

Effectiveness Monitoring Committee Full Project Proposal Form

Full Project Proposals will be requested directly from Applicants by email with the due date clearly identified. In general, applicants will have one (1) month after notification to return the Full Project Proposal.

Project #: **Date Submitted:**

Project Title:

Principal Investigator(s), Affiliation(s), and Contact Information (email, phone):

Collaborator(s) and Affiliation(s):

Project Duration and Dates (MM/YY - MM/YY):

1. Project Description

a. Background and Justification:

Advancements in passive acoustic survey methods have improved the efficiency and effectiveness of surveying and monitoring of an array of species (Sugai et al., 2019, Kahl et al., 2021, Wood et al., 2021, Lesmeister et al., 2021). Most notably, employing passive acoustic survey methods has been proven effective for monitoring species that are considered rare and elusive (Wade et al., 2006, Brandes T.S., 2008, Thompson et al., 2010, Lesmeister et al., 2021). Survey protocols utilizing this technology have been developed and are currently being implemented to survey for a range of Federally listed (USFWS 2021) and candidate species (Kramer et al. 2024). Recent research comparing audio visual surveys, radar surveys and passive acoustic surveys to detect murrelet species throughout their range (Borker et al., 2015 and Cragg et al., 2015) have opened the door for the opportunity to potentially utilize autonomous recording units (ARUs) for project level surveys to avoid take of Marbled Murrelet (*Brachyramphus marmoratus*, MAMU) under the Endangered Species Act (ESA) (Duarte et al., 2024). By establishing a passive acoustic-based survey protocol for MAMU, land managers (regardless of ownership/permit status) will be provided with a more cost effective and time efficient mechanism to help streamline management activities to comply with state and federal regulations pertaining to MAMU.

The MAMU is a small seabird which nests along the Pacific Coast from Santa Cruz, California north to Alaska (Nelson, 1997). MAMUs forage on invertebrates and small schooling fish and typically nest in late-successional, old growth forests (Nelson and Sealy 1996, Ralph et al., 1995, Nelson et al., 2006). However, additional research has indicated MAMUs will also nest in younger forests that contain the structural elements which provide nesting opportunities similar to what is found in older mature forests (i.e., platforms) (Grenier and Nelson 1995, Nelson and Wilson 2002). In some areas, MAMUs are known to fly up to 70 miles inland to reach their nesting habitat, with the longest distance being roughly 24 miles in California (PSG, 2024). Although they are considered somewhat of a social bird and typically select nest sites with other MAMUs (Valente et al. 2021) they are secretive in flight to and from such nesting locations (Nelson 1997). This behavior, coupled with their cryptic nesting behavior, makes MAMU nests extremely difficult to locate (Peery et al., 2004, Baker et al., 2006, Barbaree et al., 2014).

Although MAMUs face many threats (USFWS, 1997), forest management has been a source of conflict in the Pacific Northwest, particularly when conducted within and adjacent to nesting habitat. Loss of habitat due to forest management was identified as one of the primary threats to the species and the species was federally listed as Threatened under the Federal ESA and Endangered under the California ESA in 1992. Subsequently, the Board of Forestry (BOF) listed it as a Sensitive Species under the Forest Practice Rules. Due to these listing status', MAMUs must be addressed when preparing timber harvest plans where applicable and take avoidance measures adopted when necessary while conducting timber operations in California.

The current standard for surveys was produced by the Pacific Sea Bird Group and was recently revised in 2024 (PSG, 2024). As stated in the protocol, the updates and revisions resulted in an increase in survey requirements "generally requiring more survey visits." These additions were added on top of an already cost restrictive and labor-intensive protocol, while utilizing the same general methods that have been suggested by the group since 2003. As previously stated, we aim to provide land managers

with an additional option to comply with current legislation while still achieving the same level of certainty that the current suggested survey protocol achieves by utilizing advancements in technology.

b. Research Questions, including Objectives and Scope

The scope of this proposed project is to deploy ARUs concurrently with Audio-visual (AV, standard protocol surveys that are conducted as part of various MAMU monitoring programs to try and develop/establish a new, more cost effective/efficient survey protocol. The research questions for this project are: (1) Can a one or two year MAMU survey protocol, that achieves a high probability of detection, be established using passive acoustic technology, (2) can audio detections be used to quantify occupancy vs. presence vs. absence by comparing results of concurrently conducted AV surveys, (3) what is the effective detectability range/ARU deployment arrangement needed (i.e., survey area coverage) to achieve desired detection probabilities/survey coverage, and (4) can a custom detector be developed for MAMU so BirdNET can be utilized by any entity to scan ARU recordings for MAMU detections?

Project Duration: 3 years (Phase 1: 2025-2027)

2. Research Methods:

ARUs will be deployed during the MAMU breeding season at known occupied and unoccupied sites in or adjacent to potential nesting habitat and programmed to record acoustic data during the times that coincide with MAMU high activity periods. ARUs will be deployed concurrently with audio-visual (AV) surveys that are being conducted as part of a MAMU Habitat Conservation Plan monitoring program (Humboldt County) as well as at sites strictly being monitored for this study (Mendocino and Sonoma Counties). Audio-visual surveys will follow an agency approved survey protocol where each survey station will be visited at least five times or until occupied behavior is observed. Trained surveyors will conduct AV surveys 45 minutes prior to sunrise to 75 minutes after sunrise. The unit of measurement will be a “detection”, which is defined as sighting or hearing one or more murrelets. MAMUs typically fly in pairs, as singles, or in small groups (Naslund 1993) and groups of murrelets will be counted as a single detection when the detection is not separated by at least 5 seconds, as required by the survey protocol. An occupied behavior will be documented when a murrelet is seen flying below canopy or circling (above or below canopy).

Combining passive acoustic surveys with machine learning detectors to identify at-risk species in bulk audio datasets has become an increasingly effective approach to providing time-sensitive conservation data. Our team has successfully applied this approach to spotted owl conservation throughout California and will adapt our proven bioacoustics workflow to conduct MAMU surveys. In short, audio can be passively recorded via durable, low-cost devices deployed in stands known or suspected to be used by MAMU for nesting - as well as stands with unknown status. Prioritizing audio recorded at known occupied MAMU stands, we will manually review audio to identify target vocalizations. Though time-consuming, this creates a valuable test dataset that is independent of our detector. We will then analyze the audio with the BirdNET algorithm, a state-of-the-art machine learning tool capable of identifying thousands of species by sound alone. MAMU are one of BirdNET’s automatically identifiable species, but we can also retrain BirdNET using our own audio data (e.g., a subset of our test dataset) to increase performance if necessary. Various post-processing steps can also improve performance of both “standard” and custom versions of BirdNET. For example, by identifying

statistical patterns associated with known MAMU behavior, high scoring but biologically unlikely predictions can be excluded in order to increase accuracy.

Once detector performance has been optimized on our test dataset, we will apply it to the entire audio dataset. We can readily process tens of thousands of hours of audio in a week's time. Next, we will conduct an extensive manual review of the results, enabling us to generate probabilistic prediction thresholds of MAMU vocalizations. We can then filter the entire dataset by various levels (e.g., probability of a false positive is <5%) and we can conduct a very efficient manual review of the results such that MAMU presence or non-detection can be rapidly determined for all sites. Within the subset of sites at which MAMU occupancy status is known, we can relate a variety of vocalization rate metrics (e.g., maximum number of calls per day, three-day average number of calls per day, etc.) to occupancy status.

Importantly, derived relationships between patterns in AV and audio detections, based upon for example logistic regression analysis, will allow us to predict the likelihood of a stand of unknown status surveyed with only passive acoustic methods being (1) occupied, (2) having MAMU presence, and (3) not having MAMU presence based on patterns in those audio detections. For example, if detecting MAMUs on three consecutive mornings leads to a predicted occupied status of 95%, this threshold can be used in subsequent acoustic-only surveys to reasonably infer occupancy status of an unknown stand with high confidence. Similar approaches can be applied to the probability of presence versus no presence.

Importantly, the bioacoustic pipeline we develop, from ARU deployment to audio processing to bird detection analysis, will be readily transferable and replicable. BirdNET is a freely available tool and if we decide/need to make a custom version of it, that model can be made available at no cost via public data repositories (e.g., zenodo.org). The critical responsibility of subsequent users will be carefully replicating the protocol (for example, the score thresholds of machine learning detectors like BirdNET can be sensitive to changes in microphones, as are vocalization rates); fortunately, we have prioritized freely available and/or low-cost tools at each step of this process.

3. Scientific Uncertainty and Geographic Application, Including Monitoring Locations

This study will take place in Humboldt, Mendocino and Sonoma Counties. The primary locations are within the Humboldt Redwood Company's (HRC) Marbled Murrelet Conservation Areas with additional sites located throughout the MAMUs range in northern California. These areas include lands owned and managed by HRC as well as neighboring Headwater Forest Reserve and Humboldt Redwood State Parks which are used as control sites. Additionally, to expand the scope and location of this research project, monitoring locations have also been chosen in Mendocino and Sonoma Counties (Figure 1).

Completion of this project would benefit both industrial and non-industrial timberland managers throughout the range of MAMU in California and could also be adopted/adapted where applicable in Oregon and Washington. The development of a streamlined cost effective, time efficient survey protocol would specifically be of benefit to all Non-Industrial Management Plans (NTMPs) who have been restricted by current MAMU protocols that are in place.



Figure 1. MAMU Study Site Locations

4. Critical Questions and Forest Practice Rules Addressed

Theme 7: Wildlife Habitat: Species and Nest Sites- This study specifically relates to Theme 7 (a and b) as the research questions revolve around BOF sensitive species and state/federally listed species and developing a survey protocol to locate and apply correct protection measures as outlined in the FPRs.

Theme 9: Wildlife Habitat: Cumulative Impacts- this study directly relates to Theme 9 (a-c) as it would enable all landowners to potentially utilize a new, more cost-effective survey protocol to locate and then protect MAMUs and their associated nesting habitat and avoid significant adverse impacts where applicable.

Forest Practice Rules Addressed:

Table 1. Forest Practice Rules Addressed by Proposed Study

Rule	Rule Text	How project relates to Rule
14 CCR §919.11 Marbled Murrelet Protective Measures [Coast]	Where there is evidence of an active murrelet site in or adjacent to the THP area, or where there is evidence of a potential impact to a murrelet, the Director shall consult with CDFW as to whether the proposed THP will result in a "take" or "jeopardy" (pursuant to the California Endangered Species Act) of the murrelet before the Director may approve or disapprove a THP. Biological Assessments submitted with the THP that are prepared according to the CDFW Guidelines for Consultation shall be provided to the CDFW during consultation. If CDFW determines jeopardy or a take will occur as a result of operations proposed in the THP, the Director shall disapprove the THP unless the THP is accompanied by authorization by a wildlife agency acting within its authority under state or federal endangered species acts.	Audio Visual surveys, as described in the Pacific Sea Bird Group's Survey Protocol, are utilized to determine whether an active murrelet site is in or adjacent to THP areas. These surveys are expensive and time consuming. We aim to provide a more cost and time efficient mechanism in which surveys may be conducted to comply with 919.11
14 CCR §898.2 (d) Special Conditions Requiring Disapproval of Plans	Implementation of the plan as proposed would result in either a "taking" or finding of jeopardy of wildlife species listed as rare, threatened or endangered by the Fish and Game Commission, the National Marine Fisheries Service, or Fish and Wildlife Service, or would cause significant, long-term damage to listed species.	Developing an ARU MAMU survey protocol will provide land managers an additional mechanism to help detect MAMU. Being able to detect MAMU with confidence is a critical step in avoiding take and complying with 898.2(d).
14 CCR §1036.1 Murrelet Protection before Notice of Completion	For any THP which has been found to be in conformance with THP filing and review procedures and approved by the Director, but as to which no Notice of Completion (PRC § 4586) has been filed, when there is evidence that the THP area contains an active murrelet site or possesses a potential impact to a murrelet, the THP submitter shall immediately request a conference with CDFW or USFWS (in the event of Federal listing) to determine appropriate measures for protection of the species. Any additional mitigations for species protection which are developed through consultation with CDFW or the USFWS after initial submittal of the THP shall be submitted to the Director in the form of an amendment to the THP pursuant to 14 CCR § 1036.	Developing an ARU MAMU survey protocol will provide land managers an additional mechanism to help detect MAMU where surveys are required. Being able to confidently detect MAMU is a critical component of- and directly relates to 1036.1 and the requirement to consult with DFW and USFWS to determine appropriate protection measures.
14 CCR §1091.5 (b) Fish and Wildlife Assessment	Impacts to be addressed. The Assessment shall address threatened, endangered and sensitive species and other fish and wildlife species which Timber Operations could adversely impact, resulting in significant adverse individual or cumulative impacts. The Assessment shall address, as feasible, such species' habitat needs and the availability, shapes and distribution of habitats in relation to harvest schedule and growth projections and the impacts of harvesting on such habitats. The SYP shall discuss and include feasible measures planned to avoid or mitigate potentially significant adverse environmental effects on such fish and wildlife. The plan may also discuss positive effects of the timber or Timberland Owner's operations on fish and wildlife.	Developing a cost/time efficient ARU MAMU survey protocol will provide land managers an additional mechanism to help detect MAMU and confirm/negate the need to address any potential significant adverse impacts to MAMU when submitting an SYP. Additionally, being able to detect and confirm occupancy of MAMU with confidence allows for proper analysis for SYP holders under 1091.5(b).
14 CCR §1090.5 (n) Contents of NTMP	Information on the presence and protection of any known key habitat or individuals of any threatened or endangered plant or animal species that are listed in CDFW inventories prepared pursuant to the F&GC or any Sensitive Species as designated by the Board in these Rules.	MAMU is listed as Endangered under CESA and as a BOF Sensitive Species. By developing a new MAMU ARU protocol, land managers submitting NTMPs within the range of MAMU, can accurately present information regarding the presence and protection of MAMU within their plan area.
14 CCR §1094.6 (m)1 Contents of WFMP	State or federally listed threatened, candidate, endangered, or rare plant or animal species known locations within the biological assessment area and the WFMP, their status and habitats, take avoidance methodologies, enforceable protection measures for species within or adjacent to the WFMP and habitats within the WFMP area, and how forest management will maintain species and habitats over time;	Any party within the MAMU range submitting a WFMP will need to address MAMU and associated take avoidance measures if present within the BAA. Providing managers a more time/cost efficient survey protocol to detect MAMU within their BAA allows for proper analysis under 1094.6(m)1
14 CCR §1094.6 (m)3 Contents of WFMP	Information on the presence and known locations of individual Sensitive Species pursuant to 14 CCR § 895.1 adjacent to or within the WFMP or their key habitats within the WFMP	MAMU are listed as a BOF Sensitive Species under 14 CCR § 895.1. Any party submitting a WFMP within the MAMU range, must provide information on the presence and known locations of MAMU adjacent to or within the WFMP. Developing a cost/time efficient ARU MAMU survey protocol will provide land managers associated with a WFMP an additional mechanism to help detect MAMU and accurately comply with 1094.6 (m)3.

5. Roles, Collaborations and Project Feasibility

Many of the PI's have worked together for many years on numerous projects and produced multiple published manuscripts covering an array of species. Some of these projects have included work with ARUs and the resulting associated manuscripts and/or protocols. We represent a broad range of expertise in the biological and forestry fields in both the academia and private sector with extensive knowledge of the analytical framework needed to complete the proposed project. Feasibility of this project is extremely high given the track record of products our team has produced.

Brian Dotters will be responsible for grant oversight, project development/implementation, coordination and manuscript development. Dr. Zach Peery will be responsible for graduate student oversight, analytical methods, project development/implementation and manuscript development. Dr. Connor Wood will be responsible for graduate student oversight, analytical methods, project development/implementation and manuscript development. Sal Chinnici will be responsible for funding/completing of AV surveys, granting access to study sites and providing data. Robert Douglas will be responsible for funding/completing AV surveys and deploying ARUs in Mendocino and Sonoma Counties. Kevin Roberts will be responsible for project oversight, implementation, coordination and manuscript development. Stacy Stanish will be responsible for project oversight, consultation, implementation and manuscript review. Rich Klug will be responsible for project oversight, consultation, implementation and manuscript review. Keith Hamm will provide additional monitoring locations if needed.

6. Project Deliverables

Table 2. Project Timeline for Work and Deliverables

ACTIVITY OR DELIVERABLE	Type		Year 1 (01/25-06/25)		Year 2 (07/25-06/26)				Year 3 (07/26-06/27)			
	Act.	Del.	C	D	A	B	C	D	A	B	C	D
			Jan 1-Mar 31	Apr 1- Jun 30	July 1-Sep 30	Oct 1-Dec 31	Jan 1-Mar 31	Apr 1- Jun 30	July 1-Sep 30	Oct 1-Dec 31	Jan 1-Mar 31	Apr 1- Jun 30
Preseason Prep	X		1 2 3				1 2 3					
Establish ARU Sites	X			4				4				
ARU Sampling	X			4 5 6	7 8			4 5 6	7 8			
ARU Processing	X				9	10 11 12		1 2 3		9	10 11 12	1 2 3
AV Surveys	X			4 5 6	7 8			4 5 6	7 8			
Data Analysis	X					10 11 12		1 2 3			10 11 12	1 2 3
Project Update to funders/collaborators*		X		6		12			6		12	
Project Presentation to funders/collaborators*		X				12				12		
Final Project Presentation to funders/collaborators*		X										5 6
Completed Research Assessment (CRA) presentation to EMC*		X										6
CRA Presentation to the Board		X										6
Conference Presentations		X										6
Submission of Manuscripts to Peer-Reviewed Journals		X										6
Graduate Project Report Submission		X										6

* EMC Required Categories

7. Requested Funds

Table 3. Itemized budget and Requested Funds

Category	Description	Year 1 (01/25-06/25)	Year 2 (07/25-06/26)	Year 3 (07/26-03/27)	Total
Personnel Salary and Wages	Dr. Zach Peery 1 month salary	-	\$ 17,000.00	\$ 17,000.00	\$ 34,000.00
	Ph.D. Student	\$ 19,000.00	\$ 38,000.00	\$ 28,500.00	\$ 85,500.00
	Technician	\$ 8,750.00	\$ 17,500.00	\$ 8,750.00	\$ 35,000.00
Fringe Benefits	Dr. Zach Peery (36.50%)		\$ 6,205.000	\$ 6,205.000	\$ 12,410.00
	Ph.D. Student (22%)	\$ 4,275.00	\$ 8,550.00	\$ 6,412.50	\$ 19,237.50
	Technician(4%)	\$ 420.00	\$ 840.00	\$ 420.00	\$ 1,680.00
Tuition	Ph.D. Student	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00	\$ 36,000.00
Contractual Expenses		-	-	-	\$ -
Operating Costs		-	-	-	\$ -
Travel	Student to field and Cornell, Zach Peery and Connor Wood to field	\$ 4,500.00	\$ 9,000.00	\$ 4,500.00	\$ 18,000.00
	Vehicle Rental (2 for 4 months, and gas)	\$ 6,000.00	\$ 8,000.00	\$ 2,000.00	\$ 16,000.00
	Housing Rental	\$ 11,250.00	\$ 15,000.00	\$ 3,750.00	\$ 30,000.00
Other	Miscellaneous Supplies (i.e Batteries, SD cards)	\$ 6,000.00	\$ 6,000.00	\$ 6,000.00	\$ 18,000.00
Indirect Costs	15% University of Wisconsin Madison Overhead	\$ 10,829.25	\$ 20,714.25	\$ 14,330.63	\$ 45,874.13
EMC Funding Requested		\$ 83,024.25	\$ 158,809.25	\$ 109,868.13	\$ 351,701.63
Matching or In-Kind Contributions	HRC- AV Surveys	\$ 60,750.00	\$ 81,000.00	\$ 20,250.00	\$ 162,000.00
	SPI - ARUs, ARU Accessories Connor Wood Salary, Connor Wood Fringe, SPI Employee Time	\$ 78,319.00	\$ 25,819.00	\$ 25,819.00	\$ 129,957.00
	JDSF- AV surveys, ARU surveys	\$ 18,750.00	\$ 25,000.00	\$ 6,250.00	\$ 50,000.00
Total Budget		\$ 240,843.25	\$ 290,628.25	\$ 155,937.13	\$ 687,408.63

8. Suggestions from EMC and Associated Response:

- a. “The research project proposes a large budget, and the EMC would like to see a modified proposal with a reduced budget if possible, particularly in the first fiscal year. Moreover, the EMC would like to see additional sources of matching funding to further reduce the proposed budget request from the EMC, where possible.”

We thank the EMC for providing this suggestion. As providing matching funds was not part of the Initial Concept Proposal, you will see there is a substantial amount that has been provided as match from many of the collaborators representing 51% of the overall project cost (Table 3). Since the original concept proposal, we have also gained a new collaborator (Robert Douglas, CAL FIRE, Jackson Demonstration State Forest) who has brought additional in-kind funds and has allowed us to expand the scope of the study into Mendocino and Sonoma Counties. Additionally, the budget has been modified substantially to help reduce overall costs ($\approx 7\%$) and move costs, particularly from the first fiscal year as identified by the EMC.

This project proposes to develop a new survey protocol for a Federally and State listed species. Although research has been conducted on MAMUs using ARUs, no one has attempted to develop an actual protocol to use to be able to detect MAMUs with a high level of confidence, classify detections into presence vs. occupancy and use such classifications to avoid take under the Endangered Species Act. Given the status of the bird and what the protocol will be used to accomplish, it is necessary to complete this project at the highest standard possible. We contemplated cutting the data collection in half and downgrading it to a Master’s Thesis type project, but given the overall importance of having the best possible data set and analyses completed to develop the protocol, we felt it was essential to obtain two years of data collection/analyses and complete the project at a Ph.D. level.

- b. “The EMC would like to see if a cost comparison of current methods compared to what the methods that the PIs believe would be developed from this.”

We thank the EMC for providing this suggestion. Below is a simple (hypothetical) cost comparison of conducting the currently accepted PSG Survey Protocol AV surveys vs ARU surveys on a 100-acre survey area. Based on the cost of AV surveys on a per visit basis, completing the PSG protocol visits would range anywhere from \$8,000 to \$12,000. If we are successful in completing a one-year survey protocol using ARUs, the cost of completing surveys would be roughly \$1,470. If two years of ARU surveys are needed to establish the desired probability of detection and occupancy thresholds, the cost would increase to an estimated \$2,000 (Table 4).

Under the PSG protocol, as project areas increase in size, the number of survey areas and survey strata increase; in some cases, resulting in up to 60 visits being made for a single survey area per year with the max survey area size being 495 acres. If the survey area is larger than this, then an additional survey area must be added which also require the same number of visits in each additional area. The same would be true for utilizing ARUs to complete the surveys: the larger the survey area, the more ARUs will be needed to adequately survey the habitat. However, the ARUs represent a one-time fixed cost and can be used year after year to complete the surveys, so it is not a simple direct cost comparison. Additionally, as previously stated, we have prioritized freely available and/or low-cost tools at each step of this process so any entity choosing to use the developed protocol, should experience

significant cost reductions that exponentially increase through time following the initial purchase of ARUs. The work conducted as part of this research to develop a model that may be used in BirdNet to identify MAMUs, will be made available to the public free of cost, ensuring survey cost reductions for anyone who follows the same methodologies outlined in the developed protocol.

Table 4. Hypothetical Cost Comparison

PSG Audio Visual Surveys				
Survey approach	Visits Per Year	Cost Per Visit	Cost Per Year	Cost for Protocol (2 Years)
Occupied Only	12	\$ 500.00	\$ 6,000.00	\$ 12,000.00
Presence	8		\$ 4,000.00	\$ 8,000.00

ARU Surveys				
Item	Number	Cost	Cost Per Year	Cost For Two Years**
ARU*	2	\$ 350.00	\$ 700.00	\$ 700.00
Batteries	20	\$ 30.00	\$ 30.00	\$ 60.00
SD Card*	4	\$ 60.00	\$ 240.00	\$ 240.00
Employee Time (estimate)	10	\$ 50.00	\$ 500.00	\$ 1,000.00
BirdNet Analysis	-	\$ -	\$ -	\$ -
Total	-	-	\$ 1,470.00	\$ 2,000.00

* One time up front purchase and can be reused from year to year

**It is hoped that a one year protocol can be achieved but two may be needed to achieve desired detection probabilities/occupancy thresholds

Literature Cited

Baker, L.M., Peery, M.Z., Burkett, E.E., Singer, S.W., Suddjian, D.L. and Beissinger, S.R., 2006. Nesting habitat characteristics of the marbled murrelet in central California redwood forests. *The Journal of wildlife management*, 70(4), pp.939-946.

Barbaree, B.A., Nelson, S.K., Dugger, B.D., Roby, D.D., Carter, H.R., Whitworth, D.L. and Newman, S.H., 2014. Nesting ecology of Marbled Murrelets at a remote mainland fjord in southeast Alaska. *The Condor: Ornithological Applications*, 116(2), pp.173-184.

Borker, A.L., Halbert, P., Mckown, M.W., Tershy, B.R. and Croll, D.A., 2015. A comparison of automated and traditional monitoring techniques for marbled murrelets using passive acoustic sensors. *Wildlife Society Bulletin*, 39(4), pp.813-818.

Brandes, T.S., 2008. Automated sound recording and analysis techniques for bird surveys and conservation. *Bird Conservation International*, 18(S1), pp.S163-S173.

Cragg, J.L., Burger, A.E. and Piatt, J.F., 2015. Testing the effectiveness of automated acoustic sensors for monitoring vocal activity of marbled murrelets *Brachyramphus marmoratus*. *Marine Ornithology*, 43, pp.151-160.

Duarte, A., Weldy, M.J., Lesmeister, D.B., Ruff, Z.J., Jenkins, J.M., Valente, J.J. and Betts, M.G., 2024. Passive acoustic monitoring and convolutional neural networks facilitate high-resolution and broadscale monitoring of a threatened species. *Ecological Indicators*, 162, p.112016.

Grenier, J.J. and Nelson, S.K., 1995. Marbled Murrelet habitat associations in Oregon. *Ecology and conservation of the Marbled Murrelet. Gen. Tech. Rep. PSW-GTR-152, Pacific Southwest Research Station, Forest Service, US Dept. Agriculture, Albany, CA*, pp.191-204.

Kahl, S., Wood, C.M., Eibl, M. and Klinck, H., 2021. BirdNET: A deep learning solution for avian diversity monitoring. *Ecological Informatics*, 61, p.101236.

Kramer, H.A., Kelly, K.G., Whitmore, S.A., Berigan, W.J., Reid, D.S., Wood, C.M., Klinck, H., Kahl, S., Manley, P.N., Sawyer, S.C. and Peery, M.Z., 2024. Using bioacoustics to enhance the efficiency of spotted owl surveys and facilitate forest restoration. *The Journal of Wildlife Management*, 88(2), p.e22533.

Lesmeister, D.B., Appel, C.L., Davis, R.J., Yackulic, C.B. and Ruff, Z.J., 2021. Simulating the effort necessary to detect changes in northern spotted owl (*Strix occidentalis caurina*) populations using passive acoustic monitoring.

Naslund, N. 1993. Why do marbled murrelets attend old growth forest nesting areas year-round? *Auk* 110:594-602.

Nelson, S.K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*). In *The birds of North America*, No. (276) (A. Poole and F. Gills, eds.). The Academy of Natural Sciences, Philadelphia, PA, and the American Ornithologists' Union, Washington, D.C.

Nelson, S.K. and Sealy, S.G., 1996. Biology of the marbled murrelet: inland and at sea. *Oceanographic Literature Review*, 8(43), p.824.

Nelson, S.K. and Wilson, A.K., 2002. Marbled Murrelet habitat characteristics on state lands in western Oregon. *Department of Fisheries and Wildlife, Oregon State University, Oregon Cooperative Fish and Wildlife Research Unit, Corvallis, Oreg. Final report.*

Nelson, S.K., Huff, M.H., Miller, S.L. and Raphael, M.G., 2006. Marbled Murrelet biology: habitat relations and populations. *UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE GENERAL TECHNICAL REPORT PNW, 650*, p.9.

Pacific Seabird Group (PSG), 2024. A revised protocol for Marbled Murrelets in forests. Pacific Seabird Group Technical Publication Number 6. Available from <https://pacificseabirdgroup.org/psg-publications/technical-publications/>.

Peery, M.Z., Beissinger, S.R., Newman, S.H., Burkett, E.B. and Williams, T.D., 2004. Applying the declining population paradigm: diagnosing causes of poor reproduction in the marbled murrelet. *Conservation Biology*, 18(4), pp.1088-1098.

Ralph, C.J., Hunt Jr, G.L., Raphael, M.G. and Piatt, J.F., 1995. Ecology and conservation of the marbled murrelet in North America: an overview. *Ecology and Conservation of the Marbled Murrelet. USDA Forest Service General Technical Report PSW-GTR-152. Pacific Southwest Research Station, Albany, CA*, pp.3-23.

Sugai, L.S.M., Silva, T.S.F., Ribeiro Jr, J.W. and Llusia, D., 2019. Terrestrial passive acoustic monitoring: review and perspectives. *BioScience*, 69(1), pp.15-25.

Thompson, P.M., Brookes, K.L. and Cordes, L.S., 2015. Integrating passive acoustic and visual data to model spatial patterns of occurrence in coastal dolphins. *ICES Journal of Marine Science*, 72(2), pp.651-660.

U.S. Fish and Wildlife Service (USFWS). 1997. Recovery plan for the threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon and California. USDIA, Fish and Wildlife Service Region 1, Portland, OR.

U.S. Fish and Wildlife Service (USFWS). 2021. Protocol for surveying proposed management activities that may impact Northern Spotted Owls using passive autonomous recording unit methods. Draft Pilot Version 0.1.

Valente, J.J., Nelson, S.K., Rivers, J.W., Roby, D.D. and Betts, M.G., 2021. Experimental evidence that social information affects habitat selection in Marbled Murrelets. *The Auk*, 138(2), p.ukaa086.

Wade, P., Heide-Jørgensen, M.P., Shelden, K., Barlow, J., Carretta, J., Durban, J., LeDuc, R., Munger, L., Rankin, S., Sauter, A. and Stinchcomb, C., 2006. Acoustic detection and satellite-tracking leads to discovery of rare concentration of endangered North Pacific right whales. *Biology letters*, 2(3), pp.417-419.

Wood, C.M., Kahl, S., Chaon, P., Peery, M.Z. and Klinck, H., 2021. Survey coverage, recording duration and community composition affect observed species richness in passive acoustic surveys. *Methods in Ecology and Evolution*, 12(5), pp.885-896.

Attachments

1. Letters of Support
 - a. Mendocino and Humboldt Redwood Companies
 - b. Green Diamond Resource Company
 - c. Matt Greene Forestry and Biological Consulting
 - d. California Licensed Forester Association
 - e. CAL FIRE, Forest Practice Program
 - f. California Forestry Association
 - g. CAL FIRE, Jackson Demonstration State Forest
2. Nondiscrimination Compliance Statement (STD 19)
3. Drug-Free Workplace Certification (STD 21)
4. Payee Data Record (STD 204)
5. System for Award Management (SAM) Account Information



Kristina Wolf, Ph.D.
California State Board of Forestry & Fire Protection
Effectiveness Monitoring Committee
P.O. Box 944246
Sacramento, CA 94244-2460

July 15, 2024

RE: Letter of Support for the proposed study: Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology (Phase 1).

Dear Dr. Wolf,

The purpose of this letter is to indicate our support for the proposed study referenced above. The federal and state endangered marbled murrelet is a cryptic and difficult to study species and detecting them at their inland nesting habitat is critical to protecting their nests from potential impacts. Current survey protocols are expensive and difficult to implement. While Autonomous Recording Units (ARUs) have been successfully used to survey for other listed species, there are no existing studies that have investigated the potential use of this technology for marbled murrelet surveys. This proposed study could potentially provide land managers and regulatory agencies with a less expensive and more efficient survey alternative.

On this study we will collaborate with Principal Investigators Brian Dotters, Wildlife Biologist at Sierra Pacific Industries, Dr. M. Zachariah Peery at the University of Wisconsin, Madison, and Dr. Connor Wood at the Cornell Laboratory of Ornithology. Humboldt Redwood Company will provide access to known murrelet nesting stands, along with audio-visual surveys conducted on our working forestlands in Humboldt County, CA., along with resulting data and logistical support as needed.

We think that this study has the potential to benefit both large and small timberland managers throughout the range of the marbled murrelet in California and the development of a cost effective, time efficient survey protocol that could also potentially be adopted for use within the listed range of the murrelet in Oregon and Washington.

Please feel free to contact me if you have any questions regarding our support for this proposal.

Sincerely,

A handwritten signature in blue ink, appearing to read "Sal Chinnici", is enclosed in a light blue rectangular box.

Sal Chinnici
Director, Forest Sciences
Mendocino and Humboldt Redwood Companies



[REDACTED]
[REDACTED]
[REDACTED]
greendiamond.com

July 19, 2024

Dr. Kristina Wolf
Environmental Scientist
California Board of Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 94244-2460
kristina.wolf@bof.ca.gov

RE: Effectiveness Monitoring Committee Full Project Proposal - Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology

Dear Dr. Wolf:

I am writing to the California Board of Forestry and Fire Protection Effectiveness Monitoring Committee (EMC) to express support of the project proposal “Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology” (Brian Dotters, Sierra Pacific Industries, Dr. Zach Peery, Department of Forest and Wildlife Ecology, University of Wisconsin, Dr. Connor Wood and K. Lisa Yang, Cornell Lab of Ornithology, Center for Conservation Bioacoustics, and Sal Chinnici, Humboldt Redwood Company and Mendocino Redwood Company). The proposed study is a critically important next step in using autonomous recording unit technology to evaluate the feasibility of a survey protocol to assess the probable presence or absence and site occupancy of the federal and state-listed marbled murrelet. The proposed project clearly meets the goals and objectives of the charter for the EMC through a team of resource managers and scientists demonstrating a collaborative, transparent, and science-based approach evaluating effectiveness of specific California Forest Practice Rules for maintaining or restoring habitat for state and federally listed species on forestlands within California.

Green Diamond is a family-owned business established in 1890 in Washington State, and for six generations, it has sustainably managed timberlands in the Pacific Northwest. Currently, Green Diamond owns and manages approximately 400,000 acres in California. All lands owned and managed by Green Diamond are independently audited and certified for sustainable forest management. Green Diamond has a long history of developing and implementing long-term habitat and species conservation plans to guide the management of its forests. Green Diamond is currently engaged with state and federal agencies to develop a long-term conservation plan for the marbled murrelet on its California Timberlands. The Green Diamond ownership in California currently provides known occupied habitat for marbled murrelets that could support a broadened geographic area and increased range of habitat conditions for the proposed project.

Green Diamond is a committed collaborator allowing access to these areas by the research team assembled for this proposed project.

The proposed project is timely given the 2024 revision to the inland survey protocol for the marbled murrelet. The recently revised audio-visual protocol is costly given a minimum two-year survey effort with increased numbers of visits annually to determine probable presence or occupancy of the species and avoid take of the species. At the same time, habitat for the species is being retained and recruited on private lands through purposeful retention of individual tree habitat elements benefitting terrestrial species and for protection of anadromous salmonids in watercourse and lake protection zones under the Forest Practice Rules. As young forests age and habitat platforms used for nesting develop over time, habitat should be on an increasing trajectory on both private and public lands. An improved inland survey protocol that is effective at detecting the species with a high degree of certainty to avoid take and impacts from projects that is also cost-effective for all landowners and resource managers is likely to increase our knowledge of the species habitat needs and result in improved conservation and decision-making regarding forestry and other land use activities. The proposed project addresses important questions regarding listed species and habitat protection under the Forest Practice Act.

Sincerely,

DocuSigned by:

D82B8BAA3FD4453...

Keith A. Hamm, Conservation Planning Manager
Green Diamond Resource Company



Cc: Brian Dotters



July 19, 2024

Cal Fire Forest Practice
Effectiveness Monitoring Committee
Attn: Kristina Wolf, Environmental Scientist
P.O. Box 944246
SACRAMENTO, CA 94244-2460

RE: Support Letter for Establishing a Survey Protocol for Marbled Murrelet Using
Passive Acoustic Technology

Dear EMC,

My name is Matt Greene and I am an RPF and biologist over on the coast. I have been working with and on Marbled Murrelet (MAMU) projects for over 26 years for small private landowners. Many of my clients have chosen to grow large older forests which often favor MAMU habitat development and as such, surveys are often done in conjunction with harvest plans and fuels reduction projects. Over the years, I have conducted over 500 days of in-person official and recognizance level survey, across more than 50 projects within Santa Cruz, San Mateo, Sonoma and Mendocino Counties. These survey efforts are costly and often end up with the potential habitat being cut due to regulatory pressures due to these costs.

Marbled Murrelet science and survey protocols have not generally been offered by the US Fish & Wildlife Service or California Fish & Wildlife Department. Instead, they have been the purview of the Pacific Seabird Group, a group of surveyors and researchers spread across California, Oregon, Washington, BC and Alaska. Over the last 5 years, the Pacific Seabird Group has worked to revise their Inland Survey Protocols for MAMU's and finally released it in early 2024. I was asked to comment on a draft in late 2020 which would have likely led to costs tripling from survey effort from the 2003 Survey Protocol. During the process of the protocols being revised, the entire 30 plus years of survey effort of all California landowner's data was thrown out for their probability analysis by the Group. This analysis looked at the probability on any given day, that a bird or birds would be detected by in-person surveyors.

California's data and in particular, the southern range offers a unique setting for MAMU survey efforts since clearcutting (even-aged management) hasn't been allowed in more than 45 years. The reason that this is important is that Oregon and Washington (and to a lesser extent BC) allow for even-aged management where there are large holes in the forest canopy for viewing of passing by MAMU's. To eliminate the entire southern range and in particular an area which

is limited to uneven-aged management, the data is very skewed and doesn't represent conditions that are often found in California's survey efforts. A protocol which also still continues to rely on in-person surveys and not modern technological efforts should have been developed (and incidentally is what this proposal sets out to do). In 2020, I asked about several possible alternatives to in person surveys to aide in detection of MAMU's and keep survey costs in check. The issue at hand is we are often talking about 1 tree or a few trees as being declared habitat. There is no current regulation or law prohibiting a landowner from cutting down these trees outside of the application of the Forest Practice Rules under a "Plan". We must find solutions to survey for these endangered species which don't put a bounty on the very habitat that is required to support them.

In 2022, I began working on my landowners' projects to develop a survey protocol which involved autonomous recording units (ARU's). A few local biologists had had some luck on the nearby McCabe Reserve using ARU's and I thought it would be a good backup to in-person efforts. My initial efforts weren't great for a few reasons and this project looks to help fill in the holes that we need to do this kind of work effectively. Spacing between units, proximity to watercourses, and the specific kinds of units to use are all key parts of this as well as the software to analyze the results of the recordings.

Small landowners don't often have the ability to contribute to this kind of research and never have the ability to create a protocol which are useable, but in this case, some of the best remaining MAMU habitat is on small landowners holdings due to the long-term commitment of their stewardship. In order for them to keep managing their lands and provide habitat for this species, economical efforts need to be developed for California specific projects which take into consideration that visual detections aren't always possible. The use of ARU's in NSO surveys has boosted the detection of that species tremendously if the sampling is done for long enough time periods and in densities which are sufficient to saturate the area. This is exactly the kind of thing that is needed for MAMU's and this proposal sets out to do this. Please consider this a very helpful and meaningful project to fund and one which will significantly help small landowners here in California.

Sincerely,



Matt Greene, RPF #2747



April 12, 2024

EFFECTIVENESS MONITORING COMMITTEE
P.O. Box 944246
SACRAMENTO, CA 94244-2460

Re: Letter of Support for the Research Proposal, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology"

Dear Effectiveness Monitoring Committee,

The California Licensed Foresters Association (CLFA) was formed by Registered Professional Foresters (RPFs) in 1980. CLFA represents California Registered Professional Foresters and associated professionals, who are responsible for the sustained management of millions of acres of California forestland. The Association represents Industrial, Consulting or Public foresters working together for the common cause of enhancing the role of the Professional Forester in California.

The purpose of this letter is to indicate our support for the proposed study "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology." The proposed study will provide an alternative to current existing survey protocols for the marbled murrelet (*Brachyramphus marmoratus*, MAMU) by utilizing new technology that has yet to be fully adopted for the species.

Currently, the recommended protocols (Audio-visual surveys) are labor intensive, which in turn adds significantly to cost, particularly for non-industrial timberland owners. At a time when increasing pace and scale of effective forest management is of paramount concern, developing a more cost effective and time efficient alternative would be beneficial to all land managers within the range of MAMU. We fully support this research and the development of an additional protocol that may be used for both compliance with current legislation and potential population monitoring.

Sincerely,



Brita Goldstein
President
California Licensed Foresters Association

**DEPARTMENT OF FORESTRY AND FIRE PROTECTION**

HEADQUARTERS-SACRAMENTO

PO Box 944246

715 J Street

Sacramento, CA 94244-2460

Website: www.fire.ca.gov

July 22, 2024

California Board of Forestry & Fire Protection
Effectiveness Monitoring Committee
Post Office Box 944246
Sacramento, CA 94244-2460

Subject: California Department of Forestry and Fire Protection – Forest Practice Program
Letter of Support for the Research Proposal, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology"

Effectiveness Monitoring Committee:

The California Department of Forestry and Fire Protection – Forest Practice Program (CAL FIRE) appreciates the opportunity to provide a letter of support for the proposed research project, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology".

CAL FIRE's interest in this research covers the entire terrestrial range of Marbled Murrelet (MAMU) in California as it pertains to timber harvesting and fuels reduction treatments to prevent and minimize wildfire spread. CAL FIRE is the lead agency that regulates timber harvesting activities on private timberlands in the State of California through the authority of the California Forest Practice Act and Rules. These rules are intended to preserve and protect fish, wildlife, and other natural resources. CAL FIRE also manages its own timberland through the development of timber harvesting plans on Demonstration State Forests, with Jackson Demonstration State Forest in the MAMU range. CAL FIRE has partnered with Governor Gavin Newsom and other agencies on the Forest Management Task Force to develop California's Wildfire and Forest Resiliency Action Plan in January 2021. The goal of the plan is to increase the pace and scale of fuel treatment projects in grassland, brush, and timber to prevent and minimize impacts of wildfire, including land within the MAMU range.

Conventional take avoidance strategies for most listed bird species typically include conducting active, calling surveys. For MAMU, the commonly accepted survey strategy has been the 2003 protocol, "Methods for Surveying Marbled Murrelets in Forests: a Revised Protocol for Land Management and Research" with a recently released 2024 revised protocol. These types of surveys can be time-consuming and costly for land managers conducting timber harvesting or fuels reductions projects and having other survey methods, as this research proposes to do, can offset time and cost while providing assurances for take avoidance.

The results of this research can benefit timberland owners, CAL FIRE Review Teams in their review of timber harvesting plans, and CAL FIRE and landowner fuel reduction projects by providing an alternate strategy for demonstrating take avoidance. CAL FIRE hopes you will approve this project. CAL FIRE's Forest Practice Program biological staff are committed to providing technical support and any necessary review as the project moves forward.

Please let me know if you have any questions.

Stacy Stanish

Stacy Stanish

Senior Environmental Scientist – Forest Practice Biologist

July 22, 2024

EFFECTIVENESS MONITORING COMMITTEE

P.O. Box 944246

SACRAMENTO, CA 94244-2460

Re: Letter of Support for the Research Proposal, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology"

Dear Effectiveness Monitoring Committee,

The California Forestry Association (Calforests) is the preeminent trade association for the state's forestry sector. Our members are committed to ensuring California has an adequate and sustainable supply of affordable forest products, while maintaining and enhancing wildlife habitat, water resources, air quality and rural economies.

The purpose of this letter is to indicate our support for the proposed study "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology." The proposed study will provide a much-needed alternative to current existing survey protocols for the marbled murrelet (*Brachyramphus marmoratus*, MAMU) by utilizing new technology that has yet to be fully adopted for this species.

The current audio-visual surveys conducted under the current recommended protocol can be cost prohibitive and labor-intensive. Developing a more cost effective and time efficient alternative would be beneficial to all land managers within the range of MAMU, ranging from large industrial timber managers to small non-industrial timber managers. We fully support this research and the development of an additional protocol that may be used for both compliance with current legislation and potential population monitoring.

George D. Gentry



Senior Vice President
California Forestry Association

**DEPARTMENT OF FORESTRY AND FIRE PROTECTION**

Jackson Demonstration State Forest
802 North Main Street
Fort Bragg, CA 95437
(707) 964-5674
Website: www.fire.ca.gov



July 9, 2024

EFFECTIVENESS MONITORING COMMITTEE
P.O. Box 944246
SACRAMENTO, CA 94244-2460

Re: Letter of Support for the Research Proposal, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology"

Dear Effectiveness Monitoring Committee,

Jackson Demonstration State Forest (JDSF/State Forest) is a 48,652-acre forest owned by the State of California and managed by the California Department of Forestry and Fire Protection (CAL FIRE) for the people of California. As part of its legislative mandate, JDSF participates in and hosts research, demonstration, and education associated with its forest management activities. The State Forest also supports research projects that address relevant management and conservation questions which have high potential to benefit both forest landowners and sensitive species.

Jackson Demonstration State Forest contains 459 acres of protected old growth, 2,762 acres of late-seral development areas, and an unknown number of scattered residual old-growth trees. Identifying, managing, and protecting potential nesting habitat for the marbled murrelet (*Brachyramphus marmoratus*) has been a priority for JDSF since the species was state and federally listed as endangered and threatened, respectively, in 1992. Over the past three decades, hundreds of audio-visual (AV) surveys have been conducted across JDSF on nearly 30 distinct habitat areas without ever detecting a marbled murrelet. Forest structure in many areas of JDSF has also started to attain large limb sizes and canopy structure capable of supporting murrelet nests which has led to a substantial increase in AV surveys on the State Forest. The current recommended survey protocol for marbled murrelet relies solely on AV surveys, while new technologies, such as acoustic recording devices, have yet to be formally adopted by regulatory agencies as a viable, alternative survey approach applicable to projects and landscape monitoring programs.

The proposed study, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology" will provide needed information on the efficacy and cost-effectiveness of these recording units as compared to AV surveys. This research has broad applicability to large industrial timberland landowners, small landowners, state and county parks, as well as JDSF for endangered species compliance and monitoring. For all these reasons, JDSF supports this proposed study and will commit to funding AV surveys and assist with field deployments and checking equipment at historically occupied sites in Mendocino and northern Sonoma counties.

This proposal is consistent with JDSF's research and monitoring mission and affords an opportunity to develop survey methods that will help identify sensitive wildlife habitat, assess cumulative impacts, and better facilitate resource management decisions on the State Forest and other working landscapes.

If you have any questions, please feel free to contact me.

Robert B. Douglas
State Forest Biologist/Senior Environmental Scientist, Jackson Demonstration State Forest

<https://sam.gov/content/home>

[REDACTED]

[REDACTED]

Expiration: 1/17/25 (Renews Annually)



500 Capitol Mall, Suite 2360
Sacramento, CA 95814
916.444.6592

July 22, 2024

EFFECTIVENESS MONITORING COMMITTEE

P.O. Box 944246

SACRAMENTO, CA 94244-2460

Re: Letter of Support for the Research Proposal, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology"

Dear Effectiveness Monitoring Committee,

The California Forestry Association (Calforests) is the preeminent trade association for the state's forestry sector. Our members are committed to ensuring California has an adequate and sustainable supply of affordable forest products, while maintaining and enhancing wildlife habitat, water resources, air quality and rural economies.

The purpose of this letter is to indicate our support for the proposed study "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology." The proposed study will provide a much-needed alternative to current existing survey protocols for the marbled murrelet (*Brachyramphus marmoratus*, MAMU) by utilizing new technology that has yet to be fully adopted for this species.

The current audio-visual surveys conducted under the current recommended protocol can be cost prohibitive and labor-intensive. Developing a more cost effective and time efficient alternative would be beneficial to all land managers within the range of MAMU, ranging from large industrial timber managers to small non-industrial timber managers. We fully support this research and the development of an additional protocol that may be used for both compliance with current legislation and potential population monitoring.

George D. Gentry

Senior Vice President
California Forestry Association



CALIFORNIA
LICENSED
FORESTERS
ASSOCIATION

2149 Carson Mesa Rd • Acton, CA 93510
phone • 916.913.9970 fax • 661.269.5513
email • admin@clfa.org web • www.clfa.org

April 12, 2024

EFFECTIVENESS MONITORING COMMITTEE
P.O. Box 944246
SACRAMENTO, CA 94244-2460

Re: Letter of Support for the Research Proposal, "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology"

Dear Effectiveness Monitoring Committee,

The California Licensed Foresters Association (CLFA) was formed by Registered Professional Foresters (RPFs) in 1980. CLFA represents California Registered Professional Foresters and associated professionals, who are responsible for the sustained management of millions of acres of California forestland. The Association represents Industrial, Consulting or Public foresters working together for the common cause of enhancing the role of the Professional Forester in California.

The purpose of this letter is to indicate our support for the proposed study "Establishing a Survey Protocol for Marbled Murrelet Using Passive Acoustic Technology." The proposed study will provide an alternative to current existing survey protocols for the marbled murrelet (*Brachyramphus marmoratus*, MAMU) by utilizing new technology that has yet to be fully adopted for the species.

Currently, the recommended protocols (Audio-visual surveys) are labor intensive, which in turn adds significantly to cost, particularly for non-industrial timberland owners. At a time when increasing pace and scale of effective forest management is of paramount concern, developing a more cost effective and time efficient alternative would be beneficial to all land managers within the range of MAMU. We fully support this research and the development of an additional protocol that may be used for both compliance with current legislation and potential population monitoring.

Sincerely,

A handwritten signature in black ink that reads "Brita Goldstein".

Brita Goldstein
President
California Licensed Foresters Association