Technical Comments on the Proposed Washington State Forest Practices Habitat Conservation Plan, 12 May 2005

Christopher A, Frissell, Ph.D.
Senior Staff Scientist
The Pacific Rivers Council
PMB 219, 1 Second Ave E., Suite C
Polson, MT 59860
Phone 406-883-1503, fax 406-883-1504
Email: hanfris@digisys.net

Introduction and Qualifications

In this document I offer critical technical comment pertaining to the consideration of sediment impacts, cumulative watershed effects, and adaptive management practices in the DEIS For the Proposed Issuance of Multiple Species Incidental Take Permits or 4(d) Rules Covering the Washington State Forest Practices Habitat Conservation Plan (HCP) (DEIS). I also address the question whether, in sum, the proposed HCP will increase or reduce the likelihood of survival and recovery of freshwater species of concern.

I am a research scientist in the field of freshwater ecology and conservation biology, with an emphasis on native species of trout and salmon in landscapes of the western USA. In the past decade I have worked as Research Assistant Professor at Oregon State University and the University of Montana, and Research Associate Professor and Affiliate Research Associate Professor at The University of Montana. I presently serve as Senior Staff Scientist with The Pacific Rivers Council, where I review conservation strategies and plans, develop scientific reviews and consensus scientist panel recommendations on policy-relevant issues, and pursue and publish research in freshwater ecology, watershed processes, and conservation biology. . I have Ph.D. and M.S. degrees in Fisheries Science from Oregon State University, and a B.A. in Zoology from The University of Montana.

I have published numerous journal articles, research reports, book chapters, and books on the subject of salmonid fish conservation biology and restoration ecology. My doctoral dissertation (*Cumulative Effects of Land Use on Salmon Habitat in Southwest Oregon Coastal Streams*, Oregon State University, 1992) and related research conducted as a Faculty Research Assistant at Oregon State University during 1987-1992 concerned the ecology and conservation management of salmon, steelhead, and trout of south coastal Oregon rivers and the relationship of habitat conditions to land use and natural disturbances. In the years following, I have conducted field research and regional conservation assessments for freshwater species and ecosystems in many coastal and interior river basins in the Pacific Northwest, including many areas in western, central, and eastern Washington.

I have served on technical and advisory committees for review and monitoring and evaluations of state and private forest practices, and for state-or federally-sponsored efforts for restoration of various inland and coastal salmonids and their habitats. I have published numerous scientific papers on threats, restoration and recovery needs and limitations for native trout and salmon in the context of land and watershed management. This experience has provided the opportunity to make in-depth inquiry into the pertinent scientific knowledge and take a hard look at the scientific bases of extant or proposed conservation policies for freshwater fishes and their ecosystems, including scientific bases for watershed and fish conservation measures of the Northwest Forest Plan, national forest plans, habitat conservation plans, habitat conservation agreements, species recovery plans, and state and private forest practices programs in several states. Much of my scientific work has long focused on the assessment and appropriate design criteria for conservation strategies for protection and recovery of native salmon, trout, and other freshwater biota and their habitats in western North America.

In preparation of this declaration I reviewed the extensive relevant material within the Washington State Forest Practices HCP and DEIS, as well as draft comments provided by other scientific experts reviewing the plan. I also referred to pertinent scientific literature and to my own relevant experience in the affected area.

I. <u>Sediment Entry into Streams and its Consequences for Survival and Recovery of Affected Species is not Sufficiently Accounted For</u>.

The DEIS (e.g. in Table S-1) recognizes that improved headwater stream buffers and other practices included in Alternative 4 would significantly reduce the delivery of sediment from logging activity and roads compared to that expected in the proposed action. Yet nowhere in the record is the incremental effect of that additional sediment on fish habitat, fish, and other species of concern noted. Even a cursory technical examination of this question (easily conducted using information from existing scientific studies) would reveal that the difference is far from trivial—rather the difference is a question of many tons of sediment annually pouring into streams across the entire permit area. This sediment demands accurate accounting, as it is a primary and nearly universal threat to both water quality and fish habitat and fish viability concerns. Moreover, specific criteria are necessary for ascertaining the likely biological effect of any given level of reduction of sediment. No such criteria are provided in these documents. Hence the conclusions appear to be arbitrary.

From the standpoint of sediment effects and risks, in other words the effect of the proposed and alternative practices on take is not quantified, even though the document states that the difference could be substantial. Equally critical, I can find no hint of any analysis provided to support the necessary assumption in the DEIS and HCP that sediment delivery levels anticipated under the proposed action are sufficient to ensure that survival and recovery of the species of concern are not impaired. These omissions of fact are baffling, given that as a matter of scientific analysis and disclosure, specific findings on these facts appear to be (by law and rule, and criteria of reason) essential to justify the permission of incidental take. It is clear to me that these omissions of basic scientific data represent a troubling failure to disclose information that is absolutely crucial to assess the reasoning and relative likelihood of biological success of the proposed action. Hence, in evaluating the effect and potential effectiveness of the HCP, a principle and widely recognized threat to species survival and recovery and ecosystem health has not been accounted for.

I. a. Sediment and Landslide Effects on Habitat and Biota

This DEIS is debilitated by a lack of specificity about the mechanisms of impact that link proposed management actions to fish individual and population responses. This is important in part because, as mentioned above, the DEIS itself admits that the proposed action adopts practices that allow more risk of impact and harm that would occur under other plausible, more protective actions (e.g., Alternative 4). The failure throughout the DEIS to specify mechanisms and causes of biological take sets the stage for further vagueness, denial, and erroneous (but seldom explicit) assumptions about causes and magnitudes of harm that cripple the ability of this DEIS to analyze differences among alternatives or to disclose the likely magnitude of impact from the proposed action. Here I will briefly review some available information about sediment and landslides on fish in streams. This information needs to be explicitly considered in the DEIS and accounted for in the design of actions in the HCP if harm to fishes and other biota of concern is to in fact be minimized. Harm from sediment is inexplicably glossed over and ill considered throughout the DEIS and is evident in the choice of practices in the proposed action, which would permit extensive, ongoing and new harm from sediment to occur.

One of the most biologically severe effects of the chronic disturbance and sediment delivery caused by forest roads and logging is increased suspended sediment in streams and rivers, with increased turbidity and reduced water clarity. Exhaustive biological research on this question, reviewed in Newcombe and Jenson (1996) and Newcombe and MacDonald (1991), have shown beyond doubt that increased sediment concentration or turbidity in virtually every instance has a harmful and cumulative effect on fish health, growth, and survival. Suspended sediment impairs the ability of fish to see and obtain food; it harms gill tissues and impairs respiration; it infiltrates stream gravels, reduces percolation of water and causes oxygen depletion in egg pockets in the streambed; and it has several other harmful physiological and behavioral effects on salmonid fishes (Newcombe and MacDonald [1991]). Stream temperature may increase in some circumstances as a result of these sediment-related channel changes,

When a landslide mass or debris originating from a landslide reaches a stream occupied by salmon and trout, adults and juveniles are directly killed as a result of entrainment or entombment in the moving mass. Other individuals may be displaced and pushed by the debris-charged flood wave into lateral areas off the main stream channel, where they are isolated from mainstream habitats and die as a floodwaters recede, or are preyed on by mammal or bird predators that subsequently find them in the receding waters where they have been entrapped. The landslide deposits bury and destroy habitats in the depositional zone and downstream. This depositional habitat loss is most pronounced in large pools, ponds, and secondary channel areas (Frissell 1992, Lisle and Hilton 1991), the very habitats most critical to winter survival of overwintering salmon and trout. Passage of sediment waves originating from landslides has been observed to be associated with extensive scour of streambed gravels deep enough to destroy eggs or larvae of salmon residing in the bed (Nawa et al. 1991).

A landslide that reaches a stream also causes an episode of very high concentrations of suspended sediment in the stream, both within the zone of deposition and for significant distance downstream. The visually detectable sediment plume typically exceeds several kilometers in length, and in the case of larger landslides, can extend all the way to the river mouth and to near shore areas, with severe sediment concentrations persisting from a minimum of several hours to many days after the initial event. Based on the relationships between exposure to suspended sediment and survival reported in classic paper by Newcombe and Jensen (1996), and suspended sediment concentrations commonly observed after landslide events, it is virtually certain, in my opinion, that landslide-generated turbidity plumes commonly cause acute lethal effects on salmon and trout (displacement, asphyxiation, respiratory impairment of eggs and larvae in the gravel) within and downstream of the deposition zone during the initial hours or days after the landslide occurs. This initial pulse of lethal impact is in the vast majority of cases followed by many days, weeks, or months of chronically or elevated suspended sediment concentrations known to cause adverse sublethal effects on salmonids of all life stages, including reduction in feeding rates, suppressed food supply, physiological stress, reduced growth rate, disruption or suspension of spawning behavior, impaired homing to spawning areas, and behavioral displacement of fish from affected habitats, (Newcombe and Jensen 1996). These are all direct impacts on fish, caused by sediment imported to the stream by the landslide or entrained by a debris flow triggered by a landslide. Newcombe and Jensen (1996) report evidence that relatively coarse-grained suspended sediments appear to cause more severe biological effects on fishes than finer sediments. It is important to recognize that landsliding (along with erosion of roads) is probably the principal mechanism by which high levels of coarse-grained suspended sediment are injected into Coast Range streams.

Landslide deposits (especially larger ones) that set up as discrete piles of material in narrow valleys commonly form steep steps that block upstream passage of adult salmon and trout, hindering access to spawning areas. Even very small steps (1-2 m high) formed by landslide debris can block the movement of juvenile salmonids that seek to move upstream to occupy beaver ponds or other over-winter habitats. These dams may only last months or until the next large flood, but some can persist for many years. Even the temporary dams can hinder access or block access to significant salmonid spawning, rearing, or sheltering habitats. The headwater stream habitats that are blocked in this way are today of disproportionate importance for sustaining remaining salmonid salmon populations, because of the long-term degradation of freshwater habitats in more downstream, lower-elevation areas. Such blockages are critical in that they block fish from accessing upstream areas not affected by, and that might serve as potential refuge from, the impacted areas within and downstream of the deposition zone of the landslide.

Landslides often damage and kill standing trees in the riparian zone through which they pass. This together with widening of stream channels by scour of channel margins and floodplains, and sediment depositions can lead to significant reduction of riparian of canopy cover and subsequent warming of streams that are already warmer than salmonids require for good growth and survival (NMFS 1997 Warming can reduce the availability of coldwater refuge habitats and potentially warm the mainstem river as a whole, because cold plumes no longer develop where the tributary hits the mainstem river. Summer stream warming as a consequence of landslides is virtually certain to cause adverse effects on growth and survival of salmon and trout.

Landslides that originate or pass through forested sites can bring large wood into streams, but any such event that rearranges the existing channel structure and disturbs the pre-existing configuration of wood debris in the stream will displace or kill larval, juvenile or adult salmon and trout that reside there. A landslide or debris flow event that rearranges or changes the loading of large wood or boulders causes near-term mortality or harm to individual fish through disruption of the stream channel and the habitat they occupy, regardless of net effect on wood loading of the stream. Wood delivered from landslides has much different orientation and ecological effect than other processes of recruitment of wood into streams from streamside forests. The more incremental and distributed process of recruitment of wood to streams from trees toppling from within a natural riparian forest into an existing stream channel is a much more stable and less disruptive process, one which salmon and trout may more easily adjust to with minor local movements or behavioral shifts. Fish cannot adjust easily to or always avoid the episodic, wholesale channel turnover and readjustment that occurs when a landslide delivers wood and large quantities of mobile sediment in a single massive event. Furthermore, much of the wood entrained in landslides does not end up in locations or positions where it will create fish habitat, but rather is buried or deposited in areas away from stream channels.

Although it is sometimes argued that landslide-deposited wood can be beneficial for salmon in the long run, this is only true if the fish are able to survive the near-term, severe and adverse impacts of habitat disruption and elevated sediment levels caused by the same landslides that introduce the wood. This is increasingly in question as reduced fish populations shrink into less well-distributed patches of habitat, mostly located in smaller, alluvial streams in headwater areas where landslide impacts are most direct, most frequent, and most severely expressed. Furthermore, compared to natural landslides, landslides originating in clear-cuts bring less debris into streams, and tend to have longer debris flow runout and deposition zones. By increasing the overall rate of landsliding, logging of landslide-prone areas greatly increases the probability that any particular headwater stream will be disrupted by landslide. These are some of the direct and acute impacts within the deposition and runout zones. In addition, the increased overall frequency of landsliding caused by logging landslide-prone hillslopes prolongs the duration and increases the magnitude of suspended sediment, exposing salmonids living in the watershed to the previously mentioned adverse biological effects.

I. b. Sediment Entering Headwater Streams

Under the proposed standard for streamside management in the HCP [226 Draft FPHCP – 4d] :

> … no harvest can occur within 50 feet of Type S and Type F waters in western Washington and within 30 feet of those typed waters in eastern Washington. Type Np riparian management zones are also 50 feet wide, but are not applied to the entire Type Np network. ….. The morphology of Type Np waters will largely determine the extent of bank erosion within unbuffered stream reaches.

This prescription utterly fails to account for the crucial roles of headwater streamside forests along "Type Np" streams as filters to reduce the delivery of sediment from upslope sources, such as landslides and yarding scars, and others. Considering simply natural landslide sources of sediment, the volume of sediment delivered to the stream network, hence transported downstream to fish-bearing segments, will be substantially increased above natural conditions by the activities allowed under the proposed HCP: removing, narrowing, or substantially thinning forest buffer vegetation alongside stream channels. This effect is magnified by anticipated additional management-related increases in landsliding, and by sediment delivery from roads, stream crossings, and felling, yarding, and other logging-related ground disturbance. It is not clear from the DES and HCP that any of these effects have been formally accounted or their biological significance recognized, despite verification in Table S-1 of the DEIS that sediment delivery from these sources will be higher in the proposed alternatives than in Alternative 4, because Alternative 4 prescribes more complete protection for headwater streams. *What is the magnitude of biological harm associated with this reduced level of headwater stream protection in the proposed HCP, and how do we know that level of harm does not further threaten the survival or hinder recovery of fishes and amphibians that are already harmed by past and ongoing impacts? If Alternative 4 riparian provisions are recognized to be more effective at protecting habitat, where is the information that explains why and how they are not "practicable?"* (In fact they resemble practices currently in widespread use on federal lands.) These must be disclosed to accurately evaluate the differences among the alternatives, and to evaluate the biological effectiveness of the proposed actions.

I .c. Sediment Delivered from Roads

Roads are well-known to have pervasive, multiple, and often overwhelming effects on freshwater ecosystems (Furniss et al. 1992, Trombulak and Frissell 2000, Gucinski et al. 2001). Roads have many physical and biological effects that can severely and permanently harm streams and their biota. The many mechanisms by which roads exact this harm are reviewed in Trombulak and Frissell (2000) and Gucinski et al. (2001). Roads are an important cause of accelerated landsliding on many slope types (Gucinksi et al. 2001, Montgomery 1994). However, across the range of types forest lands covered by this proposal, the more prevalent and critical cause of harm to streams is the diversion of runoff and acceleration of erosion by upland or riparian roads, and the subsequent transfer of that sediment via road drainage systems and its injection into surface waters at stream crossings (Hagans et al. 1986, Frissell 1992, Wemple et al 1996, Frissell et al. 1997). Such effects elevate sediment levels both chronically and episodically. Most existing forest roads were not built to standards designed to prevent these effects, and in fact complete prevention of these effects is impossible (Trombulak and Frissell 2000). Adverse effects can be reduced to varying degrees through careful road location, design, and execution (e.g., Madej et al. 2001, Weaver et al. 1994, Furniss et al. 1991). In most cases, substantial reduction of sediment generation and delivery from existing roads cannot be accomplished via simple generic application of "Best Management Practices (BMPs) (Espinosa et al. 1997, Trombulak and Frissell 2000), but only through considered evaluation of road locations and conditions, followed by substantial modification or obliteration of specific road segments based on their environmental harm balanced against specific management need (Switalski et al. 2004, Gucinski et al. 2001, Luce et al. 2001, Madej 2001, Wemple et al. 1996, Weaver et al. 1994).

Net road density (expressed in units such as miles of road per square mile of drainage area) has proven to be an effective indicator of the ecological impact of roads in watersheds, and has been shown in several studies to correspond approximately linearly to in-stream conditions and biological success. General observed relationships between road density and fish population and habitat status hold true regardless of variation among road segments in their condition, design, location, and presumed level of impact (Trombulak and Frissell 2000). For example, from the Federal Register Notice the listed bull trout as a threatened species [Federal Register: November 1, 1999 (Volume 64, Number 210)][Rules and Regulations][Page 58909-58933]:

> Bull trout were less likely to use highly roaded basins for spawning and rearing, and if present, were likely to be at lower population levels (Quigley and Arbelbide 1997). Quigley et al. (1996) demonstrated that when average road densities were between 0.4 to

> 1.1 km/km^2 (0.7 and 1.7 mi/mi^2) on USFS lands, the proportion of subwatersheds supporting ``strong'' populations of key salmonids dropped substantially. Higher road densities were associated with further declines.

And also highly relevant to HCP provisions on private forest lands (p. 58922):

> When USFS lands were compared to lands administered by all other entities at a given road density, the proportion of lands supporting ``strong'' bull trout populations was lower on lands administered by other entities. Although this assessment was conducted east of the Cascade Mountain Range, some effects from high road densities may be more severe in western Washington. Higher precipitation west of the Cascade Mountains increases the frequency of surface erosion and mass wasting (USDI et al. 1996b). Limited data concerning road densities are available for the Coastal-Puget Sound DPS. It is known, however, that two bull trout subpopulations (lower Dungeness River-Gray Wolf River and Chester Morse Reservoir) occur in basins with road densities greater than 1.1 km/km^2 (1.7 mi/mi^2), and the effects of sedimentation from high road density on aquatic habitat is likely a contributing factor to the ``depressed'' status of these two ``native char'' subpopulations. Because basins in portions of the Queets River drainage contain high road densities, ranging from 1.5 to 3.0 km/km^2 (2.4 to 4.8 mi/mi^2 (ONF 1995a; Cederholm and Reid 1987), we believe that the Queets River ``native char'' subpopulation is affected by high road density.

In additional published research, Baxter et al. (1999) showed that bull trout populations among a group of Montana streams showed the capacity for recovery (via increases in spawning population counts over time) only in streams draining watersheds with low road densities. Streams in areas of road density greater than about 2-3 mi/mi^2 showed little or no capacity for recovery even where other factors in the life cycle of the fish (e,g,, harvest, migration survival) had improved. This is clear and direct evidence of habitat limitation associated with forest practices in headwater areas, and it strongly supports the hypothesis that forest road density is a useful measure of habitat condition. *Failing to cap or reduce road densities to relatively low levels threatens salmonid populations with extinction and clearly curtails their ability to recover.*

To put these concerns in perspective, it is useful to examine the road density data for covered lands in Washington presented in Table D-1 of the DEIS, Appendix D. Documentation provided for these figures indicate that these numbers likely underestimate actual road density substantially, because many existing roads are not mapped, and many new roads have been built since the mapping was compiled in 1996. The average road density reported in Table D-1 for areas within covered lands in Washington spans a range (excluding one outlier with no roads) from 1.8 to more than 6 mi/mi^2. Note that relative to the sources above, *all* of these areas exceed the road density at which harm to salmonid fishes is detectable, and the majority areas exceeds the road density known to obstruct population recovery for bull trout and where population levels of most salmonids are depressed to levels at which they are vulnerable to imminent extinction. Yet the *proposed actions include no provisions to restrict future increases in road density, nor any that ensure that future road density will decrease to levels necessary to foster recovery.*

RMAP is the primary mechanism identified in the proposed action to provide for road maintenance, upgrade, and reduction identified. RMAP does establish time frames for reporting and provides some apparent impetus for applying improved practices to existing and new roads. However, the analysis of effect of road management practices rests of assumption that implementation of forest practices under RMAP standards will eliminate all effects of roads. This assumption is unrealistic and indefensible. Even the most ideal practices (short of the ideal of not building a road in the first place) can only reduce the adverse effects (Espinosa et al. 1997, Trombulak and Frissell 2000, Madej 2001, Switalski et al 2004), and where road density is moderate to high, even fully-compliant roads will cause some sustained level of impact, including increased peak flows and mobilization and delivery of sediment in excess of natural levels (see also citations in comment by Jon Rhodes on this proposal). Unless there are standards that mandate or encourage reduction of road density and cap road density where it is currently low (e.g., *at least* equivalent to Alternative 4), i.e, *to structurally reduce the spatial extent of the road network infrastructure on a large scale*, continued loss of habitat and take will occur on an ongoing basis, over sustained times periods, and in virtually all watersheds.

I.d. Exemptions for the Most Damaging Roads May Render Road Measures Ineffective and Preclude Recovery.

The small landowner exclusion in the proposed action ensures that some watersheds will see continuing impacts of substandard roads on a significant portion of the landscape. The effect of this exclusion on habitat conditions and fish populations needs to be evaluated and disclosed, as severe impacts from roads even on a small portion of the landscape can nullify any benefit that accrues from actions elsewhere. In many instances, the most poorly-designed, badly maintained, and most harmful roads are associated with small private ownerships. *What is the magnitude and distribution of the harm associated with the small landowner exclusion, and how do we know it is incidental and not of sufficient magnitude to impair recovery in many watersheds?*

Moreover, the failure to adopt any provision to force repair of abandoned or orphan roads (FPHCP 4c-2 p. 211) could also offset or severely limit any possible benefit derived from RMAP. The sole justification offered is that state forest practices regulatory authority is not presently available for forest roads not operated since 1974. That fact, however, does not exclude landowners from liability for harm caused by orphan, abandoned, and unmaintained roads under the ESA, Clean Water Act, and other pertinent authorities. *Adopting an HCP that does not include provisions ensuring the repair and restoration of such roads in effect immunizes landowners from future liability.* In effect the proposed HCP is doubly counterproductive to habitat and salmon recovery in that it fails to provide any new incentive for restoration of orphan roads at the same time it eliminates existing incentives. How much take is occurring from the failure to properly restore, maintain, or "put to bed" orphan roads? The HCP and DEIS fail to pose or answer this critical question. *In many watersheds, the impact from orphan and unmaintained roads alone may be sufficient to jeopardize populations of fishes and amphibians, and preclude recovery of listed and other sensitive species.*

II. The HCP Provides no Process for the Effective Regulation of Cumulative Watershed Effects and No Analysis of the Consequences of this Omission

As documented by many sources (e.g., FEMAT 1993, Spence et al. 1996) and mentioned in the DEIS, salmon and trout habitat throughout Washington state is extensively impaired by historical and persistent loss of channel structure and scarcity of pools, elevated summer stream temperatures due to canopy reduction, depletion of large woody debris that forms pools, high levels of suspended sediments and deposited fine sediments in many areas. Relatively few pockets of better-quality salmonid habitat remain, and these are increasingly isolated, and are associated with smaller alluvial streams nested within steep, headwater drainages in forested watersheds. An extensive history of private land logging has contributed to a situation in which remaining salmon and trout are highly vulnerable to the effects of present and future logging and landsliding activity and the sediment delivery and other impacts that result.

According to the DEIS [Draft EIS Cumulative Effects 5-5]:

> As a result of timber harvest and other activities during the periods with less restrictive regulations, the condition of riparian areas on State and private lands is now dominated by early and mid-seral vegetation (subsection 3.7.1.7, Current Condition of Riparian Areas). Similarly, as a result of extensive road development and harvest on unstable slopes, sediment-related impacts have occurred in many watersheds (subsection 3.4.2.3, History of Forest Practices Affecting Erosion and Sedimentation). In addition, many other land uses discussed above have added to adverse impacts that have occurred due to past actions. Although the sources of many of

> these problems have been corrected, many riparian areas and stream systems on forestlands have not yet fully recovered from forest practices conducted prior to the 1974 Washington Forest Practices Act. Some resources, such as large woody debris (LWD), may require many additional decades to fully recover.

I agree with those conclusions, and they provide a critical and explicit context by which new practices must be judged. However, the conclusions can and should be more explicit. Recovery from past actions and events is not ensured, may be arrested in many areas, and can be easily impaired by imposing additional impact from new actions. I.e., past impacts have compromised the resilience of the present ecosystems, and as a result, even relatively small actions may have proportionally large adverse effects, often expressed as eliminating, hindering, or delaying natural recovery processes.

Beyond this terse admission of history, however, the so-called cumulative effects analysis in Chapter 5 of the DEIS is devoid of meaningful content. It fails to account for and discuss the real biological consequences of this legacy of harm and loss of habitat and population productivity from past actions. It does not address how long the legacy of past actions is likely to continue to threaten habitat and populations, not how long it will reduce their resilience to future impact. It simply 1) makes unjustified assumptions that multiple regulatory mechanisms and policy or planning overlays other than this HCP are (or will be) effective (though a fact not disclosed in the DEIS that should be is that virtually all of these other mechanisms assume or admit they cannot effectively alter forest practices on private lands), 2) assumes (without citation or data) that other in-place HCPs are immune from contributing to cumulative watershed effects, and 3) argues, also completely without support or citation, and in gross error, that forest lands have a lesser role in maintaining water quality when the spatial extent of commercial forest land on the landscape is smaller.

In summary, there is no substantive content to the so-called "cumulative effects" analysis in the DEIS. None of the three major premises (as listed in the previous pragraph) are substantiated with analysis or references, and the section is rife with logical and factual errors and internal contradictions that render it useless and misleading. There is no explicit evaluation of ecological outcomes or the consequences for populations and habitat of species of concern. This entire section should be scrapped, as it does not qualify either as credible analysis or as public disclosure, unless a list of contrived and unchecked distortions, fabrications based on wishful thinking can be considered disclosure. The agencies utterly failed to take a "hard look" at these several grand premises about the scope and effectiveness of extant regulatory mechanisms. Given that many of these programs have been in place for years, evaluations of their scope and record of success should be (and are) available.

Although the DEIS crows about the value of past watershed analyses in reducing the levels of cumulative watershed effects from forest practices, the adoption of the proposed action appears in fact to eliminate any incentive that landowners may have had to pursue watershed analysis. As a result, it appears the proposed HCP actually undercuts the one potentially effective mechanism that exists to assess and develop prescriptions to reduce cumulative watershed effects that result from multiple actions across a watershed over time.

Even if the landslide reduction protocol in the proposed action is perfectly implemented (and this is unlikely) human-caused landslides will inevitably occur as a result of logging on unrecognized unstable slopes (moderate risk or metastable slopes). Hence *it is a fact that there will be an increase over natural landslide rates, and there will be effects-- there is no way to ensure no increase in sediment and other effects from landslides will occur, with these or any rules that allow operations over a majority of the landscape.* He criteria for landslide risk recognition and reduction discussed in the draft HCP and DEIS are marked by inadequate attention to deep-seated features that may be reinitiated or accelerated by increased soil moisture as a consequence of tree removal on site or up-slope. These features do *not* all occur in glacial-origin deposits materials. Recent implementation history indicates these risk areas are not receiving due protection (commonly only "active" portions are removed from harvest) and as a result, harvest-caused landslide increases *will* occur. Where acres of these slope features are large, at least a doubling over natural slide rates is possible, if not likely, as a result of forest management under this proposed action. The DEIS Fails to disclose and analyze the likely effect of this acceleration of landslide rates, and the HCP does not identify effective mitigation measures.

As another example, the per-owner restriction on acres harvested for reducing rain-on-snow effects on peak streamflows (FPHCP 43-c p.212, i.e., the"green-up harvest rule"), does not in fact effectively cap cutover area in any watershed where ownership is mixed. Most large watersheds include multiple private landowners. With owner pursuing the rule as it applies to him or herself, the net. Watershed-wide outcome can be a cutover area substantially larger than the rule intends. As a result, this "green-up" provision does not effectively prevent conditions from occurring on the ground that are known to be associated with a moderate to high likelihood of cumulative watershed impacts from rain-on-snow peak flow increases. The per-owner rule was presumably shaped to presumably foster easier application and equity, but the obvious fact that that this administrative configuration of the rule undermines its ability to achieve the intended ecological and hydrologic outcome on the ground is not evaluated or disclosed in this DEIS. It does not take, and should not require, a years-long adaptive management study for the responsible agencies to recognize and accounted for such simple facts biophysical in a credible and defensible way. Thee DEIS reveals an acute need for a *priori* analysis of ecological and biological consequences *before a long-term permit is granted.*

III. Provisions of the HCP in Sum are Clearly Not Adequate to Ensure Survival and Recovery

Fully considering the comments above, and other technical concerns not explicated herein, in my judgment the proposed HCP utterly fails to identify appropriate measures to minimize take and prevent harm from forest practices.. The proposed action represents an ill-contrived, poorly-evaluated collection of management measures, each of which comes with loopholes big enough for significant widespread, and long-lasting harm to occur, and fails to provide sufficient assurances that existing harms from past actions are ameliorated before new harms occur, The proposed adaptive management framework lacks specificity, is utterly unconstrained by appropriate allocation of risk and burden of proof. The adaptive management framework in this proposed HCP simply offers a rationale for continuing risky practices everywhere, until it can be shown those practices are contributing to harm. This is the same as allowing teenagers to smoke because you won't be able to tell for sure if each individual has increased risk of lung cancer until he or she reaches middle age. It is illogical, foolish, and a recipe for harm.

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