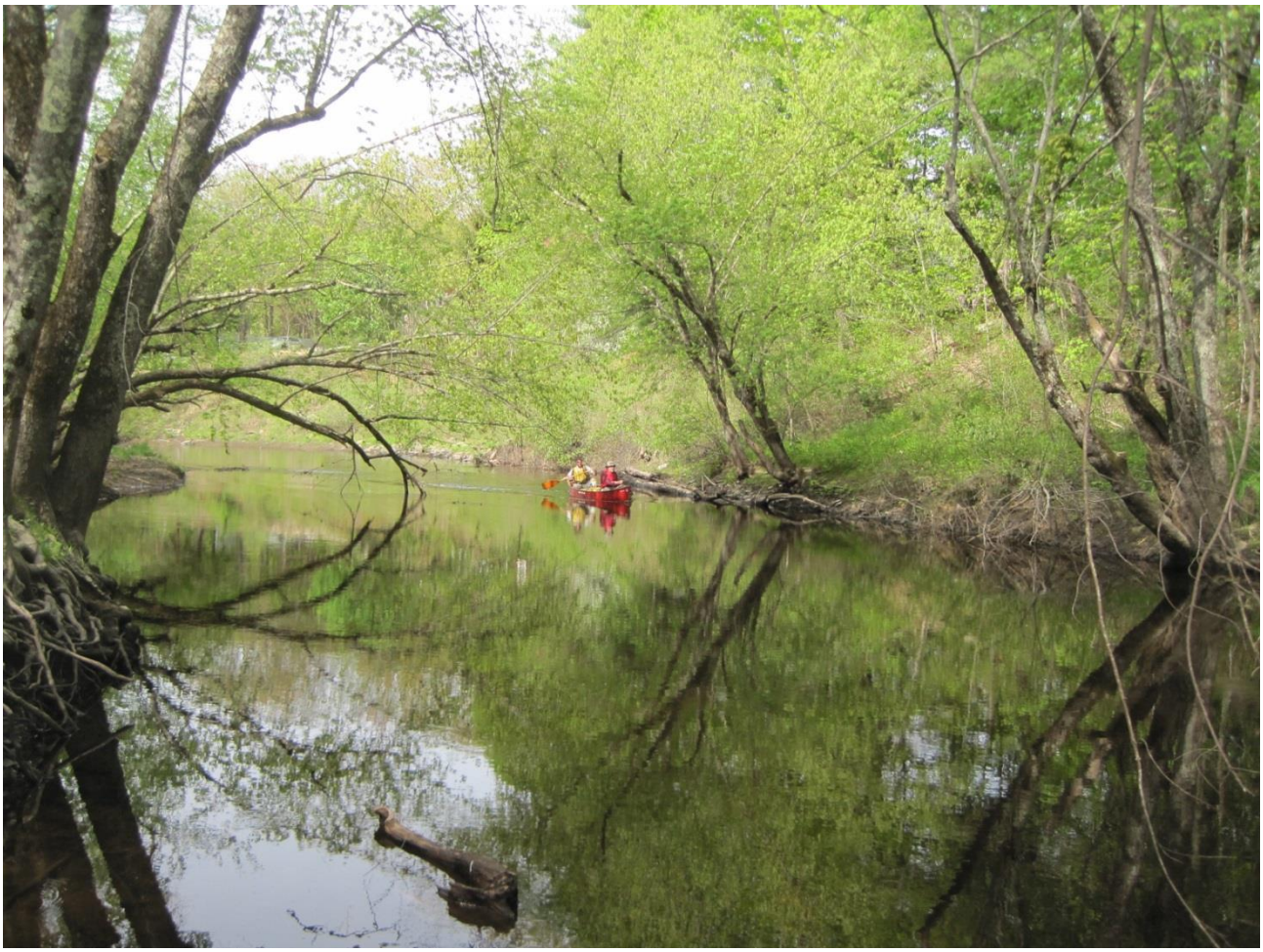
Recreation Enhancement of the Lamprey River Between Route 87 and Wadleigh Falls



Lamprey River downstream of the Route 87 Bridge. Photo by Dawn Genes.

Final Report to the Lamprey River Wild and Scenic 2015 Small Grants Program

Submitted by:

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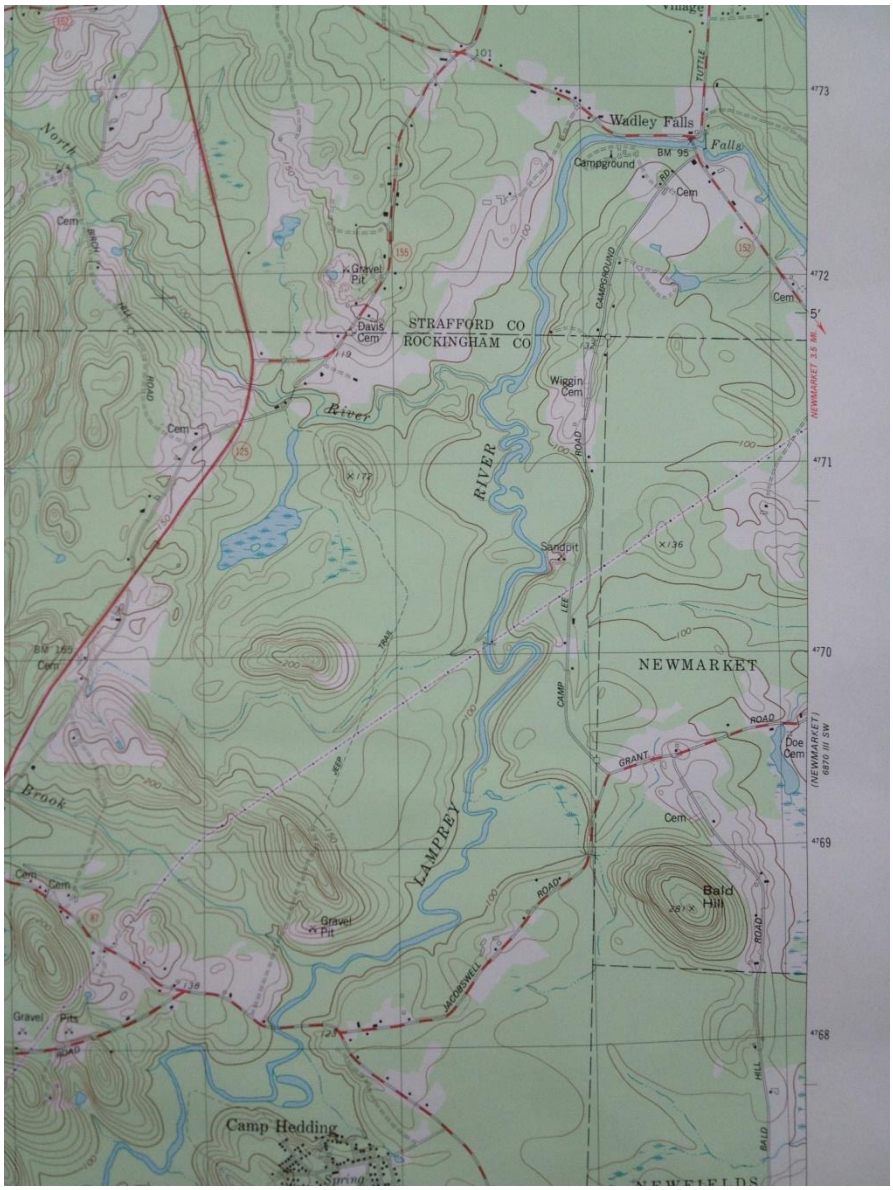


Location

The Lamprey River downstream from the Route 87 Bridge in Epping to near the confluence of the Lamprey River and North River on the Epping/Lee town line.

Objectives

1. To document woody debris blockages between the Route 87 Bridge in Epping and the Wadleigh Falls dam in Lee including landowners at each site, photos of each site, and an aerial photo with the blockage locations identified.
2. To finalize a recreational and ecological evaluation documentation process to use to consider alteration of woody debris blocking passage by people traveling in canoes or kayaks under summer conditions. This evaluation tool can be shared and applied to other rivers.

Background

The Lamprey River Watershed Association (LRWA) and the Lamprey Rivers Advisory Committee (LRAC) Wild and Scenic Subcommittee has encouraged and promoted recreation on the river for decades. As a federally designated Wild and Scenic River, the Lamprey River is classified as a "recreational river". Recreational activities along the river are defined mostly by the river itself and access to it. People use the river recreationally for canoeing, kayaking, and swimming.

Much of the Lamprey River is excellent for kayaking and canoeing. However, the river reach that is downstream of the Route 87 bridge in Epping to the canoe launch above Wadleigh Falls in Lee is known to have multiple blockages of downed trees and logs that are impossible to navigate around and are potentially hazardous during certain times of the year. Recreational users of the river have reported to LRWA and LRAC that this section is very difficult for the average paddler. Multiple portages are required and much of the vegetation on either side of the river is heavily infested with shrubs and poison ivy.

An email received by LRWA from a frustrated paddler in 2010 commented: *"I wanted to let you know in case you were not aware of this, yesterday I attempted to kayak down the Lamprey from the Route 87 bridge in Epping to Lee Hook bridge in Lee. After almost seven hours, I abandoned the idea and got off at Wadleigh Falls. There were so many log/tree jams along the route I lost track. Some could be passed narrowly staying in the river but several required lifting the kayak up and over or very much around the blockage. Until I got to the stretch along Camp lee Road, there was probably a jam every 1,000 feet. Perhaps future adventurers could be warned with this information."*

Another paddler in the same year emailed to say *"I just returned home from attempting to kayak from the Lamprey River from the Route 87 bridge to Camp Wellington. I had to pull out at Wadleigh Falls after fighting my way through miles of stagnant, littered, and nearly impassable river. I had heard that trees had fallen on the river back in 2008 but I assumed that it would have been broken up back then. Apparently not. I had to drag my kayak through tree after tree or carry it up and around debris every ten or so minutes. At one point I found some trash that has clearly been there a while. There was actually a beer can sitting on the beach that said "World Cup 1994"! This river is listed as a national wild and scenic river. It is disgusting. I just wish I had brought a camera to show exactly how bad it was."*

Trash can accumulate behind log jams and act as a screen. Until higher water flushes the trash away, the back waters are often cluttered with plastics and other junk.

Photo by Dawn Genes 2015

This section of the river has not always been so difficult. Approximately 15 to 20 years ago, the Lee Conservation Commission utilized manpower from the Strafford County Jail and with the use of chain saws, removed woody debris blockages from the river between the town line with Epping and Wadleigh Falls. Similar clearing of a limb or log was part of preparing the Lamprey River for the annual canoe race in the section of the river downstream from the Route 125 Bridge.

Historic flooding in 2006, 2007 and 2010 has contributed to the development of multiple blockages ranging in size from a branch to massive logs and smaller debris that is several feet below and above the water surface from bank to bank. As additional logs and limbs wash downstream they become clogged in these big jams and continue to accumulate additional debris.

An Historical Perspective

Rivers in forested regions currently have little wood compared to their condition prior to European settlement of the United States. One of the first activities of European settlers in forested regions was to remove wood from rivers (Sedell et al., 1991), both directly, by pulling wood from channels, and indirectly via deforestation that reduced natural inputs of wood (wood recruitment) into channels. Congress made appropriations to remove wood from rivers as early as 1776 (Harmon et al., 1986) and individuals or small groups of people began wood removal even earlier. In 1824, Congress assigned the 'improvement' of inland rivers to the Army Corps of Engineers (Reuss, 2004). Much of this improvement focused on removing wood. Indirect removal occurred not only by timber harvest that reduced subsequent recruitment of wood to channels, but also via: channelization (dredging, straightening, bank stabilization) that removed existing wood and reduced the ability of a river to retain subsequently recruited wood; log floating in association with timber harvest, which included removing naturally occurring instream wood, as well as cut logs; and flow regulation, which limited downstream transport of wood. The net effect of these activities was to remove almost all instream and floodplain wood, typically prior to the 20th century (Wohl, 2001). Consequently, most people do not expect downed wood to be abundant in the riverine environment (Chin et al., 2008), and so are not accustomed to seeing the elements that make up a naturally functioning river flowing through a forested region.

From: Management of Large Wood in Streams of Colorado's Front Range: A Risk Analysis Based on Physical, Biological, and Social Factors by Ellen Wohl Kevin Bestgen Brian Bledsoe Kurt Fausch Mike Gooseff Natalie Kramer.
http://blogs.warnercnr.colostate.edu/fluvial-grads/wp-content/uploads/sites/6/2015/03/WOOD-final.pdf

Benefits of Wood in Rivers

Woody material in rivers provides many benefits. Fish need different habitats at different times of year or life cycle. In summer, the shade from branches and logs provides a cooler habitat for fish as well as protection from predators. Branches and logs also create changes in flow and currents so that fish can choose to rest in back pools or take advantage of lunch coming downstream. Decaying debris provides nutrients for invertebrates and can greatly increase the diversity and abundance of biomass, especially if the river system is sandy. Non-aquatic wildlife utilizes woody materials that reach over or span a river as access points for watering, feeding, as travel routes or just for sunning.

Hazards of Wood in Rivers

The type, nature and extent of woody material can greatly alter the velocity of flow on either a microcosm or along an entire channel section. Wood that lies along the direction of flow has far less impact than wood that creates a blockage across the river bed, especially from bank to bank.

Bank to bank blockages can cause damage to adjacent property when the river scours around a blockage and undercuts the banks or causes a new river course to be created. Infrastructure downstream may become damaged from blockages that build up a head of water and then suddenly release, sending logs and debris crashing into bridge supports and abutments.

Bank to bank blockages can also provide risks to recreational users of a stream or river, especially when waters are swift and/or the approach is sudden such as when rounding a bend. Hazards to recreational users are dependent on several characteristics of either to river itself or the woody blockage. These include access, reach characteristics, prior knowledge, ability to avoid, and the placement of the woody obstruction.

Access: The study section for this project in in a location where the put-in and take-out locations are easily accessible. Off the road parking is available at each end and the Lamprey River Wild and Scenic program has provided an informational kiosk at the Route 87 starting point and a canoe launch station at the Wadleigh Falls end. Both access points provide an excellent opportunity for the general public to visit the river, learn about the watershed, and begin and end a water trail journey. However, neither location addresses what the river conditions are in the river reach in-between.

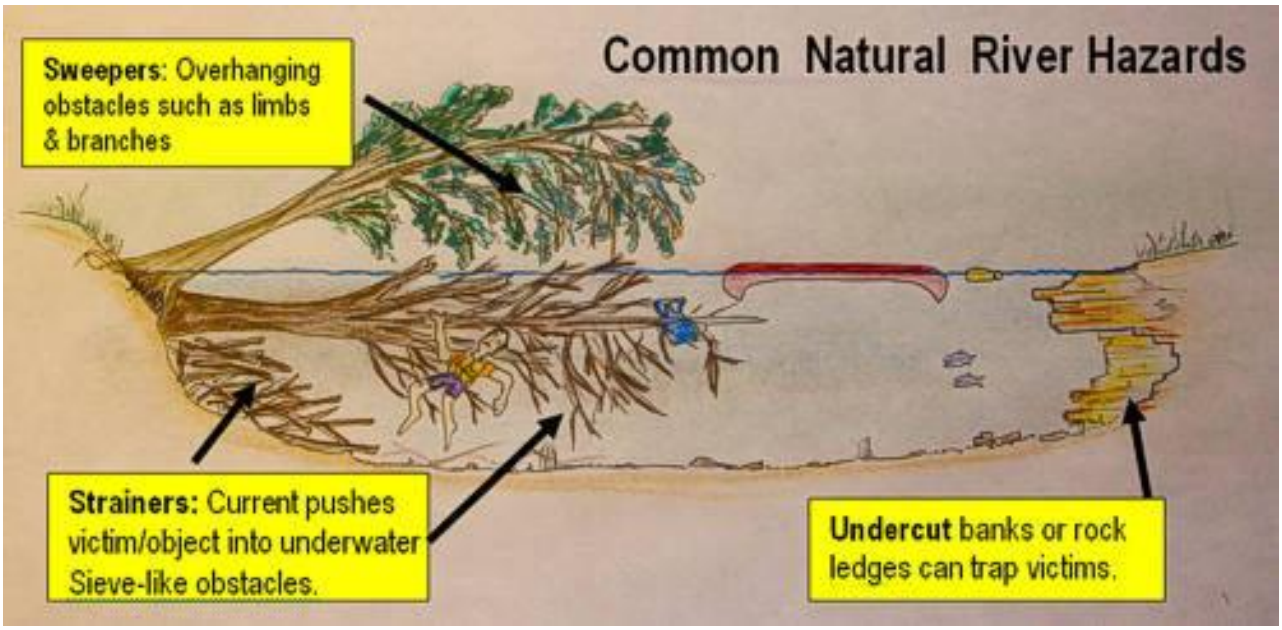
Reach Characteristics: Risk increases with water flow and velocity. The Lamprey River traditionally has high water flows from April to mid-June, depending on snowmelt and spring rains. The river flows rapidly at this time of year and in the case of 2006, 2007 and 2010, the flows exceeded the standard for a 100 year event. Swift velocity with little chance to find a suitable bank to exit the boat might cause a paddler to be swept into situations they should not be in. By mid-June, the river is running slower and shallower. This particular reach of the Lamprey River is low gradient with wide floodplains on either side. At times of low flow, the water is shallow and slow with few riffles, seeming much like backwater.

Prior Knowledge: Regardless of skill level, prior knowledge of the river section goes a long way in reducing risk. Many recreational users are surprised at the density of this section of the river and relative remoteness. Once a paddler leaves the Route 87 kiosk area there is little connection to backyards, fields or roads until nearing the take out point near Wadleigh Falls. In other words, once you begin this journey, you either must finish or take a painstaking trip back up-river to get back out. At this time, there is no posted warning at the kiosk to inform a paddler of the conditions of this section of the river. The Appalachian Mountain Club (AMC) descriptions are out-of-date and were written prior to this new level of woody obstructions present today.

Ability to Avoid: Obstructions in the river are far less hazardous if they can be seen far enough in advance as you approach; allowing decision time for determining if navigation is possible or if a portage is required. Obstructions that suddenly appear around a river bend are a greater challenge. If a portage is required there must be a feasible location for safely exiting the boat. The ability to avoid an obstruction is also a factor of the paddler's skill level.

Placement of the Woody Obstruction: Can you go over it? Can you go under it? Can you go around it? The placement of the obstruction can make all the difference as to if it poses a hazard to the recreational paddler or not. Logs and debris that are on the river bottom and allow for a boat to cruise over it are not a hazard. Logs above the water can be a hazard depending on the water elevation. A safe height of a log to be able to pass under is approximately three feet (American Whitewater). Higher skilled kayakers can squeeze through openings as narrow as the height of their boat but it does require a bit of contortion of the body! As stated before, blockages that go from bank to bank are definitely more of a hazard than those that are to the side or have an opening somewhere in the channel.

Wood characteristics that impact any user, regardless of skill or background include snagging potential of "sweepers" and the dangers of "strainers".



Tom Watson. *http://www.paddling.net/guidelines/showArticle.html?566*

Sweepers and Snagging Potential: This characteristic refers to the potential for a river hazard to snag a piece of clothing or gear as the boat passes by. Many of the blockages in this section of the Lamprey River are downed trees with the entire tree top extending into the water. As the tree deteriorates, the broken limbs become more likely to "snag" a boater, or even impale.

Strainers: These are the jams that are highly porous and the water runs swiftly through the jam with little or no backwater upstream of the blockage. A fisherman or a recreational paddler can be swept into the jam and be caught up in the branches and debris.

Project Findings – Nature and Extent of Large Woody Obstructions

On multiple occasions in the past two years, small groups of individuals associated with both the LRWA and LRAC have kayaked or canoed the Lamprey River between the Route 87 Bridge in Epping and the Wadleigh Falls boat launch in Lee. Two excursions did the length of the river section from up-river to down and several other outings were done from the boat launch up-river and back. Yet another outing included reaching a jam site by foot from Dimond Hill Road. One reconnaissance trip was on foot from the Route 87 bridge to the power line, approximately half the total distance. The purpose of each trip was to document the nature and extent of woody debris in the river that might impede or endanger paddlers. By using GPS capabilities on phones and GPS units, multiple blockages were identified.

Some of the downed trees and woody debris was small or minor and could easily be navigated around. In the photo to the left, the branch is small and does not extend completely from one bank to the other. Any paddler can steer to the left and brush past the flexible branch ends and continue on their paddle without having to encounter any danger or portage.

At other locations, debris in the river was low and more or less anchored to the bed of the river and passage by boat could occur by over the low debris. In addition, because the placement of the debris is on the sides of the channel the recreational paddler can meander through with little hazard or difficulty.

Downed trees that are above the water level may or may not be a hazard depending on the water level. Because the tree in the photo below is bank to bank it could be a hazard if the height of the water is within three feet of the branch. The amount of live branches above would prohibit being able to pass over the horizontal branch. Portage would be required unless the water level is low enough to allow the paddler to safely pass under.

The study reach is approximately five and three quarter miles long. Many, many trees and obstructions are in the river throughout the entire river reach. Based on the consensus of the participating group members from LRWA and LRAC, six sites were determined to be the largest obstructions and **require portage at any time of year under any flow conditions**. While there are many other obstructions, the placement and extent of blockage is such that under the right conditions of flow, they may be passable by a recreational paddler, although still challenging and requiring physical exertion.

Sites are numbered beginning at the put-in location at the kiosk at the Route 87 Bridge. Because the group ran this section in 2014 and in 2015, there was a bit of shifting of some of the woody material from one year to the next, as can be expected. Therefore, some sites are numbered to be added in-between site numbers recorded the first year.

The map on the following page shows the locations of the largest and most complex blockages in this section of the river – as it was in 2014 and 2015. Each year the actual location, size or complexity may change due to spring high water or any flooding event.

Sites 1 and 2

Site 1 is located approximately a mile and a quarter downstream from the Route 87 bridge with two blockages about 100 feet apart. The bank is about three feet high and the portage required is about 200 feet.

Site 2 is just a bit beyond and is a mass of more than ten trees. This area of the river is densely wooded floodplain with old oxbows, remnant channels and vernal pools. The river has changed channels many, many times over a long period of time. Portage is about 150 feet.

Site 2.5

Site 2.5 is located approximately two miles downstream from the Route 87 bridge. It is a mass of large trees that are blocking the entire river from bank to bank. The jam is several logs deep in width with some tree tops still alive and growing. On the back side of the jam are piles of smaller limb debris making this a significant blockage in width, length and depth. A paddler must portage around this obstruction and the best bet is on the left bank.

This multiple tree blockage extends from bank to bank with many complex tangles. At no time is it ever safe to try to get over this jam without exiting your boat. Shortest carry is to the left.

The back side of Site 2.5 is just as tangled and hazardous.

Site 3

About two and three quarters of a mile into the trip, a paddler will encounter Site 3. This is another blockage spanning the channel from bank to bank and consisting of more than ten trees. A short portage on the right is required.

Site 4

This site is one that was present in the reconnaissance trip of 2014 but not in 2015. The logs had moved downstream. In 2014, a 50 foot portage to the left was recommended. In 2015, the blockage was no longer present.

Sites 4.5, 5 and 6

Three major blockages exist just over three miles into the trip. In a series of deep river bends, each bend creates an opportunity for the water to slow down, for trees being washed downstream to catch on the banks of the bend in the river and begin to pile up.

Site 4.5 is a blockage of greater than ten large trees. About a 300 foot portage is required on the river right to get past this large blockage. On the next oxbow is Site 5 which is a double blockage and portage to the left for about 500 feet is required. This are also has extensive amounts of poison ivy as the major ground cover so boaters are sure to be extra annoyed and the terrain if not already put out by the hefty portage. Site 6 can be gotten past by heaving the boat behind a root wad on the left side of the river and may even be passible in higher water. Again, slippery, muddy banks and poison ivy abound.

Above: Site 6 where passage is possible around the left end of the tree depending on water depth.

While there were considerably more woody obstructions in this study section of the Lamprey River, these six were determined to be the most significant and a hazard at any water flow level and by any level of ability of the paddler. The other obstructions were either not bank to bank, oriented in such a way as to not pose a hazard, or could be safely pushed over or pulled around without much of a haul. These smaller obstructions were more of a nuisance than hazard or significant portage.

Managing Large Woody Materials in Rivers and Streams

The New Hampshire Department of Environmental Services has prepared a fact sheet "Managing Large Woody Materials in Rivers and Streams" (WD-R&L-21) as guidelines for what may or may not be done about large woody material (LWM) in rivers. The fact sheet states: "*Considering the multiple ecological benefits that LWM in the waterbody unless there is a well supported case for its removal. LWM removal should only be considered when there is strong evidence that there is a safety hazard to public infrastructure, human health is at risk or if navigational safety is compromised." The fact sheet goes on to say that "if it is determined that the LWM needs to be removed, then removal must be done in the least intrusive way possible*".

The first step in determining if LWM needs to be removed or not is documentation over a period of time, especially during times of high and low flows or flood events, the types and locations of accumulating LWM, evidence of scouring or sediment deposition and identification of locations where LWM may have obstructed the passage of floodwaters to the point of creating hazardous conditions.

If the documentation verifies that hazardous conditions exist, a removal method must be determined with the greatest factor being how to move/remove LWM without any impact to the river bank. "*A wetlands permit is generally not required for removal of LWM provided no tracked or wheeled vehicles enter the streambed or banks, only manually operated equipment or larger equipment that is operated from the top of the bank (such as winch or excavator) is used, streambed and bottom are not disturbed, dredged materials are placed out of areas protected under RSA 482-A, and removal is done gradually to prevent a sudden release of impounded water that causes erosion or siltation*."

To meet these requirements, this section of the river poses some considerable challenges. First and foremost is the lack of access to the river at locations other than the put-in at Route 87 and the take-out at the boat launch at Wadleigh Falls. Only a few properties along this section of the river have any potential to reach the river. In addition, woody material removed must not be placed in areas protected under RSA 482-A which means that any material removed would need to be hauled out and away from the floodplain. In this situation, this is significant.

How then, might the recreational potential for the Lamprey River in this section be enhanced and the risk of harm from large woody material hazards be reduced?

NH DES guidelines call for an evaluation of LWM conditions with these considerations:

Is there potential for LWM build-up to affect public and structural safety?

Does the LWM build-up have the potential to cause upstream or downstream flooding?

What kind of effect will the LWM removal have on plants, fish and wildlife?

How would the removal affect water quality and public and private land?

Evaluation of Conditions

There appears to not be an imminent threat to any infrastructure such as the bridge supports and abutments at Wadleigh Falls where Route 152 crosses the river. However, if this section of the river is to be more family friendly for recreational use, then there are public safety issues with the obstructions currently in place.

A matrix to assist with evaluation of each individual site was developed by Jim MacCartney of the US National Park Service. This tool has one page that is a Field Data Assessment Sheet For Paddling Considerations and one page that is a Field Data Assessment Sheet For Ecological Considerations. Each page has twelve parameters to score the obstruction for the potential hazard for recreational users. The data sheets also assume that if removal is recommended that only the amount of wood to be removed is the minimum amount required for passage during normal flow conditions, and pieces are relocated elsewhere within the channel so as to retain the positive benefits of wood in river.

This matrix evaluation tool was field tested by a team: Jim McCartney, NPS, Preston Samuel, W&S, Dick Lord, W&S, John Beauvilles, LRWA, Andrea Frey, LRWA and Dawn Genes, LRWA. The tool was then refined but is still considered to be in draft form. What was discovered is that the perspective of the target user must be defined prior to completing the sheets. For example, the skill level of the paddler is an important factor when determining if something is a hazard or not. The ecological considerations did not depend on who the target river user was.

In Preston Samuel's words: *"…evaluating a blockage through the eyes of an experienced bushwacker is of no use at all. ANY portage is a bad portage for the family paddler. Just look at the steepness of the banks, the softness of the soils, the preponderance of poison ivy and irregularity of the ground under thick vegetation, and think of how you are going to get your typical five-year-old around a blockage without consequences*."

The draft Field Data Assessment Sheets are included in Appendix A. The assessment takes into consideration the potential for obstructions to affect public safety and the effect on plants, fish and wildlife. The assessment does not consider the potential for upstream or downstream flooding nor the effect on water quality and private land. These considerations would need to be evaluated to comply with the guidelines for woody debris removal. In addition, consideration of access points, costs and the likelihood of future blockages need to be added to the evaluation process.

Alternatives For Increasing The Recreational Potential Of The Lamprey River Between Route 87 Bridge And The Boat Launch At Wadleigh Falls

The following alternatives can be taken under consideration by the Lamprey River Watershed Association and the Lamprey River Wild and Scenic Committee with the intent of trying to increase safe, public use of the Lamprey River by families in a manner that will protect the river, its tributaries, and the watershed.

1. **No Action**. Conditions remain the same and blockages potentially become larger and more numerous.
2. **Monitor**. Continue with annual visitations to this section of the river at times of high and low water flow. Continue to GPS the location of the most significant blockages.
3. **Close** this reach of the river. Note: the study groups, LRWA and Wild and Scenic, do not have the authority to close the river but could make this recommendation to NH DES.
4. **Signage**. The Wild and Scenic program has constructed a kiosk at the put-in location at the Route 87 Bridge. In addition to the general watershed and Wild and Scenic program information this kiosk is an excellent location to provide information about the conditions of this section of the river and the potential risk to recreational users.
5. **Remedial Pruning**. As much of the nuisance woody material is smaller in size and extent (such as the tree tips reaching halfway across the river), the enjoyment of kayaking or canoeing this section of the river could be improved with the lopping of tips and smaller branched to reduce snagging. For best results, the effort should start downstream and work up river. This would increase the recreational use of the Wadleigh Falls canoe launch site constructed by the Wild and Scenic Program several years ago. See guidelines in Appendix C - Water Trail Wood Removal Safety.
6. **Move large woody materials**. This alternative will require a written plan, consultation with the NH Department of Environmental Services and funding. The size of some of the blockages requires significant physical exertion under demanding conditions. An experienced crew such as with the Student Conservation Association (SCA) would be necessary. The cost of a SCA crew is about $1,000 per day and they book 10-day hitches. The benefit is that the crew has chain saw training and rigging training and approaches their work from an environmental perspective.
7. **Stabilization.** As was mentioned before, the risks to infrastructure or the risk of unstable pieces moving to high risk locations *at this time* is relatively minor. The closest downstream bridge is more than a mile from Site 6, the closest large woody site.

The recommended alternative is for the LRWA/W&S team to use a combination of the following:

- Provide signage immediately at the kiosk at the Route 87 bridge (Alternative 4)
- Organize volunteer crews to paddle and lop small branches, working from downstream to upstream so as to increase the recreational value of the river in Lee (Alternative 5).
- Continue to monitor the river for changes over time and under different water level conditions. Data to date includes low flows in 2014 and 2015 and additional reconnaissance will contribute to the assessment data. Assessment should be expanded to include potential for upstream or downstream flooding, the effect on water quality and private landowner considerations.

Appendix A - Draft Wood Evaluation Matrix

Appendix B - New Hampshire Department of Environmental Services Fact Sheet WD-R&L-21 - Managing Large Woody Materials in Rivers and Streams

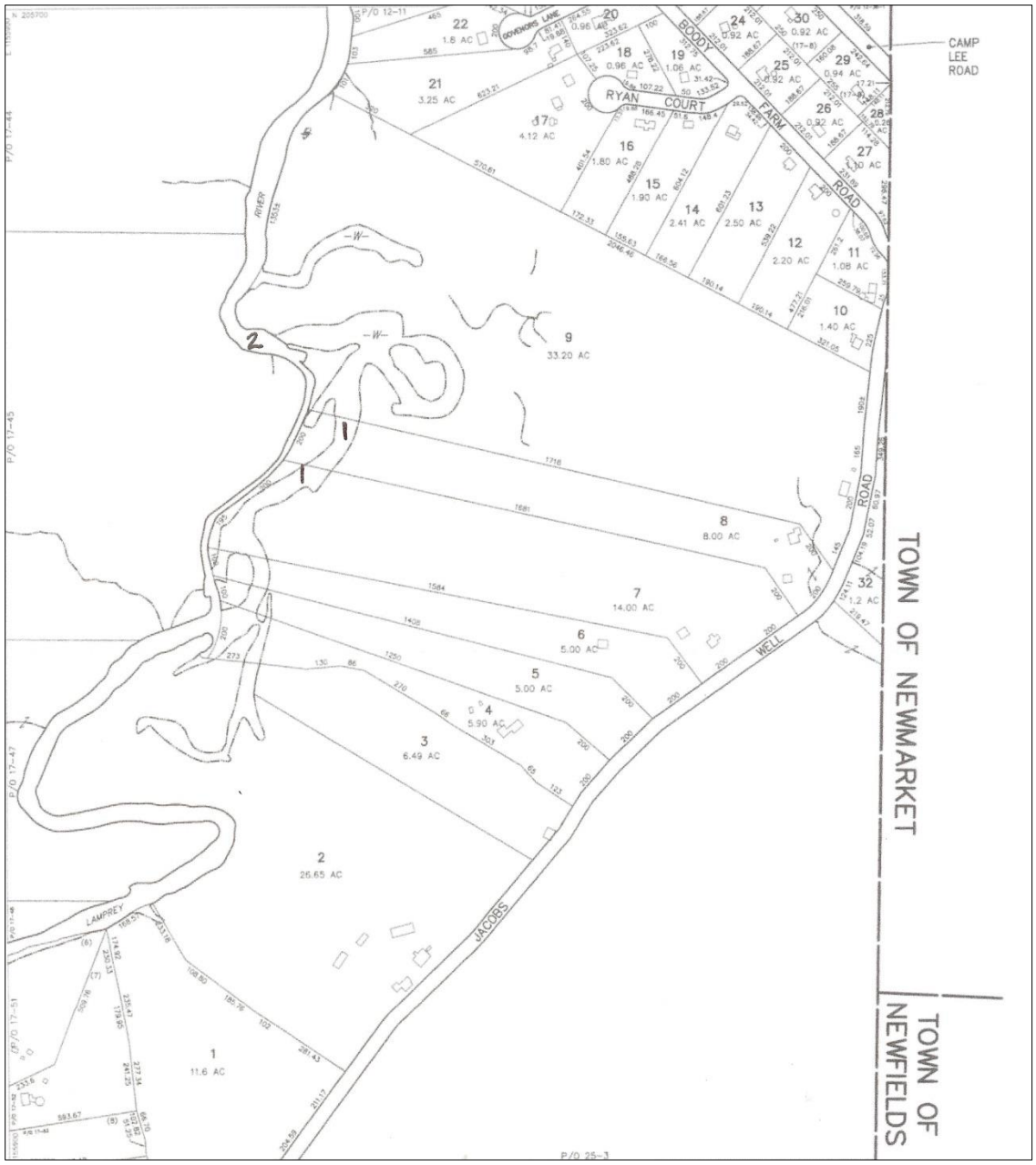
Appendix C - Water Trail Wood Removal Safety

Safely removing wood blockages from the Lamprey River will involve the observance of a few basic precautions. Guidance for our volunteers is based on first-hand reconnaissance obtained from several paddle-through evaluations, including conducted in 2014 and 2015 and referenced to the Minnesota Department of Natural Resources & Conservation Corps of Minnesota's "*Water Trails Crew Manual",* published in 2011. This manual represents the current state of the art for trail maintenance nationally.

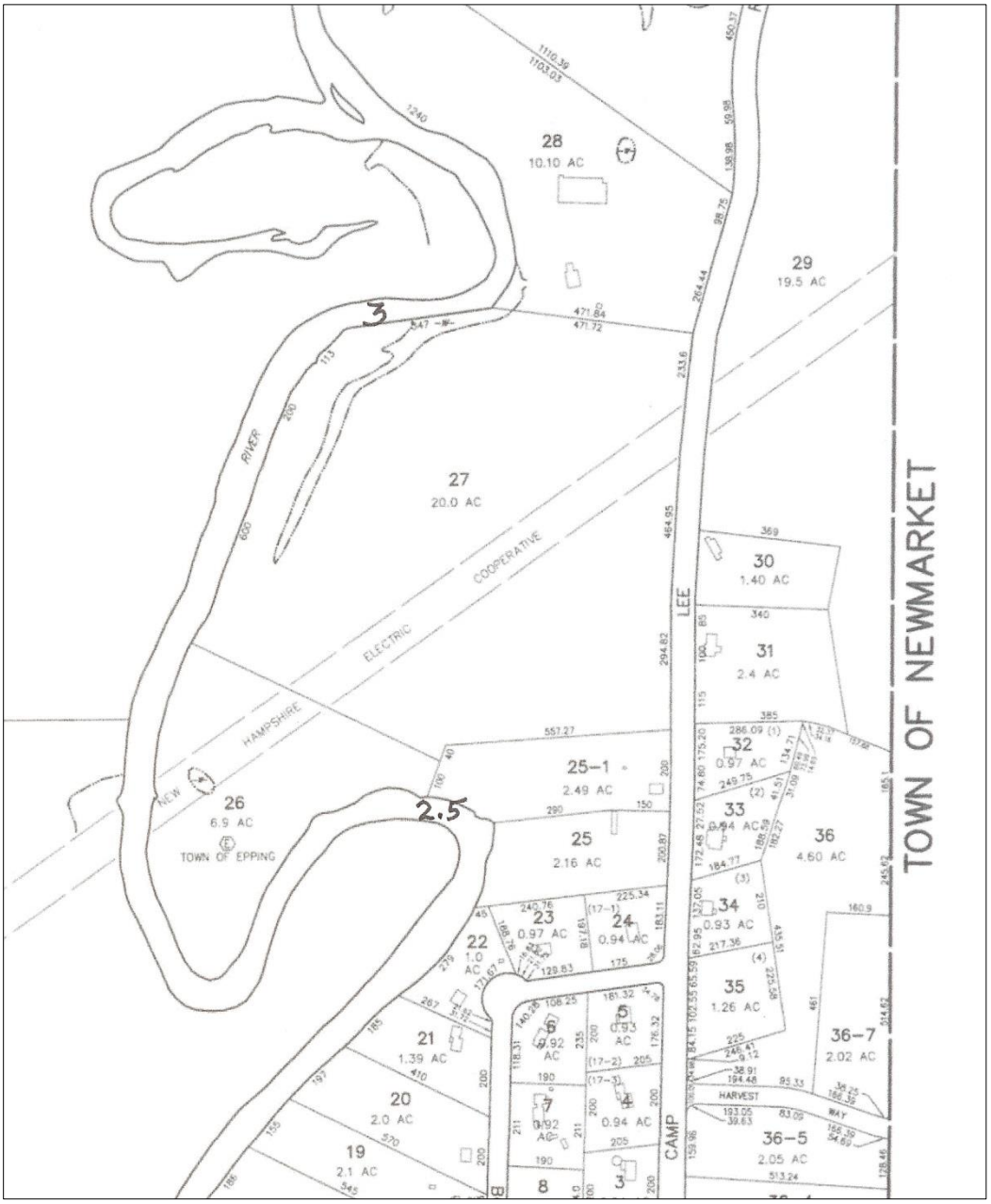
The following guidance will be observed by river crews:

1. The trail crew will be equipped with a cell phone and a basic first aid kit at all times.
2. Trail work will only be conducted when the flow of the river is at "base flow". This precaution minimizes the need to cut wood that is submerged, and thus hard to see and control.
3. Work will proceed in an upstream direction, beginning at the Lee Canoe Access and proceeding toward the Route 87 Access. This precaution, together with that stated in (1) reduces the possibility that a boat would "broach to" while being used as a working platform.
4. Only hand tools will be used. Typical hand tools will include a bow saw, long-handled loppers, a wooden pry-bar and a spade. Hatchets, axes and knives of any sort will not be allowed. The use of power equipment will not be allowed for environmental reasons as well as concerns for safety.
5. Logs over eight inches in diameter will not be disturbed. Not only is there greater danger to the crew when working with larger wood, but the environmental impacts of its removal may be significant.
6. Wood removed to support canoe passage will be relocated in the river to a point where its environmental function will best be continued as before.

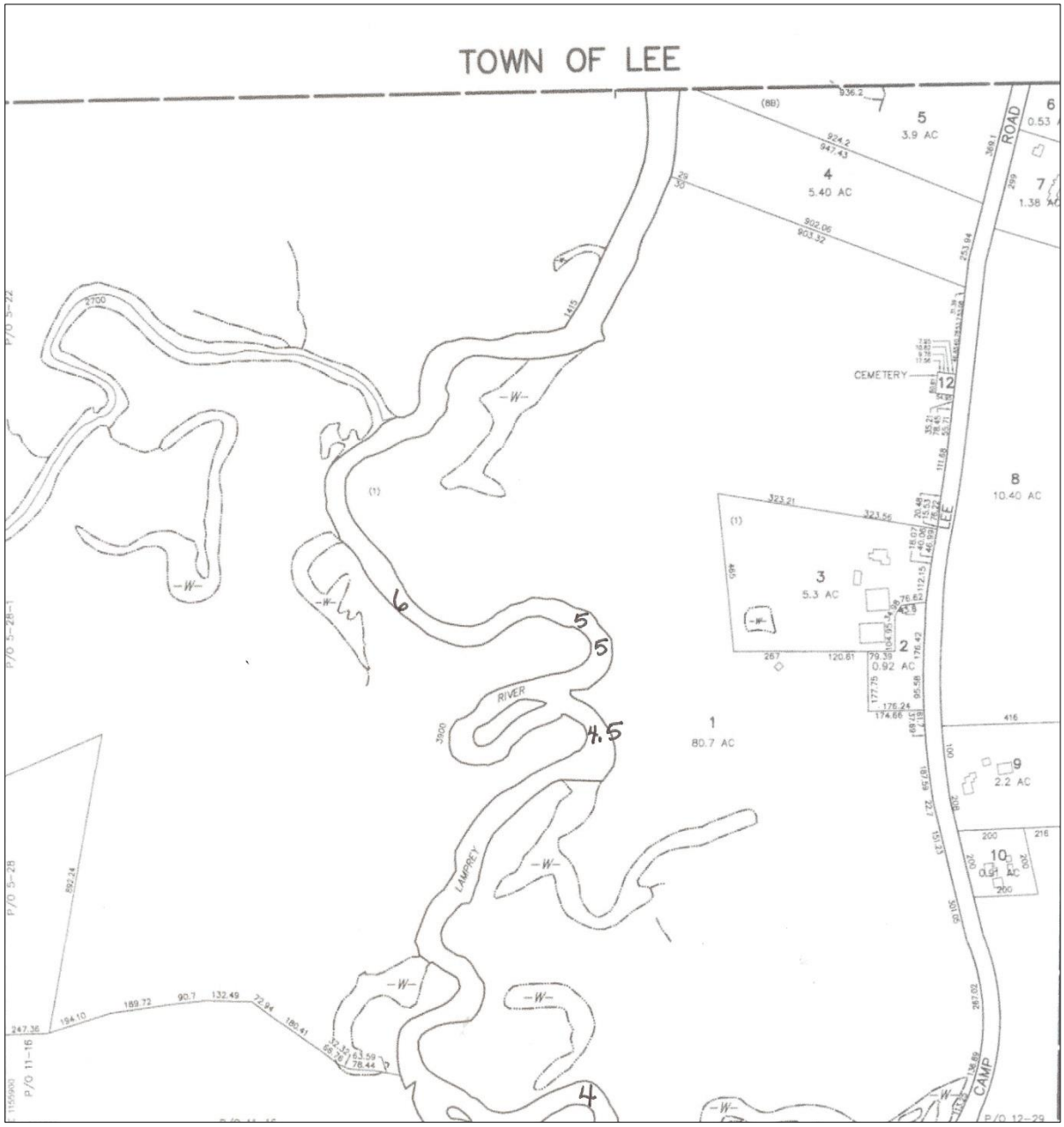
Appendix D - Maps of Landowners/Conservation Easement Holders



Blockage Site #	Map #	Lot #	Acres	Side of River	Landowner
1	18	7	14	East	Paul Richards, 100 Jacobs Well Road, Epping
1	18	8	8	East	Walter Bilynsky, 104 Jacobs Well Road, Epping
2	17	45	75	West	Candace Thayer, 175 Cabot St Unit #1, Portsmouth
2	18	9	33.2	East	David & Jackie Edgerly, 112 Jacobs Well Road, Epping



Blockage Site #	Map #	Lot #	Acres	Side of River	Landowner
2.5	11	17		West	Roger Mathes, 110 Raymond Road, Deerfield
2.5	12	25	2.16	East	Scott Kukesh, 56 Camp Lee Road, Epping
2.5	12	25-1	2.49	East	Deborah McConnell, 58 Camp Lee Road, Epping
3	11	16		West	Jeremy & James Thayer, POBox 510, Newcastle
3	12	27	20	East	Melvin & Patricia Jenkins, 80 Camp Lee Road, Epping



Blockage Site #	Map #	Lot #	Acres	Side of River	Landowner
4	6	1	80.7	East	Linda Clarke, 134 Camp Lee Road, Epping
4.5	6	1	80.7	East	Linda Clarke, 134 Camp Lee Road, Epping
5	6	1	80.7	East	Linda Clarke, 134 Camp Lee Road, Epping
6	5	28-1		West	SELT, Exeter
6	6	1	80.7	East	Linda Clarke, 134 Camp Lee Road, Epping