

An aerial photograph of a river valley. A dirt road runs along the right side of the river. The valley floor is lush with green vegetation, while the surrounding hills are rocky and sparsely forested. In the background, a large mountain peak rises under a clear blue sky.

Roads-Stream Connectivity: Scoping Proposal

Independent Research and Science Team
Institute for Natural Resources – Oregon State University

PLACEHOLDER IMAGE

Scoping Proposal

Submitted to
The Adaptive Management Program Committee
1 March 2025

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Authors

The Independent Research and Science Team

Prepared by

The Institute for Natural Resources

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Recommended Citation

Independent Research and Science Team. 2024. *Roads-Stream Connectivity: Scoping Proposal*. Institute for Natural Resources. Oregon State University. Corvallis, Oregon.

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Disclaimer

This scoping proposal is submitted to the Adaptive Management Program Committee as a requirement of the Oregon Department of Forestry Adaptive Management Program rules ([Chapter 629, Division 603](#)).

The contents of this report reflect the views of the Independent Research and Science Team (IRST), which is solely responsible for the facts and accuracy of the material presented. This scoping proposal does not constitute a standard, specification, or regulation.

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Abbreviations and Acronyms

AMPC	Adaptive Management Program Committee
INR	Institute for Natural Resources
IRST	Independent Research and Science Team
OSU	Oregon State University

Executive Summary

The Independent Research and Science Team (IRST) was established to support the work of the Oregon Department of Forestry Adaptive Management Program Committee (AMPC) by responding to AMPC-developed research questions packages. The AMPC submitted final research questions pertaining to roads and stream connectivity:

1. Introduction

1.1 Background and Project Purpose

The Independent Research and Science Team (IRST) was established via [Senate Bill 1501](#) as part of the Oregon Department of Forestry's [Adaptive Management Program](#). The IRST supports the work of the Adaptive Management Program Committee (AMPC) by responding to AMPC-developed research questions packages. Per rule, and in consultation with the AMPC, the IRST refines preliminary research questions into final research questions, then develops scoping proposal(s) to address those questions. The scoping proposal(s) need(s) to include:

- A literature review that specifies the need for, or the type of, monitoring, research, commissioned studies, or other means of scientific inquiry necessary to answer the finalized research questions mentioned above;
- A preliminary estimate of the budget for each year of the research, and a timeline to complete the research project with specific deliverables; and,
- A preliminary description of research project requirements, scope of work including an estimate of the timeline and key milestones, and an estimate of the degree to which knowledge may be improved if the research proposal is implemented.

As per [OAR 629-603-0200](#), the IRST develops requests for proposals (RFP) for competitive bid after the AMPC and Board of Forestry approve an AMPC research agenda that is based on IRST scoping proposal(s).

1.2 Research Questions

The AMPC submitted research questions package (Appendix A) pertains to

1.3 Organization of report

This report

2. Literature Review

2.1 Introduction

The roads-stream connectivity scoping review conducted by the Institute for Natural Resources (INR) provides an initial indication of the potential size and nature of the extant literature to examine the extent, range, and nature of research activities; and,

The review is intended to serve, not as a comprehensive literature review, but rather to support the development of a research proposal package that will inform the AMPC and Board of Forestry decisions about soliciting further research via requests for proposals.

2.2 Types of Literature Reviews

2.2 Methods

2.3 Findings

General characterization of the publications

- Descriptive statistics of results by sources.
- How is hydrologic connectivity defined?
- How is hydrologic connectivity measured?
- Which landowner types are covered in each study and were there differences in methods or results?
- Which studies included dry vs wet (Oregon East/West) environments? How do methods/results differ?
- What other explanatory factors (road surface type, geology, soils) were included in other studies, how were they measured, and how did they affect hydrologic connectivity?
- What elements included in the Oregon regulatory framework (e.g. undersized culverts, road location) are included in the literature, how were they measured, and how did they affect hydrologic connectivity?
- Which studies included trend monitoring and how did they structure it? What variables were included?
- What biological goals and objectives were included in the studies?
- Which studies demonstrated effectiveness monitoring by comparing road status to biological goals? How were these measured?

Characterizing the publications in relation to the AMPC questions

Baseline report

Question 1. What is the baseline status of hydrologic connectivity of roads prior to the implementation of the OFPA road rules effective Jan 1, 2024?

Question 2. How does the status of hydrologic connectivity differ based on landowner type and East/West region?

Question 3. How do particular elements of the regulatory framework (e.g. road location) or site characteristics (e.g. geology) contribute to hydrologic connectivity?

Trend monitoring

Question 4. What are the trends in the status of hydrologic connectivity of roads over 5-year intervals? These trends should be assessed for the same variables in question 1.

Determination of rule effectiveness

Question 5. Within 25 years, to what extent are road rules associated with hydrologic disconnection effective at achieving biological goals and objectives?

2.4 Summary

3. Scoping Proposal(s)

3.1 Introduction

Based on the results of the INR scoping review, three options are presented to address the AMPC research

3.2 Scoping Proposal 1:

Scope of work

[INSERT FIGURE]

Figure X. Timeline and key milestones

Knowledge contribution

Budget

3.3 Scoping Proposal 2:

Scope of work

[INSERT FIGURE]

Figure X. Timeline and key milestones

Knowledge contribution

Budget

4. Conclusions

5. References

6. Appendices

Appendix A. AMPC Research Questions Package

Appendix B. Types of Literature Reviews

Appendix C. Literature Search Strategy

Appendix D. Literature Review Examples

Appendix E. Abstracts or Summary of Relevant Publications

Appendix A. The AMPC Research Questions Package

Finalized Research questions

These finalized research questions were approved by the AMPC at the June 24th, 2024 AMPC meeting.

1. Baseline report
 - a. What is the baseline status of hydrologic connectivity of roads prior to the implementation of the OFPA road rules effective Jan 1, 2024?
 - b. How does the status of hydrologic connectivity differ based on landowner type and East/West region?
 - c. How do particular elements of the regulatory framework (e.g. road location) or site characteristics (e.g. geology) contribute to hydrologic connectivity?
2. Trend monitoring
 - a. What are the trends in the status of hydrologic connectivity of roads over 5-year intervals? These trends should be assessed for the same variables in question 1.
3. Determination of rule effectiveness
 - a. Within 25 years, to what extent are road rules associated with hydrologic disconnection effective at achieving biological goals and objectives?

Preliminary Research Questions Package: Contextual Information

The remainder of this document provides contextual information that details the context for the preliminary research questions, as required by rule¹. The following are organized per the elements in this rule.

B.1 The type of research²

This research is of type OAR 629-603-0100(1)(a): *“Conduct effectiveness monitoring by assessing the degree to which the rules facilitating particular forest conditions and ecological processes achieve the biological goals and objectives. This assessment may include evaluation of cumulative effects.”*

B.2 The rule, biological goals and objectives (BGOs), or other issue being studied³

Note that the most recent version of the BGOs is in the Dec. 2022 draft HCP. The BGOs will be finalized within the HCP due Dec. 31, 2027. The BGOs are listed below with those applicable to these questions in bold italic:

*“**Overarching Goal:** Forest practices that support the survival and recovery of the covered species by providing clean, cool, connected, and complex habitats.*

***Goal 1:** Provide clean water and substrate for the covered species.*

- ***Objective 1.1 - Forest practices near streams minimize sediment delivery.***
- ***Objective 1.2 – Slope Retention Areas reduce episodic sediment delivery to fish-bearing streams.***
- ***Objective 1.3 – Road runoff directly to streams is minimized.***

¹ OAR 629-603-0200 (3)(a)

² OAR 629-603-0200(3)(a)(A)

³ OAR 629-603-0200(3)(a)(B)

- *Objective 1.4 – Roads are not a significant source of episodic sediment delivery to streams.*

Goal 2: *Shade and watershed processes controlling stream temperature provide cool water compatible with the needs of the covered species.*

- *Objective 2.1 – Forest practices maintain stream shade sufficient to support desired cool water temperatures on fish-bearing streams.*
- *Objective 2.2 – No-harvest RMAs maintain stream shade sufficient to support desired cool water temperatures for covered amphibians.*
- *Objective 2.3 – Forest practices near non-fish-bearing perennial streams do not notably increase water temperatures in fish-bearing streams.*

Goal 3: *Stream network connectivity satisfies freshwater habitat needs for covered species.*

- *Objective 3.1 – Road crossings on fish-bearing streams are passable by the covered fish species.*
- *Objective 3.2 – Forest practices maintain the hydrologic continuity of stream-associated wetlands and stream-adjacent seeps and springs to stream habitats.*
- *Objective 3.3 – Timber harvest maintains stream-associated connectivity in riparian areas along non-fish streams sufficient to support covered amphibians.*

Goal 4: *Riparian areas function to support complex habitats for the covered species.*

- *Objective 4.1 – Mature, complex riparian forests are fostered in no-harvest zones of RMAs.*
- *Objective 4.2 – Forest practices within tree retention areas of RMAs promote delivery of large wood.*
- *Objective 4.3 – Designated Debris Flow Traversal Areas function to deliver large wood to fish-bearing streams.*
- *Objective 4.4 – Forest practices maintain stream-associated wetlands and stream-adjacent seep and spring habitat for amphibians.”*

B.3 The objective of the research⁴

1. To assess the current (baseline) status and trend of roads that are hydrologically connected to streams, and how those vary with practice, region, landowner type, and other relevant strata.
2. Determine the effectiveness of road rules associated with hydrologic disconnection at achieving biological goals and objectives.

B.4 A brief description of the context of the research question⁵

The following direction was provided in the PFA Report and provides the foundation for these research questions:

⁴ OAR 629-603-0200(3)(a)(C)

⁵ OAR 629-603-0200(3)(a)(D)

“4.3.5 Hydrologic Connectivity in Forest Practice Rules (FPR) Revisions and Proposed Inventory Processes

Hydrologic connectivity occurs where road and ditch runoff is delivered to the natural stream channel system. Roads can generate overland flow due to the relatively impermeable surface of the road prism and can also intercept interflow at cutslopes, effectively converting subsurface flows to surface flows. When these surface flows have a continuous flow path between the road prism and a natural stream channel, hydrologic connectivity occurs (Furniss et al., 2000, pp. 5-6). As Furniss et al. describe, “a hydrologically connected road becomes part of the stream network” (pp. 5-6).

Hydrologically connected roads can deliver increased runoff, sediment, and chemicals associated with roads, such as spills or oils generated on the road surface or cutslope. At the watershed scale, connections between roads and streams can also alter the drainage density of the watershed and change runoff frequency and magnitude (See Furniss et al., 2000; Weaver et al., 2015).

The Authors agree that the goal of disconnecting roads and streams is to minimize sediment delivery, hydrologic change, and risk of road pollutants entering waters of the state.”

4.3.10 Development of Monitoring Requirements

The Independent Research Science Team (IRST) created under the PFA shall design and oversee baseline and trend monitoring for hydrologic disconnection. Compliance monitoring will be conducted through the Department’s process.

- 1. Baseline and Trend Monitoring for Hydrologic Disconnection:*** *The methodology for the monitoring shall be based off of Dube et al. (2010) and Martin (2009). The purpose of the monitoring for hydrologic disconnection is to establish a baseline and to monitor and report the change in hydrologic connectivity over time as the FRIA is implemented. The overarching goal is to ensure that all forest roads and landings shall be hydrologically disconnected to the maximum extent feasible from waters of the state. The Adaptive Management Program Committee shall use the results of the baseline and trend monitoring to develop regional goals consistent with that monitoring. All hydrologic connectivity data should be public and shared as it becomes available to help focus goals, identify accomplishments, and inform statewide learning.”*

B.5 Other information the AMPC deems necessary for the IRST’s work⁶

1. It is essential to maintain the role of the regulatory framework (the OFPA) throughout the design and implementation of studies, including the following considerations:
 - a. There are two stratum classifications:
 - A. FPA regions, of which there are two - East and West of the Cascade Mountains.

⁶ OAR 629-603-0200(3)(a)(E)

- B. Landowner classifications in the FPA (of which there are two, each with a different regulatory framework for roads) – 1) small forestland owners (RCA); 2) large forestland owners (FRIA).
 - b. Assessments should differentiate Type F, SSBT, and N streams, but the design need not be stratified by stream type. Additional attributes listed in Dube et al. (2010) should also be considered.
- 2. The AMPC wants to know how metrics of interest (e.g., sediment delivery from roads) compares with background levels.
- 3. Ideally, the baseline would be for the effective date for the road rules (Jan. 1, 2024); however, the AMPC recognizes that it will take time to refine and scope the research questions, decide on the research agenda, develop and then award the RFP.
- 4. Research should include field data.
- 5. When assessing effectiveness of rules, it would be helpful to understand results both individually and cumulatively.
- 6. This entire research question package would be very complex, long, and expensive to implement as a single research project. Thus, the AMPC would appreciate the IRST dividing up this research question package into discrete projects and developing scoping proposals (per OAR 629-603-0200(4)) for each one.

Appendix B.

Appendix C.

Appendix D. Literature Search Strategy

Appendix E. Abstracts or Summaries of Relevant Publications

Reference	Location	Topic	Topic	Topic	Topic	Topic	Topic

Reference

Abstract or Summary

Reference	Location	Topic	Topic	Topic	Topic	Topic	Topic

Reference

Abstract or Summary