White Mountain National Forest

United States
Department of
Agriculture

Forest Service
Eastern
Region

Pemigewasset Wilderness Thoreau Falls Trail Bridge Removal Project

Town of Lincoln, Grafton County New Hampshire

Draft Environmental Assessment

Pemigewasset Ranger District

August 2017

For Information Contact: J. Dan Abbe
White Mountain National Forest
71 White Mountain Drive
Campton, NH 03223
Phone: 603 536-6234
Fax: 603 536-3685
http://www.fs.usda.gov/projects/whitemountain/landmanagement/projects

This document is available in large print.

Contact the Pemigewasset Ranger District
White Mountain National Forest

603-536-6100

TTY 603-536-3665

Cover photo: Thoreau Falls Bridge showing delamination of the stringers. (WMNF photo)

Printed on Recycled Paper

Table of Contents

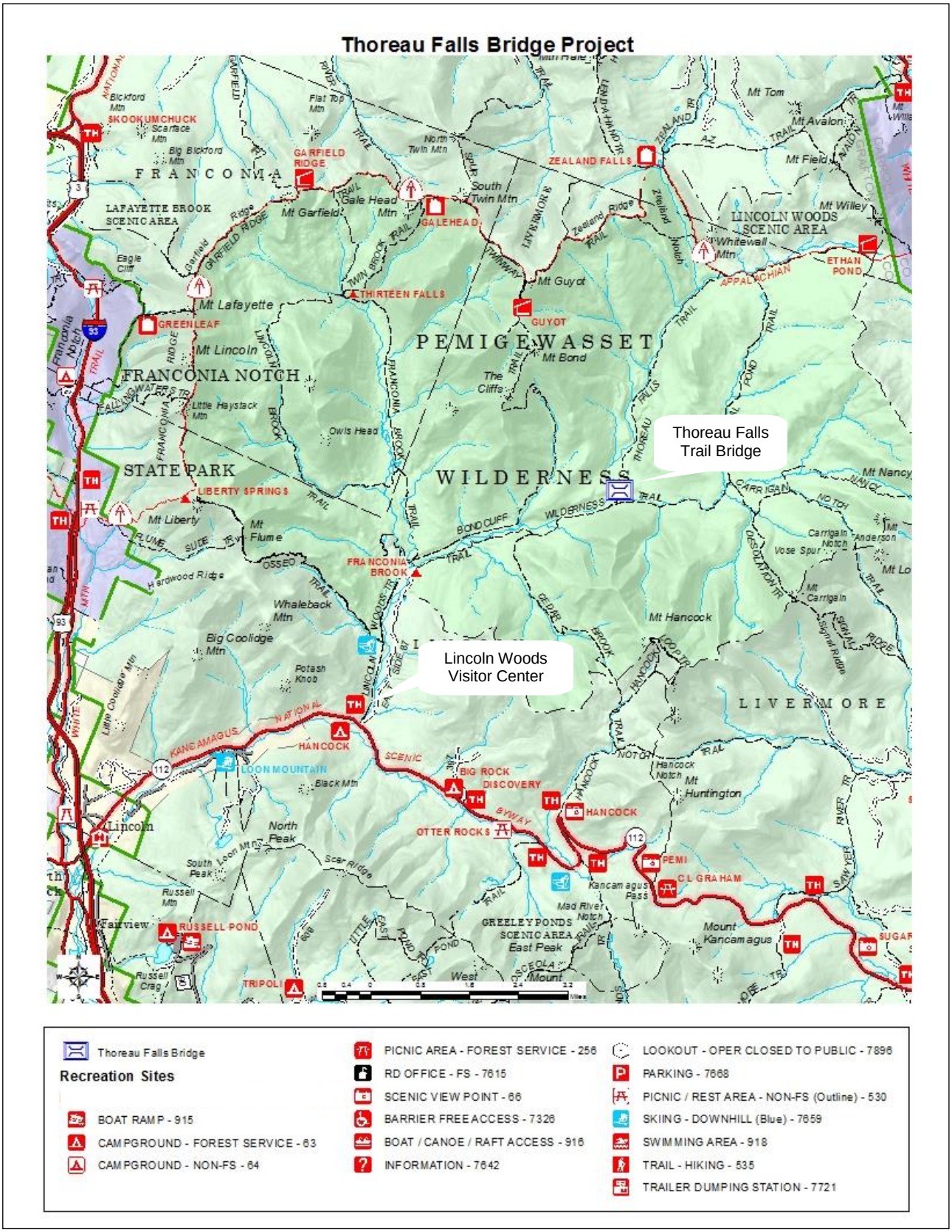

Figure 1. The Thoreau Falls Bridge is located within the Pemigewasset Wilderness.

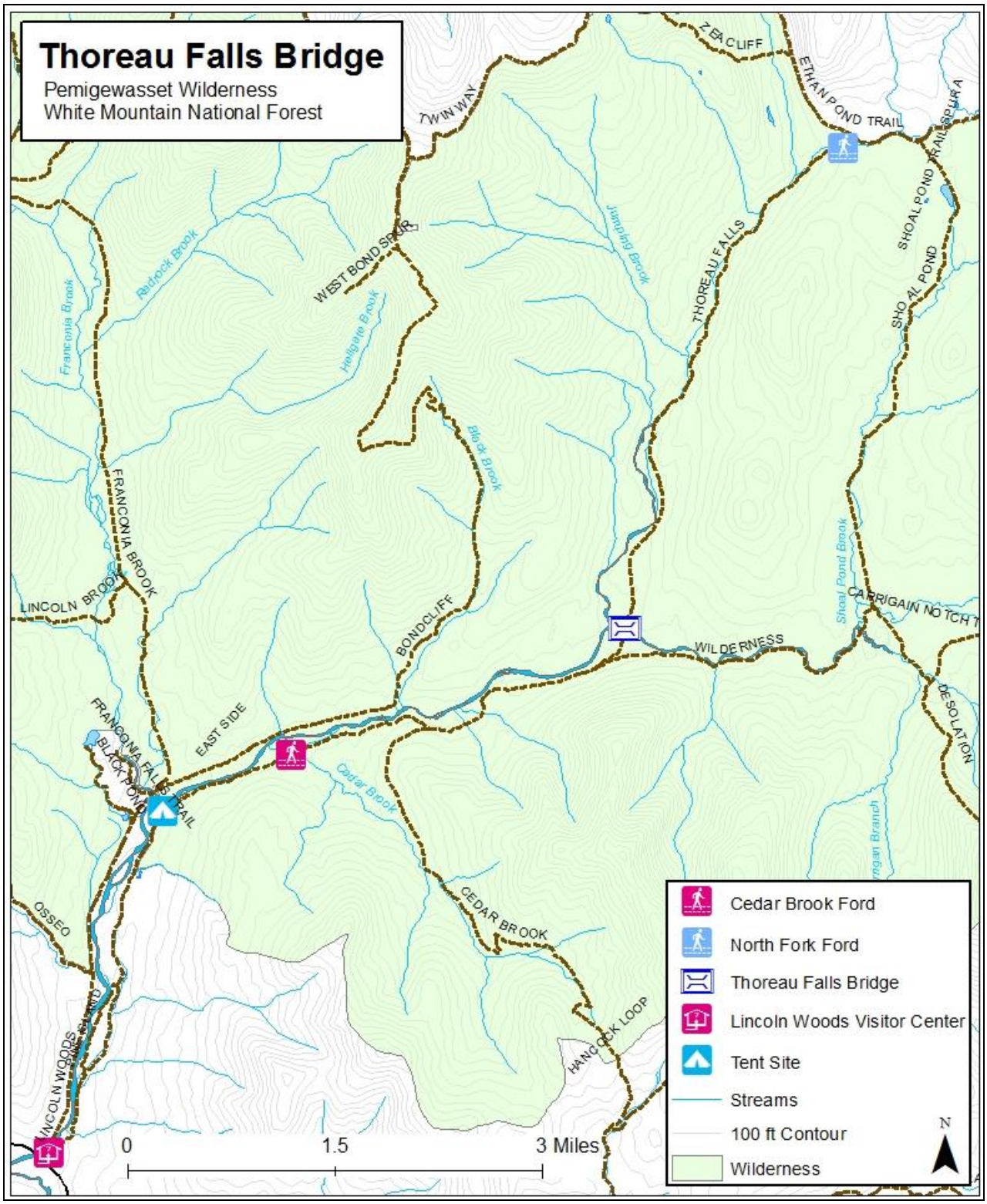

Figure 2. The shortest access point to the Thoreau Falls Bridge is from Lincoln Woods and requires a ford across Cedar Brook.

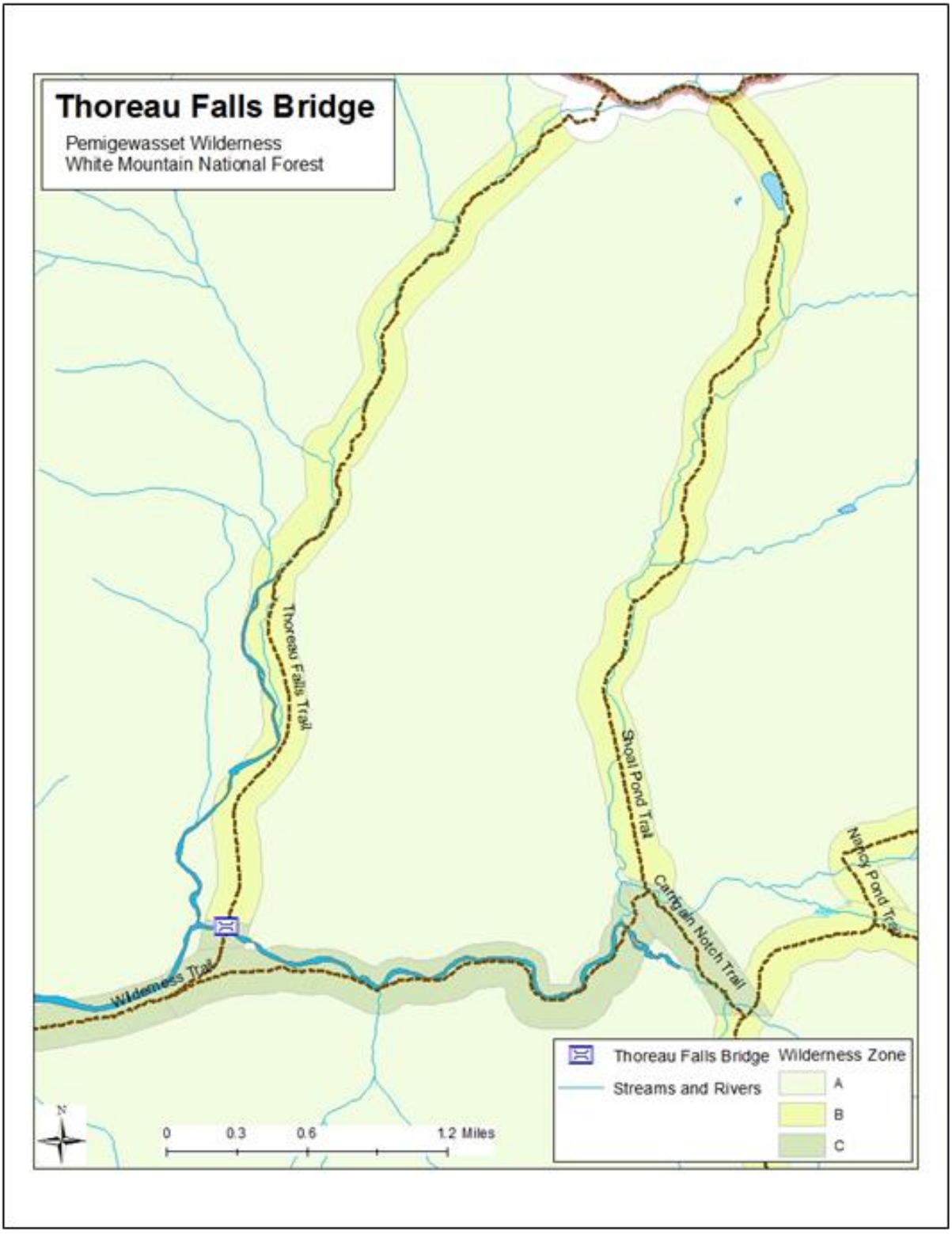

Figure 3. Wilderness zones are used to establish management goals and visitor expectations within different areas of wilderness. A small portion of the Thoreau Falls trail is zoned C to accommodate the bridge which is a developed feature in the Pemigewasset Wilderness.

Disclaimer: The Forest Service uses the most current and complete data available. The accuracy of GIS and other data products (e.g., tables and figures) may vary. These data may be: developed from sources differing in accuracy, accurate only at certain scales, based on modeling, interpretation, or estimates, incomplete while being created or revised, etc. Using GIS or other products for purposes other than those for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.

This page left blank

Chapter 1: Purpose and Need

Introduction

The Pemigewasset Ranger District of the White Mountain National Forest (WMNF) proposes the Pemigewasset Wilderness Thoreau Falls Trail Bridge Removal project (Thoreau Falls Bridge Project). The project is in the Pemigewasset Wilderness in the Town of Lincoln, Grafton County, New Hampshire (Figure 1). The Thoreau Falls Bridge is located near the center of the 45,000 acre wilderness (Figure 2). The goal of this project is to address public safety concerns related to potential failure of the bridge and whether or not it is needed in the Pemigewasset Wilderness (Figure 4).

Figure 4. Time and storm damage have resulted in delamination and cracking of the stringers and sagging of the Thoreau Falls Bridge structure. For safety reasons, the bridge has a one-person at a time weight limit.

Background

The land that includes the project area became part of the WMNF in 1936. Prior to that, the area was privately owned and extensively logged. The logging operations were supported by a network of logging railroads and camps. Following acquisition, many of the railroad beds and skid roads were converted to trails and supported recreational activities including hiking and backpacking.

The Thoreau Falls Bridge was constructed in 1962 to provide recreational hikers with a crossing of the East Fork of the Pemigewasset River and is part of the Thoreau Falls Trail (Figure 2). In a Forest Service Memo dated March 19, 1958 the Bridge was being considered with recognition that crossing the East Branch was "quite a river to cross" and during high water presented a "crossing problem." The memo did not mention incidents of hikers being injured while crossing the East Fork at this location, nor are there records of crossing-related injuries prior to bridge installation. A recent assessment by Forest Service staff determined that wading across the river at this location is possible during typical flows encountered in summer and fall, but the risk levels increase substantially during and shortly after storm events and during snow melt when stream flows are moderate to high.

The U.S. Congress designated the Pemigewasset Wilderness in 1984, adding it to the National Wilderness Preservation System (Public Law 98-323).

Management Direction

The following management directives are provided with ***emphasis added***:

- 1984 N.H. Wilderness Act and the Wilderness Act of 1964: The Wilderness Act of 1964 defines wilderness in Section 2 (c) as, "A wilderness, in contrast with those areas where man and his own works dominate the landscape, ***is hereby recognized as an area where the earth and its community of life are untrammeled by man***, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act ***an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation***, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." In Section 4(b & c) it states, "(b) Except as otherwise provided in this Act, ***each agency administering any area***

designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, ***wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use***…(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, ***except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act*** (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and ***no structure or installation within any such area.***" Emphasis added.

- Congress did not include any special provisions or restrictions in the legislation that created the Pemigewasset Wilderness.
- 36 CFR 293.2 states "Except as otherwise provided in the regulations in this part, National Forest Wilderness shall be so administered as to meet the public purposes of recreational, scenic, scientific, educational, conservation, and historical uses; and it shall also be administered for such other purposes for which it may have been established in such a manner as to preserve and protect its ***wilderness character***. In carrying out such purposes, National Forest Wilderness resources shall be managed to promote, perpetuate, and, where necessary, restore the wilderness character of the land and its specific values of solitude, physical and mental challenge, scientific study, inspiration, and primitive recreation. To that end: (a) Natural ecological succession will be allowed to operate freely to the extent feasible. (b) Wilderness will be made available for human use to the optimum extent consistent with the maintenance of primitive conditions. (c) ***In resolving conflicts in resource use, wilderness values will be dominant*** to the extent not limited by the Wilderness Act, subsequent establishing legislation, or the regulations in this part." Emphasis added.

- Forest Service Policy which appears in Forest Service Manual 2320 ***directs that replacement of bridges only occur when crossing afoot during the primary season of public use cannot be negotiated safely*** (FSM 2320 p. 20).
- Forest Service Handbook, FSM 2320, Wilderness Management provides the following related to providing appropriate access (FSM 2323.13f2 p. 20): *2. Bridges. Design bridges to minimize the impact on the wilderness. Select locations that minimize the size and complexity of the structure. Provide or replace bridges only:*

  a. When no other route or crossing is reasonably available.

  b. Where the crossing, during the primary season of public use, cannot be negotiated afoot safely, or cannot be forded by horses safely.

  c. Where unacceptable bank damage will occur from visitors seeking a crossing.

  d. Where flood waters frequently destroy or damage less sturdy structures.

- WMNF Land and Resource Management Plan (LRMP) Wilderness Management Area Direction
  - G-5: "Only those improvements needed to protect and manage the Wilderness resource, or that address an unusual and extraordinary public safety hazard should be constructed."
  - G-6: "The number and type of improvements, such as trails, footbridges, and signs should be kept to a minimum…"
- The Forest Plan objective for Wilderness is to manage the areas to standard in accordance with the Wilderness Management Plan (Forest Plan Appendix E) and national direction. "These lands (wilderness) are managed to allow natural processes to continue with minimal impediment, to minimize the effects and impacts of human use, to provide primitive and unconfined recreation opportunities…"

  The Forest Plan allocated lands within wilderness to one of four zones. The zones were developed to provide a balance between visitor use and preservation. The zones provide direction in the overall wilderness

management strategy with each zone providing a unique characteristic in terms of ecology, social conditions, and management needs. Zone A includes areas without trails and generally has the lowest use while Zone D generally the highest-use (Forest Plan pp. 3-9, E-4 to E-9). Zones along trail corridors extend 250 feet on either side of the trail to account for the characteristics found along the trail (Table 1).

Table 1. Wilderness management zones provide expectations for how areas of the wilderness will be managed and the types of experiences visitors should expect to encounter, including water crossings per Forest Service Handbook (FSH 2309.18 p. 9)

Zone	*Description*
A	Offers the highest degree of challenge, self-reliance, and risk; 500' or more from all trails; no maintained trails or structures
B	Offers a high degree of challenge, self-reliance, and risk; primitive trails and trail structures; natural fords
C	Offers a high degree of challenge and risk, and lower degree of self-reliance than Zones A and B; trails with natural fords; bridges may exist for public safety and resource protection only
D	Offers a moderate degree of challenge and risk, and lower degree of self-reliance than other Zones; trails with natural fords; bridges may exist for public safety and resource protection only

Bridge Condition, Location, and Access

The 60-foot long bridge is a single span "full tree length" log stringer bridge. It has a wooden deck, wooden rails and concrete abutments and is of simple utilitarian design. The log stringers were treated with creosote prior to installation. The bridge has deteriorated to the point that there is currently a single-hiker weight limit (Figure 5). Inspections over the years note various damage and minor repairs and include sketches and photographs of the bridge. Natural decay and storm damage have affected the bridge. Several layers of the log stringer have shredded off and there is an approximately 10 inch deep (one-half of the beam diameter) crack present at the midsection of the log (Figure 8). Warping of deck caused by deflection in stringers

The shortest route to the bridge is a relatively flat 6.6 mile hike from the Lincoln Woods parking lot off the Kancamagus Highway (Route 112) (Figure 2). The wilderness boundary is 2.8 miles north of the Lincoln Woods trailhead and 3.8 miles south of the bridge. The Thoreau Falls Trail was categorized as a moderate use trail during the 2005 Forest Plan revision. Trail counter data recorded during Spring/Summer 2016 at the bridge crossing found an average of less than three people per day. The primary seasons of use are summer and fall, although the trail gets some winter use.

The section of river where the Thoreau Falls Trail crosses is just upstream of the confluence of the North Fork of the East Branch of the Pemigewasset River. The crossing site is an alluvial reach, which is a segment of river where the stream flow decreases enough for sediment and other materials to be deposited. The alluvial deposits form a floodplain that is flooded by the river relatively frequently. As is common among White Mountain rivers and streams, this section of river is prone to rise and fall quickly in response to storm events. Data collected at the nearest USGS gauging station located downstream of this crossing in Lincoln, NH, show discharges rates drop by half of peak within 12 hours after a storm event. High flow events can occur at any time of year. Except at very low flows, the river is too large and the boulders are too far apart to be able to cross by rock-hopping. At times of moderate to high flows the river could be difficult and dangerous to cross. During times of moderate to low flow, visitors would need to evaluate their ability and comfort level to determine if they had the experience and comfort level to cross the river safely. Crossing would have a low risk during times of low to moderate flow.

Visitors approaching the bridge from either north or south must negotiate several unbridged river and stream crossing prior to reaching the bridge. Storm events have a similar effect on flows at these crossing as those described above for the Thoreau Falls Bridge location. Visitors coming from the south, including Lincoln Woods, via the East Side and Wilderness Trails must cross Cedar Brook (Figure 5) and two smaller unbridged crossings that require rock hopping or fording.

Figure 5. Crossing at Cedar Brook (August 23, 2016).

Figure 6. Crossing above Thoreau Falls. (August 23, 2016).

Visitors coming from the north, including Zealand, via the Ethan Pond Trail must cross the upper North Fork Pemigewasset River and its tributaries, including crossing above Thoreau Falls (Figure 6), 4 times without a bridge.

The bridge, and a ½ mile section of the Thoreau Falls Trail beginning at the junction with the Wilderness Trail, is in Wilderness Zone C (Figure 3, Table 1). The remaining 4.6-miles of trail to the junction with the Ethan Pond Trail is Zone B, accounting for 90% of the trail's length. The small section of trail containing the bridge was designated as Zone C because of the presence of the bridge. Visitors to Zone B are advised to "plan ahead and be well prepared for challenging travel and primitive recreation opportunities with a high level of risk. Self-reliance and proficient navigation skills may be needed to facilitate travel on minimally maintained trails. These paths may be exceptionally hard to follow under winter conditions" (Forest Plan p. E-27). Whereas visitors to Zone C

are advised to "plan ahead and be well prepared for challenging travel and semi-primitive recreation opportunities with a moderate level of risk. Navigation skills will better facilitate travel on moderately developed trails especially under winter conditions" (Forest Plan p. E-28).

Purpose and Need

The purpose of the proposed Thoreau Falls Trail Bridge Project is to address the failing condition of the log bridge as it relates to public safety and its presence in wilderness. The bridge has deteriorated over time and it sustained damage during Tropical Storm Irene in 2011. Following Tropical Storm Irene, a Forest Service engineer completed a field inspection of the bridge. Based on the inspection, the engineer recommended that the bridge be removed from service due to the poor condition of the superstructure—the log beams supporting the decking were tattered, sagging, cracking (~½ the diameter of one beam), and showing a substantial difference in beam deflection (Figure 4, Figure 7). If the bridge were to remain in service, the engineer recommended that no more than one person cross the bridge at a time and to do so slowly to avoid accentuating forces on the structure. A follow-up field inspection completed in 2015 reinforced those recommendations and instituted annual field inspections as long as the bridge remains in service. The bridge remains in use and is signed with a recommendation for only one-person crossing at a time. This project is needed to address the potential public safety concerns associated with the continued use of the bridge.

The Wilderness Act defines wilderness as an area that provides "outstanding opportunities for solitude or a primitive and unconfined type of recreation." In addition wilderness is designated "for the use and enjoyment of the American people" and recreation is one of the six public purposes of wilderness. In most areas visitor use of wilderness would be extremely limited without some type of trail for access. While the Wilderness Act defines wilderness as "undeveloped", trails are defined as an acceptable improvement. Trail standards for wilderness typically reflect a more challenging opportunity and minimal imprint on the land. The need for structures such as bridges is minimized through design and location and structures are used only for the protection of the wilderness resource and not for the convenience of the visitor.

Figure 7. Cracks and delamination of stringers.

Under the Wilderness Act, the Forest Service is required to insure that projects are reviewed and that actions taken to meet the purpose and need of projects are determined to be "…necessary to meet minimum requirements for the administration of the area for the purpose of this Act" (16 USC 1131). The Thoreau Falls Bridge predates designation of the Pemigewasset Wilderness. This proposal and analysis is needed to determine what, if any structure is necessary for crossing of the East Branch of the Pemigewasset River as part of the Thoreau Falls Trail.

Decision to Be Made

Based on the analysis in this EA, the project record, comments from the public and contributions from the interdisciplinary team, Pemigewasset District Ranger will decide whether:

- to implement the action as proposed or as described in an alternative and under what conditions and design features the decision should be implemented,
- the decision meets all applicable laws, regulations, and policies, and if it is consistent with the Forest Plan or if an amendment is needed, and

- to issue a Finding of No Significant Impact or to prepare an Environmental Impact Statement (EIS).

Public Involvement

This project has been listed on the quarterly WMNF Schedule of Proposed Actions (SOPA) since July 2015, and it will remain on the SOPA until after a decision is made. On August 4, 2015 a Scoping Report was released to the public and it was published to the WMNF website: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=46602

Notification of the availability of the report (via email and letter) was sent to the list of individuals and organizations that commented on the Pemigewasset Bridge Removal Project (Decision Memo signed September 11, 2009). The Forest issued a press release, offered two public field trips, there was a front-page article in the Concord Monitor, an article on WMUR's website, and a story on New Hampshire National Public Radio. Because of the amount of interst in the project, the Forest offered two public hikes to the bridge, one on September 26, and one on October 3, 2015. During and after public scoping the Forest received 147 comments from individuals, elected officials, private and public organizations. Those that supported the Proposed Action focused on adherence to the Wilderness Act and protection and restoration of the areas wilderness character. Those that supported replacement focused on the bridge's role in providing access and a safe crossing over the East Branch of the Pemigewasset River.

The assessment of the project's environmental affects was originally proposed to be completed as a Categorical Exclusion under 36 CFR 220.6(e)(1): Construction and reconstruction of trails. Due to the amount of interest and issues raised during public scoping, the District Ranger made the decision to conduct an environmental assessment to ensure a full analysis of tradeoffs and concerns. He felt that this process would provide an opportunity to more fully address the issues raised by the public. Interested members of the public received an update on the project, including the decision to conduct an EA, in December 2015.

Issues

The Interdisciplinary Team and the District Ranger considered all comments to identify issues and generate appropriate responses. Issues are statements that

describe cause-and-effect relationships between the proposed action and its effects. Identifying and addressing issues early in the analysis provides the opportunity to reduce potential adverse effects and compare trade-offs among effects and alternatives to inform the public and the Responsible Official (FSH 1909.15 Ch. 12.4). Public concerns about the effects of the proposed activities generated the following issues (see also Project Record):

Issue #1:

Public safety: Some commenters expressed concern that visitor safety would be compromised as a result of people having to ford the river or having to make potentially long backtracks that they may not be prepared for if they were unable to ford the river.

Resolution:

- Develop Alternative 2 – Remove Bridge with Replacement

Measurement Indicator

- Assess the potential effects to public safety by estimating the number of days each month when the flow rates are expected to be too high to ford the river safely. This provides an estimate of when an attempted ford would likely be unsafe and/or visitors would have to backtrack to their trailhead of origin rather than crossing at that time and location.
- Assess Search and Rescue (SAR) data provided by NH Fish & Game to determine the frequency of emergency responses within the Pemigewasset Wilderness and the project area. SAR data provide a means to assess the current location and frequency of SARs on the Forest relative to the location of Thoreau Falls Bridge and an opportunity to project the potential for increased SARs under the two alternatives.

Issue #2:

Access: Some commenters expressed concern that removing the bridge without replacing it would limit access; summer and winter users who were not comfortable fording the river would feel obligated to choose other trails that did not require a bridgeless river crossing effectively limiting their access to this trail.

Resolution:

- Develop Alternative 2 – Remove Bridge with Replacement

Measurement Indicator

- Compare the effects of the alternatives on the estimated number of visitors currently using the bridge (how many people could potentially be effected) and the trends in visitor use of the Pemigewasset wilderness and other areas of the White Mountain National Forest. If visitors are displaced by the need to ford the river, approximately how many visitors could this effect?

Issue #3

Wilderness Character: Some commenters stated that removing the bridge (without replacement) improves the wilderness character of the Pemigewasset Wilderness by eliminating a human structure, restoring the areas undeveloped condition and complying with Wilderness legislation.

Resolution:

- Develop Alternative 2 – Remove Bridge without Replacement

Measurement Indicator

- Compare the effects of the alternatives on the five qualities of wilderness character: untrammeled, undeveloped, natural, outstanding opportunities for solitude and primitive or unconfined recreation, other features.

Chapter 2: Alternatives

Alternative 1: Proposed Action – Removal of Bridge Without Replacement

The existing bridge would be removed using traditional tools (e.g., cross-cut saws, sledge hammers, and other similar hand tools). The concrete abutments would be left in place and allowed to decompose over time. The creosote treated wood would be removed from the site for proper disposal. Depending on the size of material to be packed out (e.g., large pieces of bridge stringers) mechanized and motorized equipment, including chainsaws and helicopters, could be used. Up to two helicopter trips would be necessary to remove large material. Untreated wood materials would be chopped up and burned on site. Up to 12 trees greater than 3" diameter at breast height (DBH) would be cut down to facilitate bridge removal. The trail would maintain its current alignment and users would ford the river using their own discretion. Bridge removal would take approximately five days and would likely occur between early July and late September. Following bridge removal, the site would be monitored for user created impacts (soil erosion), and if resource concerns were to develop, they would be addressed with future project(s) in compliance with the National Environmental Policy Act. The Zoning for the small segment of Thoreau Falls trail would be administratively changed from Zone C to Zone B to reflect the change in conditions following bridge removal, resulting in the entire trail length being Zone B.

Alternative 2: Removal of Bridge with Replacement

Removal of the existing bridge would be the same as described in Alternative 1 (the Proposed Action). Under Alternative 2, the bridge would be replaced in the same location as the current bridge using the same approaches to address accessibility. Because of the length of crossing, the new bridge would be constructed out of steel and timber in order to meet current Forest Service pedestrian bridge standards. In keeping with USDA-USDI guidelines, the bridge would also be designed to harmonize with the primitive character, natural and cultural setting to the extent possible. The existing concrete abutments would be used if they were structurally sound and capable of supporting a new bridge

built to current Forest Service standards. Otherwise, new concrete abutments would be installed to maintain the existing trail alignment. Construction would require the use of motorized equipment including helicopters, concrete mixers, jack hammers, and other small power hand tools needed to prepare the site and materials. Up to 4 additional helicopter trips could be necessary to transport materials and equipment for construction of the new bridge. There would be approximately 3,800 square feet of ground disturbance as a result of project activities (staging and construction) if the existing abutments were used. Approximately 1,800 square feet more ground disturbance would occur if new abutments had to be installed. In order to install new abutments, the old abutments would need to be removed and the area around the old abutments up to the stream would have to be excavated, the area where the new abutments were being installed would have to be dewatered of the abutment area, placement of concrete and rock, and re-vegetated. Approximately 18 additional trees greater than 3" DBH would be cut down to clear areas for construction and staging equipment and materials for bridge construction. Construction of the new bridge would likely occur between early July and late September and would take approximately 90 days.

Design Features Common to All Action Alternatives

All applicable Forest Service National Core Best Management Practices, New Hampshire Best Management Practices, and Forest Plan Standards and Guidelines would be followed during implementation of this project. All necessary State and Federal permits would be secured prior to project implementation.

Monitoring

Monitoring of conditions outlined in the Forest Plan and Wilderness Management Plan for streambank conditions would continue under all action alternatives. If the bridge is removed without replacement, the project area would be monitored for informal trail development and impacts to cultural sites. If resource concerns develop, then management proposals would be initiated to address the concerns.

Alternatives Considered but Not Analyzed in Detail

The following alternatives were either generated by public comments or were generated during the Minimum Requirements Decision Guide process (project record) and were considered by the Interdisciplinary Team and the District Ranger, but they were not analyzed in detail for the following reasons:

Bridge removal with replacement using non-motorized equipment and non-motorized transport

This alternative was developed during the Minimum Requirements Decision Guide (MRDG) process to assess the potential to replace the bridge without using tools that are prohibited under section 4(c) of the Wilderness Act. This alternative was considered, but dismissed from further analysis for the following reasons: 1) the feasibility of using pack animals to remove the old bridge and pack in materials for a new bridge is questionable given the size, weight, and quantity of material and the poor condition of the trail that includes a very large washout; and 2) the feasibility of constructing the new bridge that meets Forest Service standards is questionable.

Bridge removal without replacement using non-motorized equipment and non-motorized transport

This alternative was developed during the MRDG process to assess the potential to replace the bridge without using tools that are prohibited under section 4(c) of the Wilderness Act. This alternative was considered, but dismissed from further analysis for the following reasons: the feasibility of using pack animals to remove the old bridge is questionable given the size and quantity of material and the poor condition of the trail that includes a very large washout;

Bridge removal with installation of stepping stones

One commenter suggested that the bridge be replaced with stepping stones. This alternative was considered, but dismissed from further analysis for the following reason related to safety. Rock steps would not adequately address the perceived safety issues related to crossing the river. Stepping stones could also provide the perception of a safe ford even during times of high water, and they would not be sustainable in this very flashy location.

Bridge removal with installation of a cable car or cables

Two commenters requested that the FS consider installation of a cable car or cables to provide a means of crossing the river once the bridge is removed. This alternative was considered, but dismissed from further analysis for the following reasons related to safety and wilderness conservation. There are not any current Region 9 Forest Service standards for constructing a cable car or cables. A cable car or cables would be a new and different type of permanent structure built in wilderness. A cable car would provide a mechanized form of transport which is prohibited under Section 4(c) of the Wilderness Act unless it is shown to be the minimum "tool" needed to administer the wilderness area to meet the purpose of the Wilderness Act. A cable car would fail to provide an over the water crossing if the mechanical components failed (e.g., frozen in place due to snow or ice buildup).

Bridge removal with construction of a new trail connecting Bondcliff and Thoreau Falls Trails fording the North Fork of the Pemigewasset River

The Interdisciplinary Team discussed the potential for a new trail to connect Bondcliff and Thoreau Falls Trails providing a fordable crossing of the North Fork of the Pemigewasset River (no bridge). This alternative was eliminated from detailed analysis because constructing the approximately 1.5 – 2 miles of new trail through lands allocated to Zone A would be inconsistent with the Forest Plan (p. 3-16, Appendix E pp. 5-6).

Chapter 3: Environmental Effects

This chapter summarizes the potential effects of Alternatives 1 and 2 on affected physical, biological, and social resources. The affected environment analyzed for direct and indirect effects was the immediate area around the existing bridge where removal would occur under both alternatives and where staging would occur under Alternative 2. The cumulative effects area was the Pemigewasset Wilderness, the timeframe was the past 11 years since the Forest Plan was revised and current management was established through three years into the future which encompasses the expected direct and indirect effects of the project, and included activities in Table 2.

Table 2. Past, present, and reasonably foreseeable future projects that were considered by resource specialists for analyzing cumulative effects.

Project	Time Period
13 Falls Campsite special use permit	Past, Present, and Reasonably Foreseeable Future
Guyot Campsite Reconfiguration Project	2016-2018
Pemigewasset Bridge Removal Project	2009
Trail maintenance	Past, Present, and Reasonably Foreseeable Future

The following resources were considered by specialists, but the effects of the alternatives on these resources were not analyzed in detail. Either the alternatives would not affect the resources or the effects would be negligible and there were no comments received from the public that would indicate a concern.

- Hydrology, Non-native Invasive Species, Scenery, Soil, and Wildlife Resource specialists reviewed the alternatives, including the application of Forest Service National Core Best Management Practices, Forest Plan Standards and Guidelines, and New Hampshire Best Management Practices, and participated in site visits. Based on their assessments, they determined that the alternatives would have negligible or immeasurable effects on these resources (see project record).
- A Cultural Resources Reconnaissance Report (CRRR No. 2015-04-09/ R2015092204009) with a determination of "No Historic Properties

Affected" was submitted to the New Hampshire State Historic Preservation Office, which concurred with the determination on August 14, 2015. See Ruhan 2016 and signed New Hampshire Division of Historical Resources letter in the project record for more information.

- A Biological Evaluation of the effects of the alternatives on Federally Endangered, Threatened, and Proposed species determined that neither alterative would affect Canada lynx or small-whorled pogonia. The Biological Evaluation determined that the alternatives may effect, but were not likely to adversely affect northern long-eared bat. On March 15, 2016, the U.S. Fish and Wildlife Service concurred with this determination. In addition, the Biological Evaluation determined that the alternatives may impact individuals but were not likely to cause a trend to federal listing or a loss of viability for Regional Forester Sensitive species of woodland bats and mountain avens. (Woods and Sperduto 2016 in the project record for additional information).
- The East Branch of the Pemigewasset River was determined to be eligible for listing under the Wild and Scenic River Act during the 2005 Forest Plan revision process with this segment of the river being classified as "Wild" (USDA Forest Service, Appendix C 2005a; Forest Plan). Forest Plan Standards require the Forest Service to: "Manage eligible rivers to maintain their classification and eligibility until Congress designates the segments or decides not to designate them." Additionally, Forest Service Handbook 1909.12 (Chapter 82.5) requires that the free-flowing condition, outstandingly remarkable values (ORVs), and inventoried classification of eligible rivers be protected. Removing the bridge would improve the scenic quality of the river at this location. If a new bridge were installed, it would be designed to harmonize with the primitive character, natural and cultural setting of the area resulting in no change from the condition that existed during Forest Plan revision. Therefore, neither alternative would have a negative affect on the free-flowing condition, potential outstandingly remarkable values (ORVs), or inventoried classification of eligibility of this river segment.

Recreation

The following data were used to evaluate the potential effects of the alternatives on visitor safety and accessibility (Issues #1 and #2): stream flow data, visitor use levels, and search and rescue data from New Hampshire Department of Fish and Game (NHF&G).

Forest Service staff used a two-step process to assess the ability to ford the river as a function of stream flow (cubic feet per second; cfs). First, Forest Service staff and a few members of the public who accompanied staff on site visits made observations (summarized below) at the Thoreau Falls Trail Bridge site to determine if the river was fordable or not. Individuals assessed the river and determined if they would be comfortable fording the river under those conditions. The individuals represented a range of abilities and experience. Following the site visits, the corresponding steam flow rate data from the U.S. Geological Survey's station on the East Branch of the Pemigewasset River in Lincoln, New Hampshire were obtained and reviewed. For example, during a site visit on May 3, 2016 a Forest Service Inter-Disciplinary Team came to consensus that the site represented an unacceptable level of risk to ford; the corresponding stream flow data was 513 cfs. Individuals felt comfortable fording the river when flow rates at the gaging station were below 300 cfs (Table 3).

Stream flow data have been collected at the USGS gauging station in Lincoln, NH from April 1993 to May 2016. These data were used to estimate the probability that flows would exceed a given rate during a particular month (Figure 8). For example, the probability of encountering a flow exceeding 300 cfs in July would be approximately 20% or there would be an approximately 80% probability of a flow rate at or below 300 cfs in July. In May, the probability of encountering a flow rate above 300 cfs would be approximately 90%.

Using this hydrograph (Figure 8), Forest Staff inferred that backcountry users would have the greatest opportunities for fording during the summer into late fall (when the probability of given flow rates being exceeded is smallest). There would be a lower probability of flows that would support fording during the spring snow melt (when the probability of given flow rates being exceeded is highest). Fording during winter months with snow and ice on the river would further complicate a crossing. This inference was supported by observations made by Forest Service staff during site visits.

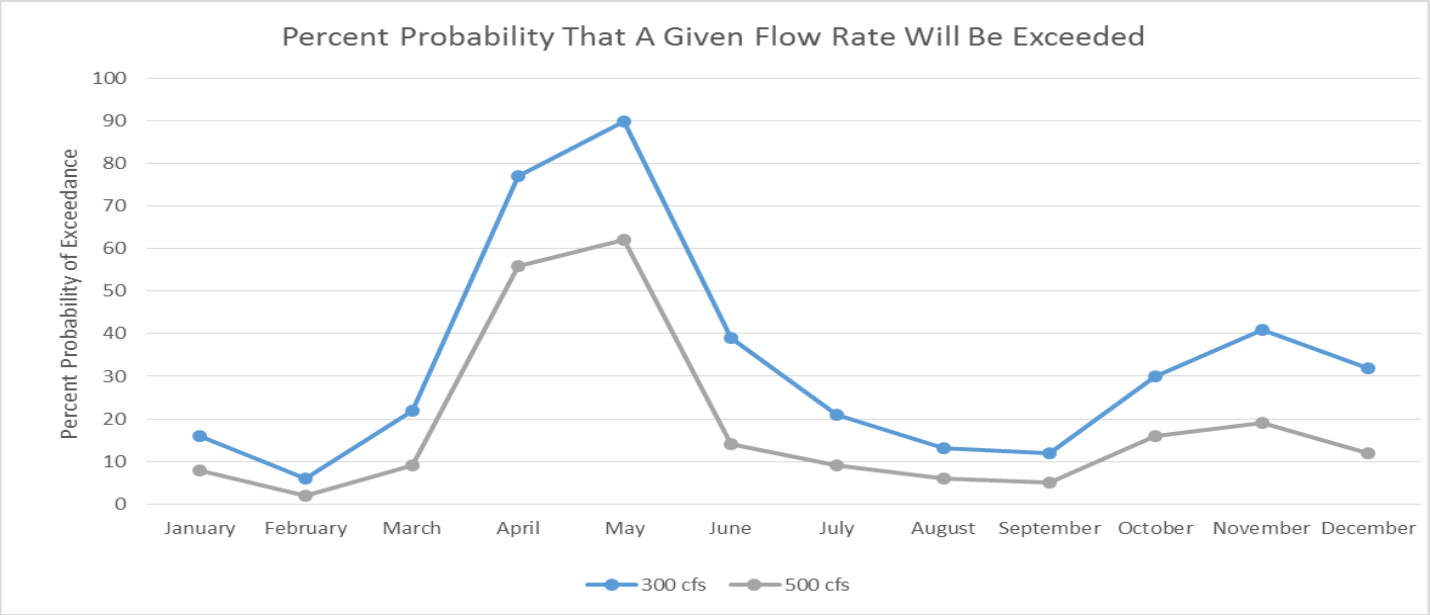

Figure 8. The percent probability that flow rates would exceed a given value was calculated using all available data collected at the USGS gauging station in Lincoln, N.H. between April 1993 and May 2016.

Table 3. Dates and times observations were made regarding fordability of the river and associated stream flow measurements (cubic feet per second; cfs) recorded at the USGS gaging station in Lincoln, NH. Dates with bold text indicate when rates of flow posed a higher risk to visitors if they attempted to ford the river as compared to lower flows. For the purpose of this assessment, flow rates below 300 cfs were considered to pose a moderate or lower risk.

Date	*Time*	*Flow (cfs)*
7/9/2015	10:45	237 cfs
10/3/2015	12:46	249 cfs
3/16/2016	**11:45**	**436 cfs**
5/3/2016	**13:19**	**513 cfs**
5/25/2016	10:47	280 cfs
6/28/2016	10:00	105 cfs
8/23/2016	15:00	165 cfs
11/1/2016	12:00	193 cfs

Visitor Use Data

The visitor use level for Thoreau Falls Trail was categorized as moderate (7 - 25 people per day) during the 2005 Forest Plan revision. Visitor use categories are based on the number of people per day during peak use. More recently, in order to assess the potential effects of the alternatives on recreation, the Forest collected site-specific visitor use data by installing two trail counters alongside the trail. One counter was set up just south of the bridge and one just north of the bridge. The trail counters were set up from March 5 through October 31, 2016. However, the trail counter just south of the bridge did not record data during September due to a malfunction. This timeframe represented the primary season of use on the Forest. These data showed higher numbers of passes during the summer months with fewer passes occurring in the spring and late summer (Figure 9). This helps validate the assumption that the peak visitor use of this trail occurs during the summer months with heaviest use in July and August.

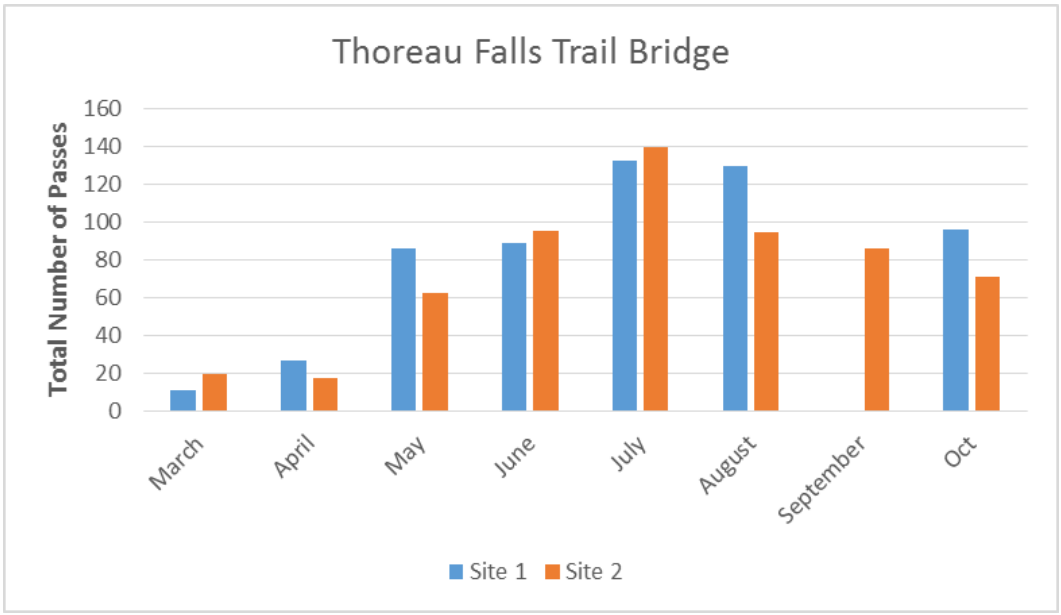

Figure 9. The total number of passes per month shows how the pattern of use changed across the monitoring period March – October 2016. *Due to a malfunction, the trail counter at Site 1 did record any data in September.

The counters recorded the number of times something passed by the counter on the trail; the counters did not distinguish between passes by people or wildlife. It is worth noting that many of these passes could have been from a hiker traveling

out and back across the bridge and not just passing by one-way enroute to a destination. There were three dates with unusual spikes in passes at Site 2 with no similar correspondingly data recorded at Site 1. On these dates (June 15, 20, and 23) the Site 1 trail counter (south side of the bridge) recorded 0, 2, and 0 passes respectively while Site 2 (north side of the bridge) recorded 38, 31, and 33 passes respectively. These data may have been the result of an animal(s) foraging in the area, were considered anomalies and were not included in the analyses. Figure 10 shows the variability in data throughout the monitoring period.

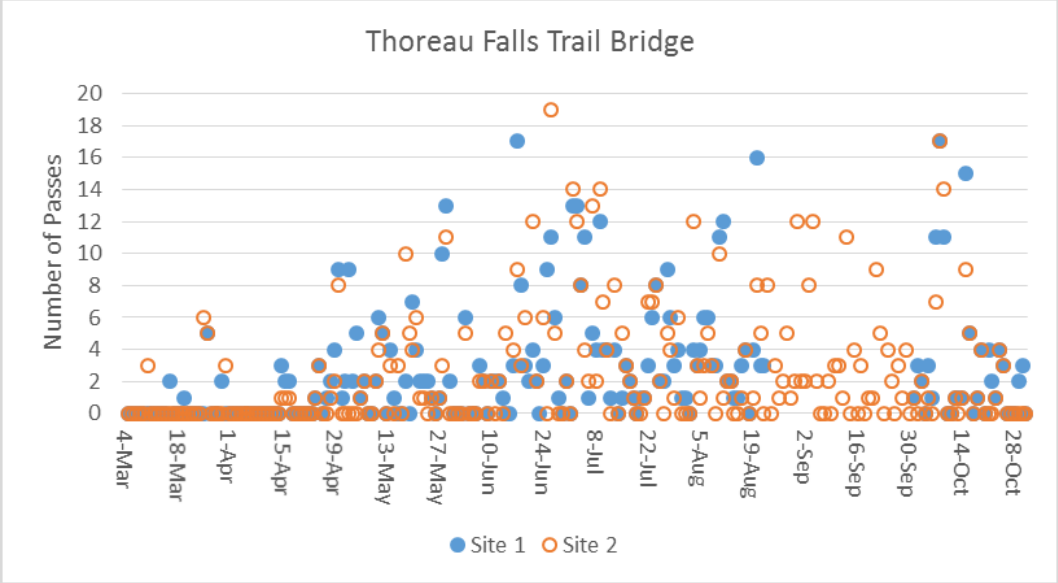

Figure 10. This figure shows the variation in the number of daily passes recorded by the trail counters between March 5 and October 31, 2016 including many days when zero passes were recorded. *Due to a malfunction, the trail counter at Site 1 did record any data in September 2016.

The two peak use days recorded by the trail counter at Site 1 were on Friday, June 17 (17 passes) and Saturday, October 8, 2016 (17 passes). The two peak use days recorded by the trail counter at Site 2 were on Sunday, June 26 (19 passes) and Saturday, October 8, 2016 (17 passes). During the Memorial Day, Fourth of July, and Columbus Day holiday weekends the trail counters showed a range of passes between 3 and 17 (Table 4).

Table 4. Trail counter data recorded during Memorial Day, the 4th of July, and Columbus Day holiday weekends.

Site #	*Saturday*	*Sunday*	*Saturday*	*Sunday*	*Monday*	*Saturday*	*Sunday*
	05/28	*05/29*	*07/02*	*07/03*	*07/04*	*10/08*	*10/09*
1	10	13	13	13	8	17	11
2	3	11	13	12	8	17	14

New Hampshire Fish and Game Search and Rescue Data

The NHF&G data included all search and rescue incidents recorded on the WMNF from January 2008 through early October 7th, 2015 (project record). The vast majority of incidents occur outside of designated wilderness areas and no incidents were reported within the project area. Most incidents occurred in high use areas and were often attributed to a lack of visitor preparedness. The trip preparation typically completed by overnight wilderness visitors may help explain the vastly lower number of search and rescue incidents within the WMNF wilderness areas. The data did not indicate an increase in incidents after the Pemigewasset Wilderness Bridge Removal Project in 2009. That decision included decommissioning the section of trail that led to the formerly bridged crossing.

Alternative 1 (Proposed Action):

Direct and Indirect Effects

Access to the area would not be closed or restricted. However, removing the bridge would make access to the area more challenging. The potential increase in visitor risk associated with a stream crossing is addressed in the Environmental Effects, Wilderness section below. There would be a change in use patterns due to some displacement of hikers and backpackers who are unable or unwilling to ford the river at this site. Displacement may be more evident in the winter when visitors would have to cross on ice and snow. Increase in trail use by crews and localized noise would have an effect on recreation for a short period of time during bridge removal.

Based on the trail counter data, it is likely that fewer than 1,000 visitors use this trail each year and most of the use is during the summer. Some of these visitors

would ford the river and some would have to modify their itineraries if river flows and/or experience levels prevent fording. Other visitors would be drawn to the remoteness of the area, and the challenge of the river crossing would be a draw to visitors seeking solitude and primitive forms of recreation. Although there may be a short-term reduction of use on the Thoreau Falls Trail, visitor trend data indicates that visitor use within the Pemigewasset Wilderness continues to increase (as shown by Appalachian Mountain Club overnight use at managed campsites and huts in and around the Pemigewasset Wilderness). As a result, the areas remoteness would be an increasing draw for visitors seeking solitude, especially in the Northeast where such experiences are limited.

Based on NHF&G data, the number of search and rescue incidents is not expected to rise if the bridge is removed. Very few search and rescue incidents occur in remote areas of wilderness likely due to visitors being more prepared and experienced for backcountry travel. The NHF&G data did not indicate an increase in the number of search and rescue incidents following the 2009 Pemigewasset Bridge Removal Project, which removed one suspension bridge and decommissioned a connector trail in the Pemigewasset Wilderness. The suspension bridge was removed to address similar safety concerns of a failing bridge and to improve wilderness character. Although, the two projects are not a perfect comparisons as the 2009 project included decommissioning of the connector trail so that visitors were not lead to a river ford, remoteness of the Thoreau Falls Trail Bridge locations, and different stream and stream bank characteristics, the lack of an increase in search and rescues following removal of the suspension bridge in addition to the general trends for where search and rescues occur in the Pemigewasset Wilderness suggest that search and rescue incidents would not increase as a result of this project. Signage and other notices would be used to alert visitors at the trailhead that the bridge was no longer in place. This would allow visitors to be aware of the new condition and decide whether or not to continue on the trail. Outreach (in particular the Trailhead Steward program), including direct visitor contact and posting of notices, has been attributed to reduced numbers of search and rescue incidents on the Forest by NHF&G. Outreach has included weather alerts to inform visitors of the potential for rapidly changing water levels and flow rates as a result of storms and spring snow melt.

Following removal of the bridge, the ½ mile section of trail between the intersection of the Wilderness Trail and the river crossing would be changed to

Zone B resulting in the entire length of trail having the same management strategy. This would have a positive effect on visitors, as there would be a consistent message about expectations for the level of challenge, risk, and self-reliance encountered on this trail (Forest Plan p. E-27).

Cumulative Effects

The cumulative effects of this alternative, combined with the removal of the suspension bridge and trail in the Pemigewasset Bridge Removal Project in 2009, would be a displacement and/or a potential reduction in visitor use/access to the certain areas of the Pemigewasset Wilderness. However, this former bridge and trail contained a shorter loop hiking opportunity than the Thoreau Fall Trail, and users likely sought a different opportunity, including a relatively short loop hike from Lincoln Woods. The users of the Thoreau Falls Trail Bridge are likely seeking more remote and lengthy wilderness hiking opportunities and use the trail to traverse from trailhead to trailhead across the Pemigewasset Wilderness, rather than a loop experience. Therefore, the affected user groups may be different and there would not be a cumulative effect on access opportunities for users of the wilderness. In addition, overnight use at Appalachian Mountain Club campsites and huts shows a trend of increased use in the Pemigewasset Wilderness, suggesting the Pemigewasset Bridge Removal Project did not impact visitor use levels. There is no indication that the Pemigewasset Bridge Removal Project in 2009 resulted in an increase in search and rescues; therefore, there would be no cumulative effects to visitor safety resulting from this alternative.

Alternative 2:

Direct and Indirect Effects

This alternative would have no direct or indirect effects to recreation compared to the current condition of a bridged crossing at this location, except for temporary disruption to visitors during bridge construction due to an increase in trail use by crews, and localized construction noise. There would be no changed in the real or perceived risk to visitor safety and no visitors would be displaced to other trails to avoid an unbridged crossing at this location. Use levels would be unaffected by this alternative.

Cumulative Effects

Because there would be no direct or indirect effects to recreation, there would be no cumulative effects from this alternative.

Wilderness

The following section includes a summary of recommendations presented in the Minimum Requirements Decision Guide (MRDG; project record) developed for this project. An MRDG is a tool developed to help responsible officials make informed decision regarding the management of wilderness within the context of the Wilderness Act. The protection and enhancement of wilderness character are an obligation of the Forest Service entrusted with stewardship of Wilderness areas. Wilderness character is comprised of five qualities: untrammeled, undeveloped, natural, outstanding opportunities for solitude or primitive and unconfined recreation, and other features or values (Table 5).

Table 5. The five qualities of wilderness character used to evaluate the impacts of management actions on wilderness.

Quality	*Description*
Untrammeled	Wild, unconstrained, unhindered and free from modern human control or manipulation.
Undeveloped	Without permanent structures, enhancements, or modern human occupation. Managed without the use of motorized equipment or mechanical transport.
Natural	Ecological systems are substantially free from the effect of modern civilization.
Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation	Offers self-reliance, challenge, non-motorized and non-mechanized recreational experiences. Provides a haven for self-discovery and rejuvenation, a refuge from civilization.
Other Features or Values	The unique qualities of a particular wilderness area including ecological, geological, or other features of scientific, educational, scenic, or historical value. “

These qualities are monitored and evaluated for any proposed project in Wilderness and used during the MRDG analysis. Chapter 1 of this EA has additional information on laws, policies, and guidance provided for the management of Wilderness and trails in Wilderness. Forest Service policy, which

appears in Forest Service Manual (FSM) 2320 (Wilderness Management), directs that when existing improvements in Wilderness areas deteriorate to the point that normal maintenance does not keep them usable, the need for the structure is to be analyzed. If it is not essential to meet the minimum requirements of wilderness administration, the structure is not to be replaced (FSM 2324.34). The Minimum Requirements Decision Guide (MRDG) is a process used by managers to determine the minimum necessary to meet the administration of the Wilderness under Section 4(c) of the Wilderness Act. An MRDG was developed for this project in order to identify, analyze, and determine: 1) whether management action was necessary by asking the questions "Does the bridge need to be removed?" and 2) if so, what is the minimum necessary tool to implement this activity (how to remove the bridge and if to replace it).

Wilderness areas by nature, policy, and law present a higher safety risk for users. Reducing or eliminating risk is not necessarily a justification for a structure under the minimum requirements for the administration of the area. The structure must be needed to protect and manage the Wilderness resource, or address an unusual and extraordinary public safety hazard, and must be consistent with zone designations (Forest Plan p. 3-14). The MRDG discloses and considers factors including effects on wilderness characteristics, public safety, time constraints, costs, and impacts to other natural resources to help inform the Decision Maker. Table 6 provides a summary of the effects of the Alternatives on the qualities of wilderness character.

Alternative 1 (Proposed Action):

Summary of Direct and Indirect Effects

Overall, this alternative would enhance the wilderness character of the area by removing an unnecessary structure and increasing opportunities for solitude and primitive forms of recreation. Visitors would be exposed to increased risk as a result of having to ford the river during moderate to high flows. This alternative would require more self-reliance, acceptance and preparation for the possibility that trip plans might have to change, and would result in an experience driven more by the natural environment and landscape. The small segment of Thoreau Falls trail on the south side of the bridge that is currently Wilderness Management Zone C would be changed to Zone B to reflect the change in conditions and the area would be managed consistent with the remainder of the Thoreau Falls Trail further protecting the wilderness character of that area.

Summary of Cumulative Effects

Removal of this bridge without replacement combined the Pemigewasset Bridge Removal Project in 2009 would have a beneficial cumulative effect on the undeveloped, solitude and primitive forms of recreation qualities of the Pemigewasset Wilderness. The removal of the Thoreau Falls Bridge also completes the removal of all man-made trail bridge structures in the Pemigewasset Wilderness which increases its wilderness character by providing a wilderness experience that is devoid of man-made trail bridge structures. The Pemigewasset Wilderness is the largest federally-designated wilderness area in the northeast and the next closest wilderness that is larger is located in West Virginia. The significance of the cumulative effects of managing the Pemigewasset Wilderness more closely to adhere to Forest Service management direction and the Wilderness Act is notable given the opportunity and experience it would provide under this alternative, especially in light of the 70-80 million people that can access it with a day's drive.

Alternative 2:

Summary of Direct and Indirect Effects

Under this alternative, the small segment of Thoreau Falls trail on the south side of the bridge would remain in Wilderness Management Zone C and management of the area would not change. Although this alternative would result in no effect to wilderness character when compared to current conditions, this alternative would not improve the wilderness character of the area because the current developed condition and management would be maintained and opportunities for solitude and primitive forms of recreation would not be enhanced. This alternative would require less self-reliance, reduced chance that trip plans would have to change due to river conditions at the site, and would result in an experience less driven by the natural environment and landscape.

Summary of Cumulative Effects

When compared to the current condition, this alternative would have no cumulative effects on wilderness character. However, the reinstallation and maintenance of the bridge would continue to have reduced undeveloped, solitude, and primitive forms of recreation qualities of the Pemigewasset Wilderness.

Table 6. Comparison of effects on the five qualities of wilderness character.

Wilderness Quality	*Alternative 1*	*Alternative 2*
Untrammeled	No effect	No effect
Undeveloped	Short term negative effects from work crews and helicopter use and long-term positive effects due to bridge removal.	Short-term negative impact on the undeveloped quality because of the use of helicopter and power tools, and a long-term negative effect due to the presence of a new bridge manufactured using dimensional lumber and steel construction.
Natural	No effect	No effect
Outstanding Opportunities for Solitude or Primitive Unconfined Recreation	Short-term negative effects on solitude due to the presence of work crews and use of helicopter. Long-term positive effects on solitude if some visitors are displaced to other locations. Long-term positive effects on opportunities for primitive recreation due to unbridged crossing.	Short-term negative effects on solitude due to the presence of work crews and use of helicopter. Long-term negative effects on solitude as more visitors chose to use this trail. Long-term negative effects on opportunities for primitive recreation due to bridge crossing.
Other Values	No effect	No Effect

Other Agencies Consulted

U.S. Fish and Wildlife Service

New Hampshire State Historic Preservation Office

References

Ruhan, J.F. 2016. Thoreau Falls Bridge Project Heritage Report. White Mountain National Forest. Campton, NH.

United States Department of Agriculture (USDA) Forest Service. 2016. Mimimum Requirements Desicision Guide for the Pemigewasset Wilderness Thoreau Falls Bridge Removal Project, White Mountain National Forest. Campton, NH.

United States Department of Agriculture (USDA) Forest Service. 2008. FSH 2309.18 - Trails Management Handbook Chapter 10 - Trail Planning. Washington, DC.

United States Department of Agriculture (USDA) Forest Service. 2007. FSM 2320 – Wilderness Management. Washington, DC.

United States Department of Agriculture (USDA) Forest Service. 2005a. White Mountain National Forest Land and Resource Management Plan. Laconia, NH.

United States Department of Agriculture (USDA) Forest Service. 2005b. Final Environmental Impact Statement for White Mountain National Forest Land and Resource Management Plan. Laconia, NH.

United States Department of Agriculture (USDA) Forest Service. 2005c. Record of Decision for White Mountain National Forest Land and Resource Management Plan. Laconia, NH.

Woods, B. and D. Sperduto. 2016. Biological Assessment/Evaluation: Pemigewasset Wilderness Thoreau Falls Trail Bridge Removal Project. White Mountain National Forest. Campton, NH.