Recreational considerations in the lower White River

Robes Parrish[a], Jason Lundgren[b], and Peter Jenkins[a]

Restoration of stream channels requires a great deal of care and planning with consideration paid not only to the ecological needs of the river, but also how those prescriptions intersect with societal demands and uses of the river. While the ecological needs can often be quantified and categorized in a systematic, scientific manner, the social issues are sometimes more difficult to identify and address.

One of the principal modern-day human-uses of rivers is for recreation. The type, location, magnitude, and season-of-use varies considerably for each river—even reach-to-reach—and must be considered uniquely for each restoration proposal. This paper attempts to summarize what is known about the lower White River (Chelan County, WA) from the Sears Creek Rd bridge to Lake Wenatchee and how the proposed Large Wood Atonement Project accounts for this use.

Project Details

The White River Large Wood Atonement Project is being proposed jointly by the Cascade Columbia Fisheries Enhancement Group and the US Fish and Wildlife Service. The project aims to "increase the trajectory of natural ecosystem recovery by increasing the retention time of existing, mobile woody material (WM)." The lower river's ecological and geomorphic function has been considerably diminished by riparian timber harvest (as recently as the mid-1980s) and associated 'river cleaning' to facilitate log drives (Figure 1). The removal of the natural WM and riparian logging has had a number of significant impacts to the instream and floodplain environments, similar to what have occurred in other Pacific Northwest rivers (Figure 2).

The White River has been identified as a high priority watershed for preservation and restoration in the Upper Columbia Spring Chinook and Steelhead Recovery Plan. This federally approved document provides the regional scientific foundation for pursuing restoration projects (such as this project) on the lower White River.

The entire reach from the Little Wenatchee River Road bridge (RM 2.0) to where it parallels the White River Road (RM 5.9) is owned by three landowners (Chelan Douglas Land Trust, WA Dept. of Fish and Wildlife, US Forest Service) and is managed exclusively for conservation purposes. Despite the current management protection, the river still suffers from the legacy impacts of 19th and 20th century logging. The most conspicuous deficiency is the lack of large, stable trees to anchor persistent log jams and the small diameter of most instream wood. It is estimated that historical log jams were often persistent for greater than 40 years (USFWS 2012) while many existing log jams are maintained for less than 5 years, in some cases (Figure 3).

Author correspondence:

[a]US Fish and Wildlife Service, Mid-Columbia River Fishery Resource Office, 7501 Icicle Rd., Leavenworth, WA 98826.

[b]Cascade Columbia Fisheries Enhancement Group, PO Box 3162, Wenatchee, WA 98801.

Most trees within the active floodplain in this reach are generally only 30 – 50 years old and will need another century before they begin to achieve their full height and diameter potential. The small size of recently recruited trees available to the river means that these log jams will be short-lived for many decades to come.

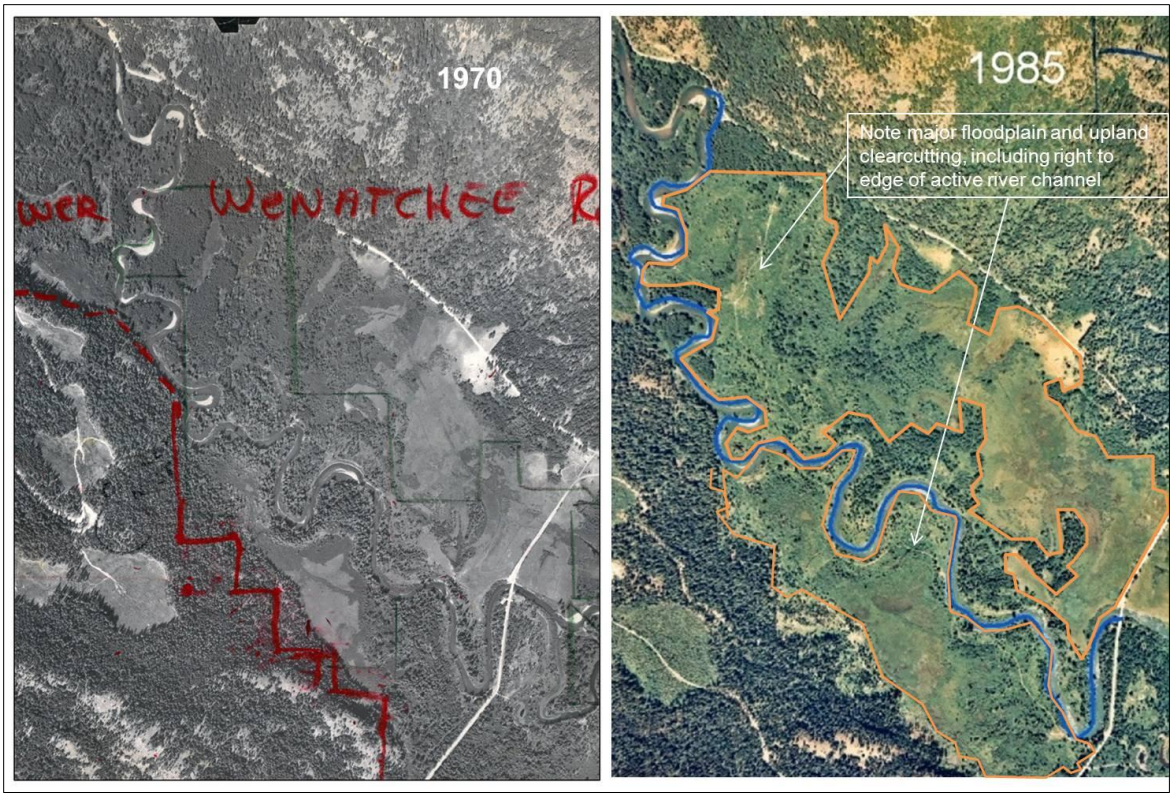

Figure 1. Aerial photo comparison of lower White River, 1970 to 1985.

The lower White River, from river mile 2.5 – 4.1 has been identified as a reach where vertical log pilings could stabilize the existing wood and increase this retention time for habitat improvement purposes. The explicit goal of the project is to improve ecological function in the lower White River by increasing the retention time of mobile WM, thereby emulating historic logjams. This will allow for more extensive, persistent habitat to form, increase sediment retention and pool scour, and possibly improve hyporheic[1] connection across the floodplain.

Pilings would protrude from the riverbed several feet above the ordinary high water elevation. They would be placed in two general configurations: 1) pilings (only) to stabilize existing log accumulations, and 2) pilings (with additional whole trees) in locations on the outside of meanders and point bars (Figure 4). Both types would be expected to accrue additional, natural LWM over time. It is impossible to predict the eventual size of each log jam, however, comparisons with the relatively pristine Chiwawa River show more frequent and persistent accumulations of wood. These larger, more stable accumulations in the Chiwawa River are an integral part of the river dynamics and provide for all of the benefits shown in Figure 2. These accumulations occasionally span the entire channel (Figure 5) and, in time, could collect enough natural material to do the same in the White River project area.

[1]The hyporheic zone is the region beneath and alongside the river where there is a mixing of shallow groundwater and surface water (source: http://www.wikipedia.org, accessed Jan, 2013).

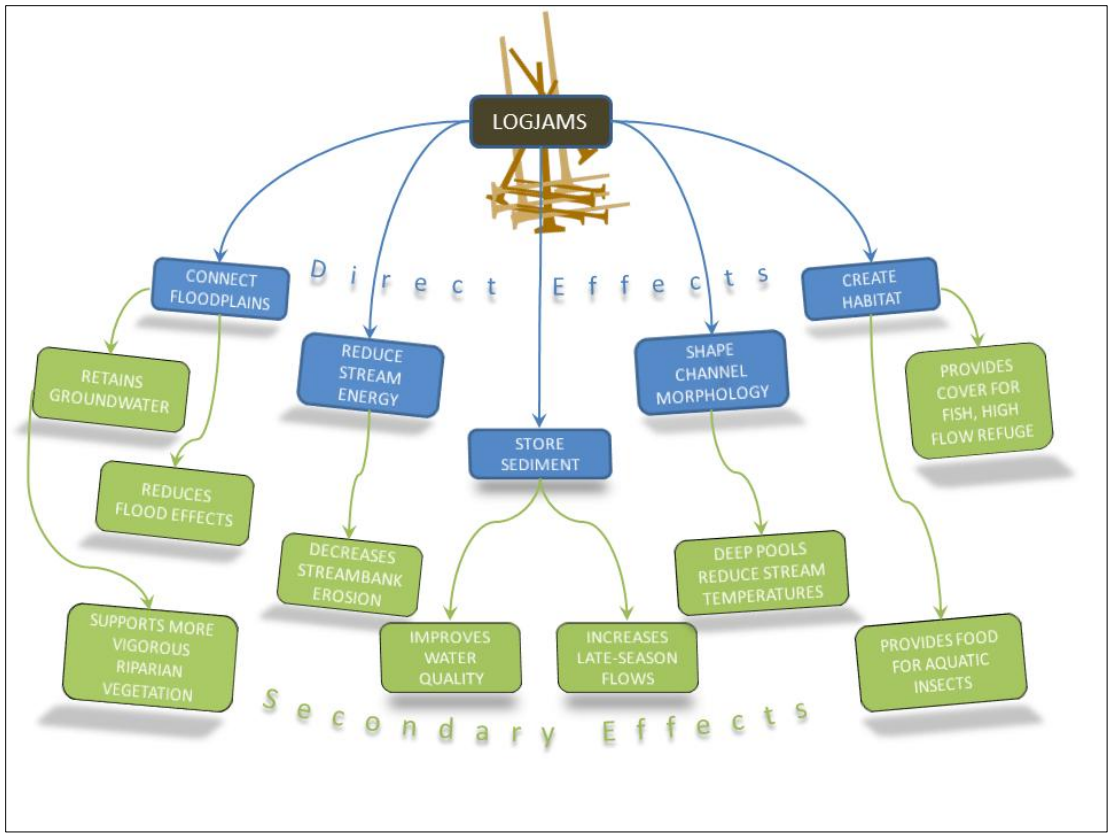

Figure 2. Generalized effects of persistent logjams in alluvial rivers.

Recreation

Any log jam presents significant risk to recreationists, natural or human-placed. We understand most of the use on the lower White River to occur between the Sears Creek Road bridge (RM 7.5) and the Little Wenatchee River Road bridge (RM 2.0), or often out to Lake Wenatchee. Nearly all of this use occurs during the low-flow periods from April – October. Given the very flat gradient it is most commonly paddled by non-commercial canoeists who are drawn to the reach for its wilderness character and relative ease-of-travel. This reach appears in several guidebooks (Landers et al. 2008, Landers and Hansen 1998) where it describes the White River:

> "*Blowdown trees are common. These "strainers" can be dangerous. Always be on the watch for logjams around bends. The river generally flows slowly enough so that if necessary, boaters can ferry to shore and portage with little difficulty*."

Wenatchee Outdoors, a common online source for recreationalists, also depicts the reach as:

> *"…littered with snags. The majority of the time it is only the occasional branch or log, but a few jams require some more complicated maneuvering to pass and, at one point, fallen trees have entirely blocked the river and it is necessary to drag boat over a gravel bar to get past." And "While there's no whitewater, there are sweepers and log jams to contend with. In places you*

need to maneuver well to get through narrow gaps flanked by woody debris. In other places you may need to get over to the bank quickly to portage around logs that are completely blocking the river."

It is incumbent upon recreationists to expect and prepare for these existing hazards. Fortunately, these existing log jams are generally easily portaged on either side. Aerial photos, our own experience, and statements by local residents note how channel spanning log jams frequently form but are often short-lived and change from one season to the next. Adequate scouting of this reach is not always possible so users must be prepared to respond quickly to hazards and maneuver their boat to avoid or portage obstructions.

Figure 3. Example of frequently mobile logjams in lower White River,RM 4.0, 2006 - 2011 comparison.

American Whitewater (AW), the primary paddling advocacy, safety, and educational organization for whitewater recreation in the United States, has recently published guidelines for integrating recreational boating considerations into habitat modification projects (Colburn 2012). They analyze all of the components of LWM in restoration projects which have impact to recreationists and describe how these can be made safer through careful design. These design elements are presented in Table 1 and are evaluated against each structure proposed in this

project. Of the eight design elements which impact recreationists, we rate six components of this project as *low hazard*. Since the possibility of eventually developing a channel-spanning log jam at any particular structure exists, it rates as *moderate*, though we are not designing specifically for this outcome. At many locations we are also proposing to import whole trees (rootwad and branches attached) to improve the aesthetic quality of bare piles and provide more roughness to catch mobile WM. The AW guidelines rank any branches as high hazard since they can more easily ensnare boaters so we have therefore determined this risk factor to be *high*.

Table 1. Design considerations based on American Whitewater recreational guidelines (Colburn, 2012).

American Whitewater Design Element	White River Applicability	Risk Level
Height Above Water	Most wood at water level; Easily visible and navigated around	Low
Channel Spanning	No structures proposed would exceed 25% of wetted channel width; possibility of future accumulations exceeding 25%	Low-Moderate
Branches	Pilings have no branches; imported trees have branches but only placed along channel margin; branches improve aesthetic quality of pilings to look more natural; branches improve habitat complexity for aquatic organisms	High
Visibility	Excellent sight distance from upstream	Low
# of Logs	Approximately 3-10 per installation; larger jams more visible	Low
Portage Potential	Easily avoided or portaged by canoes and kayaks; most proposed locations have low-flow sandbars adjacent to structures	Low
Location	Installed on channel margins with adequate sight distance	Low
Anchoring Methods	Natural piles without artificial materials (cable and rebar is hazardous)	Low

The project would, at a minimum, stabilize approximately 12 existing log jams and create 8 more on the outside of bends and adjacent point bars (Figure 4). As they are constructed, this would allow recreationists unobstructed passage through the channel at every one of these locations. Given their position in the river, some navigation around them may however be necessary. To analyze the difficulty of passage at each proposed structure, we have analyzed the line-of-sight distance to each from the perspective of a boater who is in the main flow. We then compiled measured low-flow velocities from the WA Department of Ecology stream gage at the Sears Creek bridge to estimate the reaction time a person would have at each structure. This information is presented in Table 2 and shows that, at a minimum, users have over two minutes, and an average of five minutes to react to potential hazards. We believe this should be adequate for most users, particularly canoeists, to safely avoid any natural or human caused accumulations.

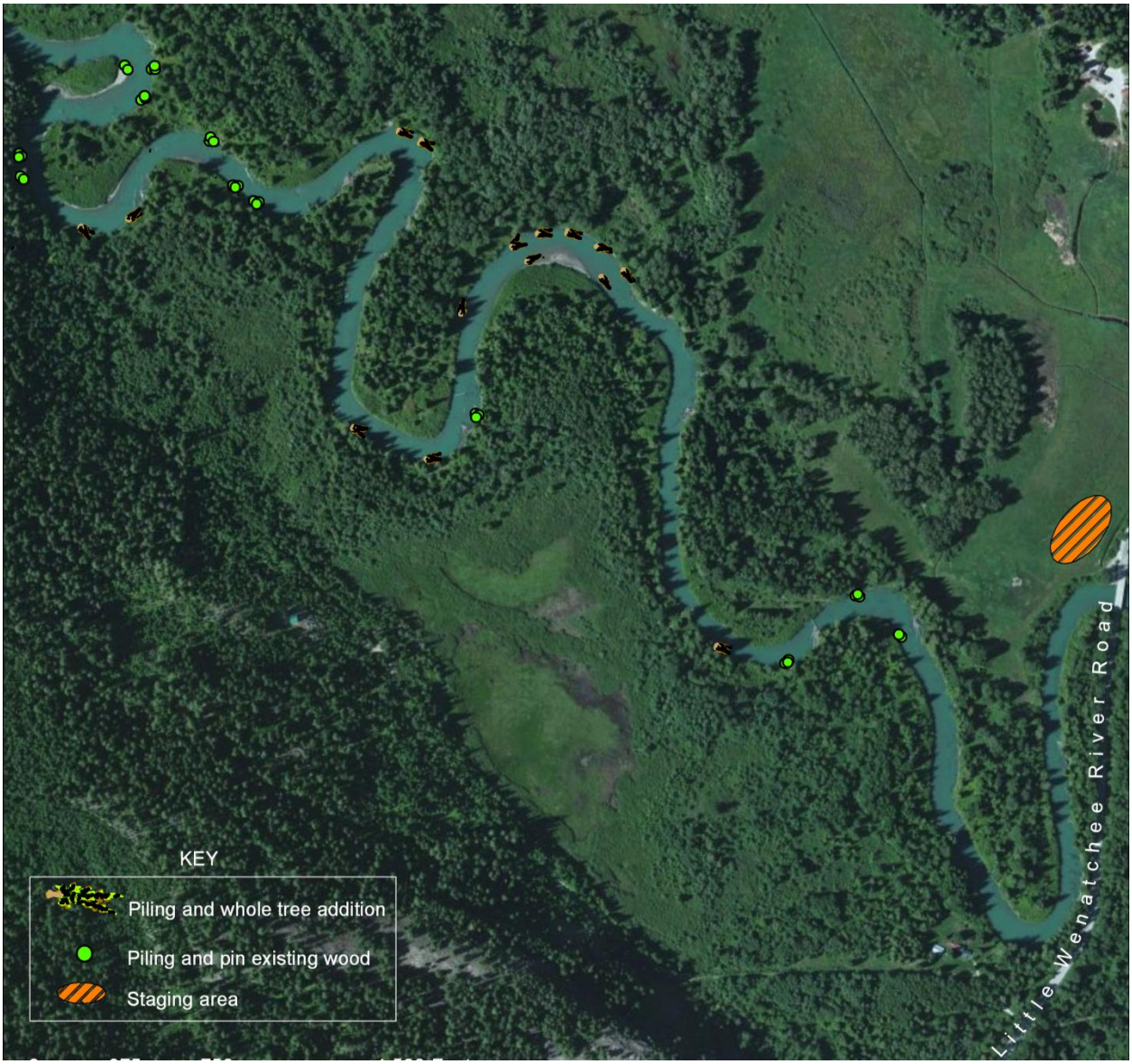

Figure 4. Location of proposed pilings (green and brown dots in river) and staging area (next to L. Wenatchee River Road bridge).

Table 2. Estimated boater reaction time at each proposed structure. (based on measured line-of-sight distance to each structure and WA Dept. of Ecology measure velocity at mean August flow of 578 cfs).

Distance (ft)	222	305	334	295	340	501	440	323	541	882	295	508	468	475	356	484	417	435	346
Minutes to react @ 1.3 ft/sec	2.8	3.9	4.3	3.8	4.4	6.4	5.6	4.1	6.9	11.3	3.8	6.5	6.0	6.1	4.6	6.2	5.3	5.6	4.4

Minimum reaction time= 2.8 minutes
Maximum reaction time= 11.3 minutes
Average reaction time= 5.3 minutes


Figure 5. Channel-spanning log jam in Chiwawa River. Note easy low-flow portage on left bank.

Conclusions

Through focus group discussions with stakeholders we have determined that the issues of greatest concern are 1) recreational safety, 2) aesthetic quality, and 3) increased flood risks. This document intends to disclose the known existing and proposed hazards to recreationists and compare these design elements with what is suggested in the literature.

Since this reach already contains ample natural logjams which are widely known, we believe that the proposed structures would not significantly change this condition. This project presents a unique opportunity to not only restore the historic ecological functions of WM, but to do so in a relatively low-use, wilderness character reach. Most Pacific Northwest rivers have been largely cleared of wood and recreationists have grown accustomed to this condition. In this case, the White River affords the public to see a river that more closely resembles its pre-European settlement condition and experience what early explorers (settlers, fur traders, and loggers) must have encountered. We suggest that this is a positive educational opportunity, although it does require a bit more planning and skill to adequately scout and avoid logjams.

We intend to address the aesthetic quality of placed-pilings by importing whole trees (with rootwads and branches) to somewhat 'hide' the vertical logs at lower flows. These also have the added ecological benefit of increasing roughness which should help meet the goal of increasing retention time of mobile WM. We have developed conceptual renderings at two proposed

locations to document how these pilings and whole trees would fit with the aesthetic character of the reach (Fig's 6 and 7).

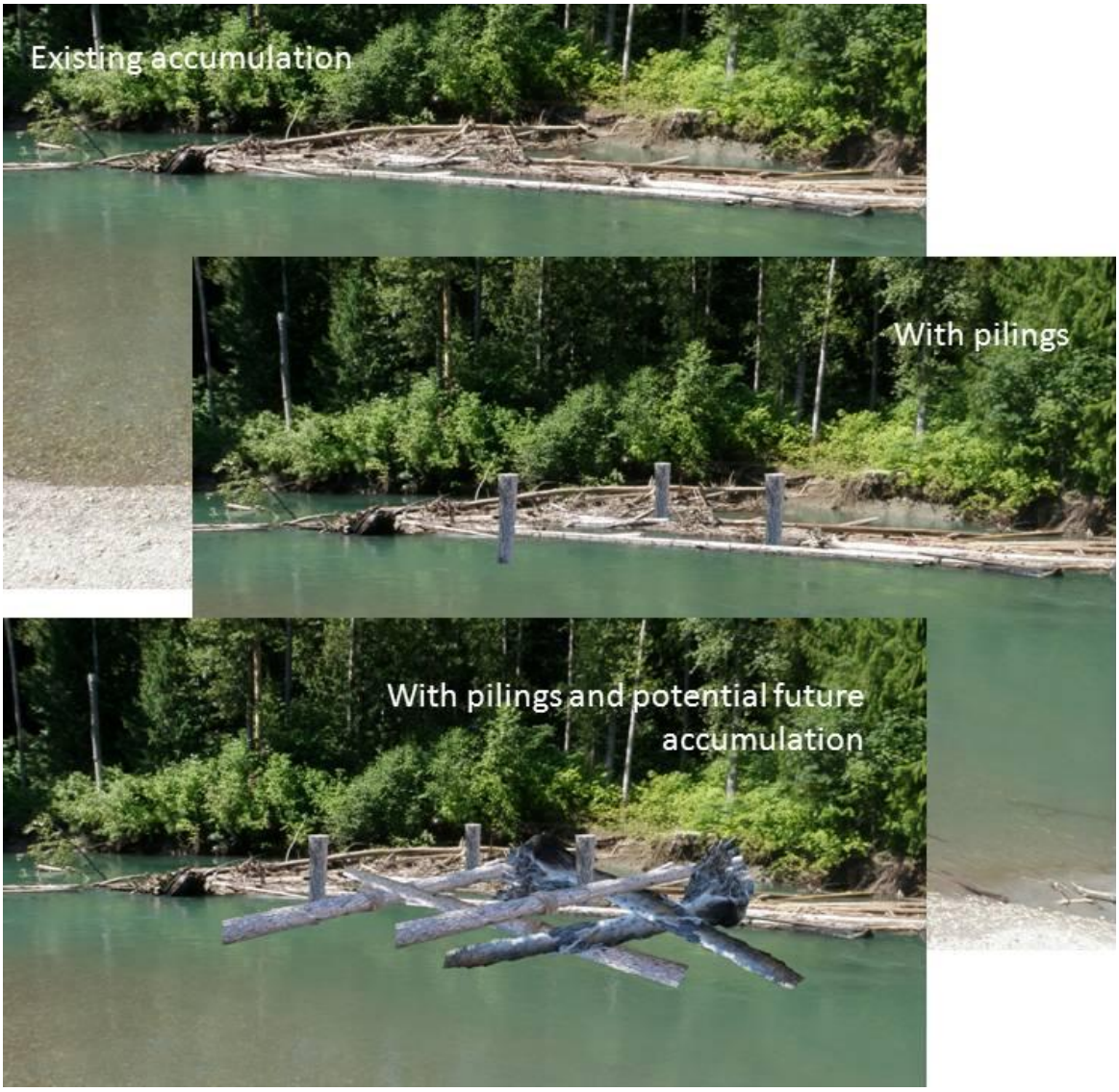

Figure 6. Conceptual photo showing example of proposed piling installation in existing logjam. (Illustration courtesy M. Hall, USFWS)

The flood risks posed by this project are expected to be negligible given the lack of infrastructure nearby and the extremely broad floodplain throughout the reach. We expect any changes in water surface elevation at flood flows to be limited to the immediate vicinity of each structure and not change at all on the periphery of the floodplain where homes are located. These risks will be modeled using a 1-dimensional step-backwater model (HEC-RAS) and presented in a separate document.

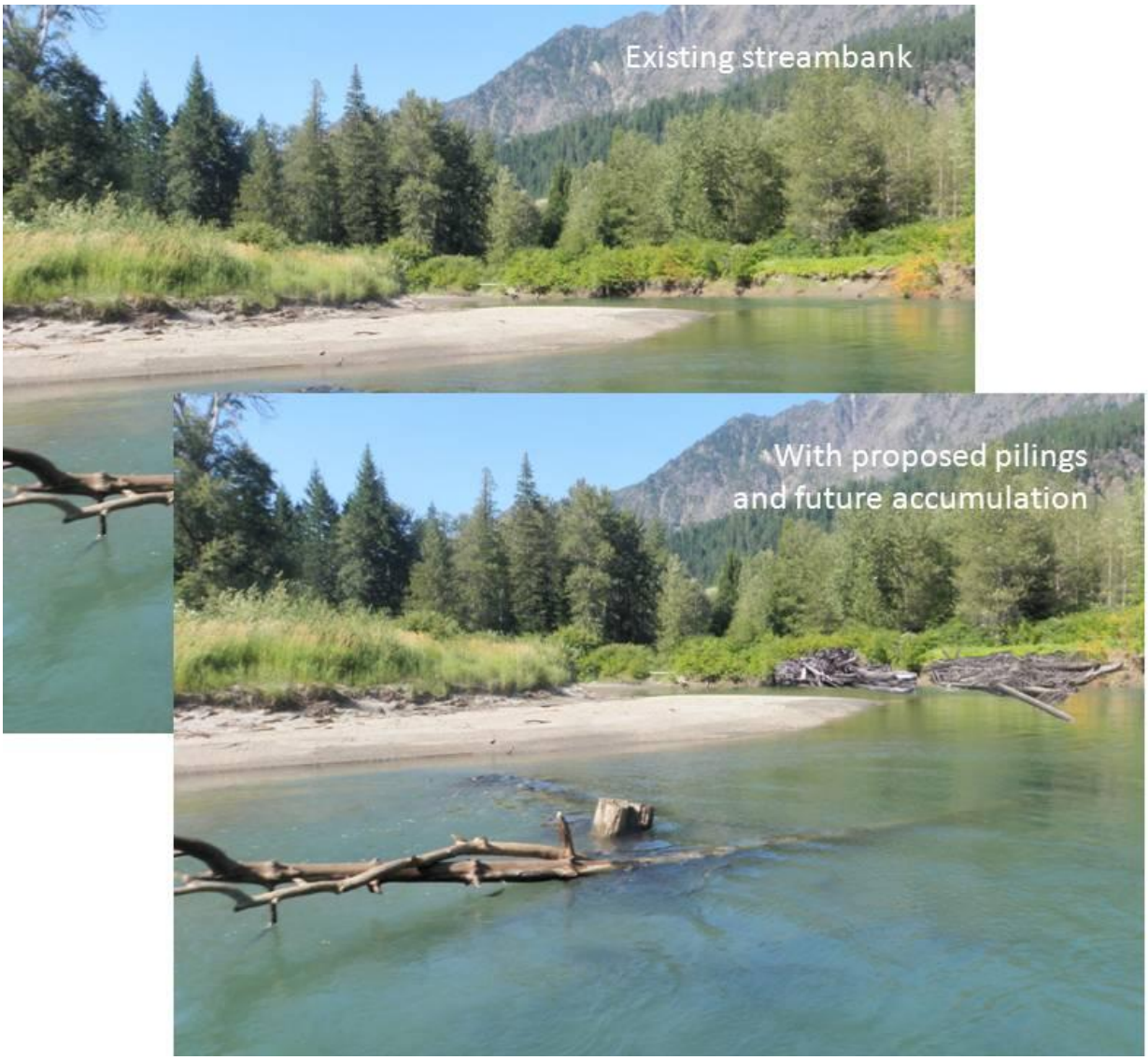

Figure 7. Conceptual photo showing estimated future log accumulation salong streambank after piling installation. (Illustration courtesy M. Hall, USFWS)

References

Colburn, K. (2012). *Integrating Recreational Boating Considerations into Stream Channel Modification & Design Projects*. Available: http://www.americanwhitewater.org/content/Document/fetch/documentid/1006/.raw Missoula, MT. 15pp.

R. Landers, D. Hansen, V. Huser, and D. North. (2008) *Paddling Washington: 100 Flatwater and Whitewater Routes in Washington State and the Inland Northwest*. The Mountaineers Books, Seattle, WA. pgs. 214-217.

R. Landers and D. Hansen. (1998). *Paddle Routes of the Inland Northwest: 50 Flatwater and Whitewater Trips for Canoe and Kayak*. The Mountaineers Books, Seattle, WA. pgs. 56-60.

USFWS (2012). *Natural Log Jams in the White River: Lessons for Geomimetic Design of Engineered Log Jams*. Parrish, R.M. and Jenkins, P.B., authors. U.S. Fish and Wildlife Service, Leavenworth, WA. 98826.

Wenatchee Outdoors: http://www.justgetout.net/Wenatchee/16767