Submitted: May 14, 2019

Oregon Board of Forestry:

Please find attached a letter to the Board of Forestry from the Oregon Stream Protection Coalition and Rogue Riverkeeper making recommendations for a decision at the June decision regarding the insufficiency of current stream protection rules in the Siskiyou region to meet the Protecting Coldwater Criterion.

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Oregon Stream Protection Coalition

Oregon Stream Protection Coalition
Rogue RIVERKEEPER®

By email
May 14, 2019

Oregon Board of Forestry
Attn: Chair Tom Imeson
2600 State Street
Salem, OR 97210
BoardofForestry@oregon.gov

Re: Urging the Board to find on June 5 that the Protecting Coldwater Criterion ("PCW") is not being met under the current forest practices rules in the Siskiyou Region

Dear Chair Imeson and Members of the Board:

Rogue Riverkeeper and the Oregon Stream Protection Coalition are transmitting this letter on behalf of 26 conservation and fishing industry organizations and their many thousands of Oregon members.

You are being asked to make a decision on June 5th about the adequacy of the water protection rules to meet the Protecting Cold Water Criterion ("PCW") in the Siskiyou Region based solely on the results of the "Siskiyou Streamside Protections Review: A Systematic Review on Stream Temperature, Shade, and Desired Future Condition," referred to as the Systematic Evidence Review ("SER").

The decision before you relates back to January 2012, when this Board initiated a rulemaking process based on the results of the ODF's "RipStream" study (Groom et al. 2011). RipStream demonstrated that logging practices under current stream protection rules did not reliably meet the PCW. In other words, logging practices under the existing rules resulted in warmer streams that violated a state water quality standard for temperature. The 2012 finding of resource degradation was not restricted geographically to exclude the Siskiyou until 2015.

This letter urges you to act based on due consideration for all available information and the history of this issue at the Board level, explaining why it is your duty to find that the current water protection rules for the Siskiyou do not meet stated objectives and a resource is being degraded under ORS 527.714 and 527.765. We find it especially significant that the limited results of the recent SER validate the relationship between temperature and riparian condition established by the Groom et. al. in the RipStream results.

Although the Department may have framed the question on the table differently, the essential question that the Board must consider is:

> *Based on currently available information, do the current water protection rules for small and medium streams ensure to the maximum extent practicable that forest operations prevent the warming that is prohibited by the Protecting Coldwater Criterion of the state's stream temperature standards*?

This letter explains why this question is the right one to be asking and why the only defensible answer based on available information is "No, the rules are not adequate to prevent warming."

I. Given the policy and research history of this issue, you can conclude that the PCW is not being met.

The Protecting Coldwater Criterion, or the "PCW" is the anti-degradation component of the stream temperature standard that limits warming from individual land use activities to 0.3 degrees C or less on Salmon, Steelhead, and Bull Trout streams. Seven years ago, in January of 2012, the Board of Forestry initiated a rule-making process on the basis of the RipStream study (Groom et. al. 2011) which demonstrated that logging to the current stream protection rules does not reliably meet the PCW due to excessive removal of riparian shade on small and medium streams in western Oregon. The 2012 finding that RipStream provides evidence of resource degradation was not restricted geographically until almost four years later.

On November 5, 2015 the Board voted 4:3 to send specific rule concepts to formal rulemaking that would not apply to the Siskiyou Georegion. No ecological or scientific basis for excluding the Siskiyou was explicitly part of the Board's decision, although a staff report advised the Board that discomfort with the "statistical risk" of extrapolating RipStream results to the Siskiyou could justify such an exclusion, as could economic impact considerations. (ODF, July 2015)[1]

The Department is now asking the Board to consider the question of rule sufficiency for PCW attainment in the Siskiyou as if it were a question of first impression, with the current rules being presumed sufficient to protect water quality and the burden on those who would prove insufficiency. This puts the burden of proof in the wrong place, and ignores this Board's previous determination that the same no-cut (20 feet) and RMA widths (50 and 70 feet on small and medium streams respectively) were insufficient to meet the PCW, broadly speaking, from January 2012- to November 2015.

We understand that the current rules are presumed sufficient as a matter of law until such time as they are changed, but a legal, policy-based presumption of sufficiency in an enforcement context does not justify extension of a sufficiency presumption in this fact-based adaptive management

[1]ODF, 2015. "Riparian Rule Analysis: Additional analyses of riparian prescriptions and considerations for Board decisions (56 pp) (discussing risks associated with geographic limitations on rule application)

context, given the body of available information indicating degradation of the public's waters and the long history of this issue at the Board level.

II. The Siskiyou evidence review provides no basis for the Board to find that the Ripstream results are not relevant to this region

The limited research reported by the Siskiyou evidence review is fully consistent with and validates the extrapolation of the RipStream findings to the Siskiyou, even though the SER studies do not replicate the exact prescriptions used in that study. Two major themes emerge:

- First, post-harvest sites demonstrated stronger temperature responses than un-harvested sites, validating the fundamental concept that solar heating happens as a result of shade removal in the Siskiyou under the same laws of thermodynamics applicable everywhere else.

- Second, stream shade as measured by canopy cover reduction was shown to be reduced from both thinning and no cut treatments, in excess of the 6% demonstrated by the RipStream study and modeling to be correlated with a stream temperature increase greater than the PCW threshold. Stephens and Alexander, 2011 reported a 12% decrease in streamside canopy cover at sites where thinning from below occurred adjacent to the stream, with an 8% decrease for no cut treatments. Because these results occurred in conjunction with less intensive vegetation removal than is authorized by the current rules, it is safe to assume that the actual results from application of FPA buffers would be even greater canopy removal and stream warming.

III. Consideration of the totality of information available supports a degradation finding for the Siskiyou

Throughout the public comment process on the Draft Report, we have consistently provided comment raising concerns about the overly narrow scope of the report, which not only excludes the 2011 RipStream study but also excludes careful analysis of the DEQ TMDL data and other available information, despite the fact that the Board directed the Department to:

> *Conduct a study to assess the effectiveness of FPA streamside protection rules in the Siskiyou on Type F stream types and size medium and small streams to meet the purpose and goal for healthy streamside forests (desired future condition) and water protection relating to stream temperature and shade.* ***Utilize research and monitoring data from peer-reviewed scientific articles, unpublished "gray" or "white" literature, TMDL analyses by ODEQ****, watershed council data or analyses, status and trend data on fish populations, streamside and fish habitat data, and voluntary measures on non-federal lands to inform the monitoring study.* ***Begin with a review of this literature****.*[2]

[2] Siskiyou Streamside Protections Review: A Systematic Review on Stream Temperature, Shade, and Desired Future Condition. Draft Report. Oregon Department of Forestry. March 2019. p. 1.

The Department appears to indicate that the Board should make its June finding solely on the basis of the SER, and yet the SER excluded consideration of the RipStream Study, despite the absence of a scientific basis for doing so. However, the Board need not – and should not -- limit itself to the narrow set of studies produced by the evidence review. Rather, the Board should consider the totality of the information available, including but not limited to RipStream, to support a finding of rule insufficiency to meet the PCW.

We note that the Board's direction to conduct a literature review did not specifically direct the use of the narrow search protocol applied here, and that there has not been Board consensus on the Department's choice to use these methods during check-ins on this project[3]. We reiterate prior input that the systematic review employed by ODF is overly narrow and rigid in ways that hinder rather than support accurate, constructive, and robust interpretation of relevant science. Use of this method appears to have excluded critical contextual interpretation that should be routine in any robust scientific literature review, but which here has been overlooked or ignored and threatens to misinform the Board's policy assessment.

A. The Board can properly and must consider information other than that included in the SER in making its decision

The Board should consider available information in addition to the SER and request assistance in evaluating such information from the Department. First and foremost, the Board should consider the results of the RipStream study and information related to the development of the 2017 stream buffer rule.

In the RipStream study conducted by Groom et al. and the basis for the 2017 stream buffer rule, the authors state that:

> "For streams adjacent to harvested areas on privately owned lands, preharvest to postharvest year comparisons exhibited a 40% probability of exceedance. Sites managed according to the more stringent state forest riparian standards did not exhibit exceedance rates that differed from preharvest, control, or downstream rates (5%)."[4]

These findings were further reviewed in the systematic review of existing stream buffer standards completed by Czarnomski in 2013, which stated that:

> "The Oregon Board of Forestry ("Board") made a finding of degradation that stream protections afforded to small- and medium-sized fish-bearing streams under the Forest Practices Act (FPA) were not likely protective of the Oregon Department of Environmental Quality (ODEQ) Protecting Cold Water (PCW)

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[3] See e.g. Minutes of the January 9, 2019 Board meeting, page 11 (motion to broaden the scope of the evidence review failed), https://www.oregon.gov/ODF/Board/Documents/BOF/20190306/A_BOFMIN_20190306_January%209%202019%20Meeting%20Minutes%20DRAFT.pdf

[4] Groom, Jeremiah, Liz Dent, and Lisa Madsen. (2011). Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research. Vol. 47. p. 2.

> criterion. This criterion prohibits human activities, such as timber harvest, from increasing stream temperatures by more than 0.3 ºC, for all sources taken together at the point of maximum impact, at locations critical to salmon, steelhead or bull trout."[5]

Critically, both Groom et al. and Czarnomski state that their findings apply to western Oregon and do not explicitly exclude southwestern Oregon. As one example, Groom et al. state that "the principal results of this study are applicable to the policy issue at hand; the results may directly inform timber management decisions in Oregon and may apply to other timber-harvesting regions with antidegradation or cold-water standards."[6]

Additionally, the Board should consider Total Maximum Daily Load (TMDL) data from the Oregon Department of Environmental Quality (DEQ), which was also excluded from the SER. A review of TMDLs in the Siskiyou where private forestlands are a dominant land use reveal a relationship similar to streams in western Oregon between canopy cover and effective shade related to observed water temperature. For example, data from the Sucker Creek TMDL (1999) demonstrate a relationship between stream temperature increase and loss of riparian cover and effective shade that is approximately the same magnitude as reported for streams in western Oregon by Groom et al. in the RipStream study.[7]

Appendix A provides an initial literature review conducted by Rogue Riverkeeper that provides additional available information we urge the Board to consider, most of which was excluded from the SER. The Board should consider this information and request additional information from the Department in its review.

B. A finding of rule insufficiency in the Siskiyou has a sound scientific basis

We reiterate that the context of this decision is significant. In 2012, the Board initiated a rulemaking process based on the results of the RipStream study demonstrating that current stream buffer rules did not reliably meet the PCW, and that finding was not restricted geographically until nearly four years later. The 2002 statewide sufficiency analysis and the results of the RipStream study in 2011 demonstrated that current stream buffer rules under the Forest Practices Act are not protective of stream temperature and violate the Protecting Cold Water (PCW) water quality standard.[8] Under ORS 527.765(1), the Board is required to establish regulations and best management practices to "insure that to the maximum extent practicable" water quality standards are achieved and maintained. Critically, the PCW water quality standard applies statewide in streams that support salmon, steelhead, and bull trout ("SSBT") and to upstream stream reaches necessary to meet the criterion downstream.

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[5] Czarnomski, Nicole. (2013). Effectiveness of riparian buffers at protecting stream temperature and shade in Pacific Northwest Forests: A systematic review. Final Report September 2013. p. 1.

[6] Groom, Jeremiah, Liz Dent, and Lisa Madsen. (2011). Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research. Vol. 47. p. 2.

[7] ODEQ (Oregon Department of Environmental Quality). 2002. Lower Sucker Creek Illinois River Subbasin Total Maximum Daily Load and Water Quality Management Plan. Portland, OR. 122 pp.

[8] Groom et al. 2011. *Response of Western Oregon (USA) stream temperature to contemporary forest management*, Forest Ecology and Management, 262: 1618-1629.

i. *Impacts to Shade and Stream Temperature from Existing Riparian Management Practices*

The science is clear that removing trees near streams reduces shade and can increase stream temperature. As Lewis et al. write, "Canopy has been widely acknowledged as influencing stream temperature. It has been shown that forest harvesting or road building that removes riparian vegetation (canopy) increases the water temperature of the adjacent stream."[9] A 2004 Independent Multidisciplinary Science Team (IMST) report emphasized the impact of stream buffers, concluding that "the vast majority of published studies document that riparian shade has a significant effect on stream temperature." [10] Leinenbach et al. further state that:

> "Substantial effects on shade have been observed with "no-cut" buffers ranging from 20 to 30 m (Brosofske et al. 1997, Kiffney et al. 2003, Groom et al. 2011b), and small effects were observed in studies that examined "no-cut" buffers 46 m wide (Science Team Review 2008, Groom et al. 2011a)."[11]

Further, these temperature increases as a result of riparian management practices can result in violations of the PCW water quality standard. The RipStream study clearly states:

> "Our analysis indicated that timber harvested according to minimum FPA standards along medium or small fish-bearing streams resulted in a 40.1% probability that a preharvest to postharvest comparison of 2 years of data will detect a temperature increase of >0.3C."[12]

The Siskiyou georegion is currently left with the same standards that Groom et al. evaluated in the RipStream study and found would not reliably meet the PCW.

ii. *Impacts to Threatened Salmonids from Existing Riparian Management Practices*

The Rogue watershed falls almost entirely within the Siskiyou georegion and includes approximately 1 million acres of private forest land managed under the Oregon Forest Practices Act. Within the Siskiyou region, the Rogue watershed provides habitat for the Southern Oregon/Northern California Coast (SONCC) Evolutionarily Significant Unit (ESU) of coho salmon, listed as a threatened species under the Endangered Species Act first in 1997 and

[9] Lewis T. E., D. W. Lamphear, D. R. McCanne, A. S. Webb, J. P. Krieter, and W. D. Conroy (1999), Executive summary: Regional assessment of stream temperatures across northern California and their relationship to various landscape-level and site-specific attributes, Forest Science Project report, 14 pp., Humboldt State Univ. Found., Arcata, Calif. p. 13.
[10] Independent Multidisciplinary Science Team. 2004. Oregon's Water Temperature Standard and its Application: Causes, Consequences, and Controversies Associated with Stream Temperature. Technical Report 2004-1 to the Oregon Plan for Salmon and Watersheds, Oregon Watershed Enhancement Board, Salem, Oregon, p. 8.
[11] Leinenbach, Peter, George McFadden, and Christian Torgersen. (2013). Effects of Riparian Management Strategies on Stream Temperature. Science Review Team Temperature Subgroup. p. 6.
[12] Groom, Jeremiah, Liz Dent, and Lisa Madsen. (2011). Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research. Vol. 47. p. 9.

reaffirmed in 2005.[13] The 2014 Final SONCC Coho Recovery Plan from NOAA Fisheries states that the Oregon Forest Practices Act and related regulations are the least protective within the SONCC coho ESU.[14] NOAA Fisheries identifies improving timber harvest practices under the Oregon Forest Practices Act as one of the highest priority recovery actions for the Illinois River, Middle Rogue/Applegate, and Upper Rogue coho populations. [15] NOAA Fisheries further states that:

> "Because of the preponderance of private timberland and timber harvest activity in the range of this ESU, and potential adverse effects, careful consideration of state forest practices rules and regulations is prudent. At the time of listing, most reviews of the forest practice rules indicated that implementation and enforcement of these rules did not adequately protect coho salmon or their habitats (CDFG 1994, Murphy 1995, Ligon et al. 1999, IMST 1999)."[16]

As one example, NOAA Fisheries found that for the Illinois River population, private forestlands had both the most potential to support coho salmon and at the same time had the least watershed protection. Specifically, the report states that "although much of the habitat in the Illinois River is federally owned, the future threat of timber harvest in the next ten years is high because much of the habitat with the best potential to support coho salmon will be harvested using less protective management actions than those used on Federal lands."[17] In other words, the inadequate protections under the Oregon Forest Practices Act, including stream buffer standards as identified by the IMST, remains a significant threat to the recovery of native salmonids in the Rogue watershed.

SONCC coho are listed under the Endangered Species Act largely because of freshwater habitat degradation caused by riparian and other logging and including elevated stream temperature. The Independent Multidisciplinary Science Team (IMST) clearly links the health of salmonids to stream temperature. In reviewing forest practices, including existing riparian buffer standards (prior to the 2017 stream buffer rule, which does not apply to the Siskiyou), the IMST states that "current rules for riparian protection, large wood management, sedimentation, and fish passage are not adequate to reserve depressed stocks of wild salmonids."[18] Failure to meet water quality standards for temperature has led to the widespread listing of rivers and streams in the region as impaired and to the development of water quality restoration targets that effectively establish no measurable stream warming as the legal standard on a majority of stream miles.

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[13] 2014 SONCC plan http://www.nmfs.noaa.gov/pr/recovery/plans/cohosalmon_soncc.pdf p. ES3-ES4
[14] Final Recovery Plan for the Southern Oregon/ Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). NOAA Fisheries. 2014. p. 3-57.
[15] 2014 SONCC plan http://www.nmfs.noaa.gov/pr/recovery/plans/cohosalmon_soncc.pdf p. ES 5
[16] Final Recovery Plan for the Southern Oregon/ Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). NOAA Fisheries. 2014. p. 3-54.
[17] 2014 SONCC 30-22.
[18] Independent Multidisciplinary Science Team (IMST). 1999. 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. p. 2

Based on a review of available data, NOAA Fisheries concluded that impaired water quality is either a high or a very high stress in 27 out of 40 populations in the SONCC coho salmon ESU, contiguous with the Siskiyou georegion, with temperature featured prominently. The U.S. Environmental Protection Agency (EPA) has recognized 21 watersheds in the ESU as impaired for stream temperature. (NMFS SONCC 2016). Water Quality Restoration Plans acknowledge that riparian logging on private lands decreases stream shade and increases solar radiation. (BLM Water Quality Restoration Plan Deer Creek Watershed, 2011).

Deer Creek Watershed

As one example, the Deer Creek watershed is located approximately 15 miles southwest of Grants Pass in the Siskiyou georegion and stretches across 55,922 acres. Deer Creek is approximately 15 miles long and is a major tributary to the Illinois River in the Rogue watershed. Private land is the largest ownership in the watershed, with the BLM managing 41 percent of lands and private ownership totaling 43 percent. According to the Water Quality Restoration Plan, the primary land uses in the watershed are agriculture and forestry. Within the watershed, Deer Creek from the mouth to river mile 17, Anderson Creek from the mouth to river mile 3.2, and Squaw Creek from the mouth to river mile 3 were listed as water quality limited for temperature.[19]

The BLM states that, "due to the mixed ownership in the Deer Creek Watershed, attainment of the water temperature standard requires multi-ownership participation and commitment to improve riparian function."[20] Further, the Water Quality Restoration Plan documents how the reduced riparian zone on private lands decreases stream shade and increases solar radiation. Specifically, the BLM states:

> "Based on the ownership distribution and aerial scanning (Google Earth), approximately 70% of the riparian zones in the Deer Creek Watershed lack mature tree structure necessary to provide large instream wood. On private lands, in the lower gradient floodplain reaches of Deer, Anderson/Clear, Draper, and Crooks creeks, reductions in riparian vegetation have decreased stream shade, thereby increasing solar radiation input into surface waters."[21]

Below, Figure 1 overlays streams that are water quality limited for temperature with salmon, steelhead, and bull trout (SSBT) streams, and private forestlands in the Deer Creek watershed. As demonstrated in this initial GIS map, most of the main stem of Deer Creek both supports salmon, steelhead, and bull trout and is listed as temperature impaired as it flows through private forestlands, providing evidence of a strong spatial association between temperature increases and private forestland in this system. This suggests that many streams are already impaired by the time they reach agricultural lands.

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[19] Water Quality Restoration Plan Deer Creek Watershed. Bureau of Land Management. 2011.
[20] Water Quality Restoration Plan Deer Creek Watershed. Bureau of Land Management. 2011. p. 13.
[21] Water Quality Restoration Plan Deer Creek Watershed. Bureau of Land Management. 2011. p. 5.

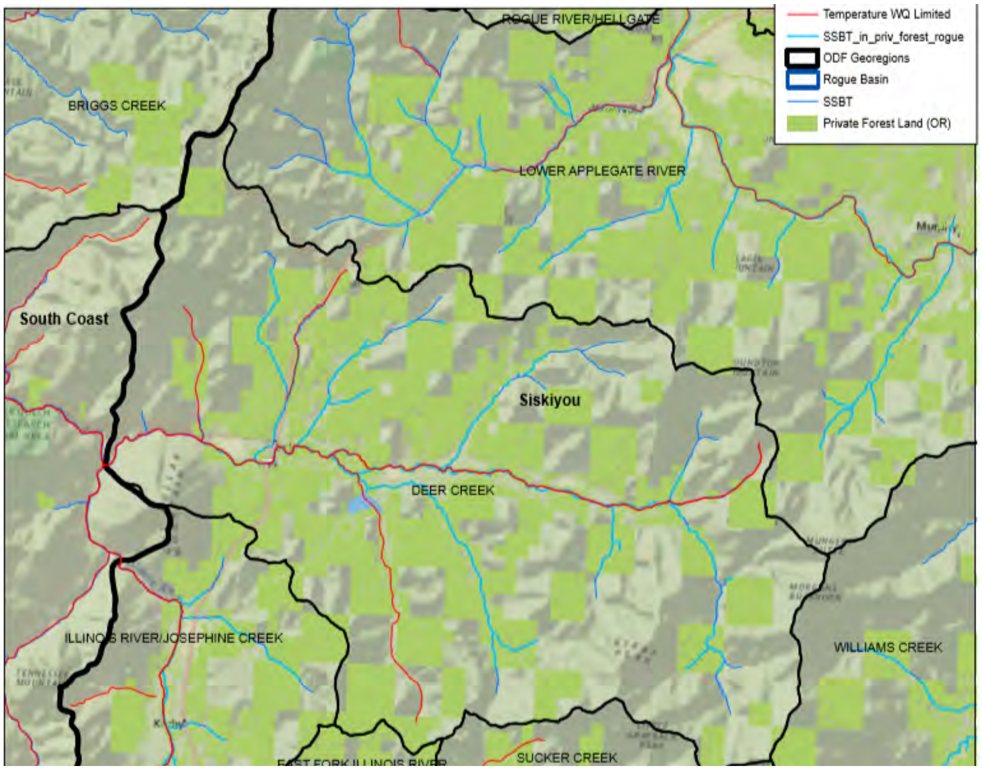

Figure 1. Deer Creek HUC-10 watershed with SSBT streams, temperature water quality limited streams, and private forestlands

iii. *Disapproval of Oregon's Nonpoint Pollution Program under CZARA*

It is also significant that EPA and NOAA cited current buffers' failure to protect against stream warming as a major issue in their disapproval of Oregon's nonpoint pollution control plan under CZARA in 2015 – and they did not exclude the Siskiyou from their findings. (EPA & NOAA, 2015).

Specifically, EPA and NOAA stated in the 2015 disapproval:

> "A significant body of science, including 1) the Oregon Department of Forestry (ODF) Riparian and Stream Temperature Effectiveness Monitoring Project (RipStream)[4]; 2) A Statewide Evaluation of Forest Practices Act Effectiveness in Protecting Water Quality (i.e., the Sufficiency Analysis) [5]; and 3) the Governor's Independent Multidisciplinary Science Team (IMST) Report on the adequacy of the Oregon forest practices in recovering salmon and trout[6], indicates that riparian protection around small and medium-sized fish-bearing streams and non-fish-bearing streams in Oregon is not sufficient to achieve and maintain water quality and protect designated uses."[22]

[22] NOAA/EPA Finding that Oregon has not submitted a fully approvable Coastal Nonpoint Program. U.S. EPA and NOAA Fisheries. 30 January 2015. Available online < https://coast.noaa.gov/czm/pollutioncontrol/media/ORCZARAdecision013015.pdf >. p. 5.

And further, that:

> "The 2011 RipStream reports found that FPA riparian protections on private forest lands did not ensure achievement of the Protection [sic] of Cold Water (PCW) criterion under the Oregon water quality standard for temperature.[7,8] The PCW criterion prohibits human activities (e.g., timber harvest) from increasing stream temperatures by more than 0.3ºC at locations critical to salmon, steelhead, or bull trout. The RipStream analysis demonstrated that the chance of a site managed using FPA rules exceeding the PCW criterion between a pre-harvest year and a postharvest year was 40 percent.[9,10]"[23]

EPA and NOAA did not exclude the Siskiyou in their discussion of what Oregon would need to do to address these deficiencies, stating:

> "The Board has the authority to regulate forest practices through administrative rule making and require changes to the FPA rules to protect small and medium sized fish-bearing streams. Recognizing the need to better protect small and medium Type F streams, the Board directed ODF to undertake a rule analysis process that could lead to revised riparian protection rules. At its September 2014 meeting, the Board voted unanimously in favor of continuing to analyze what changes might be needed in the Oregon Forest Practice Rules to provide greater buffer protection for medium-sized and small fish-bearing streams on private forest lands. NOAA and EPA encourage the State to move forward with this rule-making process expeditiously."[24]

iv. *The Relationship between Stream Temperature and Shade Removal is well-established*

Comparative analysis of existing research on the relationship between stream temperature and shade removal reveals a great deal of consistency between studies done throughout the Pacific Northwest. In an EPA assessment of this information, the ODF Bayesian model and the ODEQ Mechanistic Shade Model are two tools EPA experts have deemed as "adequately representing processes associated with shade loss response to riparian buffer width reductions" because they reflect the relationships evidenced in field studies.[25] The following graphs from EPA analysis illustrate the generally applicable relationship that should be presumed to hold true in the

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[23] NOAA/EPA Finding that Oregon has not submitted a fully approvable Coastal Nonpoint Program. U.S. EPA and NOAA Fisheries. 30 January 2015. Available online < https://coast.noaa.gov/czm/pollutioncontrol/media/ORCZARAdecision013015.pdf >. p. 5.

[24] NOAA/EPA Finding that Oregon has not submitted a fully approvable Coastal Nonpoint Program. U.S. EPA and NOAA Fisheries. 30 January 2015. Available online < https://coast.noaa.gov/czm/pollutioncontrol/media/ORCZARAdecision013015.pdf >. p 7.

[25] Leinenbach, Peter, 2016. Memorandum from Peter Leinenbach, USEPA, to Alan Henning, USEPA dated January 27, 2016 regarding Shade loss and temperature increase resulting from the Implementation of Option A and Option B of the proposed Oregon Forest Practices Rule for SSTB streams in sections of western Oregon (11 pp)

Siskiyou absent information demonstrating it does not. As discussed infra , no information contravening or in any way invalidating these modeling tools and the predictions derived from them by agency experts has been presented to the Board. To the contrary, the predictions of these modeling efforts showing stream warming associated with logging within 100 feet of streams stands at virtually the same magnitude seen in the Ripstream field studies of Groom et. al., and the studies reported in the Siskiyou Evidence Review.

Figure 6. Measured and Predicted Shade Loss Resulting from a Narrowing of the Riparian Buffer Width.

[Only field studies that implemented a BACI design within forested areas of the Pacific Northwest were included.]

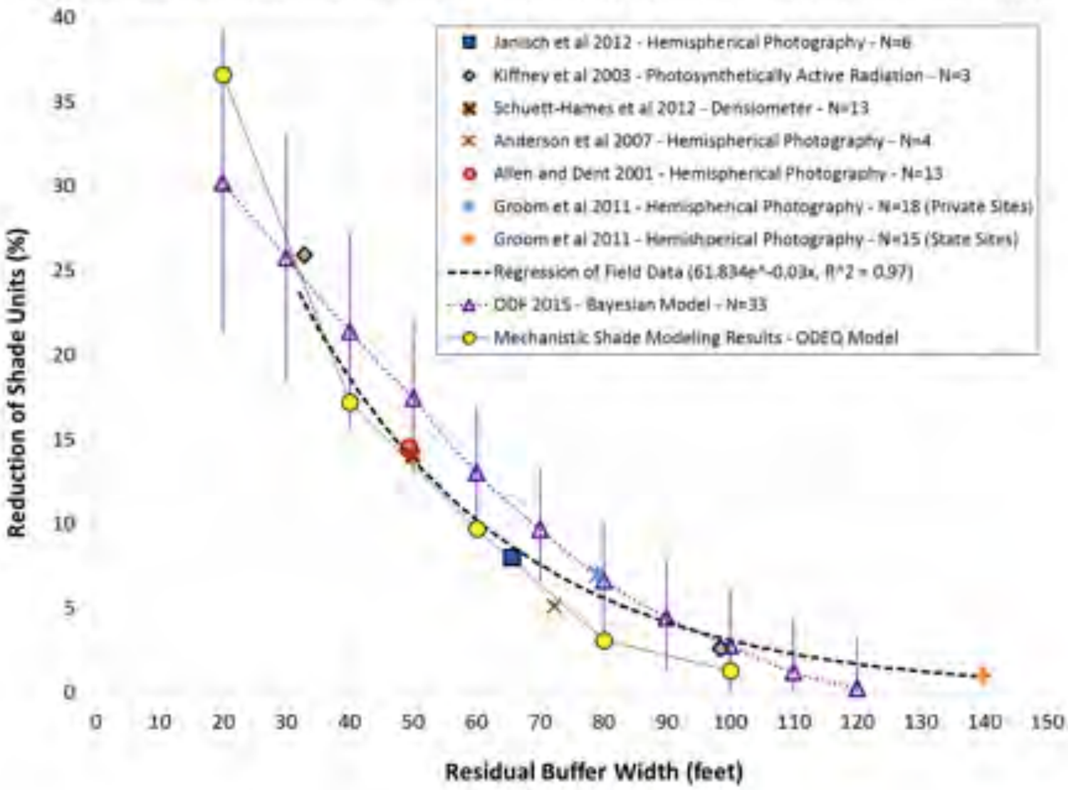
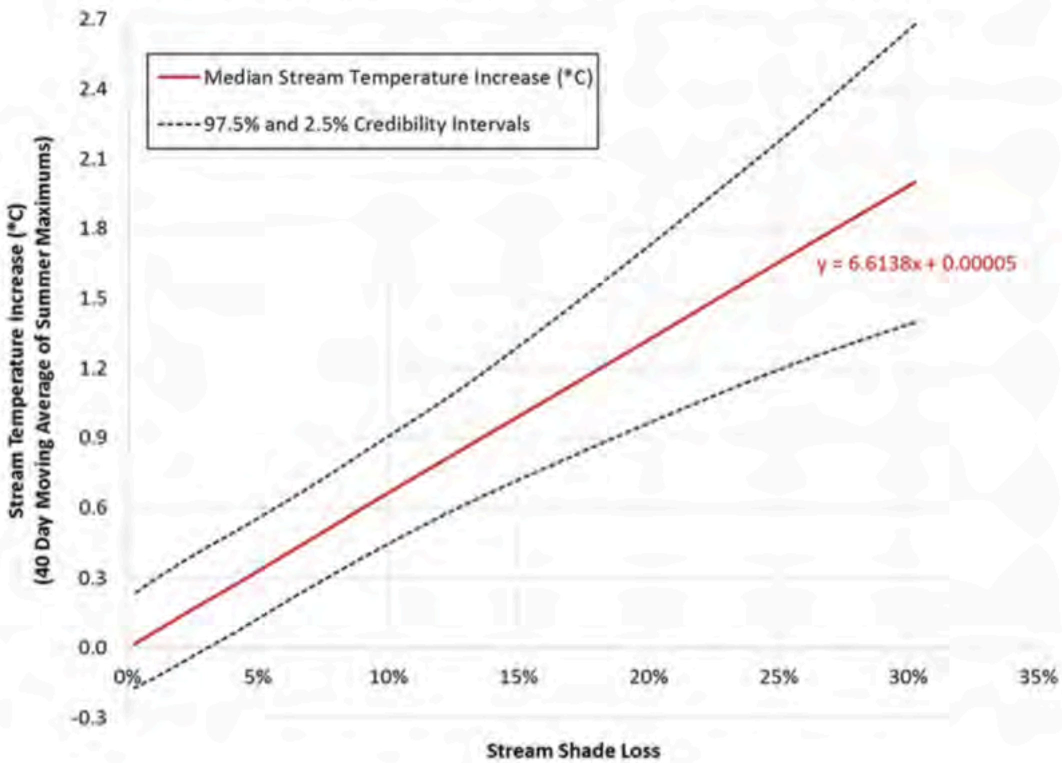


Figure 7. Predicted Stream temperature increase resulting from stream shade loss



IV. Conclusion: The Board has a duty to Act, starting with a finding that the current FPA rules do not adequately protect Small and Medium Streams from shade loss and stream warming

The Oregon Forest Practices Act clearly establishes this Board's duty to establish water protection rules that fully comply with water quality standards, except to the extent that it is not feasible (practicable) to do so. The totality of the information before you compels a finding that the current rules do not protect small and medium streams from management-caused stream warming and to initiate a process to identify options that would. The answer is the same even if the Board only considers the information provided by the SER, where larger no-cut buffers than those required by the FPA resulted in numeric and PCW exceedances.

We urge the Board to:

A. Consider all available relevant information in addition to the studies identified in the SER about the adequacy of the current riparian protection rules in the Siskiyou in preparation for the June 5 meeting, including but not limited to RipStream and associated modeling and DEQ TMDL analyses and models.

B. Please vote "YES" on the following motions:

1. *"The Board finds that the RipStream study and related administrative record and DEQ stream temperature TMDLs and associated modeling should be considered in assessing the adequacy of forest practices regulations applicable to small and medium fish streams in the Siskiyou region".*

2. *"The Board finds that existing forest practices regulations applicable to small and medium fish streams in the Siskiyou region do not meet stream temperature water quality objectives and are degrading protected water resources under ORS 527.714 (5)(a)."*

3. *"The Board directs staff to recommend a process and timeline for the Board to approve a specific rule change proposal and initiate formal rulemaking by April, 2020, with final rule adoption by the end of 2020. Alternatives evaluated shall include but not be limited to the same SSBT rule prescriptions effective in the rest of western Oregon effective July 2017."*

Sincerely yours,

Stacey Detwiler
Rogue Riverkeeper

Mary Scurlock
Oregon Stream Protection Coalition

And for the following members of the Oregon Stream Protection Coalition

Association of Northwest Steelheaders
Audubon Society of Lincoln City
Audubon Society of Portland
Cascadia Wildlands
Center for Biological Diversity
Coast Range Association
Defenders of Wildlife
Greater Hells Canyon Council
Institute for Fisheries Resources
KS Wild
McKenzie Flyfishers
Native Fish Society
Northwest Environmental Advocates
Northwest Guides and Anglers
Northwest Sportfishing Industry Association
Oregon Wild
Pacific Coast Federation of Fishermen's Associations
Pacific Rivers
Rogue Riverkeeper
Sierra Club
Trout Unlimited
Umpqua Watersheds
Washington Forest Law Center
WaterWatch of Oregon
The Wetlands Conservancy
Wild Earth Guardians
Wild Salmon Center

Enclosures:

Appendix A: Rogue Riverkeeper Literature Review "Riparian management impacts on shade and stream temperature in the ODF Siskiyou Georegion" (25 pp)

Appendix B: Maps of Private Forestland, SSBT Streams, and Temperature Water Quality Limited Streams (7 pp*)*

Cc: Governor Kate Brown
Representative Pam Marsh
Senator Jeff Golden
Richard Whitman, Director, DEQ
Kathleen George, Chair, EQC
Wade Mosby, EQC Liason to the Board of Forestry

Appendix A. Riparian Management Impacts on Shade and Stream Temperature in the ODF Siskiyou Georegion

Riparian management impacts on shade and stream temperature in the ODF Siskiyou Georegion

I. Peer-reviewed literature

A. Data from RipStream Study Analysis

Groom, Jeremiah, Liz Dent, and Lisa Madsen. (2011). Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research. Vol. 47.
Brown, George W. and James T. Krygier. (1970). Effects of Clear-Cutting on Stream Temperature. Water Resources Research. Vol. 6, No. 4.
Brosofske K. D., J. Chen, R. J. Nairman, and J. F. Franklin (1997), Harvesting effects on microclimatic gradients from small streams to uplands in western Washington,Ecol. Appl., 7, 1188–1200.
Johnson S. L. (2004), Factors influencing stream temperatures in small streams: Substrate effects and a shading experiment, Can. J. Fish. Aquat. Sci., 61, 913–923.
Lewis T. E., D. W. Lamphear, D. R. McCanne, A. S. Webb, J. P. Krieter, and W. D. Conroy (1999), Executive summary: Regional assessment of stream temperatures across northern California and their relationship to various landscape-level and site-specific attributes, Forest Science Project report, 14 pp., Humboldt State Univ. Found., Arcata, Calif.

B. Other

Adams, Paul W. (2007). Policy and Management for Headwater Streams in the Pacific Northwest: Synthesis and Reflection. Forest Science 53(2). 2007.

II. Peer-reviewed gray literature

A. ODF and EPA Analysis

Czarnomski, Nicole. (2013). Effectiveness of riparian buffers at protecting stream temperature and shade in Pacific Northwest Forests: A systematic review. Final Report September 2013.
Leinenbach, Peter, George McFadden, and Christian Torgersen. (2013). Effects of Riparian Management Strategies on Stream Temperature. Science Review Team Temperature Subgroup.

B. Threatened and Endangered Species Recovery Plans

Final Recovery Plan for the Southern Oregon/ Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). NOAA Fisheries. 2014.

III. Gray literature

A. Bureau of Land Management (BLM) Water Quality Restoration Plans

Water Quality Restoration Plan Southern Oregon Coastal Basin Big Butte Creek Watershed. Bureau of Land Management (BLM) Medford District Butte Falls Resource Area. January 2008.
Althouse Creek Watershed Assessment. Bureau of Land Management. February 2005.
Water Quality Restoration Plan Deer Creek Watershed. Bureau of Land Management. 2011.

Grants Pass Water Quality Restoration Plan Southern Oregon Coastal Basin Middle Rogue Subbasin Grants Pass- Rogue River Watershed Bureau of Land Management (BLM), Medford District Office Grants Pass Resource Area. 2012.
Water Quality Restoration Plan Southern Oregon Coastal Basin Evans Creek Watershed. Bureau of Land Management (BLM) Medford District Butte Falls Resource Area. July 2009.
Water Quality Restoration Plan Jumpoff Joe Creek Watershed. Bureau of Land Management. September 2009.
Water Quality Restoration Plan Klamath Basin Jenny Creek Watershed. Bureau of Land Management. 2011.

B. Total Maximum Daily Loads

Rogue River Basin TMDL Chapter 2: Temperature. Oregon Department of Environmental Quality. 2008.
Lower Sucker Creek Illinois River Subbasin Total Maximum Daily Load and Water Quality Management Plan (Lower Section of Sucker/Grayback Watershed: 1710031103) (USFS boundary at Mile 10.4 to the Mouth). Oregon Department of Environmental Quality. April 2002.
Applegate Subbasin Total Maximum Daily Load (TMDL) HUC # 17100309. Oregon Department of Environmental Quality. December 2003.

C. Other gray literature

Stream habitat and water quality in the Applegate Basin. OWEB Grant 99-485 Final Report. Applegate River Watershed Council. November 2004.
Betts, M., B. Bourgeois, R. Haynes, S. Johnson, K. Puettmann, and V. Sturtevant. 2014. Assessment of Alternative Forest Management Approaches: Final Report of the Independent Science Panel. Prepared with assistance from D.C.E. Robinson, A.W. Hall and G. Stankey, ESSA Technologies Ltd. (Vancouver, BC) for Oregon Department of Forestry (Salem, OR).

I. Peer-reviewed literature

A. Data from RipStream Study Analysis

(1) Groom, Jeremiah, Liz Dent, and Lisa Madsen. (2011). Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research. Vol. 47.

- "For streams adjacent to harvested areas on privately owned lands, preharvest to postharvest year comparisons exhibited a 40% probability of exceedance. Sites managed according to the more stringent state forest riparian standards did not exhibit exceedance rates that differed from preharvest, control, or downstream rates (5%)." (p. 1)

- "Several previous studies link timber harvest with increases in stream temperature [Beschta and Taylor, 1988; Moore et al., 2005, and references therein], and federal endangered species listings of trout and salmon species (*Oncorhynchus spp*.) in the Pacific Northwest cite stream temperature increases due to logging as a limiting factor for population recovery [Bryant and Lynch, 1996; Myers and Bryant, 1998; Myers et al., 1998]." (p. 1)

- "Since removal of shade is strongly associated with stream temperature increases, timber harvest operations are considered in compliance with Oregon Department of Environmental Quality (DEQ) water quality standards if harvest operations comply with the FPA [DEQ, 2004]. However, ODF must periodically conduct studies to validate the efficacy of the FPA at meeting state water quality standards [ODF, 2007b]." (p. 1)

- "The principal results of this study are applicable to the policy issue at hand; the results may directly inform timber management decisions in Oregon and may apply to other timber-harvesting regions with antidegradation or cold-water standards."

- "Our analysis indicated that timber harvested according to minimum FPA standards along medium or small fish-bearing streams resulted in a 40.1% probability that a preharvest to postharvest comparison of 2 years of data will detect a temperature increase of >0.3C." (p. 9)

- "The results from these analyses and others will inform Oregon Board of Forestry policy discussions on current regulations and potentially inform riparian timber harvest policy regulations elsewhere." (p. 11).

(2) **Brown, George W. and James T. Krygier. (1970). Effects of Clear-Cutting on Stream Temperature. Water Resources Research. Vol. 6, No. 4**.

- "Temperature differences between watersheds and all of the temperature anomalies within the clear-cut watershed can be explained in terms of shade differences. The patch-cuts on Deer Creek did not produce any significant changes in temperature in the main stream. Strips of timber 100 feet long were left beside each perennial stream; the amount of shade on the stream surface was essentially unchanged. On Needle Branch, little shade remained after the clear-cutting and burning were completed. As a result, large changes in annual and daily patterns of temperature were observed." (p. 1138).

(3) Brosofske K. D., J. Chen, R. J. Nairman, and J. F. Franklin (1997), Harvesting effects on microclimatic gradients from small streams to uplands in western Washington,Ecol. Appl., 7, 1188–1200.

- "We conclude that a buffer at least 45 m on each side of the stream is necessary to maintain a natural riparian microclimatic environment along the streams in our study, which were characterized by moderate to steep slopes, 70–80% overstory coverage (predominantly Douglas-fir and western hemlock), and a regional climate typified by hot, dry summers and mild, wet winters. This buffer width estimate is probably low, however, since it assumes that gradients stabilize within 30 m from the stream and that upslope edge effects extend no more than 15 m into the buffer (a low estimate based on other studies). Depending on the variable, required widths may extend up to 300 m, which is significantly greater than standard widths currently in use in the region (i.e., ;10–90 m).

Our results indicate that even some of the more conservative standard buffer widths may not be adequate for preserving an unaltered microclimate near some streams." (p. 1188).

(4) Johnson S. L. (2004), Factors influencing stream temperatures in small streams: Substrate effects and a shading experiment, Can. J. Fish. Aquat. Sci., 61, 913–923.

- "Changes in vegetation near streams can have major impacts on stream temperature (Brown and Krygier 1970; Beschta and Taylor 1988; Johnson and Jones 2000). Streams and their riparian areas have been greatly modified across most ecosystems (Bisson et al. 1992; Sugimoto et al. 1997). Small forested streams historically have not been protected under riparian management guidelines or forest harvest best management practices; agricultural or urban streams of all sizes have had even less protection." (p. 914).

- "Riparian vegetation influences microclimatic conditions through biological functions such as evapotranspiration and release of water vapor as well as through physical means such as decreasing wind speeds. Vegetation also provides bank stability, which can impact width to depth ratios and the exposed surface area of the stream. Accumulations of large organic matter inputs have an effect on hydraulic retention times. Although incoming radiation levels in dense natural forests can be as low as those under the experimental shade, riparian forests would have more variability of incoming light levels because of the shape and structure of the vegetation." (p. 919).

(5) Lewis T. E., D. W. Lamphear, D. R. McCanne, A. S. Webb, J. P. Krieter, and W. D. Conroy (1999), Executive summary: Regional assessment of stream temperatures across northern California and their relationship to various landscape-level and site-specific attributes, Forest Science Project report, 14 pp., Humboldt State Univ. Found., Arcata, Calif.

- "Canopy has been widely acknowledged as influencing stream temperature. It has been shown that forest harvesting or road building that removes riparian vegetation (canopy) increases the water temperature of the adjacent stream." (p. 13).

B. Other

(1) Adams, Paul W. (2007). Policy and Management for Headwater Streams in the Pacific Northwest: Synthesis and Reflection. Forest Science 53(2). 2007.

- "Under this backdrop, the National Marine Fisheries Service (NMFS 1998) proposed that Oregon adopt significantly greater Forest Practice Rule restrictions on timber harvest and other practices in western Oregon riparian areas, including headwater streams (Table 3). The NMFS proposal met significant resistance by landowner and other interests, and the Oregon Board of Forestry declined to act on it due to questions about its technical and policy bases. However, the issue did reveal the high level of federal agency concern as well as the nature and scope of the favored riparian forest protection policies." (p. 108)

- "The relatively limited measures required for headwater streams on private lands in Oregon (Table 7) have been the subject of considerable discussion and debate in recent years. For example, although the CWA generally allows state policies to prevail, recent comments from federal agency officials to the Oregon Board of Forestry (OBF) stated that ". . . improvements to management of small non-fish streams, landslide prone areas, and cumulative watershed effects would be necessary to argue convincingly that forest practices meet the [water quality] standards and TMDLs" (Markle 2004), and ". . . we are not confident that [the rule-making and voluntary measures proposed by the Board] can be relied on to meet Oregon's water quality standards . . . we believe additional improvements to the rules are needed" (Gearhard 2004). This input, while simply advisory in nature, came after the OBF had deferred action on draft rule changes to increase protection of small nonfish-bearing streams, although they had also initiated rulemaking for increased protection of headwater woody debris." (p. 111)

II. Peer-reviewed gray literature

C. ODF and EPA Analysis

(1) Czarnomski, Nicole. (2013). Effectiveness of riparian buffers at protecting stream temperature and shade in Pacific Northwest Forests: A systematic review. Final Report September 2013.

- "The Oregon Board of Forestry ("Board") made a finding of degradation that stream protections afforded to small- and medium-sized fish-bearing streams under the Forest Practices Act (FPA) were not likely protective of the Oregon Department of Environmental Quality (ODEQ) Protecting Cold Water (PCW) criterion. This criterion prohibits human activities, such as timber harvest, from increasing stream temperatures by more than 0.3 ºC, for all sources taken together at the point of maximum impact, at locations critical to salmon, steelhead or bull trout. The Board's finding was based on scientific outcomes of the Oregon Department of Forestry (ODF) Riparian and Stream Function (RipStream) monitoring project. ODF has therefore undertaken a systematic science review in support of a riparian rule analysis to address concerns about meeting the PCW criterion." (p. 1).

- "The geographic scope of the findings of degradation are based on Groom et al. (2011b), which studied streams in the Coast Range and Interior Geographic Regions of Oregon (as defined in OAR 629-635-0220). While the exact geographic extent of the rule analysis is yet to be determined, it will be limited to western Oregon. This limitation is due to the vegetation, climate and hydrologic characteristics of eastern Oregon being significantly different enough from those included in the RipStream study to preclude extending a rule to eastern Oregon." (p. 7).

(2) Leinenbach, Peter, George McFadden, and Christian Torgersen. (2013). Effects of Riparian Management Strategies on Stream Temperature. Science Review Team Temperature Subgroup.

- "The Science Roundtable Team (SRT) of technical experts was requested by the Interagency Coordinating Subgroup (ICS) to evaluate models that predict changes in shade and stream temperature as a result of the removal of trees in riparian areas. The management concern is that stream temperature in the summer may increase as a result of riparian management activities and negatively affect coldwater fishes, including salmon, trout, and associated aquatic ecosystems. The area of interest includes conifer forests of the Oregon Coast Range, but the findings of the SRT are intended to be applicable to a broader range of forests in western Oregon and Washington." (p. 1).

- "The effects of riparian vegetation on shade and stream temperature have been studied extensively, and it is generally accepted that removing trees in riparian areas reduces the amount of shade which leads to increases in thermal loading to the stream (Moore and Wondzell 2005). " (p. 2).

- "We focus on shade and the factors that influence its spatial extent, temporal duration, and quality. The primary factors that influence shade are riparian vegetation (Groom et al, 2011b) and the surrounding terrain (Allen et al. 2007)." (p. 3).

- "No-cut buffers adjacent to clearcut harvest units: Substantial effects on shade have been observed with "no-cut" buffers ranging from 20 to 30 m (Brosofske et al. 1997, Kiffney et al. 2003, Groom et al. 2011b), and small effects were observed in studies that examined "no-cut" buffers 46 m wide (Science Team Review 2008, Groom et al. 2011a). For "no-cut" buffer widths of 46-69 m, the effects of tree removal on shade and temperature were either not detected or were minimal (Anderson et al. 2007, Science Team Review 2008, Groom et al. 2011a, Groom et al. 2011b) (Figure 4). The limited response observed in these studies can be attributed to the lack of trees that were capable of casting a shadow >46 m during most of the day in the summer (Leinenbach 2011; Appendix C of this document). Reductions in shade and increases in stream temperature were more apparent at ~30 m "no-cut" buffer widths, as compared to the 46-69 m wide buffers, but the magnitude and direction of response was highly variable for both shade and stream temperature (Kiffney et al. 2003, Gomi et al. 2006, Science Team Review 2008, Groom et al. 2011a, Groom et al. 2011b). At "no-cut" buffer widths of <20 m, there were pronounced reductions in shade and increases in temperature, as compared to wider buffer widths. The most dramatic effects were observed at the narrowest buffer widths (≤10 m) (Jackson et al. 2001, Curry et al. 2002, Kiffney et al. 2003, Gomi et al. 2006, Anderson et al. 2007)." (p. 6).

B. Threatened and Endangered Species Recovery Plans

(1) Final Recovery Plan for the Southern Oregon/ Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). NOAA Fisheries. 2014.

Inadequacy of Oregon Forest Practices Act:

- "Because of the preponderance of private timberland and timber harvest activity in the range of this ESU, and potential adverse effects, careful consideration of state forest practices rules and regulations is prudent. At the time of listing, most reviews of the forest practice rules indicated that implementation and enforcement of these rules did not adequately protect coho salmon or their habitats (CDFG 1994, Murphy 1995, Ligon et al. 1999, IMST 1999)." (p. 3-54)

- "Though significant improvements have been made to the current rule package, the Oregon Forest Practice Rules represent the least conservative forest practice regulations administered by the state governments within the SONCC coho salmon ESU. Some riparian areas may be protected by narrow, no-harvest zones; however, the stands located upslope of the no-harvest zones could be subject to intense harvest, leading to diminished riparian function and cumulative effects to anadromous salmonid habitat. In a 2010 status review of Oregon Coast (OC) coho salmon, NMFS concluded that the Oregon Forest Practices Act does not adequately protect OC coho habitat in all circumstances. In particular, disagreements persist regarding: (1) whether the widths of riparian management areas (RMAs) are sufficient to fully protect riparian functions and stream habitats; (2) whether operations allowed within RMAs will degrade stream habitats; (3) operations on high-risk landslide sites; and (4) watershed-scale effects." (p. 3-57)

- "Timber harvest poses an overall very high threat to the coho salmon population. Private industrial timber lands managed under the Oregon Forest Practices Act occupy 30 percent of the landscape, but they coincide with nearly all the low gradient intrinsic potential streams. Therefore, these lands have a disproportionate effect on coho salmon. The high harvest rates and associated roads negatively impact multiple aspects of coho salmon habitat. Deep Creek is an example of where short timber harvest rotations are likely inhibiting channel and coho salmon recovery. Studies of adjacent southwest Oregon basins found that "downstream, cumulative impacts of human activity are pervasive in southwest Oregon, wherever logging has occurred over an extensive portion of a drainage basin or has involved operations on steep, unstable slopes. The downstream effects of channel sedimentation and aggradation can severely damage streams even where buffer zones of riparian vegetation have been retained, and such effects persist more than 20-30 years after logging activities have ceased" (Frissell 1992)." (p. 12-15)

Illinois Population:

- "Degraded riparian forest condition is one of the most significant stresses affecting coho salmon recovery in the Illinois River watershed. Reduction of riparian trees and gallery forests that once covered the alluvial valley floor led to reduced pool frequency and habitat simplification, has increased bank erosion, and contributed to stream warming by widening the waterways (BLM 1997, 2006, USFS 1997a). ODFW surveyed extensive reaches of coho salmon-bearing Illinois River reaches and tributaries (e.g., East Fork

Illinois, West Fork Illinois, Deer, Sucker, Althouse, Elk) and found poor conifer density with fewer than 75 trees (>36" dbh) per 1000 feet." (p. 30-14)

- "The riparian zones have been cleared or substantially modified along the mainstem Illinois River and at the mouth of Free and Easy Creek. Overall, there is a very low amount/volume of large wood in channels throughout the Illinois River sub-basin (USFS 1997a, BLM 2005a)." (p. 30-15)

- "In addition, the Independent Multidisciplinary Science Team (IMST 1999) concluded that the Oregon Forest Practice Rules for riparian protection, large wood management, sedimentation, and fish passage are not adequate to recover depressed stocks of wild salmonids…Most habitat with potential to support coho salmon is privately owned and managed under Oregon's Forest Practices Act, which NMFS' analysis determined has the lowest score for watershed protection measures of all management methods evaluated (Appendix B). Therefore, although much of the habitat in the Illinois River is federally owned, the <u>future threat of timber harvest in the next ten years is high because much of the habitat with the best potential to support coho salmon will be harvested using less protective management actions than those used on Federal lands</u>**.**" (p. 30-22)

- One of the Highest Priority Recovery Actions for the SONCC is to "improve timber harvest practices by revising Oregon Forest Practices Act." (p. 30-1)

National Marine Fisheries Service 2014: 30-25
Table 30-4. Recovery action implementation schedule for the Illinois River population.

Illinois River Population

Table 30-4. Recovery action implementation schedule for the Illinois River population. Recovery actions for monitoring and research are listed in tables at the end of Chapter 5.

Action ID / *Step ID*	Target	KLS/T	Strategy / *Step Description*	Action Description	Area	Priority
SONCC-IllR.7.2.53	Riparian	No	Improve timber harvest practices	Improve regulatory mechanisms	Population wide	1
SONCC-IllR.7.2.53.1			*Determine how to revise Oregon Forest Practice Rules so that they do not limit recovery of SONCC coho salmon and make appropriate revisions*			
SONCC-IllR.7.2.53.2			*Adopt rules for fish-bearing streams sufficient to protect both water quality and fish habitat*			
SONCC-IllR.7.2.53.3			*Adopt rules to increase protection of non-fish-bearing streams that address practices that adversely impact water quality and fish habitat*			
SONCC-IllR.7.2.53.4			*Ensure management measures for landslide prone areas include protection of water quality and fisheries habitat*			
SONCC-IllR.7.2.53.5			*Until more permanent regulatory mechanisms can be put in place, immediately adopt interim rules that increase protection for salmon habitat in forested areas, including increased natural recruitment of large wood on perennial and intermittent streams, increased shade on perennial streams, and protective buffers on intermittent streams*			

<u>Middle Rogue/Applegate Population:</u>

- One of the Highest Priority Recovery Actions for the SONCC Middle Rogue / Applegate Population Coho Population is to " improve timber harvest practices by revising the Oregon Forest Practices Act." (p. 31-1)

- "Reeves et al. (1993) found that the rate of timber harvest in Oregon coastal watersheds should not exceed 25 percent of a watershed to minimize risks and disturbances to aquatic resources. The study covered a period of 30 years (Reeves, G., pers. comm. 2003) and watersheds exceeding that level of harvest did not maintain channel integrity or Pacific salmon species diversity. Middle Rogue-Applegate sub-basin timber harvest rates are typically greater than this threshold on private timber land; therefore, the threat from timber harvest on private land will likely remain high. This private land encompasses most of the high IP coho habitat. The greatest risk from timber harvest is on private industrial timberlands that are managed under the Oregon Forest Practices Act, such as in private in-holdings in upper Slate Creek, Cheney Creek, and the decomposed granitic soils of the upper Beaver Creek watershed." (p. 31-24).

National Marine Fisheries Service 2014:31-28
Table 31-4. Recovery action implementation schedule for the Middle Rogue/Applegate rivers population.

SONCC-MRAR.7.2.50	Riparian	No	Improve timber harvest practices	Improve regulatory mechanisms	Population wide	1
SONCC-MRAR.7.2.50.1	*Determine how to revise Oregon Forest Practice Rules so that they do not limit recovery of SONCC coho salmon and make appropriate revisions*					
SONCC-MRAR.7.2.50.2	*Adopt rules for fish-bearing streams sufficient to protect both water quality and fish habitat*					
SONCC-MRAR.7.2.50.3	*Adopt rules to increase protection of non-fish-bearing streams that address practices that adversely impact water quality and fish habitat*					
SONCC-MRAR.7.2.50.4	*Ensure management measures for landslide prone areas include protection of water quality and fisheries habitat*					
SONCC-MRAR.7.2.50.5	*Until more permanent regulatory mechanisms can be put in place, immediately adopt interim rules that increase protection for salmon habitat in forested areas, including increased natural recruitment of large wood on perennial and intermittent streams, increased shade on perennial streams, and protective buffers on intermittent streams.*					

<u>Upper Rogue Population (entirely within the Siskiyou ODF unit):</u>

- One of the Highest Priority Recovery Actions for the SONCC Upper Rogue River Coho Population is to "improve timber harvest practices by revising the Oregon Forest Practices Act." (p. 32-1)

National Marine Fisheries Service 2014:32-27
Table 32-3. Recovery action implementation schedule for the Upper Rogue River population.

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-URR.10.5.14	Water Quality	No	Improve timber harvest practices	Improve regulatory mechanisms	Privately held timberlands	1
SONCC-URR.10.5.14.1	*Determine how to revise Oregon Forest Practice Rules so that they do not limit recovery of SONCC coho salmon and make appropriate revisions*					
SONCC-URR.10.5.14.2	*Adopt rules for fish-bearing streams sufficient to protect both water quality and fish habitat*					
SONCC-URR.10.5.14.3	*Adopt rules to increase protection of non-fish-bearing streams that address practices that adversely impact water quality and fish habitat*					
SONCC-URR.10.5.14.4	*Ensure management measures for landslide prone areas include protection of water quality and fisheries habitat*					
SONCC-URR.10.5.14.5	*Until more permanent regulatory mechanisms can be put in place, immediately adopt interim rules that increase protection for salmon habitat in forested areas, including increased natural recruitment of large wood on perennial and intermittent streams likely to deliver wood downstream, increased shade on all perennials, and protective buffers on small intermittent streams.*					

III. Gray literature

A. Water Quality Restoration Plans – Bureau of Land Management (BLM)

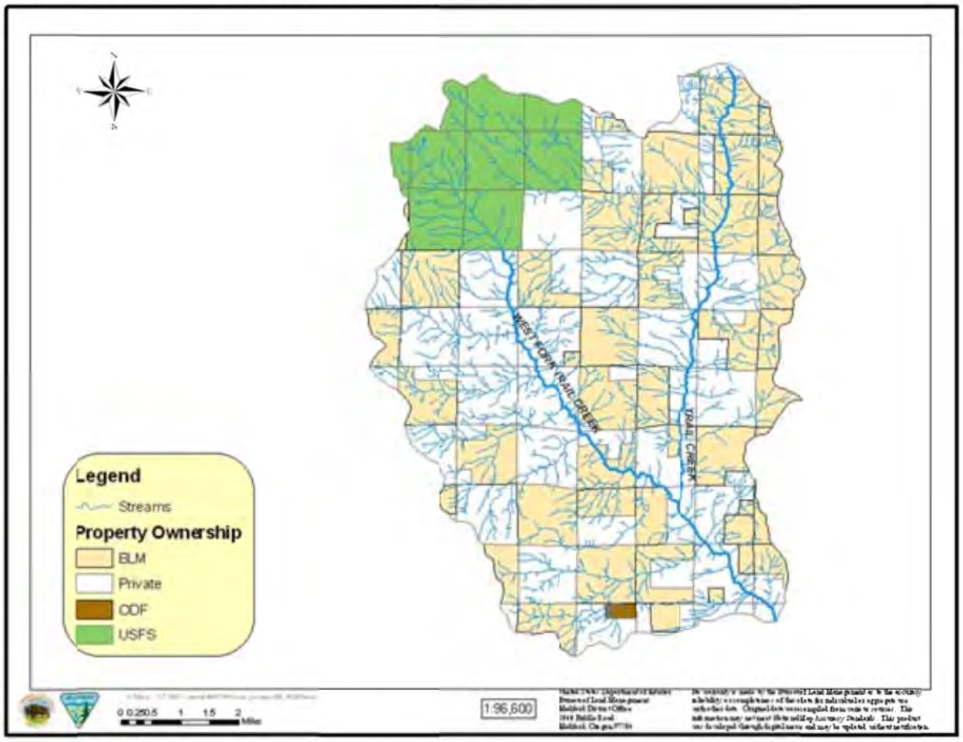
(1) Water Quality Restoration Plan Trail Creek Watershed. Bureau of Land Management. February 2011.

Trail Creek Watershed at a Glance	
Hydrologic Unit Code Number (Trail Creek)	**1710030706**
WQRP Area/Ownership	Total: 35,307 acres BLM: 14,697 acres (42%) U. S. Forest Service: 4,358 acres (12%) Private: 16,176 acres (46%) Oregon Dept. of Forestry: 76 acres (<1%)
303(d) Stream Miles Assessed	Total: 19.2 miles BLM Ownership: 4.8 miles
303(d) Listed Parameters	Dissolved Oxygen, E. Coli
Key Resources and Uses	Salmonids, domestic, aesthetic
Known Human Activities	Agriculture, forestry, roads, recreation, livestock, rural residential development
Natural Factors	Geology: volcanic Soils: various series and complexes, pervasively high clay content (30%-60%) in subsoil horizons (6 to 12 inches)

- "Land ownership patterns, past timber harvest, wildfires, and fire exclusion have contributed to the existing conditions in the watershed. Fire exclusion and harvest methods have contributed to the current high density and multiple-layered stand conditions in many of the proposed harvest units. Past harvest methods also influenced the locations and conditions of the roads within this watershed. Use of the mainstem streams to transport wood during historic timber harvest contributed to removal of large woody debris from streams, and harvest of streams in the watershed providing no riparian buffer has contributed to a reduction of shade provided by riparian canopy to streams, especially on private land, where this form of timber harvest was most common." (p. 7)

- Figure 4. BLM Land Ownership in the Trail Creek Watershed (p. 6)

Figure 4. BLM Land Ownership in the Trail Creek Watershed



- Table 5 Summary of Watershed Conditions on BLM-Administered Lands in the Trail Creek Watershed (p. 14)

Table 5. Summary of Watershed Conditions on BLM-Administered Lands in the Trail Creek Watershed

Shading	
Historical Condition	• Shading was higher, at least in the upper forks of Trail Creek, prior to heavy timber harvesting
Present Condition	• Less than 25% of all fishbearing streams provide greater than 80% stream shading.

- "Stream temperature and habitat recovery is largely dependent on vegetation recovery. Actions implemented now will not begin to show returns in terms of reduced stream temperatures or improved aquatic habitat for a number of years." (p. 19)

(2) Water Quality Restoration Plan Southern Oregon Coastal Basin Big Butte Creek Watershed. Bureau of Land Management (BLM) Medford District Butte Falls Resource Area. January 2008.

Big Butte Creek Watershed at a Glance	
Hydrologic Unit Code Number (Big Butte Creek)	**1710030704**
WQRP Area/Ownership	Total: 158,330 acres BLM: 29,544 acres (19%) U. S. Forest Service: 58,168 acres (37%) City of Medford: 1,427 acres (1%) Private: 69,144 acres (44%) Oregon Dept. of Forestry: 40 acres (<1%)
303(d) Stream Miles Assessed	Total: 54.2 miles BLM Ownership: 17.2 miles
303(d) Listed Parameters	Temperature, Dissolved Oxygen, E. Coli
Key Resources and Uses	Salmonids, domestic, aesthetic
Known Human Activities	Agriculture, forestry, roads, recreation, rural residential development
Natural Factors	Geology: volcanic Soils: various series and complexes

<u>Temperature Impairment:</u>

- "Within the Big Butte Creek Watershed, North Fork Big Butte, Clark, Dog, Doubleday, Hukill, and Jackass Creeks are on the 2004/2006 303(d) list for exceeding the 64.0°F 7-day statistic for rearing salmonids as found in the 1996 standard. There are a total of 64.4 stream miles listed for temperature in the Big Butte Creek Watershed of which 24 miles are on BLM-administered lands (Table 6 and Figure 9)." (p. 16)

- Table 7. Temperature Summary for the Big Butte Creek Watershed

Table 7. Temperature Summary for the Big Butte Creek Watershed

Stream Name	Period of Record[1]	7-day Statistic (ave. for all years) (°F)	Range of 7-day Statistic (for all years)	
			Minimum (°F)	Maximum (°F)
Big Butte Creek (above Rogue River)	1998, 1999	69.2	54.4	65.0
Big Butte Creek (above Dog Creek)	1994-1999, 2001, 2007	62.4	50.4	64.9
Clark Creek (34S-2E-7)	1995-1999,2001, 2003-2005, 2007	64.7	50.9	70.1
Dog Creek (above Big Butte Creek)	1994-1999, 2003, 2005, 2007	71.7	55.1	75.0
Doubleday Creek (35S-2E-13)	1998, 1999, 2002-2007	65.1	53.6	66.7

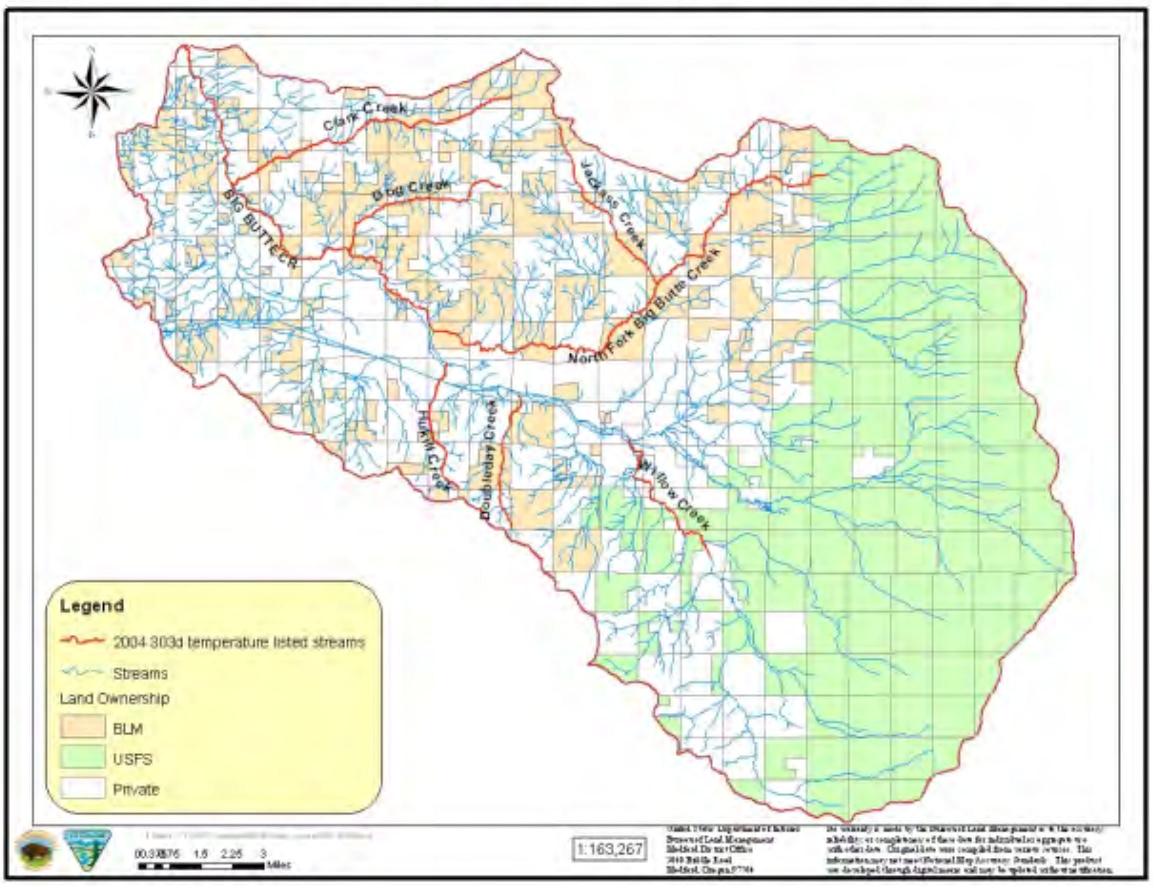
-

Stream Name	Period of Record[1]	7-day Statistic (ave. for all years) (°F)	Range of 7-day Statistic (for all years)	
			Minimum (°F)	Maximum (°F)
Hukill Creek (35S-2E-15)	1995-1999, 2001-2007	63.3	48.6	66.7
Jackass Creek (above North Fork Big Butte Creek	1994-1999, 2001, 2003-2007	68.1	50.8	71.6
North Fork Big Butte Creek (above South Fork confluence)	1994-2002, 2004, 2005, 2007	68.0	58.6	71.7

- [1] Temperature measured from June to September

- Figure 9. 2004/2006 303(d) Temperature Listed Streams for the Big Butte Creek Watershed.

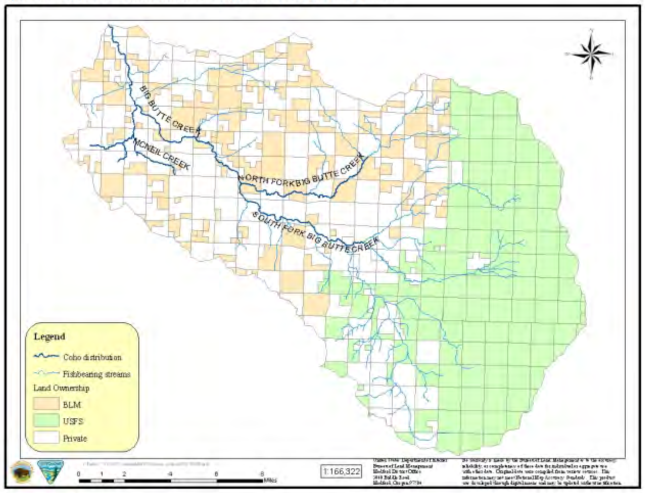
Figure 9. 2004/2006 303(d) Temperature-Listed Streams for the Big Butte Creek Watershed



**Note the mixed ownership on Big Butte/ North Fork Big Butte.*

- Figure 5. Coho Distribution in the Big Butte Creek Watershed (p. 5).

Figure 5. Coho Distribution in the Big Butte Creek Watershed



- "Prior to the completion of the TMDL for the plan area, guidance from the DEQ assumes that streams at system potential will not meet the temperature criterion during the hottest time of year (ODEQ 2004:11).Therefore, 100 percent of the load allocation for the Big Butte Watershed is assigned to natural sources and the allocation for BLM-managed lands is zero percent. <u>Any activity that results in anthropogenic caused heating of the stream is unacceptable</u>. This load allocation may be modified upon completion of the Rogue Basin TMDL." (p. 20-21)

- "It must be noted that only 32 percent of the 303(d) listed stream miles in the plan area are located on lands under BLM jurisdiction. Other organizations or groups that are (or will be) involved in partnerships for implementing, monitoring, and maintaining the Rogue Basin WQMP include the Upper Rogue Watershed Association, Jackson County, Oregon Department of Forestry (ODF), Oregon Department of Agriculture (ODA), Oregon Department of Transportation (ODOT), Oregon Department of Fish and Wildlife (ODFW), Oregon Water Resources Department (WRD), Oregon DEQ, and the U.S. Forest Service. The problems affecting water quality are widespread; coordination and innovative partnerships are key ingredients to successful restoration efforts." (p. 31)

(3) Althouse Creek Watershed Assessment. Bureau of Land Management. February 2005.

- "The first 7.5 miles of Althouse Creek (from its mouth to approximately the mouth of Tartar Gulch) is identified as "water quality-limited" due to warm summer temperature. Observations indicate that other streams in the watershed may warrant examination for water quality limitations due to high summer temperatures, flow modification, and sedimentation." (p. 7).

- "Factors limiting salmonid production include: inadequate stream flows in the summer months; high water temperatures; erosion and sedimentation; lack of large woody material in the stream and riparian area; lack of rearing and holding pools for juveniles and adults, respectively; channelization of streams in the canyons and lowlands; and blockages of migration corridors." (p. 10)

- "Coho salmon within Althouse Creek Watershed are part of the Southern Oregon / Northern California Coho ESU, which was federally listed as threatened on May 6, 1997 (Fed. Reg./Vol. 62, No. 87). The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California. Most of the coho in this ESU are in the Rogue River, with the largest remaining population in the Illinois River (Stouder et al. 1997). Currently summer water temperatures in the valley limit coho production from reaching historical levels (USDA, USDI 1997)." (p. 56)

- "Within the low-gradient reaches of the valley floor where private land ownership dominates, summer stream temperatures are not likely to improve as riparian vegetation is not returned and the demand on water allocation remains." (p. 104)

- "Changes in summer temperatures and the loss of stream complexity in Althouse Creek have affected coho and steelhead freshwater rearing habitat. The lower reaches have been affected most by the development of private land. As a result, the potential is great for private land owners to affect stream health downstream of federal ownership. However, sections of Althouse Creek on BLM and FS land are most likely to continue to provide the best coho and steelhead habitat. Key watersheds within the Illinois Basin will allow remnant stocks of coho to survive while areas disturbed by past practices recover." (p. 104)

(4) Water Quality Restoration Plan Deer Creek Watershed. Bureau of Land Management. 2011.

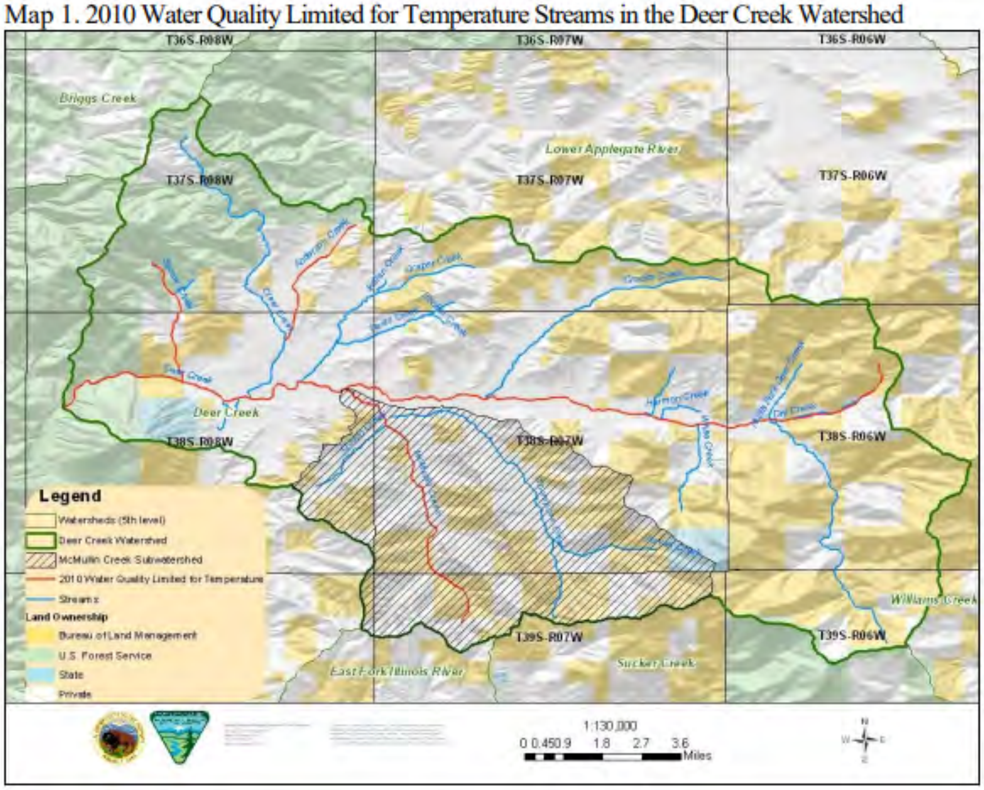
Deer Creek Watershed at a Glance	
Hydrologic Unit Code	1710031105
Watershed area/ownership	Total: 55,922 acres BLM: 23,052 acres USFS: 7,905 acres State: 1,026 acres Private: 23,939 acres
2010 303(d) listed parameters	None
Water Quality Limited for Temperature	*Deer Creek* mouth to river mile 17, *Anderson Creek* mouth to river mile 3.2, *Squaw Creek* mouth to river mile 3
Beneficial Uses	Fish (salmonids) and aquatic life, irrigation, domestic water supply
Known Impacts (human)	Water diversions, bank erosion, agriculture w/o riparian buffer, riparian harvest, woody debris removal, mining
Natural factors	Serpentine soils

- "Due to the mixed ownership in the Deer Creek Watershed, attainment of the water temperature standard requires multi-ownership participation and commitment to improve riparian function." (p. 13)

- Water Quality Limited for Temperature: Deer Creek mouth to river mile 17, Anderson Creek mouth to river mile 3.2, Squaw Creek mouth to river mile 3

- Map 1. 2010 Water Quality Limited for Temperature Streams in the Deer Creek Watershed (p. 2)

Map 1. 2010 Water Quality Limited for Temperature Streams in the Deer Creek Watershed



- "Land ownership is mostly a mix of private and BLM (Map 1), with <u>private being the dominant ownership.</u> The BLM, Medford District administers 41 percent of the lands, private ownership totals 43 percent, U.S. Forest Service manages 14 percent, and the State of Oregon lands total 2 percent…Major land uses in the watershed are agriculture and logging." (p. 2)

- "Based on the ownership distribution and aerial scanning (Google Earth), approximately 70% of the riparian zones in the Deer Creek Watershed lack mature tree structure necessary to provide large instream wood. On private lands, in the lower gradient floodplain reaches of Deer, Anderson/Clear, Draper, and Crooks creeks, reductions in riparian vegetation have decreased stream shade, thereby increasing solar radiation input into surface waters. While harvest activities fragmented riparian habitats, typical stream shade on BLM-managed land in the Deer Creek Watershed is high." (p. 5)

- Table 1. Deer Creek Watershed Water Quality Limited (WQL) Streams (p. 8)

Table 1. Deer Creek Watershed[1] 2010 Water Quality Limited (WQL) Streams

Stream Segment	WQL Stream Miles	Miles on BLM	Pollutant	Season	Standard
Deer Creek	0 - 17	2.8	Temperature	October 15-May 15	7-day-average max. ≤ 13°C.
Deer Creek	0 - 17	2.8	Temperature	Year Around (Non-spawning)	7-day average max.≤ 18°C
Anderson Creek	0 - 3.2	0.1	Temperature	Year Around (Non-spawning)	7-day average max.≤ 18°C
Squaw Creek	0 - 3	0.6	Temperature	Year Around (Non-spawning)	7-day average max.≤ 18°C

1/ Deer Creek Watershed, excluding the McMullin Creek Subwatershed (USDI 2005).

(5) Grants Pass Water Quality Restoration Plan Southern Oregon Coastal Basin Middle Rogue Subbasin Grants Pass- Rogue River Watershed Bureau of Land Management (BLM), Medford District Office Grants Pass Resource Area. 2012.

Grants Pass-Rogue River Watershed at a Glance	
Hydrologic Unit Code	1710030804
Watershed area/ownership	Total: 53,809 acres BLM: 12,482 acres Private: 40,677 acres State: 627 acres Local Government: 23 acres
303(d) Stream miles assessed	20.6 Total miles, 0.6 BLM miles
303(d) listed parameters	Temperature, fecal coliform
Beneficial Uses	Salmonid rearing, migration and spawning; cold water habitat; livestock watering; water supply; recreation
Known Impacts (human)	Timber harvest, roads, diversions, urban development, agriculture
Natural factors	Soils: Serpentine soils – poor growing conditions and low infiltration
Water Quality limited streams	*Savage Creek*—Mouth to mile 4.8 *Rogue River*—Mouth to mile 124.8

- “In 1997, the DEQ found maximum water temperatures above 23°C in Savage Creek exceeding the 17.8°C rearing maximum, leading to the 303(d) listing. A reduction of both baseflow and riparian vegetation in these are primarily responsible for increased water temperatures. Reduced volumes of water are more susceptible to warming and reduced vegetative cover increases solar radiation input. The current average shade on the 0.6 mile of Savage Creek that crosses BLM-managed land is 97 percent and the target shade is 97 percent (ODEQ 2004).” (p. 11)

(6) Water Quality Restoration Plan Southern Oregon Coastal Basin Evans Creek Watershed. Bureau of Land Management (BLM) Medford District Butte Falls Resource Area. July 2009.

Evans Creek Watershed at a Glance	
Hydrologic Unit Code Number (Evans Creek)	**1710030803**
WQRP Area/Ownership	Total: 143,349 acres Bureau of Land Management: 59,285 ac. (41%) Private entities: 82,817ac (58%) U. S. Forest Service: 1,104ac (<1%) Oregon Dept. of Forestry: 142ac (<<1%)
303(d) Stream Miles Assessed	Total: 89.6 miles BLM Ownership: 26.1 miles
303(d) Listed Parameters	Temperature, fecal coliform
Key Resources and Uses	Salmonids, domestic, aesthetic
Known Human Activities	Agriculture, forestry, roads, recreation, rural residential development
Natural Factors	Geology: volcanic Soils: various series and complexes

- Figure 10. Temperature Monitoring Sites for the Evans Creek Watershed (p. 19)

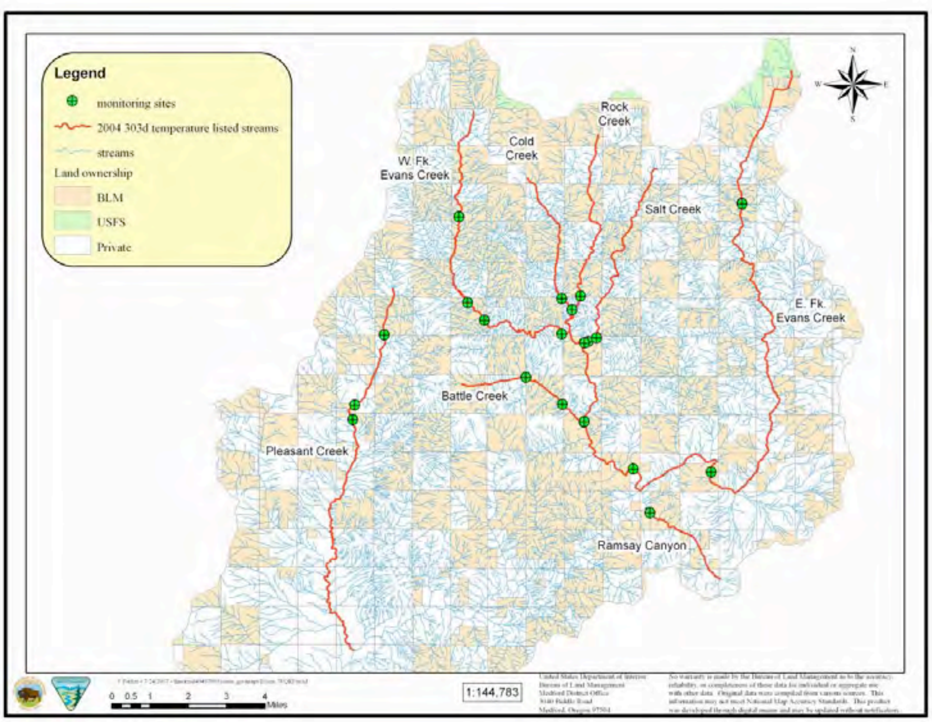


Table 7. Temperature Summary for the Evans Creek Watershed

Stream	Period of Record[1]	7-day statistic (average for all years °F)	7-day statistic range	
			Minimum (°F)	Maximum (°F)
Battle Creek (above W. Fk. Evans Ck.) – BATL	1994-1996, 2000-2002, 2007	65.9	58.1	67.9
Battle Creek (in 34s-03w-09) – BTL1	2000-2002	66.6	56.4	68.4
Battle Creek (in 34s-03w-09) – BTL2	2000-2002	63.9	56.4	66.1
Cold Creek (above Rock Creek) – COLD	1994-1996	69.0	60.8	69.8
Cold Creek (in 33s-03w-33) – CLDC	2000, 2002, 2004, 2005	65.5	53.3	68.7
East Evans Creek (above Sprignett Creek) – EEVN	1994, 1996-2002, 2007	76.8	58.3	82.0
East Evans Creek (above Wolf Creek) – EEAW	2000-2002	63.3	55.4	65.2
East Evans Creek (below Wolf Creek) – EEBW	1998	63.7	59.4	64.9
Pleasant Creek (in 33s-4w-35) – PLZM	2003-2006	66.5	58.7	70.8
Pleasant Creek (below Rt. Fk. Pleasant Ck.) – PLEZ	1994-1997, 1999, 2000	66.4	57.0	70.5
Pleasant Creek (in 34s-04w-15) –PLES	1998, 2003, 2004, 2006	66.5	57.3	68.0
Ramsey Canyon (above Evans Creek) – RAMS	1995-2002, 2004, 2005, 2007	69.3	54.1	73.7
Rock Creek (in 333s-03w-34) – ROCR	2000, 2002, 2004	67.3	57.6	69.6
Salt Creek (above W. Fk. Evans Ck.) – SALT	1996	66.2	59.9	67.1
Salt Creek (above W. Fk. Evans Ck.) – SLTC	2000	68.4	57.1	69.8
West Fork Evans Creek (above Swamp Creek) – WWAS	2004	64.8	57.4	66.0
West Fork Evans Creek (above Elderberry Flat) – WWAE	2004	67.4	58.3	68.4
West Fork Evans Creek (below Elderberry Flat) – WWBE	2004	67.8	60.1	69.0
West Fork Evans Creek (above Evans Creek) – WEVN	1994-1997, 2004-2007	72.7	62.6	77.6
West Fork Evans Creek (above Salt Creek) – WEAS	2000, 2001, 2006	71.8	60.0	75.5
West Fork Evans Creek (above Rock Creek) – WEAR	2000-2002, 2004	72.1	55.1	74.9
West Evans Creek (above Battle Creek) – WEAB	2000-2002, 2006, 2007	75.8	60.5	79.2

1/ Temperature measured from June to September

(7) Water Quality Restoration Plan Jumpoff Joe Creek Watershed. Bureau of Land Management. September 2009.

Jumpoff Joe Creek at a Glance	
Hydrologic Unit Code	17/10/03/10/01
Watershed area/ownership	Total: 69,382 acres BLM Ownership: 21,456 acres State, County, Private: 47,926 acres
303(d) listed parameters	Temperature
Beneficial Uses	Fish (salmonids) and aquatic life, irrigation, domestic water supply
Known Impacts(human)	Water diversions, bank erosion, riparian harvest, woody debris removal, mining
Natural factors	Serpentine and Granitic soils
Water Quality limited streams	*Jumpoff Joe Creek* mouth to river mile 21.3, *Louse Creek* to river mile 12.3, and *Quartz Creek* to river mile 7.3

- "Known Impacts(human) Water diversions, bank erosion, riparian harvest, woody debris removal, mining" (p. 3)

- "DEQ found 7-day average maximum stream temperatures above 18° C in Jumpoff Joe Creek, leading to 303(d) listing. The listed stream segment is River Mile (RM) 0 to RM 21.3, measured at 2 sites on Jumpoff Joe Creek. This is not reflected by water temperatures measured by BLM in the upper part of Jumpoff Joe Creek in section 3, T35S, R5W, estimated RM 15. DEQ found 7-day average maximum stream temperatures above 18° C in Louse Creek, leading to 303(d) listing. The listed stream segment is River Mile (RM) 0 to RM 12.3, measured at 2 sites. DEQ found 7-day average maximum stream temperatures above 18° C in Quartz Creek, leading to 303(d) listing. The listed stream segment is River Mile (RM) 0 to RM 7.3, measured at 2 sites. A reduction of both baseflow and riparian vegetation in the mid- and lower reaches of Jumpoff Joe, Louse, and Quartz Creeks are primarily responsible for increased water temperatures. Reduced volumes of water are more susceptible to warming and reduced vegetative cover increases solar radiation input." (p. 6).

(8) Water Quality Restoration Plan Klamath Basin Jenny Creek Watershed. Bureau of Land Management. 2011.

Jenny Creek Watershed at a Glance	
Hydrologic Unit Code Number	**1801020604**
WQRP Area/Ownership	Total: 134,348 acres BLM: 58,534 acres (44%) BOR: 3,023 acres (2%) USFS: 1,328 acres (1%) State of Oregon: 80 acres (<0.1%) Private: 71,383 acres (53%)
303(d) Stream Miles Assessed	Total: 55.7 miles BLM Ownership: 23.6 miles
303(d) Listed Parameters	Temperature
Key Resources and Uses	Resident salmonids, domestic, recreation, aesthetic
Known Human Activities	Agriculture, forestry, roads, rural residential development, and recreation
Natural Factors	Geology: volcanic landforms Soils: various series and complexes

-

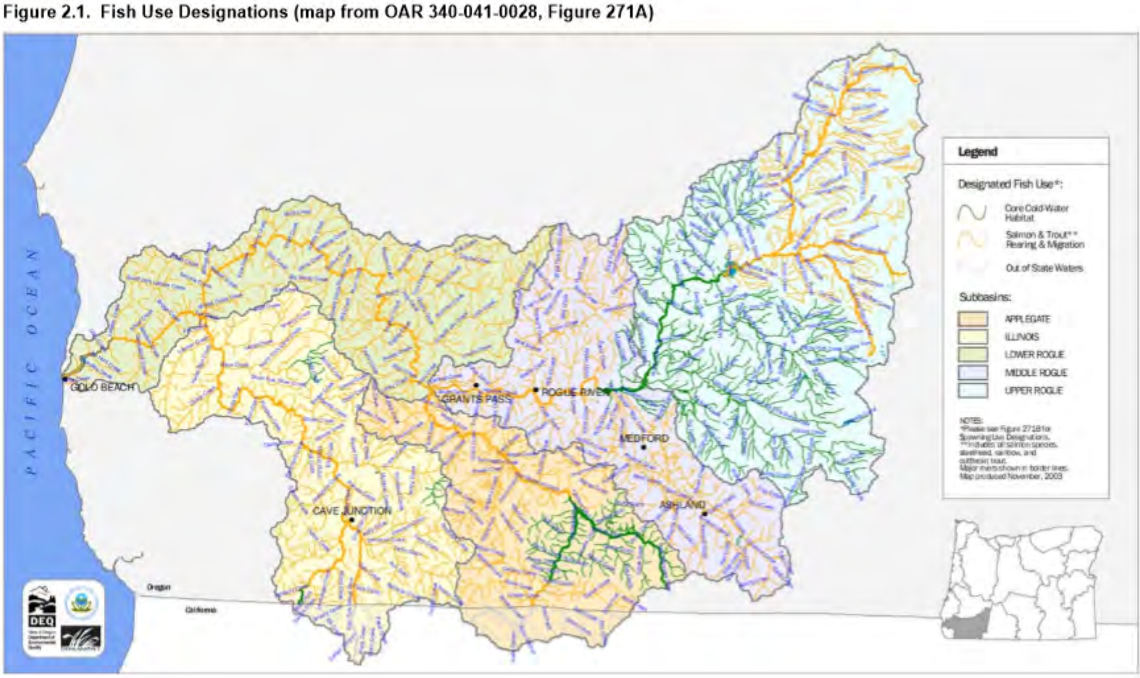
(9) Total Maximum Daily Loads (TMDLs)

(1) Rogue River Basin TMDL Chapter 2: Temperature. Oregon Department of Environmental Quality. 2008.

- "Temperature Issues in the Rogue River Subbasins: Salmonids, often referred to as cold water fish, and some amphibians are highly sensitive to temperature. In particular, Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhynchus kisutch*) are among the most temperature sensitive of the cold water fish species in the Rogue River subbasins (DEQ 1995). Excessive summer water temperatures have been recorded in a number of tributaries. These high summer temperatures are reducing the quality of rearing and spawning habitat for chinook and coho salmon, steelhead and resident rainbow trout. The potential causes of high water temperatures in the Rogue River subbasins include urban and rural residential development near streams and rivers, reservoir management, irrigation water return flows, past forest management within riparian areas, NPDES regulated point sources, agricultural land use within the riparian area, water withdrawals, and road construction and maintenance." (p. 2-2).

- Figure 2.1 Fish Use Designations (map from OAR 340-041-0028, Figure 271A) (p. 2-7)

Figure 2.1. Fish Use Designations (map from OAR 340-041-0028, Figure 271A)

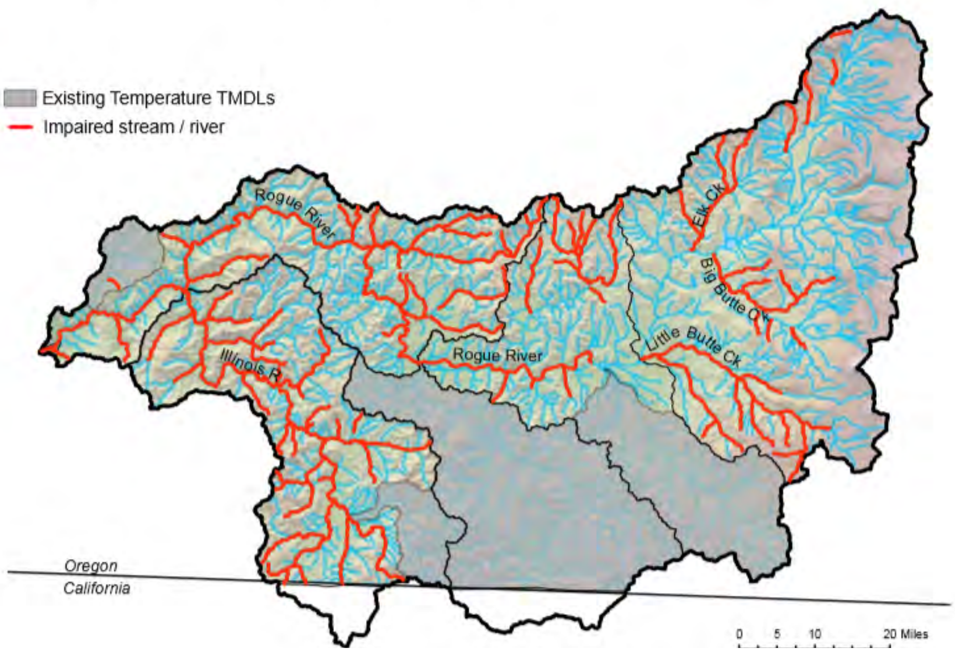


- "Monitoring has indicated that water temperatures in the Rogue River subbasins exceed the State of Oregon temperature criteria. The Rogue River basin has 101 individual temperature listings on the 2004/2006 Assessment (one of them is listed in error). Some streams may have more than one temperature listing. For example, Deer Creek in the

Illinois River subbasin is listed for exceeding the rearing criteria and the spawning criteria. Figure 2.3 and Table 2.6 highlight the streams on the 2004/2006 303(d) list for temperature." (p. 2-9)

- Figure 2.3 2004/2006 303(d) list for temperature (Red) (p. 2-9)

Figure 2.3. 2004/2006 303(d) list for temperature (Red)



- "The pollutant targeted in this TMDL is heat from the following sources: (1) heat from warm water discharges from various point sources, (2) <u>heat from human caused increases in solar radiation loading to the stream network</u>, and (3) heat from reservoirs and irrigation ditches which, through their operations, increase water temperatures or otherwise modify natural thermal regimes in downstream river reaches." (p. 2-13)

- "Near-stream vegetation disturbance/removal reduces stream surface shading via decreased riparian vegetation height, width and/or density, thus increasing the amount of solar radiation reaching the stream surface (shade is commonly measured as percent-effective shade or open sky percentage3). Furthermore, forests even beyond the distance necessary to shade a stream can influence the microclimate, providing cooler daytime temperatures (Chen et al. 1999). Riparian vegetation also plays an important role in shaping channel morphology, resisting erosive high flows, and maintaining floodplain roughness. Table 2.9 shows the potential for improvement in shade for the Rogue River and selected tributaries as the difference between current and system potential effective shade. The system potential condition as defined in this TMDL is the near-stream vegetative community that can grow on a site at a given elevation and aspect in the absence of human disturbance." (2-19).

- "Effective shade is the surrogate measure that translates easily into solar heat load. It is simple to measure effective shade at the stream surface using a relatively inexpensive instrument called a Solar Pathfinder™. The term 'shade' has been used in several contexts, including its components such as shade angle or shade density. For purposes of this TMDL, effective shade is defined as the percent reduction of potential daily solar radiation load delivered to the water surface. The role of effective shade in this TMDL is to prevent or reduce heating by solar radiation and serve as a linear translator to the loading capacities. Unless otherwise stated within this chapter, the applicable nonpoint source load allocations for Rogue River Basin streams are based upon potential effective shade values presented in this section and the human use allowance (0.04oC cumulative increase at the point of maximum impact)." (p. 2-36)

- "Most streams simulated have no assimilative capacity, which translates into a zero heat load allocation for nonpoint sources. When a stream has assimilative capacity, nonpoint and point sources may receive allocations greater than background." (p. 2-36)

(2) Lower Sucker Creek Illinois River Subbasin Total Maximum Daily Load and Water Quality Management Plan (Lower Section of Sucker/Grayback Watershed: 1710031103) (USFS boundary at Mile 10.4 to the Mouth). Oregon Department of Environmental Quality. April 2002.

- "Load Allocations (Nonpoint Sources): The numeric temperature criteria in Lower Sucker Creek is not expected to be met and therefore no measurable surface water temperature increases from anthropogenic activities are allowed. Wasteload Allocations (Point Sources): Applies to NPDES permitted point source discharges. The numeric temperature criteria in Lower Sucker Creek is not expected to be met and therefore no measurable surface water temperature increases from anthropogenic activities are allowed. NPDES dischargers, currently and in the future, are allowed no measurable surface water temperature impacts." (p. 29)

(3) Applegate Subbasin Total Maximum Daily Load (TMDL) HUC # 17100309. Oregon Department of Environmental Quality. December 2003.

- "Temperature Issues in the Applegate Subbasin: Salmonids, often referred to as cold water fish, and some amphibians are highly sensitive to temperature. In particular, Chinook salmon (Oncorhynchus tshawytscha) and coho salmon (Oncorhynchus kisutch) are among the most temperature sensitive of the cold water fish species in the Applegate subbasin. Excessive summer water temperatures have been recorded in a number of tributaries and the mainstem Applegate River. These high summer temperatures are reducing the quality of rearing and spawning habitat for chinook and coho salmon, steelhead and resident rainbow trout. The potential causes of the high water temperatures include past forest management within riparian areas, upslope timber harvest practices, agricultural land use within the riparian area, road construction and maintenance, and rural residential development near streams and rivers." (p. 13).

- "Nonpoint Sources: Riparian vegetation, stream morphology, hydrology, climate, and geographic location influence stream temperature. While climate and geographic location are outside of human control, riparian condition, channel morphology and hydrology are affected by human land use. Human activities that contribute to degraded thermal water quality conditions in the Applegate Subbasin are associated with agriculture, forestry, roads, urban development, and rural residential-related riparian disturbance. For the Applegate Subbasin temperature TMDL there are 4 nonpoint source categories which may result in increased thermal loads: 1. Near stream vegetation disturbance/removal 2. Channel modifications and widening 3. Hydromodification - Water Withdrawals 4. Natural Sources." (p. 21)

(10) Other gray literature

(1) Stream habitat and water quality in the Applegate Basin. OWEB Grant 99-485 Final Report. Applegate River Watershed Council. November 2004.

- The assessment of the Stream Habitat and Water Quality in the Applegate basin emphasizes the impacts of sediment, stream flow and temperature on salmonid habitat. Thompson Creek, Little Applegate River, and the upper Applegate were area selected to conduct more specific investigations. (p. 3)

- The ODEQ reports in the Applegate Subbasin Total Maximum Daily Load (ODEQ 2003), "Of the 700 miles of streams and creeks in the Applegate subbasin, approximately 126 miles of streams are known to exceed the 64°F (17.8° C)summer rearing temperature criteria, 2 miles of streams exceed the 55°F (12.8° C)spawning temperature criteria, 9 miles exceed the sedimentation criteria, 9 miles exceed the biological criteria, 14 miles are listed for habitat modification, and 64 miles are listed for flow modification." In the Applegate subbasin, the following streams are on the EPA's Clean Water Act Section 303(d) list of water-quality limited streams for temperature: (p. 7)

  • Applegate River • Star Gulch • Beaver Creek • Sterling Creek • Humbug Creek • Thompson Creek • Little Applegate River • Waters Creek • Palmer Creek • Williams Creek • Powell Creek • Yale Creek • Slate Creek

(2) Betts, M., B. Bourgeois, R. Haynes, S. Johnson, K. Puettmann, and V. Sturtevant. 2014. Assessment of Alternative Forest Management Approaches: Final Report of the Independent Science Panel. Prepared with assistance from D.C.E. Robinson, A.W. Hall and G. Stankey, ESSA Technologies Ltd. (Vancouver, BC) for Oregon Department of Forestry (Salem, OR).

- "Increases in stream temperature summer maxima have been observed at a number of the fish bearing stream sites harvested using FPA in the RipStream study (Groom et al. 2011a, 2011b) and in the Alsea Paired Watershed Study- Revisited (J. Light, pers. comm.) and in a systematic review on stream temperature (Czarnomski et al. 2013). The RipStream and Alsea studies showed increased summer maxima onsite, and also exceeded the "Protecting Cold Water" non-degradation standard set by EPA and the State of Oregon. Downstream of harvest in both studies, maximum stream temperatures decreased. Non-fish streams have shown a range of temperature responses after harvest using FPA; several showed increased summer maxima for stream temperature on site (Kibler 2007, Gomi et al. 2006, Surfleet and Skaugset 2013, M. Reiter, pers. comm.) and showed that the maxima decreased as the stream water travelled downstream through buffers. Streams without any buffers showed the highest temperature increases (Gomi et al. 2006, Bisson et al. 2013).” (p. 37-38).

- “If FPA were applied in State Forests, there would be an increase of forest harvest near streams, due to two main differences: (1) no designation of no-cut or limited entry riparian zones around headwater streams without fish (N), and (2) narrower limited entry zones on all other stream types (see Appendix B: Riparian Guidelines). Under FPA, riparian buffers are not required for N type streams and fewer trees are required to remain standing in the outer riparian management zone of F type streams. Removing all riparian trees near streams has been shown to have multiple impacts to water quality, instream habitat and aquatic biota (see Section 4.2.3).” (p. 85)

Appendix B. Maps of Private Forestland in the ODF Siskiyou Georegion, SSBT Streams, and Temperature Water Quality Limited Streams

Figure 1. Private Forestland and SSBT in Rogue Basin

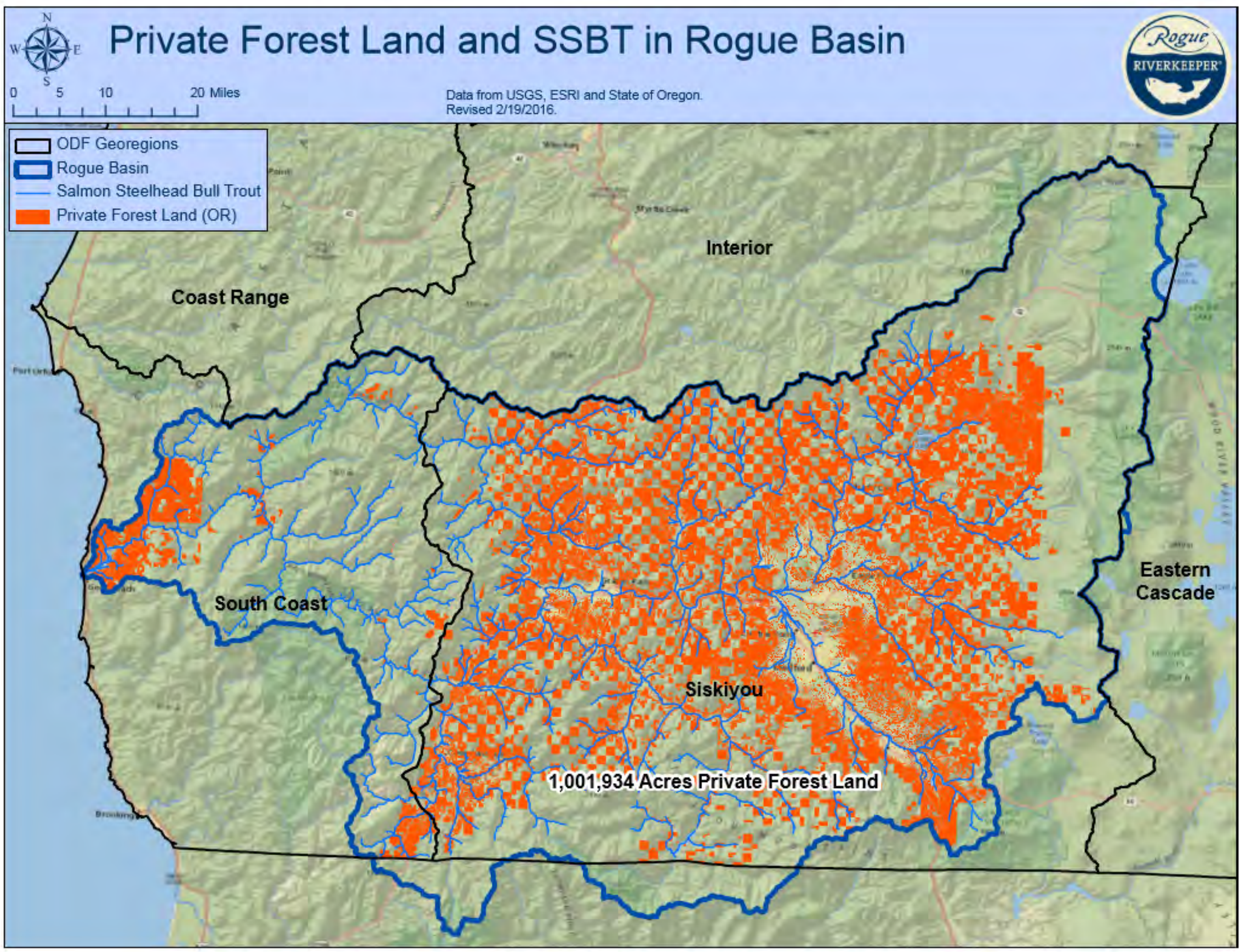


Figure 2. Map of the Siskiyou Georegion with SSBT streams, temperature water quality limited streams, and private forestlands by HUC-10 watershed

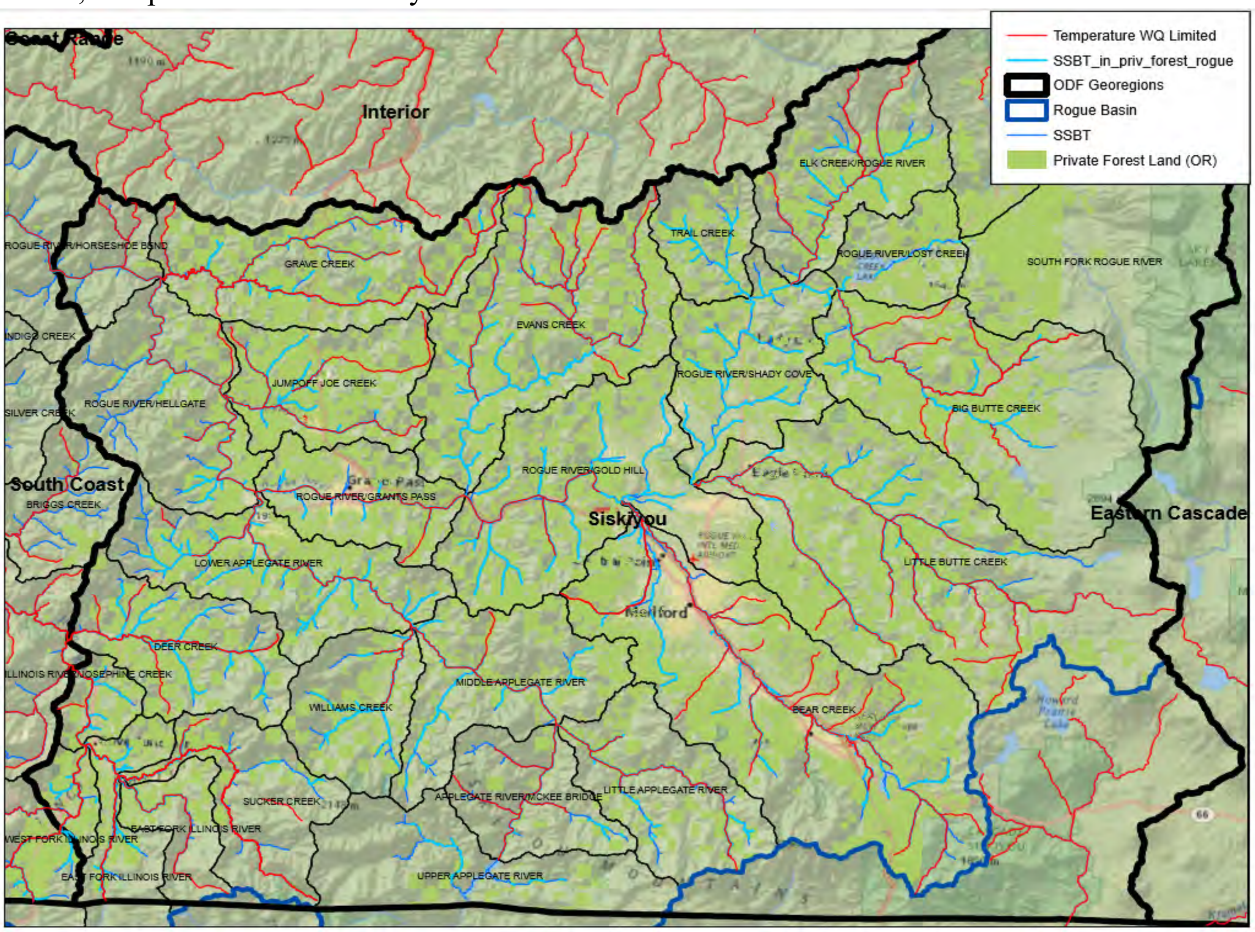


Figure 3. Deer Creek HUC-10 watershed with SSBT streams, temperature water quality limited streams, and private forestlands

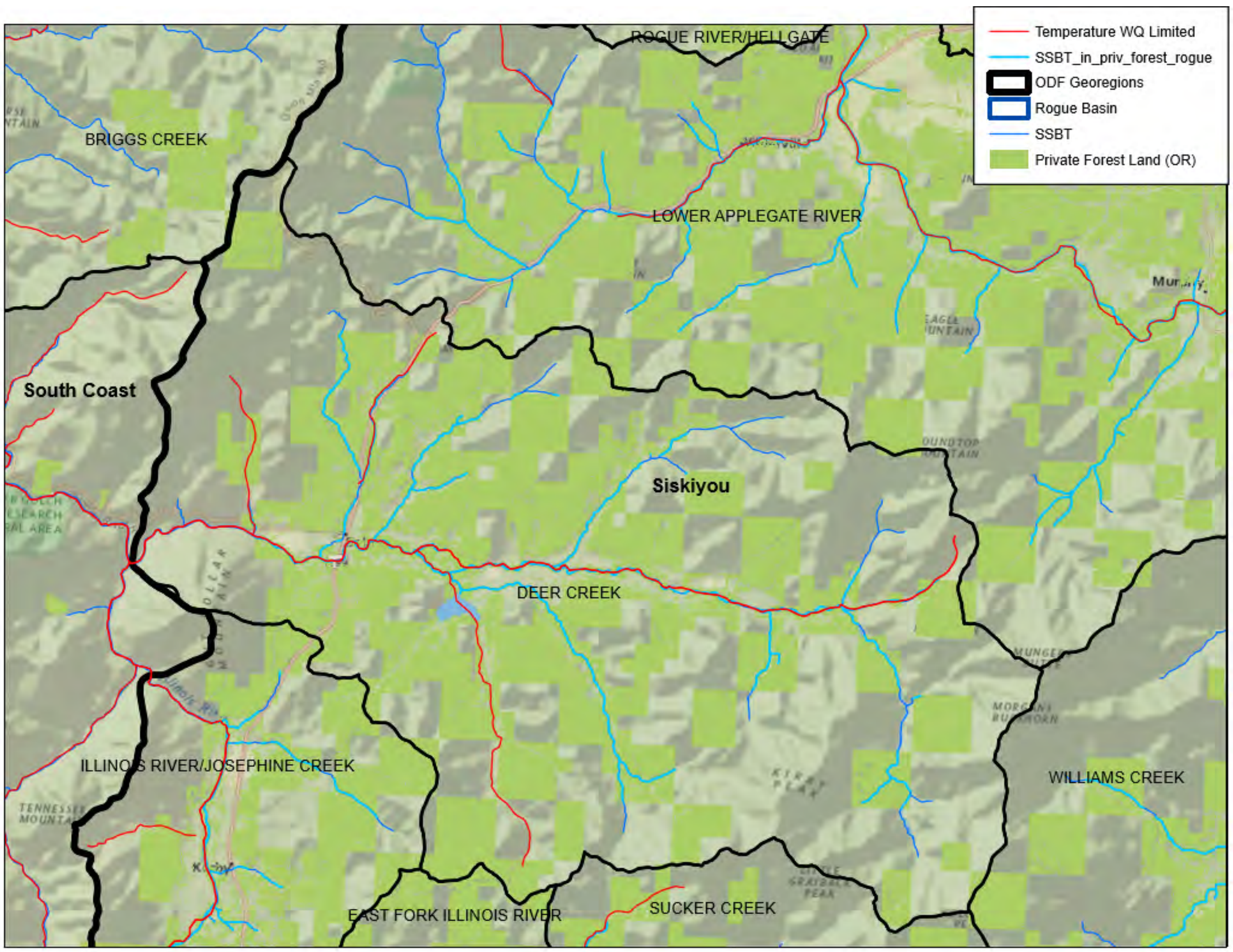


Figure 4. Jumpoff Joe Creek HUC-10 watershed with SSBT streams, temperature water quality limited streams, and private forestlands

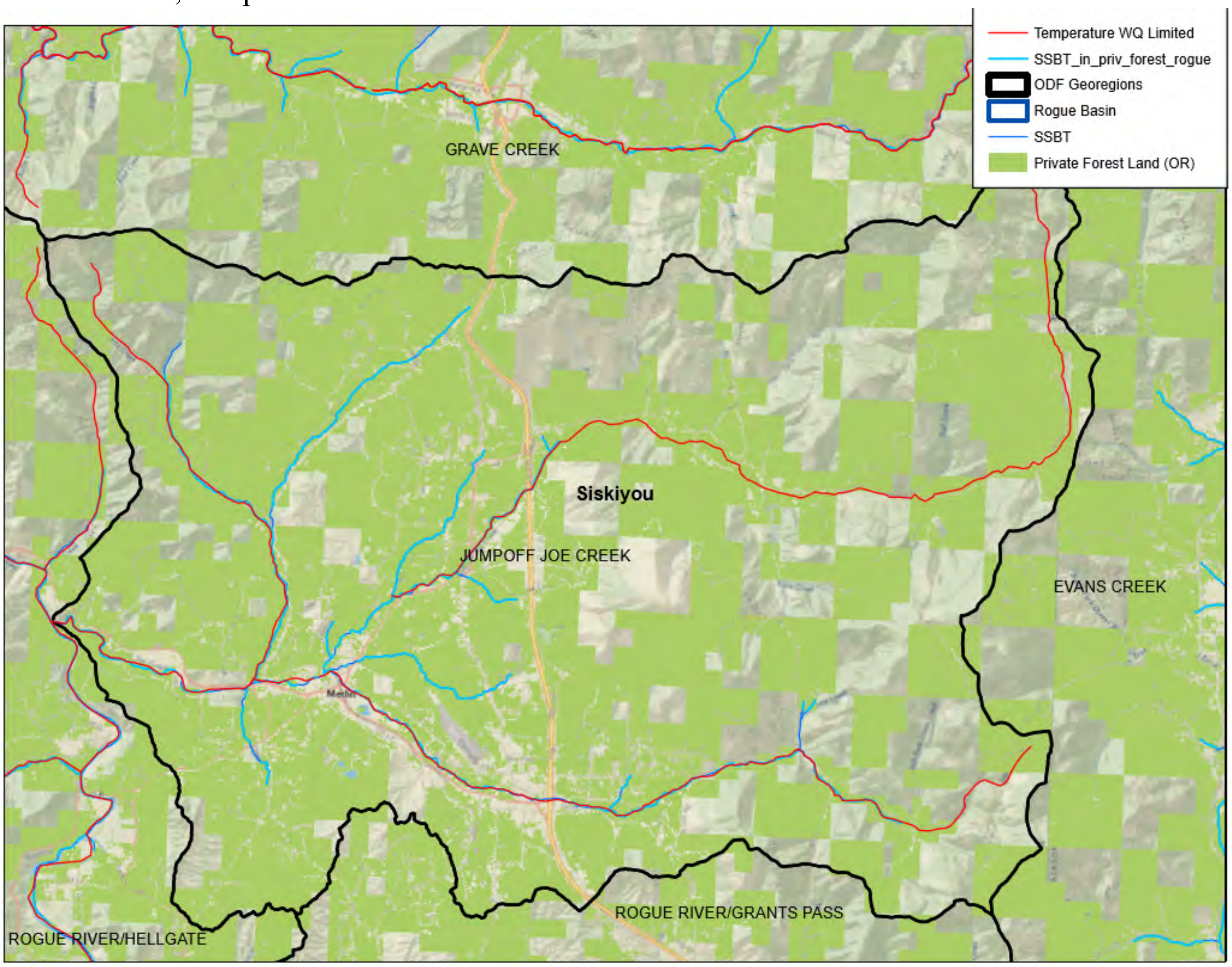


Figure 5. Evans Creek HUC-10 watershed with SSBT streams, temperature water quality limited streams, and private forestlands

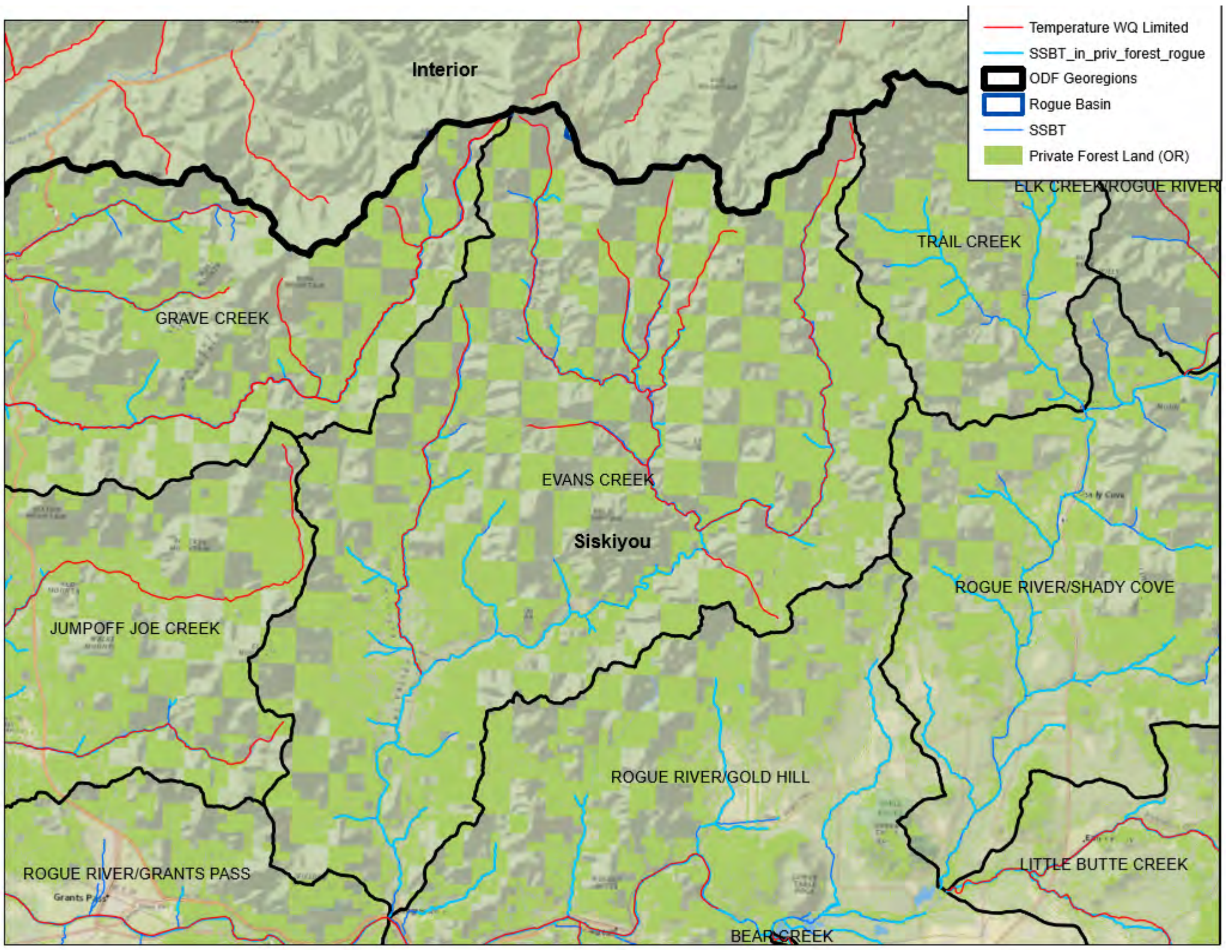


Figure 6. Applegate HUC-10 watersheds, SSBT streams, temperature water quality limited streams, and private forestlands

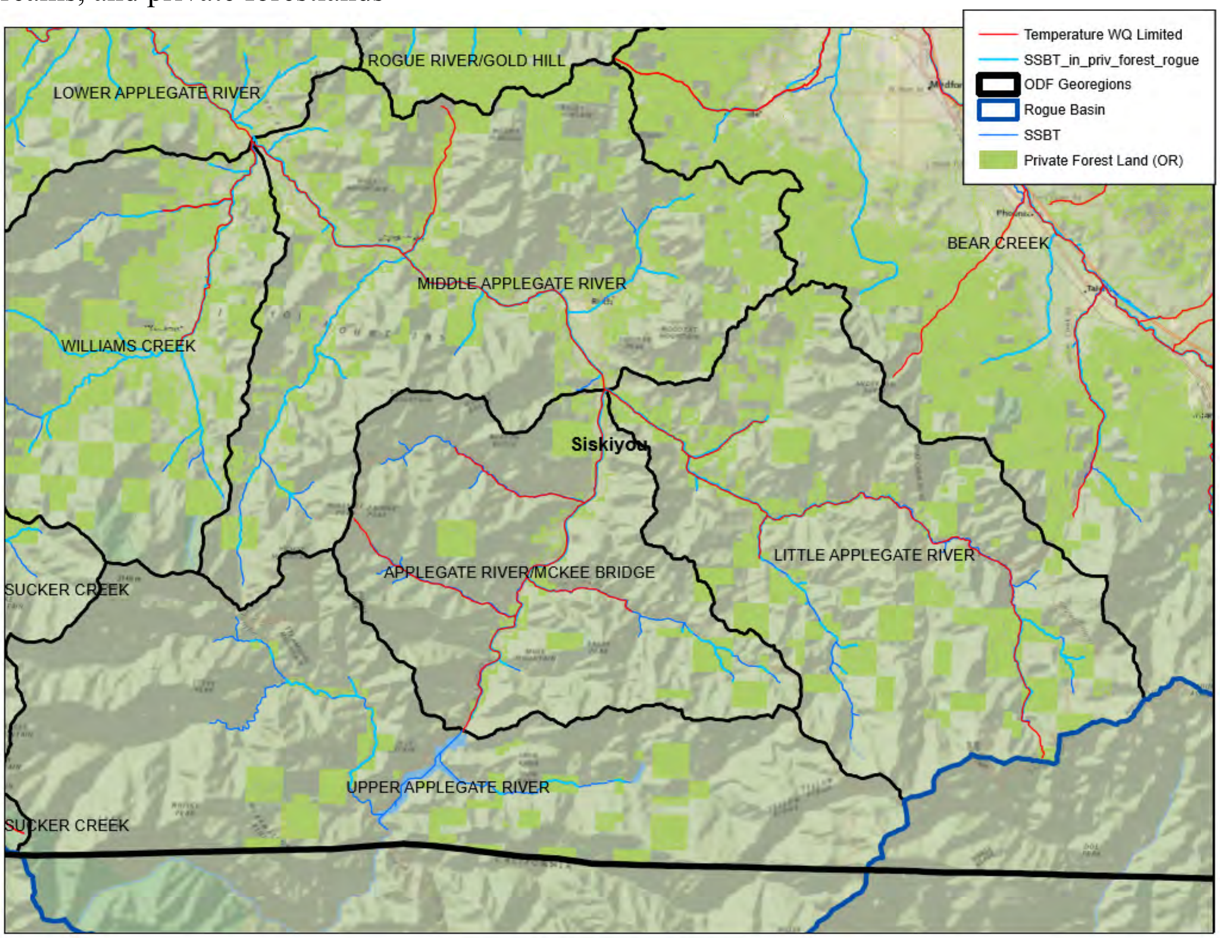


Figure 7. Big Butte Creek HUC-10 watershed, SSBT streams, temperature water quality limited streams, and private forestlands