- Sponsorship of graduate students or contribution to an existing university study(s).
- EMC planning, scheduling, meeting notes, annual reporting and making periodic updates to the EMC webpage.
- Ability to respond to rare and large event monitoring (see Section 4.2.2).
- EMC supported projects that require additional support for participation of university(s), specialized consulting or non-government organizations.
- Support for projects consistent with AB 1492 Working Groups. Also see Section 2.2 for more information related to the TRFR program.
- Funding to reimburse EMC members travel costs for meetings.
- Organizing and holding public outreach meetings to share EMC project information.
- Obtaining other sources of data or information for EMC sponsored projects (e.g. LiDAR, aerial photo acquisition).

2.0 EMC STRATEGIC PLAN OR "ROAD MAP"

The EMC Strategic Plan is the "road map" that will guide how the Committee intends to achieve the EMC goals and objectives. It is the intent to use the EMC Strategic Plan as a living document that is periodically updated. The overall EMC Strategic Plan is guided by seven primary objectives described in the EMC Charter which, for the purposes of developing critical monitoring questions, has been edited and summarized in Figure 3~~2~~.

Figure 3 Primary objectives in developing critical monitoring questions

- Seek, accept and consider questions from stakeholders and the interested public.
- EMC members, in conjunction with the Board, should identify critical monitoring questions that address various EMC goals and objectives.
- Develop guidance for appropriate scientific methods and statistical evaluation used to evaluate effectiveness of California Forest Practice Rules.
- Increase understanding of the linkage between forest practices and the resource(s) of concern.
- Provide guidance for the acceptable level of scientific uncertainty across the broad spectrum of monitoring efforts from small-scale short-term monitoring to long-term replicated studies.
- Collaboratively develop methods to prioritize monitoring questions, and based on these methods, help select the highest priority projects to monitor.
- Promote collaborative fact-finding and understanding of scientific results at local, regional, and state levels.

2.1 Development of Critical Monitoring Questions

Critical monitoring questions were developed from ~~The first step in developing critical monitoring questions the EMC has sought and accepted~~ priorities and monitoring questions sought by the EMC from~~from~~ a wide variety of stakeholders including agency(s), department(s), board(s), EMC members and ~~identifying key areas of concern of~~ the interested public. ~~Development of critical monitoring questions is an open and transparent public process where inclusion of priorities and public comments can be followed on the EMC web page (http://bofdata.fire.ca.gov/board_committees/effectiveness_monitoring_committee/). The EMC reviewed the various proposed priorities and monitoring questions and developed critical monitoring questions.~~ Development of critical monitoring questions is an open and transparent public process that can be followed on the EMC web page (http://bofdata.fire.ca.gov/board_committees/effectiveness_monitoring_committee/). Appendix D summarizes priorities and monitoring questions received from stakeholders to date.

~~The second step is~~was to A draft of the Strategic Plan, including the proposed list of critical monitoring questions, ~~submit~~ will be submitted to the Board for review ~~a final list of critical monitoring questions along with a draft Strategic Plan~~. As part of their review, the Board may provide guidance or suggested changes to the draft Strategic Plan. The EMC will consider Board guidance or suggested changes and submit a final list of critical monitoring questions with the Strategic Plan. ~~Appendix D summarizes priorities and monitoring questions received, to date, from various stakeholders. The third step is~~ oOnce critical monitoring questions are finalized, specific monitoring projects (described in Appendix E) will be evaluated and ranked. Highest ranked projects will be considered for sponsorship and implementation by the EMC. Appendix G provides information on the ~~(detailed information on~~ project evaluation process ~~is provided in Appendix G)~~. ~~The final step is to initiate EMC sponsored projects.~~ The following sections summarize~~are a brief summary of~~ the stakeholder priorities and monitoring questions listed in Appendix D.

Comment [RL5]: develop? Or, is the final list of critical monitoring questions to be re-submitted to the BoF?

2.1.1 Board of Forestry and Fire Protection ~~Committee Priorities~~

For 2014, t~~14, t~~he Board's Management Committee and Forest Practice Committee ~~and Management Committee~~ provided ~~six and two~~ priorities and monitoring questions to~~, respectively,~~ the EMC~~.~~. The Management Committee priorities focus on WLPZ effectiveness, emphasizing the use of Demonstration State Forests as potential sites for monitoring. The Forest Practice Committee priorities focus, not necessarily in order of importance, on roads, slash treatment and cumulative effects, the latter also identified as a priority in the Boards' 2014 Annual Report (Board 2014) ~~and slash treatment~~. The term 'cumulative effects' refers to 'cumulative impacts', originating in CEQA under 14 CCR § 15355. Both terms are used interchangeably in this document. ~~The Management Committee priorities focus on WLPZ effectiveness emphasizing use of Demonstration State Forests as potential sites for monitoring.~~ All Board committee priorities and monitoring questions~~topics~~ are discussed in more detail ~~in the priorities included~~ in Appendix D.

The Board recognizes that effectiveness monitoring of cumulative effects presents additional challenges due to the potential scope and scale of a monitoring effort. To attempt to address this priority the Board made three recommendations relevant to the EMC : (1) focus on effectiveness monitoring activities to support adaptive management approaches (MacDonald 2000), (2) research new computer

modeling to improve analysis (Benda et al. 2007), and (3) improve collection of information from on-going analysis to create watershed databases for agencies and public use. ~~Detailed information on how the EMC intends to monitor cumulative effects is provided below.~~

The Board understands that natural processes are complex, highly variable over time and space, and that our understanding of these processes and linkages are imperfect. However, it is known that on-site control of potential impacts offers the most direct and rapid mitigation of potential impacts and monitoring the effectiveness of these controls provides the best opportunity to increase our understanding of cause-and-effect relationships (i.e. linkages) between management and resources of concern. Also, if potential adverse impacts are minimized at the local scale, there should be reduced potential cumulative effects at a larger scale (MacDonald 2000).

Many terrestrial public trust resources, including snags, dens, and nest trees for listed and other sensitive wildlife species are assumed to contribute to the overall health of timberlands, and the potential for cumulative effects to such resources are to be evaluated at multiple spatial scales per Technical Rule Addendum No. 2. For example, habitat elements like snags are an important component of wildlife habitat, providing nesting and denning substrate for numerous species and complexity to forest structure, thus contributing to biological diversity. The FPRs contain specific measures to maintain and recruit key habitat elements like snags at the individual logging area scale so that potential adverse cumulative effects can be avoided at the biological assessment area scale (e.g. planning watershed). However, the FPRs also include exceptions to snag retention requirements for fire hazard reduction, safety, and other reasons (14 CCR § 919.1). In general, information regarding the FPRs effectiveness for snag retention is lacking, and is similarly lacking for other wildlife habitat components and characteristics, such as for protection of nest sites, retention and recruitment of large woody debris, hardwood cover, and late seral habitat connectivity. Thus, carefully designed and robust monitoring studies are needed to provide information on the effectiveness of Technical Rule Addendum No. 2 in identifying potential cumulative effects to wildlife habitat, and the opportunity for feedback and adaptive management. Due to the robust monitoring necessary and complexity of monitoring terrestrial resources across large, biologically relevant scales that typically include multiple public and private landowners, monitoring of these terrestrial resources may also be appropriate for the AB 1492 Working Groups.

The EMC recognizes that cumulative effects encompass a broad spectrum of natural processes and their linkages over time and space (MacDonald 2000, MacDonald et al. 2004, Reid 1993). The EMC also recognizes that management practices may have either positive or negative cumulative effects. Consequently, the EMC has developed a framework regarding how to monitor and evaluate potential cumulative effects. The first element of the framework is to monitor the causal linkages between FPRs and associated regulations and the resource(s) of concern at relatively small spatial and temporal scales, with special emphasis on understanding the management impacts on a particular resource and/or controlling natural process(es)(MacDonald and Coe 2007). The second element is to use a nested approach for monitoring, so that a hierarchy of information can be used to untangle the complexities that are inherent at larger spatial and longer temporal scales (MacDonald 2000). Finally, improving study design to identify appropriate spatial and temporal scales and identify potential variable interaction and indirect effects can greatly reduce spurious monitoring results (MacDonald 2000). This approach would limit problems that have confounded many previous attempts to manage cumulative effects by monitoring discrete causal linkages between FPRs and associated regulations and resource(s)

of concern (MacDonald 2000). Section 4.2 provides more guidance on choosing the appropriate spatial and temporal scale for monitoring.

2.1.2 Board of Forestry and Fire Protection - Cumulative Effects

The Board identified cumulative effects during committee discussions and as priority in their Annual Report (Board 2014). Cumulative impacts originates in CEQA under 14 CCR § 15355. The EMC recognizes that management practices may have either positive or negative cumulative impacts. The EMC will refer to cumulative effects and cumulative impacts as interchangeable terms.

The Board understands that natural processes are complex and highly variable over time and space. In addition, our understanding of these processes and linkages are imperfect. However, it is known that on-site control of potential impacts offers the most direct and rapid mitigation of potential impacts and monitoring the effectiveness of these controls provides the best opportunity to increase our understanding of cause-and-effect relationships (i.e. linkages) between management and resources of concern. Also, if potential adverse impacts are minimized at the local scale, there should be reduced potential cumulative effects at a larger scale (MacDonald 2000). To attempt to address this priority the Board made three recommendations relevant to the EMC : (1) focus on effectiveness monitoring activities to support adaptive management approaches (MacDonald 2000), (2) research new computer modeling to improve analysis (Benda et al. 2007), and (3) improve collection of information from on-going analysis to create watershed databases for agencies and public use.

The EMC also recognizes that cumulative effects encompass a broad spectrum of natural processes and their linkages over time and space (MacDonald 2000, MacDonald et al. 2004, Reid 1993). The EMC has developed two compatiblea frameworks regarding how to monitor and evaluate potential cumulative effects. OneThe first element of the framework is, to monitor the causal linkages between FPRs and associated regulations and the resource(s) of concern at relatively smaller spatial and temporal scales the causal linkages between FPRs and associated regulations and the resource(s) of concern, with special emphasis on understanding the management impacts on a particular resource and/or controlling natural process(es)(MacDonald and Coe 2007). The second element is to use a nested approach for monitoring, so that a hierarchy of information can be used to untangle the complexities that are inherent at larger spatial and longer temporal scales (MacDonald 2000). AlsoFinally, improved improving study designs that to identify appropriate spatial and temporal scales and identify potential variable interaction and indirect effects can greatly reduce spurious monitoring results (MacDonald 2000). This approach would limit problems that have confounded many previous attempts to manage cumulative effects by monitoring discrete causal linkages between FPRs and associated regulations and resource(s) of concern (MacDonald 2000). Section 4.2 provides more guidance on choosing the appropriate spatial and temporal scale for monitoring.

Many aquatic resources including public trust resources can also occupy habitat in larger watersheds and terrestrial resources at large spatial scales. Accordingly, monitoring and evaluating potential cumulative effects is also needed at these relatively larger spatial and longer temporal scales. However, at larger spatial and longer temporal scales understanding of potential cumulative effects are limited by wide variation in study site conditions, forest management effects on different site conditions, limited ability to isolate indirect effects, difficulty in validating predictive models that are typically used at larger scales, and uncertainty of future environmental events over longer temporal scales (MacDonald 2000).

~~To minimize these potential limitations, we propose a second compatible framework that uses a nested approach for monitoring, so that a hierarchy of information can be used to untangle the complexities that are inherent at larger spatial and longer temporal scales (MacDonald 2000). In other words, a hierarchical, nested approach to monitoring would help elucidate important linkages between site and project scale manipulations and ecological response at the watershed and regional scale. With this second compatible framework we can begin to better understand and establish linkages between the FPRs and associated regulations and the ecological performance of public trust resources of concern.~~

~~Similarly, many terrestrial public trust resources, including snags, dens, and nest trees for listed and other sensitive wildlife species are assumed to contribute to the overall health of timberlands, and the potential for cumulative effects to such resources are to be evaluated at multiple spatial scales per Technical Rule Addendum No. 2. For example, habitat elements like snags are an important component of wildlife habitat, providing nesting and denning substrate for numerous species and complexity to forest structure, thus contributing to biological diversity. The FPRs contain specific measures to maintain and recruit key habitat elements like snags at the individual logging area scale so that potential adverse cumulative effects can be avoided at the biological assessment area scale (e.g. planning watershed). However, the FPRs also include exceptions to snag retention requirements for fire hazard reduction, safety, and other reasons (14 CCR § 919.1). In general, information regarding the FPRs effectiveness for snag retention is lacking, and is similarly lacking for other wildlife habitat components and characteristics, such as for protection of nest sites, retention and recruitment of large woody debris, hardwood cover, and late seral habitat connectivity. Thus, carefully designed and robust monitoring studies are needed to provide information on the effectiveness of Technical Rule Addendum No. 2 in identifying potential cumulative effects to wildlife habitat, and the opportunity for feedback and adaptive management. Due to the robust monitoring necessary and complexity of monitoring terrestrial resources across large, biologically relevant scales, that typically include multiple public and private landowners, monitoring of these terrestrial resources may also be appropriate for the AB 1492 Working Groups.~~

2.1.3 California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW) suggests a number of FPRs have long warranted monitoring for their effectiveness in helping to ensure timber operations do not cause or aggravate significant direct or cumulative effects on the environment and help to conserve public trust resources. In particular, there has been a paucity of information collected on the FPRs effectiveness regarding direct and cumulative effects on terrestrial wildlife resources. These include FPRs intended to protect, in particular, sensitive and other special-status species, maintain and recruit key habitat elements (e.g. snags), maintain late-succession forest stands, and avoid habitat fragmentation and/or maintain habitat connectivity. The effectiveness of the FPRs individually and cumulatively should be demonstrated as meeting the objectives stated under 14 CCR § 897 "Implementation of the Act Intent", including:

"(B) Maintain functional wildlife habitat in sufficient condition for continued use by the existing wildlife community within the planning watershed and, (C) Retain or recruit late and diverse seral stage habitat components for wildlife concentrated in the watercourse and lake protection zones and as appropriate to provide functional connectivity between habitats".