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To WA Dept of Ecology
21 November 2025

re: Agricultural activities and clean water comments

Suites of practices include those described in <https://apps.ecology.wa.gov/publications/parts/2010008part14.pdf>. I will mainly comment on Chapter 12, riparian management zones.

1) The last page of the 'suite of practices' says that Ecology remains responsible for determining whether water quality is protected. By 'protected' that also means (I believe) the intention of the legislative mandate of RCW 90.48 is met. That says that it is the public policy to insure the purity of waters for public enjoyment and for fish, wild life, birds, game, fish and use AKART to make sure this is so. Often Ecology also can develop narrative criteria for things to protect the water quality for the people.

Ecology has jurisdiction over surface and underground waters and water courses as well as rivers ponds etc.

In today's climate the agricultural industry needs water. Farmers more than anyone appreciate the need for water and also get to experience the fish and wildlife that use waters on their lands. We all appreciate what the agricultural industry can do for us all. And we like our fish and wildlife as well.

2) Chapter 12 discusses riparian areas and surface water protection (Publication No. 20-10-008b). The word 'buffer' is used over 2900 times in this 444 page document, emphasizing its import for preventing pollution, pathogens, phosphorus, sediment and temperature. Most of these all important for salmonids mentioned 35 times. 'Bird', however, is used 5 times. Birds were probably pretty common in buffers as discussed by WDFW 2020. But what were the historical buffers?

3) In Chapter 12, historical is only used 8 times, sometimes referring to buffers that were historically forested. The table on page 113B is confusing as it says that western Washington streams with an east-west channel orientation would meet its potential shade in less than or equal to 108 feet. First this doesn't make sense as a site potential is much larger than 108 feet. And maybe this shade is ok if the east west channel stays put and the climate doesn't change. But it has. No one is ice skating on Black Lake Anymore. We don't see a frost every month of the year in Mukilteo Muck soils (cited in the 1958 Thurston County soil survey. But buffers have changed since historical. Knowing those historical conditions can inform (McAllister cited on page 65 etc in WDFW 2020). GLO surveys told us.

In Southwest Washington, pre-european vegetation communities included bottom land of various hardwoods and spruce (see figure 5 of Shroeder 2021). Early (1850) GLO surveyors noted that these forests of the bottomlands were about 0.5. to 2 miles in width with 'different kinds of hardwood, maple, with ash, cottonwood, crab-apple, chitwood alder and spruce are common to all the bottom

lands'. Perhaps these forests overlapped the lower elevation floodplains seen in lidar and other maps that sure appear to be 0.5 to 2 miles in width (Slaughter and Huber 2014). Oak areas were also identified by early surveyors. Such wide deciduous forests would have many benefits including maintaining off-channel and floodplain habitats (mentioned in WDFW 2020). About 25 years before the 1850 GLO surveys, John Work reported abundant woody debris, riparian vegetation and salmon in the upper Chehalis, so perhaps that level of riparian forest benefited existing uses.

These deciduous forests would vastly exceed the 50 foot riparian buffer width mentioned on page 124b as adequate to protect microclimate. WA Dept of Ecology should fix this language here and reference to the buffer width needed to protect microclimate.. The paragraph preceding the 50 foot recommendation say temp and humidity gradients may reach one tree height into mature riparian forest. One tree height is much more than 50 feet in Thurston County (see page 141b) so this rationale should be reconsidered. What is the 50 foot based on in the Ecology report?

The historical deciduous woods could have provided not only cover but also nutrition for cervids like elk and deer and other ungulates (Endress 2012), Science Findings - Issue 231 - September 2020 - Predicting Where Elk Will Thrive: New Models Point the Way, Endress et al 2012, Vales 2017. During hunting season elk move to cover (review in Lyon L Jack et al entitled Reducing Elk Vulnerability with road closures and landscape management: A model).

Other wildlife appreciate larger bottomland forests. Bird communities are more richer where deciduous vegetation is left (

Tewksbury 2002). Audubon Society of Washington describes how thickets of native shrubs support abundant bird communities, many of which occur in riparian zones:

https://wa.audubon.org/sites/default/files/static_pages/attachments/native_plants-bird_tips_and_bps_complete_guide.pdf. Size matters too:

Big patches of woodland support more birds as well as bird productivity (Roarke Donnelly and JM Marzluff 2004). In some cases, a wider buffer increased bird abundance in riparian zones in areas managed for forest production

(https://dnr.wa.gov/sites/default/files/2025-05/fp_cmer_rmz_bird_2014.pdf).

A large suite of birds are just more abundant in riparian zones perhaps due to the extensive amount of deciduous shrubs and trees (Pearson and Manuwal 2001). Birds indicate a healthy functioning ecosystem and have been used to indicate whether a riparian restoration project was successful for birds (Bryce and Hughes 2002 and Omerod and Tyler 1993).

More than just birds but fish and aquatic macroinvertebrates are affected in changes from deciduous woodlands to intense ag (Hughes and Vadas et al 2021).

Fish are highly affected by stream temperatures. And things are changing. No one is ice skating on Black lake anymore in Thurston County like they did in the 19-teens. Soils are experiencing frosts every month of the year, as described at least in Thurston County 1958 soil guides. Comparing

historical stream temperatures with current can be difficult. In the past, rivers spread out allowing solar exposure in shallow areas but other waters would be cooled by pockets shaded by riparian shrubs and trees whether or not water is removed from the river (Wondzell and others 2019, referring to the John Day in Oregon). But Wondzell referred to a time when the climate was cooler. It is just getting warmer and dryer since older historical days when salmon runs were high.

Most predictions are that water temp, including in the Chehalis, will increase substantially if buffers aren't improved. A Technical memo of 11 October 2024 discusses how big a buffer should be in tree heights. [Riparian Shade Temperature Model TM](#). Whats alarming was that so many river temperatures are just off the charts bad on several graphs for months in the summer.

Can a combination of farmers and Ecology and other restoration ecologists try to fix this? Buffers are proposed. But how far away. Historical bottomland forests as described above, were up to 2 miles wide. No one is asking for that buffer but thats what may have supported the fish and wildlife that probably appealed to the early settlers. Settlers who then farmed. Conditions were good. They cleared a long ways back on the nice bottomland soil, to raise crops and graze etc.

Some say that soil temperatures are going to increase (Benz 2024). Soil temps may be a function of microclimate. It may take as much as 300 meters to stabilize a buffer microclimate (Brosnoff 1997). In that paper, the relationship between soil temperature and water temperature was very strong so see Figure 9 of that paper. Page 1198 (of Brosnoff 1997) recommends that selective harvesting in the upland is strongly recommended where the surrounding watershed exerts similar strong influences so as to mitigate these effects on stream water temperature. It is foreseeable that some upland areas could exert a strong influence:

. In larger streams, stream temperature was warmer in ag land and cooler in forested landscapes (Figure 5 of Mustafa 2021). This could be presumably due to warmer groundwater which was briefly discussed on page 88 of WDFW 2020 which concluded that such interactions are difficult to predict because of the time lag etc. However sometimes we know that lag period. If groundwater is warm in winter and cold in summer what does that mean? Doesn't that mean that the groundwater was originally surface water that heated up in summer and then propagated downstream?

This happens at a well called MW-1 in Thurston County on Salmon Creek where the groundwater is warm in winter and cool in summer. People think that that warm water in winter in the downstream reaches is caused by warm water entering groundwater upstream and moving downstream over 6 months. (See the Thurston County well and water dashboard). It isn't that hard.

There is interest in protecting riparian communities (Jenkins 2021) for so many reasons. A lot of us hope that the agricultural industry can show us how to cool off rivers while providing habitat in creative ways. I buy hay. I like to think I'm buying it from those who help keep the soils cool and protect riparian birds.

Some citations below:

Benz 2024 et al. Global groundwater warming due to climate change. *Nature Geoscience*. 17:5450551.
Bryce SA and Hughes RM 2002. Development of a bird integrity index: Using bird assemblages as indicators of riparian condition. *Environmental Management* 30, 294-310.

Brososke Chen and Franklin 2010 (harvesting effects on microclimate gradients from small streams to the uplands in Western Washington).

Endress et al 2012. Effects of ungulate herbivory on aspen, cottonwood and willow under forest fuels treatment regimes. *Forest Ecology and Management* 276: 33-40.

Jenning JA. Et al. Juvenile salmonid use of freshwater emergent wetland in the Chehalis River Floodplain and its implications for Conservation Management.

Manning, D., Sullivan, S., and Mazeika, P. 2021. Conservation across aquatic terrestrial boundaries: Linking continental scale water quality to emergent aquatic insects and declining aerial insectivorous birds. *Frontiers in Ecology and Evolution* 9.

Mustafa, M et al 2021. Modeling landscape change effects on stream temperature using soil and water assessment tool.

Omerod SJ and SJ Tyler 1993. Birds as indicators of changes in water quality. Birds as monitors of environmental change. Edited by R.W. Furness and JJ Breenwood. Chapter 5. Pp 179-21ton
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Pearson SF and DA Manuwal 2001. Breeding bird response to riparian buffer width in managed Pacific Northwest Douglas-fir forests. *Zoological Applications* 11(3):840-853.

Schroeder T. 2021. Pre-settlement forests of Southwest Washington: Witness Statements.
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Slaughter SL and IJ Hubert. 2014. Geomorphic mapping of the Chehalis River floodplain, Cosmopolis to Pe Ell, Grays Harbor, Thurston and Lewis Counties Washington. Washington Division of Geology and Earth Resources. Circular 118. July 2014/

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Jenkins, D. 2021. Inslee to push for mandatory riparian buffers. Capital Press (Salem, OR), December 15: 1 p. (https://www.capitalpress.com/ag_sectors/rurallife/inslee-to-push-for-mandatory-riparian-buffers/article_0509d510-5d39-11ec-81d6-f7ba36eda5a5.html).

Hughes, R.M., and R.L. Vadas, Jr. 2021. Agricultural effects on streams and rivers: a western USA focus. Water [online] 13(14): 1901 (<https://www.mdpi.com/2073-4441/13/14/1901>).

Rowland 2022. User Guidelines for westside elk nutrition and habitat-use model.

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Tewksbury et al 2002. Effects of anthropogenic fragmentation and livestock grazing on ``

Vales DJ MP Middleton and M McDaniel. 2017. A nutrition-based approach for elk habitat management in managed forestlands. Journal of Forestry 115(5. 406-415.

Work, J. Journal of John Work, November and December. Washington Historical Quarterly of 1912. 1824.<https://user.xmission.com/~drudy/mtman/html/jwork/work02.html>

WDFW 2020. Riparian Ecosystems.<https://wdfw.wa.gov/sites/default/files/publications/01987/wdfw01987.pdf>