EXAMPLES: BANK EROSION HAZARD ASSESSMENTS

From Jefferson County Channel Migration Study

In this study, the ES is generally located on higher terraces that appear to be elevated far enough above the channel to be prone to lateral erosion rather than channel avulsion. These terraces are typically planar with few subdued channels on their surfaces and are 8-10 ft or greater above the active channel, depending on location. Vegetation is more mature than the HMZ or AHZ and consists of swordfern, cottonwood trees and large cedar stumps that were part of the virgin forest and have been able to survive many of the other species whose stumps have since rotted. Where these stumps are present, they indicate that the surfaces are at least several hundred years old. Much of the vegetation is also thickly covered with moss or other fungi and has a forest floor covered with downed trees. Surfaces that are defined as part of the ES also have greater soil development with fine-grained surface soils over gravelly substrates.

The width of the ES was defined on a reach-by-reach basis, using processes observed during the historical record to determine the possible amount of lateral erosion during a 100-year period. The assumption here is that channel migration will progress at a rate or in a similar manner in the next 100 years as it has for the past 100 years. There is considerable uncertainty in this assumption as factors such as climate and hydrology do not appear to be uniform in behavior. Changes in these factors could be important in the location and rate of channel migration.

LWD is considered to be important factors in the evolution of channel morphology and formation of stream habitat in the northwestern U.S. (Abbe, 2000). An increase or decrease in the amount of LWD in the channel may cause channel changes that are not easily predicted using the present channel geometries. Nonetheless, direct evidence of past behavior appears to be the best information for determining a practical width for the ES. Techniques used in this study include measuring the rate of lateral migration of meander bends where there was a distinct observable and measurable trend. The ES is based on the calculation of the ES coefficient in Equation [1]:

$$C_E = E_R(T_E/T_R) \quad [1]$$

Where E_R=rate of erosion (calculated by channel migration rates) T_E=average time channel is expected to erode at one location (based on meander growth and cutoff) T_R=average time for river to reoccupy same location (based on historical data).

The ES coefficient C_E is then multiplied by the timeline of the CMZ, which in this case is 100 years, to obtain the width of the ES. The first assumption in using this equation is that the materials being eroded at the measurement location are similar to those where the result is applied. The second assumption is that the rate of erosion at the measurement location can be applied to locations with differing hydraulic geometries and LWD arrangements. The growth of meander bends on rivers in the study reach tends to occur 17 over decadal time scales before the bend is cutoff by subsequent flows and appears to progress sporadically through the decade rather than at a uniform rate. Other techniques

for determining the ES coefficient included the measurement of meander amplitude or average channel width, assuming that the channel could not erode more than one meander amplitude or channel width if it had not migrated further than that during the historical record. The ES was determined for each reach along the four rivers. Since the width of the ES differs from once reach to the next, intermediate widths at the boundaries between reaches were used to avoid abrupt changes in the width of the ES and allow for a smooth transition from reach to reach.

Since there is a great amount of semi-consolidated glacial sediments that may be prone to lateral erosion and mass wasting, the delineation of a GS is also appropriate in many locations. Although Rapp and Abbe (2003) recommend a more rigorous geotechnical study to determine the GS, a 1:1 slope was assumed in this study and is similar to Jefferson County's regulations concerning setbacks from steep slopes. The GS was defined where Quaternary sediments were less than 40 feet high or were observed to retreat measurably during the historical record and were located adjacent to the active channel or adjacent to the ES. Where Quaternary sediments had greater height and were determined to not retreat measurably during the historical record, they were not assigned a GS and should be covered under Jefferson County's regulations concerning setbacks from steep slopes. When the bluffs were located adjacent to the active channel, they were assigned the full value of the EHA (ES + GS). If they were located away from the active channel, they were assigned any remainder of the ES not covered on the high terraces and the value of the GS based on the measured height of the bluff.