OMB Number: 4040-0004
Expiration Date: 12/31/2022

Application for Federal Assistance SF-424

* 1. Type of Submission:	* 2. Type of Application:	* If Revision, select appropriate letter(s):
☐ Preapplication	☒ New	
☒ Application	☐ Continuation	* Other (Specify):
☐ Changed/Corrected Application	☐ Revision	

* 3. Date Received:	4. Applicant Identifier:
03/25/2022	

5a. Federal Entity Identifier:	5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:	7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Humboldt State University Sponsored Programs Foundation

* b. Employer/Taxpayer Identification Number (EIN/TIN):	* c. Organizational DUNS:
94-6050071	0143020740000

d. Address:

* Street1:	1 Harpst Street
Street2:	SBS 427
* City:	Arcata
County/Parish:	Humboldt
* State:	CA: California
Province:	
* Country:	USA: UNITED STATES
* Zip / Postal Code:	95521-8299

e. Organizational Unit:

Department Name:	Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:	Ms.	* First Name:	Jocelyne
Middle Name:			
* Last Name:	Takatsuno		
Suffix:			

Title: Pre-Award Specialist

Organizational Affiliation:

* Telephone Number:	(707) 826-4175	Fax Number:	

* Email: jt366@humboldt.edu

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Environmental Protection Agency

11. Catalog of Federal Domestic Assistance Number:

66.034

CFDA Title:

Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act

*** 12. Funding Opportunity Number:**

EPA-OAR-OAQPS-22-01

* Title:

Enhanced Air Quality Monitoring for Communities

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

1235-Affected Areas.pdf

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Klamath River Watershed Air Monitoring Network in Partnership with Karuk Tribe and Blue Lake Rancheria Tribe

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant CA-002 * b. Program/Project CA-002

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 11/01/2022 * b. End Date: 11/01/2024

18. Estimated Funding ($):

* a. Federal	500,000.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	500,000.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Ms. * First Name: Kacie

Middle Name:

* Last Name: Flynn

Suffix:

* Title: Executive Director

* Telephone Number: 707-826-4189 Fax Number:

* Email: hsuf@humboldt.edu

* Signature of Authorized Representative: Jocelyne Takatsuno * Date Signed: 03/25/2022

Other Attachment File(s)

*** Mandatory Other Attachment Filename:** 1234-Mandatory Attachments.pdf

Add Mandatory Other Attachment | Delete Mandatory Other Attachment | View Mandatory Other Attachment

To add more "Other Attachment" attachments, please use the attachment buttons below.

Add Optional Other Attachment | Delete Optional Other Attachment | View Optional Other Attachment

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 02/28/2022

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Klamath Region Community Air Monitoring Network		$	$	$ 500,000.00	$ 0.00	$ 500,000.00
2.						
3.						
4.						
5. Totals		$	$	$ 500,000.00	$ 0.00	$ 500,000.00

Standard Form 424A (Rev. 7- 97)
Prescribed by OMB (Circular A -102) Page 1

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) Klamath Region Community Air Monitoring Network	(2)	(3)	(4)	Total (5)
a. Personnel	$ 123,545.00	$	$	$	$ 123,545.00
b. Fringe Benefits	55,000.00				55,000.00
c. Travel	2,294.00				2,294.00
d. Equipment	0.00				0.00
e. Supplies	11,000.00				11,000.00
f. Contractual	0.00				0.00
g. Construction	0.00				0.00
h. Other	192,282.00				192,282.00
i. Total Direct Charges (sum of 6a-6h)	384,121.00				$ 384,121.00
j. Indirect Charges	115,879.00				$ 115,879.00
k. TOTALS (sum of 6i and 6j)	$ 500,000.00	$	$	$	$ 500,000.00
7. Program Income	$ 0.00	$	$	$	$ 0.00

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Prescribed by OMB (Circular A -102) Page 1A

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. Klamath Region Community Air Monitoring Network	$ 0.00	$ 0.00	$ 0.00	$ 0.00
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$ 0.00	$ 0.00	$ 0.00	$ 0.00

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 265,773.00	$ 70,000.00	$ 65,000.00	$ 65,000.00	$ 65,773.00
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$ 265,773.00	$ 70,000.00	$ 65,000.00	$ 65,000.00	$ 65,773.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b)First	(c) Second	(d) Third	(e) Fourth
16. Klamath Region Community Air Monitoring Network	$ 234,227.00	$	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 234,227.00	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: 384121

22. Indirect Charges: 115879

23. Remarks: Indirect costs using the institutional federally negotiated rate (47.5% MTDC) equal $71,070 in year 1 and $44,809 in year 2.

EPA KEY CONTACTS FORM

OMB Number: 2030-0020
Expiration Date: 06/30/2024

Authorized Representative: *Original awards and amendments will be sent to this individual for review and acceptance, unless otherwise indicated.*

Name: Prefix: Ms. First Name: Kacie Middle Name:
Last Name: Flynn Suffix:

Title: Executive Director

Complete Address:

Street1: 1 Harpst Street
Street2: SBS 427
City: Arcata State: CA: California
Zip / Postal Code: 95521-8299 Country: USA: UNITED STATES

Phone Number: (707) 826-5159 **Fax Number:**

E-mail Address: hsuf@humboldt.edu

Payee: *Individual authorized to accept payments.*

Name: Prefix: Ms. First Name: Kacie Middle Name:
Last Name: Flynn Suffix:

Title: Executive Director

Complete Address:

Street1: 1 Harpst Street
Street2: SBS 427
City: Arcata State: CA: California
Zip / Postal Code: 95521-8299 Country: USA: UNITED STATES

Phone Number: (707) 826-5159 **Fax Number:**

E-mail Address: hsuf@humboldt.edu

Administrative Contact: *Individual from Sponsored Programs Office to contact concerning administrative matters (i.e., indirect cost rate computation, rebudgeting requests etc).*

Name: Prefix: Mr. First Name: Anthony Middle Name:
Last Name: Johnson Suffix:

Title: Lead Grant Analyst

Complete Address:

Street1: 1 Harpst Street
Street2: SBS 427
City: Arcata State: CA: California
Zip / Postal Code: 95521-8299 Country: USA: UNITED STATES

Phone Number: 7078265164 **Fax Number:**

E-mail Address: aj27@humboldt.edu

EPA Form 5700-54 (Rev 4-02)

EPA KEY CONTACTS FORM

Project Manager: *Individual responsible for the technical completion of the proposed work.*

Name: **Prefix:** Mr. **First Name:** Nicholas **Middle Name:**

Last Name: Lam **Suffix:** Ph.D.

Title:

Complete Address:

Street1: 1 Harpst St.

Street2: Schatz (West) 111

City: Arcata **State:** CA: California

Zip / Postal Code: 95521-8299 **Country:** USA: UNITED STATES

Phone Number: (707) 826-4345 **Fax Number:**

E-mail Address: nicholas.lam@humboldt.edu

EPA Form 5700-54 (Rev 4-02)

Project Narrative File(s)

*** Mandatory Project Narrative File Filename:** 1236-EPA - Communtiy Monitoring - 220325c.pdf

Add Mandatory Project Narrative File | Delete Mandatory Project Narrative File | View Mandatory Project Narrative File

To add more Project Narrative File attachments, please use the attachment buttons below.

Add Optional Project Narrative File | Delete Optional Project Narrative File | View Optional Project Narrative File

BLUE LAKE RANCHERIA
P.O. Box 428
Blue Lake, CA 95525

Office: (707) 668-5101
Fax: (707) 668-4272

www.bluelakerancheria-nsn.gov

March 22, 2022

United States Environmental Protection Agency
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Letter of Support for Cal Poly Humboldt Sponsored Programs Foundation/ Schatz Energy Research Center's Proposal: "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform."

To Whom It May Concern:

On behalf of the Tribal Education Agency (TEA), it is my pleasure to provide this letter of support for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish air monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform programs and decision making.

The Tribal Education Agency (TEA) strives to create programs which promote Native stories and histories, inclusive in all classroom experiences, and reflective of current and Traditional Ecological Knowledge. We have worked with Blue Lake Rancheria's Environmental Programs Department on two recent projects using air quality curriculum and regularly work with outside community partners to enhance our educational programs.

We look forward to working with the Schatz Center to provide feedback on the air quality network design and how information from these air monitors can be presented to meet TEA's needs.

I encourage the US EPA to fund this proposal in the full amount requested. If you have any questions, please contact me.

Sincerely,

Alison Robbins

Alison Robbins
Executive Director
Tribal Education Agency
arobbins@bluelakerancheria-nsn.gov

AETHLABS

1640 Valencia St. STE 2C
San Francisco, CA. 94110

March 21, 2022

To: United States Environmental Protection Agency
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Letter of Support for Humboldt State University Sponsored Programs Foundation/ Schatz Energy Research Center's Proposal: "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform."

To Whom it May Concern,

It is with great enthusiasm and interest that I write in support of the proposal of Humboldt State University Sponsored Programs Foundation and the Schatz Energy Research Center – titled "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform" – with a 1-year lease of 2 MA350 multi-wavelength Black Carbon monitors, which can be used to distinguish between traffic and woodsmoke sources. The MA350 instruments are self-contained, long-term monitors that can be connected to WiFi for telemetry and deployment management. AethLabs is happy to contribute in-kind its team's insights from its own data analysis experience and provide suggestions regarding QA/QC methods that have been developed at AethLabs using internal data science tools and related know-how.

Any required maintenance will be carried out at AethLabs' facility as part of the lease. AethLabs will provide standard manufacturer support to the project team as they deploy instruments and engage in source apportionment analyses.

AethLabs will also support the project by loaning at no charge as an in-kind contribution 5 multi-pollutant PM monitors that have been developed and commercialized under recent EPA SBIR Phase II funding for a "Black Carbon and UV Particulate Matter, Multi-gas, Multi-pollutant Sensor Platform". This device is a standalone PM monitor that can be easily deployed, has WiFi data transmission and reports PM_1, $PM_{2.5}$, and PM_{10} particle number, count, and mass concentration measurements along with CO2, total VOC and NOx measurements.

If there is interest, and additional funding becomes available before the end of the period of MA350 performance of this proposal, AethLabs will apply the rental fee towards the purchase of

those same 2 MA350 instruments so that EPA funds can be used as a long-term investment into a community network with research grade instrumentation.

We look forward to supporting the Schatz Center, the Karuk Tribe, and Blue Lake Rancheria to establish the Klamath Region Community Air Monitoring Network. We have engaged with members of the Schatz Center team in the past and have confidence that this team can accomplish what they have outlined in their proposal. We believe this network has the potential to provide value to communities in the Klamath region and produce insights that can help mitigate the impacts of their air pollution exposures.

Sincerely,

Jeffrey Blair
CEO

WESTERN KLAMATH RESTORATION PARTNERSHIP

Dear EPA Grant Selection Committee,

On behalf of the Western Klamath Restoration Project (WKRP), it is my pleasure to provide this letter of support for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform programs and decision making.

WKRP engages with communities to collaboratively co-exist with wildland fire and to foster a wildfire resilient future. The ability to assess air quality during wildfires in and around communities directly supports our efforts and we look forward to collaborating with Schatz Center to design a sensor deployment strategy and use data from the network, and tools and resources developed by the **project to within ongoing and future WKRP activities**.

If you have any questions or require additional information, please don't hesitate to contact me.

Sincerely,

Jodie Pixley

Jodie Pixley
jodie@wkrp.network
Partnership Coordinator
Western Klamath Restoration Partnership

BLUE LAKE RANCHERIA
P.O. Box 428
Blue Lake, CA 95525

Office: (707) 668-5101
Fax: (707) 668-4272

www.bluelakerancheria-nsn.gov

March 17, 2022

To: United States Environmental Protection Agency
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Letter of Support for Cal Poly Humboldt Sponsored Programs Foundation/ Schatz Energy Research Center's Proposal: "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform."

To Whom it May Concern,

On behalf of the Blue Lake Rancheria Tribal Library, it is my pleasure to provide this letter of support for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish air monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform programs and decision making.

As Librarian for the BLR Tribal Library, I strive to create programs to enhance our community's access to knowledge and information. The Tribal Library serves both tribal and non-tribal community members with both digital paper-bound resources. I would be happy to include an access point to shared data from this project at the library to increase community access to and understanding of our regional air quality.

I encourage the US EPA to fund this proposal in the full amount requested. If you have any questions about this letter, please contact me.

Sincerely,

Leia Pollard

Leia Pollard
Librarian
Blue Lake Rancheria Tribal Library
library@bluelakerancheria-nsn.gov

Mid Klamath Watershed Council

P.O. Box 409, Orleans, CA 95556 (primary)
P.O. Box 50, Happy Camp, CA 96039
Tel: (530) 627-3202
www.mkwc.org
mail@mkwc.org

Dear EPA Grant Selection Committee,

On behalf of the Mid Klamath Watershed Council, it is my pleasure to provide this letter of support for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's focus on establishing monitoring infrastructure and technical capacity, fits well with the objectives of the Klamath Prescribed Fire Training Exchange Program (KTREX). The KTREX program will use this infrastructure and technical support to inform decision making around prescribed fire around our rural communities.

TREX is a program sponsored by the Nature Conservancy's Fire Learning Network (FLN) which the Nature Conservancy describes as "a novel program that provides training and learning opportunities for wildland fire professionals while at the same time furthering the long-term objectives of FLN landscapes… events include daily burning and give trainees a concentrated dose of prescribed fire experience as well as exposure to new people, places and techniques." We look forward to collaborating with the Schatz Center and helping to shape the network. Our past collaborations with the Schatz Center include the installation of low-cost particle sensors in and around Orleans, around an area where KTREX was performing prescribed burns.

If you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,

Luna Latimer
luna@mkwc.org
Director
Mid Klamath Watershed Council

State of California—Health and Human Services Agency
California Department of Public Health

TOMÁS J. ARAGÓN, MD, DrPH
Director and State Public Health Officer

GAVIN NEWSOM
Governor

March 23, 2022

To: United States Environmental Protection Agency
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Letter of Support for Humboldt State University Sponsored Programs Foundation/ Schatz Energy Research Center's Proposal: "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform."

To whom it may concern,

My name is Dr. Kazukiyo Kumagai and I am the Chief of the Air Quality Section and Interim Chief of the Environmental Health Laboratory Branch at California Department of Public Health (CDPH). I am writing this Letter of Support on behalf of CDPH in support of Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform". This proposal being submitted in response the U.S. EPA's "Enhanced Air Quality Monitoring for Communities" RFA. The goal of the project is to establish monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform community-specific programs and decision making.

Our support of this this project will include collaborating with the Schatz Center, Karuk Tribe, and Blue Lake Rancheria to provide laboratory and sampling support to conduct periodic measurements of air pollutant hazards that supplement the real-time network of PM monitors being proposed. This may include, but is not limited to, volatile organic compounds, polycyclic aromatic hydrocarbons, metals, and gravimetric analysis of filters. Our collaboration will include short-term loans of sampling equipment and laboratory analysis of collected air samples. We will also provide input in the sampling design.

If you have any questions regarding our support for this project or organization's history please do not hesitate to contact us at the email address below.

Sincerely,

Kazukiyo Kumagai, Ph.D., M.P.H.
Chief, Air Quality Section
Interim Chief, Environmental Health Laboratory Branch
Center for Healthy Communities
California Department of Public Health

BLUE LAKE RANCHERIA
P.O. Box 428
Blue Lake, CA 95525

Office: (707) 668-5101
Fax: (707) 668-4272

www.bluelakerancheria-nsn.gov

March 17, 2022

United States Environmental Protection Agency
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Letter of Commitment for Cal Poly Humboldt Sponsored Programs Foundation/ Schatz Energy Research Center's Proposal: "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform."

To Whom it May Concern,

On behalf of the Blue Lake Rancheria, it is my pleasure to provide this letter of commitment for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform programs and decision making. The Blue Lake Rancheria Tribe is currently working to establish community air quality monitoring capabilities. The activities described in this proposal and partnership with SERC will support these efforts by establishing air monitoring and assessment infrastructure and building sustained technical capacity of staff. This network will also incorporate data from our existing network of low cost and regulatory grade air monitoring infrastructure.

We have submitted a separate proposal for which the Schatz Center has provided a letter of support. This is for a separate set of tasks that stands alone, but would also enhance the air monitoring network capabilities by providing long-term monitoring of additional air hazards not within scope of this project.

The Blue Lake Rancheria Tribe activities under the proposed project are agreed upon by the Schatz Center. These include activities throughout all project phases, including design, implementation, and outreach to additional communities to expand the network. Specific activities include:

- Facilitation of potential partner organization meetings to understand program-specific air quality needs that can be supported by project efforts.

BLUE LAKE RANCHERIA
P.O. Box 428
Blue Lake, CA 95525

Office: (707) 668-5101
Fax: (707) 668-4272

www.bluelakerancheria-nsn.gov

- Feedback and recommendations on the location of air quality sensors to deploy in and around Blue Lake Rancheria.
- Working with the Schatz team to deploy air quality sensors and instruments in and around Blue Lake Rancheria.
- Providing maintenance of air sensors and air quality instruments deployed in and around Blue Lake Rancheria with the support from the Schatz Center.
- Providing feedback and input on the layout and usability of data dashboards.
- Feedback and input on the design and implementation of training materials
- Feedback and input on the data tools that support the use of air network sensor data within community programs.
- Serving as a community knowledge hub to support new communities and organizations added to the monitoring network in the second year of the project.
- Sharing air quality data with the community through social media or a newsletter, supported by the data dashboard and other tools generated by the project.

We are happy to build upon existing partnerships with the Schatz Center to establish air monitoring capability in the region. This includes building upon the experience and infrastructure of the Smoke Air Fire and Energy (SAFE) in Rural California project that we have been conducting with the Schatz Center since 2020.

The Blue Lake Rancheria Tribe will be supported in this work with the requested funds of $60,810. The details of the budget and justification are described in a "Budget" section of the proposal document. I encourage the US EPA will fund this proposal in the amount requested. If you have any questions, please contact BLR Environmental Director, Michelle Fuller (mfuller@bluelakerancheria-nsn.gov).

Sincerely,

Jason Ramos
Tribal Administrator

HUMBOLDT BAY MUNICIPAL WATER DISTRICT

828 SEVENTH STREET, PO BOX 95 • EUREKA, CALIFORNIA 95502-0095
OFFICE 707-443-5018 ESSEX 707-822-2918
FAX 707-443-5731 707-822-8245
EMAIL OFFICE@HBMWD.COM
Website: www.hbmwd.com

BOARD OF DIRECTORS
SHERI WOO, PRESIDENT
NEAL LATT, VICE-PRESIDENT
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DAVID LINDBERG, DIRECTOR

GENERAL MANAGER
JOHN FRIEDENBACH

March 24, 2022

United States Environmental Protection Agency
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Re: Letter of Support for Humboldt State University Sponsored Programs Foundation/ Schatz Energy Research Center's Proposal: "**Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform.**"

To Whom it May Concern,

On behalf of the Humboldt Bay Municipal Water District (HBMWD), it is my pleasure to provide this letter of support for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish air monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region and Mad River basin to assess their air quality and use this information to inform programs and decision making.

At HBMWD we work to reliably deliver high quality drinking water sourced from the Mad River to the communities and customers we serve in the greater Humboldt Bay Area at a reasonable cost; reliably deliver untreated water to our wholesale industrial customer(s) at a reasonable cost; and protect the environment of the Mad River watershed to preserve water rights, water supply and water quality interests of the District.

When funded, we look forward to working with the Schatz Center, Karuk Tribe, and Blue Lake Rancheria to inform the development of the air monitoring network. The monitoring domain includes areas of the Mad River Watershed where several facilities are located and we would be happy to consider hosting several sensors on our property.

If you have any questions, please do not hesitate to contact us.

Respectfully,

John Friedenbach
General Manager

Karuk Community Health Clinic
64236 Second Avenue
Post Office Box 316
Happy Camp, CA 96039
Phone: (530) 493-5257
Fax: (530) 493-5270

Karuk Tribe

Administrative Office
Phone: (530) 493-1600 • Fax: (530) 493-5322
64236 Second Avenue • Post Office Box 1016 • Happy Camp, CA 96039

Karuk Dental Clinic
64236 Second Avenue
Post Office Box 1016
Happy Camp, CA 96039
Phone: (530) 493-2201
Fax: (530) 493-5364

March, 24th, 2022

Environmental Protection Agency
1200 Pennsylvania Ave, N.W.
Washington, D.C. 20460

Re: Letter of Commitment for Humboldt State University Sponsored Programs Foundation/Schatz Energy Research Center's Proposal: "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform."

To Whom it May Concern,

Yôotva, on behalf of the Karuk Tribe, it is my pleasure to provide this letter of commitment for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform programs and decision making. The Karuk Tribe is currently working to establish community air quality monitoring capabilities. The activities described in this proposal and partnership with Schatz Center will support these efforts by establishing air monitoring and assessment infrastructure and build technical capacity of staff.
The Karuk Tribe's activities under the proposed project are agreed upon by the Schatz Center. These include activities throughout all project phases, including design, implementation, and outreach to additional communities to expand the network. Specific activities include:

- Identifying potential partner organizations in the community and facilitating meetings to identify program-specific air quality needs that can be supported by project efforts.
- Deployment and maintenance of air sensors and instruments deployed within the Karuk Tribe service area.
- Collaboration around the design and implementation of training materials
- Collaboration around data tools that support the use of air network sensor data within community programs
- Acting as community knowledge hub to support new communities and organizations added to the monitoring network in the second year of the project.
- Review and feedback on reports to the EPA

We are happy to build upon existing partnerships with the Schatz Center to establish air monitoring capability in Karuk communities and resilience that enables co-existence with wildland fires. This includes building upon the experience and infrastructure of the Smoke Air Fire and Energy (SAFE) in Rural California project that we are conducting with the Schatz Center.

The Karuk Tribe's project team operating out of the Karuk Tribe Department of Natural Resources (KDNR) will be supported in this work by the requested funds of $129,356. The details of the budget and justification are described in the "Budget" section of the proposal document.

Russell Attebery
Chairman,
Karuk Tribal Council

Quality Assurance Statement

The success and long-term sustainability of the Klamath Region Community Air Monitoring Network will build from the quality assurance practices established during the study period. As such, team composition and project design has been designed with this in mind.

Our core project team consist of technical staff from the Schatz Center and a key partner for each community partner: at the Karuk Tribe this is Shawn Bourque (Higher Education Director) of the Karuk Tribe Department of Natural Resources (KDNR) and at the Blue Lake Rancheria Tribe this is Michelle Fuller (Environmental Programs Director). Project budgets for both partners have included no less than quarter time for one or more staff at each organization to support efforts related to this project. The Schatz Center will serve as the overall project coordinator and lead. From the Schatz Center, team scientists Nicholas Lam and Peter Alstone will serve as the project leaders and Research Engineer Tanya Garcia will serve as the overall project manager (supported by both NL and PA). Project manager responsibilities at the Schatz Center include administrative and project implementation tasks, including budget, project/staff scheduling, meeting facilitation. PM tasks also include leading the development of draft reports to the funder. The Schatz team will be supported by Research Engineer Eli Wallach who will provide back-end support for data management and adaptations of data dashboards to meet needs of community organizations. A research technician will provide technical support for implementing and maintaining air network related infrastructure (sensors, data quality assurance, calibration, co-location) in collaboration with KDNR and BLR staff. Budget for administrative support has also been budgeted to support contracting and budget reconciliation, communications, and general administrative support. Team members at the Schatz Center supported by this project have over 25 years of combined experience conducting air quality monitoring, which includes technical capacity building, use of low cost and FRM/FEM monitors, emissions sampling, building energy and air concentration modeling, personal exposure assessment, and field and lab-based air monitoring experience.

Community participant meetings will be facilitated by KDNR and BLR partners with support from the Schatz Center. A standardized set of questions will be developed in advance of meetings in collaboration with KDNR and BLR to help identify key community needs and barriers related to air monitor data, as well as perceptions related to wildfire smoke and other air pollutant concerns. As part of general practice, the Schatz Center will have these surveys (along with any other material used in interviews or protocols) reviewed by our Institutional Review Board (IRB) and IRB approval will be obtained (or existing IRB amended) to reflect these activities. Interviews may be recorded with the written consent of the participants for reference purposes and only accessible to the immediate project staff. Any original recordings or documentation of these interviews will be destroyed after two years.

Community interviews will be used to inform the placement of air quality monitors/instruments and updates to data dashboards. At the onset of the project, our team will place orders for all air quality monitoring equipment identified in the proposal, as well as service existing reference and near-reference instruments that are currently archived at each of the community partner organizations. Collocations of all monitors procured for this project will be performed following the recommendations outlined by the US EPA guidance documents at fixed periods throughout the project (every 6-7 months). Collocation of low-cost PM monitors and near-reference monitors will be conducted using at least one regulatory-grade reference or equivalent monitor (FRM/FEM). One stationary FRM/FEM and meteorological station will be present at each of the two partner communities. Gas sensors on the MA350 will be calibrated using span gas every three months or as needed. We propose to use a local "host-based" system for reducing the cost of maintaining a large network. In this system, each sensor deployed is owned by a community organization with a staff member at each overseeing their entire network. Each monitor deployed is also associated with a local community sensor host - an individual working or living very near to the monitor who is trained to setup or take-down low-cost monitors - which includes mailing the sensor back to the partner organization for their community for collocation or other QA/QC procedures. Test summaries of collocations are generated following recommendations outlined in instruction guides and tools produced by the US EPA. Each community partner will oversee collocations at their respective locations with the support of the Schatz Center. Dashboards, basic data management tools, and instruction guides to help facilitate this process across multiple partners - and enable scalability in Year 2 of the project -

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will be developed in collaboration with BLR and KDNR. Low-cost sensors in some locations may be deployed in duplicate to provide redundancy and reduce overall operating costs associated with staff time and travel.

Numerous procedures will be in place to ensure the quality and reliability of data collected by the network. As discussed previously, collocation tests will be performed with FRM/FEM monitors no less than every six months. Partners will be able to gather data from some or all sensors in the network using an open-source dashboard previously developed by the Schatz Center to support QA/QC and data summaries of a low-cost PM sensor network in the region. This tool enables users to customize the sensors they are interested in, pull data based on date ranges from the API, and generates a customizable set of figures and key metrics - informed by EPA methods and other well accepted methodologies - to assess the performance of sensors, gaps, and flag potential errors and activities. These tools also facilitate the modification of calibration coefficients at the individual sensor level (at present using default calibrations coefficients and corrections developed by US EPA). All community partners will assess the performance of their local sensor networks using these tools, and Schatz will assess sensors across the entire network. QA summaries will be generated from these assessments, which will be consistent across all community partners in the network. The Schatz Center will archive network data and reports on a local server which will be accessible to partners and the public via a network webpage that the Schatz Center will establish and maintain.

The sharing of knowledge - inclusive of experience, data, and data-related insights - across the network is the foundation of this network. Establishing infrastructure to facilitate the channels through which knowledge can be shared is a critical element of the project. The network will hold monthly online meetings (coordinated by Schatz but led by network members on a rotating basis) to share updates on network activity and provide a forum for discussion. Dashboards and a website will help to facilitate how data is shared and streamline access to documentation related to operation and maintenance of the network sensors and data-related infrastructure.

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Karuk Community Health Clinic
64236 Second Avenue
Post Office Box 316
Happy Camp, CA 96039
Phone: (530) 493-5257
Fax: (530) 493-5270

Karuk Tribe

Karuk Dental Clinic
64236 Second Avenue
Post Office Box 1016
Happy Camp, CA 96039
Phone: (530) 493-2201
Fax: (530) 493-5364

Administrative Office
Phone: (530) 493-1600 • Fax: (530) 493-5322
64236 Second Avenue • Post Office Box 1016 • Happy Camp, CA 96039

RESOLUTION OF THE KARUK TRIBE

Resolution No: **22-R-047**
Date Approved: **March 24, 2022**

RESOLUTION AUTHORIZING A SUBAWARD FROM HUMBOLDT STATE UNIVERSITY SPONSORED PROGRAMS FOUNDATION/SCHATZ ENERGY RESEARCH CENTER'S PROPOSAL TO THE ENVIRONMENTAL PROTECTION AGENCYS TO MONITOR AIR QUALITY IN KARUK ABORIGINAL TERRITORY IN THE AMOUNT OF $129,356 FOR A TWO YEAR PROJECT.

WHEREAS; the Karuk Tribe is a Sovereign Aboriginal People, that have lived on their own land since long before the European influx of white men came to this continent; and

WHEREAS; the members of the Karuk Tribe have approved Article VI of the Constitution delegating to the Tribal Council the authority and responsibility to exercise by resolution or enactment of Tribal laws all the inherent sovereign powers vested in the Tribe as a Sovereign Aboriginal People, including negotiating and contracting with federal, state, Tribal and local governments, private agencies and consultants; and

WHEREAS; the members of the Karuk Tribe have approved Article VIII of the Constitution assigning duties to the Chair, Vice Chair, and Secretary/Treasurer including signing and executing all contracts and official documents pertaining to the Karuk Tribe; and

WHEREAS; the Karuk Tribe is a federally recognized Tribe and its Tribal Council is eligible to and is designated as an organization authorized to Contract pursuant to P.L. 93-638, as amended, on behalf of the Karuk Tribe; and

WHEREAS; the Karuk Tribal Council endorsed the United Nations' Declaration on the Rights of Indigenous People on January 26, 2012; and

WHEREAS; the Department of Natural Resources supports collaboration with partner organizations to identify air quality needs, training materials, and data tools that support the use of air network sensor data;

WHEREAS; the Department of Natural Resources seeks to support, monitor, and protect the Karuk people and air quality health in aboriginal territory; now

THEREFORE BE IT RESOLVED; the Department of Natural Resources submits this proposal to fund air quality-related tribal capacity; community infrastructure and engagement processes; and Karuk-centric air monitoring network planning, equipment deployment, maintenance and community training & technical capacity; now

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THEREFORE BE IT FINALLY RESOLVED; that the Karuk Tribal Council authorizes a subaward from Humboldt State University Sponsored Programs Foundation/Schatz Energy Research Center's Proposal to the Environmental Protection Agency to monitor air quality in Karuk aboriginal territory.

CERTIFICATION

I, as Chairman, hereby certify the foregoing resolution 22-R-047 which was approved at a Regularly Scheduled Council Meeting on March 24, 2022, was duly adopted by a vote of 6 AYES, 0 NOES, 0 ABSTAIN, and said resolution has not been rescinded or amended in any way. The Tribal Council is comprised of 9 members of which 6 voted.

Russell Attebery, Chairman

3-24-2022
Date

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State of California
Secretary of State

CERTIFICATE OF STATUS

ENTITY NAME:

HUMBOLDT STATE UNIVERSITY SPONSORED PROGRAMS FOUNDATION

FILE NUMBER:	C0265392
FORMATION DATE:	07/31/1952
TYPE:	DOMESTIC NONPROFIT CORPORATION
JURISDICTION:	CALIFORNIA
STATUS:	ACTIVE (GOOD STANDING)

I, ALEX PADILLA, Secretary of State of the State of California, hereby certify:

The records of this office indicate the entity is authorized to exercise all of its powers, rights and privileges in the State of California.

No information is available from this office regarding the financial condition, 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 December 14, 2015.

ALEX PADILLA
Secretary of State

NP-25 (REV 01/2015)

HSD

ORLEANS ELEMENTARY SCHOOL

P.O. Box 130, Orleans, CA 95556 | (530) 627-3242 x2000

Karen Cole, *Principal* kcole@ktjusd.k12.ca.us

March 23, 2022

To Whom it May Concern:

On behalf of the Orleans Elementary School, it is my pleasure to provide this letter of support for the Schatz Energy Research Center's (Schatz Center) application to the United States Environmental Protection Agency to support the project "Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform." The project's goal is to establish monitoring infrastructure and technical capacity to enable rural communities and tribes in the Klamath region to assess their air quality and use this information to inform programs and decision making.

We look forward to working with the Schatz Center to identify opportunities to deploy air quality sensors near and around the school. The information from these sensors will help us to understand smoke exposure risk and design filtration strategies, renovations, and other buildings that improve air quality in the school, particularly during wildfire events. These sensors will also help us to make decisions about school activities in order to minimize exposures.

Our past collaborations with the Schatz Center include the installation of portable low-cost particle sensors at our school. The data from the sensor was used to develop a memo that will be useful for strategizing during future wildfire events.

If you have any questions or require additional information, please contact me at the email or phone number above.

Kind Regards,

Karen Cole

Karen Cole

Jana Ganion

Professional Experience

2004 – Present Sustainability & Government Affairs Director, Blue Lake Rancheria Blue Lake, CA

The Blue Lake Rancheria is a federally recognized Native American tribal government. My role is to develop climate resilient infrastructure and sustainability and policy initiatives, collaborate with the tribal government's elected leadership and economic enterprises, fulfill the tribe's zero-carbon clean energy strategy, implement clean energy assets and efficiency upgrades, lower and stabilize costs of energy, and increase overall community resilience. As director of government affairs, I manage outreach and partnerships with governments and other stakeholders on policy and co-management. Create and maintain tribal, local, regional, state, national policy and partnerships relative to tribal government activities, clean energy, climate crisis, economics. As current (2022) co-chair of US Dept. of Energy's national working group for tribal energy development, work with 576 federally recognized tribal nations on clean energy and infrastructure strategies. As the tribal appointee on California's Disadvantaged Communities Advisory Group, work with the California Public Utilities Commission and the California Energy Commission to build clean energy and electrified transportation equitably across the state and 100+ tribal nations. I have deep experience in projects with a clean energy nexus, including four (4) solar + storage microgrids at residential, facility, campus, and community scales, building and transportation electrification, energy efficiency measures including fuel switching away from fossil. I create and analyze policy/programs for whole-community, climate-smart resilience, emergency preparedness, technology R&D, and infrastructure and lifeline sector improvements. I also analyze and quantify economic and environmental effectiveness of climate resilient development, and design and fulfill knowledge transfer commitments on climate resilience initiatives in local, state, national, & international forums.

Appointments

2020 - current	Pacific Gas and Electric Co. Sustainability Advisory Council
2019 - current	Pacific Region Representative, Technical Committee, National Congress of American Indians Climate Action Task Force
2018 - current	Tribal Appointee, SB 350 California Public Utilities Commission / California Energy Commission Disadvantaged Communities Advisory Group
2018 - current	U.S. Bureau of Ocean Energy Management (BOEM) California Intergovernmental Renewable Energy Task Force
2018 - current	California Air Resources Board AB 617 Community Air Protection Program Consultation Group
2015 - current	California Integrated Climate Adaptation and Resiliency Program Technical Advisory Council
2013 - current	Co-chair (2020-present) and Representative, U.S. Deptartment of Energy, Indian Country Energy and Infrastructure Working Group

Selected Illustrative Speaking Engagements and Presentations

- International Colloquium on Environmentally Preferred Advanced Power Generation (2020)
- California Energy Commission (CEC) IEPR Workshop on Zero Emission Vehicle Resilience (2020)
- CEC Technical EPIC Forum – Powering Resilient Communities via Adv. Energy Technologies (2020)
- FEMA, National Hazard Mitigation Workshop (2020, 2021)
- IEPR Joint Agency Climate Adaptation and Resiliency Workshop – Focus on Wildfire Resilience (2018)
- DistribuTECH International (2017, 2018, 2020)

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Publications

David Carter, Doug Saucedo, Jim Zoellick, Charles Chamberlin, Marc Marshall, Steve Shoemaker, Greg Chapman, **Jana Ganion,** Peter Lehman, and Pramod Singh (2019) *Demonstrating a Secure, Reliable, Low-Carbon Community Microgrid at the Blue Lake Rancheria.* Publication Number: CEC-500- 2019–011.

Jana Ganion, Dave Carter (2018) *Microgrid Serves Multiple Purposes.* T&D World Magazine. https://www.tdworld.com/grid-innovations/smart-grid/article/20971186/microgrid-serves-multiple-purposes

David Narum, **Jana Ganion** and David Carter (2016) *Developing a Low-Carbon Microgrid on Tribal Lands: A Case Study* Proceedings of the 2016 Conference of the American Council for an Energy Efficient Economy (ACEEE).

Synergistic Activities

(2017-current) U.S. Climate Resilience Toolkit / NOAA's Weather and Climate Toolkit. Provided (and update as needed) the Blue Lake Rancheria case study (*Blue Lake Rancheria Tribe Undertakes Innovative Action to Reduce the Causes of Climate Change*) to inform rural, tribal, and other similarly-situated communities on climate resilience strategies and tactics. https://toolkit.climate.gov/case-studies/blue-lake-rancheria-tribe-undertakes-innovative-action-reduce-causes-climate-change

(2018) California Energy Commission Integrated Energy Policy Report (IEPR) Workshops. Provided two presentations and testimony on energy resiliency and microgrids (4/2018), and actions to address wildfire risks for vulnerable populations and critical facilities (8/2018).

(2018) California Fourth Climate Change Assessment. Editor of the Statewide Report: *Summary Report from Tribal and Indigenous Communities within California*.

Professional Preparation

Western Washington University (Bellingham, WA)	Bachelor of Arts, English	
California Office of Emergency Services	Certificate, Public Information Officer	2014
Columbia University Graduate School of Business (New York, NY)	Certificate, Finance and Accounting	2015
FEMA	Certificates, ICS-100, 200, 700	2017-19

Other Affiliations

2017-current Member, GRID Alternatives Tribal Advisory Group

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Tanya Garcia

(415) 815-9800 | tanyag@humboldt.edu

Biosketch

Tanya Garcia is a Research Engineer with a background and expertise in product quality assessment and environmental engineering. She currently serves as the assistant project manager for the Smoke Air Fire and Energy (SAFE) in Rural California project, which aims to identify energy and air quality infrastructure strategies that support development of climate resilient rural communities in California. On the SAFE project, she is also the coordinator of the pilot study on high performance HEPA air filtration, which involves mixed methods data collection and analysis. She has over two years of experience developing, implementing, and managing remote energy and low-cost air pollution monitoring technologies in rural communities in Humboldt County and for the Karuk tribe. The proposed research would be based on the SAFE pilot study, testing implementation at a wider scale.

EDUCATION

Cal Poly Humboldt, Arcata, CA **Graduated: Dec 2018**
B.S. Environmental Resources Engineering (ERE), ABET Accredited
B.A. Applied Mathematics

PROFESSIONAL EXPERIENCE

Research Engineer, *Schatz Energy Research Center @ Cal Poly Humboldt* **Jan 2019 – Present**
Smoke Air Fire and Energy (SAFE) in Rural California

- Working as Project Manager for the project which aims to identify energy and air quality infrastructure strategies that support development of climate resilient rural communities in California
- Coordinating pilot study on high performance HEPA air purifiers, which involves mixed methods data collection and analysis.
- Designing and deploying household energy and air audits, deploying air purifiers, and conducting in-person interviews with community members about their experience with wildfire and smoke.

Off-grid Energy Access

- Training and monitoring selected test labs to the IEC-TS-62257-9-8:2020 and IEC TS 62257-9-5:2018 testing standards to expand the VeraSol test lab network.
- Working on the VeraSol Quality Assurance team communicating with product manufacturers and test labs, developing and enforcing program policy, and reviewing specification sheets and other technical documents.

Offshore Wind Feasibility Study in Humboldt County

- Identified the benefits and concerns for a variety of stakeholders regarding offshore wind energy development.
- Analyzed the most likely and potential environmental impacts associated with offshore wind development.

Student Research Assistant, *Schatz Energy Research Center* **May 2018 – Dec 2018**

- Performed quality assurance testing and report writing for off-grid solar products in Africa and South Asia. Assist with the development of internal policies and standards for associated VeraSol test labs.

Infrastructure Design Intern, *Public Utilities Commission*, San Francisco, CA **June 2017 – Aug 2017**

- Conducted inspections of existing structures to correct as-built drawings and aid in future construction.
- Assisted project manager and project engineer with alternative analysis report for AWSS expansion.
- Reviewed RFI's, submittals, and specifications for the Calaveras Dam Replacement Project.

SKILLS

Software/Programming: LabVIEW, Microsoft Office, Fortran90, RStudio, MATLab, AutoCAD, WinTR-55, HEC-HMS, SWMM, Modflow, LaTex, Google drive.

General: Fluent in Spanish and English; Strong written and oral communication; Water quality and electronic lab experience; Soldering; Strong interpersonal skills; Effective team member; Fast learner; Adapts well to new environments; Strong leader and active listener; Advocate for social justice and intersectionality.

Relevant Coursework: Renewable Energy Power Systems, Introduction to Electronics, Thermodynamics and Energy Systems, General Physics 2, Statics, Dynamics, Environmental Health and Impact Assessment, Transport Phenomena, Fluid Mechanics.

LEADERSHIP EXPERIENCE & AWARDS

Outstanding Student of the Year 2019
Awarded to students that embody the ideals of academic excellence, service to others, and leadership that make Cal Poly Humboldt an incredible place to be at.

ERE Mentor, *Humboldt State University* **May 2017 - May 2018**

- Mentored underclassmen students to develop academic, professional, and leadership skills.
- Promoted retention in the department by providing students with emotional support, access to resources, and encouragement and guidance on how to succeed and enjoy the engineering program.
- Collaborated with department chair to implement career-oriented seminars with professionals and climate meetings for community building.

President, *Society of Hispanic Professional Engineers*, Arcata, CA **Sept 2014 - Dec 2017**
Previous position: Treasurer, Public Relations, Vice President

- Promoted academic excellence and provided a safe community for first generation student and other minorities within the Engineering department by implementing workshops, cultural events, and ERE tutoring.
- Organized annual Cesar Chavez, Dia de Los Muertos, and Latinx Independence Day events to educate the ERE department while developing awareness of Latin American culture and history, and creating connections with the larger Latinx community in Arcata.
- Developed and implemented a strategic plan to raise money utilizing food and merchandise sales with the result of over $1,500 profit in one day in order to send students to national and regional conferences.

EWB Excellence in Service Award, *EWB North Coast Professional Chapter*, Arcata, CA **Spring 2017**

- Was peer nominated and then professor selected for demonstrating outstanding service in engineering department and local community, while promoting community service and professional-student interaction.

ASCE Mid-Pacific 2017 and 2018 Competition

- Participated in an international engineering competition where students demonstrate their leadership and technical skills. Received 1st place in Waste Water Treatment, and 2nd place in the overall competition in 2017.

Volunteer, *Engineers Without Borders*, Camoapa, Nicaragua **March 2016**

- Worked as a translator for the group to communicate between the local engineers, workers, and town representatives for the installation of a water well to address hospital needs.

Practivista Intern, *Universidad Iberoamericana,* Santo Domingo, Dominican Republic **May 2015 - July 2015**

- Produced 9 prototypes of an Eco-block, crafted 600 blocks and laid 250 onto the foundation of a police station.
- Managed the scheduling of work days as well as the purchasing and delivering of materials in the Spanish language.

Nicholas L. Lam — Biosketch

Dr. Nicholas Lam is a Research Scientist with over 14 years of experience conducting impact and evaluation studies on topics that include air quality and exposure, health risk, climate impacts, energy subsidies, and household energy technology adoption. This includes experience designing and implementing mixed method studies that leverage data from low-cost sensor networks and surveys to evaluate intervention performance in over a dozen countries, including the US. He is currently serving as a co-chair of an American Thoracic Society Research Assembly on household air pollution interventions and respiratory health.

Professional Preparation

University of Illinois at Urbana-Champaign	Postdoctoral (Environmental Engineering)	2018
University of California, Berkeley	Ph.D. (Environmental Health)	2014
University of California, Berkeley	M.S. (Global Health & Environment)	2009
University of California, Irvine	B.S. (Applied Ecology)	2006

Appointments

2018-current	Research Scientist, Schatz Energy Research Center (Cal Poly Humboldt)
2014-2019	Postdoctoral Researcher, University of Illinois at Urbana-Champagne, Civil and Environmental Engineering
2007-2014	Graduate Student Researcher, UC Berkeley School of Public Health; Lawrence Berkeley National Lab Indoor Environment Group (2008-2009)
2014	Research Assistant, International Institute of Applied Systems Analysis
2007-2012	Research Specialist, Berkeley Air Monitoring Group

Publications Related to Proposal:

Rooney, B., Zhao, R., Wang, Y., Bates, K. H., Pillarisetti, A., Sharma, S., Kundu, S., Bond, T. C., **Lam, N L.**, Ozaltun, B., Xu, L., Goel, V., Fleming, L. T., Weltman, R., Meinardi, S., Blake, D. R., Nizkorodov, S. A., Edwards, R. D., Yadav, A., Arora, N. K., Smith, K. R., and Seinfeld, J. H.: Impacts of household sources on air pollution at village and regional scales in India, Atmos. Chem. Phys., 19, 7719–7742, https://doi.org/10.5194/acp-19-7719-2019, 2019.

Lam NL, Muhwezi G, Isabirye F, Harrison K, Ruiz-Mercado I, Amukoye E, Mokaya T, Wambua M, Bates N. Exposure reductions associated with introduction of solar lamps to kerosene lamp-using households in Busia County, Kenya. DOI: 10.1111/ina.1243. Indoor Air. 2018, 28 (2): 218-227.

Lam NL, Upadhyay B, Maharajan S, Jagoe K, Thompson R, Weyant C, Uprety S, Johnson M, Bond TC. Seasonal fuel consumption, stoves, and end-uses in rural households of the Far-Western Development Region of Nepal. Environmental Research Letters. 2017, 12 (12): 125011.

Pillarisetti A, Allen T, Ruiz-Mercado I, Edwards R, Chowdhury Z, Garland C, Hill LD, Johnson M, Litton CD, **Lam NL**, Pennise D, Smith KR. 2017. "Small, smart, fast, and cheap: Microchip-based sensors to estimate air pollution exposures in rural households. *Sensors*. 2017, 17 (8): 1879.

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Johnson M, **Lam NL**, Brant S, Gray C, Pennise D. Modeling indoor air pollution from cookstove emissions in developing countries using a Monte Carlo single-box model. *Atmospheric Environment.* 2011, 15 (19): 3237-3243.

(ii) other significant products:
Merrin Z, Francisco PW, Bond TC, **Lam NL**, Thompson R, Weyant C. "Air quality implications of heating with wood stoves in Kake, Alaska ." Proceedings of Indoor Air 2016, Brussels, Belgium. July 3-8, 2016.

Rosenbaum RK, Meijer A, Demou E, Hellweg S, Jolliet O, **Lam NL**, Margni M, McKone TE, Indoor Air Pollutant Exposure for Life Cycle Assessment: Regional Health Impact Factors for Households. *Environmental Science & Technology.* 2015, *49* (21): 12823-12831.

Lam N, Nicas M, Ruiz-Mercado I, Thompson LM, Romero C, Smith KR. Non-invasive measurement of carbon monoxide burden in Guatemalan children and adults following wood-fired temazcal (sauna-bath) use. *Journal of Environmental Monitoring.* 2011, 13 (8): 2172-2181.

Synergistic Activities

(2021-2022) -

(2018-current) – Maximizing impacts of clean household energy programs in peri-urban Nepal. A UN Foundation supported project that combined sensor-based monitoring of appliance use and air quality to develop strategies that transition households to cooking technologies that reduce air pollution exposure. Development of education programs and technologies for informing households on energy consumption patterns and impacts of biomass exposure. (Role: Principle Investigator)

(2014-2018) - Measurements and Modeling for Quantifying Air Quality and Climatic Impacts of Residential Biomass or Coal Combustion for Cooking, Heating, and Lighting. US EPA supported project that included a collaboration with the Tlingit-Haida Regional Housing Authority (Kake, Alaska) to install and evaluate the performance of high efficiency heating stoves – including air quality impacts. (Role: Researcher, Project Manager)

(2010-2011) – Summer Cookstove Research Institute. A US CDC supported program for educating researchers and program implementers on air-pollution related monitoring and evaluation techniques in rural settings. (Role: Director & Curriculum Designer)

Selection of Collaborators and Other Affiliations Relevant to Assignment

Dr. Peggy Lai - Harvard School of Public Health, Harvard School of Medicine
Dr. Ajay Pillarisetti, Dr. Michael N. Bates, Dr. Mark Nicas - University of California, Berkeley School of Public Health
Dr. John Balmes – UC Berkeley School of Public Health, UC San Francisco, California Air Resources Board
Dr. Michael Johnson, Dana Charron, – Berkeley Air Monitoring Group
Dr. Tami C. Bond -Colorado State University School of Mechanical Engineering
Paul Francisco – Indoor Climate Research & Training (ICRT) – University of Illinois at Urbana-Champaign

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Establishing the Klamath Region Community Air Monitoring Network: A Rural Community and Tribal Knowledge Sharing Platform

Applicant: *Humboldt State University Sponsored Programs Foundation*
Schatz Energy Research Center (Schatz Center)
1 Harpst St., Arcata, CA 94706
Primary Contact: Nicholas L. Lam (Schatz Center)
DUNS: 014302074

Set Aside: No set-aside

Description of Organization: The Humboldt State University Sponsored Programs Foundation (SPF) is an auxiliary organization to Cal Poly Humboldt, and its role is to be fiscal sponsor for Cal Poly Humboldt and its centers. The Schatz Energy Research Center (Schatz Center) is a center at Cal Poly Humboldt and its mission is to promote the use of renewable energy and engage in a wide range of local community and international collaborations that build resilience from climate change and promote healthy populations.

Project Partners: Shawn Bourque at the Karuk Tribe (Karuk Tribe Department of Natural Resources; KDNR),and Michelle Fuller at the Blue Lake Rancheria Tribe (BLR).

Project Location: Klamath region of Northern California, consisting in Year 1 of two watershed regions, each associated with one of the project partners. First, associated with the Karuk Tribe, a portion of the Klamath River watershed of Northern California, upstream from the confluence with Bluff Creek, to Upper Klamath Lake; second, associated with the Blue Lake Rancheria Tribe, the entire reach of Baduwa't (the Mad River). The entire proposed network encompasses all or parts of Humboldt, Siskiyou, Del Norte, and Trinity counties. The overall network area is approximately 29,000 square kilometers.

Air Pollution Scope: Particle pollution ($PM_{2.5}$), black carbon, volatile organic compounds, nitrogen oxides(NOx)

Budget Summary

EPA Funding Requested	Total Project Cost
$500,000	$500,000

Project Period: November 1, 2022 - November 1, 2024 (2 years)

Project Description: This project will establish the Klamath Region Community Air Monitoring Network - a community operated network of real-time particulate matter sensors (PM) with supporting calibration and data management infrastructure to serve communities in the Klamath region of Northern California heavily affected by wildfires and industrial emissions. The project builds on collaborations between three groups located in the region – Schatz Energy Research Center (Schatz Center), the Karuk Tribe, and the Blue Lake Rancheria Tribe - to deploy 100 low-cost PM sensors in outdoor and indoor locations (75%/25% split), near-reference and reference method $PM_{2.5}$ monitors, and black carbon monitors to assess air quality in our region. Our project includes activities that engage community members in understanding how data from the network can be incorporated into community-specific program decision making, tools and resources to ensure the quality of data and air monitor performance, and capacity-building resources and knowledge sharing infrastructure to foster partnership and sustain the usefulness of the air network into the future.

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1. PROJECT SUMMARY & APPROACH

A. Overall Project

This project will establish the Klamath Region Community Air Monitoring Network - a community operated network of real-time particulate matter sensors (PM) with supporting calibration and data management infrastructure to serve communities in the Klamath region of Northern California. This work is important because while this region experiences some of the highest levels of wildfire smoke nationwide[1], air quality monitoring coverage is sparse. Gaps in coverage leave community members and groups guessing during times of hazardous smoke conditions. Projections of future impacts of wildfire smoke suggest this trend will only worsen[2] - exacerbated by climate change and over a century of suppression of indigenous land management practices.

Our project will fill air monitoring gaps with strategic deployment of low-cost and near-reference grade PM monitors/instruments; and establish technical resources that support regional knowledge sharing, sustained technical capacity, and incorporation of data into community-specific programs. The project will be designed and implemented in collaboration with two community partners - the Karuk Tribe through the Department of Natural Resources (KDNR) and Blue Lake Rancheria Tribe (BLR), as well as the participation of over a dozen organizations working within communities in the air network domain. This project will involve co-deploying outdoor and outdoor sensors in strategic locations to serve community needs, with a particular focus on gaps in the outdoor sensor network, supplemented by indoor air in community buildings (e.g., schools, libraries, senior centers). These outdoor and indoor sensor co-deployments will support understanding of the interplay between outdoor and indoor air, and support community efforts to maintain clean air indoors through heavy smoke events, a prerequisite for continuity of community life.

As an organizing framework, we propose to use watershed-based domains for community air quality management, with tribal governments identified as critical stewards of the lands, waters, and air to guide deployment. This will be coupled with a regional consortium approach to build capacity for sustained maintenance of sensors and monitors and the technical capacity to use the data to support community decisions. This approach will serve our region well and help to address historic barriers to establishing sustained air monitoring programs/infrastructure in our communities (see Section B). If successful, this model could be scaled to reach and serve the needs of other rural areas and tribes.

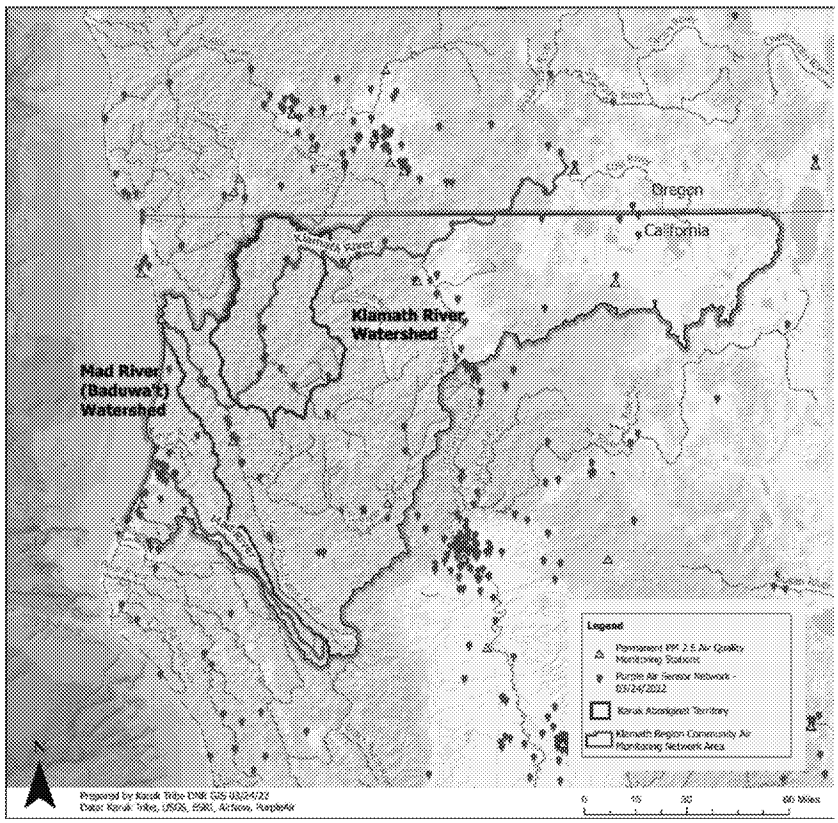

Figure 1-1. Klamath region over which the community air network will be established during the project period, highlighting the portion of the Klamath River and Mad River watersheds that are our focus for air monitoring in Year 1, and the Karuk Aboriginal Territory. Our project will significantly enhance sensing and monitoring in this region with low-cost, near-reference, and reference grade monitoring of $PM_{2.5}$.

[1] Much of the network region classified in the 90th percentile or greater nationally for $PM_{2.5}$ based on EJScreen

[2] Ford, B., Val Martin, M., Zelasky, S. E., Fischer, E. V., Anenberg, S. C., Heald, C. L., & Pierce, J. R. (2018). Future fire impacts on smoke concentrations, visibility, and health in the contiguous United States. GeoHealth, 2, 229– 247. https://doi.org/10.1029/2018GH000144

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The first year of the project is organized around two watershed regions, each associated with one of the project partners. First, associated with the Karuk Tribe, a portion of the Klamath River watershed of Northern California, upstream from the confluence with the Bluff Creek, to Upper Klamath Lake; second, associated with the Blue Lake Rancheria Tribe, the entire reach of Baduwa't (the Mad River). The Schatz Center, based in the region along Arcata Bay, will provide network-wide technical capacity and monitoring support. Our entire proposed community network will encompass areas of Humboldt, Siskiyou, Del Norte, and Trinity counties in California and may include some deployment in far southern Oregon depending on community priorities. In year 2 of the study, KDNR and BLR will serve as community knowledge hubs, supported by Schatz, to expand the network to two additional rural communities and/or tribes within this broader network area with an emphasis on tribes in Del Norte County.

To fill gaps in current real-time air monitoring, we will deploy a total of 100 low-cost PM sensors (PurpleAir II), four near-reference grade beta attenuation $PM_{2.5}$ monitors (E-BAM, MetONE), two MA350 black carbon/VOC/NOx monitors, and one reference grade $PM_{2.5}$ monitor (BAM1020, MetONE). Two E-BAM and the BAM1020 are currently archived with partners and will be repaired and deployed, all other monitors will be procured as part of the project. Currently, a mix of reference-grade monitors (many seasonally deployed at temporary locations) and opportunistically deployed low-cost sensors (PurpleAir) serve our region. Our project will build on this foundation, strategically deploying low cost sensors in outdoor and indoor locations and more accurate PM monitors to support network sensor colocation and calibration. In Year 1, 40 low-cost PM sensors will be deployed in indoor and outdoor locations in and around Karuk Tribe communities, including in Happy Camp and Orleans, CA at different elevations. 25 low-cost PM sensors will be deployed to expand monitoring along the reach of the Mad River where Blue Lake Rancheria is located, extending near Maple Creek, Mad River, and Ruth Lake. The air network will include use of existing air monitoring infrastructure in the area owned by community partners for collocation and calibration of the network, including two federal reference grade $PM_{2.5}$ and PM_{10} monitors, as well as gravimetric sampling equipment for indoor PM sensor calibration. Our project prioritizes real-time monitoring of $PM_{2.5}$ given its relevance to wildfire smoke, stated interest by partners, and reliability as a broad indicator of health risk. Multi-wavelength MA350 monitors will be deployed to help identify contributions by diesel vs. biomass smoke and assess real-time total VOCs and NOx. Expansion to include other pollutants listed in the RFA will be explored based on community concerns and the availability of funds. The California Department of Public Health Air Quality Section will serve in an advisory role and provide as-needed sampling and analysis for integrated (non-real-time) measurements of air pollutant hazards such as volatile organic compounds (VOCs) composition, metals, and gas and particle phase polycyclic aromatic hydrocarbons (PAHs).

The design and implementation of the monitoring network and supporting infrastructure will incorporate feedback from community organizations. During the planning phase of the project (Months 1-4), KDNR and BLR with support from the Schatz Center will hold meetings with participant organizations, including Western Klamath Restoration Project, Nature Conservancy's Fire Learning Network, Karuk Tribe Health and Human Services, and schools in Orleans, Somes Bar, and Happy Camp; and BLR Tribal Education Authority. These meetings will help to define indoor and outdoor sensor placement, maintenance strategies, and ways the project can support the use of network data in program operations and in meeting broader goals. This includes alterations to the functionality and user interface of analytical tools developed by the Schatz Center to help streamline data management and reporting. Use cases of network data that support community decision making based on partner discussions include using PM data to support land management activities involving fire, and to inform the existing portable air purifier distribution program managed by Karuk Tribe Health and Human Services. Comparisons between outdoor and indoor sensors deployed in schools and public facilities in Orleans and Happy Camp can be used to assess performance of mechanical air filtration systems and maintenance needs. Monitors deployed by BLR will establish a more complete baseline of PM concentrations to assess risk from industrial activities and nearby road traffic. Data from the network will also be used within air quality-related curriculum for school-aged children, expanding an ongoing effort by the BLR Tribal Education Agency. Other use cases can be supported as well through the expansion of the network and expanding awareness and access to the data.

Sensor deployments will be coupled with activities supporting the use of data by community members/organizations and knowledge resources (e.g. manuals, guides, videos) to bolster long-term

technical air monitoring capacity. These activities are designed to promote knowledge sharing of technical skills and save on the long-term costs associated with staff training. This has been identified as a particular need of the Karuk Tribe and BLR as they work to establish (or re-establish, again) internal air quality capacity. To accomplish this, we will adapt and train staff on open-source online tools (developed by the Schatz Center) that help air quality technicians and community organizations download, manage, and summarize data from the network based on specific program communication and activity needs. Identified examples include automated announcements to community members on air quality conditions from KDNR, and reports on building ventilation performance for building managers at several schools and government offices. A library of written protocols, checklists, and instructional videos that outline use and maintenance of sensors/instruments and data tools in the network, and archived data will be assembled and housed on an air network website developed by the Schatz Center in collaboration with KDNR and BLR. All resources will be open source and available online.

B. Project Significance

Communities in the Klamath region face extreme and worsening air quality from uncontrolled wildfires and industrial activities. A century of exclusion of traditional practices from the landscape, now amplified by climate change, has led to frequent catastrophic fires and extreme smoke events across the region, which is among the worst in the country for wildfire smoke exposure. (**Figure 1-2**). Exposure to smoke from these fires is heavy and sustained in Karuk Tribe communities in Orleans, Somes Bar, Happy Camp, and many others throughout the region. Much of our network region is classified in the 90th percentile or greater nationally for $PM_{2.5}$.[3] People in the area experience multi-day and sometimes weeks-long periods of inundation of smoke, with 24-hr $PM_{2.5}$ averages over 100 $\mu g/m^3$, and much higher 1-hr peak concentrations as the plumes ebb and flow through river valleys and over the mountains. For communities closer to the coast, such as BLR, industrialization of the region has increased concern about exposure to traffic and industrial emissions. The Klamath Region Community Air Monitoring Network will provide much needed air quality infrastructure to support the Karuk Tribe, BLR, and other rural communities and tribes in our region to assess exposure risk and protect community health.

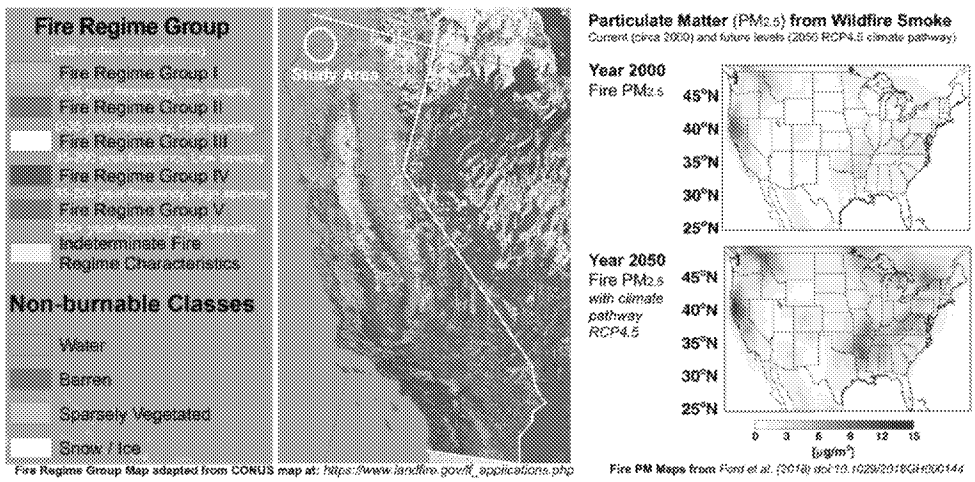

Figure 1-2. Composite maps showing the "Fire Regime Groups" in California (with approximate implementation study area circled) and estimates of current and possible future smoke from wildfires in the United States.

The challenges to establishing sustained air monitoring programs are well known to our team and must be considered in the design of air monitoring strategies. This includes sensor deployment, calibration, and data management: ensuring data is trusted and presented so they are useful in supporting decisions. Our project will create channels through which knowledge can flow across Klamath region communities to address five challenges identified as barriers in our region:

1. Resilient technical capacity - high staff turnover is a feature of many rural community and tribal organizations in the Klamath region, creating barriers to retaining technical capacity specific to air monitoring. Rebuilding this capacity is costly. As part of this project, the Schatz Center will bolster capacity across the entire network by serving as a local technical lead to assist in monitoring and - in collaboration with partners - develop training

[3] EJScreen Tool for regions within the Klamath Watershed.

resources and adapt open-source data toolkits that streamline community workflows and data management (saving resources in the long run). Community organizations in the network will serve as knowledge hubs to lead equipment and toolkit training courses to others in the network. Within the project scope, BLR will serve as the primary community training hub during year two.

2. Streamlined sensor deployment and calibration - It can be costly for staff to manage and maintain a large network of "low cost" air quality sensors. This project will define standard procedures and strategies for deployment and management by community-serving organizations, including strategies around using sensor redundancy to avoid maintenance visits, supporting remote setup by site hosts, and using mobile near reference-grade monitors to support ongoing, in situ calibration of low-cost sensors in the field.

3. Integration of indoor and outdoor air monitoring - This project will involve co-deploying targeted indoor and sensors in strategic locations to help community members interpret broader air quality data. By monitoring indoor air in community buildings (e.g., schools, libraries, senior centers), these co-deployments will support understanding of the interplay between outdoor and indoor air, and help people maintain clean air indoors through smoke events, which is a key priority for community organizations and local governments

4. Data management and accessibility - Low-cost sensors have lowered the barrier to owning air quality equipment but translating data to the knowledge products (e.g. bulletins, reports) that influence behavior remains a barrier. This data barrier will grow as air networks expand. Aggregators such as AirNow and manufacturer websites partially bridge this gap but are not community or program specific - the data insights needed by land management will differ from facility managers, air quality technicians, health and human services, let alone across communities. To help extend this bridge, meetings facilitated by KDNR and BLR with community organizations will inform updates to flexible dashboards aligned to the needs of specific program activities and goals. The framework is flexible to expand to changes in the sensor network and easily adaptable for new use cases.

5. Sustained funding - identifying sustained funding to support air monitoring activities is a persistent challenge made harder by gaps in network support that necessitate rebuilding capacity. Our project outputs - sensor deployments, training, tools – support community decision making and establish capital and technical infrastructure that will extend beyond the lifetime of this project. Meetings, websites, and training will bridge to ongoing support and work towards reducing barriers to collaboration across the region.

2. COMMUNITY INVOLVEMENT

A. Community Partnerships

The goal of this project is to establish partnerships and resources that promote regional knowledge sharing to build resilience around air monitoring capacity and promote access and use of data within communities. As such, community partners are proposed to play important roles in all phases of the project, including deployment and maintenance strategy and implementation, distribution of air pollution assessment results, and development of technical training resources.

The Karuk Tribe Department of Natural Resources (KDNR) will serve as the primary community partner for the Karuk Tribe, and the Environmental Programs department will serve as the primary community partner at BLR. Community stakeholder meetings facilitated by partners will identify use cases and needs with respect to air sensor data and help refine network deployment strategy and data dashboards/resources. Deployment and maintenance of the sensor networks will be performed jointly by KDNR, BLR, and Schatz Center over the entire two-year project period. Schatz Center will be responsible for developing training materials for sensors/instruments in the network, but both community partners will contribute to design and review of curriculum output. Schatz Center's expertise in air monitoring and in long-term technical advisory roles is intended - through project activities - to bolster technical capacity within the network, extending beyond the project period. These activities are designed to be an upfront investment that in the future will enable community partners to maintain continuity in technical monitoring capacity and improve efficiency to allow more resources to flow to using data to serve communities and for fundraising (as opposed to managing data, fixing sensors, etc.).

Both KDNR and BLR have prior experience with deploying and using air monitoring in their communities and activities. KDNR is currently working towards establishing local air quality monitoring capacity, while BLR is

in the process of re-establishing capacity. Funds from this project will help to accelerate this process - while at the same time enabling new communities to do the same with less upfront time and financial resources. This includes ongoing collaborations with the Schatz Center around development of air quality and energy infrastructure for climate resilience within respective communities (See Community Engagement).

B. Community Engagement

The establishment of the Klamath Region Community Air Monitoring Network engages community partners and participating organizations across all phases of the project. Budgeted resources to support partner staff, travel, and supplies for the full duration of the two-year project have been included with these considerations in mind. Project partners will own all air monitoring-related equipment purchased on their specific budgets.

Design and Performance – Both KDNR and BLR will be involved in the design, implementation, and maintenance of the air quality network. These activities include: Identifying potential partner organizations in the community and facilitating meetings to identify program-specific air quality needs that can be supported by project efforts; deployment and maintenance of air sensors and instruments; collaboration around the design and implementation of training materials; collaboration around data tools that support the use of air network sensor data in community programs; serving as community knowledge hub to support new communities and organizations added to the monitoring network in the second year of the project; and reviewing and co-developing project reports.

Incorporation of community input - Determination of air quality monitoring deployment locations will be determined in close collaboration with KDNR and BLR and informed by discussions with community-specific organizations that will benefit from the network. Tools and resources developed by the project will also be designed collaboratively, although the building of tools and resources will be done by Schatz Center given existing skillsets they bring to the partnership. Participating organizations representing a broad spectrum of the community - Through community partners, numerous beneficiaries of the air network will provide input on design and implementation. From the Karuk Tribe, this includes the Karuk Department of Natural Resources (KDNR), Training Exchange (TREX), Health and Human Services, and several schools in the community. Other local participating organizations that will be consulted in the design of the project and who have provided support include Mid-Watershed Council (MKWC), Blue Lake Rancheria Tribal Education Authority, Blue Lake Rancheria Library, Humboldt Bay Municipal Water District. Others who are in contact with our project team include the Fire and Fuels Program, KDNR GIS, Learning Network (FLN), Salmon River Restoration Council (SRRC), Orleans District Forest Service, Six Rivers Forest Service, and California Indian Basketweavers Association (CIBA).

Recent involvement of collaboration between partners and community members - The Karuk Tribe, Blue Lake Rancheria Tribe, and Schatz Center have worked together in collaboration to implement both air quality and energy-related projects to build resilience around the impacts of wildfire and climate change. The Smoke Air Fire and Energy (SAFE) project funded by the California Strategic Growth Council – of which both BLR and KDNR are principal investigators on – has several air quality and exposure management projects including assessment of portable filtration units in households. This includes the deployment of an air monitor at Orleans Elementary School to assess the need for air filtration, deployment of low-cost sensors to gather data during prescribed burns for the Cultural Fire Management Council and Training Exchange (TREX) program – an effort to bring indigenous land management involving fire back to local communities. As part of a US EPA collaboration, the Schatz Center developed an open-source dashboards to help air quality managers assess the performance of the low-cost PM sensors in their networks, and building managers evaluate building filtration performance. Schatz Center worked with the BLR tribe to identify pollutants of concern from a wastewater treatment plant and recommend an action plan for air modeling and analysis, sampling and testing, and equipment procurement. Most recently, low-cost PM sensors were installed around the treatment plant.

Strategy to ensure collected data are usable and accessible to communities - Adaptation of open-source toolkits/dashboards developed by Schatz that facilitate management and summarization of network data into program-specific outputs including visuals for websites, notifications, and reports. Determination of these outputs will be based on discussions community organizations collected in meetings facilitated by KDNR and BLR in respective communities. Data, as well as training and other technical resources developed by the project, will be housed on an air network website managed by Schatz and can also be housed on community partner websites.

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3. ENVIRONMENTAL JUSTICE & UNDERSERVED COMMUNITIES

As mentioned in section 1.B, the Klamath region faces extreme and worsening air quality from uncontrolled wildfires and industrial activities. Furthermore, wildfires disproportionately impact low income, indigenous, and elderly communities[4]. Through the establishment of the Klamath Region Community Air Monitoring Network, community stakeholders will be involved in the planning and implementation of the air network. Working with community participants, we will help to facilitate the use of data from this network into decision making related to land management practices, specifically bringing "good fire" back to the land through prescribed and cultural burning that help reduce the risk of extreme wildfires in the future. Environmental justice expands beyond negative health impacts to people, but to the greater ecosystem, including animals and plants which are culturally significant to the community, such as salmon and willow plants. Through the establishment of the monitoring network and automatization of data analysis, the required capacity for the tasks will be minimized and allow for more land management capacity.

The Intergovernmental Panel on Climate Change (IPCC) published a report which emphasized the importance of traditional ecological knowledge (TEK) and indigenous knowledge for addressing climate change and environmental justice[5]. This project incorporates the three principles of climate justice described by the IPCC.

- ***Distributive justice,*** which refers to the allocation of burdens and benefits among individuals, nations, and generation, is embodied through the proposed partnerships and activities of this project by supporting efforts to reduce health disparities caused by exposure to wildfire smoke and hazardous pollutants. For example, for the Karuk Tribe, data from the air network will be used by Orleans Elementary School when planning indoor and outdoor activities during the wildfire season to minimize negative health effects.
- ***Procedural justice*** refers to who participates and decides on decision making. Our project centers the community stakeholders in the air network decision making process. The design of the air network and adaptation of tools for conducting air quality assessments with participating community organizations will incorporate feedback from community partners and potential participating organizations. The resources from this project will help to empower community members and organizations with data that helps inform land management efforts and public health interventions, to name two examples.
- ***Recognition*** refers to the robust engagement and consideration of partners and participants' diverse perspectives. Through collaboration with KDNR and BLR, our project has identified numerous community organizations that may benefit from the data gathered by the air network. The design and implementation of the air network and associated resources will incorporate the feedback from over community partners collected as part of meetings with the project team and facilitated by KDNR and BLR in their respective communities. We recognize that each community and organization will have unique needs and barriers with respect to this network - there is no one-size fits all model - and these must be considered.

4. ENVIRONMENTAL RESULTS - OUTCOMES, OUTPUTS, & PERFORMANCE MEASURES

A. Expected Project Outputs & Outcomes

Table 4-1 - Project outputs and linkages to outcome categories. Numbers correspond to *output that will support changes in the outcome categories: (1) knowledge (2) behavior (3) condition* as defined in the RFA 1C-2 an 1C-3

Output Theme	Project-Specific Outputs & Outcome Linkages
Identification of air pollution	- Real-time monitoring of PM_2, concentrations across the Klamath region associated with partners in Year 1, including elevation profiles in the Karuk Tribe Service Area. Black carbon, VOCs, NOx at two locations (1)
Community-specific	- Semi- or fully-automated community air quality notification to serve KDNR and BLR communities (1, 2) - Adaptation of existing data dashboards for performing QA/QC checks on sensors in network, data quality,

[4] Masri, S.; Scaduto, E.; Jin, Y.; Wu, J. Disproportionate Impacts of Wildfires among Elderly and Low-Income Communities in California from 2000–2020. *Int. J. Environ. Res. Public Health* **2021**, *18*, 3921. https://doi.org/10.3390/ijerph18083921

[5] IPCC, 2022: Climate Change 2022: Impacts, Adaptation and Vulnerability, summary for policymakers

assessments of air pollution data	and building filtration performance (linking indoor and nearby outdoor sensors). (1,2) - Standardized report templates for summarizing air quality data and collocation results that will be used to ensure consistency across sensors in-network. - Comparisons to pollutant concentration profiles in nearby communities and regulatory sites for informing future monitor network strategy and interactions with air quality districts (BLR, KDNR). (1,2) - Assessment of indoor air filtration performance in support of health and human services air purifier programs (Karuk Tribe) and building managers of community buildings. (1,2) - Elevation profiles of pollutants for use by various land management organizations in the region (1,2) - Data summaries to support future grants for infrastructure, monitoring, and other measures that work to mitigate smoke exposure (BLR, KDNR), (1,2) - Air monitoring assessment specific to no fewer than half a dozen community organizations, including schools, land management, and health services. (1,2,3)
Deployment of equipment to conduct air quality monitoring	- Equipment to be deployed: 100 low-cost PM sensors across outdoor (75%) and indoor (25%) locations including public facilities (i.e. schools, offices, health clinics); four E-BAM for outdoor locations (rotating), and one stationary BAM 1020. (1) → 30x low-cost PM sensors & 2x E-BAM $PM_{2.5}$ samplers in Karuk Tribe service area including outdoor, schools, offices, and other public facilities (1) → 25x low-cost PM sensors & 2x E-BAM along the Mad River watershed (1) → Remaining 45x low-cost PM sensors will be deployed indoors and outdoors across the regional network based on feedback from community partners outside of BLR and KDNR service areas. (1) -1x BAM1020 for $PM_{2.5}$ (redeployed after servicing); location TBD - Spot measurements of VOCs, PAHs, metals, and other pollutant hazards indoors and outdoors as needed in collaboration with CDPH (1,2) - 2x MA350 black carbon monitors for source indication (12 months) (1) - Website for accessing tools, data, and technical guidance notes (1,2)
Partnership building & knowledge sharing	- Establishment of Klamath Region Community Air Monitoring Network in collaboration with KDNR and BLR - Workshops & meetings with community organizations/stakeholders to inform uses of data and needs. (1) - Meetings with no fewer than a dozen community-specific organizations during design and implementation phases. - BLR and KDNR serve as knowledge hubs in Year 2 to support 1-2 more communities and/or tribes to expand/add air monitoring in their communities and use these data to inform actions locally. (1,2) - Standardized templates and data infrastructure to facilitate sharing of data across partners (1) - Continued partnership between Karuk Tribe and BLR with Schatz Center related to air quality and wildfire resilience(1) - Collaboration with California Department of Public Health Air Quality Division for long-term technical support for assessing non-real time air pollutant concentrations. (1) - Collaboration with AethLabs in deploying two multi-wavelength aethalometer for supporting source identification of PM characterization in Year 1. (1) - Collaboration with at least two additional community organizations for participation in network (1)
Community-specific monitoring capacity resilience	- Field training of community partners on use and maintenance of equipment (1) - Written and video training documentation for operating, deploying, and maintaining equipment within the monitoring network. (1,2) - Maintenance schedules and protocols for calibration and other QA/QC (1,2) - Monthly meetings with network participants/stakeholders to share knowledge and identify current and future needs. (1) - Establishment of a technical advisory committee to support the air network (1)

B. Performance Measures & Plan

The implementing project team, which includes the Schatz Center, KDNR, and BLR currently hold weekly meetings to discuss progress on ongoing collaborations which will be expanded to include this air monitoring network. A project manager (PM) has been budgeted at approximately 50% FTE, whose duties include tracking progress towards achieving milestones outlined in the timeline and outputs described in **Table 4-1**, and reports to EPA. For tracking expenditures, we will conduct monthly reconciliation and variance reporting to ensure project spend down aligns to project effort and scope. The PM and Schatz Center Operations Director provide internal subaward engagement and management with oversight provided by Sponsored Programs (SPF).

C. Timeline & Milestones

Table 4-2. Major project tasks, milestones and time periods

Project Component	Description	Month(s)
1. Network Design	Partner & participant meetings to determine specific sensor deployment locations, needs, and data barriers. Maintenance plan and scheduling to be finalized based on deployment strategy.	1-4
	Procurement of air quality monitors and related supplies & equipment	4
2. Data Dashboard Updates	Finalize data workflow and dashboards to meet partner use cases/needs	3-7
3. Deployment	Deploy air pollution sensors/instruments, data-related resources in KDNR and BLR territories.	5-6
	Expand infrastructure to additional communities in network region	12-24
4. Service & Maintenance	Servicing of archived E-BAM, BAM1020 owned by partners	2
	Pre-deployment co-location & calibration of KDNR and BLR sensors	5
	Collocation and calibration of low-cost PM sensors with FEM/FRM method	12, 16, 24
5. Capacity Development	Training of partners on air pollution equipment, development of training guides, website.	4-9
	Community knowledge hub training of new community participants	12-24
6. Reporting	Quarterly and final report	3, 6, 9, 12, 15, 18, 21, 24

5. QUALITY ASSURANCE STATEMENT - See Additional Information

6. PROGRAMMATIC CAPABILITY & PAST PERFORMANCE

A. Past Performance

These examples demonstrate a history of the Schatz Center successfully completing assistance agreements of large-scale community-integrated projects, air quality monitoring, collaboration with the Blue Lake Rancheria and Karuk Tribe, and which require deliverable targets and satisfaction of reporting requirements to funders.

1-Smoke, Air, Fire, Energy (SAFE) in Rural California: Energy and Air Quality Infrastructure for Climate-smart Communities (CA Office of Planning and Research, Strategic Growth Council; $990,350).
Partners: Blue Lake Rancheria, Karuk Tribe | **Period:** 10/1/2020 - 3/31/2023 | **Status:** Ongoing.
Project objective: Identify sustainable pathways to climate-smart rural California communities through energy and air quality infrastructure development that integrates social dimensions of change.

2-Solar+ (California Energy Commission, $1.5M)
Key Partners: Blue Lake Rancheria **Period:** 9/17/2017-12/31/2022 | **Status**: Successfully Completed
Project objective: Develop and pilot test a set of site targeting guidelines, hardware design practices, and model-predictive control software for advanced distributed energy systems that include solar photovoltaic, energy storage, and advanced building system controls (solar+).

3-Blue Lake Rancheria Microgrid (California Energy Commission, $1.5M)
Key Partners: Blue Lake Rancheria | **Period:** 7/28/2015-3/30/2018 | **Status:** Successfully Completed
Project objective: Build a microgrid for Blue Lake Rancheria, a Native American Tribe located in Northwestern CA, integrating three sources of energy generation with grid-scale energy storage and controllable loads into a microgrid capable of indefinitely islanding and providing power during disaster or prolonged grid outage.

4-Clean Cooking Nepal (United Nations Foundation; Award: $252,776)
Period: 3/27/2018 - 3/31/2021 | **Status:** Successfully Completed
Project Objective: Conduct a community-wide assessment of air quality and energy impacts resulting from demand and supply side interventions to increase uptake of induction cooking stoves in peri-urban Nepal. Included

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deployment and analysis of over 1000 low-cost real-time monitors for assessing appliance usage, air quality, and exposure to $PM_{2.5}$ for up to nine months of deployment.

B. Reporting Requirements

Deliverable and reporting requirements successfully completed for the projects above (as number above included). (1-SAFE) Interim and final project reports; Standalone reports, e.g., Microgrid Management for Wildfire Risk Mitigation; Progress memos on key project elements, e.g. Social Dimensions of Change, Energy and Air Quality Infrastructure Performance; Summary memo on Project Outcomes and Next Steps. **(2-Solar+)** Interim and final project reports; draft and final fact sheets; draft and final Measurement and Verification Plans; Engineering Plan Sets, Specifications, and Cost Estimates; Memos for Design and Engineering; System Procurement. **(3-BLR Microgrid)** Interim and final project reports; draft and final fact sheets; draft and final Engineering Plan Sets, Specifications, and Cost Estimates; Memos for Design and Engineering, System Interfacing, and Commissioning, Design and Engineering; Initial, mid-term, and final Benefits Questionnaires; draft and final Technology/Knowledge Transfer Plans and Reports; draft and final Production Readiness Plans. **(4 - Clean Cooking Nepal)** Policy briefs, multiple interim reports, final report, project setup and staff training

C. Staff Expertise

The Schatz Center was founded in 1989, and its interdisciplinary staff of approximately 35 professionals has extensive expertise in energy systems engineering, air quality and emissions monitoring, public health, impact assessment, program management, laboratory measurements, data science, energy policy, and quality assurance of renewable energy systems. The Schatz Center has worked extensively with communities in Northern California and the Klamath Region, including numerous projects with the Karuk and Blue Lake Rancheria Tribes related to energy and wildfire resilience (see Sections 6A and 6B). Our project team has extensive experience supporting the development of technical standards and technical capacity in the US and internationally, including 25+ years of team combined experience on (each topic) air quality monitoring and exposure assessment, quality assurance testing and development, and renewable energy systems engineering. Projects have been supported by grants and contracts from the California Energy Commission, California Strategic Growth Council, US EPA, United Nations Foundation, World Bank, and International Finance Corporation, as well numerous community-based organizations in the Klamath Region. From the Schatz Center, Dr. Nicholas Lam (Project Principal Investigator) has over 15 years of experience conducting air quality monitoring and related assessments in the US and internationally, including early development of low-cost PM sensors used for epidemiological studies and successful completion of a recent project in Nepal that synthesized data from over 1100 low-cost monitors deployed in rural households (UN Foundation). Dr. Peter Alstone and Dr. Tesfa Yacob, in collaboration with project partners Shawn Bourque (KDNR), Michelle Fuller (BLR), and Jana Ganion (BLR), are currently working to build resilience around wildfire smoke through energy and air purification measures, with funding from the CA Strategic Growth Council. This has included the deployment of low cost sensors in collaboration with both community partner organizations. Our team also includes two research engineers and an administrative staff. See separate attachments for staff CVs and biosketches.

7. BUDGET

SPF manages all aspects of grant management and ensures accountability, efficiency, and transparency of its fiscal stewardship through annual audits in compliance with federal requirements. This includes tracking each award with a distinct project number, as well as compiling all required financial and technical reports as applicable, and overseeing compliance with federal, state, and local regulations.

A. Personnel: $123,545

Salary is based on current rates plus estimated annual increases (5% for year 1 and 5% for year 2).

Dr. Nicholas Lam, Schatz Center Scientist and Project Principal Investigator, requests salary for 134 hours per project year (equivalent to 0.70 months/year). Requested yr 1 salary is $6,771 and is based on $48.17. Requested yr 2 salary is $7,110 and is based on $50.58. Dr. Lam will oversee the entirety of the project, collaborate on designing and implementing the network, and support project management.

Dr. Peter Alstone, Schatz Center Scientist, requests salary for 129 hours per project year (equivalent to 0.70 months/year). Requested yr 1 salary is $7,341 based on $54.20. Requested yr 2 salary is $7,708 based on $56.91.

Dr. Alstone will oversee the entirety of the project, collaborate on designing and implementing the network, and support project management.

Tanya Garcia, Research Engineer, requests salary for 541 hours per project year. Requested yr 1 salary is $18,072 and is based on current year rate, $31.84. Requested yr 2 salary is $18,976 and based on $33.43. Tanya will provide project management, collaborate on designing and implementing the network, assist with stakeholder engagement and training, and draft reports.

Eli Wallach, Research Engineer, requests salary for 111 hours per project year. Requested yr 1 salary is $3,723 and is based on current year rate, $31.84. Requested yr 2 salary is $3,909 and is based on $33.43. Eli will collaborate on designing and implementing the network, data management, and data dashboard updates.

Dr. Tesfayahones Yacob, Schatz Center Scientist, requests overload salary for 77 hours per project year. Requested yr 1 salary is $4,122 based on $51.28. Requested yr 2 salary is $4,328 based on $53.84. Dr. Yacob will collaborate on designing and implementing the network.

Staff tbd, requests salary for 494 hours per project year. Requested yr 1 salary is $14,972 based on $28.88. Requested yr 2 salary is $15,720 based on $30.32. The staff will support implementation of the network, assist with stakeholder engagement and training, and draft reports

Three Schatz Center staff will provide direct support to the project: Allison Hansberry, Operations Director, requests salary for 30 hours per project year. Requested yr 1 salary is $1,529 and is based on $48.17. Requested yr 2 salary $1,606 and is based on $50.58. Maia Cheli, Communications & Outreach Manager, requests salary for 57 hours per project year. Requested yr 1 salary is $2,005 and is based on $33.43. Requested yr 2 salary is $2,105 and is based on $35.10. Carolyn Ortenburger, Office Manager, requests salary for 57 hours per project year. Requested yr 1 salary is $1,730 and is based on $29.09. Requested yr 2 salary is $1,817 and based on $30.54.

B. Fringe & Benefits: $55,000

Costs represent real costs. Fringe rates on faculty reimbursed time / buy out during the academic year include payroll taxes and all health, dental, vision and life insurance rates according to each person's individual benefit plan. Faculty overtime and summer pay incur 11.74% in payroll taxes, which includes: Worker's Compensation (0.99%) Unemployment (3.1%), Social Security (6.2%) and Medicare (1.45%). Staff employees who work at least 75% time are eligible for a range of benefits, which includes payroll taxes at 11.74%, Retirement (10%), Dental Insurance (2.21%), Vision Insurance (0.45%), Life Insurance (0.10%), and Medical Insurance at a flat monthly charge that depends on the employee's coverage needs.

C. Travel - Domestic Travel Costs: $2,294

We request $1,208 in year 1 and $1,087 in year 2 , which will be spent for 26 in-state trips for training staff, meeting with stakeholders, and implementing and maintaining the air network. Travel costs include vehicle rental and/or mileage reimbursement, and each trip is approximately 150 miles roundtrip.

D. Equipment: N/A

E. Supplies: $11,000

We request $10,500 in year 1 and $500 in year 2. Supplies in year 1 will include: 1 year lease of two AethLab MA350 monitors, consumables, and technical support ($10,000), office-related materials for training and surveys ($500). Supplies in Year 2 include office-related materials for training and surveys ($500)

F. Contractual: N/A

G. Construction: N/A

H. Other: $192,285

Subawards: $190,167

Category	Karuk Tribe	Blue Lake Rancheria
Personnel	$53,731	$24,960

Fringe benefits	$10,970	$9,984
Travel	$3,000	$1,500
Equipment*	$10,897	$10,897
Supplies*	$24,124	$6,250
IDC	$26,634	$7,219
Total	$129,356	$60,810

* *Supplies and equipment for the Karuk Tribe includes 1x E-BAM ($10,897); four years of consumables for E-BAM ($5374); 75 Purple Air sensor ($18,750 @ 250 ea). Supplies and equipment for the Karuk Tribe includes 1x E-BAM ($10,897); 25 Purple Air Sensors ($6,250 @ $250 ea).*

Project specific information technology: $2,116. A total of $2,116 ($1,037 yr 1 / $1,079 yr 2) is requested for teleconferencing and communications ($337 yr 1 / $351 yr 2), project management software ($526 yr 1 / $545 yr 2), and cloud storage ($174 yr 1 / $183 yr 2).

I. Total Direct Charges: $384,121

J. Indirect Costs: $115,879

Indirect costs using the institutional federally negotiated rate (47.5% MTDC) equal $71,070 in year 1 and $44,809 in year 2.

Line Item & Itemized Cost	**EPA Funding**
Personnel	
(6) Key personnel (see budget detail above)	$112,753
(3) Other Project Staff (see budget detail above)	$10,792
TOTAL PERSONNEL	$123,545
Fringe Benefits	
9 personnel (see budget detail above)	$55,000
TOTAL FRINGE BENEFITS	$43,680
Travel	
26 trips @ 150 miles RT: Mileage and/or car rental	$2,294
TOTAL TRAVEL	$2,294
Supplies	
Outreach Materials and Supplies	$2,500
5 Tablet Computers @ $750/unit	$3,750
TOTAL SUPPLIES	$11,000
Other	
Subawards	$190,167
IT services	$2,116
TOTAL OTHER	$192,282
Indirect Charges	
Federal Negotiated Indirect Cost Rate = 47.5%	$115,879
TOTAL FUNDING	**$500,000**
TOTAL PROJECT COST	**$500,000**

MICHELLE FULLER

Blue Lake Rancheria Environmental Director
(707) 668-5101 x1036 | mfuller@bluelakerancheria-nsn.gov

SKILLS PROFILE

- Strong project and program management skills, including fundraising and reporting.
- Excellent written and oral communication, with analytical expertise.
- Successfully collaborates with diverse stakeholder groups and communities.
- Values rooted in sustainability, equity and justice.
- Interdisciplinary expertise and experience in biology, ecology, environmental policy and social science.
- Strong work ethic including the ability to work independently and manage concurrent projects.
- Dedicated and reliable for professional and volunteer commitments.

EXPERIENCE

Environmental Director, Blue Lake Rancheria 2007 — present

Blue Lake, CA

- Successfully manages department of four people and an annual budget over $400,000.
- Applied to and received funding from US EPA, US Fish & Wildlife Service, Bureau of Indian Affairs, National Park Service, Department of Energy, California Department of Fish & Wildlife, California Air Resources Board, CalEPA, Native American Agriculture Fund, and the Natural Resources Conservation Service.
- Projects range from: governance/policies, water and air quality monitoring, regulatory consultation and advocacy, community education and outreach, watershed restoration projects, and planning and research.
- Represents the Tribe at local, state, and national meetings and conferences, including serving as a Tribal Advisory Committee member for the California Water Plan Updates (2010 and 2018).
- Mentors summer interns in the department and collaborates with college professors and students at Cal Poly Humboldt to further research on tribal land.

Division 5 Director, Humboldt Bay Municipal Water District 2017 — present

Eureka, CA

- Serves on Board of Directors to oversee all aspects of the water district.
- Advocate for sustainable approaches to water management in planning for a changing climate.
- Vocal opponent to projects that pose a threat to water quality and watershed health.

Board President, Mad River Alliance 2012 — 2017

Blue Lake, CA

- Founding Board President helping establish the nonprofit watershed group.
- Established core program areas of: science & monitoring, restoration, education & outreach, and conservation.
- Provided leadership and support in various fundraising efforts.
- Collaborated with agencies, commercial timber companies, farmers, tribes, and other nonprofits to advance our initiatives.

Research Assistant, National Marine Fisheries Service 2002 — 2005

Santa Cruz, CA

- Field work included beach seines in coastal lagoons and estuaries, water quality monitoring, snorkel surveys of coastal streams, as well as midwater trawls and plankton sampling on ocean research cruises.
- Laboratory work included data entry/organization, fish dissections, and otolith analysis. Wrote regular reports summarizing otolith data for my supervisor, Dr. Bruce MacFarlane, and wrote manual on otolith preparation protocol for the Santa Cruz lab.
- Supervised a UCSC student on an independent research project on juvenile Chinook salmon growth in the river habitat using otolith microstructure analysis.

Previous Employment, Various Temporary Positions 2000 — 2005

California (Catalina Island to Humboldt Bay)

- Field Technician at Humboldt Bay National Wildlife Refuge, assisted with botanical surveys and invasive *Spartina* eradication.
- Research Diver/Lab Assistant for various projects: SCUBA collections of fish, mark and recapture studies, and lab dissections (fin clips, DNA samples, stomach removal and preservation, and otolith extraction).
- Internships with Monterey Bay Aquarium, Bodega Marine Laboratory, Coastal Watershed Council and Californians for Alternatives to Toxics.

EDUCATION

M.A. Social Science: Environment & Community, Humboldt State University

Arcata, CA

- Graduate coursework in Water Rights and Water Law, Environmental Impact Assessment, Environmental Policy, Community & Place, Environmental Research Methods, Natural Resource Conflict Resolution, Environmental Justice, and Ecosystems and Society.
- Thesis: *Herding Cats: Grassroots and Centralized Organizing in the Case of California's Fire Safe Councils.*

B.S. Marine Biology, UC Santa Cruz

Santa Cruz, CA

- Conducted a research project for my senior thesis mapping the spatial extent of the invasive alga, *Undaria pinnatifida*, in the Monterey Harbor using SCUBA.
- Research Experience for Undergraduates program: research assistant for Dr. Robin Ross (UCSB) monitoring krill (*Euphasia superba)* and other plankton assemblages off the Antarctic Peninsula.

CONTINUING EDUCATION

- Institute for Tribal Environmental Professionals Courses (2012-2021): Introduction to Air Quality Monitoring, Reviewing Air Quality Permits, Treatment as a State for Air Quality, and Management of Tribal Air Programs.
- Cascadia Leadership Program graduate (2015).
- Professional Certificate in Wetland Delineation from Portland State University (2013).
- River Restoration Professional Certificate, Portland State University (2012). Courses included: Physical Processes of River Restoration, Ecological Processes of River Restoration, Stream Reconnaissance and Assessment Tools, River Restoration Design, and Restoration Project Management.
- Surface Water Ambient Monitoring Program (SWAMP) Bioassessment Field Sampling Training. Arcata, CA (2011).

Peter Alstone

peter.alstone@humboldt.edu

Cal Poly Humboldt

Associate Professor – Environmental Resources Engineering

www.humboldt.edu/engineering

Faculty Scientist – Schatz Energy Research Center

www.schatzcenter.org

Biosketch

Peter Alstone is a Faculty Scientist at the Schatz Center and Associate Professor of Environmental Resources Engineering at Cal Poly Humboldt. Peter's research focus is on distributed energy systems, air quality, global access to reliable energy services, microgrids, off-grid solar, California energy policy, and natural resource modeling. His approach combines data science, community-based field research, technology modeling, and economic analysis. The courses he teaches bring these topics and methods into the classroom, where Peter uses active and project-based learning techniques to educate the next generation of environmental engineers, practitioners, and scientists. Peter earned a B.S. in Chemical Engineering at North Carolina State University, M.S. in Environmental Systems at Humboldt State, and a PhD in Energy and Resources from the University of California, Berkeley; this was followed by an ITRI-Rosenfeld postdoctoral fellowship at Lawrence Berkeley National Laboratory, where he now holds a guest appointment as a Faculty Affiliate researcher.

Work History

2016 – current	Associate Professor – California State Polytechnic University, Humboldt Faculty Scientist – Schatz Energy Research Center	*Arcata, CA*
2015-2016	ITRI-Rosenfeld Postdoctoral Fellow – LBNL	*Berkeley, CA*
2013-2015	Information-Energy Nexus Research Network – U.C. Berkeley	*Berkeley, CA*
2012-2016	Independent Engineering and Program Strategy Consultant	*various*
2007-2011	Lecturer / Teaching Associate – Humboldt State Univ. Env. Eng. Dept.	*Arcata, CA*
2005-2008	Research Engineer – Schatz Energy Research Center	*Arcata, CA*

Education

Ph.D. Energy and Resources (2015) — *University of California, Berkeley*
M.S. Environmental Systems / Engineering (2009) — *Humboldt State University*
B.S. Chemical Engineering (2004) — *North Carolina State University*

Affiliations

Research Affiliate at Lawrence Berkeley National Laboratory (Energy Technology Area)

Awards and Accomplishments

ITRI-Rosenfeld Postdoctoral Fellow (2015-2016) – at Lawrence Berkeley National Laboratory
U.S. Environmental Protection Agency STAR Fellow (2012-2015) – supported doctoral training
Engineer in Training (EIT) Certification (2004) – passed North Carolina exam
Rotary Club Youth Leadership Award (1999) – for academic and extra-curricular leadership
Eagle Scout (1998) – Boy Scouts of America
National Merit Scholarship Finalist (1998)

Highlighted Research Projects

Smoke, Air, Fire, Energy (SAFE) in Rural California (2020-2023)
Strategic Growth Council [$1 M] [Co-PI with D. Chatti and T. Yacob]
Community-engaged research (with Blue Lake Rancheria and Karuk tribes) to develop planning tools for integrated resilient energy and air quality infrastructure with a focus on indigenous communities.

Backup Generators Global Characterization Study (2018-2019)
International Finance Corporation [$65k] [Co-PI with N. Lam]
Developing a global-scale data analysis framework to estimate the scale and environmental impacts of backup generators serving electric load in developing countries.

Solar+ for Small and Medium Commercial Buildings (2017-2021)
California Energy Commission EPIC 16-309 [$1.5 M]
Collaboration with Blue Lake Rancheria tribe; Develop and deploy a building-scale microgrid at convenience stores with refueling stations, including technology R&D and market deployment activity.

Demand Response Policy Research (2017-)
California Public Utilities Commission / CIEE [$300k]
California public policy development for advanced demand response with a first-of-its kind potentials study and follow up engagement with policymakers and stakeholders.

Information-Energy Nexus Research Network (2013-2015)
National Science Foundation [$300k] [P.I. is D. Kammen]
Developing research infrastructure and support field research on information and energy systems.

Publication Highlights

Lam, N. L., E. Wallach, C.-W. Hsu, A. Jacobson, **P. Alstone**, P. Purohit, and Z. Klimont. 2019. "The Dirty Footprint of the Broken Grid: The Impacts of Fossil Fuel Back-up Generators in Developing Countries." https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/financial+institutions/resources/dirty-footprint-of-broken-grid.

Krishnan Prakash, Anand, Kun Zhang, Pranav Gupta, David Blum, Marc Marshall, Gabe Fierro, **Peter Alstone**, James Zoellick, Richard Brown, and Marco Pritoni. 2020. "Solar+ Optimizer: A Model Predictive Control Optimization Platform for Grid Responsive Building Microgrids." Energies 13 (12): 3093. https://doi.org/10.3390/en13123093

Peter Alstone and Arne Jacobson. *LED Advances Accelerate Access to Electric Lighting*. Comptes Rendus Physique (2018). *In Press*. https://doi.org/10.1016/j.crhy.2017.10.015

Gerke, Brian F., Giulia Gallo, Sarah J. Smith, Jingjing Liu, **Peter Alstone**, Shuba Raghavan, Peter Schwartz, Mary Ann Piette, Rongxin Yin, and Sofia Stensson. 2020. "*The California Demand Response Potential Study, Phase 3: Final Report on the Shift Resource through 2030*." https://doi.org/10.20357/B7MS40.

Peter Alstone (2018) "Demand Response for Meeting Grid Needs," presented to the California Public Utilities Commission *Load Shift Working Group*. San Francisco, April 18, 2018.

Peter Alstone, Jennifer Potter, Mary Ann Piette, Peter Schwartz, Michael A. Berger, Laurel N. Dunn, Sarah J. Smith, Michael D. Sohn, Arian Aghajanzadeh, Sofia Stensson, Julia Szinai, et al. (2017) *2025 California Demand Response Potential Study Phase 2 Report.* for California Public Utilities Commission Energy Division, supporting R.13-09-011

Peter Alstone, Dimitry Gershenson, Daniel M. Kammen (2015), *Decentralized energy systems for clean energy access*. in Nature Climate Change 5 (305-314) https://doi:10.1038/nclimate2512

Alstone, P., P. Lai, E. Mills, and A. Jacobson. (2014). "High Life Cycle Efficacy Explains Fast Energy Payback for Improved Off-Grid Lighting Systems." *Journal of Industrial Ecology* 18 (5): 722–33. doi:10.1111/jiec.12117.

Manifest for Grant Application # GRANT13580440

Grant Application XML file (total 1):

1. GrantApplication.xml. (size 35635 bytes)

Forms Included in Zip File(total 6):

1. Form ProjectNarrativeAttachments_1_2-V1.2.pdf (size 16031 bytes)

2. Form SF424_3_0-V3.0.pdf (size 24191 bytes)

3. Form SF424A-V1.0.pdf (size 23068 bytes)

4. Form EPA4700_4_3_0-V3.0.pdf (size 22769 bytes)

5. Form OtherNarrativeAttachments_1_2-V1.2.pdf (size 15896 bytes)

6. Form EPA_KeyContacts_2_0-V2.0.pdf (size 37289 bytes)

Attachments Included in Zip File (total 20):

1. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1253-Training Exchange (TREX)_LOS[1]_updated.pdf application/pdf (size 315475 bytes)

2. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1252-LOS_CDPH-Schatz Center_20220323.pdf application/pdf (size 302265 bytes)

3. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1251-Humbolt and Schatz Letter of Support AEthLabs.pdf application/pdf (size 79191 bytes)

4. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1246-BLR_TEAsupportletter.pdf application/pdf (size 191351 bytes)

5. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1243-2022MFuller_resume.pdf application/pdf (size 149778 bytes)

6. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1250-HBMWD SUPPORT LTR(1).pdf application/pdf (size 342808 bytes)

7. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1242-Yacob_CV_03_2022.pdf application/pdf (size 98428 bytes)

8. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1249-EPA Air Monitoring-WKRP LOS[1].pdf application/pdf (size 125042 bytes)

9. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1245-Shawn David Bourque Bio-Sketch .pdf application/pdf (size 99498 bytes)

10. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1248-DOC032322-03232022164750-Orleans Elementary.pdf application/pdf (size 33913 bytes)

11. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1244-Ganion-CV-2022-final.pdf application/pdf (size 176600 bytes)

12. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1247-

BLRlibrary_supportletter.pdf application/pdf (size 555176 bytes)

13. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1239-Lam-biosketch_v1 (1).pdf application/pdf (size 82398 bytes)

14. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1238-Karuk-EPA Letter signed 3-24-22.pdf application/pdf (size 94572 bytes)

15. OtherNarrativeAttachments_1_2 OtherNarrativeAttachments_1_2-Attachments-1234-Mandatory Attachments.pdf application/pdf (size 317943 bytes)

16. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1241-Garcia_Tanya_Resume_3_25_22.pdf application/pdf (size 179019 bytes)

17. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1236-EPA - Communtiy Monitoring - 220325c.pdf application/pdf (size 3173834 bytes)

18. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1240-Peter_Alstone_resume-biosketch_combo-2022.pdf application/pdf (size 200280 bytes)

19. SF424_3_0 SF424_3_0-1235-Affected Areas.pdf application/pdf (size 534740 bytes)

20. ProjectNarrativeAttachments_1_2 ProjectNarrativeAttachments_1_2-Attachments-1237-BLR_Letter of Commitment_signed.pdf application/pdf (size 155327 bytes)

Biosketch

Tesfayohanes Yacob is a Professor in the department of Environmental Resources Engineering at Cal Poly Humboldt and a Faculty Research Associate at the Schatz Energy Research Center with background and expertise in measurement of air pollution and community-serving environmental engineering. He is a Co-PI on the SAFE project, which is the foundation for this proposal. In his recent research and service work, he has focused on wildfire-related air quality monitoring and management. He also works in pyrolysis of biomass, the development of innovative point-of-use drinking water treatment technologies, and sustainable wastewater treatment. His teaching experience includes air quality management, senior capstone design, water and wastewater treatment, groundwater hydrology, environmental transport processes, fluid mechanics, appropriate technology for developing communities, and engineering statics. He enjoys hiking, taking long walks, reading, and listening to audiobooks. He has a B.Sc. in Chemical Engineering from Addis Ababa University in Ethiopia and a Ph.D. in Civil and Environmental Engineering and the University of Colorado at Boulder.

Appointments

Assistant Professor , Environmental Resources Engineering, Cal Poly Humboldt, 2020 to Present
Faculty Research Associate, Schatz Energy Research Center, Cal Poly Humboldt, 2021to Present

Instructor, Environmental Resources Engineering, Cal Poly Humboldt, 2019 to 2020

Visiting Assistant Professor of Environmental Engineering, Saint Francis University, 2018 to 2019
Assistant Professor of Environmental Engineering, Messiah College, Mechanicsburg PA, 2105 to 2018
Post-Doctoral Research Associate, University of Colorado at Boulder 2012 to 2015

Education

2012 Ph.D. Civil (Environmental) Engineering, University of Colorado, Boulder, CO USA
2005 B.Sc., Chemical Engineering, Addis Ababa University, Addis Ababa, Ethiopia

Instructional Areas

- Air Quality Management, Engineering Statics, Groundwater Hydrology, Engineering Capstone Design, Computational Methods
- Water and Wastewater Treatment, Hazardous Waste and Air Pollution Management, Fluid Mechanics

Grants and Contracts

- CO PI on 'Smoke, Air, Fire, Energy (SAFE) in Rural California: Energy and Air Quality Infrastructure for Climate-smart Communities' - $990,000 – California Strategic Growth Council. 2020
- PI on 'Interdisciplinary student competition for the designing, testing, and prototyping of Gel Transilluminator boxes between Biology and Engineering', $ 3500. RSCA Grant, Cal Poly Humboldt. 2020
- PI on "Point of Use ceramic water filter optimization project to improve virus removal" $ 15,000 . Funded by State of Alaska and DOWL/CDM Smith - Research Contract. 2016
- PI on Development and evaluation of Point of Use water filters to remove chemical contaminants using a proprietary treatment media. $ 20,000. Funded by Sawyer Products Inc. Research Contract. 2017
- PI on "Affordable sanitation hardware upgrades to combat latrine collapse in Upper East Region of Ghana". $ 21,000. Funded by World Vision. Contract. 2015.

ED_013931A_00001429-00001

Publications and Presentations

- Fisher, R. P., Lewandowski, A., **Yacob, T. W.**, Ward, B. J., Hafford, L. M., Mahoney, R. B., Oversby, C., Mejic, D., Hauschulz, D., Summers, RS., Linden, KG., & Weimer, A.W. Solar Thermal Processing to Disinfect Human Waste. *Sustainability.* 2021, *13*(9), 4935.
- **Tesfayohanes Yacob**, Richard Fisher, Karl Linden, Alan Weimer. Pyrolysis of human feces: gas yield analysis and kinetic modeling. Waste Management. 2018, 79, 214-222. https://doi.org/10.1016/j.wasman.2018.07.020
- Barbara J. Ward, **Tesfayohanes W Yacob**, Lupita D Montoya. *Evaluation of Solid Fuel Char Briquettes from Human Waste.* Environmental Science & Technology, 2014, 48 (16), pp 9852–9858
- Yaal Lester, **Tesfayohanes Yacob**, Ian Morrissey, and Karl G. Linden. *Can We Treat Hydraulic Fracturing Flowback with a Conventional Biological Process? The Case of Guar Gum.* Environmental Science & Technology Letters 2014, 1, 133-136
- **Tesfayohanes Yacob**, Sachin Pandey, JoAnn Silverstein, and Harihar Rajaram. *Soluble Microbial Products Decrease Pyrite Oxidation by Ferric Iron at pH < 2* . Environmental Science & Technology 2013, 47 (15), 8658-8665
- *Rebar-fabric Latrine Liner for Areas with Non-Cohesive Soil. Water and Health Conference, Oct 24 - 26, 2016. Accord Network. Ridgecrest, NC. Kenton Grossnickle, Gavin (IV) Stobie, Adam Pozun, Sydney Schandel, Duane Troyer, Connor McGovern,* ***Tesfayohanes Yacob****, Anthony Beers, Brian Swartz, David Vader.*
- *Rebar-fabric Latrine Liner for Areas with Non-Cohesive Soil.Water and Health Conference, Oct 10-14, 2016. University of North-Carolina, Chapel Hill, NC.* ***Tesfayohanes Yacob****, Anthony Beers, Brian Swartz, David Vader, Gavin (IV) Stobie, Kenton Grossnickle Adam Pozun, Sydney Schandel, Duane Troyer, Connor McGovern.*
- *Odors in Fecal Sludge Management: Sources, Impacts, and Control using Adsorption and Biofiltration. Water and Health Conference, Oct 26 - 30, 2015. University of North-Carolina, Chapel Hill, NC.* ***Tesfayohanes Yacob****, Kate Stetina, Stewart Farling, Siddharth Kawadiya, Kathy Jooss, Marc Deshusses, Karl Linden.*
- *Advancing the design of ceramic disc filters for household water treatment in Guatemala. Water and Health Conference, Oct 26 - 30, 2015. University of North-Carolina, Chapel Hill, NC. Christopher R. Schulz, Philip Wilson, Fernando Mazariegos, Rhonda Birdnow,* ***Tesfayohanes Yacob****, Christie Ritter.*

Publication Review

- Journal of Water, Sanitation, and Hygiene for Development
- Environmental Science and Technology
- Waste Management
- Journal of Analytical and Applied Pyrolysis

Shawn David Bourque
Environmental Higher Education and Research Division Coordinator
Pikyav Field Institute
Department of Natural resources
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Biosketch

Shawn is the Higher Education Director at the Pikyav Field Institute in the Department of Natural Resources. In this role he coordinates many research projects that involve University collaboration. These projects cover a diverse range of topics: monitoring cultural plants under climate change, supporting Karuk Youth with higher education opportunities, and sustainable infrastructure planning consistent with tribal priorities. He has long experience working to ensure a diverse range of research is supportive of tribal priorities, intellectual property rights, and supports strategic partnerships. (Note: The staff time spent on this project is already fully covered by funding through the SAFE (Smoke, Air, Fire, Energy in Rural California) project, on which he is a Co-PI).

Professional Preparation

University of Oregon	Eugene, OR	Anthropology Bachelor of Science, 1999
New School for Social Research	New York, NY	Anthropology Master of Arts, 2014

Appointments

2018-Current	**Environmental Higher Education and Research Division Coordinator** Karuk Tribe, Department of Natural Resources, Orleans, CA
2019-Current	**Climate Change Tribal Indicators Working Group Member** California Office of Environmental Health Hazard Assessment, Sacramento, CA
2005-Current	**Sipnuuk Advisory Board** Karuk Tribe, Happy Camp, CA
2014-2018	**Field Operations Manager** Orleans Community Service District
2010-Current	**Amayav Co-Founder** Orleans, CA
2006-2013	**Klamath-Salmon Media Collaborative Coordinator** Orleans, CA
2003-2006	**Research Assistant** Karri Norgaard, University of Oregon, Eugene, OR
2001-2002	**Research Assistant** Terry Williams, New School for Social Research, New York, NY

Publications

Willing, Pelliter, Van Nuland, Chin, Villa, Yeam, Bourque, Tripp, Peay. (Forthcoming). The tall and the small: the forest microbiome and global change. Nature Reviews Microbiology.

Sowerwine, Mucioki, Bourque, Lake, Sarna-Wojcicki, D. (2021). Conceptualizing Indigenous Cultural Ecosystem Services (ICES) and benefits under changing climate conditions in the KRB and its implications for land management and governance.

Hurwitz and Bourque. (2018). Killing the settler to save the human: The untidy work of unsettling Klamath River. Fourth World Journal. Volume 17 Issue 1.

Hurwitz and Bourque. (2014). Settler Colonialism Primmer. https://unsettlingamerica.wordpress.com/2014/06/06/settler-colonialism-primer/.

Synergistic Activities

(2020-Curent) SAFE Co-Principle Investigator (Co-P.I.) for the Karuk Tribe, "Smoke, Air, Fire, Energy (SAFE) in Rural California: Energy and Air Quality Infrastructure for Climate-Smart Communities."

(2021-Curent) Project Manager, Karuk Tribe Áhish Áah (Turn On the Light) Project: An Initiative for Climate and Energy Solutions,

Strategic Growth Council.

(2018-Current) Western Klamath restoration Project: Research and Monitoring Group, Co-Lead.

(2020-Current) Co-Principal Investigator (Co-PI) for the Karuk Tribe on the Climate research project: "Karuk Agroecosystem Resilience and Cultural Foods and Fibers Revitalization Initiative: xúus nu'éethti, we are caring for it." Developed collaboratively with co-PI Jennifer

Sowerwine, this project highlights focal species monitoring with regard to climate variables and invasive species, as well as supports the advancement of tribal K-12 STEM education.

(2019) Supervisor for the college-accredited field course: "Ecocultural Restoration and Salmon Science in the Klamath Basin," developed with co-PI Cleo Erskine- Woelfle engaged UW students and Karuk/Yurok Tribal students in field writing, informal STEM, and Indigenous research management through visits to restoration sites and the Karuk Tribe and Quartz Valley Indian Community.

(2018-Curent) Research Coordinator, Karuk Resource Advisory Board, Orleans, CA.
(2018-Curent) Higher Education Coordinator, Karuk Tribe Pikyav Grant, United States Department of Education.

(2018-Current) Professional Activities: Karuk Education Committee: member (2018-Present); Karuk-UC Berkley Collaborative; Member (2018-present; Orleans Elementary School Garden: Founder (2017-current). Klamath Action Group: Co-Founder (2006-2018).

Collaborators and Other Affiliations

Jennifer Sowerwine, University of California; Frank Lake, U.S. Forest Service; Kari Norgaard, University of Oregon. Peter M Alstone, Cal Poly Humboldt, Arielle Harpern, SouthernOregon University; Cleo Woefle-Erskine, University of Washington, Jeff Kane, Cal Poly Humboldt, Meg Krawchuk, Oregon State University, Deepti Chatti, Cal Poly Humboldt, Susan Zimmerman, Laurance Livermore National Laboratories, Tesfayohanes Yacob, Cal Poly Humboldt

Areas Affected by Project

Location: Klamath Region

County: Humboldt, Siskiyou, Del Norte, and Trinity counties

State: California

Klamath region of Northern California, consisting in Year 1 of two watershed regions, each associated with one of the project partners. First, associated with the Karuk Tribe, a portion of the Klamath River watershed of Northern California, upstream from the confluence with Bluff Creek, to Upper Klamath Lake; second, associated with the Blue Lake Rancheria Tribe, the entire reach of Baduwa't (the Mad River). The entire proposed network encompasses all or parts of Humboldt, Siskiyou County, Del Norte, and Trinity counties. The overall network area within California is approximately 29,000 square kilometers.

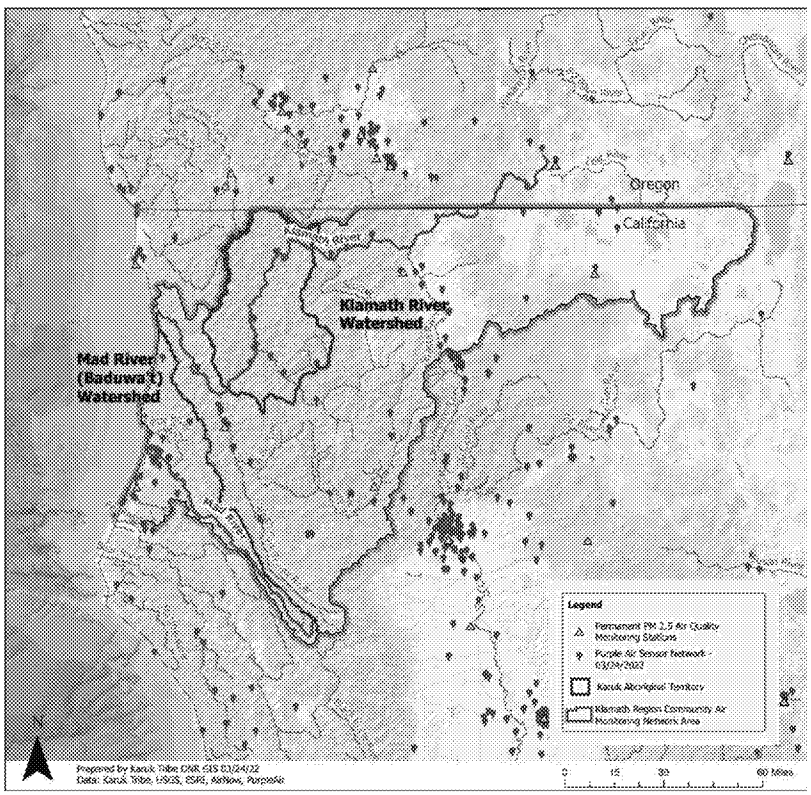

Figure 1-1. Klamath region over which the community air network will be established during the project period, highlighting the portion of the Klamath River and Mad River watersheds that are our focus for air monitoring and the Karuk Aboriginal Territory. Our project will significantly enhance sensing and monitoring in this region with low-cost, near-reference, and reference grade monitoring of $PM_{2.5}$.