

**Effectiveness Monitoring Committee -
Completed Research Assessment for EMC-2017-001: Effects of Forest Stand Density
Reduction on Nutrient Cycling and Nutrient Transport at the Caspar Creek
Experimental Watersheds**

EMC Members:

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1. Does study fulfill and address scientific question(s) posed in proposed research?

Yes/No. The study was able to achieve the majority of objectives addressed in the original scope of work. However, some objectives (i.e., Objective 3) will not be achieved until a synthesis of the Third Caspar Creek experiment is implemented.

The original objectives of the study include:

1. Determining the changes in stream water and soil water solute concentrations and nutrient fluxes during storm flow and baseflow conditions prior- and post-harvest in the South Fork Caspar Creek watershed. [note that pre-logging water samples are currently being analyzed]
2. Compare nutrient export between harvested and reference watersheds.
3. Examine the linkage between nutrient flux and biotic response (using macroinvertebrate data collected as part of the bioassessment study in place).

A. Does the study inform a rule, numeric target, performance target, or resource objective?

Yes. The study informs the following rules, numeric targets, performance targets, or resource objectives:

- **896** General;
- **898** Feasibility Alternatives;
- **898.2 (h)** Special Conditions Requiring Disapproval of Plans;
- **912.9, 932.9, 952.9** Cumulative Impacts Assessment Checklist;
- **916, 936, 956** Intent of Watercourse and Lake Protection;
- **923, 943, 963** Intent for Logging Roads, Landing, and Watercourse Crossings;
- **1090.14** NTMP Deviations;
- **1091.6** Watershed Assessment and Planning;

- **1092.26** Amendment;
- **1093.1** Guidelines for Orderly Evaluation of Activities Proposed by RMP;
- **1093.2** Contents of Road Management Plan;
- **4514.3** Exemption from waste discharge requirements; conditions;
- **4582.71** Findings by a regional water quality control board under which a timber harvesting plan may not be approved; discharge into a impaired Watercourse; delegation of board authority; notice of finding; role of director.
- **Article 9.5 Timber Regulation and Forest Restoration Fund, 4329** Legislative findings and declarations;
- **4629.2** Legislative intent; purpose of article;

B. Does the study inform the Forest Practice Rules?

ii) **Yes.** Many of the rules listed above require that activities meet “Water Quality Requirements.” Under the FPRs, Water Quality Requirements are defined as:

A water quality objective (narrative or numeric), prohibition, TMDL implementation plan, policy, or other requirement contained in a water quality control plan adopted by the Regional Board and approved by the State Water Board.

In this study, the water quality requirements measured include:

	North Coast RWQCB	NPDES Drinking Water Systems	SWRCB (Drinking Water)
Turbidity	Turbidity shall not be increased more than 20% above natural occurring background levels (NCRWQCB, 2018).	Corresponds with the Regional Water Board basin plan water quality objectives for turbidity (SWRCB, 2014).	N/A
pH	pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 units within the range specified above in fresh waters with designated COLD or WARM beneficial uses (NCRWQCB, 2018).	Corresponds with the Regional Water Board basin plan water quality objectives for pH (SWRCB, 2014).	N/A
EC	Should not be exceeded, either the 90% upper limit or the 50% upper limit. The 50% upper limit ranges in value from 100 to 1300 µmhos/cm, depending on the water body (SWRCB, 2004).	N/A	Typical ranges in freshwater streams from 100-2000 µmhos/cm (SWRCB, 2004).
Total N	Only mentions concentrations in terms of groundwater not exceeding total nitrogen concentration of 40 mg/L or	N/A	Current MCLs for nitrate in drinking water is 10 mg/L (as Nitrite as N) &

nitrate concentration of 10 mg/L (NCRWQCB, 2018).	45 mg/L (for nitrate as NO ₃) (SWRCB, 2024).
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2. Is the study scientifically sound?

A. Was the study carried out pursuant to valid scientific protocols (i.e., study design, peer review)?

Yes. The study utilized a BACI paired watershed approach (Dymond et al., 2021). A limitation of the study was the short duration of before and after treatment measurements used to compare treatment effects.

3. Is the study scalable?

A. What does the study tell us? What does the study not tell us? Do findings apply to other areas of the state?

The study was performed in the coastal redwood belt, so findings are best applied to similar ecotypes with comparable geology and precipitation regimes. Watersheds ranged from 32 to 1030 acres in size, with smaller watersheds (32-64 acres) nested within the larger South Fork Caspar Creek watershed (1030 acres). The short duration of the study, along with the extreme variability in precipitation before and after treatment, likely results in poor statistical power to detect change (to be determined).

Table 2. Pre- and post-treatment periods identified for the five sample locations.

Period	SFC	WIL	TRE	UQL	ZIE
Pre-Harvest	5/1/16 - 3/31/18	5/1/16 - 3/31/18	5/1/16 - 7/31/18	5/1/16 - 5/30/18	5/1/16 - 3/31/18
Post-Harvest	4/1/18 - 6/30/20	4/1/18 - 6/30/20	8/1/18 - 6/30/20	6/1/18 - 6/30/20	4/1/18 - 6/30/20

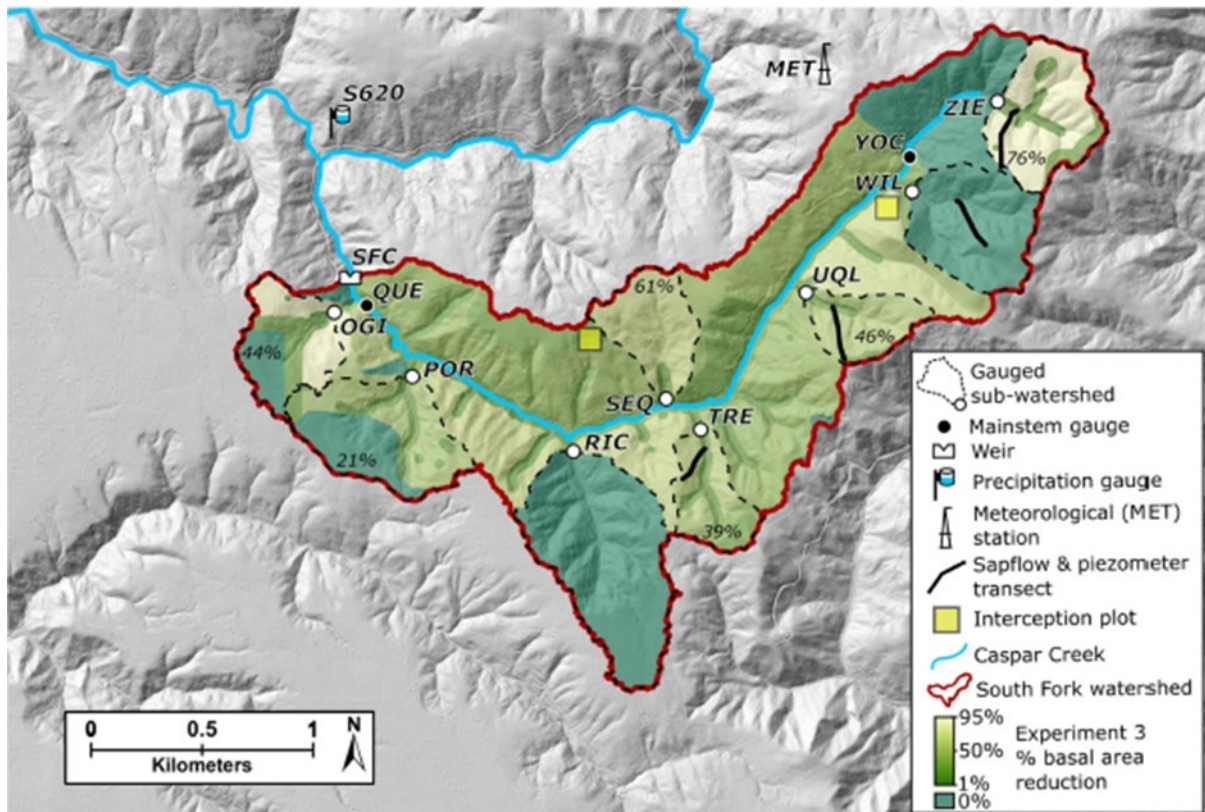


Figure 1. Shaded relief map of the South Fork watershed showing study locations and harvest intensity. Nutrient sampling was performed in SFC, WIL, TRE, UQL, and ZIE.

4. More Research Needed?

A. **Literature Review Sufficient?** – Yes, the literature review in the final report is adequate.

B. **Further Funding Needed?** - Dr. Dahlke has stated that additional funding is needed to provide continued sampling following harvest and to turn the final report into a publishable manuscript.

C. **What is the relationship between this study and any others that may be planned, underway, or recently completed?**

- i. **Feasibility of obtaining more information to better inform policy about resource efforts –**
- ii. **Are other relevant studies planned, underway, or recently completed? (If yes, what are they?)**
- iii. **What are the costs associated with additional studies?**
- iv. **What will additional studies help us learn?**
- v. **When will these additional studies be completed (i.e., when will we learn the information)?**
- vi. **Will additional information from these other studies reduce uncertainty?**
- Yes.

5. **Scientific Applications - What is the scientific basis that underlies the rule, numeric target, performance target, or resource objective that the study**

informs? How much of an incremental gain in understanding do the study results represent?

References:

Dymond, S. F., Richardson, P. W., Webb, L. A., Keppeler, E. T., Arismendi, I., Bladon, K. D., ... & Wagenbrenner, J. W. (2021). A field-based experiment on the influence of stand density reduction on watershed processes at the Caspar creek experimental watersheds in northern California. *Frontiers in Forests and Global Change*, 4, 691732.