Executive Summary: Large Wood in the Upper Chattooga River Watershed, November 2007

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Prepared January 2008
During the week of November 12th 2007, personnel from the Southern Research Station’s Center for Aquatic Technology Transfer (CATT), Francis Marion-Sumter National Forest, and Chattahoochee-Oconee National Forest conducted an inventory of dead and down large wood (LW) in the upper Chattooga River, West Fork Chattooga River, and two tributaries of the West Fork Chattooga River. Crews counted all wood larger than 1 m long and 10 cm in diameter that had the potential to influence stream channel shape and function (Table 1); in practice this meant all wood that impinged on the bankfull channel. Crews used a global positioning system to delineate consecutive stream reaches of 0.5 km and maintained separate tallies of wood for each reach. Individual large wood accumulations and other features such as slides and slumps were noted and photographed with digital cameras. Flow at the time of the inventory was near base conditions, enabling crews to wade the entire stream channel. We summarized our results using a geographic information system for ease of interpretation (Figure 1). The raw data have been tabulated and are accessible either electronically or in written format.

From November 13-15 we walked 26.4 miles of the Chattooga and West Fork (Table 2). The Chattooga mainstem had 205 and the West Fork 357 pieces of LW per mile of stream channel. As is typical, the LW tended to be located along stream margins, channel bends, and on sediment bars and in a few small jams.

Table 1. Size categories used for LW inventories in the Chattooga River watershed, November 2007. All LW within the bankfull channel were recorded.

<table>
<thead>
<tr>
<th>Size Class</th>
<th>Length (m)</th>
<th>Diameter (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 - 5</td>
<td>10 - 55</td>
</tr>
<tr>
<td>2</td>
<td>1 - 5</td>
<td>&gt; 55</td>
</tr>
<tr>
<td>3</td>
<td>&gt; 5</td>
<td>10 - 55</td>
</tr>
<tr>
<td>4</td>
<td>&gt; 5</td>
<td>&gt; 55</td>
</tr>
</tbody>
</table>

Table 2. Total LW counts from streams inventoried in November 2007.

<table>
<thead>
<tr>
<th>River</th>
<th>Start Location</th>
<th>Length (miles)</th>
<th>Total LW</th>
<th>LW per mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chattooga</td>
<td>confluence with West Fork Chattooga</td>
<td>20.4</td>
<td>4171</td>
<td>205</td>
</tr>
<tr>
<td>West Fork Chattooga</td>
<td>confluence with mainstem Chattooga</td>
<td>6.0</td>
<td>2154</td>
<td>357</td>
</tr>
<tr>
<td>Holcomb Creek</td>
<td>Three Forks</td>
<td>2.7</td>
<td>1446</td>
<td>529</td>
</tr>
<tr>
<td>Overflow Creek</td>
<td>Three Forks</td>
<td>2.9</td>
<td>551</td>
<td>193</td>
</tr>
</tbody>
</table>
Figure 1. Counts of LW in 0.5 km reaches on the upper Chattooga River watershed, November 2007.
One notable exception to the general pattern of LW distribution was a very large jam on the upper river in North Carolina, which occupied the entire channel to a height of 18-20 feet (Figure 2). Wood in this jam was in various states of decay and disintegration, suggesting that it had accumulated over many years. This jam is unique; jams of this size are unusual in the southeastern US, where as a result of past human activities most streams carry small loads of LW.

Figure 2. Large wood jam on the upper Chattooga River, North Carolina, November 2007

Much of the relatively larger LW load in the West Fork Chattooga appears to be derived from past logging in the West Fork drainage. Many if not most of the LW pieces were logs as evidenced by two saw-cut ends and typical saw-log lengths. These logs tended to form major portions of the banks along the mid-lower West Fork channel.

Although many of the LW pieces found in Holcomb Creek were likely also residual from logging as evidenced by saw-cut ends, none of the cuts were recent. At least some of the pieces in the lower half of Holcomb Creek probably had broken loose from an old splash dam¹, located about 0.5 km downstream of the bridge on FS road 86b. Comparison of recent photos with others taken in 1989 suggest that while the base of the dam is largely intact at the upper end, many logs have become detached from the lower end and transported various distances downstream (Figures 3 – 4).

¹ Constructed about 1915, this dam was constructed from logs cut on site and used for several years to facilitate floating and movement of logs harvested in the watershed. The remaining base is a log crib-work held together by iron spikes of about 1” diameter and 12-18” length
Figure 3. Upper end of splash dam in 1989 (left) and 2007 (right).

Figure 4. View across splash dam on Holcomb Creek, West Fork Chattooga River, November 2007.
Large wood loads in Holcomb and Overflow Creeks, two major tributaries of the West Fork Chattooga, were notably different. At 193 pieces per mile, Overflow Creek had the lowest LW load of all reaches surveyed. Holcomb Creek, on the other hand, had the highest load at 529 per mile.

We also have included the results from a 1989 LW inventory conducted in Holcomb and Overflow creeks. These data were collected as part of a larger study of fish habitat and production conducted during the late 80's - early 90's. In contrast to the 2007 inventory wherein all wood in the bankfull channel was counted, LW in 1989 was tallied within the wetted channel only. This means that we cannot examine changes in the amount of LW between 1989 and 2007. However, we were able to compare LW loads between streams within each year. In 1989 there were 34 and 96 pieces per mile in Overflow and Holcomb, respectively. In both 1989 and 2007 Holcomb had about 2.5x more total wood than Overflow (Figure 5).

1989: LW within WETTED channel

2007: LW within BANKFULL channel

Figure 5. Large wood counts in 0.5 km reaches on Overflow Creek and Holcomb Creek in 1989 and 2007. In 1989, pieces within the wetted channel were counted. In 2007, pieces within the bankfull channel were counted.
The large number of LW pieces exhibiting saw-cuts is an indication that human intervention is at least one of the reasons for the dramatically lower LW load in Overflow Creek (Figures 6 – 9). While a portion of the LW in Overflow Creek probably represented residual pieces from logging conducted in the last century, some of the cuts were very recent; we found an empty motor oil container among the rocks at Three Forks near the confluence of Holcomb and Overflow creeks, where we also observed and photographed a channel-spanning hemlock and maple that had been sectioned into smaller pieces. Sawdust and small cut branches were present at this site, which was a plunge pool immediately below a small waterfall.

Figure 6. Freshly cut wood found near Three Forks, November 14, 2007.

Figure 7. Freshly cut wood found near Three Forks, November 14, 2007.
We noted several additional locations on the mainstem Chattooga and Overflow Creek where pieces of LW had been cut or removed from the stream channel. The age of the cuts varied from several days to several years. Several of the targeted pieces were channel spanners that provide measurable benefit to streams in the form of sediment and organic debris retention.

Figure 8. Cut wood suspended above wetted channel on Overflow Creek, November 2007.

Figure 9. Partially submerged cut wood found in Overflow Creek, November 2007.
Wood is an important feature of streams flowing through forested areas. In particular, large wood and other obstructions such as boulders slow flow, trap sediments, and damp and delay flood peaks. Tree boles are major pool forming elements and wood contributes to aquatic habitat in diverse ways such as by providing cover from predators, refuge from high velocity flow, and substrate and organic matter for macroinvertebrates. Large wood is considered so beneficial that riparian forests today are managed for LW inputs and where recruitment or loading is judged insufficient; LW is intentionally added to stream channels.

Wood loads tend to be lower in streams disturbed by human activities such as logging and land clearing, both because wood has deliberately been removed and because forested riparian areas have not recovered sufficiently to replenish the supply of dead and down large wood. In the eastern US, streams flowing through previously logged wilderness areas have lower wood loads than streams draining undisturbed wilderness. Similarly, the Chattooga Wild and Scenic River corridor exhibits signs of its logging history and thus is in a state of recovery. Paradoxically, LW loads in Holcomb Creek are uncharacteristically high at least in part due to residual pieces left from logging and recent disintegration of a splash dam.

Wood naturally enters stream channels by various avenues including bank undermining or blowdown of individual trees or groups of trees and transport en masse in debris flows or landslides from upstream channels or adjacent riparian areas. Although logging was one of the more dramatic causes of large wood loading and subsequent decline, other human influences such as roads and trails, and land clearing for any reason have influenced both the rate and amount of large wood entering streams. Other more insidious events also can lead to variation in the rate of LW recruitment. Since the beginning of the previous century a fungus, inadvertently brought to North America on nursery stock from Asia, has killed nearly all American chestnut trees. American chestnut was a dominant tree throughout much of the eastern US where, except for areas of salvage, its demise resulted in higher than expected rates of large wood and debris recruitment.

The distribution and abundance of LW we documented in November 2007 is similarly a reflection of both past and present day disturbances within the Chattooga River watershed and while the impacts some disturbances are known, the effects of others are yet to be seen. The watershed contains thousands of hemlock trees, the majority of which exhibit varying states of degrees of damage from the hemlock wooly adelgid. As was the case with American chestnut, it appears that nearly all affected trees die. We documented several hemlocks that already have died and been recruited as LW pieces (Figures 10-11).

The ongoing drought in the southern US also will contribute to the increasing rate of wood recruitment. Trees, particularly those already stressed by insects or disease, are further weakened by extreme weather conditions and thus susceptible to windthrow or high precipitation events. It seems likely that even relatively mild storm events will contribute to increased slope failures and tree toppling over the next few years. While it is not possible to predict the total number of pieces that ultimately will be recruited, regular monitoring will reveal the extent of these LW and other organic material additions and will help determine the degree to which depleted wood loads in the Chattooga River watershed are replenished.
Figure 10. Recently fallen hemlock in mainstem Chattooga, November 2007.

Figure 11. Recently fallen hemlocks in Overflow Creek, November 2007.