). Further, most member companies are targeting paper products that are as close as possible to virgin material for recycle (i.e., not products previously treated with PFAS). Some recovered fiber mills have zero tolerance for food contamination and will not accept any food contact papers and packaging for recycle. Because the production of PFAS-treated paper products is low (and continues to decrease) and most recovered fiber is not generated from PFAS-treated paper products, it is unlikely that recovered fiber facilities would be a significant source of PFAS discharges. Based on pulp and paper mill effluent data collected by the National Council for Air and Stream Improvement (NCASI), EPA determined that PFAS concentrations in effluent from mills using virgin pulp and mills using recovered fiber are low and that these data also show no significant difference in type or quantity of PFAS between the two types of facilities (U.S. EPA, 2022n; ERG, 2022b).

EPA continued to evaluate the available data on types and concentrations of PFAS in wastewater discharged from pulp, paper, and paperboard facilities. As described in Preliminary Plan 15, EPA previously identified three state permitting authority data sources containing PFAS monitoring data for pulp and paper mill effluent (MI EGLE, 2020b; MI EGLE, 2020c; VT DEC, 2020; U.S. EPA, 2021e). EPA has since collected analytical data from four additional data sources that meet EPA's acceptance criteria for inclusion in analyses for characterizing PFAS in industrial wastewater discharges:[43]

- Michigan EGLE 2022 PFAS monitoring results for direct and indirect discharging facilities (U.S. EPA, 2022d).
- Wisconsin Department of Natural Resources 2020 investigative order PFAS monitoring data for 40 industrial facilities and 78 POTWs (U.S. EPA, 2022e).
- New Hampshire Department of Environmental Services submission of PFAS sample results from the state's Environmental Monitoring Database (U.S. EPA, 2022l).

[43] EPA's acceptance criteria are presented in the memorandum "Development of the PFAS Wastewater Characterization Analytical Database" (ERG, 2022a).

- AF&PA data submission of NCASI-collected effluent samples for six unidentified pulp and paper mills (U.S. EPA, 2022n).

EPA included 4,664 PFAS sample results representing 52 facilities from the combined seven data sources in its analysis characterizing PFAS in pulp, paper, and paperboard facility effluent. Table 6-3 presents the average, minimum, and maximum concentrations for each PFAS observed in effluent from the 52 pulp, paper, and paperboard facilities. As illustrated in the table, EPA estimated the average concentrations for short-chain PFCAs were generally higher relative to PFSAs and long-chain PFCAs. Despite the phase-out of long-chain PFAAs, some pulp, paper, and paperboard facilities still report detectable levels of PFOA and PFOS in their wastewater.

Table 6-3. Pulp, Paper, and Paperboard Effluent PFAS Concentrations

PFAS Subgroup	Analyte[a,b]	Facilities with Data	Quantified Detections/ Total Sample Results	Concentration Range (ppt)[c]	Average Concentration (ppt)[c]
Perfluoroalkyl carboxylic acids (PFCAs)	Perfluorobutanoic acid (PFBA)	26	32/43	ND – 638	38.5
	Perfluoropentanoic acid (PFPeA)	26	33/43	ND – 246	22.7
	Perfluorohexanoic acid (PFHxA)	26	41/43	ND – 640	33.1
	Perfluoroheptanoic acid (PFHpA)	26	39/43	ND – 206	15.2
	Perfluorooctanoic acid (PFOA)	52	168/229	ND – 680	22.2
	Perfluorononanoic acid (PFNA)	38	34/57	ND – 52.6	4.08
	Perfluorodecanoic acid (PFDA)	26	15/43	ND – 19.7	0.969
	Perfluoroundecanoic acid (PFUnA)	26	9/43	ND – 15.3	0.423
	Perfluorododecanoic acid (PFDoA)	26	6/43	ND – 20.3	0.469
	Perfluorotridecanoic acid (PFTrA)	26	5/43	ND – 24.9	0.503
	Perfluorotetradecanoic acid (PFTeA)	26	6/43	ND – 23	0.465
	Perfluorohexadecanoic acid (PFHxDA)	3	0/7	ND	ND
	Perfluorooctadecanoic acid (PFODA)	3	2/7	ND – 14.6	2.91
Perfluoroalkane sulfonic acids (PFSAs)	Perfluorobutane sulfonic acid (PFBS)	38	36/57	ND – 254	4.84
	Perfluoropentane sulfonic acid (PFPeS)	25	4/42	ND – 1.43	0.122
	Perfluorohexane sulfonic acid (PFHxS)	38	32/57	ND – 59	1.98
	Perfluoroheptane sulfonic acid (PFHpS)	23	4/40	ND – 0.28	0.03
	Perfluorooctane sulfonic acid (PFOS)	52	161/231	ND – 810	16.1
	Perfluorononane sulfonic acid (PFNS)	25	1/42	ND – 2.17	0.022
	Perfluorodecane sulfonic acid (PFDS)	26	3/43	ND – 5.17	0.117
Perfluoroalkane sulfonamides (FASAs)	Perfluorooctane sulfonamide (PFOSA)	25	1/42	ND – 17.5	0.7
Fluorotelomer sulfonic acids (FTSAs)	4:2 fluorotelomer sulfonic acid (4:2 FTSA)	23	0/33	ND	ND
	6:2 fluorotelomer sulfonic acid (6:2 FTSA)	24	19/36	ND – 284	8.7
	8:2 fluorotelomer sulfonic acid (8:2 FTSA)	24	6/36	ND – 0.821	0.119
Perfluoroalkane sulfonamido ethanols (FASEs), perfluoroalkane	N-methyl perfluorooctane sulfonamide (NMePFOSA)	18	0/22	ND	ND
	N-ethyl perfluorooctane sulfonamide (NEtPFOSA)	18	0/22	ND	ND

Table 6-3. Pulp, Paper, and Paperboard Effluent PFAS Concentrations

PFAS Subgroup	Analyte[a,b]	Facilities with Data	Quantified Detections/ Total Sample Results	Concentration Range (ppt)[c]	Average Concentration (ppt)[c]
sulfonamido acetic acids (FASAAs), and N-Alkyl FASAAs	N-methyl perfluorooctane sulfonamido ethanol (NMeFOSE)	18	2/22	ND – 6.62	0.459
	N-ethyl perfluorooctane sulfonamido ethanol (NEtFOSE)	18	0/22	ND	ND
	N-methyl perfluorooctane sulfonamido acetic acid (NMeFOSAA)	26	12/43	ND – 12	1.56
	N-ethyl perfluorooctane sulfonamido acetic acid (NEtFOSAA)	26	20/44	ND – 46	4.31
Per- and polyfluoroalkyl ether carboxylic acids (PFECAs)	Hexafluoropropylene oxide dimer acid (HFPO-DA)	20	10/25	ND – 3.14	0.392
	4,8-dioxa-3H-perfluorononanoic acid (DONA)	17	0/17	ND	ND
	Sodium dodecafluoro-3H-4, 8-dioxanonanoate (NaDONA)	2	0/6	ND	ND
Per- and polyfluoroalkyl ether sulfonic acids (PFESAs)	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS/F-53B Major)	16	0/16	ND	ND
	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OudS/F-53B Minor)	16	0/16	ND	ND

Sources: ERG, 2022b.

Abbreviations: ND – nondetection; ppt – parts-per-trillion (equivalent to nanograms per liter).

A – This table presents data for all PFAS listed in draft EPA Method 1633 analyte list for which sample results are available and meet EPA's acceptance criteria. EPA also collected data for 10:2 fluorotelomer sulfonic acid (10:2 FTSA) and perfluorododecane sulfonic acid (PFDoS).

B –The table identifies short-chain PFCAs (≤7 carbons) and short-chain PFSAs (≤5 carbons) in blue text, while long-chain PFCAs (≥8 carbons) and long-chain PFSAs (≥6 carbons) are designated in red text.

C – In this analysis, EPA treated all nondetection results as zero for the purpose of estimating concentrations. All concentration values are rounded to three significant figures.

Based on this information, EPA is not prioritizing a rulemaking on the Pulp, Paper and Paperboard Point Source Category at this time. EPA will continue to review this category with particular attention to understanding the potential for legacy discharges from these facilities after the industry's transition to PFAS-free additives. EPA intends to provide updates on these activities in subsequent ELG program plans.

6.3.5 POTW Influent PFAS Study

EPA's PFAS Strategic Roadmap identifies the unique challenges posed by PFAS contamination and states its approach includes a "deeper focus to preventing PFAS from entering the environment in the first place—a foundational step to reducing the exposure and potential risks of future PFAS contamination." EPA's PFAS Strategic Roadmap and Preliminary Plan 15 further discuss the ubiquitous nature of PFAS and the paucity of PFAS monitoring data from industrial sources. EPA has reviewed the readily available PFAS monitoring data to date and continues to look for additional sources of PFAS. For many industries, PFAS monitoring of effluent discharges has not yet been conducted. These characterization data would fill a crucial data gap in the agency's efforts to establish technology-based limits for PFAS. Pending resource availability, EPA intends to initiate a POTW Influent PFAS Study, which will focus on collecting nationwide data on industrial discharges of PFAS to POTWs. This includes indirect discharges from categories recently reviewed and categories identified but for which insufficient PFAS monitoring data exists.

EPA's intent is to partner with wastewater treatment facilities to conduct this national sampling effort. Recent improvements to analytical methods; including Draft EPA Method 1633, which measures 40 PFAS in a number of environmental matrices, and Draft EPA Method 1621, which measures Adsorbable Organic Fluorine (AOF) (a surrogate for the presence of PFAS), in wastewater. EPA plans to collect samples of PFAS and AOF from industrial sources upstream of POTWs, before mixing and dilution from other wastestreams make it difficult to identify the source of the PFAS. As part of initiating this effort, EPA intends to develop an Information Collection Request (ICR) and a sampling strategy providing more details about the POTW Influent PFAS Study.

7. ONGOING ELG RULEMAKINGS

This section summarizes the status of EPA's ongoing ELG rulemaking efforts.

7.1 Steam Electric Power Generating Point Source Category (40 CFR part 423)

EPA promulgated new ELG for the Steam Electric Power Generating Point Source Category in 2015 and revised them in 2020. The rules are subject to legal challenge in the U.S. Court of Appeals for the Fifth and Fourth Circuits. The legal challenges to the 2015 ELG for flue gas desulfurization (FGD) wastewater and bottom ash (BA) transport water have been held in abeyance since EPA commenced its reconsideration rulemaking, which EPA completed in August 2020. The 2020 Rule established revised effluent limitations for FGD wastewater and BA transport water. Meanwhile, the Court proceeded to hear claims on aspects of the 2015 rule that were not the subject of EPA's reconsideration rulemaking. On April 12, 2019, the U.S. Court of Appeals for the Fifth Circuit struck down as unlawful aspects of the 2015 ELG pertaining to effluent limitations for "legacy" wastewater and combustion residual leachate. The Court vacated those portions of the 2015 ELG rule and remanded them to the agency.

Subsequent to the 2020 Rule, on July 26, 2021, EPA announced it was initiating a new supplementary rulemaking to strengthen certain wastewater pollution discharge limitations for coal power plants that use steam to generate electricity. EPA undertook a science-based review of the 2020 Rule under Executive Order 13990, finding that there are opportunities to strengthen certain wastewater pollution discharge limitations. For example, treatment systems using membranes have advanced since the 2020 Rule's issuance and continue to rapidly advance as an effective option for treating a wide variety of industrial pollution, including from steam electric power plants. EPA expects this technology to continue advancing and the agency will evaluate its availability (as defined in the CWA) as part of the new rulemaking. While the agency pursues this new supplementary rulemaking, the current regulations are being implemented and enforced. These requirements provide significant environmental protections relative to a 1982 rule that was previously in effect. The 2015 and 2020 rules are leading to better control of water pollution from power plants while reducing the cost of controls such as biological treatment systems and membrane treatment systems. The agency's approach is securing progress made by the 2015 and 2020 rules while the agency considers more stringent requirements.

EPA continues to work on the new supplementary rulemaking announced in July 2021, including continuing to analyze information and data, such as performance data and costs related to various pollution control technologies for treating and controlling steam electric wastewaters. EPA anticipates signing a notice of proposed rulemaking by early 2023.

7.2 Meat and Poultry Products Point Source Category (40 CFR part 432)

EPA initially promulgated the MPP ELG in 1974 and amended the regulations in 2004. The current regulation covers wastewater directly discharged by meat and poultry slaughterhouses and further processors as well as independent renderers. The technology basis for existing non-small direct dischargers includes biological treatment with partial denitrification. The current MPP ELG does not include pretreatment standards for any facilities indirectly discharging process wastewater. In the Effluent Guidelines Program Plan 14 (January 2021), EPA announced a detailed study of the MPP Category. The MPP Category ranked among the top two industrial categories in EPA's cross-industry review of nutrients in industrial wastewater. During the study, EPA evaluated publicly available data for

direct discharging facilities, which make up a small portion of the industry, and data from POTWs. The record indicated that in addition to having high nutrient discharges, indirect discharging MPP facilities may be causing problems for POTWs. In addition, the data showed that some MPP facilities are already removing nutrients and achieving effluent concentrations below the current ELG requirements. In Preliminary Program Plan 15, EPA summarized the detailed study, indicated that a revision to the ELG may be appropriate, and stated that EPA would be initiating a rulemaking to revise the MPP ELG.

A survey of the current MPP industry is critical for the rulemaking process and necessary for EPA to determine what revisions may be appropriate. Data collection activities will provide a robust data set that characterizes wastewater generation, treatment, and discharge from MPP facilities. As part of the rulemaking process, EPA processed and received Office of Management and Budget approval in June 2022 for an ICR to collect financial and engineering data from MPP facilities. With input from stakeholders, EPA's Office of Water has developed a short, census questionnaire and a more detailed questionnaire that was sent to facilities in fall 2022. EPA is currently administering both of these questionnaires to facilities engaging in meat and poultry processing, including those currently regulated under 40 CFR part 432 and facilities that discharge wastewater directly to waters of the United States, indirectly discharge wastewater, or do not discharge wastewater. EPA is administering both questionnaires via a web-based platform, Qualtrics Survey Software (Qualtrics). Based on data primarily from the U.S. Department of Agriculture Food Safety and Inspection Service and ICIS-NPDES, EPA estimates the MPP industry has between 7,000 and 8,000 facilities. Because no one data source collects information from all MPP facilities, the exact number is unknown, and the survey questionnaires will help determine the number of facilities. In addition, EPA has conducted site visits of facilities that represent meat and poultry processors across current effluent guidelines subcategories, including those that treat process wastewater with high-level treatment technologies.

EPA intends to select up to 10 facilities for multiday sampling to fill any data gaps remaining from the questionnaire data collection. The purpose of the multiday sampling is to characterize pollutants in raw wastewaters prior to treatment, as well as to document wastewater treatment plant performance. Selection of facilities for multiday sampling will be based on an analysis of information collected during the site visits, as well as the following criteria:

- The facility performs meat and/or poultry slaughtering and/or further processing operations representative of MPP facilities.
- The facility uses in-process treatment and/or end-of-pipe treatment technologies that EPA may consider for technology option selection.
- Compliance monitoring data for the facility indicates that it is among the better performing treatment systems or that it employs a wastewater treatment process for which EPA sought data for option selection.

EPA intends to propose this regulation in December 2023.

7.3 Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category: PFAS Manufacturers and Formulators (40 CFR part 414)

EPA announced in Preliminary Plan 15 and in the PFAS Strategic Roadmap that it will revise the ELG for the OCPSF Point Source Category (40 CFR part 414) to address wastewater discharges of PFAS from PFAS manufacturing facilities. Based on information and data collected, EPA determined that PFAS have been, and continue to be, manufactured and used by PFAS manufacturing facilities in the United States.

In December 2021, EPA delivered a data request under Section 308 of the CWA to obtain information and data from the industry that will provide a robust data set that characterizes wastewater generation, treatment, and discharge from PFAS manufacturing facilities. In addition, EPA has conducted virtual site visits of facilities that manufacture PFAS and treat the process wastewater with advanced wastewater treatment technologies.

Based on data collected from outreach and the Section 308 questionnaire, EPA sampled wastewater at a number of facilities in 2022. The purpose of the sampling was to characterize pollutants in raw wastewaters prior to treatment, as well as to document wastewater treatment performance. Selection of facilities for sampling is based on an analysis of information collected during the site visits and the responses to the data request. Pending resource availability, EPA intends to publish a proposed rule in the spring of 2024 and intends to continue to evaluate the need to develop regulations to address PFAS discharges from PFAS formulators/processors.

7.4 Metal Finishing (40 CFR part 433) and Electroplating (40 CFR part 413) Point Source Categories

EPA announced in Preliminary Plan 15 and in the PFAS Strategic Roadmap that it will revise the ELG for the Metal Finishing and Electroplating Point Source Categories (40 CFR part 433 and part 413, respectively) to address wastewater discharges of PFAS. Based on data collected to date, EPA has identified facilities conducting operations that use or may have used hexavalent chromium, including chromium electroplating, chromium anodizing, chromate conversion coating, and chromic acid etching (referred to as chrome finishing facilities), as the most significant source of PFAS in the Metal Finishing and Electroplating Point Source Categories. Existing data demonstrate that these facilities have concentrations of PFOS in their effluent that is, on average, several orders of magnitude higher than metal finishing and electroplating facilities that do not conduct chrome finishing.

PFAS are present in wastewater from chrome finishing facilities primarily due to the use of PFAS containing chemical fume suppressants to mitigate emissions and inhalation exposure of hexavalent chromium. A revision to the National Emission Standards for Hazardous Air Pollutants (NESHAP) phased out the use of PFOS in 2015; however, PFOS is still detected in wastewater from facilities that have used PFOS-based chemical fume suppressants in the past. As a result of the phase-out, many facilities switched to a chemical fume suppressant containing a different PFAS: 6:2 fluorotelomer sulfonic acid (6:2-FTSA). This has been detected at high levels in the wastewater from chrome finishing facilities that use it.

EPA has learned that: (1) it is possible to successfully mitigate hexavalent chromium emissions using commercially available chemical fume suppressants that do not contain any PFAS; (2) many facilities

could switch their operations to using trivalent chromium, which does not require the use of chemical fume suppressants; (3) a number of facilities are successfully using granular activated carbon to treat PFOS in wastewater to meet water quality limitations and granular activated carbon may be effective for other PFAS in metal finishing and electroplating wastewater; and (4) other technologies exist or are in development that may be able to treat PFAS in wastewater from chrome finishing facilities, including membranes, ion exchange, and PFAS destruction techniques.

Pending available resources, EPA intends to collect the data necessary to revise these ELGs, which will include conducting a survey of the industry and analysis of wastewater samples in the coming year. EPA intends to publish a proposed rule by the end of 2024.

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Appendix A—Response to Remand of ELG Plan 14 in Food and Water Watch V. EPA (No. 21-71084 9th Cir.)

A.1 Background

CAFOs are facilities that confine and maintain large numbers of animals for a specified period of time. 40 CFR 122.23 (defining CAFOs in precise terms). The CAFOs ELG regulates two parts of CAFOs: the "production area" and the "land application area." The production area is the area that includes the animal confinement area, manure storage areas, raw materials storage area, and waste containment areas. 40 CFR 122.23(b)(8). The land application area is the land under the control of a CAFO owner or operator to which manure, litter, and process wastewater from the production area is or may be applied. 40 CFR 122.23(b)(3).

In Effluent Guidelines Program Plan 14, EPA stated that it was not appropriate at that time to revise the effluent guidelines for the CAFOs industrial point source category. This determination with respect to CAFOs was challenged in the U.S. Court of Appeals for the Ninth Circuit. *Food and Water Watch v. U.S. EPA*, (9th Cir. No. 21-71084). On February 25, 2022, the court granted EPA's motion for remand of that decision. This Plan responds to that remand.

A.2 Existing CAFOs ELG

The existing CAFOs ELG imposes substantial and detailed requirements on both the production area and land application area. The ELG requirements for the production area prohibit the discharge of manure, litter, and process wastewater from the production area to waters of the United States, with only one exception. 40 CFR 412.31(a). Under this exception, the ELG allows discharges from the production area where those discharges are caused by precipitation and where the production area is designed to contain all manure, litter, and process wastewater from a 25-year, 24-hour rainfall event. 40 CFR 412.31(a)(1) (defining this exemption in precise terms).

The ELG requirements for the land application area prohibit discharges unless those discharges qualify as "agricultural stormwater," which the Clean Water Act expressly excludes from regulation. 33 USC 502(14). EPA interprets "agricultural stormwater" to include any precipitation-related discharges of manure, litter, and process wastewater from the land application areas if the manure, litter, and process wastewater has been applied to the land application area in accordance with a site-specific "nutrient management plan" that ensures appropriate agricultural utilization of the nutrients in the manure, litter, or process wastewater. 40 CFR 122.23(e). A nutrient management plan addresses the form, source, amount, timing, and method of application of nutrients on each field to achieve crop production goals while minimizing the transport of nutrients to surface waters. 40 CFR 412.4(c)(1). The application rates for manure, litter, and process wastewater must be established in accordance with technical standards established by each state. See 40 CFR 123.36; 412.4(c)(2).

The ELG also requires CAFOs to comply with certain recordkeeping and reporting requirements related to both the production area and the land application area. 40 CFR 412.4(b), (c).

A.3 Information to Determine Whether to Undertake Rulemaking to Revise the CAFOs ELG

A decision whether to undertake rulemaking to revise the CAFOs ELG is informed by understanding the extent to which the current ELG is controlling pollutant discharges from CAFOs, and, if not, the extent to which revisions to the ELG could result in improved water quality protection. Understanding the potential effectiveness of ELG revisions requires up-to-date information about the extent to which

CAFOs are discharging to "waters of the United States," technologies that are available and economically achievable for controlling CAFOs discharges, and implementation issues associated with currently applicable standards. EPA has decided to gather additional information and conduct a detailed study on these issues in order to be able to make an informed decision as to whether to undertake rulemaking.

A.4 Information Gathering and Study

EPA intends to gather information about many aspects of implementation of the existing CAFOs ELG and discharges from the production area and land application area. This information will help shed light on the appropriateness of ELG revision in light of the statutory standards for effluent guidelines, including that they reflect the best available technology economically achievable, after consideration of factors specified in the Act.

First, EPA intends to identify the extent to which CAFOs discharge into "waters of the United States." As commenters on Preliminary Plan 15 noted, EPA's data about discharges of pollutants from CAFOs is sparse; indeed, its preliminary analysis was only able to analyze monitoring data from sixteen reporting CAFOs. EPA intends to gather information about discharges from the production area to appropriate characterize whether manure, litter, and process wastewater flows off land application areas. EPA has reviewed many studies addressing impacts of CAFOs on surrounding communities and the environment, but little data is available demonstrating the impacts of CAFOs specifically on "waters of the United States," particularly considering the agricultural stormwater exemption. EPA also intends to assess whether any discharges from CAFOs are concentrated in particular regions or states, or whether they are widespread nationally. Understanding the nature and frequency of discharges is critical to understanding the extent to which potential revision of the ELG could yield significant pollutant reductions.

In addition, EPA plans to gather information about new technologies and practices for reducing discharges from the production area and land application area. EPA will consider whether these technologies may be technologically available and economically achievable for the CAFOs point source category. See 33 U.S.C. § 1311(b)(2). EPA lacks a sufficient understanding of technologies and practices that may have developed since its 2003 and 2008 rules, including their effectiveness at reducing discharges of pollutants beyond what is already required in the CAFOs ELG, the applicability of these technologies in a variety of situations, any secondary impacts they may have on farm production, and their cost to CAFOs owners and operators. EPA also intends to study the financial health of the agriculture industry as a whole and by sector, to the extent possible. Given the statute's requirement that any ELG revision be technologically available and economically achievable, EPA believes it should have a greater understanding of the availability, effectiveness, and economic achievability of new technologies.

This information is important for EPA to be able to make an informed, reasoned decision regarding the effectiveness of the existing ELG and whether emerging alternatives to existing requirements may be technologically available and economically achievable and may better protect water quality. EPA will evaluate other issues related to the CAFOs ELG in addition to the issues highlighted above, and the focus of the detailed study will evolve as EPA gathers information.

A.5 Conclusion

For the reasons provided above, EPA has determined that gathering additional information and conducting a detailed study of the CAFOs ELG is a necessary next step for evaluating whether revisions to the ELG are warranted. Completing this study before determining whether to revise the ELG also reflects EPA's careful evaluation of the Agency resources that would need to be committed to a rulemaking, due to the large number of environmental priorities that EPA has concluded need to be addressed through rulemaking. Typical ELG rulemakings take several years, 3 full-time employees, and a million dollars per year in contractor support. As noted above, EPA promulgated the CAFOs ELG in 2003 and revisions in 2008 – these rulemakings and associated litigation spanned approximately 11 years. Thus, a decision to undertake rulemaking has significant implications for the Agency's allocation of its resources. EPA has concluded that the information that will be collected is the appropriate course of action to make an informed, reasoned determination whether the potential environmental benefits of undertaking rulemaking justify devoting the significant resources that are required for such a rulemaking.

In deciding to gather information and conducting a detailed study prior to making a decision whether to undertake such a rulemaking, the Agency has also considered the substantial resources that it has committed to revising ELG for other industrial sectors and that undertaking rulemaking for CAFOs at this time could divert resources from these efforts. For example, EPA has undertaken rulemaking to control, for the first time, discharges of per-and polyfluoroalkyl substances (PFAS) from certain manufacturers and processors. See Section 7.3 and the Multi-Industry PFAS Study – 2021 Preliminary Report. EPA has also recently determined that it will undertake rulemaking to improve control of discharges from meat and poultry slaughterhouses. See Section 7.2. EPA is also now engaged in rulemaking for part of the power industry sector. See Section 7.1. EPA is undertaking those rulemakings because it had sufficient information to determine that revising those ELG would advance protection of quality of the nation's waters and, in the absence of such information with regard to CAFOs, has determined not to divert resources from those efforts.

For the reasons described above, EPA has determined that collecting further information and conducting a detailed study will enable the Agency to make an informed, reasoned decision whether to undertake rulemaking to revise the ELG for CAFOs.

Appendix D

Canada Lynx US FWS Fact Sheet

Canada lynx
(*Lynx canadensis*)

Photo credit: Kyle Lima

Description: The lynx is a secretive forest-dwelling cat of northern latitudes and high mountains. It is medium-sized, similar in size to the bobcat, but appears larger because of its long legs. It has unique, long (over one inch), black tufts of fur on the ears and a short, black-tipped tail. The winter coat is light gray and faintly spotted, and the summer coat is much shorter and has a reddish-brown cast. Lynx have unusually large, densely haired feet to help travel over snow. Adult males average about 33 1/2 inches long and weigh 26 pounds. Females are about 32 inches long and average 19 pounds.

Mating occurs during March, and 1 to 7 young are born 60-65 days later in May. Maine litters produce one to four kittens. Lynx dens in Maine consist of a bed under thick regenerating fir or elevated downed logs. The female raises the kittens. Young leave the den area in late June or early July and stay with the female for a full year before leaving their mother in late winter.

Lynx are highly specialized to hunt snowshoe hare, which comprise over 75 percent of their diet. When hares are abundant, lynx may consume one or two a day. In the summer, the diet is more varied and may include grouse, small mammals, and squirrels. In winter, carrion (dead animals) may supplement the diet.



Habitat: Critical habitat is designated in northern Maine (link). Lynx habitat is widespread through northern Maine. Foraging habitat consists of large patches of young, dense stands of spruce and fir approximately 12 to 40 years-old. Lynx habitat is created after a major forest disturbance (clearcutting, fire, insect damage). These stands have dense understory vegetation that support high densities of snowshoe hares, the primary food of snowshoe hares. Lynx also use areas of hardwood and mature softwood to travel between foraging areas.

Occurrence in Maine: Lynx occur in the boreal forest in northern Maine and sometimes in eastern Maine (link to species range map?). Lynx occur in areas of deep, fluffy snow where they have a competitive advantage over bobcats and other predators.

Survey: Lynx can be detected using snow track or camera trap surveys over large township-sized areas.