

Critical Aquifer Recharge Areas Guidance – March 2021 DRAFT

Review Comments

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Abstract

1. Page xi, 1st paragraph. The opening paragraph should acknowledge that the protection of recharge has benefits that extend far beyond public water supplies. As part of the hydrologic cycle, it also protects environmental services, especially streamflows that support salmon habitat and other ecological functions.
2. Page xi, 3rd paragraph.
 - a. This paragraph should also mention how Indian Treaty Rights and federal laws and regulations relate to the guidance.
 - b. This paragraph should specifically note the connection of this guidance to other elements of Critical Areas management, especially protection of salmon habitat.
3. Page xi, 4th paragraph. This paragraph should note that an additional motivation or purpose of the guidance is to better integrate the guidance with overarching goals for environmental protection and restoration.
4. The points above related to the Abstract apply, and should be integrated, into the Guidance as a whole.

Section 1 – Introduction

5. Page 2, “In addition, public drinking water supply depends on groundwater availability.” Expand on this point to include the benefits of replenishment for ecological functions such as stream base flow support, cold water refuges, and other salmon habitat needs.
6. Page 2, 2nd bullet near the end, “Identifying threats to groundwater” Expand this bullet to note threats to both the quantity and quality of groundwater recharge.
7. Page 3, last paragraph. Expand the discussion in this paragraph to mention specifically the connection between groundwater recharge and salmon habitat.
8. Page 4, 1st paragraph. Expand this paragraph to note the specific ways that recharge has been integrated with other environmental components. Also mention that further study could be beneficial to identify the best approaches to integrating critical areas.
9. Page 4, definition beginning “Aquifer Recharge...” Revise to add language: “...adds to the underground water that can supply a well, *and supports springs and stream base flows that provide salmon habitat.*”
10. Page 5, “Maps” Also note that maps can show overlap or proximity to critical areas for salmon habitat and in general to streams with salmon habitat that may be affected by recharge or discharge.
11. Page 8, “Groundwater and Other Critical Areas” This a useful and important section. Provide more discussion on how to address how CARAs can integrate with protecting salmons habitat. In particular discuss the tension between protecting quality and quantity, for example, how a project can protect water quality without reducing recharge volumes. Or how the loss of recharge from protective measures, like paving a storage area, can be mitigated to ensure no loss of recharge.
12. Page 8, last paragraph Include “biological assessment” in the list of “...activities...done by others...”

Section 2 – Basic Groundwater Concepts

13. Page 10, Figure 1 Add “recharge” to the figure. Add an arrow showing groundwater entering surface fresh waters.
14. Page 10, final paragraph Make these definitions more general, such as “...permeable enough *for water to flow vertically or horizontally and to yield...*” and “not permeable enough *flow to surface waters or to yield...*”

15. Page 11, paragraph beginning “A confined aquifer...” Add language that confined aquifers can also create springs or upwelling in surface waters.
16. Page 11, paragraph beginning “A water-table aquifer...” Add language that this aquifer is the first level to receive recharge from the surface, and most likely to flow towards surface water.
17. Page 11, “Recharge...” Thank you for this sentence: “Therefore, recharge is at the center of preventing pollution and maintaining supply both for drinking water aquifers and for freshwater habitats.” This is the kind of holistic approach that should be reflected throughout the Guidance.
18. Pages 12-13, “The Water Table” Thank you for this detailed discussion.
19. Pages 13-15, “Hydrogeologic Setting...”
 - a. The opening of this section could be clearer with a bulleted list of each step of the contamination process: 1) stuff gets on the ground; 2) stuff gets into the unsaturated soil, from the ground or directly from a leak or drain pipes; 3) stuff gets in the aquifer, either from percolation from the unsaturated soil or directly from a leak or drain pipes; 4) stuff in the aquifer moves with the groundwater to a well or surface water. This clear beginning helps to set the stage for both assessing vulnerability and developing prevention or remediation.
 - b. The rest of the section can follow this structure. Currently the section jumps straight to ground water flow without stepping through the other elements of the transport process.
20. Page 14, The paragraph beginning “The hydrogeologic setting...” This is an example of the previous comment. It jumps to groundwater flow without mentioning surface conditions, soils layers, saturation state, and other factors that affect recharge prior to groundwater flow in the aquifer. Since the guidance is about recharge, emphasizing this part of hydrogeology seems appropriate. Something along the line of “once it’s in the groundwater, it can flow to the well, but recharge is the process where it gets into the groundwater in the first place. It’s more effective to stop contamination for entering recharge than to clean up groundwater once contaminated.”
21. Page 15, “Susceptibility...” This is related both to geology, to surface vegetation and soil conditions, and to the human land use that may have modified surface or subsurface conditions.
22. Page 15, “Susceptibility factors” An additional factor that might deserve a new first bullet is the conditions at the soil surface – vegetation, compaction or paving, surface permeability, etc.
23. Page 16, “Seawater Intrusion” A paragraph should be added discussing how recharge can increase the gradient between freshwater and saltwater and reduce intrusion. Conversely, a loss of recharge can add to intrusion by reducing the gradient holding back seawater.
24. Page 17, “Groundwater monitoring” This section should be renamed “groundwater studies and analysis” and be expanded to discuss other hydrogeological tools, such as assessment of seepage, development of water budgets, and groundwater modeling.

Section 3 - Streamflow, Water Availability, and Permit-Exempt Wells

25. Page 18, 2nd paragraph Add some information about where plans were developed, their status at the time that this guidance was developed, the process for Ecology approval, and some information for the future user of the guidance about where to obtain the planning information.
26. Page 18, 3rd paragraph This sentence is a bit too optimistic. Suggest: “Information developed during streamflow restoration planning efforts which may be useful to delineate Critical Aquifer Recharge Areas includes:”
27. Page 18, bullet list Thank you for pointing to these important sources of information.

Section 4 - Protecting the Functions and Values of Critical Aquifer Recharge Areas

28. Page 19, “The functions and values...” Also note that management of recharge through CARAs can support management of other critical areas, such as salmon habitat.
29. Page 19, “Preventing pollution...” Also mention the importance of pollution prevention as a way to protect the quantity of recharge as well as the quality. A very clear statement should be made that preventing pollution from contaminating recharge is the first priority, and preferred to management practices and treatment methods that reduce recharge quantities.

30. Page 19, 2nd bullet under No. 8 Thank you for including this important goal.
31. Page 20, 1st paragraph Revise to say: "Identifying the location and extent of critical aquifers that provide drinking water supply and support instream flows is an essential step in protecting the functions and values of Critical Aquifer Recharge Areas."
32. Page 20, 2nd paragraph Say "groundwater resources" instead of "groundwater supply"
33. Page 20, 3rd paragraph Say "critical aquifers;" not "drinking water aquifers" (this comment applies globally in the text that follows as well)
34. Page 20 et seq, "Aquifer Maps" section Add language to call for mapping salmon streams in the aquifer area that may be affected by recharge to the underlying aquifers.
35. Page 24, Figure 5 Add to the example map the salmon-bearing streams. SalmonScape is an "off-the-shelf" resource for this. Add "salmon-bearing streams" to the bulleted list
36. Page 25 et seq, "Some of the Methods Hydrogeologists Use..." Add a description of seepage studies and the use of shallow piezometers as tools to assess recharge, discharge and develop water budgets for use in modeling.
37. Page 32, "Resources" Add to this list: focused ground water studies conducted by USGS, Ecology, and universities.
38. Page 36, "Publications" Mention that many basins have had detailed hydrogeological studies done under watershed planning, especially 90.82 plans.
39. Page 39, "Categories based on set priorities and risk" Add a bullet for connectivity of the aquifer to salmon-bearing streams.
40. Page 40, "Step 6..." This is another section where some emphasis should be expressed about the need to prevent contaminants from entering recharge while maintaining the volumes or recharge.
41. Page 43, "The goals..." Thank you for the emphasis placed on stream flow here. Third bullet should be revised for parallel construction: "Support the GMA goals for water availability through initiatives under watershed planning, streamflow restoration, aquifer storage and recovery, and stormwater."
42. Page 43-44, "Recharge" Thank you for this discussion. This is another location to mention the challenges of increasing recharge while reducing contamination.
43. Page 44-45, "Streamflow Restoration" More information should be provided explaining the draft plans that were developed, that Ecology must adopt final plans, and that there are large amounts of background information from planning that could be explored. Some discussion should also be added about how implementation of the plans that Ecology adopts should be integrated with management of Critical Areas.
44. Page 45, "Watershed Planning" Mention that the planning archives include detailed technical studies that often have useful information on groundwater and watershed hydrology.
45. Page 45, "Water System Planning" Coordinated Water System Plans should also be described and discussed.

Section 5 - Best Available Science

46. Page 47, 8th bullet The term "special consideration" needs to be explained. In addition, add more information: "The locations of salmon-bearing streams and how base flows in those streams depend on groundwater."
47. Page 48, 4th paragraph Add that the precautionary approach should also be applied to protecting and restoring groundwater recharge and protecting the stream baseflows needed for salmon habitat.
48. Page 48, "The objective of best available science..." This section should discuss the need to use best available science to support the functions and values of all kinds of critical areas, and integrate CARAs with management of other critical areas, especially salmon habitat.
49. Page 50, "Best available science for special consideration of anadromous fish species" Explain very clearly the importance of recharge to maintaining the baseflow of salmon-bearing streams.
50. Page 51 et seq, "Sources for Best Available Science for Critical Aquifer Recharge Areas" Add a section discussing the sources of information on the use of streams by salmon and their lifecycle needs for baseflows.

Section 6 - Working with State and Federal Laws and Rules

51. Page 55, “Local jurisdictions need to grant...” A sentence should be added to the effect that local jurisdictions should grant themselves the authority or protect and restore the quality and quantity of recharge.
52. Page 61, “Water Resources” This section should explain the other water resources laws and rules related to water management, including the WRIA instream flow rules and the laws and rules governing the issuance and adjudication of water rights.
53. Some discussion should be include in this section encouraging local governments to establish “no net loss of recharge” in their policies and ordinances.

Section 8 - Adaptive Management – Change Happens

54. Some discussion should be added about adapting to emerging information about salmon biology and habitat needs.

Section 9 - Critical Aquifer Recharge Area Reports

55. Thank you for the inclusion of fishery information in this section.
56. Add a bullet for summer baseflow conditions for streams supported by critical aquifers.

Section 10 – Interjurisdictional Coordination

57. Include a discussion of intergovernmental consultation with Treaty Tribes.

Section 11 – Implementation – Authority, Monitoring, and Program Integration

58. Expand the discussion of monitoring to include collaboration in groundwater modeling and special hydrogeological studies and research.