

**Shoreline Inventory and Characterization Report
Skamania County, Washington**

**Appendix C
Channel Migration Zone Analysis for
SMA Streams in Skamania County**

MEMORANDUM

To: Skamania County SMP Update Team
From: Jay Cook, Hydrogeologist, WA Department of Ecology
Date: May 19, 2016
Subject: Channel migration zone analysis for SMA streams in Skamania County

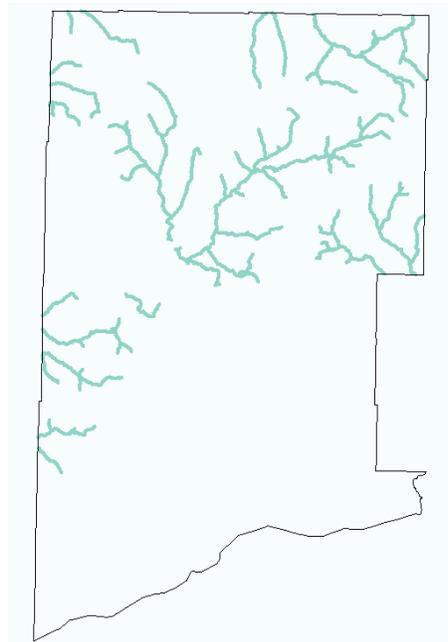
Provided with this memo is a collection of digital data files (ArcGIS map package) that show the results of a planning-level assessment of channel migration zones completed on behalf of the County for the Shoreline Master Program (SMP) Update.

The GIS map data provided by Ecology include two layers. The first is a line layer of the Planning Level Channel Migration Zone (pCMZ) boundaries. The second is a point layer with comments of notable observations, which is not required for the SMP update but hopefully will provide some useful information.

Please note that the pCMZs within the map package are currently drafts. Skamania County, upon review of the pCMZ map data and this document, may contact Ecology to discuss the delineations and the possibility and protocol for adjustments prior to finalizing.

Understanding the low development pressure in the federally owned lands within Skamania County and to expedite the process of generating pCMZs, the county was divided into two parts – low development potential (federally owned land) and higher development potential (privately held land within the National Forest and privately owned land within the rest of the county). In low-development areas, the pCMZ was auto-generated based on channel confinement and valley width. In the higher-development areas, a standard pCMZ analysis was performed.

Low Potential Development Areas



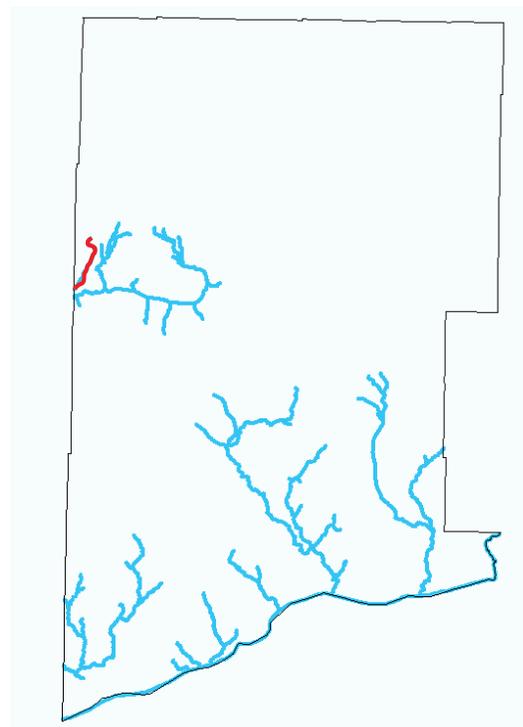
Auto-generated pCMZs

- In GIS, the SMA-jurisdiction streams layer was compared to the CHAMP (Channel Migration Potential) layer. CHAMP layer streams segments, which are present upstream of the 20 cubic feet per second (cfs) regulatory threshold, were trimmed to match the SMA jurisdictional extent. *CHAMP data are described in Ecology Publication No. 15-06-003, "Screening Tools for Identifying Migrating Stream Channels in Western Washington" and are available for public use at the Department of Ecology website.*
- The relative degree of channel confinement, found in the CHAMP dataset, was selected as the most suitable attribute to categorize stream segments for auto-generating pCMZs. Stream segments were divided into two categories: 1) unconfined, and 2) confined and moderately confined. The Screening Tools publication suggests that in confined and moderately confined stream settings, the valley bottom is a reasonable and conservative approximation of the planning level CMZ. The publication does not offer similar guidance for unconfined settings. Thus, the standard pCMZ methodology, outlined in Ecology's publication No. 14-05-025, "Methodology for Delineating Planning Level Channel Migration Zones", was consulted to aid in appropriately locating pCMZs. The auto-generated pCMZs were assigned as follows:
 - o Confined and moderately confined segments: pCMZ = Valley Bottom Width (attribute within CHAMP data layer).
 - o Unconfined segments: pCMZ = Valley Bottom Width plus 500 feet. Rationale for this approach is as follows: Ecology's pCMZ publication prescribes first delineating the "Modern Valley Bottom" (MVB), followed by situating the pCMZ at some distance relative to the MVB. In settings with very wide valleys relative to the stream, the pCMZ may be placed streamward of the MVB. In settings where the stream is likely to impinge on the valley wall, the pCMZ may be placed outside of the MVB to recognize potential erosion due to undercutting of valley walls. The placement of the pCMZ when outside of the MVB for any segment is controlled by several factors, including the probability of impingement against valley walls, erodibility of valley wall materials, and height of the valley wall. In settings with low erodibility and high valley walls, as generally expected in northern Skamania County, the methodology suggests the pCMZ be placed up to one channel width outside the MVB. In order to assign a common, protective "buffer" distance outside of the valley bottom for all streams in the low-development area, the area stream with the widest active channel, Muddy River, was evaluated. The active channel for Muddy River reaches more than 1,000 feet in width in a few places. While this appears to be atypically wide for streams in the general area, it was a consideration in determining the common pCMZ placement for unconfined stream segments. Considering the Muddy River channel, the hydrologic and geologic setting, and that no migration analysis was performed, it was determined that a reasonable and protective pCMZ for all unconfined stream segments is 500 feet outside of the valley bottom defined in the CHAMP dataset
- It should be noted that pCMZ areas delineated in this fashion are very coarse, and depending on actual stream location versus stream-location data in GIS, the delineated pCMZ area could be significantly misaligned. **Skamania County should narratively explain in their SMP update that**

proposed development near (inside or outside of) these auto-generated pCMZs should first be analyzed on the ground to determine if the project is actually within the valley bottom for confined stream segments or within about 500 feet of the valley bottom for unconfined stream segments. Additionally, the SMP update should note that proposed developments within the physical, on-the-ground boundaries will require a site-specific, detailed CMZ analysis. Ecology Publication #03-06-027 “A Framework for Delineating Channel Migration Zones” provides a methodology for such a detailed analysis that should be conducted by a qualified professional.

- There are 5 streams/stream segments within the Low Development Areas that fall under SMA jurisdiction but are not in the CHAMP stream dataset. Three are in the northwest corner of the county – South Coldwater Creek headwaters, North Fork Toutle River, and Studebaker Creek. Two are in the eastern portion of the county – Trout Lake Creek and the upper White Salmon River. Absent CHAMP data, valley width and confinement information, the valley bottom was hand-digitized using available data (USGS Topographic Information from ESRI, 10-m DEM, and Aerial Photos), and the pCMZ was set back 500 feet from the mapped valley bottom.
 - o The upstream portion of South Coldwater Creek is the outfall of Spirit Lake and appears to travel through a tunnel, thus no pCMZ was generated for that section.
- The pCMZ delineation lines within the GIS package overlap at many stream confluences. Where this occurs, the most protective (i.e., farthest from the stream) should be used.

Higher Potential Development Areas



- Standard pCMZ analyses were performed using available desktop methods.
- Note that all mapped CMZs are “Planning-Level”:
 - o Fairly abbreviated process, relying on visible landforms, channel characteristics, valley characteristics, historic migration, and soils/geology. Channel migration rates were not analyzed. Considering the abbreviated nature of the analysis, the pCMZs are relatively conservative (wide). More precise or narrower CMZs could be generated, but a more detailed analysis would require significantly more time and costs.
 - o In many cases, the pCMZ boundary is above the valley bottom onto valley walls as described in the previous section.
 - o For all streams, the “natural” pCMZ was mapped without regard for man-made structures such as levees and roads that may actually limit migration.

- LIDAR available – Lower White Salmon River – available LIDAR data were utilized to generate the pCMZ following the protocol outlined in Ecology’s Planning Level CMZ publication, referenced above.

- No other streams within the county had significant LIDAR coverage. Absent high-resolution data, ten-meter resolution Digital Elevation Model (DEM) data were used to analyze all other streams. Recognizing coarseness of the data and in order to be protective, the pCMZs were intentionally placed slightly farther from the streams than if LIDAR data were available. Relative Water Surface Elevations (RWSE) were produced for all stream segments using the 10-meter DEM data. The RWSEs were used to aid in visibly locating the preliminary pCMZ or to create a contour (5-10 meters) above the water surface to approximate the valley bottom or a reasonable zone above and outward from the active stream. Once generated, the preliminary pCMZ or the contour was manually adjusted (either streamward or landward) based on historic orthophotos, topographic information, and geologic/soils information. Again, protocol from Ecology’s pCMZ document was followed.

- Note, the unnamed stream in red in the map above was not delineated. It appears to be a mistake within the SMA jurisdiction GIS dataset. The stream is not readily evident in orthophotos or USGS topo maps.

Columbia River

Understanding that the Columbia River has little tendency to migrate and in being consistent with previous CMZ assessments, it was decided to use the existing FEMA 100-year flood zone delineation as the pCMZ. The most current digital flood-zone data available for Skamania County are the FEMA Q3 data, which often do not project well in GIS. This problem, which results in the 100-year flood delineation not aligning properly with the river and adjacent landforms, was noted during assessment of the Q3 data for the Columbia River.

The Columbia River pCMZ delineation presented by Ecology for Skamania County should be recognized in the SMP update as imprecise and should be used only in an advisory capacity. Project-level decisions should utilize existing Flood Insurance Study maps and information and/or more detailed, site-specific delineations.