

## **Adaptive Management Proposal Initiation FPA Np Stream Basin Analysis**

### **Introduction**

The TFW Policy Np Workgroup established in late 2019 is nearing completion of their work. The workgroup intends to deliver a final draft report to TFW Policy by late February or early March and finalize their report by April or May 2021. At that time TFW Policy will begin deliberations on the Np workgroup report recommendations, with a goal of forwarding a consensus action recommendation on to the FPB by the end of 2021.

Current and ongoing Type N stream research is a high priority in the Adaptive Management Program (AMP). However, only about half the Type N stream projects identified in the CMER workplan have been completed, and headwater streams have not been extensively studied by others. Therefore, knowledge gaps exist regarding effectiveness of different Np stream riparian management zone (RMZ) configurations at meeting both resource protection and operational objectives, and how applicable the findings from the hardrock (and softrock) studies are to common forest practices applied across the western Washington landscape. Per the hardrock phase I final report, *“Scope of inference is limited by the site selection criteria listed...”* (pg. 2-22). Site selection criteria for the hardrock study are listed in Table 2-1 on page 2-5 of the final report. Of particular interest is a comparison of the Np stream basin size and associated harvest prescriptions applied in the hardrock study (and softrock) with the broader population of Np stream basins on managed forestland subject to the rules.

To gain some insight into this question, WFPA recently conducted a pilot GIS effort to delineate Np basins and estimate the percentage of basin area harvested from a sample of FPAs within the Mitchell Creek WAU in Southwest Washington. Within six sampled FPAs, we delineated 18 Np basins, determined contributing catchment area, and measured the percentage of each Np basin harvested within the FPA. The analysis showed that five of the 18 Np basins had basin area acreage matching the site selection basin area criteria of the hardrock study. None of the five Np stream basins were fully contained within the FPA harvest unit boundaries. The range was 24% to 87% and the average was 50%.

This was a pilot effort to test a GIS method and determine if further analysis of the issue is warranted. We learned the GIS methods could be more efficient by maximizing use of LiDAR, and digitized FPA boundaries and stream type breaks. The results of this analysis suggests that examination of a more representative sample of FPAs over a broader area is warranted. WFPA is moving ahead with an expanded evaluation of FPAs. However, we recommend this work be done cooperatively in the AMP, hence this proposal initiation. Information gained from this analysis will provide context about Np basin size and harvesting patterns which is highly relevant to AMP deliberation over alternative Np stream RMZs and other potential solution components. The nature of this project is such that it can likely be accomplished by CMER staff over a relatively short period of time.

### **Board Manual 22 Proposal Initiation Questions**

#### **1. The affected forest practices rule, guidance, or DNR product.**

This project will inform the AMP deliberations over alternative Np stream RMZ recommendations. The rule affected is WAC 222-30-021 (2) (a), (b), (c) Western Washington protection for Type Np and Ns Waters

**2. The urgency based on scientific uncertainty and resource risk.**

The TFW Policy Np Workgroup intends to deliver a final draft report in late February/early March and a final report by April or May. Final CMER reports for hardrock phase II and softrock phase I are anticipated mid and late 2021, respectively. Ecology's December 2019 letter to the FPB extended Clean Water Act assurances to December 2021 in anticipation of formal rule making on Np streams to commence by then. Consequently, TFW Policy will begin deliberations this spring and attempt to conclude with an action recommendation to the FPB by the end of this year. Therefore, acquiring information from this proposal as soon as possible is recommended.

**3. Any outstanding TFW, FFR, or Policy Committee agreements supporting the proposal.**

Although Type N stream research is a high priority in the AMP, only about half the Type N projects identified in the CMER workplan have been completed. In addition, the AMP has fallen short of original commitments to research and monitoring at multiple scales and testing of less costly alternative prescriptions which may be effective in producing conditions/processes that meet resource objectives. Nor does the AMP have much information regarding how Np stream study results fit common forest practices across the broader landscape. Filling these knowledge gaps is imperative to designing potential solutions and better understanding of the benefits and costs of any recommendation being considered. It is also required by the Administrative Procedures Act and is foundational to adaptive management principals.

**4. How the results of the proposal could address Adaptive Management Program key questions and resource objectives or other rule, guidance, or DNR product; and**

This proposal seeks to inform pending Type Np stream RMZ deliberations in TFW Policy, which is directly linked to Forests & Fish Report goals and Schedule L-1 resource objectives and performance targets.

**5. Available literature, data and other information supporting the proposal.**

See attached method and analysis results summary. This was a limited investigation of two primary questions: 1) how often are Np stream basins like the hardrock study sites (and softrock) encountered in routine FPAs; and 2) how often is 100% of those Np stream basins harvested in a single FPA? Preliminary results suggest the answers may be not often and never, respectively. Given these preliminary results, further investigation including additional sub-basins and FPAs is warranted to understand the applicability of the hardrock and softrock study results to common forest practices, inform alternative solutions and the potential costs/benefits of different solutions. While WFPA is prepared to conduct this work, the information is in the interest of all stakeholders and a collaborative effort is recommended.

*Responses to the additional proposal initiation questions in BM-22 are not included as they are more focused on a formal study or project plan. We recommend a detailed approach to the above proposal be developed by CMER staff.*

# Np Basin Analysis

Scoping:  
Criteria primarily based on CMER 2018 Np Study  
Note: No stream order consideration

Initial approach:  
Selecting an WAU (Mitchell Creek)  
Focus on 'even-age' FPAs  
(DNR FPA Polygon downloaded Oct 1, 2020)

Data prep:  
LiDAR DTM to flow direction and accumulation  
Create fish & no fish polyline feature  
Create stream type break point feature  
Dissolve FPA polygons (1 polygon per FPA)  
LiDAR canopy height model  
LiDAR percent slope  
LiDAR 10 foot contour

Exploratory Approach:

1. Visually assess if a given FPA area appears to overlap all of a given basin
2. Georeference FPA
3. Create point feature for each stream type brake
4. Create pour point for each stream type break on flow accumulation layer then run 'watershed tool'
5. Convert watershed tool output to vector polygon them manually edit polygon to reflect known drainage structures, topographic contour, and informed by flow direction where discernable
6. Create non-fish stream polyline feature a determine stream slope gradient for each Np stream.

Issues Encountered:

- Older FPA download link broken
- No readily available method for bulk conversion of FPA map to .tif for georeferencing
- FPA map quality effects georeferencing and accuracy
- Road effects watershed delineation
- \*resampling DTM did not appreciably improve the watershed delineation, it did improve stream delineation across some roadways

Potential Remedies:

- Prescreen FPA for relevant criteria i.e. lithology and basin coverage\*
- Obtain all fish break fish points and Np streamlines from given landowners
- 'Burn' all known drainage structures into DTM and rerun flow accumulation tool
- \*without fully automated watershed delineation process screening basin coverage is a visual approximation followed by manual basin boundary adjustments

'Watersheds' i.e. basins color coded  
Blue = Np basin entirely within FPA  
Yellow = Np basin partially in given FPA

Analysis Output  
Np basin counts and acreage by lithology and percent canopy removed outside RMZ

Attachment A

Table 1. Summary of Mitchell Creek WAU Np Basin Criteria FPA Sample Analysis Results

Criteria	2018 CMER Np Study Criteria	FP2928083	FP2904743 & FP2916949	FP2926375	FP2905165 & FP2905153	Processing notes
<b>Geographic Range</b>	<i>Olympic Mountains Willapa Hills South Cascades</i>	<i>Willapa Hills</i>	<i>Willapa Hills</i>	<i>Willapa Hills</i>	<i>Willapa Hills</i>	
<b>Elevation</b>	<i>Olympic Mountains: &lt; 3,500ft Willapa Hills: No limit South Cascades: &lt; 4,000ft</i>	NA	NA	NA	NA	Extract DTM from basin boundary
<b>Stream Gradient</b>	<i>5-50% (3-27 deg)</i>	<i>tbd</i>	<i>tbd</i>	<i>tbd</i>	<i>tbd</i>	Clip and merge stream polyline from nearest fish stream intersection; Convert merged polyline to 3D; Create logitudinal profile
<b>Lithology</b>	<i>Competent (or any Lithology that could potentially be competent)</i>	<i>basalt flows and flow breccias, Crescent Formation</i>  <i>basic (mafic) intrusive rocks</i>	<i>marine sedimentary rocks</i>	<i>marine sedimentary rocks</i>  <i>tuffs and tuff breccias</i>	<i>basalt flows</i>	Intersect Basin with 100k geology
<b>Type Np Basin Size</b>	<i>12-49 ha (30 - 120 ac)</i>	<i>Basin 1: 34.5 Basin 2: 19.8 Basin 3: 12.3 Basin 4: 11.5 Basin 5: 4.8 Basin 6: 12.9 Basin 7: 3.3 Basin 8: 4.1 Basin 9: 9.2</i>	<i>Basin 1: 41.2 Basin 2: 13.4 Basin 3: 103.2 Basin 4: 112.2</i>	<i>Basin 1: 13.0 Basin 2: 5.8 Basin 3: 13.7 Basin 4: 10.8</i>	<i>Basin 1: 122.9</i>	Calculate geometry of basin polygon
<b>% Type Np Basin Harvested</b>		<i>Basin 1: 39.5% Basin 2: 94.4% Basin 3: 81.8% Basin 4: 76.3% Basin 5: 65.5% Basin 6: 64.2% Basin 7: 72.8% Basin 8: 79.5% Basin 9: 41.3%</i>	<i>Basin 1: 86.7% Basin 2: 88.4% Basin 3: 58.1% Basin 4: 24.1%</i>	<i>Basin 1: 55.5% Basin 2: 86.5% Basin 3: 94.4% Basin 4: 91.5%</i>	<i>Basin 1: 40.3%</i>	Calculate geometry of basin after removing RMZ derived from Canopy Height Model and areas outside FPA Harvest Boundary
<b>Stream Order</b>	<i>Second order stream (Strahler, 1952)</i>	NA	NA	NA	NA	Can be visually determined upon final results review
<b>Stream Network Geometry</b>	<i>Minimum of 75m (246ft) of stream between the F/N break and nearest downstream tributary intersection</i>					Calculate geometry of stream polyline from nearest fish stream intersection and stream type break
<b>Stand Age</b>	<i>&gt;70% of stands between 30 and 80 yo during time of harvest</i>	NA	NA	NA	NA	Obtain from ownership or potentially extrapolate from available historical aerial imagery
<b>Harvest Timing</b>	<i>Apr 2008 - Mar 2009</i>	2015	2004	2014/15	2004	Obtained from GFC, ownership, or additional available DNR records; <b>*Results in this analysis were derived from GFC</b>
<b>Area Owned</b>	<i>&gt;80% owned by single participating landowner</i>					Obtained available county parcel data
<b>FPA Landowner</b>		Timberlands Holding Co WA LLC	Pacific West Timber / Sierra Pacific Ind	Rayonier	Campbell Global / Pacific West Timber	
<b>FPA Acres</b>		102.1	76 / 126	88.95	69 / 53	
<b>FPA Expiration</b>		2017	2005 / 2007	2016	2005 / 2005	