Effectiveness Monitoring Committee
Full Project Proposal Form

Deadline for Submission: November 16th, 2019

Project #: EMC-2019-002 **Date:** November 15th, 2019

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

Principal Investigators: David Saah, PhD and Jason Moghaddas, MS, RPF #2774

Collaborators: Hannah Hepner, Coordinator, Plumas County Fire Safe Council (PCFSC), 47 Trilogy Lane Quincy, CA 95971, PlumasFireSafe@plumascorporation.org, (530) 283-0829

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Project Duration (Years/Months): 1 year, 6 months (18 total months)

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1. Background and Justification

Since 2002, the Plumas County Fire Safe Council (PCFSC) has implemented over 50 Hazardous Fuel Reduction projects, covering nearly 14,000 acres of private and public lands (Appendix 1). To date, over 16 million dollars of state, federal, and other funding have been invested on the ground in these projects across Plumas County. The treatments implemented were designed to reduce immediate fire risk to structures, reduce fire severity, and over time, improve overall community fire resilience. While there is often funding for the initial treatment planning and implementation, the opportunity to conduct long-term maintenance while costs are still relatively low can be missed if not properly planned for-science-based information is critical to the maintenance planning process. Given the scale of state and federal funding invested in PCFSC fuel treatments to date, objectively assessing maintenance needs and a program of work around those needs is essential while vegetation can be maintained at relatively low costs compared to the initial treatment investment.

The Plumas County Fire Safe Council has convened a maintenance sub-committee to evaluate the condition of past projects. Casual observations from the group suggest that vegetative response to the initial treatment can be highly variable and site specific. In some cases, work done 10 years ago on one site has not yet reached the need for significant maintenance while a different site requires nearly the same level of work that was initially done.

The completed acquisition of LiDAR date for Plumas County, integrated with on-the ground

field measurements, and Unmanned Aerial Vehicle (UAV) imagery allows for a cost effective, quantitative, and repeatable approach for assessing WUI treatment maintenance needs at a landscape scale. This approach to monitoring may be readily adopted or scaled to other WUI fuel treatment projects across the state, where LiDAR is available.

2. Objectives and Scope

This project will assess the current maintenance needs on for all projects implemented, funded, or otherwise supported by the Plumas Fire Safe Council. This assessment will result in allow critical questions (see critical questions addressed in section 3) described in the Effectiveness Monitoring Committed (EMC) Strategic Plan (Husari and Henly 2018) to be answered spatially and quantitatively over all PCFSC treated lands in Plumas County.

The goal will be to help inform the Plumas FSC on its treatment life cycle, so it may better plan for and fund future treatment maintenance and substantiate that the Fire Safe Council has and continues to utilize "best available science" in their treatment design and long term maintenance strategy.

3. Critical Questions and Forest Practice Regulations Addressed

Critical Questions Addressed

This evaluation will address all of the critical questions outlined for Theme 6 (Wildfire), as described in the Effectiveness Monitoring Committee Strategic Plan (Husari and Henly 2018). The evaluation will assess at a project level the efficacy each regulation, including the complexity or ease of implementation, its result in meeting its planned specified result, and its long term effects on potential fire behavior. The study will address the questions below as they apply to treatments in Wildland Urban Interface.

a) Treating post-harvest slash and slash piles to modify fire behavior?
b) Treating post-harvest slash and retaining wildlife habitat structures, including snags and large woody debris?
c) Managing fuel loads, vegetation patterns and fuel breaks for fire hazard reduction?

In addition to the questions above, the evaluation will address these specific questions below, in an effort to better quantify treatment effectiveness, longevity, and maintenance needs.

- How many years are fuel reduction treatments in the WUI effective for?
- Is there a variation in treatment effectiveness over time by vegetation type, type of treatment, or equipment type used?
- What are the potential maintenance needs for existing treatments and at what treatment age?

- Are there quantifiable differences in tree mortality within existing WUI fuel treatments compared with areas adjacent to these treatments?
- How can the described method be efficiently applied to all Fire Safe Council projects across the entire State of California?

Applicable Forest Practice Regulations and Exemptions

All of the fuel treatment projects implemented by the Plumas County Fire Safe Council have been implemented in the Northern Forest District. These projects have included components of all of the Forest Practice Rules and exemptions listed below.

- Minimum stocking standards (14 CCR § 912.7 [932.7, 952.7])
- Special silvicultural methods and stocking requirements (14 CCR § 961)
- Silvicultural objectives and regeneration methods (14 CCR § 913 [933, 953])
- Logging slash and hazard reduction (14 CCR § 917 [937, 957])
- Exemptions which facilitate removal of dead, dying or diseased trees (14 CCR § 1038),
- Emergency notices which also facilitate removal of burned, dead, dying or diseased trees (14 CCR § 1052) and fuel hazard reduction (14 CCR § 1051)

Relevant Vegetation Types and Geographic Application

Fuel treatments within the WUI of Plumas County have been implemented in vegetation types common across the Sierra Nevada. These include Sierran Mixed Conifer, East Side Pine, black oak woodland, sagebrush, and montane chaparral. Representative pre/post treatment photos are shown for dominant vegetation and treatment types within the full set of projects implemented by PCFSC (photos 1-3). A detailed analysis of treatments in these types at the county (Plumas) level will have broad application to similar vegetation types with in the greater Northern and Southern Forest Districts. Monitoring findings will be generally applicable to similar vegetation types, soil types, and climate zones, within both the Northern and Southern Forest Districts. Coastal Region FPRs are included but comparisons will be more limited due to different vegetation types, local climate, and treatment practices. The methods utilized in this study can be readily used for assessing fuel treatments and prescribed burns across the state, particularly where LiDAR is available or UAVs are permitted for pre or post treatment data collection. This approach allows for collection of surface and canopy fuels data, and assessing fire hazard and risk based on that data. The closest State Forest to the study site is La Tour Demonstration State Forest, ~130 miles from Quincy, but there is not matching LiDAR coverage at that forest to conduct the same analysis.

Photo 1. Pre and post treatment example of completed fuel treatment in a mixed conifer forest.

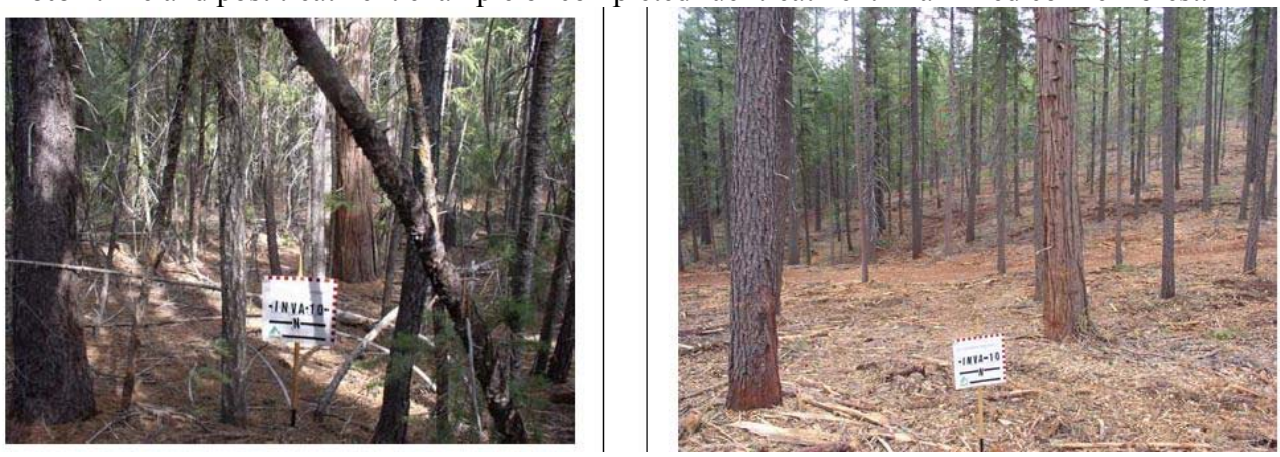


Photo 2. Pre and post treatment example of completed fuel treatment in a black oak dominated forest.

Photo 3. Pre and post treatment example of completed mastication of shrubs.

4. Research Methods

Task 1: Organization of Individual Completed Projects by Specific Forest Practice Rules (FPRs), Vegetation Types, Treatments, and Treatment Age

Since 2002, the Plumas County Fire Safe Council has implemented over 50 projects (Appendix 1). These projects will be inventoried to develop a matrix of applicable Forest Practice Rules for the project at the year of implementation, vegetation type, treatment type, equipment type, and treatment age.

Sub Task 1.1 Determining Applicable Forest Practice Rules and Exemptions by Project

All projects (Appendix 1) will be reviewed in detail to determine Forest Practice Rules and Exemptions that were applicable at the year of project implementation. This information will be compiled by reviewing past Timber Harvest Plans (THPs), grant applications, reports, existing pre/post monitoring photos, as well as interviews with those involved in project planning and implementation.

Sub Task 1.2 Stratification of Projects by Treatment

The information reviewed for Sub Task 1.1 (above) will also be used to determine the treatment or suite of treatments utilized for each project. Treatments will be stratified age class categories; <5 years old, 5-10 years, 10-15 years and 20+years old. These classes will be assessed by difference in long term performance and maintenance needs by age, treatment type (mechanical harvest, mastication, prescribed fire, hand thinning, and pile burning), and vegetation type by field sampling and observations and photo comparisons.

The projects implemented to date cover the full range of treatments commonly utilized in Sierra Nevada forest and shrub ecosystems, including:

- Commercial harvest of saw log material
- Harvest, removal, and chipping of biomass
- Hand thinning of small trees and shrubs
- Mastication of shrubs, small trees, and dead and downed material
- Chipping of cut material on-site
- Piling and burning
- Under burning

Sub Task 1.3 Stratification of Projects by Vegetation Type

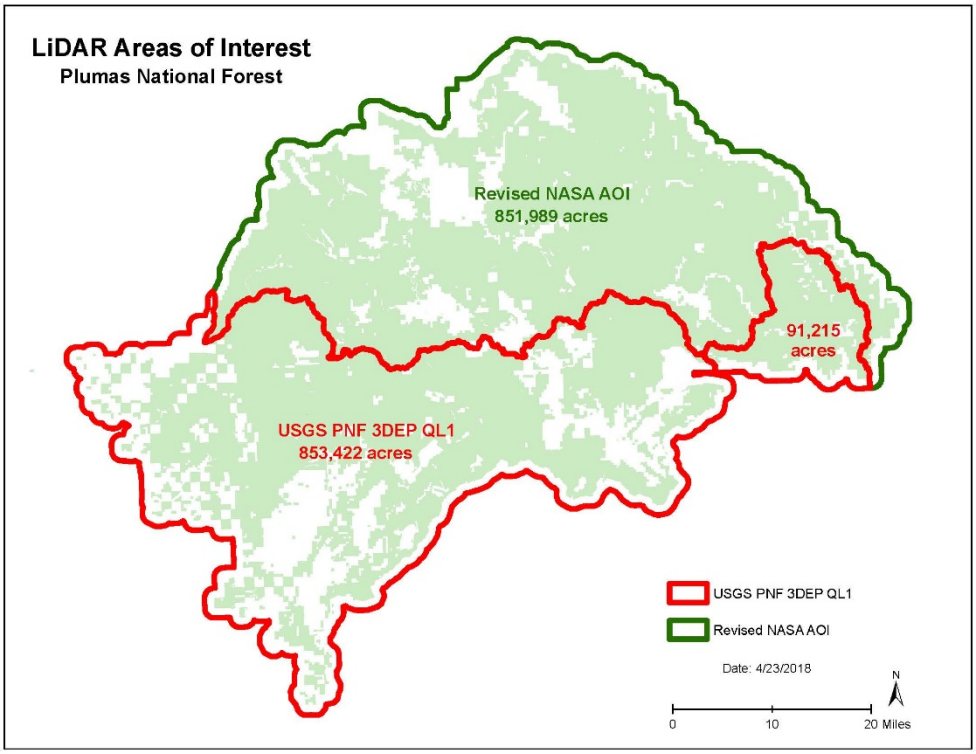
Project locations will be compiled into a single GIS database. The vegetation type by treatment will then be assessed using CALVEG, though data from LANDFIRE and other local (USFS) vegetation mapping efforts may be considered if considered higher resolution or more accurate.

Classified vegetation validated for each project site using a combination of high resolution aerial imagery and ground observations described in Task 4.

Task 2: Assessment of Current Stand Structure Using 2018 LiDAR Data and EcObject

The Plumas National Forest acquired LiDAR data covering the entire forest administrative boundary during the summer of 2018 at an estimated cost of over $1,000,000 under agreement between NASA 's Jet Propulsion Lab, the US Forest Service, and the US Geological Survey using two different vendors (Airborne Snow Observatory and Quantum Spatial) (Figure 1). Due to wildfire smoke issues during 2018, flights were staggered over the summer, but the final acquisition covers all projects implemented to date by the Plumas Fire Safe Council (Appendix 1). Utilization of this existing LiDAR data gives us a unique opportunity to quantify stand structure at the project, parcel, and even 1m scale using EcObject.

Figure 1. LiDAR coverage for Plumas County



Derived from aerial-based Light Detection and Ranging (LiDAR) data, Ecological Object Based Vegetation Mapping (EcObject) is created from LiDAR-derived tree approximate objects and then aggregated by stand and tree-level ecological relationships. The resulting segments are then populated with a collection of traditional and contemporary metrics at scales that benefit both project-level planning and large-landscape analysis (Figures 2 –4).

For all areas treated by the Plumas Fire Safe Council, LiDAR imagery will be used to assess stand structure using the general steps below with post-treatment updates provided by 3d point cloud data generated by a UAV (See Task 3).

1) Utilize LANDFIRE Total Fuel Change tool (LFTFC) to update/improve LANDFIRE fuels layers in MROSD AOIs where high density LiDAR has been acquired.
2) Perform an EcObject segmentation in MROSD management AOIs where high density LiDAR has been acquired
3) Calculate direct LiDAR derivatives (IE canopy cover at different height slices) and assimilate into EcObject segmentation
4) Synthesize updated fuel information and any other meaningful raster based vegetation information with EcObject segmentation
5) Apply satellite based vegetation disturbance and recovery tracking workflows to assess where substantial vegetation changes have occurred (both disturbed and recovered)
6) Utilize UAV technologies (Task 3) to then fly those areas to generate a PhoDAR based point cloud if needed for projects completed after the LiDAR acquisition (2018).
7) Run EcObject and LFTFC workflows on PhoDAR point clouds
8) Stitch new information in existing EcObject dataset
9) Analyze, ground truth, summarize, and present findings

Figure 2. Example LiDAR based EcObject classification of canopy cover

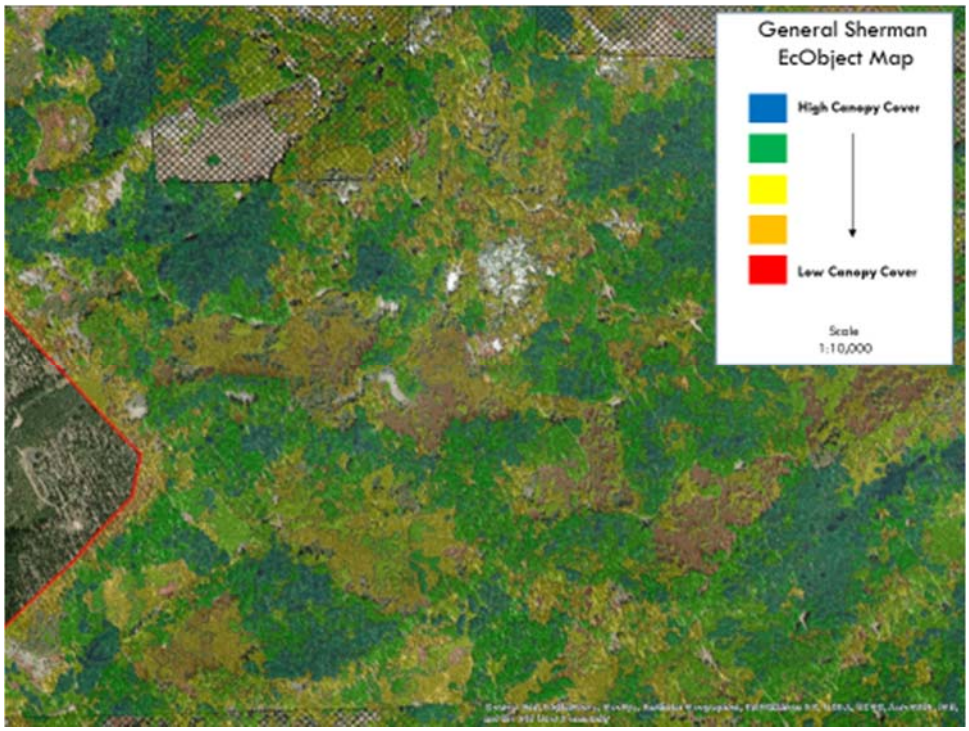


Figure 3. Example LiDAR based EcObject classification of forest clump distribution

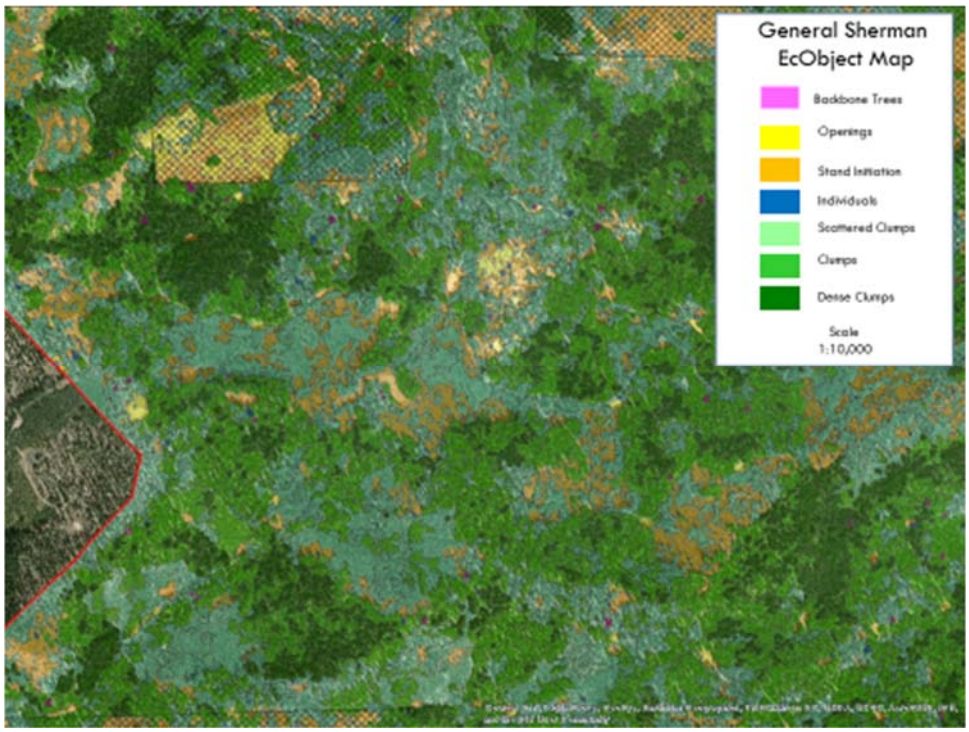
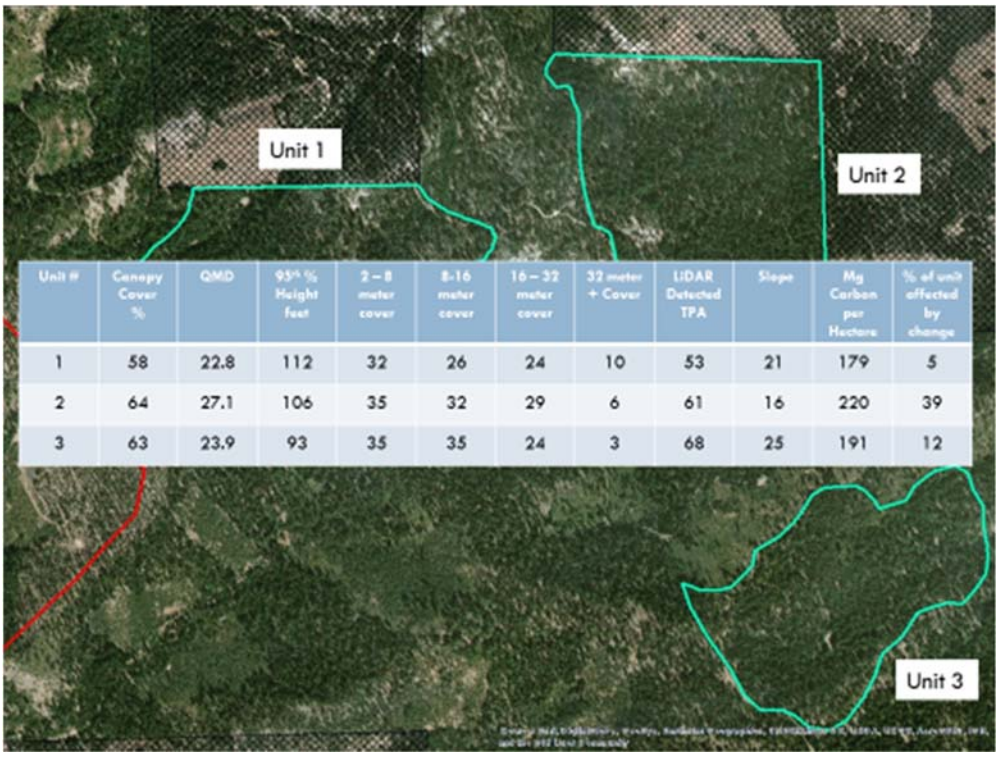


Figure 4. Example LiDAR based EcObject classification of treatment unit level stand structure



Unit #	Canopy Cover %	QMD	95th % Height feet	2 – 8 meter cover	8-16 meter cover	16 – 32 meter cover	32 meter + Cover	LiDAR Detected TPA	Slope	Mg Carbon per Hectare	% of unit effected by change
1	58	22.8	112	32	26	24	10	53	21	179	5
2	64	27.1	106	35	32	29	6	61	16	220	39
3	63	23.9	93	35	35	24	3	68	25	191	12

Task 3: Additional Assessment of Current Stand Structure Using UAV Acquired Point Clouds

For projects that were completed after the acquisition of the 2018 LiDAR Data, a quadracopter or fixed wing UAV will be used to acquire additional structural data as described below.

Brief Description of Unmanned Aerial Vehicle (UAV) Types

Quadracopter UAV: A quadracopter (Figure 5) is generally the lowest cost approach to acquiring imagery over a relatively small area. These UAV's can capture imagery down to an area of ~1/10th acre up to 25 acres in a single flight. The Mavic Pro® can take high resolution imagery that can be used to generate point clouds over 25 acres in a 30 minute flight (one battery). Lower resolution imagery (no point cloud) can be acquired over ~40 acres over the same duration (30 minutes). Multiple flights can be implemented to cover larger areas but generally total area for a quadracopter to cover in a day over 3 flights is ~100 acres

Figure 5. The Mavic Pro® quadracopter UAV

Fixed Wing UAV: A fixed wing UAV (Figure 6) allows data capture over a larger area when compared to a quadracopter. The Ebee can take high resolution imagery that can

be used to generate vegetation cover and topography over 200 acres in a 45 minute flight (one battery). Higher resolution imagery 100 acres over the same duration (45minutes), which can be used to generate 3d point clouds and Digital Surface Models (DSMs).. Multiple flights can be implemented to cover larger areas but generally total area for an Ebee® to cover in a day over 3 flights is ~300-600 acres depending on resolution of imagery taken.

Figure 6. The Ebee® Fixed wing UAV

UAV Data Collection Capabilities

Both UAV types (fixed wing and quadracopter) can be used to generate the different geospatial products described below. This information can be used to validate LiDAR calculated metrics and provide high resolution local imagery of the project site. This includes treatment level structural data derived using UAV created 3d point clouds or "Phodar":

i. ***"Phodar"***- Creates 3D points cloud derived from photogrammetric processing of aerial photos. This mimics LiDAR point clouds and can be inserted in LiDAR based workflows to produce metrics for comparison after a post LiDAR disturbance occurs.

ii. ***High-resolution Orthomosaics*** – Creates extremely crisp and clear aerial photographs (~3cm resolution) that are accurately aligned with the earth's surface.

iii. ***Digital Surface Model (DSM)*** –A DSM captures the natural and built features on the Earth's surface and are useful in 3-dimensional modeling. DSM give you the elevation value of each pixel for above ground features.

iv. ***Digital Elevation Model (DEM)/Digital Terrain Model (DTM)*** – A DEM is synonymous with Digital Terrain Model and is a 3-dimensional representation of the earth's surface. When you filter out non-ground points such as trees, bridges and roads, you get a smooth digital elevation model. Like DSM, DEM/DTM gives the elevation value of each pixel.

v. ***Contour Lines*** – We can use DSM/DTM/DEM data to provide a simplified representation of topography, and display with elevation values.

vi. ***3D Textured Model*** – We can generate a full 3d triangular mesh with a photo draped texture – great for 3d visualization of urban and natural settings.

vii. ***Image Timeseries and Change Detection*** – UAVs can provide repeat visits to a site of interest to: 1) verify project progress, 2) compliance with regulatory requirements, or 3) to monitor and quantify change in features of interest (e.g., aquatic invasive species abundance and distribution, stream channel morphology, riparian and forest vegetation, or recovery from natural disturbance such as wildfire or flooding, etc.).

viii. ***Custom Feature Extraction, Mapping, and Quantification*** - Aerial image interpretation using object-based image analysis (OBIA) procedures, including automated feature extraction, or manual feature delineation that integrates other GIS data to generate the information where LiDAR coverage is out of date or unavailable.

ix. ***360-degree View*** – The Hangar 360 application to produce a 360-degree view of your area of interest from 300 feet above ground. The finished product, a 360-degree panoramic image, allows user to pan side to side and up and down, and scroll in and out for a unique birds-eye view. Examples of Hanger 360 images from the region can be found at the following links:

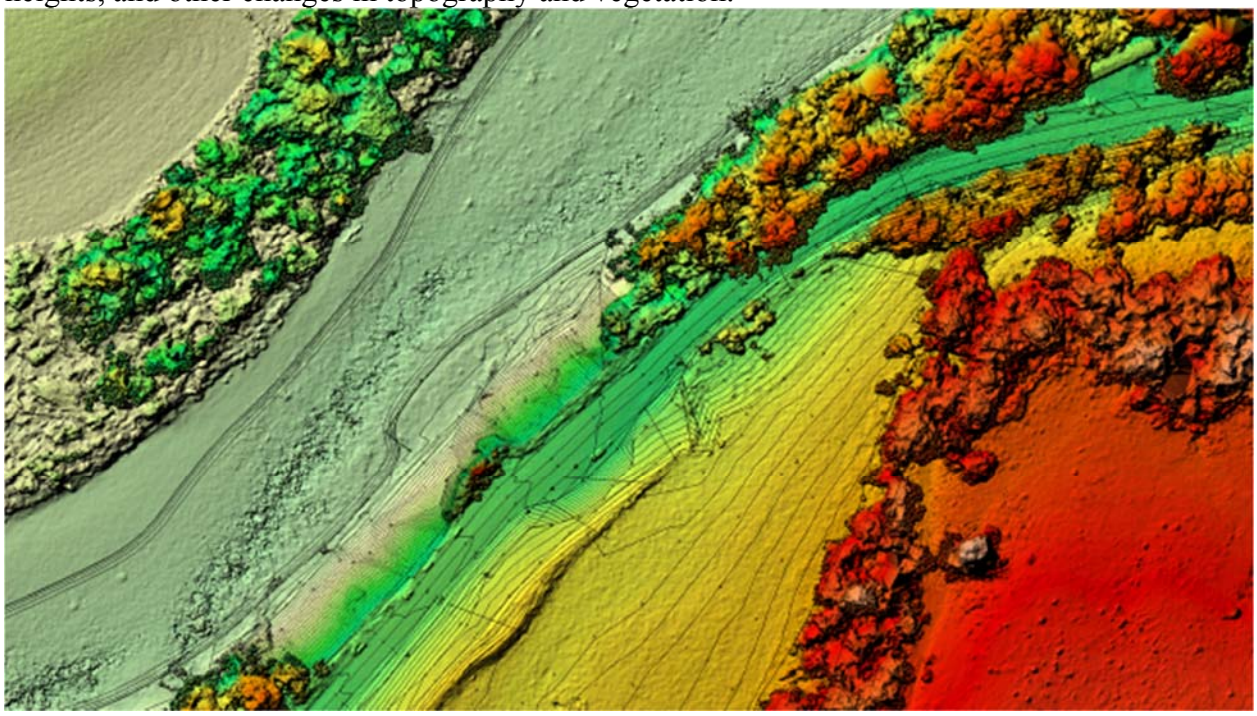
- Moonlight Fire on Private/USFS Boundary: https://viewer.hangar.com/360?productId=6reOGKJY
- Antelope Lake (Plumas NF), adjacent to Boulder and other fires: https://viewer.hangar.com/360?productId=80RQlw5r
- Kings Canyon Near Lake Tahoe: https://viewer.hangar.com/360?productId=8rD8D3Lr

x. ***Aerial video and still images*** – The UAV can capture professional quality aerial video and/or photos. This imagery can be used to develop not only a high resolution photographic record, but can also be used to create changes in topography due to landslides, flooding, or 3d point clouds that can be used to update LiDAR based calculations (Figures 7-9)

Figure 7. Riverside image with topography over standard NAIP imagery available online.

Figure 8. Same riverside area as figure 7 with topography over UAV acquired image- note increased resolution.

Figure 9. Same riverside area as figure 8 with topography represented in a 3d point cloud as captured using a UAV. 3d images from UAV's can be used to compute volumes, heights, and other changes in topography and vegetation.



Task 4: Additional Field Data Collection for LiDAR and UAV Analysis

On a subset of sites, additional field data will be collected using standard forest inventory methods in order to calibrate and validate LiDAR and UAV input and output data. Standard protocols to be used are described in The Common Stand Exam (CSE) Protocols (USDA 2019a) and Stephens et al., (2012). These protocols provide a comprehensive approach to measuring forest and woodland vegetation and are set to allow easy conversion of files into the Forest Visualization Simulator (FVS) (USDA 2019), which in turn can be used to quantify forest carbon, fire risk, stand structure data, and model treatments. Additional onsite measures can include:

- Tree species
- Diameter at breast height (DBH)
- Tree height
- Tree height to live crown base
- Canopy cover
- Surface fuel loading
- Large woody debris inventory
- Additional plot photos as needed

Task 5: Assessment of Current Fire Hazard and Risk

Sub Task 5.1 Fire Hazard Assessment

Using locally and publically available fuel treatment location data, LANDFIRE, and the modeling tool FLAMMAP, 3 key fire hazard metrics will be modeled across the study area (Plumas County). These include potential flame length (feet), rate of spread (feet per min or chains per hour), fire type (surface fire, passive crown fire, active crown fire). Generally treatment areas with a modeled flame length of less than 4 feet and predicted surface fire under 90th percentile weather conditions will be considered effective, though the assessment will be completed at 97.5th percentile for comparison.

Sub Task 5.2 Fire Risk Assessment

This assessment is completed by assessing "The Conditional Burn Probability" in the model FLAMMAP. We also use the fire behavior landscapes generated in Subtask 5.1 above with the Minimum Travel Time (MTT) model to estimate conditional probability of high-severity fire (greater than a defined flame length) across the landscape by simulating 10,000 fires per landscape / timestep. This information will be summarized for treated areas within the study areas.

Task 6: Draft and Final Analysis and Report

The analysis will assess the current fire hazard of treated properties with untreated areas adjacent to those properties (within 1,000 feet). The draft report will provide a summary of the project findings and include all deliverables as appendices or digital data as appropriate. The report will be graphically enhanced to make it as engaging and informative as possible to readers. The final report will be developed in response to the feedback on the draft report from the EMC and other stakeholders. After property incorporating feedback, the final report will be delivered.

5. Scientific Uncertainty and Geographic Application

This analysis of fuel treatments in these types at the county (Plumas) level will have broad application to similar vegetation types with in the greater Northern and Southern Forest Districts. Monitoring findings will be generally applicable to similar vegetation types, soil types, and climate zones, within both the Northern and Southern Forest Districts. Coastal Region FPRs are included but comparisons will be more limited due to different vegetation types, local climate, and treatment practices.

While LiDAR does provide a consistent method to assess vegetation structure, we will clearly identify and acknowledge any scientific uncertainty and application of any findings within this analysis.

6. Collaborations and Project Feasibility

SIG is working with the Plumas County Fire Safe Council (Hannah Hepner) on this project. Results will be presented locally and results made readily available to other local entities involved with WUI fuels reduction work, including the US Forest Service, Natural Resource Conservation Service, Feather River Resource Conservation District, the Plumas Underburn Cooperative, the Plumas County Board of Supervisors, and University of California Cooperative Extension.

The project can be implemented with no additional permitting, CEQA, or NEPA. Team will work with individual willing landowners for access as needed for field data collection. All necessary skills sets and equipment, including UAVs are within the team listed on the proposal.

7. Project Deliverables

- Spatially explicit maps, summaries, field data, and associated GIS data for stand structure attributes for all treated areas delivered electronically via FTP, “Box” email, and/or portable hard drive.
- Draft Report- delivered electronically
- Final Report- delivered electronically and if requested in up to 3 hard copies
- A Powerpoint presentation that can be used to describe the project, methods, and results.

8. Detailed Project Timeline

Task Number	Start Date	End Date	Months from Contract Start to Task Completion
Task 1: Organization of Individual Completed Projects by Specific Forest Practice Rules (FPRs), Vegetation Types, Treatments, and treatment age	July 1st , 2020	October 31st, 2020	4
Task 2: Assessment of Current Stand Structure Using 2018 LiDAR Data and EcObject	November 1st, 2020	May 31st, 2021	7
Task 3: Additional Assessment of Current Stand Structure Using UAV Acquired Point Clouds	November 1st, 2020	May 31st, 2021	7
Task 4: Additional Field Data Collection for LiDAR and UAV Analysis	November 1st, 2020	May 31st, 2021	7
Task 5: Current Fire Hazard Assessment	June 1st, 2021	August 30th, 2021	13
Task 6: Draft and Final Report	September 1st, 2021	December 31st, 2021	18

9. Requested Funding

We will be requesting $68,167.79 to complete the work described in this analysis (See detailed budget, next page). This includes all field time, UAV flights, analysis, equipment, travel, and report preparation. SIG will contribute $4,348 in labor to the project. In addition, over $400,000 has been expended to acquire the LiDAR dataset used for the analysis-we may utilize that data at no cost to the project. As the project team lives near the treatment areas and is familiar with Plumas County, there will be minimal travel needed with no overnight travel anticipated.

Category	Description	Project Role	Hourly Rate	Year 1 Hours	Year 1 Total	Year 2 Hours	Year 2 Total	Total
					July 1, 2020, June 30, 2021		July 1, 2021, December 31, 2021	
Personnel	David Saah, PhD	Principal Investigator	$ 55.00	10	$ 550.00	10	$ 550.00	$ 1,100.00
"	Gary Roller, MS, RPF #2899	Field work	$ 30.00	250	$ 7,500.00	50	$ 1,500.00	$ 9,000.00
"	Jason Moghaddas, MS, RPF #2774	Co-Investigator, Project management, analysis	$ 52.00	80	$ 4,160.00	40	$ 2,080.00	$ 6,240.00
"	Jarrett Barbuto, BS	UAV Pilot and Geospatial Analyist	$ 30.00	220	$ 6,600.00	60	$ 1,800.00	$ 8,400.00
"	Scott Conway, MS	LiDAR Analyst, Fire Modeling	$ 52.00	260	$ 13,520.00	55	$ 2,860.00	$ 16,380.00
"	Hannah Hepner, MS	FSC Projects, GIS, and Landowner Access	$ 50.00	140	$ 7,000.00	80	$ 4,000.00	$ 11,000.00
	Total Labor			**$ 950.00**	**$ 38,780.00**	**$ 285.00**	**$ 12,240.00**	**$ 51,020.00**
			Fringe Rate (%)		**Year 1 Fringe**		**Year 2 Fringe**	
Fringe Benefits % Personnel Cost	David Saah, PhD		23		$ 126.50		$ 126.50	$ 253.00
"	Gary Roller		23		$ 1,725.00		$ 345.00	$ 2,070.00
"	Jason Moghaddas		23		$ 956.80		$ 478.40	$ 1,435.20
"	Jarrett Barbuto		23		$ 1,518.00		$ 414.00	$ 1,932.00
"	Scott Conway		23		$ 3,109.60		$ 657.80	$ 3,767.40
"	Hannah Hepner		23		$ 1,610.00		$ 920.00	$ 2,530.00
	Total Fringe				**$ 8,919.40**		**$ 2,815.20**	**$ 11,734.60**
	Total Labor + Fringe				**$ 47,699.40**		**$ 15,055.20**	**62,754.60**
Other	No "Other" costs requested in budget			0	$ -	0	$ -	$ -
Operating Expenses	No "Operating Expenses" requested in budget			0	$ -	0	$ -	$ -
Indirect Cost (15%)	15% indirect on total labor + fringe				$ 7,154.91		$ 2,258.28	$ 9,413.19
			Mileage Rate	**Year 1 Mileage**		**Year 2 Mileage**		
Travel	Travel costs will be contributed as "In Kind"		0.58	400	$ 232.00	200	$ 116.00	$ 348.00
	Total Cost				**$ 55,086.31**		**$ 17,429.48**	**$ 72,515.79**
	In Kind Contributions-Mileage				232		116	$ 348.00
	In Kind Contributions-Labor				2500		1500	$ 4,000.00
	Total In Kind Contributions				$ 2,732		$ 1,616	$ 4,348.00
	EMC Funding Requested				**$ 52,354.31**		**$ 15,813.48**	**$ 68,167.79**

References

Stephens, S. L., Collins, B. M., & Roller, G., 2012. **Fuel treatment longevity in a Sierra Nevada mixed conifer forest.** Forest Ecology and Management, 285, 204-212.

USDA 2019a. Common Stand Exam-Region 5 Field Guide. USDA Forest Service. 114p

USDA 2019b. Forest Visualization Simulator Software Package. USDA Forest Service. https://www.fs.fed.us/fvs/software/complete.php

Appendix 1: Table of Fire Safe Council Projects (Following Pages)

Fiscal Year	Agency Source	Grant Project Name	Project Type	Acres
02-03	USFS - EAP	Hazardous Fuel Reduction Demo	HFR-Treatment	63.3
02-03	RAC/USFS- Title II	50 acres HFR-Plumas Eureka	HFR-Treatment	50.0
03-04	RAC/USFS- Title II	Indian Falls Community HFR DZ	HFR-Treatment	39.8
03-04	RAC/USFS- Title II	Camp Layman HFR	HFR-Treatment	50.0
03-04	RAC/USFS- Title II	Cromberg HFR	HFR-Treatment	155.0
03-04	RAC/USFS- Title II	Quincy CSD HFR	HFR-Treatment	13.0
03-04	USFS -Comm Protect	Delleker North HFR	HFR-Treatment	131.0
04-05	RAC/USFS- Title II	C Road1 HFR	HFR-Treatment	65.8
07-08	RAC/USFS- Title II	C Road1 HFR -Supplemental	HFR-Treatment	31.6
04-05	USFS -Comm Protect	C Road1 HFR	HFR-Treatment	24.6
04-05	RAC/USFS- Title II	Red Clover (Genesee)	HFR-Treatment	73.2
04-05	RAC/USFS- Title II	Canyon Dam HFR	HFR-Treatment	550.0
05-06	RAC/USFS- Title II	Grizzly Creek HFR	HFR-Treatment	87.0
05-06	RAC/USFS- Title II	Whitehawk HFR	HFR-Treatment	105.0
05-06	RAC/USFS- Title II	Greenhorn Ranch HFR	HFR-Treatment	25.5
06-07	CA FSC-FS Comm Prot	WACC HFR	HFR-Treatment	17.0
06-07	CA FSC-FS Comm Prot	Eastern Plumas HFR	HFR-Treatment	121.0
05-06	RAC/USFS- Title II	Eastern Plumas HFR	HFR-Treatment	50.0
06-07	RAC/USFS- Title II	Little Grass Valley	HFR-Treatment	111.0
06-07	CDF Prop 40	Massack HFR	HFR-Treatment	125.0
07-08	RAC/USFS- Title II	La Porte Pines	HFR-Treatment	5.0
07-08	RAC/USFS- Title II	Taylorsville Campground HFR	HFR-Treatment	27.0
07-08	CA FSC-FS Comm Prot	Indian Valley HFR	HFR-Treatment	183.5
06-07	CDF Prop 40	La Porte Road I HFR	HFR-Treatment	119.0
07-08	Sierra Nevada Conservancy	Grizzly Creek HFR	HFR-Treatment	10.0
08-09	CA FSC-FS Comm Prot	Gold Mountain HFR	HFR-Treatment	187.0
09-10	CA FSC-FS Comm Prot	Crescent Grade HFR	HFR-Treatment	129.0
10-11	PNF Stevens Funds	Long Valley II HFR/Whitehawk II HFR/C Road HFR	HFR-Treatment	192.9

Fiscal Year	Agency Source	Grant Project Name	Project Type	Acres
-	Landowner Contributions	C-Road Narrows	HFR-Treatment	25.0
10-11	RAC/USFS- Title II	Crescent Grade HFR	HFR-Treatment	38.0
10-11	RAC/USFS- Title II	Long Valley II HFR	HFR-Treatment	50.0
12-13	RAC/USFS- Title II	La Porte Road II HFR (Cutler Meadows)	HFR-Treatment	65.2
11-12	CDF Prop 40	La Porte Road II HFR (partial/ Non Product)	HFR-Treatment	73.1
12-13	Sierra Nevada Conservancy	La Porte Road II HFR (partial/Biomass)	HFR-Treatment	74.6
11-12	PNF Stevens Funds	Dwyer Tree Farm & Lee Summit (SW lands)	HFR-Treatment	135.0
12-13	PNF Stevens Funds	Bufords Place-East Quincy (Sopher Wheeler Lands)	HFR-Treatment	92.0
12-13	PNF Stevens Funds	Barry Creek Units A-C (Graeagle Land & Water)	HFR-Treatment	59.4
12-13	PNF Stevens Funds	East Shore Lake Almanor	HFR-Treatment	9.8
14-15	PNF Stevens Funds	W.Quincy Hwy 70	HFR-Treatment	51.3
13-14	RAC/USFS- Title II	Crescent Grade HFR Phase II	HFR-Treatment	68.4
14-15	PG&E	Cutler HFR	HFR-Treatment	16.0
14-15	PG&E	Crescent Grade HFR Phase II	HFR-Treatment	30.0
14-15	CAL FIRE SRA FPF	American Valley HFR	HFR-Treatment	135.0
15-16	PNF Stevens Funds	Dixie Valley Collaborative HFR	HFR-Treatment	72.6
16-17	Sierra Nevada Conservancy	Wolf and Grizzly Creek Municipal Watershed Protection	HFR-Treatment	500.0
16-17	PNF Stevens Funds	Mohawk Vista/C-Road HFR	HFR-Treatment	167.9
16-17	Sierra Nevada Conservancy	Bucks Lake HFR	HFR-Treatment	342.5
16-17	PNF Stevens Funds	Gold Mountain HFR	HFR-Treatment	110.9
18-19	Sierra Nevada Conservancy - Prop 1	Butterfly Twain Fuels and Forest Health	HFR-Treatment	454.9
18-19	Sierra Nevada Conservancy - Prop 1	Little Grass Valley Reservoir Watershed Protection	HFR-Treatment	480.0

Fiscal Year	Agency Source	Grant Project Name	Project Type	Acres
18-19	CAL FIRE CCI Forest Health	Plumas Collaborative Forest Health	HFR-Treatment	7859.0
18-19	CAL FIRE CCI Fire Prevention	Portola HFR	HFR-Treatment	152.0
18-19	PNF Stevens Funds	American Valley II HFR	HFR-Treatment	160.0
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