

Informal STEM Learning at Biological Field Stations



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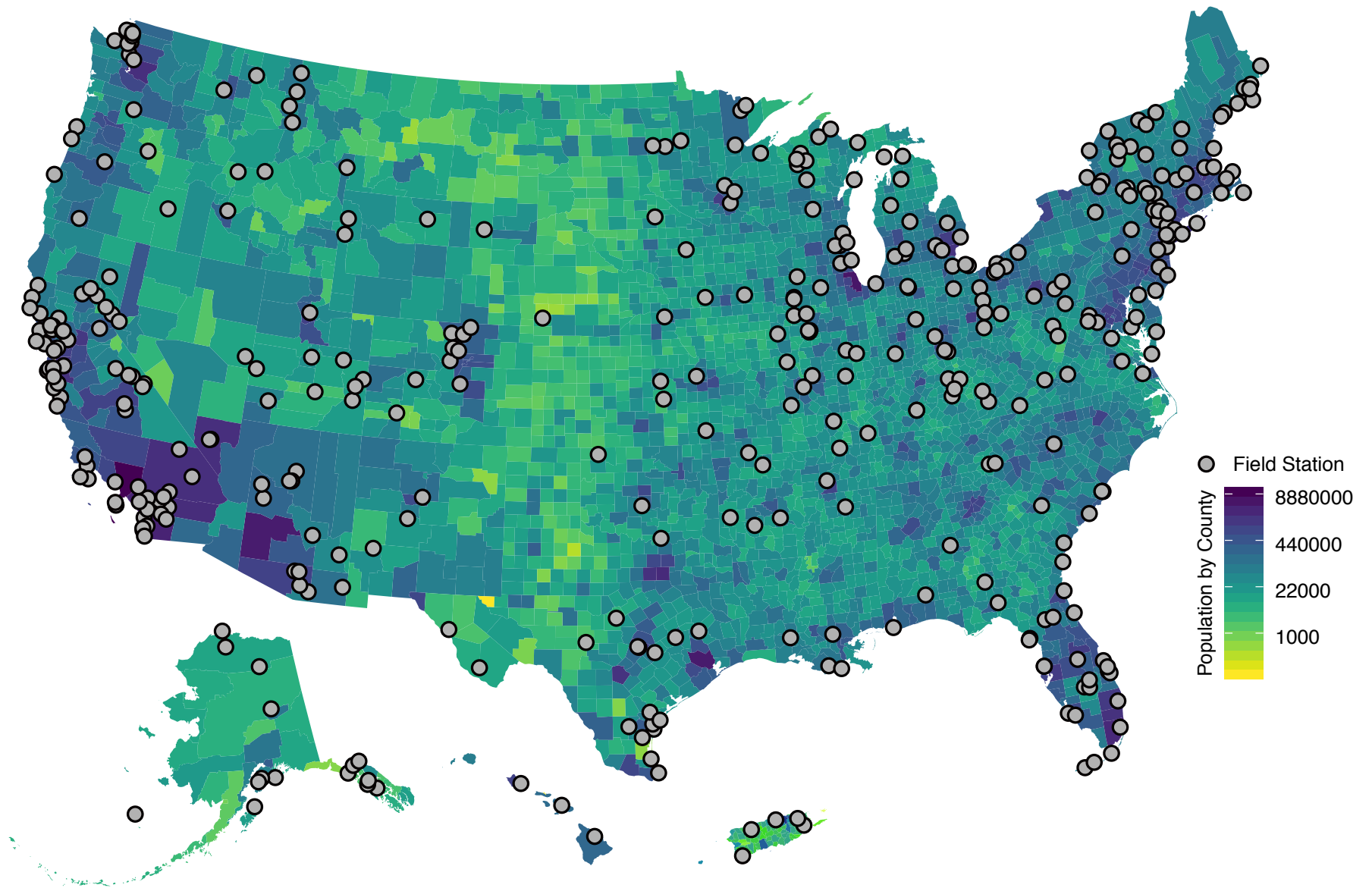
Overview



- Background on field stations
- The Project: <https://fieldstationoutreach.info/>
- Preliminary study results



UC Santa Barbara, Valentine Eastern Reserve



Field stations in the United States (n = 406).

Field Stations



Four main functions:

1. Provide access to the environment,
2. Provide logistical support for a wide range of activities (scientific research, student training, and outreach),
3. Establish a model ecosystem
4. Foster a community of scholars.



Field Stations

- Approximately 78% of the U.S. population lives within 60 miles of a field station, and 98% within 120 miles.
- Provide personal experiences in nature, which foster exploration, a sense of discovery, and environmental stewardship
- Excellent sites for education on issues of conservation and sustainability



Utah Valley University,
Capitol Reef Field Station

Field Stations/LTER Sites (14)	In Data Set?	Outreach Effort (%)
H.J. Andrews Experimental Forests*	Y	5
Anheuser Busch Coastal Research Center; Virginia Coastal Reserve LTER*	Y	20
Cedar Creek Ecosystem Science Reserve	Y	15
Coweeta Hydrologic Laboratory	N	Unknown
El Verde Field Station	N	Unknown
Harvard Forest	In Progress	10
Hubbard Brook Experimental Forest	In Progress	Unknown
Konza Prairie Biological Station	Y	10
Mountain Research Station; Niwot Ridge LTER	Y	10
Sevilleta Field Station	N	Unknown
Toolik Field Station; Arctic LTER	Y	2
Trout Lake Station; North Temperate Lakes LTER	N	Unknown
University of Georgia Marine Institute; Georgia Coastal Ecosystems LTER	N	Unknown
W. K. Kellogg Biological Station*	Y	18

What Kinds of Outreach Exist?



- National survey of 400+ field stations
 - 346 programs described by 156 field stations (as of 10/26)
- Designed to explore the connection between existing field station outreach and our conceptual model
 - How do field stations promote public awareness of STEM knowledge and provide informal learning opportunities to their local communities?
 - Build on approaches to engagement, assessment and evaluation, and the professionals who design/deliver programs.



Preliminary Study Results

- [Program Goals](#)
- [Target Audiences](#)
- [Scientist Involvement](#)
- [Program Topics](#)
- [Program Types](#)

- **LTER Examples**
 - [H.J. Andrews Experimental Forests](#)
 - [Anheuser Busch Coastal Research Center](#)
 - [W.K. Kellogg Biological Station](#)



Sitka Sound Science Center

Outreach Program Goals



Goal of Program	%
Encourage conservation or environmental stewardship	76
Teach about the environment generally	74
Disseminate knowledge and skills	72
Inspire curiosity	63
Raise awareness of the field station work	63
Reach a particular audience	58
Build community	56
Promote STEM careers	50
Make field station resources available to the public	42
Raise money	17
Teach researchers how to communicate with the public	15
Other	6

Outreach Program Target Audiences



Age Groups	%
Adults (18 years and older)	52
Youth (Under 14 years)	47
High school students	41
University students	41
All ages/family	37
Professionals	35
Retirees	34
Graduate students	32
Other	5

How Are Scientists Involved in Outreach?



Scientist Role	%
Teachers/facilitators	70
Guest speakers	57
Organizers	50
Participants	32
Content reviewers	23
Not involved	9
Other	4

Outreach Program Topics



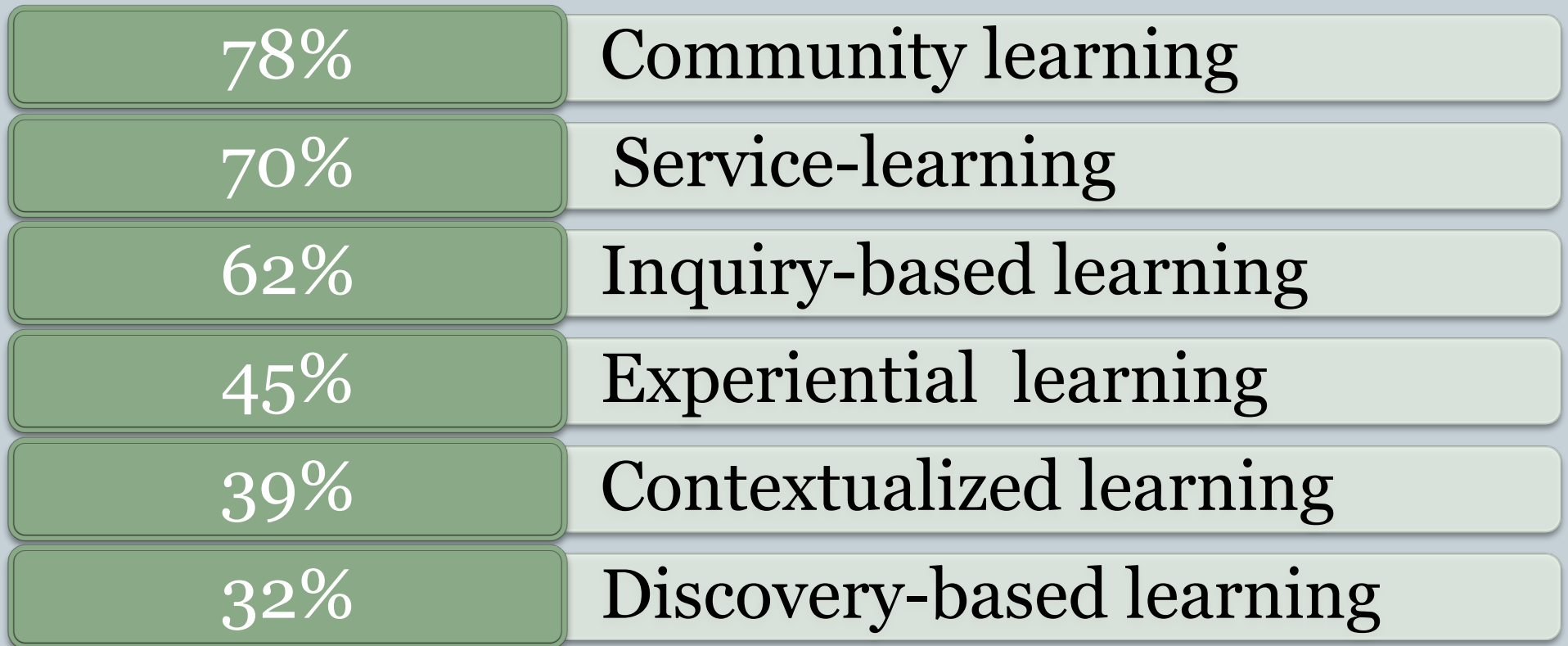
Most Common Program Topics	%
Ecology	86
Conservation	79
Ecosystems	79
Environment	77
Animals	75
Biodiversity	74
Biology	74
Field Science	68
Plants	68
Natural History	67
Botany	64
Water	62
Climate	60

Outreach Program Types



Program Type	%
Field trip(s)	48
Lecture(s)	42
Guided tour(s)/walk(s)	32
Data collection and sharing (e.g. citizen science, BioBlitz)	25
Special event(s)	24
Other	22
Community service	19
Internship/youth development	18
Open house(s)	16
Camp(s)	14
Volunteer support	11
Self-guided tour(s)/walk(s)	10

Approaches to Learner Engagement



Strands of Science Learning



42%

Understand scientific knowledge

42%

Engage in scientific practices

41%

Identify with the scientific enterprise

40%

Understand the scientific enterprise

37%

Engage in scientific explanation and argument

14%

Develop interest & excitement in science

Oregon Season Tracker Program

H.J. Andrews Experimental Forest



Citizen science program targeting K-12 learners and rural landowners. Participants are trained in weather and phenology data collection and contribute to national datasets that complement research at the field station. Participants collect data at their schools and properties and learn about the field station's work and climate change.

Topics Covered

- Climate
- Ecology
- Plants

Scientists Involvement

- Teachers
- Facilitators
- Participants
- Guest speakers

Science Learning

- Develop interest and excitement in science
- Engage in scientific practices
- Engage in scientific explanation and argument
- Identify with the scientific enterprise

K-12 Field Trips

W.K. Kellogg Biological Station



School field trip programs that utilize the field station's place to teach about the environment, encourage conservation and environmental stewardship, inspire curiosity, promote STEM careers, and raise awareness of the field station's work.

Topics Covered

- Climate
- Biodiversity
- Ecology
- Ecosystems
- Water
- Microorganisms
- Conservation
- Environment
- Plants
- Animals

Scientists Involvement

- Teachers
- Facilitators
- Content reviewers

Science Learning

- Develop interest and excitement in science
- Understand scientific knowledge
- Engage in scientific practices

Oyster Gardening Workshop

Anheuser Busch Coastal Research Center; Virginia Coastal Reserve LTER



Program that trains teachers to bring oyster culturing program into their classrooms and provide their students with the opportunity to observe, pose hypotheses, collect data, and contribute to restoration efforts.

Topics Covered

- Marine/field science
- Natural history
- Biodiversity
- Ecology
- Ecosystems
- Water
- Animals
- Biology
- Environment

Scientists Involvement

- Teachers
- Facilitators
- Organizers.

Science Learning

- Understand scientific knowledge
- Engage in scientific explanation
- Understand scientific enterprise
- Engage in scientific practices

References



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