

NHDES Commissioner's Declaration of the Establishment of Protected Instream Flows for the Cold Designated River

January 18, 2022



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Prepared by

**Watershed Management Bureau
NH Department of Environmental Services**

R-WD-21-13

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This document establishes protected instream flow criteria as water quality criteria for stream flow for the designated Cold River. The Instream Flow Administrative Rules, Env-Wq 1900, state that protected instream flows established by the New Hampshire Department of Environmental Services (NHDES) Commissioner "shall serve as water quality criteria for the purpose of administration of water quality standards by NHDES under the federal Clean Water Act and RSA 485-A."

NHDES calculated the Cold River's protected instream flow criteria as part of a river-specific study. NHDES then drafted the flow criteria into a report and held a public hearing on these criteria. The public comment period closed November 17, 2021. This document is the final step in the process in which the NHDES Commissioner issues a decision establishing protected instream flows for the designated river.

RSA 483:9-c, IV requires that the protected instream flow criteria established by the Commissioner be maintained at all times. NHDES will use these criteria to guide development of the Cold River's Water Management Plan. The water management plan will describe actions water users will take to both satisfy their water use needs and also maintain the protected instream flow criteria.

Table 1 (attached) compiles the protected instream flow criteria. The full study report, [R-WD-21-09 Protected Instream Flow Study Report - Cold River](#), is available on the NHDES website and at the following locations:

NHDES Public Records Center
NH Dept. of Environmental Services
29 Hazen Drive
Concord, NH 03301
603-271-3503

NH State Library
20 Park Street
Concord, NH 03301
603-271-2144

I hereby establish the protected instream flows, as described in the Protected Instream Flow Study Report (R-WD-21-09) dated December 2021, as the water quality standards for flow for the Cold Designated River.


Robert R. Scott, Commissioner, NHDES

1/25/22
Date



Declaration of the Establishment of Protected Instream Flows for the Cold Designated River

1. Authority

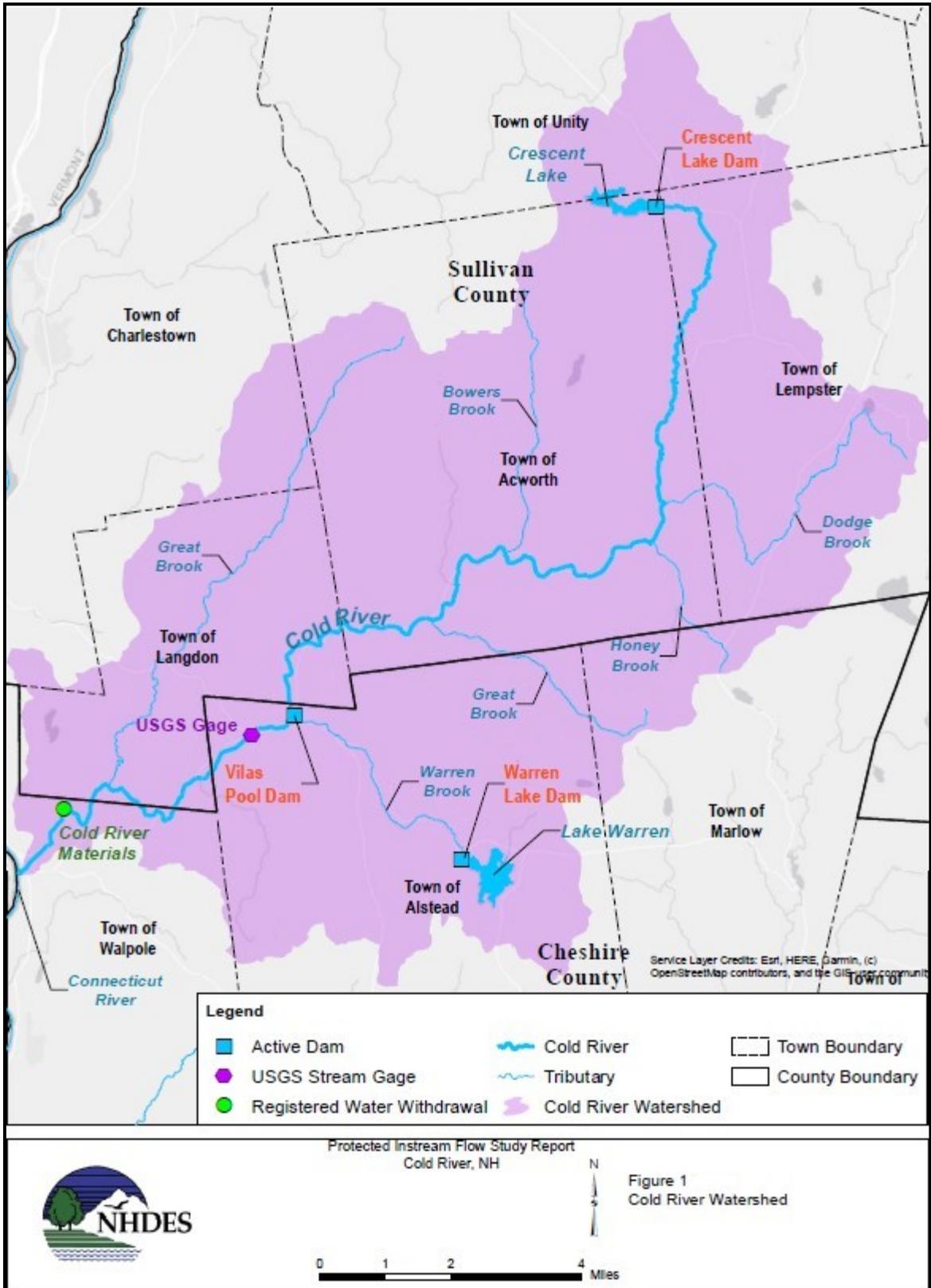
The Rivers Management and Protection Act (RSA 483) and Env-Wq 1900 (Instream Flow Rules) describe how protected instream flows are to be established as water quality standards. RSA 483 requires the Commissioner of the New Hampshire Department of Environmental Services (NHDES) to develop rules specifying the standards, criteria, and procedures for establishment and enforcement of protected instream flows for each Designated River or segment. Env-Wq 1900, Rules for the Protection of Instream Flow on Designated Rivers, fulfills this requirement. The Instream Flow Rules describe the procedure for establishing protected instream flows.

This Establishment Declaration follows the procedures in Env-Wq 1904.05, which describes the process for a decision and lists the required content of this document. This rule requires a written decision, after study and public input, stating the scientific basis for the protected flows, including an assessment of how the protected instream flows will meet applicable water quality standards.

The Instream Flow Rules also specify a review of impacts required under RSA 483:9-c, V as part of the establishment. This statute requires an assessment of the effect of a protected instream flow upon existing hydroelectric power generation, water supply, flood control, and other riparian users. Estimates of the impacts will be described here, but the final impacts will only be known as part of developing and approving the Cold River's Water Management Plan. RSA 483 also requires a summary of the comments and an explanation of how the comments affected the final protected instream flows.

RSA 483 directs the Instream Flow Program to establish protected instream flows that meet water quality standards on the State's Designated Rivers and prioritizes meeting water quality standards over other river characteristics. Narrative water quality standards are set out in RSA 485-A and Env-Wq 1700. The protected instream flow criteria apply numerical values to these narrative water quality standards.

For the purposes of this Establishment Declaration, the designated Cold River is described in RSA 483:15, XII and includes the 24 miles of river beginning at the Crescent Lake Dam in Acworth, NH and continues to the river's confluence with the Connecticut River in Walpole, NH. These protected instream flows apply to this Designated segment. Key features of the Cold River watershed are shown below in **Figure 1 – Cold River Watershed**.



2. Scientific basis for the protected flows

The [Protected Instream Flow Study Report - Cold River](#) (Cold PISF Report) describes the scientific assessment methods applied on the Cold River to determine its protected instream flow criteria.¹ Description of the protected instream flow criteria follows the concepts of the Natural Flow Paradigm that recognizes flow protection needs to protect biology and hydrology by maintaining natural flow patterns.

The scientific basis for these Cold River assessments was determined by the earlier Instream Flow Pilot Program. The methods used on the Cold River were developed during the Instream Flow Pilot Program on the designated Lamprey and Souhegan rivers. These methods were closely scrutinized by experts in fisheries, statistics, riparian species, and modeling. Upon completion, NHDES documented the Pilot Program's conclusions and recommendations describing the methods for future protected instream flow studies in the 2015 [Report of the Instream Flow Pilot Program](#) (Pilot Report).²

The Cold River's protected instream flow study applied the assessment methods to determine the protected instream flows for those flow-dependent entities. These protect flows result from applying three assessment methods to flow-dependent, riverine entities: an incremental flow model for fish habitat; floodplain transect surveys at unique riparian ecosystems; and surveys and interviews of recreationalists, and online research for recreational uses. The flow protections for the three areas of assessment were defined with terms to provide the variability identified in the Natural Flow Paradigm.

A. The Natural Flow Paradigm

The foundation of New Hampshire's protected instream flow protection is the Natural Flow Paradigm. The Natural Flow Paradigm recognizes that the principal management objective is to allow streams to flow as close to the pattern of their natural flow regime as possible. The Natural Flow Paradigm is based on evidence that natural variability of flows is necessary to support the biological integrity of aquatic ecosystems. By framing protected instream flows within the Natural Flow Paradigm, flow-dependent entities are protected, yet unrealistic flows are not required because variability, including low flow, is allowed.

The Natural Flow Paradigm provides the necessary framework for describing protected instream flows that allow daily to seasonal variability. Stream flow variability requires using terms in addition to magnitude. The Cold River protected instream flow criteria were described in terms of flow, timing, duration, frequency, as well as magnitude. By describing stream flow in these terms, the complexity of natural stream flow pattern variability is preserved. The Cold River's protected instream flow assessments used these variability terms in their results.

¹ *Protected Instream Flow Study Report - Cold River* is incorporated by reference. The report is available at the NHDES Public Records Center, the State Library; and on the NHDES website.

² *The Report of the Instream Flow Pilot Program* (December 1, 2015) R-WD-15-1 is incorporated by reference and available on the NHDES website.

B. Protected Instream Flow Assessments

The Cold River protected instream flow study used the three assessment methods first applied during the Pilot Program. These assessments were used to determine the protected instream flow criteria that protect aquatic life, riparian wildlife and vegetation, and human recreation use. Each of the three entities was assessed using a different scientific assessment method, described below. The resulting protected instream flows based on these assessments for the Cold River are in Table 1.

The protected instream flow criteria were assessed using stream flow measurements collected at a USGS stream flow gage - [USGS 01154950 COLD RIVER AT HIGH STREET, AT ALSTEAD, NH](#). This gage is the stream flow index location for the Cold Designated River. To determine the instream flow condition of the river, NHDES compares the daily stream flows from this gage to the protected instream flow criteria. NHDES evaluates the flow conditions in a publicly-available tracking tool, which is available on the NHDES website at [Current Cold River Instream Flow Conditions](#).

NHDES determined one set of protected instream flow criteria for the Cold River. In 2018, the Cold River was characterized to determine whether the river should be subdivided. The Cold River was characterized using a number of factors as part of a Statewide Target Fish Community Assessment (Gomez and Sullivan, 2018). The river was characterized based on factors including stream order and watershed size, rock and soil types, fish collections, ecoregion, slope and stream gradient, and water chemistry. The assessment determined that dividing the river into smaller segments was not needed because there was no combination of factors that would result in a major fish community shift.

i. Fish Habitat Assessment Using an Incremental Flow Model

Protected instream flows for the river's key fish species were developed using a physical habitat simulation model (PHABSIM). PHABSIM is a well-known model, developed by the U.S. Fish and Wildlife Service, to estimate habitat availability as a function of flow. Protected instream flow criteria were calculated for Cold River fish species and life stages identified in the Statewide Target Fish Community Assessment using values of magnitude, duration, and frequency for each biologically-significant period of the year (bioperiod). Six bioperiods were identified based on the Cold River's hydrology and the needs of the target aquatic species and life stages.

The PHABSIM model was applied separately to each bioperiod to incorporate timing to the flow criteria. The model results were analyzed to identify three separate stream flow magnitudes for each of these bioperiods. The magnitudes, from highest to lowest, are called Common, Critical and Rare. Flows are described at three biologically-significant magnitudes so that moderate, very low and critically low thresholds are defined for protection. Each magnitude represents an important threshold of change in the flow/habitat relationship. Falling below these magnitudes represents increased levels of stress for fish and aquatic life.

Stream flows below the protected flow magnitudes are expected at times and for brief durations. Extended durations when flow is below these thresholds represent increased levels of stress beyond the historic range. Each flow magnitude was characterized using frequency

analysis to determine two durations representing excessive stress conditions characterized as Persistent (also shown as Allowable in Table 1)³ and Catastrophic conditions. These durations, respectively, identify when flow-dependent species are under chronic (Persistent) or acute (Catastrophic) levels of stress. Management is applied to avoid or recover from Catastrophic conditions representing excessive levels of stress. Note that a Catastrophic condition also occurs when repeated Persistent conditions happen. A Catastrophic condition occurs when three Persistent conditions occur uninterrupted in a bioperiod within three years. More than one Persistent condition may happen within a bioperiod in one year. Catastrophic conditions represent flow magnitudes and durations that do not meet the protected instream flow criteria. NHDES assesses the daily stream flows against the timing, magnitude, duration and frequency criteria to determine the instream flow condition and the need for flow management.

The purpose of having three flow magnitudes with two sets of durations each applied to each bioperiod is to define stream flow conditions with the flexibility to mimic the natural variability recommended by the Natural Flow Paradigm. Together, these criteria allow that very low flow conditions can recur for limited durations without being considered water quality standard impairments.

ii. Floodplain Transect Method to Assess Riparian Species

The Floodplain Transect Method was used to assess flows that are necessary to inundate critical riparian habitats. Riparian plant communities rely on moderate and high stream flow conditions that wet the bank or floodplain to maintain their habitat. Bank inundations support critical life stages of plants and wildlife. This generally describes conditions of low to moderate flooding.

Species and communities that prefer more frequent inundation will occupy lower positions on the bankings. Higher flows occur less frequently than moderate flows. Species that prefer less frequent inundation or can tolerate higher flows may occupy positions higher on the bank. The biological objective is to maintain the species types and quantities similar to the distribution mapped during the protected flow studies. Maintaining the magnitude and duration of inundations will support the riparian species' flow needs.

Surveys were conducted to identify riverbank (riparian) plants and their communities and their elevations on the river banks and in floodplains. Because of the relationship between a stream's water level and its flow, the flows that will inundate these communities can be determined. Studies of species' life cycles were examined to determine the preferred frequency of the inundations, or the historical frequency of the flows required to inundate the plant community were identified.

Flow protections were identified by magnitude and frequency that maintain flow conditions that support the life cycles of plants found in these communities. These flows are prescribed for durations of at least one day. Higher flows defined for riparian plant protection also support

³ The terms Allowable and Persistent are sometimes used interchangeably for the same duration. Low flows up to the number of days in the duration are considered Allowable, and beyond the duration are considered Persistent.

fish by rejuvenating the river structure and bottom conditions vital to the long-term sustainability of the fish community.

iii. Surveys to Assess Recreation Flow Preferences

The needs of flow-dependent recreation were identified by performing surveys and interviews of recreationalists, and by conducting online research to identify usage preferences. To provide continued opportunities for boating, flows in the preferred range must be maintained at the expected timing, frequency and duration. The middle and higher range of river flows that support the riparian plants and wildlife also lend support to human recreational uses of a river. However, in the Cold River, surveys were unable to identify boating as a recurring or current use of the river. As a result, protected instream flow criteria for recreational use have not been made for the Cold River.

3. The Protected Instream Flows Meet Water Quality Standards

This section is the assessment, required by Env-Wq 1904.05(b)(3), describing how the established flows meet applicable water quality standards. The protected instream flows are required to meet applicable water quality standards. The Rivers Management and Protection Act gives priority to meeting these water quality standards over protection of all other river uses. The Cold River Protected Instream Flows were developed to maintain and protect water quality standards and the Clean Water Act's existing and designated uses related to stream flow.

Narrative standards related to stream flow are found in the Surface Water Quality Standards (Env-Wq 1703). Env-Wq 1703.01 describes water quality standards requiring:

- That all surface waters be restored to maintain the chemical, physical, and biological integrity of surface waters.
- That all surface waters provide for the protection and propagation of fish, shellfish and wildlife, and for recreation.
- That, barring naturally-occurring conditions, surface water shall be maintained at levels that protect existing and designated uses.

In addition, Env-Wq 1703.19 defines biological integrity as requiring that all surface waters support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

A strong correlation has not been identified between chemical water quality standards and stream flow. However, maintaining flows in their natural patterns of variability would support water quality parameters affected by flow. Physical and biological integrity are also met by developing these protected instream flows under the Natural Flow Paradigm. These protected flows maintain the pattern of stream flows within ranges consistent with natural conditions to which aquatic species have adapted. Maintaining flow in their historical patterns allows supports species life and reproduction needs. Recreational opportunities are consistently available within the natural variability of flows.

The designated uses under the Clean Water Act and RSA 485-A that are applicable to instream flow include protection of recreation and aquatic life. Water quality is required to be sufficient to protect recreation and aquatic life. These flow-dependent designated uses are also required to be protected under RSA 483.

4. Assessment of the Effect of the Protected Instream Flow

An assessment of the effect of a protected instream flow upon existing hydroelectric power generation, water supply, flood control, and other riparian users is required by RSA 483:9-c, V and Env-Wq 1904.05. The establishment of protected flow criteria by itself has no impact on any of these uses until the criteria are applied to define management actions for the affected parties. Management actions will be developed and compiled in the upcoming Cold River Water Management Plan. The Water Management Plan is the next step following establishment of the protected instream flows.

Under a Water Management Plan, the protected instream flows apply to the Cold Designated River, and also to certain water users and dams in the watershed. These water users and dams include water users who are required to be registered under RSA 488 (Affected Water Users), and dam owners in the watershed with impoundments greater than 10 acres (Affected Dam Owners).

Three sub-plans make up the Water Management Plan. Water Conservation Plans and Water Use Plans are components of a Water Management Plan for Affected Water Users. A Dam Management Plan applies to each Affected Dam and to hydroelectric dams. NHDES also considers homeowners and lake users at impoundments with Affected Dams as having an interest in the Water Management Plan. These sub-plans of the Water Management Plan define the actions to be taken by Affected users. There are currently one Affected Water User and two Affected Dams in the watershed.

Water management plans are developed to maintain the established protected instream flow criteria. Until the water management plan is completed, a general description of estimated impacts can be developed. The historical frequency of management events and the circumstances of the Affected parties can be described. Detailed accounting of the effects on the Affected parties will be described for public review in the draft Cold River Water Management Plan.

A. Assessment of Historic Recurrence of Stream Flows Not Meeting the Protected Instream Flow Criteria

A general description can be discussed of the expected impacts based on historical stream flow conditions. The frequency and duration of these historical events can be used to estimate management that may be applied to the water users, dams, and riparian users affected by the rules.

NHDES conducted an assessment by applying the protected instream flows to a long set of the historical stream flow data to see the timing and magnitude of protected instream flow deficits.

NHDES found that management would have been appropriate under Catastrophic conditions for 4.1 percent of the days between 1/1/1951 and 9/21/2021.

A shorter record was used to focus on more recent climate conditions. Between 1981 and 2020, there were a number of events when management would have been applied because stream flow remained below thresholds beyond Catastrophic durations. In the forty years, there were 14 years when management events occurred. During these years, there were seven years when events occurred once and seven years when two to four events occurred. There were a number of years when no events occurred during these years. No events occurred over one 6-year period. Twice no events occurred for five years and once, for four years. The 12 remaining years, an event occurred every other year.

B. Affected Parties and Water Management Plan Impacts

NHDES will coordinate with the water users and dam owners to identify the actions under their part of the Cold River Water Management Plan. A water management plan may not require management actions. Management actions under a water management plan balance the protected instream flows with the Affected parties' water needs and their operational management capacity. These needs and operational capacities will be identified during the water management plan's development.

Management by Affected users is applied to maintain the protected instream flows. Catastrophic conditions represent flow magnitudes and durations that do not meet water quality standards. Management under the Cold River Water Management Plan will be applied when Catastrophic conditions occur and when stream flows fall below the Rare flow magnitude. NHDES will apply management actions generally when the stream flow condition is under the Critical or Rare flow magnitudes and of Catastrophic duration. Management is also applied during the low flow bioperiods when flow falls below the Rare magnitude. This precaution is applied to avoid the occurrence of a Rare Catastrophic condition when stream flows are particularly critical for supporting aquatic life.

An Affected Water User will have a Water Conservation Plan as their part of the Water Management Plan. They will also have a Water Use Plan which will explain how they will get the water they need and the actions they will take to maintain the protected instream flows. Affected Dams and hydropower dams will each have a Dam Management Plan describing their operations to maintain the protected instream flows. Dam Management Plans may apply a 48-hour relief pulse to restore the protected instream flow criteria. The size of these pulses is determined by the bioperiod-specific stream flow deficits between the protected instream flows and the daily stream flows. If a relief pulse is applied to these impoundments, management of these dams would affect the lakes' levels. Management is limited to less than two feet, but in practice is measured in inches or less. When identifying dam management options, NHDES considers the balance between an impoundment's existing recreational uses, ecological needs and the impacts of management.

Management is tailored to flow and water use conditions. Water use management is applied more directly when the use has a significant impact on stream flow and less when it does not.

Water use may be insignificant during some bioperiods or at Common flows and would not warrant management. Management may be revised if conditions change. The public will be asked to comment on the Water Management Plan before it is adopted.

C. Affected Parties in the Cold River Watershed

There is currently one Affected Water User in the Cold River watershed. Instream flow management under the Cold River Water Management Plan is likely to affect this water use. Cold River Materials⁴, a quarrying and paving materials company in Walpole, is the only registered water user in the Cold River watershed. NHDES expects that Cold River Materials will develop a Water Conservation Plan and will have management actions under the Water Management Plan.

Cold River Materials has five water withdrawals sources, one of which is likely affected by the establishment of Cold River protected instream flows. The affected source withdraws water seasonally from the Cold River for dust suppression on the facility's roads. The established protected instream flows will be maintained by development of a Water Conservation Plan for the facility and a Water Use Plan for this source as part of the Cold River Water Management Plan. One of their sources is outside the watershed and is not affected by instream flow management of the Cold River.

The Water Use Plan may have several options to reduce the impact of the Affected withdrawal on stream flow during periods of extended low flows. Two of the options that are likely are 1) increasing the duration and reducing the instantaneous withdrawal rate to reduce and spread the impact over more of the day; or 2) shifting the withdrawal to the facility's other source either temporarily during low flows or permanently. Other options may be identified by Cold River Materials or by NHDES for managing the withdrawal's impact on low stream flows.

Two recreational dams may be affected by instream flow management under the water management plan. Crescent Lake and Lake Warren are two modest-sized lakes with low-head dams and are considered as Affected Dams that may be managed under a Dam Management Plan to support stream flow. The interests of lake front owners will be considered in the development of Dam Management Plans. Dam Management Plans sometimes apply relief pulses for 48-hours after extended low flows in order to reset the protected instream flow pattern. A relief pulse applies a small amount of flow that mimics a small rainstorm. Water levels in these impoundments would be impacted if one or both are used for relief pulses.

The size of a relief pulse, and the resulting water level change, depend on the flow deficit in the river. The Instream Flow Program limits the maximum water level change to less than 2 feet even before taking specific lake conditions into account. Designing a relief pulse considers the impacts on the impoundment's other purposes and its ecological health which may limit water level changes further.

⁴ Water user identification 20216

There are no hydroelectric power generation facilities or public water supplies. Flood control is not likely to be affected by management. No other riparian users affected by the Water Management Plan have been identified.

5. Summary of Comments

NHDES published the draft Protected Instream Flow Study Report - Cold River (R-WD-21-09) online on August 31, 2021 and solicited comments on the proposed protected instream flow criteria. The online calendar also provided the details of an informational meeting and a public hearing on the study. NHDES emailed notifications of the informational meeting and public hearing posting and the availability of the draft report to the entities listed in Env-Wq 1904.04 and to people in the NHDES notifications database on September 10, 2021 and again on October 18, 2021.

The informational meeting was held September 27, 2021 from 7:00 pm to 8:30 pm both virtually and at the Alstead Town Hall, 9 Main Street, Alstead, NH. NHDES and their consultant, Gomez and Sullivan Engineers, presented the report, described the processes used to determine the protected flows and answered questions at the informational meeting. No comments were received.

A public hearing was held October 18, 2021 from 7:00 pm to 8:30 pm both virtually and at the Alstead Town Hall, 9 Main Street, Alstead, NH. NHDES and their consultant, Gomez and Sullivan Engineers, were in attendance to receive comments. Some technical questions focused on clarification of the presentation were asked and answered. There was one comment about the draft report stated at the October public hearing that it was a good report.

Comments were solicited at the informational meeting and at the public hearing and via the email notifications. The 30-day comment period following the public hearing ended at 4:00 pm on November 17, 2021. No comments were received during the comment period.

6. Changes based on Comments Received

Because there were no comments during the comment period, the final Cold Report was largely unchanged from the draft report presented at the informational meeting and the public hearing. A discussion of the comments was added to the report as Appendix H. Some changes were requested by NHDES and made to the final report. NHDES requested that the flow criteria in Table 1 be restated by changing 3,710 to 3,490 cfs every 10 years to 3,490 to 3,710 cfs every 10 years, and suggested a few editorial changes.

REFERENCES

Gomez and Sullivan. 2018. Statewide Target Fish Community Assessment. Cold River. Final Report.

Poff, N.L., Allan, J.D., Bain, M.B., Karr, J.R., Prestegard, K.L., Richter, B.D., Sparks, R.E., and J.C. Stromberg., 1997. The Natural Flow Regime: A Paradigm for River Conservation and Restoration. *BioScience* 47(11): 769-784

Watershed Management Bureau, NH Department of Environmental Services (December 1, 2015) *Report of the Instream Flow Pilot Program (R-WD-15-1)*. Available at: [Report of the Instream Flow Pilot Program \(December 1, 2015\)](https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/r-wd-15-1.pdf)
<https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/r-wd-15-1.pdf>.

Watershed Management Bureau, NH Department of Environmental Services (December 2021) *Protected Instream Flow Study Report - Cold River (R-WD-21-09)*. Available at: [Protected Instream Flow Study Report – Cold River](https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/r-wd-21-09.pdf)
<https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/r-wd-21-09.pdf>

Table 1 - Instream Protected Flows for the Cold Designated River described in RSA 483:15, XII.

Bioperiod	Date Range	Common Flow				Critical Flow				Rare Flow			
		Common Flow (cfs)	Common Flow (cfsm)	Allowable Duration Under (days)	Catastrophic Duration (days)	Critical Flow (cfs)	Critical Flow (cfsm)	Allowable Duration Under (days)	Catastrophic Duration (days)	Rare Flow (cfs)	Rare Flow (cfsm)	Allowable Duration Under (days)	Catastrophic Duration (days)
Winter Survival	December 1 – February 28/29	136	1.82	50	74	36.5	0.49	27	43	16	0.21	11	15
Freshet	March 1 – April 15	480	6.43	21	37	63	0.84	13	21	39	0.52	8	12
Sucker Spawning	April 16 – May 15	94.5*	1.27	14	20	61	0.82	10	16	55.5	0.74	4	7
Springtime Anadromous Fish	May 16 – July 7	125	1.68	24	48	16	0.21	9	14	10	0.13	6	8
Rearing and Growth	July 8 – September 21	31	0.42	40	63	7	0.09	15	22	4	0.05	10	17
Fall Salmonid Spawning	September 22 – November 30	76.5	1.03	28	64	15.5	0.21	15	27	7.5	0.1	6	10

Retain Flow Event Frequencies for riparian species:

• >3,730 cfs, every 10 to 25 years	3,730 cfs in cfsm =	50.0		
• 3,490 to 3,710 cfs every 10 years	3490 cfs in cfsm =	46.8	3,710 cfs in cfsm =	49.7
• 1,080 cfs to 1,920 cfs every 2 years	1,080 cfs in cfsm =	22.7	1,920 cfs in cfsm =	40.3

Note: Flows provided are for the USGS gage in Alstead, NH (USGS Gage No. 01154950)

Protected Instream Flows for Boating were not defined due to lack of occurrence.

* Note: Though higher flows are more common in the Sucker Spawning bioperiod than the Springtime Anadromous Fish bioperiod, Longnose Sucker do not require as high of common flows as Springtime Anadromous Fish due to the habitat-flow relationship for this species and the flows that commonly occur during the sucker spawning season.

Allowable Durations are also known as Persistent Durations.

See additional notes about Table 1 in the Table 1 – Attachment.

Instream Protected Flows for the Cold Designated River as described in RSA 483:15, XII.
Table 1 - Attachment - Definitions
Bioperiod - biologically-significant periods - time segments within a year having biological significance for survival or propagation of one or more aquatic species or life stages.
cfs - cubic feet per second - a measure of flow - one cubic foot is 7.48 gallons. One cfs is equivalent to ~459 gallons per minute.
cfs_m - cubic feet per second per square mile of watershed. CFSM may be derived from a stream flow gage with known stream flow and known watershed drainage area. The cfs _m at a stream flow gage may be used to determine stream flow in cfs at an ungaged location by multiplying the gage's cfs _m value by the drainage area of the ungaged location.
PISF - Protected Instream Flows - stream flow protection criteria that are described for each bioperiod with Common, Critical and Rare flow magnitudes, each of which has an Allowable and a Critical duration.
Flow levels, flow durations, flow condition, and relief flow definitions
Flow magnitudes - Common, Critical and Rare flow magnitudes - assigned to a bioperiod and have an associated Allowable and Catastrophic durations.
Common Flow - the flow corresponding to the highest habitat magnitude above which the frequency of occurrence begins to decline significantly. Common flow magnitudes represent near optimal habitat availability conditions for species dependent on flow.
Critical Flow - the flow corresponding to the second to the lowest habitat magnitude for which the frequency of occurrence increases significantly with incremental increase in habitat magnitude. Critical flow magnitudes describe less habitat availability than that provided by the Common flow and more than Rare flow. This habitat magnitude is not unusual.
Rare Flow - the flow corresponding to the lowest of habitat magnitudes for which the frequency of occurrence increases significantly with incremental increase in habitat magnitude. Habitat availability is severely reduced for species dependent on flow. Flows below this magnitude are uncommon.
Durations - Allowable or Catastrophic - limits on the number of consecutive days when flow is below a protected flow magnitude. Count of durations are reset at the beginning of each new bioperiod and when the flow magnitude is exceeded for two days.
Allowable - duration occurring in an average year. Flow below protected flow levels may often continue for this duration.
Catastrophic - duration occurring once in ten years. Flows below protected levels for catastrophic durations initiate management activities pursuant to a Water Management Plan.
Conditions - the result of stream flow relative to protected flow magnitude and duration.
Persistent condition - when stream flow is below a Critical or Rare protected instream flow magnitude for more than the Allowable duration, but less than the Catastrophic duration. Three repeated Persistent conditions become a Catastrophic condition usually resulting in a relief pulse pursuant to a Water Management Plan. Persistent conditions are rescinded after stream flow levels rise above the protected flow magnitude for two days as a result of increased flow from natural conditions or a relief pulse.

Catastrophic condition - when stream flow is below a **Critical** or **Rare** protected instream flow magnitude for longer than the catastrophic duration; or if a **Persistent** condition occurs repeatedly. Repeated **Persistent** conditions become a Catastrophic condition if **Persistent** conditions occur during the same **bioperiod** for three consecutive years, or if three **Persistent** events occur during the same **bioperiod** three times in one year. A Catastrophic condition usually initiates a **relief pulse** as a management activity pursuant to a Water Management Plan. Catastrophic conditions are rescinded after stream flow levels rise above the protected flow magnitude for two days as a result of increased flow from natural conditions or a relief pulse.

Relief pulse - an artificial release of water from one or more dams that may provide relief from **Catastrophic** conditions. A relief pulse is a release of water for a duration of two days designed to raise flows above the protected flow magnitude. Relief pulses reset the duration count of days below the protected flow magnitude to zero.