Goals and Scientific Basis of the "Protecting Cold Waters" Rule

Summary of Key Points

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1. Goals of key laws and regulations behind the Protecting Cold Waters (PCW) rule – as we move from the laws to the policy and the rule, the focus shifts from protecting the species and its habitat to the water quality standards and finally to just the temperature itself.

Document	Key goals relevant to PCW Rule
Clean Water Act (5)	"*maintain* the chemical, physical, and biological integrity of the Nation's waters;" "provides for the protection and propagation of fish, shellfish, and wildlife"
Endangered Species Act (13)	"any action … is **not likely to jeopardize the continued existence** of any endangered species or threatened species or **[not likely to] result in the destruction or adverse modification of habitat** of such species"
Antidegradation Policy (7)	"Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, **that quality shall be maintained and protected** "
PCW rule (1)	"waters … may not be warmed by more than 0.3 degrees Celsius"

2. The big picture – how it should all fit together, so the rule achieves the goals of the laws.

Hypothesis	Status
1. The PCW rule should be necessary and sufficient to protect threatened and endangered salmonid species (TES).	No scientific evidence presented. Compare presence and absence of scientific evidence in Attachments 1 and 2.
2. Best Management Practices (BMP) should ensure PCW rule is met.	Not supported by Ripstream study.
3. BMPs shouldn't have unintended adverse effects.	No evidence that it was considered in guidance; BMP history was not reviewed.

3. Documents examined – links to all of these documents are provided in the write-up.

EPA Region 10	DEQ
Guidance for Temperature WQS	Protecting Cold Waters (PCW) Rule
Two rounds of public comments	Implementation Guide
Implementation Guide	Summary of DEQ Technical Advisory Committee
Clean Water Act, Endangered Species Act	1997 Scientific Basis for Temperature Standard
Antidegradation Policy 40 CFR 131.12 (a)(2)	1995 Temperature Issue Paper
Sound Science Policy 40 CFR 131.11 (a)(1)	
5 Technical Issue papers & synthesis paper	

4. Two ways of looking at different issues – one approach, not based on scientific evidence, is juxtaposed against another approach, which is based on the traditional scientific method.

Issue	No particular evidence approach	Evidence based approach
1. What *is* the basis for the PCW rule?	*A list of "potential benefits," without any particular scientific evidence*; maintain the "current thermal regime" as an approximation of the "natural thermal regime."	*Scientific evidence showing: the PCW rule is necessary and sufficient to protect TES*.
2. What is the *goal* of the PCW rule?	Pull out all the stops to provide the "best-possible" temperatures, with "best-possible" operationally defined as "no human impact."	Do whatever is necessary and sufficient to protect the TES, but don't go overboard with measures of untested effectiveness, "just to be on the safe side."
3. In the face of *uncertainty*, what is our *approach to environmental regulations*?	*Assume a forest operation is harmful to habitat until proven otherwise*; then the burden of proof for the safety of the operation lies with the operator, so regulator doesn't have to show a regulation is necessary; similar to "precautionary principle."	*Assume a regulation isn't necessary until proven otherwise*; then the burden of proof for the necessity of a regulation lies with the regulator.
4. How do we examine key hypotheses, such as "the PCW rule is necessary and sufficient to protect TES"	Accept key hypotheses as *axioms*, "statements so obvious and so uncontroversial that they are accepted without critical examination of evidence."	*Traditional scientific method*: gather data, evaluate it critically and determine whether the data support the hypothesis.
5. What is the rationale for trying to preserve the "natural thermal regime?"	Evolution occurred under the historical "natural thermal regime," so TES are adapted to it. The current thermal regime is an adequate approximation of the natural thermal regime, or at least the best that we can do, so maintain the current thermal regime with the PCW rule.	If added heat were the only human impact on the natural thermal regime, then controlling added heat with the PCW rule is logical; but almost all aspects of the habitat have been impacted, so evidence is needed for the effectiveness of the rule for TES.

5. What to do? – three options on how to proceed in the face of uncertainty.

1. Accept a simple PCW rule axiomatically, with no discussion of the evidence, develop corresponding BMPs.
2. Review the scientific evidence for the efficacy of the PCW rule in protecting the TES; in the long run, have rules and BMPs demonstrated effective in protecting TES.
3. It's too complicated to take rational action so do nothing; or, study it interminably with the effect of doing nothing.

Attachment 1. Scientific basis for numeric criteria. Excerpt from Section V.1 of *EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Standards* (p. 16) that illustrates EPA's attention to detail in providing the scientific rationale for their guidance on coldwater salmonid uses and numeric criteria to protect those uses. The issue papers that are cited provide references to the original scientific publications.

Table 1 - Summary of Temperature Considerations For Salmon and Trout Life Stages

Life Stage	Temperature Consideration	Temperature & Unit	Reference
Spawning and Egg Incubation	*Temp. Range at which Spawning is Most Frequently Observed in the Field	4 - 14°C (daily avg)	Issue Paper 1; pp 17-18 Issue Paper 5; p 81
	* Egg Incubation Studies - Results in Good Survival -Optimal Range	 4 - 12°C (constant) 6 - 10°C (constant)	 Issue Paper 5; p 16
	*Reduced Viability of Gametes in Holding Adults	> 13°C (constant)	Issue Paper 5; pp 16 and 75
Juvenile Rearing	*Lethal Temp. (1 Week Exposure)	23 - 26°C (constant)	Issue Paper 5; pp 12, 14 (Table 4), 17, and 83-84
	*Optimal Growth - unlimited food - limited food	 13 - 20°C (constant) 10 - 16°C (constant)	 Issue Paper 5; pp 3-6 (Table 1), and 38-56
	*Rearing Preference Temp. in Lab and Field Studies	10 - 17°C (constant) < 18°C (7DADM)	Issue Paper 1; p 4 (Table 2). Welsh et al. 2001.
	*Impairment to Smoltification	12 - 15°C (constant)	Issue Paper 5; pp 7 and 57-65 Issue Paper 5; pp 7 and 57-65
	*Impairment to Steelhead Smoltification	> 12°C (constant)	
	*Disease Risk (lab studies) -High - Elevated - Minimized	 > 18 - 20°C (constant) 14 - 17°C (constant) 12 - 13°C (constant)	Issue Paper 4, pp 12 - 23
Adult Migration	*Lethal Temp. (1 Week Exposure)	21- 22°C (constant)	Issue Paper 5; pp 17, 83 - 87
	*Migration Blockage and Migration Delay	21 - 22°C (average)	Issue Paper 5; pp 9, 10, 72-74. Issue Paper 1; pp 15 - 16
	*Disease Risk (lab studies) - High - Elevated - Minimized	 > 18 - 20°C (constant) 14 - 17°C (constant) 12- 13°C (constant)	 Issue Paper 4; pp 12 - 23
	*Adult Swimming Performance - Reduced - Optimal	 > 20°C (constant) 15 - 19°C (constant)	 Issue Paper 5; pp 8, 9, 13, 65 - 71
	* Overall Reduction in Migration Fitness due to Cumulative Stresses	> 17-18°C (prolonged exposures)	Issue Paper 5; p 74

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Attachment 2. Basis for PCW rule. The excerpt is the entirety of Section V.2 of *EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Standards* (pp. 32-33), which is the guidance that led to the PCW rule. Paragraphs 1, 2 and 4 provide the basis for the guidance, and paragraph 3 is what amounts to the guidance itself. Key statements are numbered and emphasis has been added. The first statement is a principle, the second is a reference to the antidegradation policy, and 3-9 seem like a list of "potential benefits" from following the guidance. Each of these statements is qualified by a word like *likely*, *believes*, *can* or *may*, so it looks like the authors stopped short of considering these statements to be facts, clearly supported by science – and, no citations were provided.

V.2. Provisions to Protect Water Temperatures That Are Currently Colder Than The Numeric Criteria

[1] **One of the important principles in protecting populations at risk for any species is to first protect the existing high quality habitat** and then to restore the degraded habitat that is adjacent to the high quality habitat. Further, [2] **EPA's WQS regulations recognize the importance of protecting waters that are of higher quality than the criteria (in this case, waters that are colder than numeric temperature criteria). See 40 C.F.R. § 131.12.** EPA, therefore, believes it is important to have strong regulatory measures to protect waters with ESA-listed salmonids that are currently colder than EPA's recommended criteria. [3] **These waters likely represent the last remaining strongholds for these fish.**

Because the temperatures of many waters in the Pacific Northwest are currently higher than the summer maximum criteria recommended in this guidance, [4] **the high quality, thermally optimal waters that do exist are likely vital for the survival of ESA-listed salmonids. Additional warming of these waters will likely cause harm by further limiting the availability of thermally optimal waters.** Further, [5] **protection of these cold water segments in the upper part of a river basin likely plays a critical role in maintaining temperatures downstream. Thus, in situations where downstream temperatures currently exceed numeric criteria, upstream temperature increases to waters currently colder than the criteria may further contribute to the non-attainment downstream**, especially where there are insufficient fully functioning river miles to allow the river to return to equilibrium temperatures (Issue Paper 3). [6] **Lastly, natural summertime temperatures in Pacific Northwest waters were spatially diverse, with areas of cold-optimal, warm-optimal, and warmer than optimal water.** The 18°C and 20°C criterion described in Table 3 and the natural background provisions and use attainability pathways described in Section VI are included in this guidance as suggested ways to address those waters that are warmer than optimal for salmonids. **EPA believes it is important**, however, **for States and Tribes to balance the effects of the warmer waters by adopting provisions to protect waters that are at the colder end of their optimal thermal range**.

EPA, therefore, recommends that States and Tribes adopt strong regulatory provisions to protect waterbodies with ESA-listed salmonids that currently have summer maximum temperatures colder than the State's or Tribe's numeric criteria. EPA believes there are several ways a State or Tribe may do this. One approach could be to adopt a narrative temperature criterion (or alternatively include language in its anti-degradation rules) that explicitly prohibits more than a de minimis increase to summer maximum temperatures in waters with ESA-listed salmonids that are currently colder than the summer maximum numeric criteria. Another approach could be to identify and designate waterbodies as ecologically significant for temperature and either establish site-specific numeric criteria equal to the current temperatures or prohibit temperature increases above a de minimis level in these waters. States and Tribes following this latter approach should conduct a broad survey to identify and designate such waters within the state (or tribal lands). For non-summer periods it may be appropriate to set a maximum allowable increase (e.g., 25% of the difference between the current temperature and the criterion) for waters with ESA-listed salmonids where temperatures are currently lower than the criteria.

[7] **Provisions to protect waters currently colder than numeric criteria can also be important to ensure numeric criteria protect salmonid uses.** As discussed in Section V.1.A, the recommended criteria in this guidance are based in part on the assumption that meeting the criteria at the lowest downstream point at which the use is designated will likely result in cooler waters upstream. Cold water protection provisions as described here provide more certainty that this will be true. Further, if a State chooses to protect some or all of the sensitive uses in Table 4 (e.g., spawning) by using only the summer maximum criteria, [8] **it may also be necessary to protect waters currently colder than the summer maximum numeric criteria in order to assure that these sensitive uses are protected**. Further, as described in Section V.1.B, [9] **protecting existing cold water is likely important in river reaches where a 20°C numeric criterion applies to protect salmon and trout migration use**.