

## Technical Comments on Environmental Protection Agency and National Oceanic and Atmospheric Administration Concerns Regarding the Adequacy of the Oregon Forest Practice Act Rules to Address Water Quality and Fish Issues under the Coastal Zone Management Act

George Ice, NCASI

In a May 12, 2010, letter to the Oregon Department of Environmental Quality (ODEQ) and the Oregon Land, Conservation and Development Commission (LCDC), the United States Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) raised concerns about the adequacy of the Oregon Forest Practices Act rules to meet requirements under the Coastal Zone Management Act (CZMA). They specifically focused on three issues:

- Protection of riparian areas
- Management of landslide-prone landscapes
- Management and maintenance of forest roads, and particularly legacy roads

Oregon is uniquely positioned to address these concerns. It has a rich history of research and forest practice innovation. Today Oregon hosts the Watersheds Research Cooperative (WRC) at Oregon State University, representing the most comprehensive test of the adequacy of forest practice rules anywhere in the United States. This includes both physical and biological monitoring to test the adequacy of contemporary forest practices. Here we describe the WRC and other ongoing efforts to examine forest practice rules. The solutions proposed by the EPA/NOAA letter threatens a clearly effective program without waiting for or even supporting research to identify needed changes in forest practice rules.

### What is the Coast Zone Management Act and What Actions do EPA and NOAA Propose?

The Coastal Zone Management Act (CZMA) encourages states/tribes to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. It includes areas bordering the Atlantic, Pacific, and Arctic Oceans, Gulf of Mexico, Long Island Sound, and Great Lakes. A unique feature of this law is that participation *by states/tribes* is voluntary. To encourage states/tribes to participate, the act makes federal financial assistance available to any coastal state, tribe, or territory, including those on the Great Lakes, that is willing to develop and implement a comprehensive coastal management program. Most eligible states/tribes are, or will be, participating in the program.

In its reauthorization of the Coastal Zone Management Act in 1990, Congress identified **nonpoint source pollution** as a major factor in the continuing degradation of coastal waters. Congress also recognized that effective solutions to nonpoint source pollution could be implemented at the state/tribe and local levels. Therefore, in the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), Congress added Section 6217, which calls upon states/tribes with federally approved coastal zone management programs to develop and implement coastal nonpoint pollution control programs. The Section 6217 program is administered at the federal level jointly by EPA and the National Oceanic and Atmospheric Agency (NOAA). (from <http://www.epa.gov/agriculture/lzma.html#Summary%20of%20Coastal%20Zone%20Management%20Act%20and%20Amendments>)

Oregon has coastal lands addressed by the CZMA and participates in the program. Management measures under the CZMA are equivalent to Best Management Practices (BMPs) and forest practice rules. As stated, a key component encouraging participation in the CZMA is financial assistance to the states. In their May 12, 2010, letter to ODEQ and LCDC, EPA and NOAA threaten to disapprove

Oregon's nonpoint source control program for the CZMA and withhold a portion of Oregon's Clean Water Act 319 and Coastal Zone Management Act Section 306 funds unless, "...a prescriptive TMDL [Total Maximum Daily Load] approach, extended to address all three outstanding forestry issues..." is implemented. An attachment lists these outstanding forestry issues as riparian areas, landslide-prone areas, and roads (especially legacy roads). The attachment goes on to request a legal opinion that ODEQ has the authority to implement additional management measures for forestry and "...to enforce TMDLs, including 'safe harbor' BMPs, with regard to riparian buffers, landslide-prone areas, and legacy roads."

### **History of Innovative Forest Practices Regulation and Research**

When the 1972 Federal Water Pollution Control Act Amendments (also known as the Clean Water Act) precipitated development of state programs to control so-called nonpoint-source pollution from forestry, agriculture, and other diffuse sources, the landmark Oregon Forest Practices Act was proposed to be a model for the rest of the United States. This occurred at the same time as implementation of the CZMA. Federal agencies criticizing the forest practice program in coastal Oregon need to take a broader look at how Oregon manages forest watersheds to maintain fisheries and water quality values. Specifically, they need to become more acquainted with and involved in ongoing research in this state to test the effectiveness of Oregon's Forest Practices Act.

There is no question that Oregon has been a leader in development of BMPs. BMPs are practices or combinations of practices determined to be the most effective and practical means of controlling pollution. One commonly applied BMP for forestry is a stream buffer or riparian management area where trees are left to provide wood recruitment and shade to streams and disturbance to the stream corridor is avoided. Between 1959 and 1973, a study in the Alsea Watershed tested the impacts of clearcutting and prescribed burning without any stream protection (Stednick 2008). The study was a cooperative effort, with federal and state agencies, forest landowners, and Oregon State University all contributing. The Alsea Watershed Study also tested the effectiveness of buffers to moderate water quality impacts along fish-bearing streams. Emerging lessons led to development of the first Forest Practices Act (FPA) in the nation that specifically addressed protection of water quality and fish habitat (in addition to fire control and reforestation) (Hairston-Strang, Adams, and Ice 2008). This included new FPA rules or BMPs specifically addressing protection of streams during harvesting. Some important facts about the Oregon Forest Practices Act are that it was the first of its kind in the nation; it predated the 1972 amendments to the Clean Water Act; it was strongly influenced by emerging findings from the Alsea Watershed Study; the rules have been greatly modified over the years when new information has become available; and **it has enjoyed broad support from the forestry community since its adoption.**

This latter observation of broad support cannot be over-emphasized. Oregon's forestry community is proud of the Act and what it has accomplished. Two overriding issues must be addressed if water resource goals related to forest watersheds are to be sustainably met on private forestlands. The most important issue is to keep forestland in forests despite pressures for permanent land conversion, especially to urbanization and rural housing development. Clearly, conversion to other land uses has negative consequences for water quality and fish (Pess et al. 2002). Oregon has unique land use laws designed to maintain agricultural and forest lands (Kline and Alig 1999). While these laws create some inequities, they are designed to retard conversion of forest lands. Favorable economic conditions for forest landowners also help avoid land conversion. Too often, wider buffers or more restrictive regulations are viewed as better. In defining BMPs, the term "practical" includes whether the practice is technologically, economically, or institutionally practical. Oregon continues to try to make its Act and rules practical, and this continues to engender broad support from the forestry community. Complex and expensive rules for forestlands discourage their retention and investment in watershed protection measures.

The second major issue is the rate of compliance with BMPs or forest practice rules. The most recent comprehensive review of application of Oregon's forest practice rules found a 96% compliance rate (Robben and Dent 2002). Assessments across the United States find that when BMPs are implemented

negative water quality impacts are generally avoided (Ice 2004). It is a combination of effective BMPs and a high level of implementation that make overall nonpoint source programs effective. So how effective are Oregon's forest practice rules?

### **Ongoing Research and the Watersheds Research Cooperative**

Oregon has not remained passive about testing the effectiveness of the existing rules. The Oregon Department of Forestry (ODF) has continued to monitor key water quality concerns and, where necessary, recommend changes in FPA rules to the Board of Forestry (Hairston-Strang, Adams, and Ice 2008). When 1996 floods resulted in numerous landslides on forestlands, ODF's monitoring program, working with Oregon State University, conducted a study of landslides to assess whether the rules needed revisions (Robison et al. 1999). Copies of resulting landslide report and reports from other monitoring studies can be found at <http://www.oregon.gov/ODF/privateforests/TechReportsNumerical.shtml>. When issues related to management of headwater streams became a concern a broad cooperative of federal, state, and industry partners began the Oregon Headwaters Research Cooperative (<http://www.headwatersresearch.org/>). Three comprehensive, decades-long paired-watershed studies with multiple private and public partners are beginning to yield data about impacts of forest management under FPA rules. As part of the WRC at Oregon State University, the Hinkle Creek study near Roseburg and similar studies in the Alsea and Trask watersheds in the Coast Range focus on the effectiveness of the Oregon FPA in protecting fish and water quality in small fish and non-fish headwater streams—exactly the landscapes and issues for which the federal agencies have expressed concerns. These three studies represent the most comprehensive scientific assessment of the effectiveness of forest practice regulations ever undertaken in the United States. Each has or will yield new findings.

One of the major concerns raised about the FPA rules is their treatment of non-fish-bearing headwater streams and possible impacts to stream temperature. These concerns arose from findings from the original Alsea Watershed Study, where exposure of a stream resulted in an extreme streamwater temperature increase. Early findings from Hinkle Creek show that this may now not be as severe a problem as during the Alsea Watershed Study. Notably, the new research is looking at the basic mechanisms determining water quality responses so that the most direct and practical rules can be designed. The Alsea Watershed Study Revisited allows us to go back to the watershed completely clearcut in 1966 to see how current FPA rules affect water quality. "Revisit studies" conducted elsewhere in the United States suggest that negative water quality changes may be reduced by 80% or more with contemporary practices. Preliminary findings from the Alsea suggest a similar response, with dramatically muted temperature and dissolved oxygen changes related to harvesting. The Trask Watershed Study provides replicated testing of alternative headwater treatments, focusing on how downstream salmon and trout are affected by these alternative practices. These three studies are complementary, providing replication of research and a broad spectrum of conditions to test FPA rules. To learn more about these studies visit <http://watershedsresearch.org/>.

Other research includes studies by Oregon State University (Tolman and Skaugset 2007; Surfleet 2008) and ODF (Mills, Dent, and Robben 2003; Mills, Dent, and Cornell 2007) on forest roads and hydrology/water quality, the RipStream Study of streamwater temperature response to the current forest practice rules, and another set of basinwide streamwater temperature studies under the WRC.

### **EPA and NOAA Support for WRC and Testing of BMP Effectiveness**

If EPA had found evidence of inadequate forest practice rules it would seem logical that it would be providing funding and otherwise supporting the WRC and other research efforts to test alternative forest practice regulations. This is not the case. The WRC lists dozens of financial supporters and technical collaborators, none of which include EPA or NOAA. The only federal financial supporters are the Bureau of Land Management and the United States Geological Survey, while the Forest Service is a collaborator and provides invaluable control watersheds, such as Flynn Creek in the Alsea Watershed

Study Revisited. Again, neither EPA nor NOAA has provided financial support or conducted research to test the effectiveness of the Oregon Forest Practices Act rules, relying instead on a comparison between federal forest rules or adjacent state regulations to make their judgments. In fact, EPA and NOAA participation at WRC-sponsored conferences (with presentation of preliminary findings) has been meager despite overwhelming participation by the rest of the forestry community.

Again, if EPA and NOAA are critical of the adequacy of the Oregon Forest Practice Act rules then their own research programs should logically be focused on assessing forest practices. We were recently invited to participate in a peer review of an EPA Ecohydrology Model. The model is designed to “Provide a framework for integrated assessments that identify policy and management strategies for entire ecosystems and the bundled services they provide...” This is clearly a laudable goal. However, as currently configured the model cannot assess riparian management areas, roads, or landslides—the three outstanding issues raised by EPA in its criticism of the Oregon Forest Practices Act rules (Ice 2010a)

Similarly, in a peer review of the draft NOAA-led *Scientific Conclusions of the Status Review for Oregon Coastal Coho Salmon*, we found that the Biological Review Team did not even acknowledge ongoing forest watershed and biological research by the WRC (Ice 2010b). Further, it adopted a precautionary approach that accepted least-favorable habitat trend assessments and dismissed more favorable ones. An example justifying this conclusion is found on page 69 of the draft status review, where a discussion about conclusions from a paper by Burnett et al. (2007) on current and future conditions of riparian areas summarizes:

The percentage of buffers with large and very large trees is projected to increase to at least 75% on federal land and 60% on state lands in 100 years under current policies. Less than 25% of the buffers in private ownership will have vegetation in these size classes at the end of that time. As a result, Burnett et al (2007) conclude widespread recovery of habitat in high IP [intrinsic potential] streams, a key element of future OC [Oregon coast] coho salmon habitat recovery, is unlikely unless there are greater improvements on private lands.

At first read, this conclusion seems impossible. Oregon FPA rules include riparian management areas (RMAs) adjacent to fish-bearing streams designed to create mature riparian forests. However, a more detailed reading of Burnett et al. finds that they were assessing forest conditions within a 100 m riparian zone. RMAs under the Oregon FPA vary from 50 to 100 feet, depending on stream size (discharge) and water use (non-fish, fish, domestic water supply). There is a law of diminishing returns for many riparian functions, so stream-adjacent wood recruitment potential may be high within this smaller zone around the stream even though forest stand condition within the 100 m buffer would not be assessed as consisting of large or very large trees.

NCASI is a co-sponsor of research looking at coho population data for Oregon to assess land use impacts. While there appears to be no difference between presence or absence of coho for different forest ownerships, there is evidence that high number coho reaches are less frequent on private lands than on public lands, especially for private non-industrial lands (Dr. Kelly Burnett, USDA Forest Service, personal communication). We believe this pattern may be a result of mixed land uses and that farms and other minor land use activities clustered along high-value coho reaches may be causing this pattern (Pess et al. 2002).

One effort of note by NOAA scientists is a recent paper in the *Journal of the American Water Resources Association* assessing stream temperature relationships to forest harvesting in western Washington (Pollock et al. 2009). Based on harvest patterns and monitoring of stream temperatures, Pollock et al. concluded that “...forest harvest activity is in some way contributing to stream heating other than by exposing the stream surface to direct solar radiation.” Ice et al. (2010) raised concerns about this conclusion, and especially the lack of field data to test mechanisms for changes in stream temperature. A response to these concerns is found in Pollock and Beechie (2010). For this presentation the key issue

debated in that exchange is the need to identify specific mechanisms that result in changes in stream heating. Only by doing so can effective management solutions be identified and forest practice rules be implemented. If, for example, debris flows are a source of stream heating, as appears likely in the Washington case and has been observed elsewhere, then a focus on road failures or other high hazard conditions seems a reasonable response (not basin harvest scheduling based on unspecified stream heating mechanisms or limited to specific landscapes).

### **Addressing the Three Outstanding Forest Practice Rules Issues**

Simply put, no state is investing more than Oregon in testing the effectiveness of forest practice rules (although Washington and California are certainly on the same scale). The approach taken by the WRC is based largely on paired watersheds to partially account for natural variability in water quality and biological response. Key concerns about this type of research (other than the expense) include the need for replication to avoid unique watershed observation that are not transferable; the need to demonstrate benefits of rules or BMPs to achieve water resource goals; and the need to determine “how much is enough” and to test alternative management practices. The WRC is uniquely positioned to address these concerns. First, there is replication in its studies. There are three separate paired watershed studies: Hinkle Creek, the Alsea Watershed Study Revisited, and the Trask. Second, there is replication within watershed studies, with multiple harvest units and streams being monitored in Hinkle Creek and the Trask. While the Alsea design does not allow for replication, there are multiple monitoring sites along Needle Branch to assess impacts between non-fish-bearing headwater and fish-bearing reaches and there will be two separate harvest units in Needle Branch. Historic data from the original Alsea Watershed Study (Stednick 2008) allow us to test for improvements in water quality and habitat resulting from implementation of the Oregon FPA rules. Extensive biological monitoring associated with all three studies allows an assessment of whether the rules are achieving both water quality and biological objectives.

Roads are included in all three WRC paired watershed studies and have been the subject of additional research by Oregon State University, ODF, and others. It is clear that the forestry community has long recognized that roads can be significant sources of sediment to streams and that control measures can reduce those impacts. The forest industry’s commitment to the Oregon Plan for Salmon and Watersheds included identification of problem roads and correction of these problems. There is evidence that active forest management allows for upgrading of problem road conditions. For example, Montana BMP surveys reports that 50% of applicable audit sites reduced sediment delivery to streams from existing roads as part of an active project (Ziesak 2009). Economically depressed conditions dampen opportunities for private landowners to address problem roads, just as lack of federal funding retards road maintenance and improvement activities on federal forestlands.

Addressing legacy road conditions under the Oregon Forest Practices Act seems to be a special concern for EPA and NOAA. All land use activities have some legacy conditions. Important legacy conditions in the Oregon Coast Range include location of farms and development along high intrinsic potential salmon reaches. Roads were often located near streams or built using methods no longer considered sensitive to environmental concerns. Direct drainage of road runoff to streams is one example. In recent years there has been a concerted effort to disconnect roads from streams and to provide for dispersal of runoff and settling of sediment. Again, the opportunity to address legacy road conditions is increased with active management and economic vitality.

Landslides are difficult to study using paired watershed approaches because of their rare and dispersed nature. A better approach is the use of carefully conducted landslide inventories. As noted, ODF took advantage of the 1996 floods to initiate an extensive review of landslides on forestlands and to develop suggested changes in the forest practice rules (Robison et al. 1999). Our view of what is desirable continues to change, as landslides are now viewed as largely favorable events and there is an effort to provide some trees along debris flow pathways to provide for input of wood into streams. Landslide

inventories that have been repeated in the same areas provide evidence that new road practices and recognition of high hazard conditions, such as uncompacted side-cast road construction, can reduce landslide rates (Ice 1985).

One final thought is that the EPA and NOAA letter rejected an option that would use the normal process of rule change under the Oregon FPA. They concluded that “It would take years for the rule change process to play out and there is no certainty the resource-intensive-effort would ultimately result in substantive rule changes to address NOAA and EPA’s remaining forestry concerns...” As a society, we should be careful to base changes to laws and regulations on sound science. The often-cited case of wood removal from streams in a misguided effort to improve fish habitat provides an excellent example of what can happen without careful deliberation. The WRC is yielding unexpected findings such as the muted changes in stream temperature observed for timber harvests along non-fish-bearing stream reaches and the importance of predation in small forest streams. One preliminary observation from this year’s monitoring is that young-of-the-year fish numbers appear to be down for all the streams (both treated and control), perhaps as a result of the cool, wet late season (Doug Bateman, Oregon State University, personal communication). One exception to this pattern is the headwater reach in Hinkle Creek that experienced the debris flow. This suggests tremendous resilience and adaptability of these biological communities to disturbance. What is clear is that the Oregon Forest Practices Act is providing substantial water quality protection compared to unrestricted practices. The Oregon Forest Practices Act has been revised over the years based on new findings and it will continue to evolve with new information. In making these programs work it is critical that they be effective in protecting fish and water quality and practical for foresters, loggers, and landowners to implement. We hope that those criticizing the Oregon Forest Practices Act will take a broader look at the issues and become more involved in the ongoing research of the Watersheds Research Cooperative.

## References

- Burnett, K.M., Reeves, G.H., Miller, D.J., Clarke, S., Vance-Borland, K., and Christensen, K.R. 2007. Distribution of salmon-habitat potential relative to landscape characteristics and implications for conservation. *Ecological Applications* 17:66-80.
- Hairston-Strang, A.B., Adams, P.W., and Ice, G.G. 2008. The Oregon Forest Practices Act and forest research. 95-114 in *Hydrological and biological responses to forest practices: The Alsea Watershed Study*. Stednick, J.D. [Ed.]. Ecological Study, Vol. 199. New York: Springer.
- Ice, G.G. 1985. *Catalog of landslide inventories for the Northwest*. Technical Bulletin No. 456. Research Triangle Park, NC: National Council for Air and Stream Improvement, Inc.
- Ice, G.G. 2004. History of innovative Best Management Practice development and its role in addressing water quality limited waterbodies. *Journal of Environmental Quality* 130(6):684-689.
- Ice, G.G. 2010a. Ecohydrology Model Review. Comments to EPA as part of a peer-review of the Ecohydrology Model (sent April 8, 2010). On-file with George Ice at the NCASI West Coast Regional Center, Corvallis, OR.
- Ice, G.G. 2010b. July 20, 2010 letter to NOAA on Draft Report: Scientific Conclusions of the Status Review for Oregon Coast Coho Salmon (*Oncorhynchus kisutch*). On-file with Dr. George Ice at the NCASI West Coast Regional Center, Corvallis, OR.
- Ice, G.G., Brown, G.W., Gravelle, J.A., Jackson, C.R., Light, J.T., Link, T.E., Martin, D.J., McGreer, D.J., and Skaugset, A.E. 2010. Discussion - Stream temperature relationships to forest harvest in western Washington by M.M. Pollock, T.J. Beechie, M. Liermann, and R.E. Bigley. *Journal of the American Water Resources Association* 46(4):838-842.

- Kline, J.D., and Alig, R.J. 1999. Does land use planning slow the conversion of forest and farm lands? *Growth and Change* 30:3-22.
- Mills, K., Dent, L., and Cornell, J.L. 2007. Rapid survey of road conditions to determine environmental effects and maintenance needs. Paper presented at 9<sup>th</sup> *International Conference on Low Volume Roads*, Austin, TX.
- Mills, K.L., Dent, L., and Robben, J. 2003. *Oregon Department of Forestry wet season road use monitoring project: Final report*. Forest Practices Monitoring Program Technical Report 17. Oregon Department of Forestry. <http://www.oregon.gov/ODF/privateforests/TechReportsNumerical.shtml>.
- Pess, G.R., Montgomery, D.R., Steel, E.A., Bilby, R.E., Feist, B.E., and Greenberg, H.M. 2002. Landscape characteristics, land use, and coho salmon (*Oncorhynchus kisutch*) abundance, Snohomish River, Washington, U.S.A. *Canadian Journal of Fisheries and Aquatic Science* 59:613-623.
- Pollock, M.M., and Beechie, T.J. 2009. Reply to discussion by G. Ice, G. Brown, J. Gravelle, C.R. Jackson, J. Light, T. Link, D. Martin, D. McGreer, and A. Skaugset – Stream temperature relationships to forest harvest in western Washington. *Journal of the American Water Resources Association* 46(4):843-847.
- Pollock, M.M., Beechie, T.J., Liermann, M., and Bigley, R.E. 2009. Stream temperature relationships to forest harvest in western Washington. *Journal of the American Water Resources Association* 45(1):141-156.
- Robben, J., and Dent, L. 2002. *Oregon Department of Forestry Best Management Practice Comprehensive Monitoring Project: Final Report*. Forest Practices Monitoring Program Technical Report 15. Oregon Department of Forestry. <http://www.oregon.gov/ODF/privateforests/TechReportsNumerical.shtml>.
- Robison, E.G., Mills, K., Paul, J., Dent, L., and Skaugset, A. 1999. *Oregon Department of Forestry Storm Impacts and Landslides of 1996: Final Report*. Forest Practices Technical Report 4. Oregon Department of Forestry. <http://www.oregon.gov/ODF/privateforests/TechReportsNumerical.shtml>.
- Stednick, J.D. [Ed.]. 2008. *Hydrological and biological responses to forest practices: The Alsea Watershed Study*. Ecological Study, Vol. 199. New York: Springer.
- Surfleet, C. 2008. *Uncertainty in forest road hydrologic modeling and catchment scale assessment of forest road sediment yield*. PhD dissertation. Corvallis, OR: Oregon State University.
- Toman, E.M., and Skaugset, A.E. 2007. Designing forest roads to minimize turbid runoff during wet weather use. 612-616 in *Watershed Management to Meet Water Quality Standards and TMDLs: 4<sup>th</sup> Conference Proceedings*. St. Joseph, MI: American Society of Agricultural and Biological Engineers.
- Ziesak, R. 2009. *Montana Forestry Best Management Practices Monitoring: 2008 Forestry BMP Audit Report*. Missoula, MT: Montana Department of Natural Resources and Conservation, Forestry Division.