EFFECTIVENESS MONITORING COMMITTEE

2023 ANNUAL REPORT & WORKPLAN

Submitted to the State Board of Forestry and Fire Protection

Approved: MONTH XX, 2024

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California State Board of Forestry and Fire Protection

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EXECUTIVE SUMMARY

The Effectiveness Monitoring Committee (EMC) Annual Report and Workplan (Report) is a living document which is updated and approved by the Board of Forestry and Fire Protection (Board) annually and is intended to catalogue the yearly accomplishments and status of ongoing EMC efforts. The Report summarizes EMC accomplishments, details EMC funding actions for the year, and provides an update of current EMC membership and staffing. For Fiscal Year (FY) 2023/2024, the EMC selected one proposed effectiveness monitoring project to fund and support utilizing a newly developed grant program, and one additional project is still under consideration for funding. Ongoing projects from prior years continued to be funded and supported; numerous project presentations were provided at four open public EMC meetings; a Field Tour was conducted at Boggs Mountain Demonstration State Forest; and the EMC welcomed two new members, reappointed one member, and appointed a new co-chair from the current membership.

I. EMC PROCESS

The EMC was formed to develop and implement an effectiveness monitoring program to address both watershed and wildlife concerns, and to provide an active feedback loop to policymakers, managers, agencies, and the public to better assist in decision-making and adaptive management. As an advisory body to the Board, the EMC helps implement an effectiveness monitoring program by soliciting robust scientific research that addresses the effectiveness of these laws at meeting resource objectives and ecological performance measures related to AB 1492 (AB-1492 California Assembly 2011-2012). In particular, the EMC funds robust scientific research aimed at testing the efficacy of the California Forest Practice Rules (FPRs) and other natural resource protection statutes, laws, codes, and regulations.

Four formal documents guide the activities and goals of the EMC:

(1) Charter (EMC 2013);

(2) Strategic Plan (EMC 2022), which is updated approximately every three years;

(3) Annual Report and Work Plan (i.e., this report), which is updated every calendar year (see EMC 2023a for the most recent past report); and,

(4) Research Themes and Critical Monitoring Questions (CMQs) (EMC 2024), which may be updated annually as determined necessary by the EMC.

All four documents are linked and interact in varying ways to guide the direction and activities of the EMC. The EMC reports on its activities in a variety of ways. The EMC Strategic Plan lays out how the Committee intends to achieve the EMC goals and objectives. This Annual Report and Workplan tracks progress on individual projects, documents the Committee's ranking and selection of proposed monitoring projects, and details other annual accomplishments and ongoing EMC efforts. The EMC conducts open meetings a minimum of four times per year (quarterly) to conduct EMC business, during which progress reports, final reports, or other presentations on EMC-funded projects or other related research may be provided. The EMC Co-Chair or Board staff also report on the EMC's activities via verbal updates at Board meetings throughout the year.

EMC projects are solicited through an annual Request for Proposals (RFP) which is released following the start of the new FY (see **Figure 1**). The RFP, ranking, and selection process are detailed in the Strategic Plan (EMC 2022).

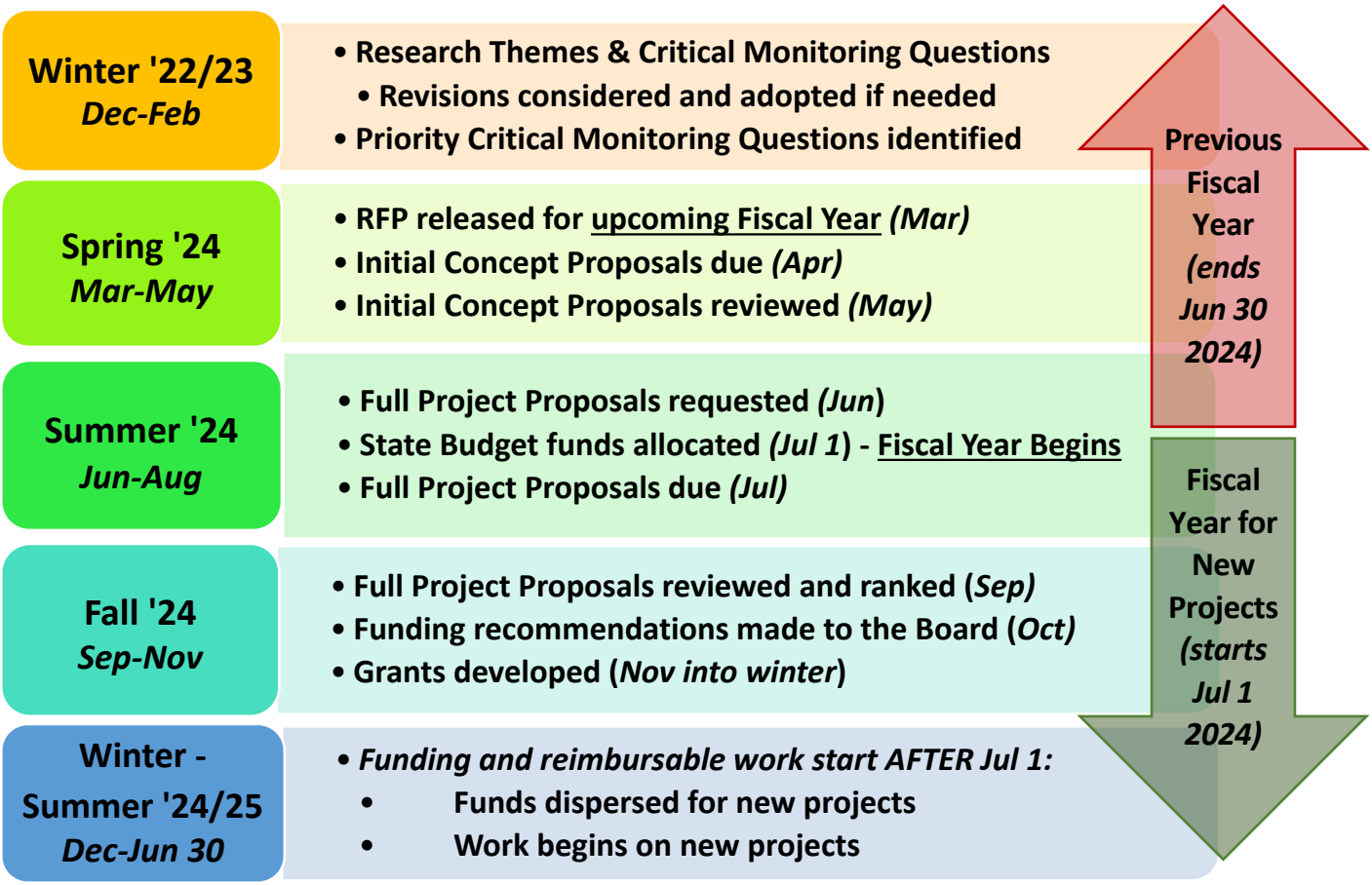

Figure 1. Sample Anticipated EMC Project Submission and Grant Processing Timeline
Key: RFP = Request for Proposals.

For FY 2023/24, the EMC was allocated ongoing funding of $425,000 from the Timber Regulation and Forest Restoration Fund (TRFRF), established by AB 1492, of which $204,476 was allotted to support ongoing, previously awarded projects and $220,524 remained for new projects starting in the current FY 2022/23 (see **Table 1** for a list of active projects and funding status). The EMC anticipates an allocation of $425,000 in FY 2024/25 and subsequent years and selected proposed projects with funding terms ending June 30, 2026 based on this anticipated funding. This funding is allocated to projects through the Board/Department of Forestry & Fire Protection (CAL FIRE) grants department.

Table 1. Ongoing EMC Projects with Continued Funding and/or Activity in Current (2023/2024) or Upcoming Fiscal Year(s)

Project #, *Award*	**Title**	**Primary Investigator(s), *Affiliation(s)***	**Project Liaison(s)**	**Project Status**	**Funding Status or Remaining Budget**
EMC-2015-001 *$ 221,271*	Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal influence of headwater streams into fish bearing systems	• Dr. Kevin Bladon, *Oregon State University* • Dr. Catalina Segura, *Oregon State University*	• Drew Coe	• Project Complete and Closed • Final project deliverables received • Anadromous Salmonid Protection Rule change resulted in 2022 • Additional refereed publications anticipated 2024	Fully allocated
EMC-2016-002 NA*	Post-fire Effectiveness of the Forest Practice Rules in Protecting Water Quality on Boggs Mountain Demonstration State Forest	• Joe Wagenbrenner, *Michigan Technological University* • Kevin Bladon, *Oregon State University* • Drew Coe, *CAL FIRE* • Don Lindsay, *California Geological Survey*	None[†]	• Project Complete and Closed • Final project deliverables received • Additional refereed publications anticipated 2024	Funded outside of the EMC
EMC-2016-003 *$ 100,000*	Road Rules Effectiveness at Reducing Mass Wasting (Repeat LiDAR Surveys to Detect Landslides)	• Bill Short, *California Geological Survey*	• Dr. Matthew O'Connor	• In progress and deliverables up-to-date • Final project deliverables and CRA anticipated 2024	Fully allocated

Project #, *Award*	**Title**	**Primary Investigator(s), *Affiliation(s)***	**Project Liaison(s)**	**Project Status**	**Funding Status or Remaining Budget**
EMC-2017-001 *$ 192,251*	Effects of Forest Stand Density Reduction on Nutrient Cycling and Nutrient Transport at the Caspar Creek Experimental Watershed	• Dr. Helen Dahlke, *University of California, Davis* • Dr. Randy Dahlgren, *University of California, Davis*	• Drew Coe • James Burke	• Final project report and presentation received • Peer-reviewed publication(s) and CRA anticipated 2024	Fully allocated
EMC-2017-002 *$ 1,200*	Boggs Mountain Demonstration State Forest (BMDSF) Post-Fire Automated Bird Recorders Study	Stacy Stanish, *CAL FIRE*	Dr. Kristina Wolf	• In progress • Final project deliverables and CRA anticipated 2024	Fully allocated
EMC-2017-006 *$ 114,844*	Fuel Treatment Alternatives in Riparian Zones of the Sierra Nevada	Dr. Rob York, *University of California, Berkeley*	• Dr. Matthew O'Connor • Drew Coe • Mathew Nannizzi	• Final project presentation received • Final project report, a refereed publication, and CRA anticipated 2024	Fully allocated
EMC-2017-007 *$ 71,278*	The Life Cycle of Dead Trees and Implications for Management	Dr. John Battles, *University of California, Berkeley*	• Dr. Michael Jones • Drew Coe	• Final project presentation received • Final project report and CRA anticipated 2024	Fully allocated
EMC-2017-008 *$ 108,986*	Do Forest Practice Rules Minimize Fir Mortality from Root Disease and Bark Beetle Interactions	Dr. Richard Cobb, *California Polytechnic State University*	• Ben Waitman • Jessica Leonard	• Work completed and final project deliverables received • Additional refereed publication anticipated 2024	Fully allocated

Project #, *Award*	**Title**	**Primary Investigator(s), *Affiliation(s)***	**Project Liaison(s)**	**Project Status**	**Funding Status or Remaining Budget**
EMC-2017-012 NA*	Assessment of Night-Flying Forest Pest Predator Communities on Demonstration State Forests – with Monitoring across Seral Stages and Silvicultural Prescriptions	Dr. Michael Baker, *California Department of Forestry & Fire Protection*	Drew Coe	• In progress and deliverables up-to-date • Final project deliverables anticipated 2025	Fully allocated via other funding streams outside of the EMC*
EMC-2018-003 *$ 101,802*	Alternative Meadow Restoration	Dr. Christopher Surfleet, *California Polytechnic State University*	• Dr. Leander Love-Anderegg • Dr. Matthew O'Connor	• Final project deliverables received • CRA anticipated 2024	$ 172.78
EMC-2018-006 *$ 694,371*	Effect of Forest Practice Rules on Restoring Canopy Closure, Water Temperature, & Primary Productivity	• Dr. Kevin Bladon, *Oregon State University* • Dr. Catalina Segura, *Oregon State University* • Matt House, *Green Diamond Resource Company* • Drew Coe, *CAL FIRE*	• Drew Coe • Mathew Nannizzi	• Final report received • Final project presentation and CRA anticipated 2024	$ 324.19
EMC-2019-002 *$ 68,168*	Evaluating Treatment Longevity and Maintenance Needs for Fuel Reduction Projects Implemented in the Wildland Urban Interface of Plumas County	• Brad Graevs, *Feather River Resource Conservation District* • Jason Moghaddas, *Spatial Informatics Group*	• Dr. Stacy Drury • Drew Coe	• Final project deliverables received • CRA anticipated 2024	Fully allocated

Project #, *Award*	**Title**	**Primary Investigator(s), *Affiliation(s)***	**Project Liaison(s)**	**Project Status**	**Funding Status or Remaining Budget**
EMC-2019-003 *$ 156,665*	Fuel Treatments & Hydrologic Implications in the Sierra Nevada	• Dr. Terri Hogue, *Colorado School of Mines* • Dr. Alicia Kinoshita, *San Diego State University*	Drew Coe	• In progress and deliverables up-to-date • Final project deliverables and CRA anticipated 2024	$ 45,539.60
EMC-2019-005 *$ 56,200*	Sediment Monitoring and Fish Habitat – San Vicente Accelerated Wood Recruitment	Cheryl Hayhurst, *California Geological Society*	Bill Short	• Due to wildfire, contract term expired and remaining funding disencumbered • Project plan revised and results to be shared in future	Fully allocated and remaining funds disencumbered
EMC-2021-003 *$ 448,510.00*	Evaluating the Response of Native Pollinators to Fuel-Reduction Treatments in Managed Conifer Forests	Dr. James Rivers, *Oregon State University*	Dr. Michael Jones	Funding awarded and work in progress	$ 319,599
EMC-2022-003 *$ 207,876*	Santa Cruz Mountains Post-Fire Redwood Defect Study	Nadia Hamey, *Hamey Woods*	Jonathan Meurer	Funding awarded and work in progress	$194,024
EMC-2022-004 *$ 85,000*	A critical evaluation of Forest Practice Regulation's capacity to accommodate forest restoration and resilience targets	Dr. Rob York, *University of California, Berkeley*	Dr. Leander Love-Anderegg	Funding awarded and work in progress	$85,000
EMC-2022-005 *$ 91,278*	Decay Rates and Fire Behavior of Woody Debris in Coastal Redwoods	• Tori Norville, *U.C. Cooperative Extension* • Dr. Michael Jones, *U.C. Cooperative Extension*	Drew Coe	Funding awarded and work in progress	$91,278

Project #, *Award*	**Title**	**Primary Investigator(s), *Affiliation(s)***	**Project Liaison(s)**	**Project Status**	**Funding Status or Remaining Budget**
EMC-2023-002 *$ 94,588*	Assessing Fire Hazard, Risk, and Post Fire Recovery for Watercourse and Lake Protection Zones (WLPZ) and riparian areas of California	• David Saah, *Spatial Informatics Group* • Ryan Tompkins, *U.C. Cooperative Extension*	Jessica Leonard	Funding awarded and work in progress	$94,588
EMC-2023-003 *$* 252,492	Pre- and Post-Harvest Fuel Loads and Implications for Site Productivity	Dr. John D. Bailey, *Oregon State University*	Clarence Hostler	Funding awarded and work in progress	$252,492

Key: CAL FIRE = California Department of Forestry & Fire Protection; CRA = Completed Research Assessment.

* EMC-supported, but not EMC-funded

† project liaisons were introduced in late 2020, and the performance period (i.e., funding period) ended prior to assignment of liaisons.

II. EMC SUPPORTED MONITORING PROJECTS – 2015 to 2023

A comprehensive list of all EMC-supported monitoring projects and links to supporting materials—including completed and closed projects—can be found on the Board's EMC webpage.[1]

III. EMC PRIORITIES AND ACCOMPLISHMENTS

2023 EMC Priorities and Accomplishments

Annual priorities are developed by the EMC and the Board as needs arise and with input from the public and stakeholders via an annual call for input. The EMC accomplished its 2023 priorities (see EMC 2023a) as follows:

1. **Meet at least four times per year in open meetings accessible to the public.**

   The EMC met four times virtually and in person in open, webcast meetings to conduct business.

2. **Meet in the field at least once to observe active or proposed monitoring projects.**

   The EMC conducted a full-day field tour at Boggs Mountain Demonstration State Forest in November 2023 to observe monitoring projects (see November 16, 2023 EMC meeting[2] and Boggs Mountain Demonstration State Forest Field Tour). The tour was attended by members of the public, governmental and non-governmental agencies, and forestry and industry professionals from across the State.

3. **Support projects related to the EMC Themes and CMQs, including funding new projects where knowledge gaps exist.**

   - The EMC received an ongoing allocation of $425,000 from the Timber Regulation and Forest Restoration Fund, of which $204,476 was allocated to previously awarded projects (see **Table 1**).
   - For the second year, the EMC utilized a new grant program developed in 2021. The release of the RFP was also shifted earlier in the year to March 2023, rather than summer as in previous years. This decision was made to allow for increased time to review applications, develop project and funding agreements, and encumber funds. This also allows project PIs to begin work earlier in the FY than has been possible in previous years, as the time limitations of State funding agreements limit the period during which PIs can receive reimbursement for approved research expenses.
   - Over the three fiscal years (starting in 2023/24) under consideration for funding in the 2023/24 RFP, and after consideration of previously allocated funds of $305,405 over that time period, remaining funding available for newly proposed projects starting in 2023/24 totaled $969,595, comprising $220,524 in FY 2023/24; $324,071 in FY 2024/25; and $425,000 in FY 2025/26. Funded one new EMC project proposal in 2023, with one additional project still under review for potential funding in the 2023/24 FY.
   - The EMC reviewed four Initial Concept Proposals (ICPs) at an open, public meeting and requested Full Project Proposals (FPPs) from all four research teams. Upon review and discussion at a

[1] https://bof.fire.ca.gov/board-committees/effectiveness-monitoring-committee/

[2] https://bof.fire.ca.gov/media/ifqhi0ua/04-nov-16-2023-emc-agenda-final.pdf

subsequent public meeting, the committee voted to recommend funding for one proposal, EMC-2023-003, with a request to the PIs to add in a Data Management Plan; the committee tabled a vote on a second proposal to allow for additional time for EMC members to work with the PIs to make substantial alterations to the Full Project Proposal prior to a vote.

- **Funded:** EMC-2023-003: Pre- and Post-Harvest Fuel Loads and Implications for Site Productivity[3]
- **Pending Vote on Funding Recommendation:** EMC-2023-002: Assessing Fire Hazard, Risk, and Post Fire Recovery for Watercourse and Lake Protection Zones and riparian areas of California[4]

Board staff began developing required documents for funding encumbrance on EMC-2023-003 through the grants program in July 2023. The EMC met in November 2023 to vote on the second proposal, but a quorum was not present and a vote could not be cast. It is anticipated that the EMC and the Board will review and finalize funding recommendations on EMC-2023-002 in early 2024.

4. Monitor progress on EMC-funded or EMC-supported monitoring projects and share relevant publications.

- The EMC continued to utilize a new framework for processing completed EMC-funded projects—established and utilized for the first time in 2021—to better facilitate EMC reporting to the Board. This "Completed Research Assessment" (CRA; previously known as "Science to Policy Framework") (EMC 2021) provides a step-by-step approach to guide EMC members in verifying scientific integrity and validity of the research, and interprets the results of the scientific research as to the implications for management and policy. Two EMC members volunteer to work with the PIs of each project to complete this document, which is then presented to the EMC and amended as necessary prior to presentation to the Board. This provides an easily understood narrative and synthesis for Board members to give context to study results and inform policy changes, if justified.
- Additional staff support was secured via the Water Boards to assist with tracking EMC projects, taking notes during EMC meetings, and coordinating with Project Liaisons and PIs.
- **Reports or other deliverables** were submitted to the EMC in 2023 for the following projects:
  - EMC-2015-001: Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal influence of headwater streams into fish bearing systems – previously unsubmitted deliverables were received from years prior to 2023:
    - Master's thesis, "Assessing the Thermal Sensitivity and Stormflow Response of Headwater Stream Temperatures: A Seasonal and Event-scale Exploration in Northern California, USA" (Wissler 2021) (also associated with EMC-2018-006: Effect of Forest Practice Rules on Restoring Canopy Closure, Water Temperature, & Primary Productivity)
    - Honor's thesis, "Effects of Contemporary Forest Practices on Stream Nutrients, Temperature, and Periphyton in Small Headwater Streams" (Pimont 2022)

[3] https://bof.fire.ca.gov/media/z5tjp0qu/5-emc-2023-003-osu-redacted_ada.pdf
[4] https://bof.fire.ca.gov/media/x3tinzr5/5-emc-2023-002-sig-redacted_ada.pdf

- EMC-2017-001: Effects of Forest Stand Density Reduction on Nutrient Cycling and Nutrient Transport at the Caspar Creek Experimental Watershed – "Effects of forest stand density reduction on nutrient transport at the Caspar Creek Watershed", a previously unsubmitted final project report (Dahlke 2021)
- EMC-2017-012: Assessment of Night-Flying Forest Pest Predator Communities on Demonstration State Forests - with Monitoring across Seral Stages and Silvicultural Prescriptions – three deliverables were shared in 2023:
  - "Singing silver-haired bats (*Lasionycteris noctivagans*)", a poster was presented at the 51st annual North American Symposium on Bat Research (Lausen et al. 2023a)
  - "Singing silver-haired bats", a previously unsubmitted poster received in 2023, was presented at the Northeastern Bat Working Group meeting (Lausen et al. 2022); and,
  - A dataset is housed online at Dryad | Data -- Singing silver-haired bats (*Lasionycteris noctivagans*) (datadryad.org) (Lausen et al. 2023c)
- EMC-2018-003: Alternative Meadow Restoration – three deliverables were submitted in 2023:
  - "Final Report to the California State Board of Forestry and Fire on EMC-2018-003: Alternative Meadow Restoration", a final project report (Surfleet 2023b);
  - "Hydrologic response of meadow restoration following the removal of encroached conifers", a poster presentation at the 2023 Society for American Foresters National Convention (Ramirez and Surfleet 2023); and,
  - "Effectiveness of meadow and wet area restoration as an alternative to watercourse and lake protection (WLPZ) rules", a final project presentation (Surfleet 2023a).
- EMC-2018-006: Effect of Forest Practice Rules on Restoring Canopy Closure, Water Temperature, & Primary Productivity – two deliverables were shared in 2023:
  - "Effectiveness of Class II Watercourse and Lake Protection Zone (WLPZ) Forest Practice Rules (FPRs) and Aquatic Habitat Conservation Plan (AHCP) Riparian Prescriptions at Maintaining or Restoring Canopy Closure, Stream Water Temperature, Primary Productivity, and Terrestrial Habitat", a final project report (Bladon et al. 2023); and,
  - "Summer Low Flow response to Timber Harvest and Riparian Treatments in Forested Headwater Streams of Coastal Northern California", a previously unsubmitted Master's thesis (Nicholas 2022)

- **Presentations** were provided at public EMC meetings in 2023 by members of research teams for the following projects:
  - EMC-2017-002: Boggs Mountain Demonstration State Forest (BMDSF) Post-Fire Automated Bird Recorders Study – "Boggs Mountain Demonstration State Forest Bird Study", a project status presentation (Stanish 2023)

- EMC-2017-006: Fuel Treatment Alternatives in Riparian Zones of the Sierra Nevada – three presentations were given in 2023:
  - "Alternatives for Fuel Treatments in Riparian Zones in Mixed Conifer Forests", a Blodgett Forest field tour (York 2023a)
  - "Fuel treatment alternatives in riparian zones of the Sierra Nevada", a final project presentation (York 2023b);
  - "Fuel treatment alternatives in riparian zones of the Sierra Nevada" a presentation to the Forest Practice Committee (York 2023c).
- EMC-2017-008: Forest Practice Rules to Minimize Fir Mortality from Root Diseases – a final draft of the CRA (Waitman and Leonard 2022) was shared with the EMC and the Board
- EMC-2018-003: Alternative Meadow Restoration – "Effectiveness of meadow and wet area restoration as an alternative to watercourse and lake protection (WLPZ) rules", a final project presentation (Surfleet 2023a)

- **Peer-reviewed journal articles** were submitted to the EMC in 2023 from the following EMC projects:
  - EMC-2015-001: Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal influence of headwater streams into fish bearing systems – "Comparing headwater stream thermal sensitivity across two distinct regions in Northern California", a previously unsubmitted article was published in *Hydrological Processes* (Wissler et al. 2022) (also associated with EMC-2018-006: Effect of Forest Practice Rules [FPR] on Restoring Canopy Closure, Water Temperature, & Primary Productivity)
  - EMC-2017-008: Forest Practice Rules to Minimize Fir Mortality from Root Disease – "Changes to relative stand composition after almost 50 years of *Heterobasidion* root disease in California true fir and pine forests", a peer-reviewed article published in *Forest Pathology* (Flores et al. 2023)
  - EMC-2017-012: Assessment of Night-Flying Forest Pest Predator Communities on Demonstration State Forests - with Monitoring across Seral Stages and Silvicultural Prescriptions – "Singing silver-haired bats (*Lasionycteris noctivagans*)", a peer-reviewed article published in the *Wildlife Society Bulletin* (Lausen et al. 2023b)
  - EMC-2018-006: Effect of Forest Practice Rules [FPR] on Restoring Canopy Closure, Water Temperature, & Primary Productivity – two deliverables were received in 2023:
    - "Comparing headwater stream thermal sensitivity across two distinct regions in Northern California", a peer-reviewed article published in *Hydrological Processes* (Wissler et al. 2022) (also associated with EMC-2015-001: Class II Large Watercourse Study: Multiscale investigation of perennial flow and thermal influence of headwater streams into fish bearing systems); and,
    - "Stream temperature responses to forest harvesting with different riparian buffer prescriptions in northern California, USA", a peer-reviewed article published in *Forest Ecology and Management* (Miralha et al. 2023)

- To facilitate **dissemination of EMC-relevant research**, the EMC coordinates with CAL FIRE to post and share selected publications and information relevant to the EMC's efforts.

- The EMC shared the California Forestry Report No. 7: Mitigation Potential Sediment Delivery from Post-Fire Salvage Logging (Waggenbrenner et al. 2023) on its website and on the Board's 'Latest' webpage. This report was a collaborative effort between the Pacific Southwest Research Station and CAL FIRE's Watershed Protection Program that is geared toward practitioners with a goal of reducing sedimentary impacts with post-fire salvage logging. There is a lot of emphasis on understanding post-fire process, the effects of logging on those processes, and the interactions between those disturbances. This is the first report of its kind synthesizing research results into operational recommendations.
- Member Coe noted that the Board approved the Forest Fire Prevention Monitoring Report at the January meeting; the draft has now moved to agency for further review. This extensive report looks at outcomes following implementation of forest fire prevention exemptions, and recommendations do call for the potential need for statutory change.

5. **Review and update EMC Research Themes and CMQs as needed.**
   - The Research Themes and CMQs were revised by the EMC and approved in January 2024 (EMC 2024a).
   - One new CMQ was added to Research Theme 9, Wildlife Habitat - Cumulative Impacts, along with few minor, non-substantive changes made for clarification (see all revisions in the DRAFT Research Themes and CMQs 2024, EMC 2024b). The final version of the Research Themes and CMQs for 2024 were approved by the EMC and the Board, and posted online (EMC 2024a).
6. **Identify up to five themes/CMQs for priority research funding in the 2023/24 RFP.**

   Six CMQs were prioritized for funding in the 2023/24, as the EMC members determined that an additional CMQ should be prioritized for funding. As in previous years, these questions were prioritized for research funding in the current FY, but not to the exclusion of projects focusing on the remaining CMQs or other research needs related to the FPRs and associated regulations (see the 2023/24 RFP, EMC 2023b).
7. **Revisit the EMC's 2014 Charter to assess need for changes, and begin process of revision, if needed.**

   In 2023, the EMC identified a potential need to secure funding sources to support EMC member travel to public meetings. This priority was not pursued based on information received from the Natural Resources Agency that EMC travel should come out of Board-allocated funds.
8. **Fill currently open and pending open EMC seats, as well as any seats for which terms expire in 2023, filling gaps in expertise and agency representation as needed.**

   Two new members were welcomed to the EMC in 2023, a new co-chair was appointed, two members will continue appointments that expired in 2023, and two members stepped down. The updated Membership Roster is available online at EMC Members and Term Expirations (EMC 2024c). See Section IV. EMC Membership and Staff for further details.

2024 EMC Priorities

In 2024, the EMC priorities are as follows:

1. **Meet at least four times per year in open meetings accessible to the public.**
2. **Meet in the field at least once to observe active or proposed monitoring projects.**
3. **Support projects related to the EMC Themes and CMQs, including funding new projects where**

knowledge gaps exist.

4. **Monitor progress on EMC-funded or EMC-supported monitoring projects.**
5. **Review and update EMC Research Themes and CMQs as needed.**
6. **Identify themes/CMQs for priority research funding in the 2024/25 RFP.**
7. **Use an Adaptive Management approach to provide research results that inform management and policy development.**

   Once projects are completed, ensure a full review of the results that translates research results for management purposes and to inform the regulations and rule-making processes via an Adaptive Management Process as described in the Strategic Plan (EMC 2022). This may be accomplished by the CRA process or other mechanisms, including discussions and presentations at Board meetings or the Board's Standing Committee meetings (i.e., the Forest Practice Committee, Resource Protection Committee, and Management Committee).

8. **Review EMC Guidance Documents and revise as needed.**

   Assess the need for changes to or retirement of documents that guide the goals, priorities, actions, and general workflow protocols of the EMC (e.g., Strategic Plan, Charter, Project Liaison Guide, etc.). Revise and update the EMC's 2014 Charter (EMC 2013) to reflect current needs and priorities of the EMC, the Board, stakeholders, and the public.

9. **Fill currently open and pending open EMC seats, as well as any seats for which terms expire in 2024, filling gaps in expertise and agency representation as needed.**

   See Section IV. EMC Membership and Staff, for further details.

IV. EMC MEMBERSHIP AND STAFF

The EMC has 17 mandated seats, including two co-chairs (one from the Board), eight agency representatives, and seven monitoring community members. Additional staff support positions are provided by the Board, CAL FIRE, and other agencies. In 2023, the EMC welcomed two new members, a new co-chair was appointed, and two members agreed to continue their appointments expiring in 2023 after a reappointment vote anticipated in January 2024. Three seats remained unfilled on the EMC, two of which were vacated in 2023: two seats for the Monitoring Community, and one seat for a representative of the U.S. Fish and Wildlife Service. More details on member terms and seats follows:

- Member Coe filled the seat of former co-chair Loretta Moreno in mid-July. Co-chair Coe is an agency representative for CAL FIRE and has served on the EMC since 2014. Ms. Moreno served on the EMC since July 2019.
- Jonathan Meurer joined the EMC as an agency representative of the Central Valley Regional Water Quality Control Board when the Board approved the EMC's recommendation at the March 3, 2023 meeting. Member Meurer is an Engineering Geologist for the Central Valley Regional Water Quality Control Board, and fills the seat behind Justin LaNier, who also represented the Central Valley Regional Water Quality Control Board.
- Clesi Bennett filled Loretta Moreno's seat as an agency representative of the California Natural Resources Agency when the Board approved the EMC's recommendation at the November 2 meeting.

- Terms for Members Dr. Love-Anderegg and Dr. O'Connor—who sit on the Monitoring Community—expired in June, and they have agreed to continue their terms if the EMC has a positive reappointment vote for each member in January 2024, assuming a quorum is present at that first meeting of the new calendar year.
- Two seats on the Monitoring Community remain vacant as of September 2021 and July 2023. The agency representative seat for the U.S. Fish and Wildlife Service has been vacant for many years. While currently filled, two agency representative seats will be back-filled as soon as appropriate candidates have been identified, nominated, and a public EMC vote can take place.

The updated Membership Roster is available online at EMC Members and Term Expirations (EMC 2023c). See **Table 2** for a list of current membership and support staff.

Table 2. Current EMC Membership and Support Staff.

Name	Specialty	Affiliation	Term End Date
Co-Chairs			
Drew Coe *Formerly:* Loretta Moreno	Hydrology and Forestry	CAL FIRE	7/14/2027
Elizabeth ("Liz") Forsburg-Pardi, Ph.D.	Forest and Water Policy	Board of Forestry and Fire Protection The Nature Conservancy	01/15/2025
Monitoring Community			
Michael Jones, Ph.D.	Forest Health and Disturbance Ecology, RPF 3241	Forest Advisor Mendocino, Lake, and Sonoma Counties University of California Cooperative Extension	08/17/2026
Mathew Nannizzi	Aquatic Biology	Green Diamond Resource Company	11/02/2026
Sal Chinnici	Wildlife	Humboldt and Mendocino Redwood Companies	07/03/2024
Matthew O'Connor, Ph.D.	Geology and Geomorphology	Public, O'Connor Environmental	07/05/2023 reappointment vote in 2024
VACANT *Formerly:* Sarah Bisbing, Ph.D.	*Formerly:* Forest Ecology and Forestry	*Formerly:* 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 reappointment vote in 2024
VACANT *Formerly:* Peter Freer-Smith, Ph.D.	*Formerly:* Plant Ecology and Environmental Policy	*Formerly:* University of California, Davis	*Resigned 07/05/2023*
Agency Representatives			
Pending Open Seat Stacy Drury, Ph.D.	Fire Ecology	USDA Forest Service Pacific Southwest Research Station	n/a
Ben Waitman	Wildlife	California Department of Fish and Wildlife	n/a

Name	Specialty	Affiliation	Term End Date
Clesi Bennett *Formerly:* Drew Coe	Climate Change, Environmental Justice, and Natural Resources Policy	California Natural Resources Agency	n/a
Pending Open Seat Jessica Leonard	Watershed Management	State Water Resources Control Board	n/a
Jonathan Meurer *Formerly:* 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
VACANT		U.S. Fish & Wildlife Service	n/a
Support Staff			
Edith Hannigan	Forestry and Fire Protection, Land Use Planning	Executive Officer, Board of Forestry and Fire Protection	n/a
Aaron Rachels	Geology, Engineering, Forest Activities, and Storm Water Management	Central Valley Regional Water Quality Control Board	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
Kristina Wolf, Ph.D.	Rangeland and Restoration Ecology	Environmental Scientist, Board of Forestry and Fire Protection	n/a

Key: CAL FIRE = California Department of Forestry & Fire Protection; RPF = Registered Professional Forester; USDA = United States Department of Agriculture.

Two seats on the Monitoring Community expired in 2023; members in those seats are interested in continuing their terms and their reappointments will be agendized for a vote at the first meeting of 2024. As of December 2023, nominations are being accepted for up to 5 seats on the EMC. Of these, three seats are currently vacant, and two are filled by members that will vacate them once an appropriate candidate can be identified and confirmed. The seats are:

1. **Monitoring Community:** two open seats
    - One open seat previously filled by a professor with expertise in forest ecology and forestry from University of Nevada, Reno; this seat was vacated in September 2021.
    - One open seat previously filled by a professor with expertise in plant ecology and environmental policy from University of California, Berkeley; this seat was vacated in July 2023.

2. **Agency Representatives:** up to three open/pending open seats
    - State Water Resources Quality Control Board (SWRQWB) – pending open seat currently filled by Jessica Leaonard, whose background is in watershed management.
    - US Forest Service (USFS) – pending open seat currently filled by Dr. Stacy Drury with the Pacific Southwest Research Station, whose background is in fire ecology. While not a mandated seat, the USFS has had agency representation on the EMC for some time, and there is strong EMC support for continued representation. Member Drury will vacate this seat once an appropriate candidate is appointed.
    - US Fish and Wildlife Service (USFWS) – one open seat; the USFWS was expected to recommend a nominee in 2022 and 2023, but the seat remains open without a nominee.
3. **Term Expirations:** one term expires in 2024; if that member is unable to remain in their seat, a call for applications including that seat will be advertised on the EMC webpage, Board webpage, and via listservs.

V. EMC PROJECT UPDATES AND PRODUCTS

The following project summaries provide more information on reported activities in 2023 (or prior years, if previously unreported), including details on project deliverables provided in 2023 or that are anticipated in future years.

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

Final project deliverables and a CRA were submitted and presented in 2021. Previously unsubmitted project deliverables from years prior to 2023 were received, including theses from 2021 ("Assessing the Thermal Sensitivity and Stormflow Response of Headwater Stream Temperatures: A Seasonal and Event-scale Exploration in Northern California, USA" [Wissler 2021]; also see EMC-2018-006) and 2022 ("Effects of Contemporary Forest Practices on Stream Nutrients, Temperature, and Periphyton in Small Headwater Streams" [Pimont 2022]), and a peer-reviewed publication, "Comparing headwater stream thermal sensitivity across two distinct regions in Northern California" published in *Hydrological Processes* (Wissler et al. 2022; also see EMC-2018-006). While the project work has been completed and all final deliverables, project reports, and the CRA have been received, additional products and at least one peer-refereed publications are anticipated in 2024. A rule revision related to the Anadromous Salmonid Protection Rules resulted from this research in 2022, such that the rule language was simplified for identification of Class II Large (II-L) watercourses (i.e., 14 CCR § 916.9 [936.9, 956.9] (g)(1)(A)(2) was removed, as was the sunset language in 14 CCR § 916.9 [936.9, 956.9] (g)(1)(C)] which mandated an assessment of the effectiveness of the various Class II-L identification methods).

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

Final project deliverables were submitted from 2016 through 2021, with one additional presentation in 2021. A CRA was not developed for this project as it was closed prior to the development of this requirement for EMC projects. While the project work has been completed and all final deliverables and project reports have been received, additional peer-refereed publications related to this work are anticipated in subsequent years; none were received in 2023.

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

Project status updates and presentations were provided for this project in 2022. Member Short provided a project update at the February 16, 2023 meeting to provide context for EMC members deciding on potential involvement in developing a CRA for this project. This project was one of the first EMC proposals and designed to test the effectiveness of repeat surveys in assessing landslide movement in harvested and unharvested forests as a proof-of-concept that repeated surveys could be used following large storm events rather than requiring on-the-ground assessments and aerial photographs. Previously collected LiDAR (Light Detection and Ranging) data in the El Dorado County area was being used in these assessments and receipt of LiDAR data was significantly delayed, resulting in delays in analysis. The project was not entirely complete at the time of the update, and the analysis and final report were pending completion. A final project report, presentation, and CRA are expected in 2024 and beyond.

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

Several project status updates were given on this project from 2017 through 2022 and a final project presentation was given in late 2022, but these deliverables do not represent the full suite of products that are likely to come out of these experiments in the next year or two. At the February 16, 2023 Member Coe reported that additional staff would be brought on to contribute to these additional deliverables, and at the August 2, 2023 EMC meeting Member Coe reported that the additional staff were not brought on after all, so the timeline may have to be extended. A previously unsubmitted final project report, "Effects of forest stand density reduction on nutrient transport at the Caspar Creek Watershed" (Dahlke 2021) was received in late 2023. Additional refereed publications and a CRA are still expected in 2024 and beyond.

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

A progress report presentation was given to the EMC at the February 16, 2023 meeting entitled "Boggs Mountain Demonstration State Forest Bird Study" (Stanish 2023) by Department of Forestry & Fire Protection Forest (CAL FIRE) Practice Biologist and Registered Professional Forester Anastasia ('Stacy') Stanish. Boggs Mountain Demonstration State Forest (BMDSF) is located in Lake County and comprises stands of ponderosa pines, sugar pines, Douglas Fir and hardwoods at 2,400 to 3,750 feet in elevation across almost 3,500 acres. The 2015 Valley Fire burned 99% of BMDSF at a moderate to high severity, resulting in a "moonscape" appearance. Plots were established on the forest to investigate three different treatments: 1) "Harvest – pile & burn-rip": salvaged, ripped, pile burned, herbicide, and planted; 2) "Harvest – top & scatter": salvaged, pile burned, no herbicide or planting; and 3) "Control": unsalvaged. This study was nested into the approximately 15-acre plots with four replicates of each treatment type.

The study design was based on the Ecological Biodiversity Monitoring (EBM) protocol developed by the Department of Fish & Wildlife (CDFW), which requires setting out autonomous recording units (ARUs) in late spring and early summer over the course of three days, recording for 5 minutes at 30 minutes before sunrise, at sunrise, and 30 minutes after sunrise. Photos were also taken in all cardinal directions from the center of each plot to capture information on the vegetation at the time of the recording. The study continued for three years, and data were sent to a bird interpreter to document types of calls/songs, how close sounds were to the ARU, and wing flaps, consistent with the EBM protocol. Few detections were collected in the salvaged plots, but there were many more in the control plots. Sixty-three distinct species were identified, which is remarkable in a forest that had been burned so dramatically; this is consistent with

previously conducted point count survey done many years before the Valley Fire. There was consistent but decreasing occupancy over the course of the three years. A cursory analysis of species richness showed that the control was most consistent, while treatment plots were much more variable.

The last year of data collection occurred in 2019, and the bird interpreter completed their work in 2020. The COVID-19 pandemic delayed the analyses and study completion, but the PI is working with an in-house CAL FIRE statistician on the analysis and would like to see a publication come out of this. The study will restart the study in 2025, and the PI would like to replicate it again in 2035 to investigate the "winners and losers", i.e., changes in species dynamics, in these plots over time. Member Coe reported that this research is tiered to the Fire and Resource Assessment Program (FRAP) study, and FRAP was just completing to their data analysis, so the strength of this study would be increased once those abundance and richness metrics can be linked to the FRAP vegetation characteristics data.

A tour of the study site and brief presentation on this project were also provided at the combined November 16, 2023 EMC meeting[5] and Boggs Mountain Demonstration State Forest Field Tour.[6] Other presentations and/or posters have been made at conferences or other events in prior years, but the EMC does not have copies of all deliverables for this project, although Board staff continue to work on obtaining those documents. A final project presentation, report, and CRA are expected in 2024 and beyond.

EMC-2017-006: Fuel Treatment Alternatives in Riparian Zones of the Sierra Nevada

A final project presentation, "Fuel treatment alternatives in riparian zones of the Sierra Nevada" (York 2023b), was provided by Dr. Rob York of U.C. Berkeley at the February 16, 2023 EMC Meeting. This project investigated fuel treatment options in watercourses, which are relatively limited due to the protected status of riparian areas. The King Fire of 2014 influenced this research, as it was a high-severity fire with generally severe effects, but there was decent survival in upslope areas with successful fuel treatments adjacent to riparian areas, coupled with massive mortality in untreated areas adjacent to riparian areas. This research asked if these special status areas should be prioritized for fuel treatment, and if the current guidance around lack of treatment in riparian zones is based on out-of-date understanding of protective measures, and therefore may be counterproductive to protecting riparian zones.

Fire Return Intervals (FRI) in riparian areas and upslope from riparian areas were similar, at 16.6 and 16.9 years, respectively, and seasonality (i.e., late summer-early fall) was similar as well. Moving from very dry to less dry forests, low density forests dominate the landscape, so it is not a leap to assume that riparian zones may also naturally be of a lower density. Riparian zones are disturbance dependent, but are not generally managed as such, allowing them to grow more densely. In an upslope WLPZ, surface fuels may reach 13 tons per acre, while within the WLPZ, these may reach 45 tons per acre, which is a very high and may not represent natural conditions. Dr. York suggested treatments in WLPZs be considered to help restore structure, process, and composition. However, fuels treatments outside of timber operations may not necessarily be sustainable because of high costs, and timber is not harvested to offset costs, it is not economically feasible. Compared to a prescribed burn or mastication alone, a commercial thin generates income that allows for additional fuels treatments. Some treatments may also not be considered because they might be considered too damaging within the riparian zone, causing soil compaction, erosion,

[5] https://bof.fire.ca.gov/media/ifqhi0ua/04-nov-16-2023-emc-agenda-final.pdf
[6] https://bof.fire.ca.gov/media/xuflfyg1/boggs-mtn-dsf-field-tour-nov-16-flyer_ada.pdf

sedimentation and runoff, introduction of invasive species or potential for introduction of fire-sensitive riparian species, and potential heating of water from increased radiation.

This study has three phases and is intended to be a long-term (decadal) study. The current Phase (Phase 1) conducts experimental trials of treatment alternatives at one site to inform policy and regulatory development. Phase 2 will expand this study to several sites. Phase 3 will include repeat treatments and long-term monitoring, with the intention to continue to inform policy and regulatory development. This presentation focused on Phase 1 in Blodgett Forest Research Station in El Dorado County in the Central Sierras. All Class I and II WLPZs in the forest were designated as the study areas, and were randomly allocated to one of four treatments:

1) Control – do nothing;
2) Status Quo – follow the FPRs; no heavy equipment and comply with the WLPZ protections table introduced earlier;
3) Thin/Fuel Treatment with Equipment, "Fuel tx" – following guidance like in Agee and Skinner's article, "Basic principles of forest fuel reduction treatments", thinning from below to 150 ft^2/acre with follow up treatment to pile and burn or broadcast burn to reduce ladder and surface fuel treatments; and,
4) Thin/Gaps/Fuel Treatment with Equipment, "Fuel Tx+gaps" – same as treatment 3 plus gap-based silviculture with gaps ranging from 0.1 to 0.4 acres, post-harvest slash piling with excavator and pile burning, and planting with Ponderosa pine and sugar pine.

Measurements within plots included forest structure and composition; light availability (%TTR = of light that hits the canopy, the percent that reaches the forest floor); alder trees, revenue, yield, and sediment delivery corridors. Measurements were taken adjacent to the watercourse and further from the watercourse outside the plots. Some measurements were not successful: soil strength, surface fuel, and regenerative success of planted pine species. Pre-treatment measurements were taken in 1997 (historical data because the plots were existing, permanent plots), and again in 2007 and 2016. Commercial thins were conducted from 2018–2021, and post-commercial thin measurements and fuel treatments were conducted as possible thereafter.

Analyses revealed an increase in degree of light input moving from Treatment 2 (Status Quo) to Treatment 3 (Fuel tx) and to Treatment 4 (Fuel tx+gaps), but post-hoc comparisons suggested no significant difference between the Status Quo and Fuel tx, although there was a difference between those and Fuel tx+gaps. Overall, light input was still low given that 40% TTR is the minimum requirement for Ponderosa pine regeneration, and all light inputs were below 40%. Light input did increase after all treatments in Treatments 2, 3, and 4. The edges of treatments had higher light inputs, but patterns were similar as within the treatment plots adjacent to the watercourse. In riparian zones, if the goal is to reduce fire hazard while minimizing light input, then thinning without gaps works (Fuel tx). If the goal is to reduce fire hazards, create heterogeneity, and introduce a severe enough disturbance to increase light inputs and regenerate shade intolerants (e.g., Ponderosa pine, alder), then larger gaps and/or more intense thinning than was tested in this study would likely be needed (i.e., some *more intense* combination of Fuel tx+gaps). If the goal is to only increase heterogeneity without increasing light inputs substantially, the Fuel+tx approach works well.

The Status Quo treatment (removal of 5 trees per acre [tpa]) did not yield nearly as much timber as Fuel tx (51 tpa) and Fuel tx+gaps (52 tpa). Yield increases resulted from more trees being removed, and not from

bigger trees being removed. Given the differences in assumed net revenue rates, the assumed net was about ten times higher in the Fuel tx+gap compared to the Status Quo. The increased yield from the increased fuel treatment costs in the more heavily treated plots more than offsets the cost of the treatments, which suggests potential for economic sustainability.

Dr. York also provided a presentation entitled "Fuel treatment alternatives in riparian zones of the Sierra Nevada" on this research to the Forest Practice Committee at its March 8, 2023 meeting (York 2023c); the EMC does not have copies of that presentation, but Board staff continues to work on obtaining it. Field tours were provided for the Watershed Education Foundation in July 2023, as well as to the Board at Blodgett Forest (see "Alternatives for Fuel Treatments in Riparian Zones in Mixed Conifer Forests", York 2023a) in November. A peer-reviewed publication is expected from this research in 2024, and the PI is considering plans for Phase 2 with the hopes of informing policy and regulatory development. A final project report is expected in 2024, and Members Coe and Nannizzi volunteered at the February 16, 2023 meeting to develop a CRA for this project to be presented in 2023. Member Coe noted at the August 2, 2023 meeting that the CRA would be presented at the next EMC meeting, although this was delayed to 2024 due to time conflicts with a field tour.

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

Following a final project presentation (see "The Life Cycle of Dead Trees and Implications for Management", Battles et al. 2022) and receipt of a draft final report in 2022, the report was revised and resubmitted in 2023 and is in the process of a final revision. Co-Chair Moreno provided a brief project update at the June 7, 2023 EMC meeting that she would work with Member Jones to finalize the report and develop a CRA. However, Co-Chair Moreno stepped down from the EMC in fall 2023, and this work was shifted to Member Jones and Member Coe. The final research report and CRA are expected in 2024.

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

Dr. Richard Cobb of California Polytechnic State University, San Luis Obispo provided a final project presentation in 2022 to the EMC and the revised draft of the CRA (Waitman and Leonard 2022) was shared with the EMC and the Board in January 2023. A peer-reviewed article was published in 2023 in *Forest Pathology* entitled "Changes to relative stand composition after almost 50 years of *Heterobasidion* root disease in California true fir and pine forests" (Flores et al. 2023). While the results of this research do not directly address specific targets or prescriptions in the FPRs, this work addressed an important disease affecting commercial timber species and identified important practices that can aid the timber industry in maintaining susceptible stands. One additional refereed publication is anticipated in 2024.

EMC-2017-012: Assessment of Night-Flying Forest Pest Predator Communities on Demonstration State Forests – with Monitoring across Seral Stages and Silvicultural Prescriptions

This study focuses on forest stands where bats would be foraging for insects (avoiding travel routes or watering sites) and explores bat communities in 50+ year old stands at Jackson Demonstration State Forest (JSDF). The main research question is, "Are the FPRs effective in promoting habitats suitable for bat survival?" which is related to the following regulations: 14 California Code of Regulations (CCR) § 897, 14 CCR § 912.9 (932.9, 952.9), 14 CCR § 913.4 (939.4, 959.4), and 14 CCR § 919 (939, 959). The research relates to EMC Research Theme 7 (Wildlife Habitat: Species and Nest Sites), Theme 8 (Wildlife Habitat: Seral Stages), and Theme 10 (Wildlife Habitat: Structures).

Some of the data collected as part of this effort was utilized in a publication in the *Wildlife Society Bulletin* entitled "Singing silver-haired bats (*Lasionycteris noctivagans*" (Lausen et al. 2023b). Data from Jackson DSF were instrumental in moving the work forward to produce this paper when a previously-unreported phenomenon was noted during review of some individual bat call recordings from this project. These 'songs' are very different from the more-familiar echolocation pulses that bats use for navigation in total darkness and for detecting and capturing insects on-the-wing. An associated poster—also titled "Singing silver-haired bats (*Lasionycteris noctivagans*)"—was presented by the lead author at the 51st annual North American Symposium on Bat Research in Winnipeg (Manitoba), Canada (Lausen et al. 2023a). A previously unsubmitted poster was also received in 2023, "Singing silver-haired bats", which was presented at the Northeastern Bat Working Group meeting (Lausen et al. 2022). A dataset from this research has been saved at Dryad | Data – Singing silver-haired bats (*Lasionycteris noctivagans*) (datadryad.org) (Lausen et al. 2023c).

Sampling for this project has occurred at Jackson Demonstration State Forest (DSF), Mountain Home DSF, and Soquel DSF, with final sampling scheduled at the Latour DSF in summer 2024 with the goal of producing a final report in 2025. Future progress reporting for each DSF will mirror the current format. The final report will present analyses of bat species presence relative to silvicultural history and local/landscape level habitat measurements with discussion of aggregate results from all four DSFs.

EMC-2018-003: Alternative Meadow Restoration

This study evaluates application of CCR § 933.4[e] for removal of encroached conifer trees in a northern Sierra meadow. Removal of conifers (*Pinus contorta*) resulted in observed increases in shallow groundwater elevation and soil moisture except in drought years. At one of the two meadows subject to study, Marian Meadow, the groundwater elevation and soil moisture increases were persistent over a six-year monitoring period. Meadow vegetation recovery occurred relatively quickly in wetter areas and was slower to recover in dry areas of the Rock Creek meadow site. Disturbance to soils was evaluated from a variety of perspectives and found to be minor. Aquatic habitat conditions were measured and monitored, but disturbance effects from the Dixie Fire to the project area were believed to be greater than project effects. Tree removal by logging contractors within the WLPZ caused very little disturbance; some meadow areas outside the WLPZ were disturbed to a greater degree. Implementation of the project was hampered in some respects by regulatory matters.

Dr. Christopher Surfleet of the Natural Management and Environmental Sciences department at California Polytechnic State University, San Luis Obispo submitted a Final Report to the California State Board of Forestry and Fire on EMC-2018-003: Alternative Meadow Restoration to the EMC (Surfleet 2023b). A poster presentation was provided at the 2023 Society for American Foresters National Convention entitled "Hydrologic response of meadow restoration following the removal of encroached conifers" (Ramirez and Surfleet 2023). Dr. Surfleet gave a final project presentation entitled "Effectiveness of meadow and wet area restoration as an alternative to watercourse and lake protection (WLPZ) rules" (Surfleet 2023a) at the November 16, 2023 EMC meeting.

At the August 2, 2023 EMC meeting Member Dr. O'Connor reported that a CRA was ready to be developed, which Members Dr. O'Connor and Dr. Love-Anderegg will produce for presentation to the EMC in 2024. A Master's thesis will be completed in 2024 on Rock Creek meadow, which included one additional year of data collection beyond this EMC-funded project. A publication on the 10 years of data collected at all the research meadows is in preparation, and submission to the journal *Forest Ecology and Management* is

expected in summer 2024. A publication on the vegetation response of Rock Creek Meadow following lodgepole pine removal will be submitted to the journal *Restoration Ecology* in summer 2024 as well.

EMC-2018-006: Effect of Forest Practice Rules on Restoring Canopy Closure, Water Temperature, & Primary Productivity

Member Coe provided an update at the August 2, 2023 EMC meeting that the post-doctoral scholar Dr. Lorrayne Miralha recently left for a full-time faculty position, but the final project report would be completed by October 2023. The final project report, "Effectiveness of Class II Watercourse and Lake Protection Zone (WLPZ) Forest Practice Rules (FPRs) and Aquatic Habitat Conservation Plan (AHCP) Riparian Prescriptions at Maintaining or Restoring Canopy Closure, Stream Water Temperature, Primary Productivity, and Terrestrial Habitat", was submitted in October 2023 (Bladon et al. 2023), and a final project presentation and CRA are anticipated in 2024. Previously unsubmitted project deliverables from years prior to 2023 were also received, including two theses ("Assessing the Thermal Sensitivity and Stormflow Response of Headwater Stream Temperatures: A Seasonal and Event-scale Exploration in Northern California, USA", Wissler 2021; also see EMC-2015-001; and "Summer Low Flow response to Timber Harvest and Riparian Treatments in Forested Headwater Streams of Coastal Northern California", Nicholas 2022) and a peer-reviewed publication, "Comparing headwater stream thermal sensitivity across two distinct regions in Northern California" (Wissler et al. 2022; also see EMC-2015-001). Finally, a peer-reviewed publication titled "Stream temperature responses to forest harvesting with different riparian buffer prescriptions in northern California, USA" was published in *Forest Ecology and Management* (Miralha et al. 2023).

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

All final project deliverables were received by the EMC in 2021 and 2022, and a draft CRA was produced in 2023. However, the EMC project liaisons will be working with the project PIs to reassess project results implications and develop a plan to improve the impact and reach of this research, so finalization of the CRA was delayed. A revised CRA will be developed by Members Coe and Dr. Drury for presentation to the EMC in 2024.

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

In the context of the Sagehen experimental watershed in the Sierra Nevada, researchers in this project investigated how and to what spatial scale forest treatments impact annual runoff (water yield) and annual evapotranspiration. Several unexpected setbacks, including the pandemic, resulted in delays with completing the work, and a time extension was processed on April 25, 2022, allowing the PIs up to one additional year (to June 30, 2023) to develop the final deliverables. Final project deliverables, including a report, presentation, and CRA are anticipated in 2024.

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

This project was severely impacted at several points by wildfire, the COVID-19 pandemic, and other factors outside of the researchers' control. Two watersheds to be studied in Santa Cruz County burned in the CZU Lightning Complex and the Timber Harvest Plan (THP), a critical component of the research, could no longer be efficiently pursued. It was determined that the project could not be completed within the timeframe allowed by the contract, and approximately $9000 was distributed for equipment, with the remaining funds

reverting on June 30, 2022. The California Geological Survey (CGS) planned to continue work going forward with a modified research plan.

The 2022/2023 winter season yielded significant rain events into late spring, preventing field access until later summer/fall. During Fall 2023, the first annual post- Accelerated Wood Recruitment (AWR) implementation monitoring event occurred. Data collected included study reach large wood inventories, cross-section surveys, thalweg profile surveys, pebble counts, and data collection from photo points, time-lapse game cameras, pressure transducers, and a rain gauge. The drone LiDAR and photogrammetry data collection was completed in 2022 and CGS received primarily raw, unprocessed data in late Spring 2023. Ground control points were collected over Fall 2023. Data collected and received during 2023 are currently being processing and analyzed. Preparations are in progress for the second annual monitoring event scheduled for summer/fall 2024. While this is no longer an EMC-funded project, the researchers will provide more results to the EMC in the future as the research progresses.

EMC-2021-003: Evaluating Response of Native Pollinators

This research aims to determine how wild bee communities respond to widespread fuel-reduction treatments in managed forests that are commonly implemented under current FPRs. Encompassing EMC Research Theme 6 (Wildfire Hazard) and Theme 9 (Wildlife Habitat: Cumulative Impacts) together, these themes cover a range of FPRs. This work combines these two themes to quantify and evaluate whether current FPRs and associated regulations for reducing fire risk that that arise from timber harvesting plans (14 California Code of Regulations [CCR] 2 § 1038, 1051.4, 1052.4), special prescriptions (14 CCR§ 913.4 [933.4, 953.4]), and hazard reductions (14 CCR§ 917 (937, 957) are effective in providing suitable protection practices for wildlife (14 CCR§ 919, 939, 959).

Principal Investigator Dr. James Rivers reported that lead graduate student Megan Sampognaro (Master of Science, College of Forestry, Oregon State University) completed the first field season in 2023. With over 10,000 specimens collected, preliminary results indicate more bee diversity in shaded fuel breaks relative to untreated areas. Specimens are currently being process and identified by project collaborators in Utah. The 2024 field season started in late May and bee phenology appeared to be lagging behind the previous year.

A poster was presented at the Western Forestry Graduate Research Symposium in April 2023 entitled "Evaluating native bee community response to fuel-reduction treatments in private industrial dry forests" (Sampognaro et al. 2023). The project is progressing as planned, and funds have been encumbered in all three fiscal years (2021/22, 2022/23, 2023/24), with the contract term ending June 29, 2025. A poster will be presented at the 2024 Oregon State University Spring Poster Symposium, an invited talk will be given to a forestry group at Collins Timber in 2024, a field tour will be conducted in July 2024, a project status presentation will be given to the EMC in fall 2024, and a project presentation is anticipated for September 2024 at the Sacramento-Shasta Chapter of The Wildlife Society.

EMC-2022-003: Santa Cruz Mountains Post-Fire Redwood Defect Study

This project investigates how post-fire measurements correlate with the amount of defect in individual coast redwood trees and will seek to understand the relationships between fire damage and bole decay from fire indicators and post-fire effects on live redwood. The study will address the CMQs for Research Theme 6 (Wildfire Hazard), and may influence the following standards: Minimum stocking standards (14 CCR § 912.7 [932.7, 952.7]); Silvicultural methods and stocking requirements (14 CCR § 913.8); Silvicultural objectives and regeneration methods (14 CCR § 913 [933, 953]); Exemptions which facilitate removal of dead, dying or diseased trees (14 CCR § 1038); and Emergency notices which also facilitate removal of

burned, dead, dying or diseased trees (14 CCR § 1052). The study will also address the CMQs for Theme 7 (Wildlife habitat: species and nest sites) by helping land managers make informed decisions on tree selection during a salvage harvest, which affects wildlife habitat; and CMQs for Theme 8 (Wildlife habitat: seral stages), as it will assist foresters in determining tree health and potential longevity, which may allow for more trees to remain, thereby accelerating the return of late seral stage features. Finally, the study will also shed light on the CMQs for Theme 10 (Wildlife habitat: structures), as wildlife habitat is created in redwoods via repeated fires that introduce rot and burn out basal hollows. Therefore, this study has implications for timber production as well as management for overall forest health and wildlife habitat.

Progress reports were submitted as of end June 2023 (Hamey 2023a), September 2023 (Hamey 2023b), and December 2023 (Hamey 2023c). The PIs partnered with researchers from U.C. Santa Cruz in Dr. Greg Gilbert's lab, which added a tomography component to the study. Dr. Gilbert has studied wood-decay fungi in tropical and temperate forests for three decades and directs the UCSC Forest Ecology Research Plot. Doctoral student Liz Rennie brings experience in molecular ecology and disease ecology. They will deploy Sonic tomography (Picus 3) to make a computerized depiction of structural decay versus healthy wood in a subset of the study trees; and Impedance tomography (Treetronic) which reflects moisture content to indicate wetter and drier regions at breast height. Changes in patterns can indicate waterlogging or disruption of the vascular system, often before structural loss is detectable, and readings will be correlated with the post-fire effects and scaling data. The data collection and analysis are ongoing for the Santa Cruz Mountains Post-Fire Redwood Defect Study, carried out by Hamey Woods and research partners at UC Berkeley and UC Santa Cruz. Data collection has focused on two properties, Swanton Pacific Ranch (SPR) and San Vicente Redwoods (SVR), which both burned in the 2020 CZU Fire.

Approximately 60 trees at SPR were assessed for burn damage, then 60% of the logs were scaled for defect. Approximately 70 additional trees at SVR were assessed for burn damage. Each tree was assessed using Sonic tomography in collaboration with our partners at UCSC in Dr. Greg Gilbert's lab, specifically PhD student Liz Rennie. Tomography was carried out 1 meter from the base of the tree to make a computerized depiction of structural decay versus healthy wood, and Impedance tomography, which reflects moisture content to indicate wetter and drier regions in the tree. The trees were then felled and bucked at 1 meter from the base to be scaled at the same height as the tomography and the cambium checks. The data is being analyzed to determine which post-fire effects more accurately predict the introduction of decay in the bole of the tree. The results of the analysis will be presented at the fall 2024 EMC meeting. Hamey Woods is working on a field guide that shows visible indicators of burn damage to help land managers make informed decisions on post-fire tree selection and acceptable levels of burn damage.

The project is progressing as planned, and funds have been encumbered in the first two fiscal years (2022/23, 2023/24), with the project performance period ending March 31, 2025.

EMC-2022-004: A Critical Evaluation of Forest Practice Regulation's Capacity to Accommodate Forest Restoration and Resilience Targets

The FPRs rely heavily on basal areas as the primary metric for retention requirements during any selection or thinning harvest (e.g., Title 14 CCR 913.2(a)(2)(A); CCR 913.3(a)(1)(A)). However, historic basal areas are often far below those currently recommended in the FPR's (Collins et al. 2015), which intend to maintain high levels of growth and yield for timber production (Title 14 CCR 913.11), and recent studies (Goodwin et al. 2020; Bernal et al. 2022) have suggested that stocking targets may still be too high given climatic stress.

This project will investigate how current FPRs can facilitate or preclude meeting condition targets for forest restoration and resilience by compiling the range of historical forest stocking measures from the best available research for these ecosystems, compare this range to current Forest Practice Rules for the dry mixed conifer forests in California, and explore the silvicultural methods to reach these restoration and resilience targets. The Shared Stewardship agreement between the State of California and the USDA Forest Service (Agreement for Shared Stewardship of California's Forests and Rangelands 2020) acknowledges the need to reduce forest density and sets forth a plan wherein forests regulated by the state would be restored to improve resilience. This project will explore how certain FPR guidance for silvicultural techniques such as shelterwood, group selection, and selection thinning may or may not facilitate resilience restoration targets; how contemporary FPR guidance may or may not be aligned with mid-century projections of forest sustainability and how past and present levels of stocking will compare with the coming future; and how post-fire measurements correlate with the amount of defect in individual coast redwood trees to elucidate the relationships between fire damage and bole decay from fire indicators and post-fire effects on live redwood.

The project is progressing as planned, and funds have been encumbered in the first two fiscal years (2022/23, 2023/24), with the project performance period ending March 31, 2025.

EMC-2022-005: Decay Rates and Fire Behavior of Woody Debris in Coastal Redwoods

This research investigates the effectiveness of the current FPRs in mitigating the wildfire hazard and risks for "normal" fire scenarios (i.e., conditions in which an initial attack is more likely to be successful) or in which fuel treatments have a higher likelihood of being effective. To that end, this study will look at industrial timberland slash treatments (e.g., lop and scatter) along public roads, specifically targeting Title 14 CCR 917.2 and Technical Addendum #2 – Cumulative Impacts, H. Wildfire risk and hazard (2-4) to determine if the rules are adequate to decrease fire behavior.

To date, the first season of fieldwork has been completed and the graduate student has outlined the decay rate sampling protocol. During the 2023 field season, it was decided to include collecting data in unentered second-growth sites to understand the 'natural' inputs of woody material and to establish a baseline for what level of material would 'naturally occur' in an unmanaged scenario. This change was determined necessary to fully understand the effectiveness of the treatments, which doubled the number of plots that were originally estimated for the project, as each managed plot has an unmanaged control plot for comparison. The increase in sampling sites has pushed the project into a second field season for data collection, but overall the project is still on track for completion; however, the data have not yet been analyzed.

The project is progressing as planned, and funds have been encumbered in the first two fiscal years (2022/23, 2023/24), with the project performance period ending March 31, 2025. Next steps include a second season of treatments and data collection to resume in 2024, along with the analysis and write-up. The write-up is anticipated to extend into June 2025. The project is on track to give a final report to the EMC in the summer of 2025 with outreach to a broader audience afterwards.

Work did not start on projects recommended for funding in the 2023/24 Fiscal Year until 2024, and as such, updates are not provided in this report.

VI. POTENTIAL EMC PROJECT IMPACTS TO REGULATIONS

The EMC provides valuable insight to the Board on testing the effectiveness of the FPRs and associated regulations by way of science-based research projects. EMC-funded studies may show that regulatory modifications, either minor or major, need to occur to ensure the effectiveness of the FPRs (14 CCR § 895 et seq.). The EMC moved findings from EMC-2017-008 (Forest Practice Rules to Minimize Fir Mortality from Root Diseases) to the Board for consideration in 2023 (Waitman and Leonard 2022). The EMC did not find that any regulatory modifications were warranted in 2023 based on the results of EMC-supported research.

The EMC anticipates sharing findings for the following EMC-supported studies with the Board for consideration in 2024 or 2025:

- EMC-2016-003: Road Rules Effectiveness at Reducing Mass Wasting (Repeat LiDAR Surveys to Detect Landslides
- EMC-2017-001: Effects of Forest Stand Density Reduction on Nutrient Cycling and Nutrient Transport at the Caspar Creek Experimental Watershed
- EMC-2017-002: Boggs Mountain Demonstration State Forest (BMDSF) Post-Fire Automated Bird Recorders Study
- EMC-2017-006: Fuel Treatment Alternatives in Riparian Zones of the Sierra Nevada
- EMC-2017-007: The Life Cycle of Dead Trees and Implications for Management
- EMC-2018-003: Alternative Meadow Restoration
- EMC-2018-006: Effect of Forest Practice Rules on Restoring Canopy Closure, Water Temperature, & Primary Productivity
- EMC-2019-002: Evaluating Treatment Longevity and Maintenance Needs for Fuel Reduction Projects Implemented in the Wildland Urban Interface of Plumas County, CA
- EMC-2019-003: Fuel Treatments and Hydrologic Implications in the Sierra Nevada

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