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Via EPA's Rulemaking Docket, http:// www.regulations.gov.

Mr. Prasad Chumble
EPA Headquarters
Office of Wastewater Management
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Docket No. EPA–HQ–OW–2015–0668; comments and petition to EPA to adopt a national regulatory program to address water quality impacts from forest roads.

Dear Mr. Chumble:

Thank you for the opportunity to comment on the need for the U.S. Environmental Protection Agency to regulate and limit stormwater discharges from forest roads to protect water quality. These comments are submitted on behalf of the Northwest Environmental Defense Center, WildEarth Guardians, Waterkeeper Alliance, Natural Resources Defense Council, Environmental Defense Center, Northwest Environmental Advocates, Wild Fish Conservancy, Environmental Protection Information Center, Klamath Forest Alliance, Oregon Wild, Center for Biological Diversity, Klamath-Siskiyou Wildlands Center, Olympic Forest Coalition, Conservation Congress, Oregon Coast Alliance, Rogue Riverkeeper, Snake River Waterkeeper, Friends of the Bitterroot, Klamath Riverkeeper, Atlantic States Legal Foundation, Inc., Friends of the Wild Swan, Washington Chapter of Great Old Broads for Wilderness, Swan View Coalition, Conservation Law Foundation, Friends of the Bitterroot, Sarah and Andy Roubik, Larry Campbell, William J. Nelson, and James R. Olsen (collectively "the Conservation Groups") in response to the request for public comments published in the Federal Register on November 10, 2015 (80 Fed. Reg. 69653) and December 17, 2015 (80 Fed. Reg. 78728).

In addition to this comment letter, on February 5, 2016, we sent EPA a compact disc containing journal articles, studies, reports and other information pertinent to this issue. We are also re-submitting the comments we submitted to EPA on June 22, 2012 and October 4, 2012 in response to EPA's prior Federal Register notices seeking comments about the need to regulate stormwater discharges from forest roads—*see* 77 Fed. Reg. 30473 (May 23, 2012) and 77 Fed. Reg. 53834 (Sept. 4, 2012)—because those comments provide detailed information about how forest roads adversely impact water quality and how a national regulatory program could limit those impacts. Please include these comments, the June 22 and October 4, 2012 comments, and the materials we submitted to EPA via courier on February 5, 2016, in the administrative record for this matter (Docket Number EPA-HQ-OW-2015-0668). Please also respond to each comment in writing and alert the Washington Forest Law Center, the Crag Law Center, and each of the Conservation Groups in writing if you take any action in response to these comments.

Before responding to EPA's latest request for public comment, we wish to express our disappointment with EPA's decision not to respond to the comments members of the conservation community submitted on June 22, 2012 and October 4, 2012 in response to EPA's prior requests for comment. Those comments provided EPA with plenty of evidence that forest roads adversely impact water quality and that existing state and federal programs do not adequately protect water quality, public drinking water supplies, or aquatic species from those impacts. Instead of responding to those comments and creating a regulatory program for stormwater discharges from forest roads, as requested and as required by the Clean Water Act, EPA ignored those comments and caused additional delay when what is plainly needed is an effective federal policy to address the widespread and well-known impacts from forest roads.

Given EPA's longstanding refusal to regulate stormwater discharges from forest roads—a refusal that goes back to the mid-1970s—with this letter the undersigned Conservation Groups hereby petition EPA pursuant to the Administrative Procedure Act, 5 U.S.C. § 553(e), to create an effective, enforceable, and uniform federal program regulating forest roads to protect water quality, public drinking water supplies, and aquatic species. As EPA has recognized for years, "[s]tormwater discharges from logging roads, especially improperly constructed or maintained roads, may introduce significant amounts of sediment and other pollutants into surface waters and, consequently, cause a variety of water quality impacts." 77 Fed. Reg. at 30476. The time has come for EPA to address this problem by adopting a uniform federal regulatory program that limits water quality impacts from forest roads.

Specifically, in order to protect beneficial uses and meet the requirements of 33 U.S.C. § 1342(p)(6), EPA should adopt a regulatory program for forest roads that includes, or requires state programs to include, the following essential elements: 1) an inventory of all roads (including unauthorized, unused and temporary roads); 2) a plan for action; 3) a schedule for completion; 4) performance measures that achieve water quality standards; 5) accountability measures through enforcement (*e.g.*, civil penalties); 6) a monitoring program; and 7) adaptive management. EPA's program should also include performance standards that are actually linked to water quality so EPA and the public can be sure EPA's program effectively protects water quality.

I. Legal Background.

EPA's authority to regulate forest road pollution derives from sections 402(p)(5) and (6) of the Clean Water Act, 33 U.S.C. §§ 1342(p)(5) & (6). Section 402(p)(6) requires EPA to issue regulations that "designate stormwater discharges … to be regulated to protect water quality and [to] establish a comprehensive program to regulate such designated sources." 33 U.S.C. § 1342(p)(6); *see also* 33 U.S.C. § 1342(p)(5)(C). Any national regulatory program must meet certain requirements: "The program shall, at a minimum, (A) establish priorities, (B) establish requirements for State stormwater management programs, and (C) establish expeditious deadlines." *Id.* "The program may include performance standards, guidelines, guidance, and management practices and treatment requirements, as appropriate." *Id.*

Water quality standards are defined as the designated beneficial uses of a water body, in combination with the numeric and narrative criteria to protect those uses and an antidegradation policy. 40 C.F.R. § 131.6. The Clean Water Act requires numeric criteria adopted in water quality standards to protect the "most sensitive use." 40 C.F.R. § 131.11(a)(1). However, since that is not always possible, the task of evaluating whether standards have been met also requires an assessment of the impacts to designated beneficial uses. In *PUD No. 1 of Jefferson County v. Washington Department of Ecology*, 114 S. Ct. 1900, 1912 (1994), the U.S. Supreme Court underscored the importance of protecting beneficial uses as a "complementary requirement" that "enables the States to ensure that each activity – even if not foreseen by the criteria – will be consistent with the specific uses and attributes of a particular body of water." The Supreme Court explained that numeric criteria "cannot reasonably be expected to anticipate all the water quality issues arising from every activity which can affect the State's hundreds of individual water bodies." *Id.*

EPA regulations implementing section 303(d) of the Clean Water Act reflect the independent importance of each component of a state's water quality standards:

> For the purposes of listing waters under §130.7(b), the term "water quality standard applicable to such waters" and "applicable water quality standards" refer to those water quality standards established under section 303 of the Act, including numeric criteria, narrative criteria, waterbody uses, and antidegradation requirements.

40 C.F.R. § 130.7(b)(3). In short, EPA must consider *all* elements of water quality—including narrative criteria and including designated beneficial uses—as it evaluates whether to adopt a regulatory program for forest roads.

In doing so, EPA can learn much from other parts of the Clean Water Act: while the National Pollution Discharge Elimination System (NPDES) program has been remarkably successful in reducing surface water pollution from regulated point sources, nonpoint source programs under sections 208 and 319 of the Clean Water Act are widely acknowledged to be ineffectual. *See, e.g.*, R. Bryant McCulley, *The Proof Is in the Policy: The Bush Administration, Nonpoint Source Pollution, and EPA's Final TMDL Rule*, 59 WASH. & LEE L. REV. 237 (2002) ("noting that "[d]espite its congressional fanfare, the management programs of § 319 have suffered from many of the same problems that prevented § 208 from being successful in combating NPS pollution."). The failure of the nonpoint programs has been ascribed primarily to the lack of mandatory monitoring requirements, the lack of agency and citizen enforcement actions, and the lack of penalties for noncompliance.

EPA can also learn much from the failure of the many existing state, federal, and tribal programs to limit the adverse water quality impacts caused by forest roads. As EPA discusses in the Federal Register notice requesting comment on these issues, many jurisdictions have programs in place that attempt to address impacts from forest roads. *See* 80 Fed. Reg. 69653, 69657-69660. But as EPA has recognized, and as the conservation community explained in detail in the June 22 and October 4, 2012 comments to EPA, forest roads across the country still adversely impact water quality, drinking water supplies, and aquatic species. In other words, it is one thing for a state to have a program addressing forest roads; it is quite another for a state to have a program that actually limits the adverse water quality impacts caused by forest roads. EPA should only rely on existing programs if there is actual water quality data proving that such programs eliminate water quality impacts from forest roads and protect designated beneficial uses. Without that data, there is no basis for EPA to conclude that existing programs protect water quality, or that there is no need for EPA to regulate forest roads under the Clean Water Act

II. Summary of Impacts: EPA Must Regulate Stormwater Discharges from Forest Roads Because They Continue to Adversely Impact Water Quality.

The construction, use, maintenance, and existence of forest roads detrimentally affects stream health and aquatic habitat by increasing sediment delivery and stream turbidity (Furniss et al. 1992, Trombulak and Frissell 2000, Gucinski et al. 2001). In the western United States, roads are the primary source of sediment from forest management activities (Megahan and Ketcheson 1996). Much forestry-related sediment is delivered episodically via stormwater runoff or road-related landslides. Roads, road construction, road use and logging activities all cumulatively elevate peak flows, erosion, sediment delivery, turbidity, and sedimentation (Meehan 1991, Rhodes et al. 1994, UFSF and USBLM 1997a, Beschta et al. 2004).

Both stream networks and road networks are spatially distributed across the landscape. Where they intersect, that is, where roads cross streams, there is always an increased risk of pollution entering streams, including sediment, temperature, and chemicals related to transportation and weed control. Sediment is a particular problem on unpaved logging roads. Many road/stream crossings are facilitated by culverts that can become blocked by debris during storm events, which can result in saturation and mass failure of the road fill.

Topographic location of roads has a large impact on road impacts. Roads located in the riparian area or floodplain interfere with normal water flow paths and floodplain functions, resulting in channelization, erosion of the stream bed and banks, increased turbidity, and long-term changes in stream channel configuration and temperature. Roads located on steep side slopes are typically constructed using cut-and-fill or cut-and-haul methods which often cause interception of slow subsurface water flow, converting it to rapid surface run-off. The road drainage network then acts like an adverse extension of the stream network. On a sub-watershed basis, this results in significant increases in peak flows during storm events. Unnaturally high peak flows result erosion of the stream bed and banks and increased suspended sediment and turbidity, and long-term changes in stream channel configuration and temperature.

Roads located on steep slopes or next to streams pose the greatest risk of sediment delivery and adverse impacts to stream habitats. The use of the road is a factor with some studies suggesting that "the single greatest factor affecting generation of sediment from road surfaces is the amount of traffic." (Reid and Dunne 1984). The greater the disturbance area and the closer to streams, greater is the risk of sediment delivery. Best Management Practices, stream crossings, age of the road, and type of road construction also are important variables.

Forest roads impact beneficial uses of waterways through a variety of means, namely:

- Road use and inadequate maintenance leads to excessive fine sediment entering stream channels.
    - Most road surfaces are made of erodible material. Exposure to rainfall leads to surface runoff, which carries the sediment into streams (Sugden and Woods 2007).
    - Surface erosion is strongly related to maintenance – less maintenance results in increased delivery of fine sediment to streams (Weaver and Hagans 1999, Reiter et al. 2009).
    - Changes in road drainage (often brought on by heavy use) can increase erosion and sediment delivery (Brooks et al. 1991, Sheridan 2007).
    - Culverts – if too small to meet storm capacity – can get plugged. Water then overtops the road, which can divert streamflow onto the road surface and/or can erode fill (Best et al. 1995, Bloom 1998, Wemple et al. 2001).
    - Excess suspended sediment can interfere with drinking water treatment (Dellasala et al. 2011).
    - Fine sediments can adversely affect fish. Reproductive success is reduced when sediment interrupts the ability of eggs to metabolize. Young fish that have not emerged from the interstitial spaces of spawning gravel areas can be smothered. And the abundance and quality of spawning substrate can be severely affected by sedimentation. (Cederholm et al. 1980, Eaglin and Hubert 1993, Endicott 2008).

- Roads can potentially increase the frequency of landslides – depositing large amounts of debris into streams.
    - As debris pours into the creek, it fills pools, aggrades the streambed, and covers spawning gravels suffocating fish (Trombulak and Frissell 2000).
    - Roads built with side-cast techniques and mid-slope roads on steep ground (that used unstable fill) are usually the most prone to failure (USDA FS 2000a, Swanston 1991).
    - Large volumes of material from landslides can be deposited to streams and can scour channels for some distance (Weaver and Hagans 1999, Endicott 2008).

- Roads can alter stream morphology – which can result in increased water temperature.
    - Roads can intercept subsurface flow and re-route the water through ditches, cross-drains and stream crossings (USDA FS 2000a). During storms, this system operates like an extension of the stream network - increasing peak flows (Wemple et al. 1996).
    - Changing peak flows can alter the channel dimensions of the stream, often making them wider and/or shallower, which can increase stream width-to-depth ratios and lead to increased water temperatures (USDA FS 2000a).
    - Roads in valley bottoms can restrict the area where the stream can move (meander). Stream velocities could increase which then leads to increased bank erosion (USDA FS 2003).

- Roads often contain undersized or poorly built culverts at stream crossings—resulting in blocked or restricted passage for aquatic organisms.
    - Culverts—the most widely used crossing type—primarily prevent upstream migration, reducing spawning habitat for aquatic organisms (including threatened and endangered fish). If the culvert has a poor outlet, fish can be injured/killed as they move downstream (Clancy and Reichmuth 1990, Cupp et al. 1999, Hendrickson et al. 2008).

As briefly outlined above, it is well-established in the scientific literature that sedimentation from forest roads has a major impact on beneficial uses of our nation's rivers and streams. According to the *2008 National Level Assessment of Water Quality Impairments Related to Forest Roads and Their Prevention by Best Management Practices Final Report,* "Among all pollutants measured in streams, sediment has the largest effect on stream biota" (Endicott 2008).[1] Sedimentation has major impacts on stream water quality and fish habitat. The health of a stream depends greatly on the ability of fish and other organisms to survive. Therefore, sedimentation is a major concern for the overall health of forest streams.

In EPA's 2009 water quality report to Congress, EPA noted that sediment continues to be identified as one of the top 10 causes of impairments in assessed rivers and streams (US EPA 2009). The "Wadeable Streams Assessment" included in that report concludes that excess streambed sediments (and nutrients) have the highest impact on biological condition (US EPA 2009). The U.S. Forest Service has also identified sediment (turbidity and bedload) to be one of the most significant water quality problems on national forests (USDA FS 2000b). EPA acknowledges that pollution from forestry and related activities is among the "top twelve probable sources of impairment for rivers, streams, and coastal shorelines." *Id.* Knowing these effects of forest roads, EPA would be remiss to not address the issue by adopting a national regulatory program for forest roads.

III. Some Problems with "Best Management Practices."

Best management practices ("BMPs") are methods, techniques, treatments, or activities that are used to work towards objectives. For forest roads, BMPs are supposed to address erosion and sediment delivery to streams that results from the building, maintenance, and use of those forest roads (Endicott 2008, NCASI, 2012). The theory is that the implementation of these forest road BMPs will reduce the erosion and sediment delivery that would otherwise pollute the relevant waterway. Addressing these impacts effectively is extremely important, particularly if a regulatory program is structured around BMPs, as most of the water quality problems that arise from logging operations are caused by poorly designed and constructed roads and skid trails (Nolan et al. 2015).

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[1] Endicott, D. 2008. National Level Assessment of Water Quality Impairments Related to Forest Roads and Their Prevention by Best Management Practices – Final Report (Prepared for the U.S. Environmental Protection Agency, Office of Water, Office of Wastewater Management Permits Division) (Contract No. EP-C-05-066, Task Order 002).

One cannot draw conclusions about water quality from BMP compliance rates, however, nor can one evaluate water quality in a particular stream reach by reviewing the extent to which a given logging operation complies with forest practices regulations. As discussed by Endicott on page 70 of that report, BMPs are "largely procedural, describing the steps to be taken in determining how a site will be managed," but they lack "practical in-stream criteria for regulation of sedimentation from forestry activities." (Endicott 2008 at p. 70). The selection and implementation of BMPs are often "defined as what is practicable in view of 'technological, economic, and institutional consideration.'" *Id*. at 72. The ultimate effectiveness of the BMPs are therefore impacted by the individual land manager's "value system" and the perceived benefit of protecting the resource values as opposed to the costs of operations. Endicott specifically notes that although BMPs may generally be able to mitigate pollution from forestry activities, the "exception to this generalization is unstable locations in key problem areas of the Pacific Northwest (Idaho, northwest California, western Oregon and Washington, and southeast Alaska) where conventional BMPs for road construction may not be sufficient to prevent adverse effects on stream channel and fish habitat (Binkley and MacDonald 1994)." *Id*. at 91.

There is additional scientific work documenting that BMPs are ineffective at addressing impacts, in particular cumulative impacts from continued logging and road density. Espinosa et al. 1997 demonstrated that aquatic habitats were severely damaged by roads and logging in several watersheds despite BMP application.[2] The authors further noted that the blind reliance on BMPs in lieu of limiting or avoiding activities that cause aquatic damages serves to increase aquatic damage. Even activities implemented with somewhat effective BMPs still often contribute negative cumulative effects.[3] MacDonald and Rittland 1989 concluded that roads typically double suspended sediment yield even with state of the art construction and erosion control and that suspended sediment contributions from surface erosion, alone, from roads in the absence of mass failure, are typically in the range of 5 to 20 percent above background and remain at elevated levels for as long as roads are in use.[4] Kattelmann 1996 concluded that BMPs could do little to reduce sediment delivery from roads at stream crossings.[5] The synthesis prepared for EPA by Endicott, as well as a body of scientific work that discusses the limitations

[2] Espinosa, F.A., J.J. Rhodes, and D.A. McCullough. 1997. The failure of existing plans to protect salmon habitat on the Clearwater National Forest in Idaho. J. Env. Management 49: 205-230.

[3] Ziemer, R. R., J. Lewis, T.E. Lisle, and R.M. Rice. 1991b. Long-term sedimentation effects of different patterns of timber harvesting. In: Proceedings Symposium on Sediment and Stream Water Quality in a Changing Environment: Trends and Explanation, pp. 143-150. International Association of Hydrological Sciences Publication no. 203. Wallingford, UK. *See also* Espinosa et al. 1997.

Rhodes, J.J., D.A. McCullough, and F.A. Espinosa, Jr. 1994. A Coarse Screening Process for Evaluation of the Effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. CRITFC Tech. Rept. 94-4, Portland, OR.

Beschta, R.L., J.J Rhodes, J.B. Kauffman, R.E. Gresswell, G.W. Minshall, J.R. Karr, D.A. Perry, F.R. Hauer, and C.A. Frissell. 2004. Postfire Management on Forested Public Lands of the Western USA. Cons. Bio., 18: 957-967.

[4] MacDonald, A. and K.W. Ritland. 1989. Sediment Dynamics in Type 4 and 5 Waters: A Review and Synthesis. TFW-012-89-002, Wash. Dept. of Natural Resources, Olympia, Washington.

[5] Kattelmann R. 1996. Hydrology and water resources. Pages 855–920 in SNEP Science Team, Sierra Nevada Ecosystem Project Final Report to Congress: Status of the Sierra Nevada, vol. 2. Davis: Centers for Water and Wildland Resources, University of California. Wildland Resources Center Report no 39.

of BMPs, particularly in the Pacific Northwest, demonstrates that BMP prescriptions for forest roads, in the absence of more, do not sufficiently protect water quality.

Indeed, any forest road BMP program that does not base road management decisions on *pertinent water quality data* is necessarily deficient because complying with road BMPs simply does not equate to protecting water quality. (Endicott 2008 at p.166). Only pertinent water quality data can demonstrate that road management BMPs actually prevent adverse water quality impacts. Specifically, one can only confirm that BMPs in fact eliminate adverse water quality impacts caused by the roads if one measures water quality impacts from roads, institutes management changes in response to adverse water quality impacts caused by roads, and then monitors the stream a second time or more to determine the extent to which BMPs reduce water quality problems. Implementing BMPs without ascertaining how those BMPs actually affect water quality compliance tells one nothing about whether particular forest roads are adversely impacting water quality.

Though they differ from state to state, most forest road BMPs are based on a relatively small number of guiding principles (Endicott 2008):

- Recognize and avoid high-erosion hazard areas.
- Minimize the total amount of landscape disturbed by roads, bare ground and soil compaction.
- Engineer stable road surfaces, drainage features and stream crossings to reduce erosion.
- Separate bare ground from surface waters and minimize delivery of road-derived sediments to streams.
- Provide a forested buffer around streams, which exclude roads and minimize crossings.
- Design and install stream crossings to allow passage of fish, other aquatic biota, and large wood.
- Put BMPs in place to anticipate triggering events.
- Unless obliterated/removed, all forest roads, crossings and associated BMPs must be maintained.[6]

However BMP implementation is variable, and there is little quantitative research addressing the effectiveness of BMPs where they have been implemented (Endicott 2008). This is further complicated by the fact that the performance of BMPs and their associated impacts vary considerably with geology, terrain, watershed characteristics, site locations and weather, meaning that BMPs will function differently at different locations (Endicott 2008).

States currently have wide latitude in how they address water quality impacts from forest roads (Sugden et al. 2012). As a result, all 50 states have now developed state-specific BMP programs and guidelines (NCASI 2009). In addition, the U.S. Forest Service (USFS) provides a set of “nonprescriptive” BMPs for forest roads on National Forest System lands (USFS 2012). However, USFS maintains that classifying these BMPs as such was merely a nominal change and that they were otherwise already in existence as regulations, guidance, or procedures (USFS

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[6] Note that most of these are related to road construction and not to roads that are already built. This issue with forest road BMPs as they exist now will be further discussed below.

2012). Regardless, it is clear that there is currently a wide array of BMP programs that lack standardization and that have varying levels of BMP implementation and effectiveness.

The lack of standardization and a cohesive national policy on BMPs is a poor method by which to ensure that water quality is protected from the impacts of forest roads. This current system leaves states open to regulatory capture wherein regionally important interests with a significant impact on the state's economy (such as mining, logging, etc.) have the potential to influence the democratic process and influence regulations in their favor at the expense of the public (Hardee 2014). Such capture has and will continue to reduce the effective regulation of stormwater runoff from forest roads. EPA is much better equipped to avoid such capture and ensure that water quality is adequately protected through a national system of forest road BMPs (Hardee 2014). EPA could help to improve the implementation and effectiveness of BMPs across all forest roads in this rulemaking. This would result in reduced erosion and sediment delivery to streams and would further the purposes of the Clean Water Act.

The signers of this letter support EPA regulating forest roads to limit water quality impacts because there have been numerous issues with state BMPs. EPA will have to avoid those pitfalls if it chooses to proceed with a BMP-based approach to protecting water quality. Should EPA choose to proceed in this manner, it must ensure that the BMPs that it chooses are robust, that they apply to all forest roads, and that the effectiveness of those BMPs—maintaining water quality—is monitored, with the results of that monitoring informing application of additional and/or different BMPs if necessary.

A. BMP Implementation Compliance: Standard Assessment and Reporting is Needed.

In order for BMP programs to be successful, two requirements must both be met: (1) the BMPs that the programs prescribe must be used and (2) when used, the BMPs must reduce the forest roads' impacts so that desired water quality goals are achieved (Endicott 2008). Implementation addresses the first requirement. However, implementation is complicated by many factors. For instance, ensuring BMP implementation by nonindustrial private landowners is challenging because they may only harvest timber once every 20 years. This infrequent harvest will limit the familiarity that these landowners have with BMPs and will make it less likely that they are implementing the most current BMPs. In addition, auditors in Montana have been unable to gain permission to visit 25% of selected nonindustrial private samples sites over the last 20 years. The inability to monitor some of these lands decreases the certainty that BMPs are being implemented there. There is also a constant influx of new private landowners that may have not had any exposure to previous forest management or training. These new landowners will likely have limited familiarity with BMPs and how to implement them properly. Finally, nonindustrial private landowners do not necessarily have the technical resources that agencies and timber companies have to ensure compliance (Sugden et al. 2012).[7]

[7] Federal lands also have below average BMP compliance rates (Sugden et al. 2012), which is particularly problematic in western states where the federal government is often the dominant landowner, sometimes by an extremely large margin.

The breaks in implementation point up several sources of potentially very large slippage. Firstly, it is important to note that, while implementation of forestry BMPs in general may be high in some places at some times, it is nearly always less than 100% (Endicott 2008). This is especially true for forest road and stream crossing BMPs with state data consistently showing the implementation rates for these BMPs to be among the lowest among all forest practice categories (Endicott 2008). For example, one recent study found that 31.8% of skid trail stream crossings and 15% of truck road stream crossings in the southern Piedmont region of Virginia were not meeting the relevant stream crossing BMPs (Nolan et. al 2015). This is extremely problematic because (as discussed below) stream crossings on forest roads are disproportionately responsible for sediment delivery to those streams. Therefore, failure to meet BMPs in these areas will have a disproportionately negative impact on water quality as compared to upland BMP violations. Failure to follow a relatively small number of BMPs could thus result in a high implementation rate number while also still resulting in high impacts to water quality. In addition, noncompliance with BMPs will run the whole gamut from relatively minor noncompliance to full-blown disregard of BMPs. This is important because, assuming that the episode of implementation failure is a result of full disregard of BMPs, the resultant water degradation could be severe. This would not be captured by simple implementation percentages. Lack of BMP implementation is thus a serious driver of water quality problems even where implementation rates are relatively high (Endicott 2008).

States assess and report implementation differently with some states reporting compliance levels based on meeting the spirit (overall meeting resource protection goals) or the letter (meeting or exceeding specific prescriptions) of the BMP (Ice et al. 2009). This makes comparisons difficult and complicates assessing the degree of implementation that is actually occurring. However, because state BMPs are generally prescriptive, implementation monitoring will generally focus on whether BMPs were implemented rather than by measuring compliance with water quality standards (Endicott 2008). This decreases the certainty that the BMPs are actually accomplishing their goal, which brings us to the paradox that the literature on forest road BMPs largely fails to address: if rates of BMPs implementation are high, then why are there still water quality impairments from forest roads? (Endicott 2008). In addition to the implementation issues discussed in this section, much of the answer to this question likely lies in the effectiveness of the BMPs that are currently used.

B. BMP Implementation Does Not Equate To BMP Effectiveness: Water Quality Goals Should Be Met.

Effectiveness refers to how well the forest road BMP system meets its water quality goals. While implementation of BMPs is assumed to reduce impacts to water quality, the extent to which this assumption is true is variable. Endicott 2008 explained that implementation of BMPs may in fact be a poor indicator of the effectiveness of programs to address forest roads and protect water quality. For instance, compliance with a set of BMPs that are outdated or otherwise ineffective will do little to protect water quality. As a result, the focus on implementation of BMPs, at the exclusion of adequate effort towards providing practical in-stream criteria for regulation of sedimentation from forest roads and monitoring of actual sedimentation, is problematic.

One possible way to measure the effectiveness of BMPs would be to look to their effectiveness in achieving state water quality standards or stream habitat goals (Endicott 2008). However, these water quality standards do not adequately characterize what is achievable or even desirable, they vary state by state, and they will not take account of the full impacts of sediment, and other, additions to the water (Endicott 2008). Industry groups have effectively blocked the use of ecologically based water quality criteria to designated impaired waters, which hampers the use of those criteria (Endicott 2008). These factors complicate reliance on these sources.

In addition to issues with determining whether BMPs are effective under normal circumstances, even otherwise effective BMPs can be overcome when their limits are exceeded, causing them to fail.

> In the case of BMPs for forest roads, the limits are related to the level of disturbance created by the road, the untreated rates of erosion, drainage connection and proximity to the surface water, and other regional and site-specific factors: unstable and/or highly erodible sites/locations, "Problem" roads, and excessive harvest rates and associated high road use. Erosion and sedimentation control may be ineffective because the BMPs in place are inadequate to control the runoff, erosion from the various components of the road prism, stability of cut and fillslopes, downslope sediment travel, plugging and washout of culverts, etc. In many cases, control of these problems is technically feasible if the BMPs are upgraded to a higher level of protection and performance or are enhanced by adding additional BMPs. In some cases, however, control of the problem may not be feasible: location "trumps" management practice.

(Endicott 2008). This means that BMPs that would be effective on one forest road may not be effective on another even if they are bolstered and/or upgraded. For instance, conventional BMPs for road construction appear to be insufficient to prevent adverse effects on stream channels and fish habitat in key problem areas of Idaho, northwest California, western Oregon and Washington, and southeast Alaska (Endicott 2008). As a result, there are no quantitative data indicating that road BMPs in the coastal California region have substantially improved instream water quality or salmonid habitat conditions (Endicott 2008).

Mass failures, legacy roads, cumulative impacts, highly sensitive aquatic resources, and extreme storm events (several of which are discussed in more detail below) can also reduce BMP effectiveness and/or indicate that higher water quality standards may need to be met for a certain area (Endicott 2008). This makes reliance on BMPs problematic. In fact, the USFS has found that, while BMPs for some forest management activities were effective, BMPs for forest roads are not as effective (Cristan et al. 2016).

C. Why BMP Effectiveness is Over-Estimated – An EPA Program Should Address These Challenges To Ensure Effectiveness is Actually Achieved.

In addition to a lack of concerted effort to assess and improve the effectiveness of BMPs, the BMP implementation monitoring that occurs is also unlikely to uncover effectiveness issues.

Therefore, where BMP implementation rates are conflated with BMP effectiveness, effectiveness will be overestimated.

Cristan et al. 2016, amongst other sources, provide numerous examples of BMPs reducing sediment loss and sediment delivery from forest roads to streams. While the BMPs used do reduce these sediment issues work to varying degrees, their benefits are typically overstated because of an inherent bias in their starting point. These studies nearly always express their results in terms of the reduction in sediment delivery of the road with BMPs present as compared to a road without the BMPs in place. However, roads almost invariably increase sediment loss and delivery to streams. Therefore, even a road with highly restrictive BMPs will generally be responsible for sediment impacts that are above the natural rate of the same undisturbed, roadless area. For example, observation of newly constructed logging roads in the southern Appalachian Mountains found that soil loss rates were greatly reduced after the roads had been seeded and graded, but that this reduced erosion was still *about 20 times the normal rate for undisturbed forest* (Endicott 2008). A study that looked only at the "improvement" in sedimentation of the roadway after the BMPs were installed would ignore that the road is ultimately causing exponentially more sedimentation than the area did before the road was added. Conversely, few studies have measured the actual efficiency of forest BMPs. The three studies that we are aware of that provided BMP efficiencies with regard to sediment loading reductions reported BMP efficiencies ranging from 53%–94% (Nolan et al. 2015). This means that, assuming these results are accurate, the BMPs still allowed a 6%-47% increase in sediment to occur. In addition, even the implementation of BMPs can have short term negative effects, including generation of sediment where ground-disturbing activities are required (Endicott 2008).

A variety of factors will considerably impact the measured performance of BMPs, including geology, traffic, terrain, other watershed characteristics, site locations, and weather. Not only can these factors lead to water quality problems that may not be fully controllable by BMPs, especially at the cumulative scale of watersheds, but they can also obscure BMP effectiveness failures where they vary between observation periods (Endicott 2008). For instance, BMP effectiveness is especially difficult to judge under dry conditions (Endicott 2008). Therefore, if effectiveness was only measured during dry weather, the results will not reflect how road drainage features handle stormwater erosion (Endicott 2008). Because rain events govern study findings, a lack of rainfall may give undue credit to BMP effectiveness in protecting water quality (Brown 2014).

The inability to judge the effectiveness of BMPs in dry weather is highly problematic because implementation audits typically occur during summer, when conditions are dry and vegetation is leafed out (Endicott 2008). One example of a study that is likely affected by the scarcity of rain during the study period is Sugden et al. 2012. That study looked at BMP audits that are conducted in Montana during relatively dry times of year (July and early August). As a result, the study's determination that effectiveness rates essentially mirror implementation rates, with effectiveness rates actually being slightly higher, is of questionable validity as to other, wetter times of year.[8] This is because under dry conditions it would be unusual to actually observe runoff, erosion, or sediment transport (Endicott 2008).

Even if monitoring were occurring during a storm, the biotic and chemical "noise" in larger streams would complicate detection of the water quality effects of forestry activities using BMPs. In order to accurately estimate suspended sediment load in many watersheds, frequent sampling when sediment transport is high is necessary and errors of 50-100 percent are probably typical when sampling is based on convenience (Endicott 2008).

Other issues with using implementation monitoring to judge BMP effectiveness include:

- The majority of compliance monitoring efforts are usually completed on recently harvested land.
- These evaluations may not investigate road maintenance or obliteration practices.
- On-the-ground determinations of BMP implementation are qualitative and judgmental by design, adding to the difficulty of comparing or reproducing results.
- Most state surveys are conducted after on-the-ground activities have ceased. Thus, it is possible that water-quality impacts could occur but stabilize prior to the site being evaluated.

(Endicott 2008).

Not only do storms often provide the only real opportunity to monitor the effectiveness of BMPs, they also are the times most likely to experience BMP failures. As the magnitude of a storm increases, so does the likelihood that BMPs will fail.

> For example, a culvert sized to accommodate flow from a 50-year flood has a 33% chance of failure during its 20 year design life. In watersheds where culverts and other stream crossings are sized for a 5 or 10 year flood, essentially all the crossings may be subject to catastrophic "dambreak" failure in a 50 or 100 year storm. The likelihood of mass failures on roaded steep, unstable slopes likewise increase with the magnitude of rare events, although the probabilities of failure are less well understood.

(Endicott 2008). "Assessments of BMP effectiveness must therefore wait for 'testing storms', like the severe 1996 floods in Oregon and southern Maine." (Endicott 2008).

Where failures, especially these catastrophic failures, of BMPs occur, the results can be immense. For example, one study of two watersheds dominated by Douglas Fir in the Cascade Mountains in the U.S. Pacific Northwest region found that 44% of 80 sediment debris slides were associated with roads, even though roads comprised only 3.1% of the area (Nolan et al. 2015). Another source indicates that, although roads only accounted for between 3% and 13% of the average area of hardwood harvest sites in New York, they contributed 90% of the erosion

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[8] This study also looked at sites after one to three runoff seasons, which would obscure the initial impacts of any ground-disturbing activity, which are periods of especially high erosion.

from those sites (Nolan et al. 2015). These failures account for large quantities of sediment that may originate from relatively few sources.

Figure 1. This image from Nolan et al. 2015 shows the real impacts that BMPs can have on stream crossings. BMP- (top photos) delineates crossings that are not meeting BMPs, and the accompanying images show an extremely degraded crossing that will contribute significant sediment to the stream. BMP-Standard (middle photos) indicates that BMPs are met and BMP+ (bottom photos) indicates that those BMPs are exceeded. The likely decrease in sedimentation from these latter two categories is clear in the accompanying images.

Studies that purport to show the effectiveness of BMPs will also overestimate effectiveness where they neglect to consider highly sensitive aquatic resources. Where forest streams and waters downstream of those forest streams are habitat for species that are especially sensitive to the adverse effects of sedimentation, less degradation is acceptable. As a result, relatively small BMP effectiveness failures may have a disproportionately negative effect on these species that would not be captured by a simple assessment of the percentage reduction of sediment that results from application of BMPs or the percentage of forest roads that are implementing BMPs (Endicott 2008).

Finally, human error can reduce the effectiveness of BMPs that are installed. Equipment operators who visually estimate requirements with little measurement often are responsible for placement of water control structures. This can result in problematic BMP measures, including poorly designed turnouts that are too small or lead water directly towards streams. This can also include inadequate coverage with gravel and seeding grass in a way that results in poor establishment (Nolan et al. 2015). Where the BMPs that are implemented are done so poorly, their effectiveness will be decreased or eliminated.

EPA should seek to account for these implementation and effectiveness issues when it creates its BMP program. By learning from these issues, EPA can ensure that BMPs are followed and that they are effective, and, in doing so, EPA can ensure that water quality is improved.

D. Limited Utility of Prediction Software: EPA Should Require Direct Monitoring When Possible.

Direct monitoring of the effectiveness of BMPs can be difficult and costly. As a result, there is a natural desire to use software to predict the effectiveness of BMPs instead (Nolan et al. 2015). However, the available software appears to be inadequate to replace traditional monitoring. One of the most commonly used prediction tools thus far has been the Water Erosion Prediction Project ("WEPP"). However, WEPP has offered very wide prediction levels that call its accuracy into question beyond predicting relative differences in sedimentation. This is particularly true in the absence of observations of runoff and sediment yield that would increase the usefulness of its results (Brown 2014). There is conflicting evidence as to whether the Universal Soil Loss Equation ("USLE-Forest"), another erosion model, more closely parallels field monitoring (*Cf.* Nolan et al. 2015, Brown 2014). As a result, there appears to be a substantial gap between models and field monitoring that precludes the use of models to accurately estimate erosion levels at this time (Brown 2014). EPA should thus require direct monitoring wherever possible and should ensure that use of modeling is compared to monitoring results to the maximum extent practicable to ensure its accuracy.

E. Site-Specific: Local Conditions Must Be Included to Achieve Objectives, Requiring Guidance and Training.

Part of the reason that predictive models do poorly at estimating the erosion and sediment delivery that will result from a set of BMPs may be due to the fact that these factors, and, as a result, the BMPs that will be required to combat them, are highly influenced by many site specific factors (Endicott 2008, Akbarimehr and Naghdi 2012, Nolan et al. 2015). This not only complicates estimation of effects, but also complicates the choice of which BMPs to require on which forest roads. The difficulty with accounting for the site-specificity of BMPs can lead to over-protection in some areas (wasting resources that could be applied to higher priorities) and under-protection in others (allowing undesired impacts) that reduces the efficiency of BMPs (Endicott 2008).

Because the site of the forest roads that they are applied on largely determines the effectiveness of BMPs, BMPs must be selected and applied based upon site-specific needs (Endicott 2008). Specific examples of BMPs related to site conditions include the following:

- Avoid sidecast road construction in steep, landslide prone regions.
- Diversion-proof or storm proof roads where gully formation is a significant risk (*e.g.*, steep forest roads).
- Provide adequate rocking or use geotextile reinforcement where surface fines are generated by traffic.
- Remove runoff concentrated by interception of subsurface flow or precipitation from the road (using cross drain distance, outsloping, rolling dips, road runoff diversion structures) before concentration and excessive rutting occur.
- Avoid direct delivery of sediment from roads by limiting the road distance draining to stream crossings, by applying effective buffer distances and slash/debris/grass buffers;
- Use energy dissipaters where road runoff energy is high.
- Apply mitigation measures such as road decommissioning or removal, or upgrading with additional BMPs, to reduce risks in legacy watershed situations.

(Endicott 2008). However, customizing BMPs for each site requires more effort and skill and increases the difficulty in determining whether BMPs have been properly implemented (Endicott 2008). This complicates the use of BMPs and will further reduce the effectiveness of BMPs where they are not sufficiently site-specific in many circumstances. However, rather than militating against creation of a comprehensive BMP program, this simply means that EPA will need to provide sufficient guidance to ensure that the character of the individual sites is accounted for in the BMPs that are prescribed for each forest road.

F. Existing Roads: Often Overlooked But Need To Be Addressed.

Another important weakness of BMPs as they are currently used is that they often focus on construction of new forest roads, which happens less often than it did in the past, to the exclusion of addressing the impacts of already-existing forest roads. In many states, these older roads, built before current, or indeed in some cases any, BMPs were promulgated, are "grandfathered in," or are not required to be brought up to current design standards until either a segment needs to be reconstructed or the road shows immediate signs of failure that would damage waters of the state (Endicott 2008). This is problematic because old roads, particularly those built with practices prevalent in the 1950s, 1960s, and early to mid-1970s are still significant sources of erosion (Endicott 2008). In addition, some features of these roads are often referred to as "loaded guns" that are just waiting to fail with the stress of strong storm events. As a result, EPA should require that these roads are proactively inventoried and that their numbers are reduced (Endicott 2008). Unfortunately, the fact that inventorying, monitoring, and removal/obliteration of these roads is expensive has meant that the rate of addressing these roads has lagged behind need (Endicott 2008).

Road closure BMPs remain relatively ignored in state BMP programs. While 44 states have some form of BMPs addressing road construction, only 24 have BMPs for road closure

(Endicott 2008). In addition, 72% of state BMPs do not address road closure (Endicott 2008). Therefore, even in states where road closure BMPs do exist, they are less numerous than other BMPs, indicating a lesser focus and degree of control over the archaic roads that are most likely to cause water pollution issues. As a result, these roads are instead left with lower standards and a lower degree of BMP implementation than newly constructed roads (Brown 2014).

Instead of closing these roads, use of these older roads, including abandoned "legacy" roads, is ubiquitous in forests. This is very problematic. Short of removal, these roads may require significant re-grading, water control structure installation, gravel application, and other maintenance and BMP installation in order to protect water quality (Brown 2014). Unfortunately, it appears that these roads receive much less maintenance attention than other roads (Endicott 2008). This leaves a highly significant source of sedimentation on the landscape with little effort made to reduce or eliminate its negative effects on water quality. This is inconsistent with, and counterproductive to, attempts to reduce these impacts on newly constructed roads.

Should EPA choose to regulate water quality impacts from forest roads under a BMP approach, it is imperative that it addresses these older roads and prioritizes those roads that may affect more sensitive watersheds and vulnerable downstream uses. While ground-disturbing activities associated with the removal of roads may increase erosion in the short term, this erosion quickly normalizes and avoids the ongoing deterioration of the road over time that would otherwise continue indefinitely (Nolan et al. 2015).

The good news is that, at least in some cases, implementing strong BMPs can reduce sedimentation from old and legacy roads, even where the original road design was not ideal (Brown 2014). However, because road planning is at least arguably the most crucial BMP to reduce sediment inputs to streams, some of these roads will have to be removed entirely where their planning was poor (Brown 2014). In addition, these roads should be the first that are considered for removal when road network density reductions are considered, as they will often be the "low hanging fruit" for water quality impairment reduction.

G. Good BMPs: EPA's Program Should Focus on Road Removal, Stream Crossings and Cumulative Impacts.

The positive side of all 50 states and USFS having their own BMP regimes is that EPA will have many BMPs to choose from and adapt when promulgating its own BMP program. The groups on this letter will not attempt to relist all of these and instead directs EPA to table 3-1 of Endicott 2008 and to Part 3 of USFS 2012 as two good, and relatively comprehensive, sources. EPA should focus on assessing the effectiveness of these BMPs, improving their effectiveness wherever possible, providing guidance as to where site-specific factors will necessitate certain BMPs, and work to ensure that the BMPs are implemented and effective after the program's promulgation. However, in addition to these more general comments, we have provided the analysis below to focus on a few BMPs that deserve particular attention.

H. Road Removal as a Key BMP.

"Although new roads are uniformly discouraged, and are subject to improved design and standards, they are not prohibited, even on steep, unstable or otherwise sensitive sites." (Endicott 2008). In addition, decommissioning existing roads is deemphasized (Endicott 2008). State "FPRs do not recognize ecological importance of maintaining low road density where it exists, and reducing road density in high density watersheds is not a rational resource prioritization." (Endicott 2008). Finally, "[m]ost rules have no requirement that roads be brought up to standards on any set timeline, and improvements are [almost always] conducted according to operations convenience . . ." (Endicott 2008). This massive, expanding, and oftentimes outdated road network means that forest roads' cumulative sedimentation impacts are immense. EPA should thus seek to eliminate old roads to the extent possible while also constraining the creation of new roads.

As EPA discussed in its Federal Register notice for this rulemaking, "[t]he Northern Cheyenne Tribe requires that all new roads be obliterated and seeded after forest harvesting activities. Similarly, the Blackfeet Nation has a no net new road miles policy, which requires the closure of an existing road before a new forest road may be constructed." 80 Fed. Reg. 69,653, 69,658 (November 10, 2015). These policies recognize that, in the absence of a policy that seeks to mediate against the creation of endless new roads, forest road networks will continue to grow and will continue to cause sedimentation, particularly as older roads deteriorate. By adopting a similar policy to halt the creation of permanent new road miles, EPA could reduce new sediment vectors and could potentially make serious inroads into removing problem roads that were constructed based on archaic, weak, or even no, BMPs. Such a policy would also encourage using existing roads and creating only temporary roads that would later be removed, would discourage new roads where they are duplicative, and would help encourage limitation of road footprints, all BMPs in their own right (USFS 2012).

EPA should also ensure that the removal of old roads, and the construction of new roads for that matter, meet BMPs sufficient to minimize their impacts on water quality and that older roads that are not removed are reconstructed to the degree necessary to meet current BMPs (USFS 2012). Any road construction or reconstruction should be preceded by a suitable soils and geotechnical evaluation to identify susceptibility to erosion and stable angles of repose (USFS 2012). Any slope stabilization work, including revegetation efforts, that is required based on design criteria should be kept as current as possible with ground disturbing activities. A corollary of this BMP is that road construction and reconstruction should proceed in segments to reduce exposure of disturbed area to erosion in the event of adverse weather. Avoiding ground-disturbing activities during critical periods for species of concern and severe weather events would also strengthen the ability of these measures to avoid sedimentation and its negative effects.

I. Stream Crossings as Priority Locations.

Stream crossings, which include features such as bridges, fords, and culverts, cause the most significant forest road sediment problems (Endicott 2008, Brown 2014). However, BMPs that require designing and/or reconstructing stream crossings to avoid diversion potential, to accommodate natural disturbances, and to allow unrestricted passage of fish, sediment bed load, and large wood have not been incorporated by many states (Endicott 2008). Instead states have continued to allow practices such as fords and log crossings, despite their recognized impacts on sedimentation of streams (Endicott 2008). This is unfortunate as studies show that improved stream crossings can significantly reduce sediment from forest roads (Nolan et al. 2015). In addition to upgrading the stream crossing itself, BMPs that focus on preventing sediment transfer in the areas directly leading up to the stream crossing can also be highly effective (Nolan et al. 2015).

Upgrading existing stream crossing sites can also be quite cost-effective. One study indicated that truck stream crossings that were not meeting BMPs could be brought into BMP compliance at an average cost of only $450 and that this could reduce the erosion rate of the current stream crossing by 5.1 times. Furthermore, improving the already-compliant stream crossings beyond current BMP requirements would only cost $450 to $500 and could reduce the sedimentation by an additional 11 times, leaving an erosion rate that is similar to undisturbed forestlands (Nolan et al. 2015). In addition, optimization strategies, such as using CulSed modeling software and other tools, should be used to ensure that changes to stream crossings are as beneficial as possible at avoiding sedimentation of streams (Endicott 2008). EPA should also develop new BMPs to reduce sedimentation of these areas as they can contribute a disproportionate sediment burden to affected waterways.

When relocating roads (or if critically needed – road construction), EPA should ensure that the road builders take extra care when those roads go near or cross a stream. USFS has a BMP that requires that roads are located as far from waterbodies as is practicable to achieve access objectives, with a minimum number of crossings and connections between the road and the waterbody (USFS 2012). Another USFS BMP provides that roads should avoid sensitive areas such as riparian areas, wetlands, meadows, bogs, and fens, to the extent practicable (USFS 2012). Where these waterbody crossings cannot be avoided, they should be designed so that they avoid or minimize adverse effects to soil, water quality, and riparian resources to the extent practicable (USFS 2012). Work on crossings should avoid direct stream disturbance whenever possible and should avoid it altogether during high flows. EPA should adopt these BMPs and should also work to develop other BMPs that are maximally effective at avoiding sedimentation from these sites.

J. Cumulative Impacts Should Be Consistently Considered.

In addition, EPA should ensure that the BMPs in a watershed are sufficient to avoid undue impairment of the water body due to cumulative effects (Endicott 2008). In the absence of protection from cumulative impacts, chronic erosion from many sites may impair a water body, even though relatively little sediment is delivered from each site (Endicott 2008). This is particularly important for fine-grained sediment (usually the most significant pollutant from roads) as it can be transported for a relatively far distance downstream once it has entered a watercourse (Endicott 2008). Because it may combine with sediments from many other sources over this time, cumulative impacts tend to be greater downstream of larger watersheds; watersheds with more forestry activity, higher road density and/or problem roads, crossings, etc.; watersheds with older road networks and a greater percentage of legacy roads; and watersheds where the rates of chronic sediment delivery and/or mass wasting are higher due to regional and site-specific factors (Endicott 2008). Therefore, such sites will need to be prioritized for cumulative effects management.

Idaho has a cumulative watershed effects process that is designed to lead landowners to conduct future forest practices according to three "staged" criteria (Endicott 2008):

1. In watersheds where beneficial uses are not supported as a result of forest practices and are not improving, mitigation and rehabilitation activities must be conducted in conjunction with current forest practice activities so that, on balance, a generally improving trend is maintained until adverse conditions no longer exist.
2. In watersheds where beneficial uses are not supported as a result of forest practices but conditions are improving, activities must be conducted in a way that does not interrupt this improving trend.
3. In watersheds where beneficial uses are supported, forest practices will be designed to prevent loss of this support.

While we encourage BMPs that address cumulative impacts, Idaho's system is not strong enough. A suitable system would require that, even where beneficial uses are supported or there is a trend of improvement, additional attempts at mitigation continue to both further improve water quality and provide a buffer for mass failures, storm events, and other circumstances that can quickly reduce water quality on both a localized and regional scale. Idaho's current system does not go far enough.

Washington has a much stronger system than Idaho. In Washington, regardless of existing water quality, all known, available, and reasonable methods of prevention, control, and treatment must be applied to avoid sedimentation. However, even meeting this technology-based standard alone is not sufficient. Compliance also requires meeting the water quality-based antidegradation rules and the numeric turbidity criteria. The water quality-based antidegradation rules prohibit lowering of water quality to any measurable extent where feasible methods exist to prevent or significantly reduce that effect. Where these requirements are met, no activity may cause or contribute to a violation of the numeric turbidity criteria or harm the existing or designated uses established in the state standards for the specific water bodies. The criteria are set based on background turbidity and typically do not authorize any zone for dilution, meaning that the criteria must be met at the point where the road runoff enters the water body. Where these standards are not being met, BMPs for the site must be reevaluated. EPA should adopt a similar method to address cumulative impacts.

K. Mandatory Requirements and Enforceability are Essential.

Under the current BMP system there is limited enforcement and enforceability of rules/guidance relevant to many BMPs (Endicott 2008). In fact, nine states (including Illinois, Oklahoma, and Utah) have a BMP program without enforcement (Endicott 2008). The enforcement issues are exacerbated by the fact that many states have voluntary or only quasi-regulatory BMP programs. Northeastern and Pacific Northwest (including California) states typically follow a Forest Practice Act (FPA) that, *inter alia*, requires use of specific BMPs during forest road activities. However, southeastern states generally use a voluntary approach.

In this voluntary approach, the road builder selects which prescription best meets water quality protection needs for the project. In the quasi-regulatory BMP programs, prescriptions may be voluntary but landowners have certain legal requirements such as notifying a state agency of intent to harvest or applying for permits to install stream crossings (Cristan et al. 2016).

The differing structures of these BMP programs create differing levels of enforceability. EPA should choose the strongest, most enforceable of these, which would be akin to the Forest Practice Act approach. This would allow EPA to set prescriptive guidelines as to what BMPs must be implemented on forest roads. While some flexibility must be required to take site-specific factors into account, this, along with a strong suite of BMPs, is the best system for ensuring that water quality protection goals are met.

EPA should also retain strong provisions for dealing with "bad actors" that cause water quality degradation to ensure that the BMP requirements are adequately enforced. EPA must be willing to act when it notes a BMP violation or when it is clear that the BMPs that are in place are not sufficiently effective to protect water quality. Current responses by state forestry agencies to BMP violations or complaints varies widely from established, formal interagency agreements that can include referral to enforcement agencies to no formal process for follow-up or referral, with only some referrals to other agencies actually happening (Endicott 2008). Problems with BMP programs are overwhelmingly met with strengthened education and training programs in the specific area identified (Endicott 2008, Sugden et al. 2012). These educational opportunities are essential to ensuring compliance with BMPs and improving stakeholder buy in, and all state forestry agencies attempt to work with landowners to correct deficiencies prior to referral to enforcement agencies. However, persistent noncompliance can result in a variety of enforcement actions, which range from mandatory installation of BMPs, fines, and orders to cease forestry activities (Endicott 2008). EPA should ensure that all enforcement mechanisms are on the table and that a system is in place – such as utilizing benchmarks - to use these enforcement mechanisms to maximize the effectiveness of its BMP program.

In addition, expanding notification requirements to countrywide implementation would help alert EPA to proposed forest road activities that it could then ensure meet the relevant BMPs. Notification allows for inspections where there are priority risks and where special protection may be needed. In Oregon, for example, where there are special risks associated with activities in areas with a high risk of landslide or near fish-bearing streams and wetlands, written plans are required. Oregon and Idaho also allow for special protection rules in watersheds that are water quality limited (Endicott 2008). EPA should develop similar systems that can be applied wherever water quality impacts may occur.

The Conservation Groups recommend that EPA assess all of these measures and keep those that are most protective of water quality. We also recommend that EPA work to strengthen compliance through increased enforcement actions in an attempt to bring implementation of BMPs to as close as 100% as possible and to ensure that the BMPs that are implemented are effective at preventing water quality impacts from forest roads.

L. Public Involvement and Monitoring are Useful.

Public reporting of stream sedimentation is a key requirement for learning of problems and potential BMP violations. Such reporting can be used to complement EPA's enforcement efforts as history has shown that many states have been unwilling or unable to put strong, consistent efforts into monitoring programs (Endicott 2008). In fact, only 21 states specifically monitor road BMPs and only 19 monitor stream crossings (Endicott 2008). Lack of effective monitoring is problematic as measuring the success of BMP programs requires regular and credible surveying of BMP implementation and effectiveness (Endicott 2008). EPA should take steps to ensure that this value is retained, and indeed enhanced, in its BMP program.

While public monitoring is doubtless helpful, a system that relies too heavily on it will be insufficient. This must be complemented by sufficient government monitoring as well.

> In Washington's system for management of road erosion and sediment delivery impacts, roads are field inventoried and the data are used with simple spreadsheet based models that quantify erosion and sediment delivery in comparison to estimates of natural background watershed sediment delivery. When delivery is considered to be too high, an adverse condition exists that must be addressed with management prescriptions designed to alleviate the condition. These prescriptions are developed by local land managers and agencies, must address the specific areas of hazard and resource concern identified by the scientific assessments, and are subject to public review and appeal prior to final acceptance of the plan.

(Endicott 2008). This preserves a public role while also adding a level of consistency to monitoring that will make it more effective. Our groups recommend that EPA provide for the use of both public and government involvement in monitoring.

M. Ways to address failing BMPs.

EPA should provide for methods to improve failing BMPs. Monitoring and effectiveness data should be used to identify BMPs that are not functioning to sufficiently improve water quality impacts from forest roads and actions should be required to improve performance. EPA should assess the Northeast BMP Monitoring Protocol and the US Forest Service/ NAASF BMP Monitoring Protocol to see if they would provide useful aid in meeting these goals (Ice et al. 2009). Changes to address failing BMPs may include (Endicott 2008):

- Adding components to BMP systems. By adding additional components, the overall treatment efficiency can be incrementally improved.
- Improving inspection and maintenance practices may also improve failing BMPs by anticipating and preventing failures. By designing the BMP program to anticipate failure in a proactive way, changes can be made before an impact even occurs.
- Should a road prove to be unresponsive to BMPs, removal of that road may be a more effective solution to avoiding ongoing sediment delivery.
- Conducting wet weather monitoring of forest roads would also allow problem areas to be

identified and subsequently fixed.

EPA should develop strong measures to ensure that the BMPs that it requires are effective and to remedy conditions on forest roads where BMPs are not successful in avoiding sediment delivery to streams. A dynamic system that is cognizant of the various issues that we have identified in these comments is necessary to preserve and enhance water quality and will be necessary for any effective BMP program.

IV. Case Study: Oregon

Oregon's forest practices rules—their BMPs—are woefully deficient in limiting adverse water quality impacts from forest roads. Oregon's forest practices regulations for forest roads are found in OAR 629-625-0000 through 629-625-0700. "The purpose of the road construction and maintenance rules is to establish standards for locating, designing, constructing and maintaining efficient and beneficial forest roads; locating and operating rock pits and quarries; and vacating roads, rock pits, and quarries that are no longer needed in manners that provide the maximum practical protection to maintain forest productivity, water quality, and fish and wildlife habitat." OAR 629-625-0000(3). Those rules include a variety of provisions addressing the location, construction, maintenance, and retiring of forest roads, including many provisions intended to protect water quality. Unfortunately those rules impose generic BMPs and do not use pertinent water quality data to drive road management decisions; in fact they are precisely the kind of BMPs that have been shown to be inadequate and ineffective at protecting water quality and beneficial uses.

The Oregon forest practices regulations applicable to forest roads consistently prioritize logging over protection of water quality. For example, Oregon recognizes that "[a] properly located, designed, and constructed road greatly reduces potential impacts to water quality, forest productivity, fish, and wildlife habitat." OAR 629-625-0100(1). Oregon therefore requires operators to submit a written plan before constructing forest roads in locations "where there is an apparent risk of road-generated materials entering waters of the state," before conducting machine activity in Type F or D waters, and before "constructing roads in riparian management areas." OAR 629-625-0100(2). But Oregon's rules do not require ODF to disapprove written plans for the construction of logging roads that may result in adverse water quality impacts. *See* ORS § 527.670. Moreover, although Oregon imposes additional forest practices regulations where construction of a forest road on a high landslide hazard location would threaten public safety, *see* OAR 629-625-0100(3), it imposes no additional restrictions where a similarly situated road would threaten water quality or Oregon coast coho salmon (listed as a threatened species under the Endangered Species Act (ESA)). The upshot is that Oregon recognizes that road construction can cause water quality problems, and it recognizes that operators can avoid some of those problems, but it does not empower regulators to disapprove written plans for the construction of roads that may—or even are likely to— pollute streams and lead to violations of water quality standards and destroy habitat of ESA-listed species.

Presumably Oregon instead relies on its authority to take enforcement action against operators' violating the rules. But many of Oregon's forest practices rules are vague, ambiguous, precatory, or conditional such that there is little or no basis for bringing an enforcement action after the fact. For example, to "minimize" impacts to waters of the state, Oregon requires operators to "designate road locations which minimize the risk of materials entering waters of the state and minimize disturbance to channels, lakes, wetlands and floodplains." OAR 629-625-0200(2). But requiring operators to "minimize the risk" is of course not the same as requiring them to avoid adverse impacts to water quality: even minimizing impacts from a road can still mean that nonpoint source pollution from the road is enough to violate water quality standards and adversely impact designated uses. Indeed, "minimizing the risk" may not ever protect waters of the state or avoid adverse water quality impacts, especially where the logging operations are inherently risky. Operators might do everything they can to properly locate a road and "minimize the risk" to waters of the state, but the road might still be in a location where it is 60 percent or more likely to slide into a stream and cause water quality violations. In this scenario the operator would be in compliance with the rule because they would have "minimized" the risk to Oregon waters, but it is still more likely than not that the road will cause water quality impairments sometime in the future. The regulatory language demonstrates that Oregon's road location rule does not require operators to eliminate or avoid water quality problems; rather, it simply requires them to minimize risk. But even minimal risk activities can have large water quality impacts. And what risk is minimal? And how often has the ODF brought an enforcement action against an operator who chose a road location that did not "minimize" those risks?

In fact, Oregon's road rules are rife with obligations to "minimize" risks or impacts. *See* OAR 629-625-0200(4) ("Operators shall minimize the number of stream crossings."); OAR 629-625-0310(4) ("Operators shall design cut and fill slopes to minimize the risk of landslides."); OAR 629-625-0320(1) (requiring minimization of fill when building stream crossing structures; recognizing that "[f]ills over 15 feet deep contain a large volume of material *that can be a considerable risk to downstream beneficial uses if the material moves downstream by water*"; and requiring a written plan that only minimizes, rather than eliminates, the likelihood of "surface erosion;" "embankment failure;" and "downstream movement of fill material."); OAR 629-625-0330(1) (creating road surface drainage obligations to minimize alteration of stream channels and the risk of sediment delivery to waters of the state); OAR 629-625-0430(1) ("When constructing stream crossings, operators shall minimize disturbance to banks, existing channels, and riparian management areas."); OAR 629-625-0600(6) ("In the Northwest and Southwest Oregon Regions, operators shall maintain and repair active and inactive roads as needed to minimize damage to waters of the state.") While we can all applaud efforts to minimize risks to waters of the state, minimizing risks from forest roads simply does not equate to eliminating adverse water quality impacts from forest roads.

There are other similar problems with Oregon's forest road rules. For example, the road location rule requires operators to "avoid locating roads on steep slopes, slide areas, high landslide hazard locations" and in other high-risk areas "where viable alternatives exist." Along with suggesting that locating roads in those areas clearly poses risks to Oregon streams, this rule also suggests that where someone determines that viable alternatives do not exist, an operator can with impunity go ahead and locate a road on a steep slope in an area likely to generate a landslide that adversely impacts a stream. Here again the rule does not prevent building of the road in a high-risk landslide area, it simply requires someone to conclude that no other viable alternative exists before they do so. But who makes the decision on what is "viable"? And is "viability" determined based on civil engineering principles or costs to the operator? Similarly, to reduce the duplication of road systems and associated ground disturbance, OAR 629-625-0200(5) requires operators to make use of existing roads "where practical." But who decides what is practical and what criteria go into the analysis? Costs incurred by the operator? Likewise OAR 629-625-0310(1), which sets forth rules regarding road prisms, requires operators to use variable grades and alignments "to avoid less suitable terrain so that the road prism is *the least disturbing* to protected resources[.]" Oregon's forest road rules are so loaded with vague, ambiguous, precatory, and conditional language that they afford no rational basis for concluding that they ensure protection of water quality and designated beneficial uses.

Compounding the problem, Oregon's enforcement authority only kicks in *after* damage to water quality occurs. Many of Oregon's rules are written so that operators must manage logging operations to avoid impacts to water quality. *See, e.g.,* OAR 629-625-0310(2) ("Operators shall end-haul excess material from steep slopes or high landslide hazard locations *where needed to prevent landslides*."); OAR 629-625-0310(5) ("Operators shall stabilize road fills *as needed to prevent fill failure and subsequent damage to waters of the state* using compaction, buttressing, subsurface drainage, rock facing or other effective means."); OAR 629-625-0410 ("Operators shall not place debris, sidecast, waste, and other excess materials associated with road construction in locations where these materials may enter waters of the state during or after construction."); OAR 629-625-0500(1) ("The development, use, and abandonment of rock pits or quarries which are located on forestland and used for forest management *shall be conducted using practices which maintain stable slopes and protect water quality*."); (3) ("When using rock pits or quarries, operators shall prevent overburden, solid wastes, or petroleum products from entering waters of the state."); (4) ("Operators shall stabilize banks, headwalls, and other surfaces of quarries and rock pits to prevent surface erosion or landslides."); (5) ("When a quarry or rock pit is inactive or vacated, operators … shall dispose of all other debris so that such materials do not enter waters of the state."); OAR 629-625-0600(2) ("Operators shall maintain active and inactive roads in a manner sufficient both to provide a stable surface and to keep the drainage system operating *as necessary to protect water quality*."); (3) & (5). Here again, while these are laudable goals, the rules generally mean that so long as operators are not harming water quality they are in compliance with the rule. More importantly, for all such rules the operator becomes out of compliance with the rule *only after* impacts to water quality have occurred. But by then it is too late for Oregon's enforcement authority to matter.

Oregon also cannot use its enforcement authority to prevent adverse impacts to streams from vacated forest roads. Forest roads are a very significant source of landslides that can and often do impair water quality (Gucinski et al. 2001, Sidle and Ochai 2006). The best way to prevent a road from sliding once it has been constructed is to decommission the road so it no longer poses a risk to downslope waters. The Oregon rule directed at this problem is anemic, however. Instead of requiring decommissioning of roads, Oregon only requires operators to block the road to prevent vehicular traffic and to take all reasonable steps to leave the road "in a condition where road-related damage to waters of the state is unlikely." OAR 629-625-0650(2). Unfortunately Oregon's rule then states that "[d]amage which may occur from a vacated road, consistent with Sections (2) and (3) of the rule, will not be subject to remedy under the provisions of the Oregon Forest Practices Act." In other words, if an operator takes the most minimal steps to vacate a road, the operator will not be subject to an enforcement action if that road later slides into a stream and impairs water quality.

It is also worth noting deficiencies with Oregon's wet weather road use rule. *See* OAR 629-625-0700. The purpose of the rule is "to reduce the delivery of fine sediment to streams caused by the use of forest roads during wet periods that may adversely affect downstream water quality in Type F or Type D streams." OAR 629-625-0700(1). Here again the rule is deficient because it is designed "to reduce" the delivery of fine sediment; it is not designed "to eliminate" the delivery of fine sediment or "to ensure" that such delivery does not impair water quality. In any event, to accomplish the stated goal, the rule requires operators to use certain surfacing measures to avoid the development of a layer of mud on the surface of "road segments that drain directly to streams." OAR 629-625-0700(2). Additionally, the rule requires operators to "cease active road use where the surface is deeply rutted or covered by a layer of mud and where runoff from that road segment is causing a visible increase in turbidity" in certain streams. OAR 629-625-0700(3). The problem with the rule is that ceasing active road use during a wet weather event does not protect a stream from a hydrologically-connected road that is used for active timber hauling because timber hauling grinds up the road surface and creates fine sediment even during dry weather. While stopping hauling during wet weather may reduce impacts to some extent, the real answer to the problem of hydrologically-connected roads is to disconnect them from the streams so they do not impair water quality. Washington State has just such a program to address the issue, but Oregon has no such program and its wet weather haul rule is not an adequate substitute because it maintains roads across the forested landscape as significant polluters of streams.

Finally, yet another problem with Oregon's forest road rules is that they are only triggered when active logging operations occur. The lack of a requirement to bring existing, inactive logging roads and other forest roads up to a standard that effectively prevents water quality problems results in many forest roads that are not currently being used for logging falling through the regulatory cracks and continuing to have a negative impact on water quality. Currently only the State of Washington requires land managers to upgrade old roads to comply with today's standards; across most of the country, the oldest, most harmful logging/forest roads continue to deliver sediment into streams and rivers (Endicott 2008 at pp.118-19). Oregon's rules, of course, do not address forest roads that are not associated with active logging. And indeed many forest roads formerly used for logging have never been upgraded to comply with today's standards.[9] A detailed evaluation and recommendations for improvement to the Oregon FPA with regard to roads can be found in a report prepared by Oregon's Independent Multidisciplinary Science Team ("IMST") in 1999.[10] Oregon's program is also deficient in this

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9 *See* Glen Spain, *Dam, Water Reforms, and Endangered Species in the Klamath Basin*, 22 J. Envtl. L. & Litig. 49, 65 n. 60, 83-84 (2007) (noting the National Marine Fisheries Service and other independent reviewers have critiqued the OFPA and determined it to be insufficient to prevent salmonid species' extinction).

10 *Recovery of Wild Salmonids in Western Oregon Forests: Oregon Forest Practices Act Rules and the Measures in the Oregon Plan for Salmon and Watersheds*. (Technical Report 1999-1 to the Oregon Plan for Salmon and Watersheds, Governor's Natural Resources Office, Salem, Oregon.) located at http://www.fsl.orst.edu/imst/reports/1999-1.pdf. *See also* NOAA-NMFS, 2010. 75 Federal Register 29489-29506 *Listing Endangered and Threatened Species: Completion of a Review of the Status of the Oregon Coast Evolutionarily Significant Unit of Coho Salmon; Proposal to Promulgate Rule Classifying Species as Threatened*

regard and, standing alone, Oregon's failure to develop a regulatory program that addresses forest roads that are not currently in use for logging fully justifies EPA's and NOAA's finding that Oregon has failed to submit an approvable Coastal Nonpoint Pollution Control Program.

So long as the logging roads are operated in good faith compliance with the best management practices established by the State Board of Forestry they will not be found to violate water quality standards. ORS § 527.770. But it is also clear, simply from the text of the rules themselves, that Oregon's forest road rules do not prioritize protection of water quality over logging operations, nor do they ensure that logging operations in Oregon's coastal areas will protect water quality and designated beneficial uses. The Oregon FPA and applicable forest practices rules fail to prevent forest roads from causing or contributing to violations of water quality standards. Implementation of BMPs without reference to and monitoring of applicable water quality standards—including the protection of designated beneficial uses—is simply inadequate to protect Oregon streams. Absent such a feedback loop, and absent a new program for requiring land managers to decommission inactive roads or bring roads built to old standards up to modern and effective standards, one cannot rely on any set of Oregon BMPs to protect water quality.

In a lengthy declaration discussing the many deficiencies in Oregon's nonpoint source pollution control programs, Dr. Christopher Frissell confirms many, if not all, of these problems and weaknesses with Oregon's forest road BMPs. *See* Declaration of Dr. Christopher Frissell, at 37-48.[11] For example, Dr. Frissell states that Oregon has not provided a sufficient description of the measures landowners use to reduce impacts from forest roads or sufficient data supporting a claim that those measures are effective. Frissell Declaration at 37-38, ¶ 69. Dr. Frissell then provides additional observations about Oregon's forest roads program and its inability to protect water quality. Frissell Declaration at 37-48. Dr. Frissell specifically notes widespread nonpoint source pollution from forest roads in Oregon's coastal areas, at 38-39 ¶ 71; the lack of standards, benchmarks, and monitoring in Oregon's road program, at 39-40 ¶ 72; and many other problems with Oregon's forest roads regulations, at 40-48. Dr. Frissell specifically concludes that:

> Oregon has adopted no watershed-scale measures of road system condition to establish a benchmark for acceptable conditions for salmon persistence and survival, water quality, and other water resources. This curtails the state's ability to measure progress toward water quality compliance and maintaining beneficial uses, and contributing to salmon recovery.

(May 26, 2010) located at http://www.gpo.gov/fdsys/pkg/FR-2010-05-26/html/2010-12635.htm; Oregon Department of Forestry. 1997. *Forest Roads, drainage and sediment delivery in the Kilchis River Watershed.* Report for the Tillamook Bay National Estuary Project (rating 31% of the road length was rated certain or possible for sediment delivery to streams) located at http://www.oregon.gov/ODF/privateforests/docs/kilchis.pdf?ga=t; Skaugset, Arne and Marganne Allen, Oregon Department of Forestry Forest Practices Monitoring Program. 1996. *Road Sediment Monitoring Project Report: Survey of Road Drainage in Western Oregon*. ODF Technical Report (monitoring on state and private lands found a general lack of filtering of drainage waters near streams and that a significant proportion of active and inactive roads can deliver sediment to streams by ditch delivery) located at http://www.oregon.gov/ODF/privateforests/docs/RoadSediment.pdf?ga=t.

[11] Dr. Frissell's declaration, along with the materials he cites in his section on forest roads, is being submitted into the administrative record for this matter.

Frissell Declaration at 45 ¶ 82. In other words, *at best* Oregon can have absolutely no idea whether its forest roads program is protecting water quality. But Dr. Frissell goes further than that:

> In my opinion the inherent contribution of forest roads to nonpoint source pollution, in particular sediment but also nutrients, to streams, coupled with the extensive occurrence of forest roads directly adjacent to streams through large portions of the coastal Oregon area, adversely affects water quality in streams to a degree that is directly harmful to fish and other aquatic life. In my opinion this impairment occurs on a widespread and sustained basis; runoff from roads may be episodic and associated with annual high rainfall or snowmelt events, but once delivered to streams, sediment and associated pollutants deposited on the streambed cause sustained impairment of habitat for salmon and other sensitive aquatic and amphibian species. Current road design, management of road use and conditions, the locations of roads relative to slopes and water bodies, and the overall density of roads throughout most of the coastal area all contribute materially to this impairment. This effect is apart from, but contributes additively in effect to, the point source pollution associated with road runoff that is entrained by culverts or ditches before being discharged to natural waters.

Frissell Declaration at 47-48 ¶ 83.

V. The Elements of a Strong Regulatory Program for Forest Roads.

In order to protect beneficial uses, EPA needs to regulate forest roads under a national, enforceable, program. The State of Washington has adopted a program for disconnecting forest roads from streams to further water quality protection and reduce impacts to fish and other aquatic species. *See* Wash. Admin. Code Chapter 222-24 and the extensive materials about Washington's program we are submitting into the administrative record. Washington's Road Maintenance and Abandonment Plans (RMAPs) process was developed as part of the Forest and Fish Rules in 2001. The planning and upgrade process provides landowners with a method to evaluate their forest roads, identify areas that do not meet forest practices rule standards, and schedule needed upgrades and/or repairs to be completed to protect water quality and aquatic species. *See* Wash. Admin. Code § 222-24-010. The RMAP program is mandatory for large landowners, enforceable by the Washington State Department of Natural Resources, and appears to be contributing to a reduction in hydrologic connectivity and forest road impacts to water quality in Washington State. Although not perfect, EPA should look to Washington's RMAP program for the basic building blocks of a national regulatory program for forest roads.

Whether or not EPA follows Washington State's lead, EPA's regulatory approach should provide consistency, at a minimum, and should include the following essential elements to ensure that water quality protection will be achieved during a reasonable compliance period: 1) an inventory of all roads (i.e. including new and old roads, unauthorized, legacy, unused and temporary roads); 2) a plan for action; 3) a schedule for completion; 4) performance measures that achieve water quality standards; 5) accountability measures through enforcement (i.e., civil penalties); 6) a monitoring program; and 7) adaptive management.

A. Inventory of all roads.

All forest landowners should develop and maintain an inventory of all roads and submit that inventory to the regulatory agency. The inventory should include roads currently being used, roads no longer used, temporary roads, skid trails, and unauthorized roads. In addition, the inventory should contain minimum information about the condition of the roads that is supported by field verification.

The inventory should not only include the location and type of road but also should be evaluated against a set of criteria to determine the risk of delivering sediment to a stream, creek or river. Sediment can be delivered chronically or episodically and both of these risks should be addressed. For example, rainfall that flows across a forest road will pick up sediment, flow into a ditch or culvert, which then often flows directly into a stream. That "hydrological connection" should not exist and efforts should be made to re-direct the sediment-laden rainfall to filter and disperse onto the forest floor. Locations where roads are hydrologically connected to streams and chronically deliver sediment to water bodies should be identified in the inventory.

Failures of the road, blockages of culverts at stream crossings, plugging of cross-drains, etc. can lead to a large delivery of sediment to a stream. These "episodic" events can happen because of large storms, which are predicted to worsen with climate change, but also occur when maintenance of road infrastructure is neglected. Infrastructure not updated to handle 50-100 year event storm intensities and climate change are especially vulnerable. Locations that are at risk for episodic failure should be identified in the inventory.

A road inventory should consider all the risks from the forest road; for example how close the road is to a stream, the condition of the culverts and stream crossings, number and location of cross drains, amount of road fill, slope of the road and side-slopes, nearby seeps, geology, soils, failure history, road use, etc. There are road inventory procedures that have been established to varying degrees of success, as noted in the discussion above. One example, USFS Rocky Mountain Research Station has developed a methodology called the *Geomorphic Road Analysis and Inventory Packag*e (*GRAIP*), which is specifically "designed to help land managers learn about the impacts of road systems on erosion and sediment delivery to streams".[12]

Supporting aquatic life is a beneficial use of a river or stream that should also be considered with the road inventory. To that end, forest roads also create barriers to fish moving up and down streams. A road inventory should assess the number of fish passage barriers, the species impacted and the miles of habitat blocked.

It is important to document the progress over time, which is another failure of many of the current voluntary or mandatory programs across the county. The first inventory will establish the initial baseline and should summarize the findings from the inventory such as:

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[12] USFS Rocky Mountain Research Station. http://www.fs.fed.us/GRAIP

- Total forest road miles (active, inactive, legacy, temporary, unauthorized, etc.).
- Stream crossings – number and location that are hydrologically connected to the stream and are sediment sources; number and location that are at high risk of failure.
- Problem roads – mumber and location of roads adjacent to streams, in landslide hazard locations, with risky sidecast construction, etc. The miles of roads that will be addressed either through BMPs, road improvements, decommissioning, etc. should be documented.
- Culverts/ditch relief problems – number and location of cross drains, culverts, ditches that are hydrologically connected to the stream or is at high risk for failure should be listed. In addition, the locations and road miles that will be addressed through BMPs, culvert improvements, decommissioning, etc. should be documented.

Completed inventories should be submitted to the regulatory agency, made available to the public, and be updated annually.

B. An annualized plan for action.

Forest landowners should submit a plan for action – to address impacts from their roads - to the regulatory agency for approval. The plan should include the following: (a) a map of all roads, fish passage barriers and identified drainage problems; (b) a list of roads plus a prioritized ranking of roads to be treated noting fish passage barriers, drainage problems, and landslide risk (dealing with the worst first); (c) proposed treatments (*i.e.*, decommissioning, maintenance, improvements); (d) work detail; (e) a schedule for implementation; and (f) a storm plan to handle emergency maintenance and repairs. The plan for action should prioritize disconnecting forest roads from the stream network, *i.e.* reducing hydrologic connectivity between forest roads and nearby rivers and streams. Any changes to the work plan should be approved by the regulatory agency and the plans should be updated and resubmitted annually. An example of this type of plan can be viewed at Washington State's regulatory program (*See* 77 Fed. Reg. 30,477).

The plan for action should be developed based on the inventory described in #1. Once the baseline has been established, all the problem roads, stream crossings, culverts identified, in addition to the actions identified above, the plan should provide a thorough understanding of the following:

- An overall description of how roads will be managed into the future.
- Milestones of when road problems will be addressed along with the "treatments" that will be used (i.e. approved BMPs, decommissioning, upgraded culverts, etc.).
- Basic outline of how the road work will be accomplished.
- Checks/balances – for when a selected BMP is not effective, the landowner should have a process outlined for how the problem will be further remedied. The objective always is to protect water quality.

The roads inventoried and the actions should be prioritized according to risk of sediment delivery. Protecting streams that are critical to threatened and endangered aquatic species as well as streams that are drinking water sources should be the first tier priority. Additionally, roads and road/stream crossings that were identified in the inventory as chronic sediment sources should be top priorities. And the locations that are most likely to catastrophically fail (an episodic event) should be further evaluated to determine priority based on risk of largest sediment delivery.

C. Schedule for completion.

Forest landowners should submit for agency approval an overall schedule for addressing all impacts to streams from their road network. The schedule should include interim milestones and expected completion dates to bring roads up to standards. Some tasks, such as maintenance, will be ongoing to ensure impacts are eliminated or reduced, but should also be included in the schedule. The schedule helps secure a commitment from the landowner that water quality protection will occur within a reasonable timeframe. The schedule should be kept up-to-date and re-submitted every year with the annual report. Any changes to the schedule must be approved by the regulatory agency.

D. Performance measures, meeting water quality standards and reporting.

EPA should establish clear and understandable performance measures for both BMPs and meeting water quality standards. Performance measures are on-the-ground outcomes that may be met through a combination of different best management practices (BMPs). An example of a site-specific performance measure from Washington State is: no visible plume of sediment. To meet this, a broad range of BMPs may be implemented such as sediment barriers, mulching, improving road surfaces, settling basins, etc. If a sediment plume is observed, then water quality standards are clearly not being met and BMPs need to be evaluated and improved.

In some states that already mandate BMPs, additional BMPs can and should be developed where those BMPs are not adequate to meet the performance measures. In states that have no mandatory BMPs, a full suite of BMPs will have to be developed by EPA to meet the performance measures. By establishing performance measures, EPA will allow for flexibility while still maintaining a consistent level of protection for the designated and existing uses adopted in each state's water quality standards. It is important that BMPs be thoroughly vetted, adapted and monitored to ensure they are effective. As noted, there are currently many challenges with BMPs.

Examples of performance metrics:

- Miles of road delivering sediment per miles of stream.
- Miles of road that meet EPA standards.
- Percent of the landbase that met the sediment performance target (tons of delivered sediment/year/miles of stream).
- Percent of road network hydrologically disconnected from streams.

The program must ensure that the use of BMPs is verified to ensure that BMP implementation will achieve the results expected, namely meeting the performance standards and protecting water quality. There is extensive scientific research that documents that BMPs are often ineffective at addressing impacts, and, in particular, cumulative impacts from roads often are not accounted for.[13] Because some, if not all, states operate under the principle that landowners' implementing recommended or required BMPs is the equivalent of meeting water quality standards, it is essential that any permit require a demonstration that BMPs meet the performance measures and other water quality goals. Large landowners—including states—should be require to monitor *both* BMP implementation and in-steam water quality and attainment of beneficial uses. They should also be required to report everything to the regulatory agencies on an annual basis.

In developing these performance measures, EPA must be comprehensive in providing full protection of existing and designated beneficial uses. For example, when analyzing culverts, consideration of fish passage must include all life cycle stages of relevant fish. In areas of non-fish bearing streams, consideration for protection of amphibians must include addressing passage concerns that are essential for purposes of allowing populations to recolonize. Likewise, culverts should be designed not only to accommodate 100-year floods with debris passage but should also consider locally-projected impacts of global climate change.

Annual progress reports should be submitted to EPA or the Delegated Management Authority every year and made available to the public summarizing (at minimum):

- Change in total road mileage (if roads are treated and decommissioned).
- Treatments completed per year and evidence of their effectiveness in protecting water quality.
- Summary of work remaining to be performed.
- Any changes, updates, new problems identified, new inventories, related to the road network.

Landowners should also be required to submit, every other year, a supplemental report on whether performance measures and water quality standards are being met. This will ensure that road maintenance and implementation of BMPs are tracked by the landowner and the regulatory agency, and that the implementation of those BMPs actually meets water quality standards. Annual water quality monitoring should also be used to verify that BMPs and performance measures are sufficient to achieve or maintain water quality. If water quality standards are still not being met for a water body, additional measures would be required.

Reporting cannot be over-emphasized as an essential component of an effective regulatory program. For example, in Oregon, one of the complaints Federal Agencies noted with the State's CZARA program was that "the State [Oregon] has not provided the federal agencies with specific data to document the effectiveness of voluntary efforts to determine the extent of forestry road

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[13] Espinosa et al. 1997 demonstrated that aquatic habitats were severely damaged by roads and logging in several watersheds despite BMP application. The authors further noted that the blind reliance on BMPs in lieu of limiting or avoiding activities that cause aquatic damages serves to increase aquatic damage. Even activities implemented with somewhat effective BMPs still often contribute negative cumulative effects (Ziemer et al. 1991, Rhodes et al. 1994).

miles not meeting current road standards within the coastal nonpoint management area." Adequate reporting provides evidence to agencies and the public that progress is being made.

E. Accountability – Enforcement – Civil Penalties.

EPA should ensure the regulatory program has measures in place to achieve accountability. Objectives must be understood from the beginning so it is clear when a road is in compliance. Some states have training programs that help educate landowners and contractors on how to effectively implement BMPs. Checks and balances are needed to ensure road inventories are complete, BMPs are being implemented and built correctly, BMPs are effective as designed, water quality standards are being met, and schedules are being adhered to.

Some states use inspectors to provide oversight in the field and the undersigned Conservation Groups recommend that EPA and regulatory agencies fund a program to verify BMP implementation and resulting water quality through objective, independent studies on a state-by-state or regional basis. That would allow EPA and the states to collect independent data that is comprehensive and reflects what is actually happening on the road system and in nearby water bodies.

Even with training, inspectors, and annual reporting, EPA and state water quality protection agencies should retain authority to implement enforcement actions, such as stop work orders, and should impose civil penalties, if these elements are not adhered to. In addition, citizens should retain the right to provide additional oversight and file lawsuits if EPA is not enforcing the Clean Water Act or landowners are not complying with it.

The role of citizens cannot be understated. It's been noted that public reporting of stream sedimentation is currently one of the most important means of learning of problems or potential violations. Local observations of highly-turbid streams, then reported to designated authorities, has helped stop problems before they became worse (Corner et. al. 1992).

In the 2013 Oregon CZARA decision, federal agencies stated that Oregon failed to: "provide a legal opinion from its Attorney General asserting the State has adequate back-up enforcement authority for the voluntary measures and commit to exercising the back-up authority when necessary. While the State has provided the federal agencies with a legal opinion detailing the suitability of its back-up authorities, the State has not provided (either in writing or through past practice) a commitment to exercise its back-up authority to require implementation of the additional management measures for forestry roads, as needed."[14] In addition, in Washington State, there is little evidence that the state uses its enforcement authority when problems are not being addressed on private or federal lands.

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[14] See Oregon Coastal Nonpoint Program. NOAA/EPA Proposed Finding. https://coast.noaa.gov/czm/pollutioncontrol/media/OR%20CZARA%20Decision%20Doc%2012-20-13.pdf

F. Monitoring.

EPA should include a monitoring component – beyond the annual reports described in #4. Monitoring should cover (1) implementation to ensure actions are being taken as planned and to keep track of progress over time and (2) effectiveness – whether the program, BMPs and/or other activities are indeed effective at reducing impacts to beneficial uses of the Nation's waters. Water quality monitoring should be conducted during storm events.

Some studies show that BMP implementation rates are generally high and other studies question the methods used to determine these values. Many studies question BMP effectiveness. Thus, a handful of states have established monitoring/evaluation programs which could be used as models. Monitoring could include some or all of the following:

- Current status of hydrologic connectivity of the road network.
- Trend of road network hydrologic connectivity.
- Trend of road failure risk.
- Trend of forest road risk to water resources.
- Trend of storm damage and impacts to water resources (landslides, culvert blowouts, stream crossing failures, etc.).
- Compliance with regulations.
- Current status and trend of barriers to anadramous and resident fish passage.
- Selective monitoring of water quality and biological communities.
- Selective monitoring of BMP effectiveness.
- Visual monitoring of BMP effectiveness during rain events.

Monitoring is extremely important to show that the management actions and remedies taken are actually resulting in improvements.

G. Adaptation.

Although landowners, agencies and the public appreciate predictability, there will be times when changes need to be made to meet the desired outcomes. As stated repeatedly in this letter, the goal is to ensure forest roads are compliant with the Clean Water Act. If measures and practices outlined in an EPA regulatory program are not meeting the goal, then the program needs to be reviewed and changed.

As is often stated by stakeholders, the development of the program, implementation, and results should all be transparent. In addition, it should be consistent enough to be applicable from state to state, across land ownerships and between EPA regions while also considering geographic and climatic differences. Landowners often manage their roads in multiple states and roads cross multiple ownership boundaries, thus consistency can be helpful. The program should be equitably administered and should achieve results in a timely fashion.

Earlier in this letter, a case study from Oregon highlighted some of the challenges that are inherent in the wide-variety of state-based programs being implemented across the nation. The problem is that they are not achieving the water quality protection results that are mandated by the Clean Water Act, which is the goal. One could say that EPA's oversight and development of a forest road regulatory program now is an example of an "adaptation" step in that current efforts are not sufficient, EPA is evaluating what can be changed, and will develop an adapted program that is applicable across the United States. Once that program is in place, EPA should retain the flexibility in the program to make changes when monitoring shows the goals are not being met.

VI. Conclusion.

Section 402(p) of the Clean Water Act, 33 U.S.C. § 1342(p), requires EPA to develop a program to address forest roads discharging stormwater to waters of the U.S. The program should be regulatory, not voluntary, and EPA must use water quality data—not simply data about BMP implementation—to build and manage the program. As EPA recognizes, "[s]tormwater discharges from logging roads, especially improperly constructed or maintained roads, may introduce significant amounts of sediment and other pollutants into surface waters and, consequently, cause a variety of water quality impacts." 77 Fed. Reg. at 30,476.

Thank you for considering and responding to these comments. Please inform the Washington Forest Law Center, the Crag Law Center, and the Conservation Groups in writing of any action you take related to the regulation of stormwater discharges from forest roads. In the meantime, please contact me if you have any questions about these comments or if you would like to discuss these issues further.

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