

**2021 EFFECTIVENESS
MONITORING COMMITTEE
ANNUAL REPORT AND
WORKPLAN**



**STATE BOARD OF FORESTRY AND FIRE
PROTECTION**

January 10, 2022

1 **EXECUTIVE SUMMARY**

2 The Effectiveness Monitoring Committee (EMC) Annual Report and Workplan (Report) is a living document
3 which is updated and approved by the Board of Forestry and Fire Protection (Board) annually and is
4 intended to catalogue the yearly accomplishments and status of ongoing EMC efforts. The Report
5 summarizes EMC accomplishments, details EMC funding actions for the year, and provides an update of
6 current EMC membership and staffing. For fiscal year (FY) 2021/2022, the EMC selected two proposed
7 effectiveness monitoring projects to fund and support. Ongoing projects from prior years continued to be
8 funded.

9 **EMC PROCESS SUMMARY**

10 The EMC was formed to develop and implement an effectiveness monitoring program to address both
11 watershed and wildlife concerns, and to provide an active feedback loop to policymakers, managers,
12 agencies, and the public to better assist in decision-making and adaptive management. As an advisory body
13 to the Board, the EMC helps implement an effectiveness monitoring program by soliciting robust scientific
14 research that addresses the effectiveness of these laws at meeting resource objectives and ecological
15 performance measures related to AB 1492.¹

16 Three formal documents guide the activities and goals of the EMC: (1) the EMC Charter,² (2) the EMC
17 Strategic Plan,³ which is updated approximately every three years, and (3) the EMC Annual Report and
18 Work Plan⁴ (i.e., this report), which is updated every calendar year. The longer, more static Strategic Plan
19 and the shorter, more fluid Annual Report and Work Plan, is a linked process developed in response to
20 Board member requests. The EMC reports on its activities in a variety of ways. The EMC Strategic Plan road
21 map lays out how the Committee intends to achieve the EMC goals and objectives. This Annual Report and
22 Workplan tracks progress on individual projects, documents the Committee's ranking and selection of
23 proposed monitoring projects, and details other annual accomplishments and ongoing EMC efforts. The
24 EMC conducts open meetings a minimum of four times per year (quarterly) to conduct EMC business,
25 during which progress reports, final reports, or other presentations on EMC-funded projects or other
26 related research may be provided. The EMC Co-Chair or Board staff also report on the EMC's activities via
27 verbal updates at Board meetings throughout the year.

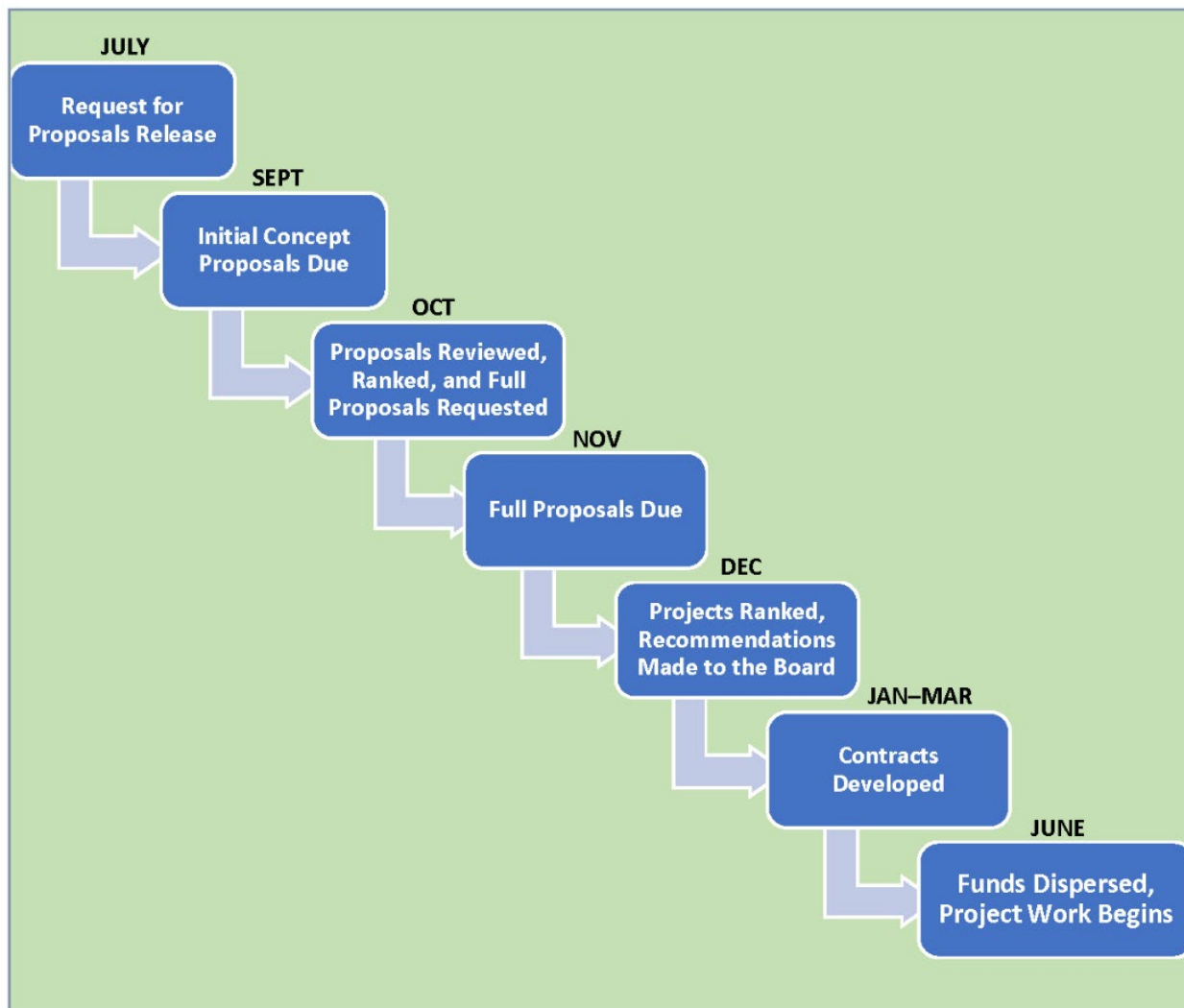
28 EMC projects are solicited through an annual Request for Proposals (RFP) which is released following the
29 start of the new fiscal year (FY) (see Figure 1). The RFP, ranking, and selection process are detailed in the
30 Strategic Plan.

¹ AB-1492 Forest resource management (2011-2012), Health & Safety Code 13009.2; see
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB1492

² https://bof.fire.ca.gov/media/10115/effectiveness-monitoring-committee-charter-7120_ada.pdf

³ <https://bof.fire.ca.gov/media/9122/2018-emc-strategic-plan-ada.pdf>

⁴ <https://bof.fire.ca.gov/media/gjinn1q0/2020-emc-annual-report-and-workplan.pdf>



31
32 **Figure 1. EMC Project Submission Timeline (approximate)**

33 **EMC FUNDING**

34 For FY 2021/22, the EMC has been allocated ongoing funding of \$425,000 from the Timber Regulation and
 35 Forest Restoration Fund (TRFRF),⁵ established by AB 1492 (2012), of which \$154,472 was allotted to support
 36 ongoing, previously awarded projects and \$270,528 remains for projects to be funded starting in FY
 37 2021/22. The EMC anticipates an allocation of \$425,000 in FY 2022/23 and 2023/24 as well. This funding is
 38 allocated to projects through the Board/CAL FIRE contracting process.

⁵ http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB1492.

39 **Table 1. Ongoing EMC Projects with Continued Funding and/or Activity (2021/2022)**

Project #	Title	Primary Investigator(s)	Funding Status
EMC-2015-001	Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal influence of headwater streams into fish bearing systems	Kevin Bladon & Catalina Segura	Fully allocated
EMC-2016-002	Post-fire Effectiveness of the Forest Practice Rules in Protecting Water Quality on Boggs Mountain Demonstration State Forest	Joe Wagenbrenner, Kevin Bladon, Drew Coe, & Don Lindsay	Not applicable*
EMC-2016-003	Road Rules Effectiveness at Reducing Mass Wasting (Repeat LiDAR Surveys to Detect Landslides)	Bill Short & Matt O'Connor	Fully allocated
EMC-2017-001	Effects of Forest Stand Density Reduction on Nutrient Cycling and Nutrient Transport at the Caspar Creek Experimental Watershed	Helen Dahlke & Randy Dahlgren	Fully allocated
EMC-2017-002	Boggs Mountain Demonstration State Forest (BMDSF) Post-Fire Automated Bird Recorders Study	Stacy Stanish	Fully allocated
EMC-2017-006	Tradeoffs among Riparian Buffer Zones, Fire Hazard, and Species Composition in the Sierra Nevada	Rob York	Allocated
EMC-2017-007	The Life Cycle of Dead Trees and Implications for Management	John Battles	Fully allocated
EMC-2017-008	Do Forest Practice Rules Minimize Fir Mortality from Root Disease and Bark Beetle Interactions	Richard Cobb	Fully allocated
EMC-2018-003	Alternative Meadow Restoration	Christopher Surfleet	\$23,230.85
EMC-2018-006	Effect of Forest Practice Rules on Restoring Canopy Closure, Water Temperature, & Primary Productivity	Kevin Bladon, Catalina Segura, Matthew House, & Drew Coe	\$97,207.81
EMC-2019-002	Evaluating Treatment Longevity and Maintenance Needs for Fuel Reduction Projects Implemented in the Wildland Urban Interface of Plumas County	Brad Graevs & Jason Moghaddas	\$4,386.74
EMC-2019-003	Fuel Treatments & Hydrologic Implications in the Sierra Nevada	Terri Hogue & Alicia Kinoshita	\$97,637.64

Project #	Title	Primary Investigator(s)	Funding Status
EMC-2019-005	Sediment Monitoring and Fish Habitat – San Vicente Accelerated Wood Recruitment	Cheryl Hayhurst	\$56,200.00

40 *EMC-supported, but not EMC-funded

41 **EMC ACCOMPLISHMENTS**

42 In 2021, the EMC accomplished the following:

- 43 • The EMC met five times virtually in open, webcast meetings to conduct business. The January
44 meeting was delayed from December 2020.
- 45 • The EMC implemented a new communication system that was established in 2020, in which
46 individual committee members were assigned as project liaisons to provide check-ins with EMC-
47 funded Principal Investigators to ensure project progress and deliverables are on track for BOF
48 acceptance. Project liaisons provided project updates, as appropriate, at regularly scheduled EMC
49 meetings, and worked with Board staff to facilitate communications and plan receipt of deliverables
50 to the EMC.
- 51 • Research priorities were selected from the established Priority Themes and Critical Monitoring
52 Questions described in the Strategic Plan via anonymous vote of all EMC voting members. The top
53 five critical monitoring questions were prioritized for funding in the 2021/22 FY, although not to the
54 exclusion of projects focusing on the remaining critical monitoring questions.
- 55 • The EMC finalized a new framework for processing completed EMC-funded projects to better
56 facilitate EMC reporting to the Board. This “Completed Research Assessment” (previously known as
57 “Science to Policy Framework”) provides a step-by-step approach to guide EMC members in
58 verifying scientific integrity and validity of the research, and interprets the results of the scientific
59 research as to the implications for management and policy. Two EMC members work with the
60 Principal Investigator(s) of each project to complete the required form, which is then presented to
61 the EMC and amended as necessary prior to presentation to the Board. This provides an easily
62 understood narrative and synthesis for Board members to give context to study results.
- 63 • A Completed Research Assessment was prepared for project EMC-2015-001: Effectiveness of
64 Class II Watercourse and Lake Protection Zone (WLPZ) Forest Practice Rules (FPRs) and Aquatic
65 Habitat Conservation Plan (AHCP) Riparian Prescriptions at Maintaining or Restoring Canopy
66 Closure, Stream Water Temperature, and Primary Productivity. The results and implications of this
67 project were presented to the EMC and then forwarded to the Board for consideration by the
68 Forest Practice Committee. Results from EMC-2015-001 were utilized to craft a draft rule revision
69 related to the Anadromous Salmonid Rules. The draft plead is currently in the Forest Practice
70 Committee.
- 71 • The EMC received an ongoing allocation of \$433,000 from the Timber Regulation and Forest
72 Restoration Fund, of which \$154,472 was allocated to previously awarded projects (see Table 1),
73 and the remaining \$278,528 will be available to projects awarded in the 2021/22 fiscal year.

- 74 • The EMC reviewed three initial concept proposals and requested full concept proposals from two
75 research teams. Upon review and discussion, the committee voted to fund both proposals:
- 76 ○ EMC-2021-001: Aquatic Toxicity and Cumulative Watershed Effects of Pesticide Discharge
77 Related to Post-Fire Reforestation
- 78 ■ Following the ranking process, the organization withdrew the proposal due to the
79 inability to meet the EMC’s maximum indirect costs of 15%.
- 80 ○ EMC-2021-003: Evaluating the Response of Native Pollinators to Fuel-Reduction
81 Treatments in Managed Conifer Forests
- 82 • While not an EMC-funded project, a final project presentation on a project that is relevant to EMC-
83 funded research (i.e., related to the FPRs and related regulations) was provided on the Railroad
84 Gulch BMP Evaluation Study conducted in the Elk River watershed, Humboldt County.
- 85 • Brief project updates were provided by Principal Investigators and/or Project Liaisons at EMC
86 meetings for the following projects: EMC-2015-001 (Class II Large Watercourse Study), EMC-2016-
87 003 (Repeat LiDAR Surveys to Detect Landslides), EMC-2017-001 (Caspar Creek Experimental
88 Watershed), EMC-2017-008 (Forest Practice Rules and Fir Mortality), EMC-2018-003 (Alternative
89 Meadow Restoration), EMC-2018-006 (Effect of Forest Practice Rules), EMC-2019-002 (Treatment
90 Longevity and Maintenance Needs for Fuel Reduction Projects), and EMC-2019-005 (San Vicente
91 Accelerated Wood Recruitment).
- 92 • A Draft Strategic Plan was updated at the end of 2021 and will be finalized in early 2022. The EMC
93 investigated a grant program as a means of distributing funding on future projects and will
94 continue to evaluate the merits of instituting a grant program for implementation in FY 2022/23.

95 **EMC SUPPORTED MONITORING PROJECTS – 2015 to 2021**

96 The comprehensive list of EMC-supported monitoring projects can be found on the Board’s [EMC webpage](https://bof.fire.ca.gov/board-committees/effectiveness-monitoring-committee/)
97 (<https://bof.fire.ca.gov/board-committees/effectiveness-monitoring-committee/>).

98 **EMC PRIORITIES**

99 EMC priorities are developed by the Committee, but as an advisory body to the Board, the Board can also
100 request prioritization of items by the EMC. The current EMC priorities are as follows:

- 101 • Support projects related to the EMC Themes and Critical Questions.
- 102 • Monitor progress on previously funded or supported EMC monitoring projects.
- 103 • Meet in the field at least once per year to observe active or proposed monitoring projects (this was
104 not achieved in 2020 or 2021 due to the COVID-19 pandemic, although one virtual field tour was
105 conducted and several comprehensive presentations were given during public meetings).

106

107 **CURRENT APPOINTED EMC MEMBERS AND STAFF**

108 For FY 2021/2022, the Committee has two Co-Chairs; up to 16 EMC members, including eight agency
 109 representatives and seven monitoring community members (two seats were vacated during 2021 and
 110 remain open); and five support staff positions (one seat was vacated in 2021, but filled within two months).

111 **Table 2. Current EMC Membership and Support Staff**

Name	Specialty	Affiliation	Term End Date
Co-Chairs			
Loretta Moreno	Co-Chair, Forest Ecology	California Natural Resources Agency	07/05/2023
Susan Husari	Co-Chair, Forestry and Fire Management	Board of Forestry and Fire Protection	11/06/2023
Monitoring Community			
OPEN SEAT Greg Giusti	Forestry, Registered Professional Forester (RPF) 2709	University of California Cooperative Extension Advisor Emeritus - Lake and Mendocino counties	Vacated 07/01/2021
Matt House	Hydrology and Fisheries	Green Diamond Resource Company	08/31/2024
Sal Chinnici	Wildlife	Humboldt and Mendocino Redwood Companies	07/01/2024
Matt O'Connor, Ph.D.	Geology and Geomorphology	Public	11/06/2023
OPEN SEAT Sarah Bisbing, Ph.D.	Forest Ecology and Forestry	Academic, University of Nevada, Reno	Resigned 09/08/2021
Leander Love-Anderegg, Ph.D.	Forest Ecology and Forestry	University of California, Santa Barbara	07/05/2023
Peter Freer-Smith, Ph.D.	Plant Ecology and Environmental Policy	Academic, University of California, Davis	07/05/2023
Agency Representatives			
Stacy Drury, Ph.D.	Fire Ecology	USDA Forest Service Pacific Southwest Research Station	n/a
Elliot Chasin (to 09/21/2021) Ben Waitman (from 09/22/2021)	Wildlife	California Department of Fish and Wildlife	n/a
Drew Coe	Hydrology/Forestry, RPF 2981	CAL FIRE	n/a

Name	Specialty	Affiliation	Term End Date
Jessica Leonard	Watershed Management	State Water Resources Control Board	n/a
Justin LaNier	Geology, Hydrology, and Water Quality	Central Valley Regional Water Quality Control Board	n/a
Clarence Hostler	Fisheries	National Oceanic & Atmospheric Administration National Marine Fisheries Service	n/a
Bill Short	Engineering Geology and Hydrogeology	California Geological Survey	n/a
Jim Burke	Geology and Water Quality	North Coast Regional Water Quality Control Board	n/a
Support Staff			
1. Matt Dias (to 07/01/2021) 2. Edith Hannigan (from 11/03/2021)	1. Forestry, RPF 2773 2. Forestry and Fire Protection	Board of Forestry and Fire Protection Executive Officer	n/a
1. Pete Cafferata (to 07/01/2021) 2. Andrew Lawhorn (from 12/14/2021)	1. Hydrology/Forestry, RPF 2184 2. Forestry and Fire Management	1. CAL FIRE 2. Board of Forestry and Fire Protection	n/a
Stacy Stanish	Biology and Fisheries, RPF 3000	CAL FIRE	n/a
Dave Fowler	Geology and Water Quality	North Coast Regional Water Quality Control Board	n/a
1. Katie Harrell (to 01/31/2021) 2. Kristina Wolf, Ph.D. (from 02/01/2021)	1. Forestry 2. Rangeland and Restoration Ecology	Board of Forestry and Fire Protection	n/a

112 **EMC PROJECT UPDATES**

113 The following section provides more information on reported project activities in 2021, or prior if
114 applicable:

115 **EMC-2015-001: Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal** 116 **influence of headwater streams into fish bearing systems**

117 At the January 13, 2021 EMC meeting, Member Drew Coe announced that OSU PhD student Austin Wissler
118 had analyzed the thermistor data for this project as the first part of his dissertation research. This portion of
119 his research was submitted for publication to the journal Hydrological Processes in January 2021. A paper

120 was accepted and published in the journal *Authorea* in January 2021 (Wissler et al. 2021). As part of a
121 California Fire Science Seminar Series, Dr. Kevin Bladon provided a presentation titled “Wildfire and Post-
122 Fire Management Effects on Water Resources” on April 13, 2021 (Bladon 2021).

123 At the April 21, 2021 EMC meeting, Member Coe presented on longitudinal trends in stream temperature
124 from work conducted in the Caspar Creek Experimental Watersheds and on LaTour Demonstration State
125 Forest (contrasting lithologies). Data were collected in five Caspar watersheds and three LaTour basins in
126 2017 and 2018. Drainage areas ranged from 57 to 773 acres. Air and stream temperatures tracked much
127 more closely for the coastal basins compared to the inland LaTour basins. Input of coldwater springs
128 decreased water temperature at entry points in the Cascade Range, providing cooling in a downstream
129 direction, while four out of five Coast Ranges streams had a warming trend downstream. Spring inputs were
130 found to lower the relationship between air and water temperatures. This study showed that not all
131 streams meet the assumptions of uniform downstream warming utilized with the Class II-Large
132 Anadromous Salmonid Protection (ASP) rules. The general pattern of complex instead of assumed
133 asymptotic downstream warming makes implications for the California FPRs difficult. This conclusion
134 validates the concepts included in the FPRs, 14 CCR § 916.9 [936.9, 956.8](v), allowing RPFs to develop site-
135 specific riparian zone measures where they are appropriate.

136 Adam Pate’s earlier work conducting a regional assessment of parameters for determining Class II flow
137 permanence and network connectivity was also briefly described (Pate et al. 2020). Approximately 100
138 streams were studied, with channel characteristics and surface water conditions measured in mostly ASP
139 watersheds. The most important variable for connectivity was winter precipitation. Drainage area was
140 found to be more important than bankfull channel width, and width was found to work in the opposite
141 direction than expected (decreased flow with wider channels). For connected streams, the rule requirement
142 of 100 or 150 acres depending on forest practice district came reasonably close to the mid-values measured
143 in this field study. The rule mandated drainage areas did not work as well for flow permanence, but they
144 were still tracking appropriately (larger watersheds had more flow permanence). In general, this study
145 provides evidence that channel width is not a good predictor for higher water temperatures being
146 transmitted downstream, while drainage area is a good parameter for use in the CA FPRs.

147 Member Coe also reported that the manuscript previously submitted to the journal *Hydrological Processes*
148 was rejected, and that modifications would be made to the discussion section and the paper would be
149 resubmitted over the summer. Another new manuscript was recently accepted into *Hydrological Processes*
150 with major revisions.

151 The EMC determined that the completed project EMC-2015-001 would provide a good beta test for the
152 draft Science to Policy Framework (i.e., the precursor to the Completed Research Assessment). It was found
153 that the study (1) did fulfill the funding requirements and informed a FPR; (2) was scientifically sound (one
154 published paper to date); (3) scalable: clear differences in warming patterns were documented in different
155 lithologies, with complex patterns observed in the Cascade Range; a key limitation was that only
156 temperature was studied, while the ASP rules were also developed to address the transport of sediment,
157 large wood, and nutrients; (4) additional research needed: it is appropriate to determine findings from EMC-
158 2018-006 prior to initiating new research; and (5) scientific application: our understanding of controls for
159 perennial/connectivity flow for headwater streams in California has been substantially increased.

160 At the July 21, 2021 EMC Meeting, Member Coe summarized the revised Completed Research Assessment
161 that he and Member Matt House completed for this project. The project determined that drainage area is

162 considerably more important than the active channel width for determining both Class II flow connectivity
163 and flow permanence. The document suggested that simplifying the FPRs by removing channel width as a
164 criterion for classifying Class II-Large watercourses was merited. Revisions were suggested to the document
165 prior to its presentation to the Board's Forest Practice Committee.

166 The final project results were presented to the Board by Member Coe on July 14, 2021. Final project results
167 and a Completed Research Assessment were presented at the EMC meeting on July 21, 2021. The
168 Completed Research Assessment was also presented to the Forest Practice Committee at the September
169 10, 2021 Board meeting, including potential implications for policy. In response, the Board proposed rule
170 changes, and the item will be discussed at a future Board meeting. Updated presentations were given to the
171 Board at the Forest Practice Committee meeting on November 3, 2021, and again on December 8, 2021.

172 **EMC-2016-002: Post-fire Effectiveness of the Forest Practice Rules in Protecting Water Quality on Boggs**
173 **Mountain Demonstration State Forest**

174 At the January 13, 2021 EMC Meeting, Member Coe summarized a published poster presented online at the
175 Fall 2020 AGU (American Geophysical Union) meeting titled "Alternative methods for reducing sediment
176 delivery from skid trails used for post-fire logging" (Waggenbrenner 2020). This component of the study was
177 included to develop and demonstrate alternative best management practices (BMPs) for post-fire salvage
178 operations. Rainfall simulation was used to test post-fire treatments on skid trails in an area that burned
179 with high severity in the 2015 Valley Fire. Runoff experiments were conducted to compare changes in
180 runoff and sediment outputs among five mitigation techniques. The treatments were:

- 181 3. Control: standard waterbar spacing with the FPRs (100 feet with moderate EHR; 30-40% slopes).
- 182 4. Double-drainage: waterbar spacing set to ½ the prescribed FPR spacing (50 feet).
- 183 5. Slash-covered: skid trail covered with logging slash at a rate of 50%.
- 184 6. Slash-packed waterbar outlets: outlets covered with logging slash (70%) and machine packed.
- 185 7. Walked-in slash: both skid trail and waterbar outlet covered by slash (50% and 70%, respectively),
186 and machine packed.

187 A licensed timber operator made four round trips on each skid trail. There were six plots randomly assigned
188 for each treatment. Plot test sections were ½ the distance between waterbars and the full skid trail width.
189 The application rate for the runoff simulator was 28 mm/hr (1.1 in/hr) for 30 minutes, which corresponded
190 to the runoff rate from rainfall simulations with an applied rainfall rate of 71 mm/hr (>100-year recurrence
191 interval). Variables included surface cover, surface roughness, runoff velocity (using a pulsed saline injection
192 tracer), runoff rate, and sediment concentration. Results were as follows:

- 193 1. Cover: There was no difference in wood cover between the Control and Double-drainage plots or
194 outlets. Plot wood cover was greater for the Slash-covered and Walked-in treatments, which
195 included addition of wood on the skid trail surface. Outlet wood cover was greater for Slash-
196 covered, slashpacked, and Walked-in treatments.
- 197 2. Surface roughness: Surface roughness showed no differences in the plots. Roughness in the outlets
198 was more variable within each treatment than in the plots, and none of the treatments appeared to
199 affect surface roughness.

- 200 3. Runoff velocity: The plot runoff velocities were lower for the treatments where slash was added to
201 the skid trails (Slash-covered and Walked-in). All treatments had lower runoff velocities in the
202 outlets than the Controls, particularly where slash was added to the waterbar outlets.
- 203 4. Runoff rate: Runoff rates across all treatments were highly variable. Runoff rates in the Double-
204 drainage treatment were lower than the Controls because of the higher frequency of waterbars
205 and shorter plot lengths. Runoff rates in the Slash-covered and Walked-in treatments were lower
206 than the Controls.
- 207 5. Sediment concentration: Sediment concentrations were similar at the plot sample location across
208 treatments except for the Slash-covered, which was slightly lower. At the outlets, there was no
209 difference in sediment concentration between the Controls and Double-drainage treatments, and
210 the Slash-covered, Slash-packed, and Walked-in treatments had lower concentrations. Sediment
211 rating curves still need to be constructed to allow sediment yields to be calculated.

212 Additional characterizations of hydraulic roughness and erosion may also be generated using structure for
213 motion photogrammetry. The main conclusions to date from this study are that (1) reducing the distance
214 between waterbars has little effect on sediment delivery, and (2) the addition of slash to waterbar outlets
215 has a greater influence on sediment delivery than slash added to the skid trails. The value of slash packing
216 the outlets of skid trails following salvage logging operations validates the existing FPRs, which state that,
217 “Where waterbreaks cannot effectively disperse surface runoff, including where waterbreaks on roads and
218 skid trail cause surface runoff to be concentrated on downslopes, roads or skid trails, other erosion controls
219 shall be installed as needed...(914.6 [934.6, 954.6](f)).” Since roads and skid trails share similar properties
220 and similar rule requirements (e.g., 914.6, 934.6, 954.6), results from this study may also apply to elements
221 of the “Road Rules”, specifically to elements of 923.5, 943.5, 963.5.

222 In related research, Dr. Joe Wagenbrenner provided a presentation titled, “Post-Fire Salvage Logging Effects
223 on Soils, Runoff, and Sediment Production in Western Watersheds” (Wagenbrenner et al. 2021). The
224 presentation was recorded on April 5, 2021 and was part of a Salvage Webinar series co-hosted by the
225 Rocky Mountain Research Station, Northern Rockies Fire Science Network, Southern Rockies Fire Science
226 Network, and the Northwest Fire Science Consortium. The primary investigators continue to analyze the
227 data from this study and new papers are forthcoming.

228 **EMC-2016-003: Road Rules Effectiveness at Reducing Mass Wasting (Repeat LiDAR Surveys to Detect** 229 **Landslides)**

230 The processing of the light detection and ranging (LiDAR) data by the USGS and its contractors was delayed
231 due to COVID-19 response and by prioritizing processing of LiDAR data from areas affected by wildfires. At
232 the April 21, 2021 meeting, Member Bill Short reported that LiDAR delivery from the USGS was still delayed.
233 At the July 21, 2021 EMC meeting, Member Short informed the EMC that LiDAR data for Amador and El
234 Dorado counties has been accepted, and that California Geological Survey (CGS) should be getting the data
235 in the next few weeks, and would be uploaded to the national USGS site ([https://www.usgs.gov/core-
236 science-systems/ngp/tnm-delivery/gis-data-download](https://www.usgs.gov/core-science-systems/ngp/tnm-delivery/gis-data-download)).

237 At the Oct 21, 2021 EMC Meeting, Member Matt O’Connor and Member Short provided a project update.
238 They reported that allocated project funds were expended in support of LiDAR acquisition to implement the
239 project, and CGS was still awaiting the LiDAR data. Once received, CGS would implement an investigation of
240 sequential LiDAR as a tool for identifying and tracking landslides; the analysis is expected to occur in early
241 2022.

242 **EMC-2017-001: Effects of Forest Stand Density Reduction on Nutrient Cycling and Nutrient Transport at**
243 **the Caspar Creek Experimental Watershed**

244 At the April 21, 2021 meeting, Pete Cafferata reported that the pandemic imposed major restrictions on
245 laboratory access for cation-anion analysis on 1,600 remaining water samples, but that Seanna McLaughlin's
246 master's thesis was expected by June and a final report by the end of the calendar year. No project
247 deliverables were provided in 2021.

248 In December 2021, principal investigator (PI) Dr. Helen Dahlke provided a project update via email. Dr.
249 Dhalke reported that due to the pandemic university closures, non-essential laboratory research was not
250 permitted. In addition, analysis of water samples for major cations and anions was reliant on a
251 chromatograph for which access was not permitted until spring 2021, and additional repair and
252 maintenance was then needed, preventing analysis at that time. Moreover, the MS student employed on
253 the project left the university in 2021 without finishing her degree. The new plan is to train two other
254 students on use of the analytical equipment sometime after January 2022 and draft a final report
255 thereafter.

256 **EMC-2017-002: Boggs Mountain Demonstration State Forest (BMDSF) Post-Fire Automated Bird**
257 **Recorders Study**

258 The third and final year of bird recordings were made in the late spring of 2019 and the bird call interpreter
259 completed the recording analysis in January 2020. Member Stacy Stanish is working with a CDFW
260 statistician to analyze the data. No project updates or deliverables were provided in 2021.

261 **EMC-2017-006: Tradeoffs among Riparian Buffer Zones, Fire Hazard, and Species Composition in the**
262 **Sierra Nevada**

263 At the January 13, 2021 EMC Meeting, Katie Harrell, Board staff, reported that this project was significantly
264 affected by COVID-19, and a contract amendment extended the project to June 30, 2022. Commercial
265 harvests for the project were completed by end 2021. These harvests represent the first of a sequence of
266 treatments applied as part of the experiment. The sequence includes:

- 267 1. **Commercial harvest** - A commercial harvest within WLPZ that have been designated as
268 "experimental forestlands" by the Board. These harvests are one of three experimental treatments:
269 1) a "status quo" harvest of directional felling of large trees; 2) a thin from below to a target basal
270 area; and 3) a thin from below plus small canopy gap creation.
- 271 2. **Activity fuel piling** - This occurs after the commercial harvest and consists of hand crews and low
272 impact heavy equipment. The objective is to concentrate activity fuel from the harvest as well as
273 precommercial trees into piles that can be burned.
- 274 3. **Burning of piles.** This represents the final treatment and can be a combination of discrete pile
275 burning or pile burning plus broadcast burning (i.e. "pilecast" burns).

276 In 2021, phase 2 was completed for all study areas utilizing funds outside of the EMC contract. While the
277 intent was to complete phase 3 in 2021, this did not occur in all study areas because a burn permit was not
278 authorized to burn the piles when conditions were appropriate to meet defined objectives. By the time
279 burning could be permitted in the fall time, conditions were very wet. Hand piles and small machine piles
280 absorb a lot of moisture and do not stay dry within an interior core, as does occur with large machine piles.

281 High fuel moisture of hand piles is especially pronounced in riparian areas, which tend to be relatively wet
282 and cold. Despite efforts to keep the piles dry with wax coated paper covers, the piles were very wet
283 because of rain and snowfall. The perimeters of the piled areas were lined with a dozer and were prepped
284 for burning during drier conditions, but the permitting challenges prohibited burning.

285 Despite the setback, piles have been burned whenever resources were available, and approximately 75% of
286 the study areas have been burned. The burning, however, is time-intensive because of wet conditions. It is
287 possible that burning will be completed in the spring of 2022, but this will depend on permitting. Seasonal
288 crews will be available to help with burning in early June. In dry springs, Cal Fire has suspended all burn
289 permits; thus, the completion of the treatments will depend on weather and the ability to obtain burn
290 permits during times when burning is not constrained by wet conditions. In anticipation of these difficulties,
291 most post treatment measurements were completed during summer 2021. This was not preferred because
292 the measurements do not capture the fuel consumption that occurs after burning. To maximize the utility of
293 the data, fuel transects were placed so that they did not overlap with piles. Hence, the measurement
294 assumes that no fuel beyond the pile perimeters would be consumed during burning.

295 Several preliminary results have been reported for this project and related issues (Board of Forestry and Fire
296 Protection 2019, York and Roughton 2019, York 2020, Ingram 2021). A progress report and results are
297 expected in the late spring or summer of 2022.

298 **EMC-2017-007: The Life Cycle of Dead Trees and Implications for Management**

299 This project is in a 24-ha stand at Blodgett Forest (identified as Compartment 160) where snags have been
300 tracked for almost four decades. Dr. John Battles developed a new annual snag tracking protocol at Blodgett
301 Forest Research Station. The first annual inventory using the new monitoring protocol was completed in
302 2020. A retrospective study of log decay was also completed to complement the long-term study of downed
303 wood decay rates. This project is complete, and results and a final presentation are expected in spring of
304 2022.

305 **EMC-2017-008: Forest Practice Rules to Minimize Fir Mortality from Root Diseases**

306 At the October 21, 2021 EMC Meeting, Richard Cobb reported that several publications were in
307 development, recently submitted, or in review. A paper titled “Efficacy of Chemical and Biological Stump
308 Treatments for the Control of *Heterobasidion occidentale* Infection of California *Abies concolor*” was
309 published in October 2021 in the journal *Pathogens*. A final project presentation is anticipated for the April
310 2022 EMC meeting, and two additional publications are expected to be published in 2022.

311 **EMC-2018-003: Alternative Meadow Restoration**

312 At the April 21, 2021 meeting, Member O’Connor reported that due to extremely low winter precipitation,
313 no meadow streamflow was recorded, greatly complicating measurement of treatment effects.
314 Determination of water quality changes from the WLPZ removal treatment could not be explored due to
315 lack of streamflow in spring and summer of 2021. It is anticipated that—given winter already has significant
316 snowpack—there is a good likelihood of an average water year with spring runoff that would enable the PI
317 to complete the water quality objective. However, it would be beneficial to extend the hydrologic
318 measurements past the spring into the summer for more conclusive evaluation of treatment effects.
319 Further, extending the project into the summer would allow vegetation surveys and soil compaction
320 analysis following a, hopefully, more average winter. Therefore, the PI intends to submit a time extension
321 on this contract, the term of which is currently set to expire on June 30, 2022.

322 Member O'Connor corresponded with the principal investigator (PI) on October 20, 2021 regarding effects
323 of the Dixie Fire on the project field area, as all meadow sites were affected by the fire. The PI reported the
324 loss of a few instruments, although the fire appeared to have benefitted the grasslands. The surrounding
325 watershed was significantly altered by the fire, likely increasing water yield. This will likely affect previous
326 assumptions regarding upslope drainage contributions to the meadow system. The biggest problem noted
327 by the PI was that fire roads cut directly through the meadow restoration area, and it is currently unclear
328 whether the areas will be restored.

329 The remaining funds were allocated in August of 2021, and analyses were ongoing and originally expected
330 to be completed in spring 2022. Given the drought conditions and fire impacts, a project extension is
331 merited, and will be submitted for an extension for a term end of October 1, 2022 for final reporting.

332 **EMC-2018-006: Class II Watercourse and Lake Protection Zone**

333 At the April 21, 2021 EMC meeting, Member Matt House announced that harvesting occurred in 2020, and
334 2021 post-harvest data were being collected. Green Diamond Resource Company staff had supplemented
335 Oregon State University staff due to field limitations related to the pandemic. Austin Wissler scaled back his
336 study to a master's project, and Drs. Bladon and Segura were pursuing a post-doc to continue the project.

337 At the July 21, 2021 EMC meeting, Dr. Bladon provided a recorded video (see the EMC webpage link:
338 https://bof.fire.ca.gov/media/5uie1e1g/bladonsegura_emcupdate_2021-07-21.mp4) and progress
339 presentation on this project being conducted on Green Diamond Resource Company (GDRC) timberlands in
340 Humboldt County. There are 18 watersheds included in the study—six reference watersheds and four of
341 each of the three riparian treatments. Treatment watersheds were all harvested in 2020 with one of the
342 three treatments: (a) Coastal Anadromy Zone ASP Class II-L Prescription (30-ft core zone, 70-ft inner zone
343 with 80% overstory canopy cover), (b) GDRC Habitat Conservation Plan Prescription (30-ft inner zone with
344 85% overstory canopy, 70-ft outer zone with 70% overstory canopy cover), or (c) an alternative prescription
345 resembling pre-ASP (& Threatened or Impaired Watersheds (T/I) Rule Package) requirements (100-ft zone
346 with 50% overstory canopy).

347 There are six circular 1/10 acre fixed-area plots in the riparian area of each watershed to quantify pre- and
348 post-harvest tree condition, species, diameter at breast height (DBH), basal area, and canopy closure from
349 hemispherical photographs. Stream discharge is being measured with salt solution gaging, and dissolved
350 oxygen (DO) and photosynthetically active radiation (PAR) (radiation reaching the stream) data are also
351 being recorded. Longitudinally along each of the 18 stream reaches (1,000 feet) there are four air
352 temperature sensors and 12 stream temperature sensors (288 total sensors). Two centrally located
353 meteorological stations are also maintained to quantify precipitation, air temperature, wind speed, soil
354 moisture, and relative humidity. Additionally, 27 groundwater wells have been installed to document how
355 water is routed to stream channels. All automated sensors have been set up to collect data at 15-minute
356 intervals.

357 Pre-harvest mensuration data presented show that the three treatment sites and the controls are generally
358 comparable when considering the mean number of trees per acre, basal area, canopy closure, and leaf area
359 index (LAI). Annual precipitation was only approximately 50% of the long-term average during the winter of
360 2019–2020, but air temperatures were close to average. Stream discharge was similar in the reference and
361 pre-ASP watersheds, but considerably lower in the ASP basins. Very limited flow response is expected due
362 to the very low WLPZ harvest rates.

363 Preliminary stream temperature data show little evidence of discrete locations of groundwater discharge or
364 spring inputs (i.e., stable temperature moving in a downstream direction). Plots of stream temperature for
365 reference watersheds vs. ASP and HCP basins show no effect, while pre-ASP basins show a harvest effect,
366 with increases of ~0.3°C (0.5°F). Photosynthetically active radiation data show no treatment differences,
367 except for pre-ASP basins, where increases of 244% have been documented. Mean chlorophyll-a
368 concentrations are slightly elevated for all the treatment basins and the reference watersheds. Monthly
369 water chemistry grab samples for nitrogen, phosphorus, and dissolved organic carbon (DOC) do not reveal
370 large changes to date. Next steps include continued data collection and sampling, application of Quality
371 Assurance and Control protocols, post-harvest data analyses, and publishing a stream temperature paper in
372 early 2022 (Wissler) and a streamflow response paper in late 2022 (Nicholas). Post-doctoral scholar Dr.
373 Lorraine Miralha started on the project in October 2021 to conduct longer term data analyses. Final results
374 are expected in 2023.

375 **EMC-2019-002: Evaluating Treatment Longevity and Maintenance Needs for Fuel Reduction Projects**
376 **Implemented in the Wildland Urban Interface of Plumas County, CA**

377 At the July 21, 2021 EMC Meeting, Member Stacy Drury provided a project update. Member Drury was in
378 contact with the Feather River Resource Conservation District (RCD), which had moved forward with the
379 project, COVID had put the project behind schedule. Some experimental sites burned in 2020, and fires in
380 the summer had encroached on some of the plots, but the project was still on track to provide the
381 contracted deliverables.

382 At the October 21, 2021 meeting, Member Drury provided an additional update, stating that the project
383 was wrapping up. The Dixie Fire burned most of the experimental sites, and many could no longer be
384 evaluated, resulting in a delay in the final report, so the project investigators would need to re-evaluate the
385 next steps and timeline.

386 An additional update provided by Michael Hall with the Feather River District was also provided in
387 December 2021. Mr. Hall reported that the North Complex Fire (2020) and Dixie Fire (2021) directly
388 impacted several projects implemented by the Plumas County Fire Safe Council, including this one. This
389 created an opportunity to assess how the treatments were utilized by firefighters as defensible space and
390 how the treatments may have affected post fire mortality. Once the fire closures were lifted, several of
391 these burned projects were visited and evaluated using ground and UAV based imagery. Additional analysis
392 was ongoing as of December 29, 2021, and a final report was submitted to the EMC on December 31, 2021
393 (Moghaddas et al. 2021).

394 **EMC-2019-003: Fuel Treatments and Hydrologic Implications in the Sierra Nevada**

395 In December 2021, the PIs provided an update via email, reporting that in 2020, COVID-19 delayed the start
396 date of the project by several months and ongoing impacts due to the pandemic impacted the proposed
397 timeline. Further, Dr. Kinoshita was on maternity leave during Fall 2021. However, several site visits were
398 conducted in 2021 to the Sagehen watershed for extensive spatial data collection, and work is ongoing on
399 the statistical analysis of various data streams, and initial work was started on integrated hydrologic
400 modeling for the Sagehen watershed. Streamflow data were acquired and reset in both June and October
401 this year. These data are being quality controlled and added to the existing long-term dataset. An additional
402 year of data were acquired for Leaf Area Index, Simplified Surface Energy Balance (SSEBoP)
403 evapotranspiration (ET) and Moderate Resolution Imaging Spectroradiometer (MODIS) Fraction of
404 Photosynthetically Active Radiation (FPAR) 4-day global datasets were acquired using Google Earth Engine

405 and analyzed. LiDAR data available for Sagehen was acquired for both 2014 and 2018 for the basin and
406 canopy cover loss/gain was analyzed for the system. Streamflow data at the sub-basin scale and watershed
407 outlet (USGS) have been analyzed and change detection methods applied.

408 Preliminary results indicate that at the watershed and sub-watershed scale, changes in runoff are explained
409 by precipitation and ET is not an important part of the variability in observed runoff depth. Using 30-m
410 satellite-based ET, there was less than a 15% change at the sub-basin scale. The relative change in forest
411 density between 2014 and 2018 highlights the potential for high variability or monitoring hot spots for large
412 changes in ET at the sub-basin scale. This demonstrates that ET and forest structure are linked; however,
413 the scale of treatment is relatively minor at the watershed scale, and the impacts to basin-scale runoff are
414 not discernable. Further scaling of “hot spot” behavior to the watershed scale, using integrated hydrologic
415 modeling, will provide further insight on treatment impacts on ecohydrologic response and impact from
416 regional treatments.

417 Initial results were presented in a talk titled “Hydrologic response to forest treatment practices for wildfire
418 mitigation in a Sierra Nevada watershed” at a regional fire symposium workshop in Boulder, CO in October
419 2021 and at the AGU Fall National meeting in New Orleans, LA in December 2021.

420 The PIs intend to file a request for a contract time extension to complete the following tasks:

- 421 • Finalize physically-based hydrologic model parameterized for a range of spatially-varying fuel
422 treatments;
- 423 • Further develop statistical tools and algorithms that integrate the monitoring data and satellite-
424 based products and can further elucidate relationships between forest canopy change and
425 hydrologic response;
- 426 • Create an integrated package, including models and statistical framework, that is downloadable and
427 usable by stakeholders, resource managers and decision-makers; and,
- 428 • Produce scientific papers and reports.

429 **EMC-2019-005: Sediment Monitoring and Fish Habitat – San Vicente Accelerated Wood Recruitment**

430 At the April 21, 2021 EMC meeting, Member Short reported that the two watersheds to be studied in Santa
431 Cruz County had burned in the CZU Lightning Complex and the Sempervirens Fund was not going to
432 continue with the Timber Harvest Plan (THP). Project investigators met with Board staff to discuss
433 alternatives that might be available, including changing the project to a post-fire large wood study.
434 However, RPF Nadia Hamey was planning to go forward with the project. The California Geological Survey
435 had installed monitoring equipment in the stream channels, and data were being collected. They observed
436 significant sediment within the channels.

437 At the October 21, 2021 meeting, Member Short reported that a modified plan for the project would be
438 submitted. At that time, the project was still on hold, but Member Short anticipated that the plan would go
439 through as modified and work to fly the LiDAR for pre-project analyses was planned for winter, and some
440 streamflow surveys had been conducted.

441 More recent communication with RPF Hamey indicates that trees have been remarked for the project and
442 the THP and Section V Accelerated Wood Recruitment (AWR) documents are in the process of being revised
443 and are planned to be submitted early in the new year. The AWR aspect of the project is intended to
444 commence Summer 2022. Full baseline surveys are anticipated to be conducted during Spring 2022 and
445 post-implementation surveys conducted Fall 2022.

446 **EMC PROJECT RESULTS AND PRODUCTS**

447 The following section provides more information on reported project deliverables in 2021, or prior if
448 applicable:

449 **EMC-2015-001: Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal** 450 **influence of headwater streams into fish bearing systems**

451 This project is complete, and additional publications and presentations are expected. One manuscript is
452 being revised for submission to a different journal after rejection from the journal *Hydrological Processes*.
453 Another new manuscript was recently accepted into *Hydrological Processes* with major revisions. Once
454 published, final versions will be shared with the EMC. The following items were published or presented in
455 2021:

- 456 • An article titled, “Comparing headwater stream thermal sensitivity across two contrasting
457 lithologies in Northern California” was published in January 2021 with the journal *Authorea* (Wissler
458 et al. 2021).
- 459 • Member Coe provided a project update at the January 13, 2021 EMC meeting.
- 460 • As part of a virtual California Fire Science Seminar Series, Dr. Bladon provided a presentation titled
461 “Wildfire and Post-Fire Management Effects on Water Resources” on April 13, 2021 (Bladon 2021).
- 462 • A final project presentation on results was given at the EMC meeting on April, 21, 2021.
- 463 • Co-Chair Husari provided the Board with a project update at the July 2, 2021 Board Meeting.
- 464 • Final project results and a Completed Research Assessment were presented to the Board at the
465 Forest Practice Committee meeting on July 14, 2021, and at the EMC meeting on July 21, 2021.
466 Following revisions, an additional presentation was given to the Board at the Forest Practice
467 Committee meeting on September 10, 2021. A presentation on policy implications and an
468 additional project update were presented to the Board at the Forest Practice Committee meeting
469 on November 3, 2021, and again on December 8, 2021.

470 **EMC-2016-002: Post-fire effectiveness of the Forest Practice Rules in protecting water quality on Boggs** 471 **Mountain Demonstration State Forest**

472 This project is complete, and additional publications and presentations are expected. The following items
473 were published or presented in 2021:

- 474 • At the January 13, 2021 EMC meeting, Member Coe summarized a published poster that was
475 presented online at the Fall 2020 AGU meeting titled “Alternative methods for reducing sediment
476 delivery from skid trails used for post-fire logging” (Wagenbrenner et al. 2020).
- 477 • Dr. Joe Wagenbrenner gave a presentation titled, “Post-Fire Salvage Logging Effects on Soils,
478 Runoff, and Sediment Production in Western Watersheds” (Wagenbrenner et al. 2021) on April 5,

479 2021 at the Salvage Webinar series co-hosted by the Rocky Mountain Research Station, Northern
480 Rockies Fire Science Network, Southern Rockies Fire Science Network, and the Northwest Fire
481 Science Consortium.

482 **EMC-2016-003: Road Rules Effectiveness at Reducing Mass Wasting (Repeat LiDAR Surveys to Detect**
483 **Landslides)**

484 Project updates were provided at the April 21, July 21, and October 21, 2021 EMC meetings. Results for this
485 project are expected in mid-2023, and as such, no publications or presentations occurred in 2021.

486 **EMC-2017-001: Effects of Forest Stand Density Reduction on Nutrient Cycling and Nutrient Transport at**
487 **the Caspar Creek Experimental Watershed**

488 A project update was provided at the April 21, 2021 EMC meeting. Results for this project are expected in
489 2022, and as such, no publications or presentations occurred in 2021.

490 **EMC-2017-002: Boggs Mountain Demonstration State Forest (BMSDF) Post-Fire Automated Bird**
491 **Recorders Study**

492 Results for this project are expected in spring 2022, and as such, no publications or presentations occurred
493 in 2021.

494 **EMC-2017-006: Tradeoffs among Riparian Buffer Zones, Fire Hazard, and Species Composition in the**
495 **Sierra Nevada**

496 Several extension products with preliminary results have been developed and are comprised as follows: a
497 presentation was given at the California Licensed Foresters Association in 2019 (York and Roughton 2019); a
498 field tour was given to the EMC in 2020 (York 2020); a white paper on partial harvests in the WLPZ (Board
499 2019); and a blog entitled “Fuels Management in Creeks and Streambeds” published with the University of
500 California Agriculture and Natural Resources Forestry Research and Outreach Program (Ingram 2021). A
501 project update was provided at the January 13, 2021 EMC meeting, and an email update was provided in
502 September 2021. Results for this project are expected in late spring or summer of 2022, and as such, no
503 publications or presentations occurred in 2021.

504 **EMC-2017-007: The Life Cycle of Dead Trees and Implications for Management**

505 A project update was provided at the January 13, 2021 EMC meeting. Results for this project are expected
506 in spring 2022, and as such, no publications or presentations occurred in 2021.

507 **EMC-2017-008: Forest Practice Rules to Minimize Fir Mortality from Root Diseases.**

508 A project update was provided at the October 21, 2021 meeting. A final project presentation, including
509 discussion of the Completed Research Assessment, is planned for the EMC’s April 2022 meeting. In mid-
510 2021, Mr. Cobb reported provided an email update with information on publication status of three articles
511 as follows:

- 512 • An article titled, “Efficacy of Chemical and Biological Stump Treatments for the Control of
513 *Heterobasidion occidentale* Infection of California *Abies concolor*” was published in October 2021
514 with the journal *Pathogens* (Poloni et al. 2021).
- 515 • A second article titled, “Heterobasidion effects on stand composition over fifty years of root disease
516 in California fir and pine forests” will be submitted to a peer-reviewed journal soon.

- 517 • A third article titled, “Interactions between forest structure, host community, and pathogen
518 identity during 50 years of Heterobasidion root disease in the Sierra Nevada - Southern Cascade
519 Mountains” is being prepared.

520 **EMC-2018-003: Alternative Meadow Restoration**

521 A project update was provided at the April 21, 2021 meeting. It is expected that a presentation will be given
522 to the EMC in spring of 2022. At least two theses are expected to be completed in 2022. Other anticipated
523 deliverables include at least one peer reviewed journal manuscript to be prepared in 2022, and one
524 presentation to be delivered at a professional forest science related conference. Due to the complicating
525 effects of drought and fire on the project sites, the PI intends to submit a project extension request to allow
526 for an additional four months to allow for supplementary data collection and time to complete analyses and
527 produce final reports.

528 **EMC-2018-006: Class II Watercourse and Lake Protection Zone**

529 A project update was provided at the April 21, 2021 EMC meeting. A recorded project presentation, virtual
530 field tour, and project status update were provided at the July 21, 2021 EMC meeting. Final results for this
531 project are expected in 2023.

532 **EMC-2019-002: Evaluating Treatment Longevity and Maintenance Needs for Fuel Reduction Projects**
533 **Implemented in the Wildland Urban Interface of Plumas County, CA**

534 Project updates were provided at the July 21 and October 21, 2021 EMC meetings, and a final report was
535 submitted to the EMC on December 31, 2021 (Moghaddas et al. 2021). A final presentation and Completed
536 Research Assessment are expected in 2022.

537 **EMC-2019-003: Fuel Treatments and Hydrologic Implications in the Sierra Nevada**

538 A project update was provided by email in December 2021, which included preliminary results, an adjusted
539 timeline, and information on a talk titled “Hydrologic response to forest treatment practices for wildfire
540 mitigation in a Sierra Nevada watershed” given at a regional fire symposium workshop in Boulder, CO in
541 October 2021 and at the AGU Fall National meeting in New Orleans, LA in December 2021 (Bode et al.
542 2021). The PIs intend to file a request for a contract time extension to produce additional deliverables,
543 including: (1) a hydrologic model parameterized for a range of spatially-varying fuel treatments; (2)
544 statistical tools and algorithms integrating monitoring data and satellite-based products to explore
545 relationships between forest canopy change and hydrologic response; (3) an integrated package, including
546 models and statistical framework, that is downloadable and usable by stakeholders, resource managers and
547 decision-makers; and (4) scientific papers and reports.

548 **EMC-2019-005: Sediment Monitoring and Fish Habitat – San Vicente Accelerated Wood Recruitment**

549 Results for this project are expected in 2022, and as such, no publications or presentations occurred in
550 2021. Project updates were provided at the April 21 and October 21, 2021 meetings.

551 **POTENTIAL EMC PROJECT IMPACTS TO REGULATIONS**

552 The EMC provides valuable insight to the Board on testing the effectiveness of their rules and regulations by
553 way of science-based research projects. EMC-funded studies may show that regulatory modifications, either
554 minor or major, need to occur to ensure the effectiveness of the FPRs (14 CCR § 895 et seq.). The EMC
555 moved findings from EMC-2015-001 (Class II Large Watercourse Study) to the Board for consideration in

556 2021, and this will likely lead to rule revision in 2022. Th EMC expects to move findings from EMC-2016-003
557 (Repeat LiDAR Surveys to Detect Landslides), EMC-2017-006 (Tradeoffs among Riparian Buffer Zones, Fire
558 Hazard, and Species Composition in the Sierra Nevada), and EMC-2017-008 (FPRs to Minimize Fir Mortality
559 from Root Diseases) to the Board for consideration in 2022 or 2023.

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