Evaluating Post-Fire Restocking Strategies and Their Effectiveness is Promoting Wildfire Resilience in Industrial and Non-Industrial Timberlands

State of California Board of Forestry and Fire Protection Effectiveness Monitoring Program Grant - Full Proposal
EMC Project #: EMC-2025-005

Proposal submitted: 7/23/2025

Proposed Project Duration: 18–24 months (anticipated start: January 2026)
Geographic Area of Work: CAL FIRE's Northern Forest District
Total EMC Funding Requested: $144,672.37
In-kind or Matching Contributions: $15,666,69 in labor and travel from SIG and collaborators

Submitted by
Spatial Informatics Group, LLC
[redacted]

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Collins Pine Company
[redacted]

Additional coordination is underway with Sierra Pacific Industries (SPI), the U.S. Forest Service, and local Registered Professional Foresters (RPFs) to support site access and landowner engagement

A. Project Details

I. Project Duration

We anticipate that the project will require 18-24 months to complete. See section C for a timeline detailing anticipated deliverable completion dates.

II. Background and Justification

California's Northern Forest District has experienced numerous fires in the last three decades, ranging in size from small (<5K acres) to extremely large (>900K acres). The largest of these fires was the 2021 Dixie Fire, which was not only unprecedented in scale and severity but also reburned several recently burned areas, including the 2007 Moonlight Fire, 2019 Walker Fire, 2000 Storrie Fire, 2020 North Complex Fire, and several others.

The Northern Forest District contains some of California's most productive timberlands, comprising private industrial, private non-industrial, and public forests. The post-fire management of these lands is extremely diverse. Treatments have included various combinations and intensities of salvage logging, mechanical site preparation, chemical site preparation, planting arrangements, and stocking densities. Reforested structure and composition vary significantly within and between ownership types, creating a unique opportunity to assess the effectiveness of different post-fire restocking and rehabilitation strategies related to forest regeneration, sustainable timber harvest, and timber quality.

California's Forest Practice Rules (FPRs) establish restocking standards following even-aged harvests and serve as a guideline following high-severity fires. These standards primarily aim to achieve long-term timberland productivity and do not focus on fuels management. However, the effectiveness of these regulations in mitigating fire risk and sustaining forest productivity remains uncertain, particularly in the context of large-scale industrial and non-industrial timberland management in an age of extreme weather and fire.

A key consideration is the role of post-fire tree removal ("salvage harvest"), which can be implemented after high-severity wildfires to recover some economic value, remove what would otherwise become surface fuels in the future stand, create safe conditions for future work by crews, and generally prepare sites for replanting. While salvage harvests have these multiple benefits, research suggests (McGinnis et al., 2010; Leverkus et al., 2021) that intensive post-fire management—including high-density replanting—may create homogenous stands with higher fuel loads, potentially increasing fire severity in subsequent burns. Further, even low-density stands may be vulnerable to "re-burns" once they begin to generate their own surface fuel loads. Conversely, areas left to regenerate naturally may exhibit greater structural diversity and be resistant to re-burn for a short period, but may not meet productivity goals. Once shrubs develop into continuous canopies, they are also receptive to high-severity fire under extreme weather conditions.

By analyzing post-fire regrowth, stand structure, and subsequent burn severity within previously burned and restocked areas, this study will assess whether existing FPR salvage and stocking standards promote wildfire resilience while maintaining long-term timberland productivity.

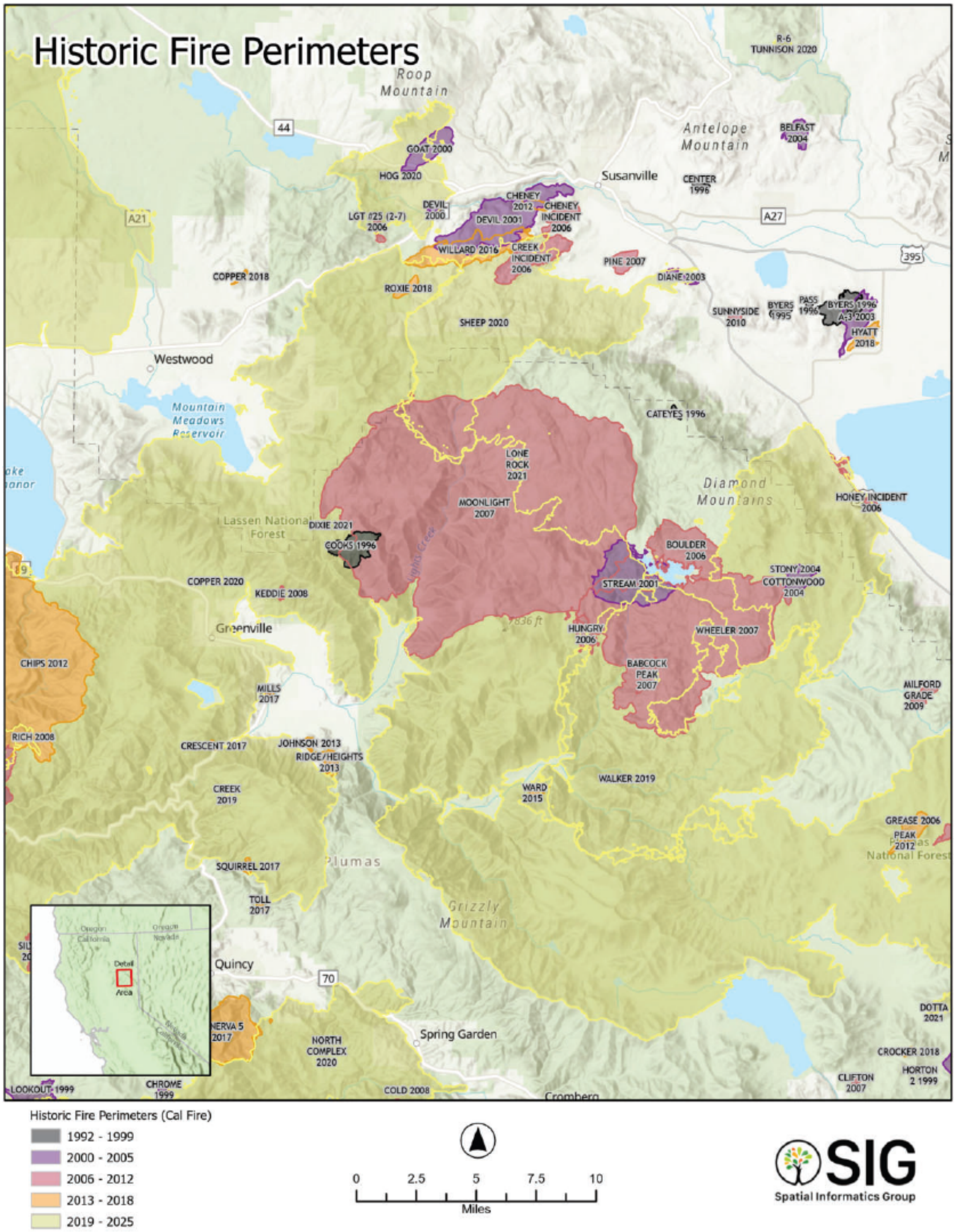

Figure 1: The above map details the recent fire history in a segment of California's Northern Forest District with a concentration of timber land. This area has been selected as an example of the opportunity to study restocking standards as they relate to post-fire outcomes in timber harvest areas that have seen repeated fire.

III. Objectives and Scope

- Develop a structural complexity[1] metric using terrestrial lidar scans from known silvicultural reference sites where planted stands have been managed for low fire hazard (e.g., Blodgett Forest) to evaluate how post-fire restocking influences vegetation-related fuel structure across ownership types.
- Evaluate how different post-fire restocking strategies (e.g., site preparation, planting density, planting pattern, such as cluster planting, and species composition) influenced forest structure before and after subsequent wildfire events.
- Evaluate post-fire restocking outcomes on industrial timberlands in relation to observed vegetation and fuel development on non-industrial and/or federal lands that were not restocked.
- Assess how planted stands were used to help contain or slow wildfires, and where they burned with high severity or contributed to fire spread. Specifically, we will look for the threshold age at which planted stands might switch from being suppression benefits to suppression liabilities.[2]
- Test whether commonly used modeling tools (e.g., FVS, fire behavior and spread models) produce outputs that align with observed fuel development and fire outcomes across post-fire stocking gradients.
- Assess whether current Forest Practice Rule (FPR) stocking standards adequately promote fire-adapted forest structures under future disturbance scenarios.
- Identify potential regulatory or silvicultural modifications that could improve post-fire recovery and resilience across land ownerships.
- Produce scalable, reproducible workflows for assessing post-fire stocking impacts using open-access remote sensing and public THP records.

IV. Research Methods

Study Area and Site Selection:

This study will focus on forestlands within CAL FIRE's Northern Forest District, which include a diverse mix of industrial timberlands, non-industrial private forests, and federal holdings. To evaluate how post-fire restocking affects forest recovery and wildfire hazard, we will compare areas with different management intensities, planting patterns (i.e., cluster planting[3] as demonstrated in Photo 1), and fire histories, including:

- Untreated federal lands (serving as a "control" condition with minimal intervention or replanting as demonstrated in Photo 2)
- Privately managed timberlands that were burned once (e.g., in 2021), and
- Twice-burned areas with known post-fire treatments following an earlier fire (e.g., Moonlight 2007 + Dixie 2021 as displayed in Photo 3).

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[1] a measure of the variation in vertical and horizontal forest structure, which influences vegetation growth, habitat quality, and fire behavior

[2] dense vegetation that increases fire intensity or hinders firefighting efforts

[3] a method where trees are planted in tight groups with open space between clusters to encourage structural diversity and reduce fuel continuity

Photo 1. Example of cluster planting area within the 2006 Boulder Fire near Antelope Lake, Plumas National Forest.

A particular focus will be placed on reburn zones, where observed fire effects can be tied to past restocking decisions and fuel development trajectories. These landscapes offer a natural experiment for evaluating whether stocking and slash management influence the severity of subsequent fires.

Site selection will be guided by a multi-step spatial filtering process, combining:

- Remote sensing indicators of disturbance, recovery, and vegetation structure (e.g., Sentinel-2, AGB change from Pelletier et al. 2024),
- Ownership class and known treatment history (e.g., THP boundaries and silvicultural prescriptions),
- Modeled fire hazard outputs from Monte Carlo simulations of fire behavior and spread,
- Biophysical variables (e.g., slope, aspect, elevation),
- Geographic distribution to ensure representative sampling across management types.

Photo 2. Example of private-public land boundary burned in the 2007 Moonlight Fire and effectively reforested on private land.

Photo 3. Portion of an established plantation from the 2007 Moonlight Fire with evidence of use for fireline construction and containment of portions of the 2021 Dixie Fire

Following this initial filtering, we will conduct field reconnaissance to validate and refine our candidate sites. These field visits will serve both to verify model outputs and to capture on-the-ground conditions that may not be visible in satellite imagery or public records (e.g., evidence of pile burning, herbicide use, natural regeneration).

To support interpretation of field-based lidar and plot data, we will also conduct terrestrial lidar scanning (TLS) within the Blodgett Forest Research Station, a UC-owned experimental forest with well-documented silvicultural histories. These reference scans will capture a spectrum of stand structures—ranging from even-aged to selection-managed to no-treatment plots—which will serve as a comparative framework for assessing fuel structure and restocking outcomes in our study area. In particular, there are several 40- to 50-year-old stands that have a diversity of current fuel structures and fire hazards because of past treatments (thinning, prescribed fire, etc.). Analysis of these stands should facilitate the development of a novel silvicultural system for reforestation that aims to achieve both timber and hazard reduction goals.

Remote Sensing and Spatial Analysis:

Remote sensing will form the foundation for our initial data collection and site selection strategy. We will leverage Sentinel-2 and Landsat time series to analyze changes in vegetation cover, burn severity, and post-fire regrowth across the study region. Vegetation type and canopy cover estimates will be informed by Dynamic World classifications and LandTrendr-based analyses, while MTBS severity rasters will be used to assess burn intensity for both initial and repeat fire events. Change detection will rely on pre- and post-fire time steps, allowing us to track the recovery trajectory in relation to stocking practices. To assess vegetation structure and biomass accumulation over time, we will integrate results from Pelletier et al. (2024), which estimates aboveground biomass (AGB) change and disturbance extent using Harmonized Landsat and Sentinel (HLS) composites. These remote outputs will be spatially joined with THP boundaries, ownership data, and modeled fire hazard layers to generate site-specific estimates of restocking density, vegetation recovery, and fuel hazard.

Modeling and Forecasting:

The Forest Carbon Accounting Tool (FCAT), developed by Spatial Informatics Group (SIG), is a streamlined workflow for using TreeMap data (Houtman et al. 2025) as the input to Forest Vegetation Simulator (FVS) simulations of forest growth dynamics and management actions. FCAT incorporates FVS outputs into a Monte Carlo wildfire spread simulation, enabling landscape-scale evaluation of how different management strategies—including no action, salvage logging, planting, and fuel treatments—affect long-term wildfire hazard and forest carbon trajectories.

For this project, FCAT will be used to model pre- and post-reburn vegetation trajectories under various post-fire restocking and treatment scenarios. Model inputs will include salvage harvest practices, residual material management, site preparation methods, planting density, and intermediate treatments. Outputs will include projections of fuel loading, canopy development, and fire hazard over decadal timescales (e.g., 10–30 years).

Model outputs will be validated through paired comparisons of modeled vs. observed post-fire conditions in once- and twice-burned stands. Particular attention will be paid to how site preparation and stocking decisions influence fuel accumulation and fire behavior. Where feasible, we will cross-reference FCAT fire behavior projections with observed fire severity (e.g., dNBR, RdNBR from MTBS or Sentinel-2) data to assess model alignment with empirical outcomes.

Field Data Collection and Ground Truthing:

Fieldwork will be used to ground-truth remote sensing and model outputs, and parameterize fire behavior models. Data collection will focus on a stratified subset of selected sites, ensuring representation across different ownerships, restocking intensities, and fire histories. At each site, we will install 1/100th-acre plots to record surface fuel loading, tree density, species composition, and structural attributes of the developing stand. We will also record evidence of slash treatment (e.g., pile burning or mastication), and indicators of past management (e.g., site prep, herbicide use). To capture fine-scale canopy and fuel structure, we will deploy an Uncrewed Aerial System (UAS) and terrestrial lidar scanning (TLS) device. A TLS unit will be used on a subset of accessible plots to obtain 3D structural metrics. Where full TLS coverage is not feasible due to terrain or cost, we will supplement with high-resolution UAS imagery to generate photogrammetric products, such as canopy height models and high-resolution orthoimagery.

Statistical and Comparative Analysis:

We will evaluate the relationship between post-fire restocking strategies and wildfire outcomes using multivariate statistical models, integrating both remotely sensed and field-based data. Primary response variables will include vegetation recovery (% evergreen cover or improved remote sensing analogs), fire severity (e.g., dNBR, RdNBR from MTBS or Sentinel-2), and modeled or observed fire hazard.

Where appropriate, we will incorporate composite burn severity layers derived from Parks et al. (2018, 2019), which offer improved accuracy and ecological interpretability relative to standard burn severity products. Explanatory variables may include stocking density, species composition, ownership class, silvicultural treatment type (e.g., clearcut, selection, salvage), slash management, time since fire, terrain, and modeled fuel accumulation.

We anticipate that advanced metrics and classification methods developed by project collaborators will further refine the ability to quantify post-fire fuel development and risk across ownership and treatment types.

V. Scientific Uncertainty and Geographic Application

Detecting causal relationships between post-fire restocking strategies and wildfire outcomes is inherently challenging due to the complexity of fire behavior and variation in on-the-ground management. In many cases, detailed information on site preparation, slash treatment, or restocking prescriptions may be unavailable or inconsistently documented across ownership types. Additionally, the timing of events—such as harvests, site preparation, replanting, and subsequent fires—can vary significantly across sites, introducing uncertainty when aligning fire effects with specific management actions.

Modeling tools such as FVS and fire behavior and spread models enable simulation of post-fire forest dynamics, but their outputs rely on assumptions about growth trajectories, treatment effectiveness, and fire behavior that may not fully capture localized ecological variability or novel disturbance regimes. We will address these limitations using stratified sampling, ground-truthing, and comparative scans from known management units (e.g., UC Blodgett Forest) to calibrate and interpret both remote and modeled results. Spatial covariates— terrain, ownership class, elevation, and time since fire—will be incorporated into our statistical design to help isolate treatment effects from confounding environmental or anthropogenic variables.

VI. Collaborations and Project Feasibility

This project is highly feasible due to the team's technical depth, long-standing interagency partnerships, and experience executing complex wildfire monitoring and modeling efforts. Spatial Informatics Group (SIG) has successfully led multiple EMC-funded projects (EMC-2019-002 and EMC-2023-002) as well as federally funded efforts focused on post-fire vegetation recovery and fuel hazard analysis. The proposed study region is well understood by the team, with established workflows in place for integrating remote sensing, fieldwork, statistical modeling, and stakeholder engagement.

The project will be led by **Nick Miley** (Project Manager, SIG), who will coordinate day-to-day implementation, including field design, site access, data integration, and deliverable production. **Jason Moghaddas**, a Registered Professional Forester (RPF #2774) with extensive experience in post-fire management and EMC-aligned forest monitoring, will serve as Principal Investigator and provide strategic and methodological oversight. **Dr. David Saah** (SIG) will also serve as Principal Investigator, supporting coordination with the Board of Forestry's Effectiveness Monitoring Committee and ensuring alignment with broader EMC goals.

The project team includes key technical collaborators from SIG and partner institutions. **Dr. Rob York** (UC Berkeley and RPF) serves as Co-Principal Investigator, advising on field design, lidar data interpretation, and facilitating access to comparative research plots at Blodgett Forest. **Dr. Jessi Brown** (Sparrowhawk Data Science) will lead geospatial and statistical analysis, building on her prior work with EMC datasets and advanced R-based workflows. **Dr. Kayla Johnston** (SIG) will oversee FVS and fire behavior and spread modeling and scenario development. **Dr. Mehdi Heris** (SIG) brings specialized experience in geospatial programming and will support analytical tool development in Python and GEE. Elijah Dalton (SIG) will lead remote sensing workflows in Google Earth Engine, including application of the Pelletier et al. (2024) biomass change and disturbance mapping framework.

Field operations will be led by **Gary Roller** (SIG), an RPF (#2899) with extensive post-fire effects and monitoring field experience in California forests. **Jarrett Barbuto** (SIG), a licensed UAV pilot and remote sensing specialist, will oversee all drone operations, including flight planning, data acquisition, and photogrammetric product development. His work will support the generation of high-resolution canopy height models and structural metrics to complement terrestrial lidar scans and field measurements.

Industry and agency collaborators include **Eric O'Kelley, RPF**, a Forest Manager with Collins Pine Company based in Chester, CA—within the project's core study area. He brings valuable insight into private silvicultural strategies and is assisting with access to industrial forest sites. **Jonathan Pangburn, RPF** (CAL FIRE) will serve in an advisory role, contributing operational context, landscape treatment history, and local expertise from the Northern Forest District. We have initiated coordination with Sierra Pacific Industries and the U.S. Forest Service to request access to additional treated and untreated forestlands, particularly those within or adjacent to our selected fire footprints. Local CAL FIRE units, RPFs, and RCDs will be consulted throughout the project to support site selection and ensure alignment with on-the-ground practices. Ongoing engagement with landowners, CAL FIRE units, and local RPFs will not only support site access but also help shape the interpretation and application of study findings. Stakeholder feedback will inform how outputs are prioritized, contextualized, and communicated for practical use.

The project is scoped to be completed in **18 months**, but given the potential for unforeseen challenges such as fire activity, weather, or administrative delays in land access, we request a flexible timeline of **18–24 months** to ensure high-quality completion.

VII. Alignment with EMC Monitoring Gaps

This project directly addresses critical gaps identified in the EMC's 2024 Monitoring Crosswalk, particularly within Theme 6: Wildfire Hazard. While past EMC-funded studies have explored fuel treatments and fire severity (e.g., EMC-2019-002, EMC-2023-002), no EMC project to date has systematically evaluated how California's post-fire stocking and slash treatment standards—codified in 14 CCR §§ 932.7 and 937.2—influence fire behavior, vegetation recovery, and long-term resilience across different ownership types.

The proposed study integrates remote sensing, field-based terrestrial lidar, and predictive modeling to assess how these regulatory practices shape fuel development and subsequent fire outcomes. In doing so, it advances the EMC's goal of connecting rule implementation to fire-adapted conditions and post-fire stand dynamics—particularly in high-risk, high-value timber regions such as the Northern Sierra Nevada and Southern Cascades.

In addition, the project supports the EMC's stated need for scalable and reproducible monitoring workflows. All analytical products—including GEE code, FVS and fire spread modeling, and lidar classification workflows—will be open-source and designed to support future EMC efforts and policy evaluations.

By focusing on regulatory effectiveness in real-world post-fire conditions, this work will directly inform future evaluations of California's Forest Practice Rules and potentially help prioritize silvicultural strategies that promote ecological resilience and sustained yield on managed timberlands.

k. Critical Question Theme and Forest Practice Rules or Regulations Addressed.

This project will address Theme 6 Wildfire Hazard, critical questions:

(d) Managing forest structure and stocking standards to promote wildfire resilience?

Stocking Standards (14 CCR § 932.7):
The project will assess whether post-fire restocking practices meeting the minimum standards outlined in 14 CCR § 932.7 result in forest structures that enhance wildfire resilience. By analyzing stand conditions and burn severity across ownership/management types, it will evaluate if current stocking levels effectively reduce fuel continuity and promote fire-adapted landscapes.

Alternative Stocking Standards (14 CCR § 932.7(b)(1)(D)):
The project will examine whether the use of alternative stocking standards under 14 CCR § 932.7(b)(1)(D) leads to more resilient post-fire forest conditions. By comparing outcomes from areas using standard versus alternative approaches, the study will evaluate how flexibility in stocking requirements influences long-term fire behavior and forest health.

(g) Maintaining timberland productivity, including wood quality and sustained yield after wildfire?

Maximum Sustained Production (MSP) (14 CCR § 933.11):
The project will evaluate whether post-fire restocking strategies align with the intent of 14 CCR § 933.11 by supporting long-term timberland productivity and wood quality. By comparing regeneration outcomes and stand development across ownerships and treatments, it will assess if current practices meet MSP goals following wildfire.

(a) Treating post-harvest slash and slash piles to modify fire behavior?

Slash Treatment Requirements (14 CCR §§ 937.2, 1038):
The project will evaluate how slash treatment practices required under 14 CCR § 937.2, which governs slash disposal in the Northern Forest District, influence fuel continuity and fire behavior. This section outlines specific requirements for lopping, scattering, chipping, or burning slash to reduce fire hazard within defined distances of roads and firebreaks. In addition, the study will assess how slash treatments implemented under post-fire timber harvest exemptions (e.g., 14 CCR § 1038) comply with these requirements and whether they promote conditions conducive to wildfire resilience. By examining how slash and landing debris are handled under these provisions, the project will analyze their role in modifying fire behavior in restocked areas.

Operational Requirements (14 CCR § 1052.4):
The project will also consider slash treatment practices conducted under 14 CCR § 1052.4, which outlines operational requirements for emergency timber operations, including post-fire salvage. It will assess whether these emergency-related requirements are effectively reducing fuel hazards and supporting long-term fire-adapted forest conditions when used in conjunction with restocking strategies.

B. Project Deliverables

Deliverable	Description	Due Date	Format
Remote Sensing-Based Restocking Index Map	Spatial dataset and interpretive memo describing post-fire stocking patterns and vegetation recovery across the study area, derived from Sentinel-2, HLS, and Pelletier et al. (2024) AGB change layers.	Month 9	Spatial dataset (.tif/.shp) + memo (PDF)

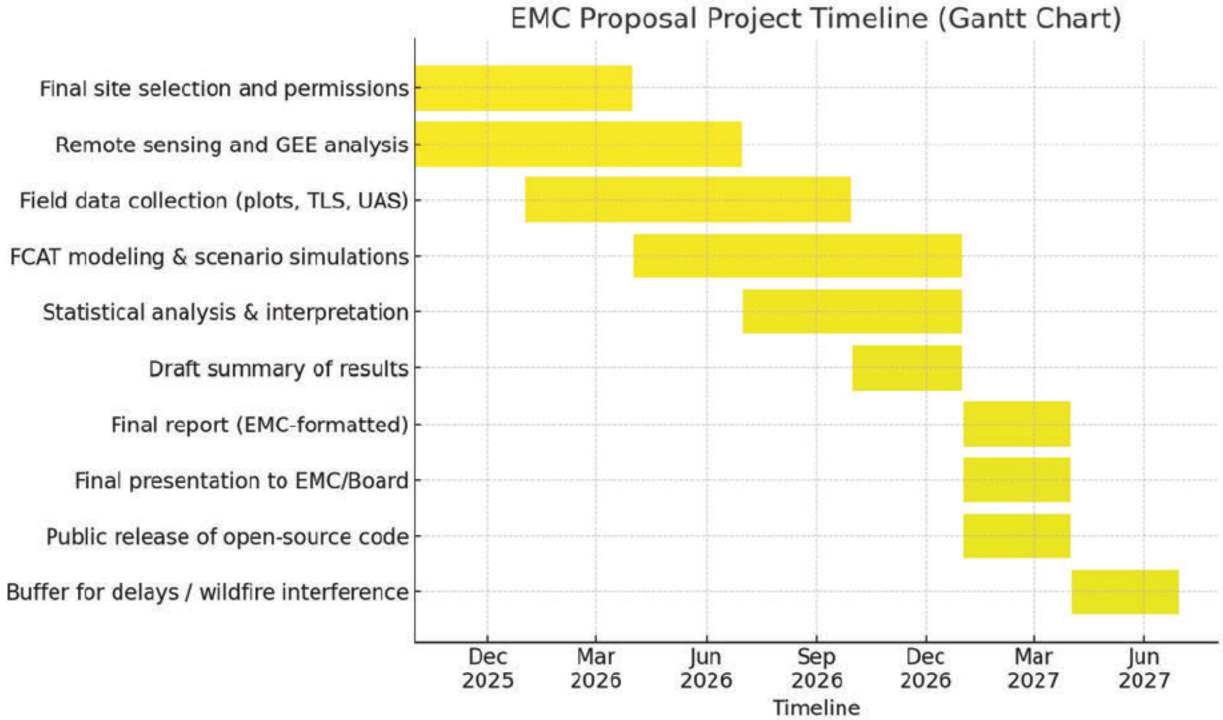
Field-Validated Structural Complexity Dataset	Ground-truthed lidar- and plot-based structural metrics from industrial, non-industrial, and federal lands. Includes comparative TLS scans from Blodgett Forest reference plots.	Month 12	CSV + lidar data files (.las/.txt) + metadata PDF
Post-Fire Treatment Scenario Modeling	FCAT-based modeling outputs showing vegetation trajectories, fuel accumulation, and fire hazards under multiple restocking and treatment scenarios.	Month 14	Model output tables + PDF summary
Statistical Analysis of Stocking-Fire Outcomes	Multivariate analysis linking restocking methods (e.g., slash treatment, density) with burn severity and vegetation recovery. Includes R-based scripts and summary tables.	Month 16	Analysis report (PDF) + R scripts (.R)
Open-Source Code and Workflow Repository	Public release of all modeling, analysis, and remote sensing code (GEE, R, Python), hosted on GitHub with documentation.	Month 16	GitHub repository (public)
Draft and Final Technical Report	EMC-formatted report summarizing methods, findings, and implications for FPRs and post-fire recovery practices.	Draft: Month 17; Final: Month 18	PDF (Word docx if preferred)
Stakeholder Engagement Summary	Summary report of engagement with landowners, CAL FIRE, USFS, and others regarding field access, study relevance, and applied takeaways.	Month 18	Short report (PDF)
Final Presentation to EMC and Board	Slide deck and presentation (in-person or virtual) summarizing findings, regulatory relevance, and recommendations.	Month 18–24	PowerPoint or PDF slides

C. Detailed Project Timeline

The anticipated timeline includes the following milestones and deliverables:

- **Q1–Q2 2026:** Finalize site selection using spatial filters and reconnaissance; initiate coordination with landowners and agencies. Early season TLS reference scans at Blodgett Forest.
- **Q2–Q3 2026**: Conduct field data collection across stratified sites (plots, TLS, UAS). Remote sensing workflows initiated (e.g., Sentinel-2 recovery trajectories, AGB change overlays).
- **Q4 2026 – Q1 2027:** Process and validate field data. Begin FVS and fire spread modeling and statistical integration of remote and ground data.
- **Q2 2027:** Complete modeling runs and statistical analyses. Public release of open-source code and workflow documentation.
- **Q3 2027:** Draft technical report, finalize structural complexity dataset, and complete restocking index map.

- **Q4 2027 – Q2 2028 (Buffer Period):** Incorporate feedback, finalize deliverables, conduct stakeholder briefings, and present results to EMC and the Board.



A Note on Implementation Timing:
The project timeline outlines an 18-month sequence of tasks, with an additional 6-month buffer to accommodate real-world disruptions (e.g., wildfire, site access, permitting delays). While the order and duration of tasks are expected to remain consistent, the calendar start date may shift depending on when the grant agreement is executed. As such, the Gantt chart should be interpreted as a representative workflow timeline, with start and end dates anchored to project initiation rather than to fixed calendar quarters.

D. Detailed Budget

Please see the separate budget appendix D for the Excel file of line item budget detail.

Requested EMC funding totals $144,672.37 over an 18–24 month project period. The majority of this funding supports personnel time for project implementation, including ~2,200hours of SIG staff work related to field data collection, geospatial analysis, modeling, and reporting. Fringe benefits are calculated at 25% of direct salaries.

Contractual costs include time for statistical and geospatial analysis support by Dr. Mehdi Harris and Dr. Jessi Brown of Sparrowhawk Data Science. Both contractors have worked on our current EMC Project focused on forest management and riparian areas, and have an understanding of forest analytical data and issues in California. Operating costs include the rental of a UAV system for 2 weeks to generate high-resolution canopy height models and supplement terrestrial lidar scans. No equipment is being purchased with EMC funds. Travel and indirect costs are modest and align with EMC guidance, with indirect costs capped at 15%.

A total of $15,666.69 is provided as match/in-kind support, consisting of contributed labor and travel from SIG and partner organizations.

Per EMC guidance, sufficient funding is allocated in FY25–26 to ensure uninterrupted progress through the summer of 2026 (Q3), even in the event of a delay in access to FY26–27 funds. This includes coverage for key fieldwork, analysis, and modeling tasks scheduled between July and September 2026.

A Note on the Increase in Funds Requested:

This budget reflects the addition of a robust field component, which was incorporated at the request of the EMC following review of our Initial Concept Proposal. Additional costs are associated with field plot installation, terrestrial lidar scanning (TLS), uncrewed aerial system (UAS) flights, and staff time required to collect and interpret high-quality ground-based data. These methods are essential for validating remote sensing outputs and ensuring that results are scientifically defensible and broadly useful to EMC stakeholders.

Appendices

Appendix A. SAM.gov Registration Screenshot

Entity Information

SPATIAL INFORMATICS GROUP LLC • Active Registration

Unique Entity ID
VTC4RJ86D2X6

CAGE/NCAGE
4S5Q3

Expiration Date
Sep 30, 2025

Physical Address
2529 Yolanda CT
Pleasanton, California
94566-7513, United States

Mailing Address
2529 Yolanda CT.
Pleasanton, California
94566-7513, United States

Purpose of Registration
All Awards

Version
Current Record

Appendix B. Payee Data Record – STD 204 Form

Print Form | Reset Form

Docusign Envelope ID: 5E496A3D-DFDE-4A8F-9550-B18BDC9B31A6

PAYEE DATA RECORD

(Required when receiving payment from the State of California in lieu of IRS W-9 or W-7)

STD 204 (Rev. 03/2021)

Section 1 – Payee Information

NAME (This is required. Do not leave this line blank. Must match the payee's federal tax return)
Spatial Informatics Group, LLC

BUSINESS NAME, DBA NAME or DISREGARDED SINGLE MEMBER LLC NAME (If different from above)

MAILING ADDRESS (number, street, apt. or suite no.) (See instructions on Page 2)
2529 Yolanda Court

CITY, STATE, ZIP CODE	E-MAIL ADDRESS
Pleasanton, CA 94566	dsaah@sig-gis.com

Section 2 – Entity Type

Check one (1) box only that matches the entity type of the Payee listed in Section 1 above. (See instructions on page 2)

- ☐ **SOLE PROPRIETOR / INDIVIDUAL**
- ☐ **SINGLE MEMBER LLC** *Disregarded Entity owned by an individual*
- ☐ **PARTNERSHIP**
- ☐ **ESTATE OR TRUST**

CORPORATION (see instructions on page 2)

- ☐ **MEDICAL** *(e.g., dentistry, chiropractic, etc.)*
- ☐ **LEGAL** *(e.g., attorney services)*
- ☐ **EXEMPT** *(e.g., nonprofit)*
- ☒ **ALL OTHERS**

Section 3 – Tax Identification Number

Enter your Tax Identification Number (TIN) in the appropriate box. The TIN must **match** the name given in Section 1 of this form. Do not provide more than one (1) TIN. The TIN is a 9-digit number. **Note:** Payment will not be processed without a TIN.

- For **Individuals**, enter SSN.
- If you are a **Resident Alien**, and you do not have and are not eligible to get an SSN, enter your ITIN.
- Grantor Trusts (such as a Revocable Living Trust while the grantors are alive) may not have a separate FEIN. Those trusts must enter the individual grantor's SSN.
- For **Sole Proprietor or Single Member LLC (disregarded entity), in which the sole member is an individual**, enter SSN (ITIN if applicable) or FEIN (FTB prefers SSN).
- For **Single Member LLC (disregarded entity), in which the sole member is a business entity**, enter the owner entity's FEIN. Do not use the disregarded entity's FEIN.
- For all other entities including LLC that is taxed as a corporation or partnership, estates/trusts (with FEINs), enter the entity's FEIN.

Social Security Number (SSN) or Individual Tax Identification Number (ITIN)

__ __ __ - __ __ - __ __ __ __

OR

Federal Employer Identification Number (FEIN)

9 4 - 3 3 1 6 2 1 1

Section 4 – Payee Residency Status (See instructions)

☒ **CALIFORNIA RESIDENT –** Qualified to do business in California or maintains a permanent place of business in California.

☐ **CALIFORNIA NONRESIDENT –** Payments to nonresidents for services may be subject to state income tax withholding.

☐No services performed in California
☐Copy of Franchise Tax Board waiver of state withholding is attached.

Section 5 – Certification

I hereby certify under penalty of perjury that the information provided on this document is true and correct. Should my residency status change, I will promptly notify the state agency below.

NAME OF AUTHORIZED PAYEE REPRESENTATIVE	TITLE	E-MAIL ADDRESS
David Saah	Managing Principal	dsaah@sig-gis.com

SIGNATURE	DATE	TELEPHONE *(include area code)*
DocuSigned by: David Saah	7/22/2025	510.427.3571

Section 6 – Paying State Agency

Please return completed form to:

STATE AGENCY/DEPARTMENT OFFICE	UNIT/SECTION	
MAILING ADDRESS	**FAX**	**TELEPHONE** *(include area code)*

CITY	STATE	ZIP CODE	E-MAIL ADDRESS

PAYEE DATA RECORD

(Required when receiving payment from the State of California in lieu of IRS W-9 or W-7)
STD 204 (Rev. 03/2021)

GENERAL INSTRUCTIONS
Type or print the information on the Payee Data Record, STD 204 form. Sign, date, and return to the state agency/department office address shown in Section 6. Prompt return of this fully completed form will prevent delays when processing payments.

Information provided in this form will be used by California state agencies/departments to prepare Information Returns (Form1099).
NOTE: Completion of this form is optional for Government entities, i.e. federal, state, local, and special districts.

A completed Payee Data Record, STD 204 form, is required for all payees (non-governmental entities or individuals) entering into a transaction that may lead to a payment from the state. Each state agency requires a completed, signed, and dated STD 204 on file; therefore, it is possible for you to receive this form from multiple state agencies with which you do business.

Payees who do not wish to complete the STD 204 may elect not to do business with the state. If the payee does not complete the STD 204 and the required payee data is not otherwise provided, payment may be reduced for federal and state backup withholding. Amounts reported on Information Returns (Form 1099) are in accordance with the Internal Revenue Code (IRC) and the California Revenue and Taxation Code (R&TC).

Section 1 – Payee Information

Name – Enter the name that appears on the payee's federal tax return. The name provided shall be the tax liable party and is subject to IRS TIN matching (when applicable).

- Sole Proprietor/Individual/Revocable Trusts – enter the name shown on your federal tax return.
- Single Member Limited Liability Companies (LLCs) that is disregarded as an entity separate from its owner for federal tax purposes - enter the name of the individual or business entity that is tax liable for the business in section 1. Enter the DBA, LLC name, trade, or fictitious name under Business Name.
- Note: for the State of California tax purposes, a Single Member LLC is not disregarded from its owner, even if they may be disregarded at the Federal level.
- Partnerships, Estates/Trusts, or Corporations – enter the entity name as shown on the entity's federal tax return. The name provided in Section 1 must match to the TIN provided in section 3. Enter any DBA, trade, or fictitious business names under Business Name.

Business Name – Enter the business name, DBA name, trade or fictitious name, or disregarded LLC name.
Mailing Address – The mailing address is the address where the payee will receive information returns. Use form STD 205, Payee Data Record Supplement to provide a remittance address if different from the mailing address for information returns, or make subsequent changes to the remittance address.

Section 2 – Entity Type

If the Payee in Section 1 is a(n)…	THEN Select the Box for…
Individual • Sole Proprietorship • Grantor (Revocable Living) Trust disregarded for federal tax purposes	Sole Proprietor/Individual
Limited Liability Company (LLC) owned by an individual and is disregarded for federal tax purposes	Single Member LLC-owned by an individual
Partnerships • Limited Liability Partnerships (LLP) • and, LLC treated as a Partnership	Partnerships
Estate • Trust (other than disregarded Grantor Trust)	Estate or Trust
Corporation that is medical in nature (e.g., medical and healthcare services, physician care, nursery care, dentistry, etc. • LLC that is to be taxed like a Corporation and is medical in nature	Corporation-Medical
Corporation that is legal in nature (e.g., services of attorneys, arbitrators, notary publics involving legal or law related matters, etc.) • LLC that is to be taxed like a Corporation and is legal in nature	Corporation-Legal
Corporation that qualifies for an Exempt status, including 501(c) 3 and domestic non-profit corporations.	Corporation-Exempt
Corporation that does not meet the qualifications of any of the other corporation types listed above • LLC that is to be taxed as a Corporation and does not meet any of the other corporation types listed above	Corporation-All Other

Section 3 – Tax Identification Number

The State of California requires that all parties entering into business transactions that may lead to payment(s) from the state provide their Taxpayer Identification Number (TIN). The TIN is required by R&TC sections 18646 and 18661 to facilitate tax compliance enforcement activities and preparation of Form 1099 and other information returns as required by the IRC section 6109(a) and R&TC section 18662 and its regulations.

Section 4 – Payee Residency Status

Are you a California resident or nonresident?

- A corporation will be defined as a "resident" if it has a permanent place of business in California or is qualified through the Secretary of State to do business in California.
- A partnership is considered a resident partnership if it has a permanent place of business in California.
- An estate is a resident if the decedent was a California resident at time of death.
- A trust is a resident if at least one trustee is a California resident.
  - For individuals and sole proprietors, the term "resident" includes every individual who is in California for other than a temporary or transitory purpose and any individual domiciled in California who is absent for a temporary or transitory purpose. Generally, an individual who comes to California for a purpose that will extend over a long or indefinite period will be considered a resident. However, an individual who comes to perform a particular contract of short duration will be considered a nonresident.

For information on Nonresident Withholding, contact the Franchise Tax Board at the numbers listed below:

Withholding Services and Compliance Section: 1-888-792-4900	E-mail address: wscs.gen@ftb.ca.gov
For hearing impaired with TDD, call: 1-800-822-6268	Website: www.ftb.ca.gov

Section 5 – Certification

Provide the name, title, email address, signature, and telephone number of individual completing this form and date completed. In the event that a SSN or ITIN is provided, the individual identified as the tax liable party must certify the form. Note: the signee may differ from the tax liable party in this situation if the signee can provide a power of attorney documented for the individual.

Section 6 – Paying State Agency

This section must be completed by the state agency/department requesting the STD 204.

Privacy Statement

Section 7(b) of the Privacy Act of 1974 (Public Law 93-579) requires that any federal, state, or local governmental agency, which requests an individual to disclose their social security account number, shall inform that individual whether that disclosure is mandatory or voluntary, by which statutory or other authority such number is solicited, and what uses will be made of it. It is mandatory to furnish the information requested. Federal law requires that payment for which the requested information is not provided is subject to federal backup withholding and state law imposes noncompliance penalties of up to $20,000. You have the right to access records containing your personal information, such as your SSN. To exercise that right, please contact the business services unit or the accounts payable unit of the state agency(ies) with which you transact that business.

All questions should be referred to the requesting state agency listed on the bottom front of this form.

Appendix C. Letters of Support

Note on Letters of Support:
We have secured formal letters of support from Collins Pine Company (Eric O'Kelley) and UC Berkeley (Dr. Rob York, Co-PI). In addition, we have received strong verbal and informal support from other key partners, including CAL FIRE (Jonathan Pangburn) and Sierra Pacific Industries (Steve Debonis). Moreover, we have already initiated the necessary paperwork and collaboration planning, including early coordination on site access and data sharing.

Dr. York joined the team as a co-PI following EMC feedback requesting a more robust field component. His involvement has been instrumental in shaping the revised field sampling approach and reflects strong scientific support for the updated study design.

Given the short, one-month turnaround for proposal development—combined with summer schedules, active field deployments, and internal review timelines—some collaborators were temporarily unavailable to submit formal letters of support by the deadline. Based on ongoing conversations, we expect these letters to follow shortly and will submit them as they become available.

Momentum for this project is strong, and our relationships with both public and private stakeholders remain active and productive. We appreciate your understanding and look forward to providing full documentation of this support.

Berkeley Forests
163 Mulford Hall | Berkeley, CA 94720
forests.berkeley.edu

To Whom It May Concern:

I am writing in support of the EMC proposal titled *Evaluating Post-Fire Restocking Strategies and Their Effectiveness in Promoting Wildfire Resilience in Industrial and Non-Industrial Timberlands*, led by the Spatial Informatics Group in collaboration with UC Berkeley and other partners.

I manage **Blodgett Forest Research Station**, a UC-owned experimental forest that will serve as a reference site for this study. As described in the proposal, our team will provide access to plots at Blodgett with well-documented silvicultural histories and diverse fuel structures, enabling comparative analysis of stand conditions and hazard outcomes.

Blodgett Forest will support this effort by providing access and forest structure data covering young stands that have been treated with a variety of fuel treatments and density management treatments. Blodgett Forest likely has the widest gradient of treatments that exists in the mixed conifer forest. I believe this project will make an important contribution to understanding how post-fire timberland management strategies and their influence on long-term forest resilience and fire behavior, especially in the context of California's Forest Practice Rules.

Please accept this letter as a formal expression of support for the proposal and our shared commitment to advancing applied wildfire science.

Sincerely,

Ariel T. Roughton

Ariel T. Roughton
Research Forests Manager, Berkeley Forests
[redacted]

Collins

Collins Pine Company
PO Box 796
Chester, CA 96020-0796 USA
530.258.2111
CollinsWood.com

7/23/2025

California Board of Forestry and Fire Protection
Effectiveness Monitoring Committee
P.O. Box 944246
Sacramento, CA 94244-2460

RE: Letter of Support – EMC Proposal: Evaluating Post-Fire Restocking Strategies and Their Effectiveness in Promoting Wildfire Resilience in Industrial and Non-Industrial Timberlands

To Whom It May Concern:

I am pleased to offer this letter of support for the proposal submitted by Spatial Informatics Group (SIG) entitled *Evaluating Post-Fire Restocking Strategies and Their Effectiveness in Promoting Wildfire Resilience in Industrial and Non-Industrial Timberlands*.

As Forest Manager for Collins Pine Company in Chester, I oversee operations on actively managed industrial timberlands within the study region. I recognize the importance of understanding how post-fire silvicultural practices—including salvage harvest, site prep, and restocking—affect future forest resilience and fire behavior. This study addresses timely and operationally relevant questions about stocking standards and fuel development that are critical to both private landowners and public policy.

Collins Pine is willing to support this research by facilitating access to recently treated sites, sharing treatment records, offering management context, etc. *We* believe the results of this study will inform more adaptive and effective post-fire recovery strategies across California's timberlands.

Please accept this letter as a formal expression of our support for the project.

Sincerely,

Eric O'Kelley, RPF
Forest Manager *RPF #2802*
Collins Pine Company
[redacted]

Appendix D. EMC Budget Spreadsheet

Appendix F. Proof of Active Business Registration with California

Secretary of State
Certificate of Status

I, SHIRLEY N. WEBER, PH.D., California Secretary of State, hereby certify:

Entity Name:	SPATIAL INFORMATICS GROUP LLC
Entity No.:	200224910042
Registration Date:	09/03/2002
Entity Type:	Limited Liability Company - CA
Formed In:	CALIFORNIA
Status:	Active

The above referenced entity is active on the Secretary of State's records and is authorized to exercise all its powers, rights and privileges in California.

This certificate relates to the status of the entity on the Secretary of State's records as of the date of this certificate and does not reflect documents that are pending review or other events that may impact status.

No information is available from this office regarding the financial condition, status of licenses, if any, business activities or practices of the entity.

IN WITNESS WHEREOF, I execute this certificate and affix the Great Seal of the State of California this day of January 31, 2025.

SHIRLEY N. WEBER, PH.D.
Secretary of State

Certificate No.: 291326831

To verify the issuance of this Certificate, use the Certificate No. above with the Secretary of State Certification Verification Search available at **biz**fileOnline.sos.ca.gov.

Appendix G. References

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Parks, S. A., Holsinger, L. M., Koontz, M. J., Collins, L., Whitman, E., Parisien, M.-A., Loehman, R. A., Barnes, J. L., Bourdon, J.-F., Boucher, J., Boucher, Y., Caprio, A. C., Collingwood, A., Hall, R. J., Park, J., Saperstein, L. B., Smetanka, C., Smith, R. J., & Soverel, N. (2019). Giving ecological meaning to satellite-derived fire severity metrics across North American forests. Remote Sensing, 10(9), 1340.

Pelletier, F., Cardille, J. A., Wulder, M. A., White, J. C., & Hermosilla, T. (2024). Inter- and intra-year forest change detection and monitoring of aboveground biomass dynamics using Sentinel-2 and Landsat. Remote Sensing of Environment, 307, 113250.