



Volunteer Team 3. Photo: Grace Dolan

Sustaining Forests, Biodiversity, and Livelihoods on Washington's Olympic Peninsula

2021 FIELD REPORT

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Dear Earthwatch Volunteers,

Thank you for your generosity and dedicated fieldwork. The intersection of our first year and the first Earthwatch project to field during a global pandemic made for a challenging season, but your enthusiasm, flexibility, and diligence made it a successful one.

With 5 teams totaling 44 volunteers, we were able to collect forest habitat data from 33 monitoring sites and to deploy and retrieve six rounds of acoustic recorders. This exceeded our research team's expectations. Trees were identified, shrubs were measured, and fallen logs were recorded while scrambling on steep slopes and sinking in the forest duff. We are currently reviewing your habitat data and the quality compares well with those collected by staff field technicians.

The brave trailblazers in the May Team were good sport for everything—from fogging masks and soggy days to protocol refinements and food experiments. The hard work and team spirit of the June Team was rewarded with a whale sighting and seeing a bald eagle catch a fish. The Teen Team from Manhattan made for the most fun we ever had in the field - our hats are off for the adaptability and the quick learning of these students and their teachers. The EY Team was vibrant, high-pace, and always smiling. A lot of work was accomplished and much knowledge was exchanged. The August Team closed the season on a productive note despite the difficult terrain and the summer heat.

We hope all of you gained appreciation for the nuances of sustainable forestry and for the efforts of the foresters, scientists and managers to find better ways to integrate ecological values and timber production. We also hope that the trips to the ocean, the evening lectures, and our conversations helped you discover the splendor of the local nature and the rich history and culture of the indigenous people on the Olympic Peninsula.

We accomplished a lot together and learned a great deal from each other. One of the most rewarding benefits for us was the opportunity to interact repeatedly with groups of curious, passionate, and giving people. As we look toward the second year of this project, it is heartening to know that motivation, teamwork, and an ongoing commitment to science can see us through.

Teddy, Lauren, and Dan

Summary

Earthwatch volunteers collected habitat data at 33 forest monitoring sites. The work included tree identification and measurements, estimates of understory cover, and measuring dead down wood in forest stands of different developmental stages. Each habitat survey took a group of 3-5 people one field day. The volunteers helped deploy and retrieve autonomous recording units (sound recorders) at multiple monitoring sites. 214 monitoring sites are established in the study area with four independent 24-hour acoustic surveys taking place at each site.

Goals, Objectives, and Results



Volunteers measure a giant red cedar.
Photo: Teodora Minkova research staff

The Earthwatch volunteers helped researchers deploy and retrieve sound records at multiple monitoring sites across the study area. The sound recorders (Song Meter Mini, Wildlife Acoustics) were programmed to record four 24-hour acoustic surveys on day 1, 4, 7 and 10 of a 10-day deployment period. Back at the research station, the recordings were screened for completeness and transferred to hard drives. All scheduled acoustic surveys for the 2021 field season were completed on time.

The goal of this project is to measure ecological diversity and responses of indicator bird species to habitat change caused by forest management.

The work during the 2021 field season completed the planned data collection for the second year of the research project.

The Earthwatch volunteers completed habitat surveys at 33 monitoring sites representing four forest developmental stages: stand initiation, competitive exclusion, mature forest and recently thinned forest. The data collection followed an established field protocol (Minkova et al. 2020) and included tree identification and measurements, understory cover estimate and height measurements, and measurements of the size and integrity of dead down wood. These habitat surveys added to the 34 sites already sampled by the research team thus completing a third of the scheduled 214 habitat surveys across 16 experimental watersheds (Figure 1).



Volunteer installs an acoustic recorder.
Photo: Lauren Kuhne

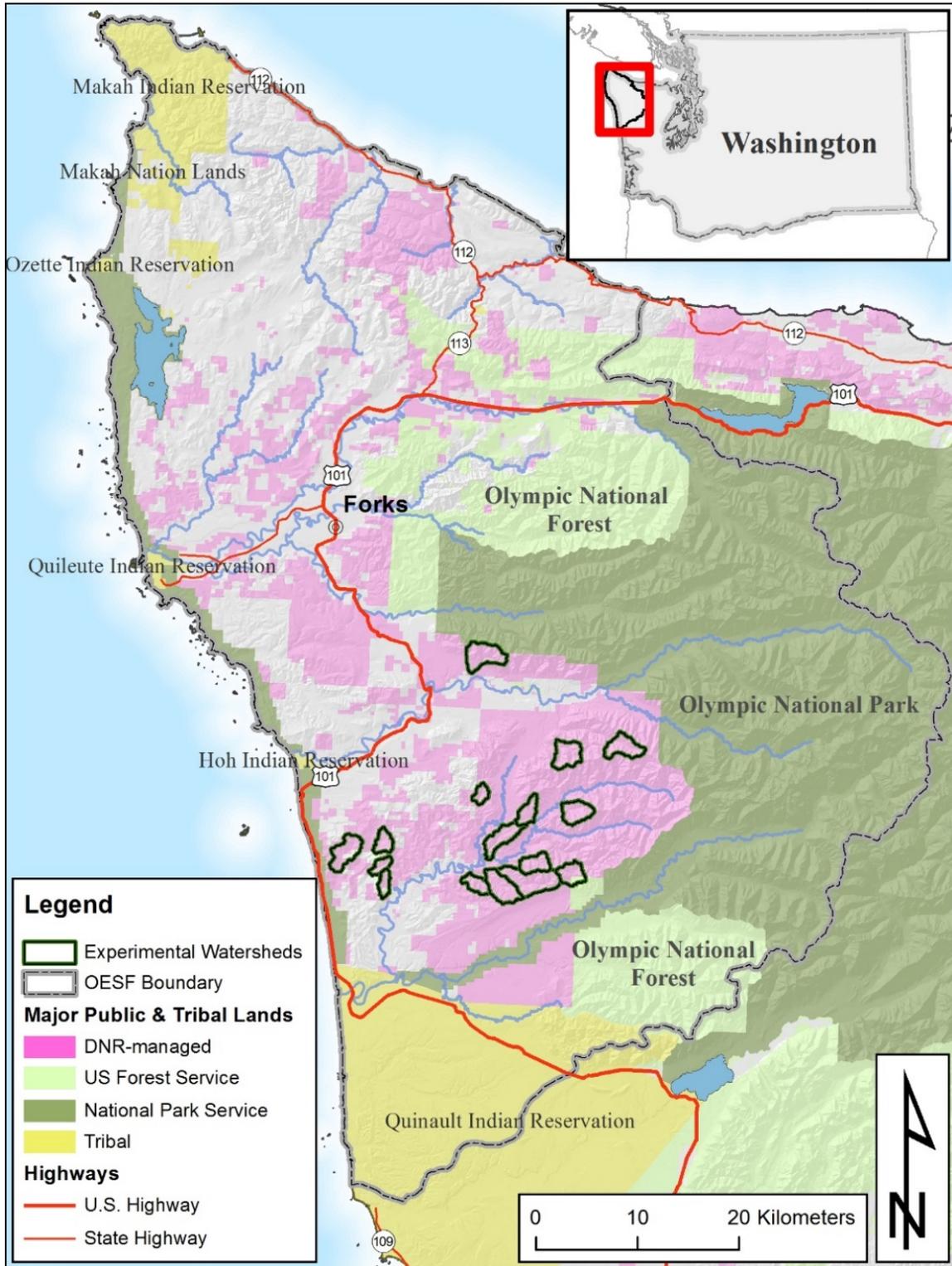


Figure 1. Study Area

TABLE 1. INDICATOR SPECIES

#	Common name	Latin name	Abundance in the study area	Peak vocalization activity
1	Pileated Woodpecker	<i>Dryocopus pileatus</i>	Fairly common year around	Spring –summer
2	Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	Common	May–June
3	Hutton’s Vireo	<i>Vireo huttoni</i>	Fairly common year around	May–July (breeding season)
4	Chestnut-backed Chickadee	<i>Poecile rufescens</i>	Common year around	Year around
5	Bewick’s Wren	<i>Thryomanes bewickii</i>	Fairly common	May–July (breeding season)
6	Pacific Wren	<i>Troglodytes pacificus</i>	Common year around	Calls in winter, but mostly in spring
7	Varied Thrush	<i>Ixoreus naevius</i>	Common year around	May –July (breeding season)
8	Brown Creeper	<i>Certhia americana</i>	Common	May –July (breeding season)
9	Orange-crowned Warbler	<i>Oreothlypis celata</i>	Common	May–July (breeding season)
10	Wilson Warbler	<i>Wilsonia pusilla</i>	Common	May –July (breeding season)

The 2021 forest habitat and acoustic data will be used to answer the 4 research questions stated in the project proposal:

1. What are the differences in forest composition and stand structure among “ecosystem types” representing four stand developmental stages?
2. What are the differences in forest composition and stand structure before and after treatment in the competitive exclusion stands?
3. What are the differences in habitat function (as determined by occupancy rates of indicator bird species) among “ecosystem types” representing different stand developmental stages?
4. What are the differences in habitat function (as determined by occupancy rates of indicator bird species) before and after treatment in the competitive exclusion stands?



NY high school volunteer team and research staff



EY Volunteer Team. Photo: Dana Salomon

Project Impacts

1. Increasing Scientific Knowledge

a) Total citizen science research hours:

Research Activity	Research Hours Per Person per Team
Training	4
Data collection in the field (habitat surveys, deployment and retrieval of acoustic recorders)	34
Processing of audio data, programming of acoustic recorders, data entry	2
Total	40
Total per field season:	1760 (44 volunteers X 40 hours)

b) Peer-reviewed publications: None yet

c) Non-peer reviewed publications:

- Minkova, T., L. Kuehne, D. Donato. 2020. Using Passive Acoustic Monitoring to evaluate sustainability of forest management. Study Plan. Washington State Department of Natural Resources, Forest Resources Division, Olympia, WA. https://www.dnr.wa.gov/publications/lm_oesf_pac_sp.pdf
- Washington Department of Natural Resources. 2021. Volunteers Take to Olympic Peninsula Forests to Help Further DNR Research. October 8, 2021 post in the WADNR blog EAR TO THE GROUND <https://washingtondnr.wordpress.com/2021/10/08/volunteers-take-to-olympic-peninsula-forests-to-help-further-dnr-research/>

d) Presentations:

- Minkova, T. 2021. Evaluating Habitat Function through Passive Acoustic Monitoring of Indicator Bird Species. Invited lecture to the Olympic Peninsula Chapter for the Audubon Society, November 17, 2021. <https://olympicpeninsulaaudubon.org/events-calendar/opas-member-meeting-passive-acoustic-bird-monitoring>
- Minkova T. 2021. Acoustic Monitoring Plan. Presentation at the Olympic Experimental State Forest Science Conference, April 22, 2021. https://www.youtube.com/watch?v=PNT_IziAsLc&list=PLKpn_iIWjh53q5QgGauWHaOR0D8AAqZ5a&index=9
- Kaitis, T. and L. Kuehne. 2021. The Sound of Science: Acoustic Monitoring and Occupancy Modeling of Songbirds in the Olympic Experimental State Forest. Poster presentation at the Olympic Experimental State Forest Science Conference, April 22, 2021 https://www.youtube.com/watch?v=LsxZLV_s-fk&list=PLKpn_iIWjh53q5QgGauWHaOR0D8AAqZ5a&index=12
- Casto, L. 2021. Songbirds as indicator species on the Olympic Peninsula – alternative sections criteria and considerations. Poster presentation at the Olympic Experimental State Forest Science Conference, April 22, 2021. https://www.youtube.com/watch?v=q2oyjo-Vfd8&list=PLKpn_iIWjh53q5QgGauWHaOR0D8AAqZ5a&index=13
- Kuehne, L., T. Minkova, D. Donato, B. Borman. 2021. Evaluating Habitat Function through Passive Acoustic Monitoring in the Olympic Experimental State Forest. Olympic Science Days, November 4, 2021.

2. Outreach and Mentoring

Graduate students

Student Name	Graduate Degree	Project Title	Anticipated Year of Completion
Shawree Zhang	Bachelor's degree thesis	Habitat associations of indicator songbird species in the Olympic Experimental State Forest	June 2022
Samantha Zink	Bachelor's degree capstone project	Climate change and Washington migratory birds	May 2022

3. Partnerships

Partner	Support Type(s) ¹	Years of Association (e.g. 2006-present)
University of Washington	Research base, logistics, academic support	2020-present
Oregon State University	Scientific consultation	2020-present
Makah Museum	Presentations and museum tours	2021
Washington Conservation Corps	Technical support	2021
Evergreen Turtle Rocket Running, LLC	Technical support	2021

¹ *Support type options: funding, data, logistics, permits, technical support, collaboration, academic support, cultural support, other (define)*

4. Conserving natural and sociocultural capital

Ecosystem services

Indicate which ecosystem service categories you are **directly studying** in your Earthwatch research and provide further details in the box below as needed.

Provisioning Services	Regulating & Support Services
<input type="checkbox"/> Fisheries (Fresh & Marine)	<input type="checkbox"/> Carbon sequestration/storage/"blue"
<input type="checkbox"/> Energy (fuelwood/hydropower)	<input type="checkbox"/> Coastal protection
<input type="checkbox"/> Livestock grazing	<input type="checkbox"/> Erosion control
<input checked="" type="checkbox"/> Material extraction (e.g. resin, grass)	<input type="checkbox"/> Flood regulation/protection
<input checked="" type="checkbox"/> Timber	<input type="checkbox"/> Pest and disease control
<input type="checkbox"/> Water supply	<input type="checkbox"/> Pollination
<input type="checkbox"/> Other food (crops, wild foods, spices)	<input type="checkbox"/> Seed dispersal
Cultural Services	Other Services
<input type="checkbox"/> Cultural/historical values	<input type="checkbox"/> Pharmaceuticals
<input type="checkbox"/> Health (mental & physical)	<input type="checkbox"/> Water purification/quality
<input checked="" type="checkbox"/> Research & knowledge	<input checked="" type="checkbox"/> Preserving/maintaining Biodiversity
<input type="checkbox"/> Recreational	<input type="checkbox"/> Nutrient cycling
<input type="checkbox"/> Spiritual/aesthetic values	<input checked="" type="checkbox"/> Employment/Livelihoods

Details:

The project evaluates birds' response to alternative forest management practices that intend to integrate habitat conservation and timber production. Experimenting with novel silvicultural approaches increases the knowledge and reduces management uncertainties. The novel silvicultural approaches aim to emulate natural disturbances and to provide higher quality early-seral habitat. The project is part of a broader forest management experiment which tests management approaches that increase environmental and community wellbeing. The latter includes jobs and other economic benefits.

Acknowledgements

We thank all Earthwatch volunteers for helping with fieldwork in 2021 and for being flexible and accommodating during the ever-changing pandemic circumstances.

We are thankful to the staff at the Olympic Natural Resources Center for their logistical support and accommodation as we tried to combine COVID safety plans of multiple entities, meet the volunteer needs, and the research requirements for training, lectures and other gatherings.

Washington Conservation Corps and Evergreen Turtle Rocket Running, LLC provided much needed help to retrieve sound recorders.

Special thanks to Janine Ledford, Makah Tribal Historic Preservation Officer, for the enlightening virtual tours of the Makah Museum. The evening lectures of Dr. Tim Billo (University of Washington), Dr Scott Horton (retired) and Jill Silver (10,000 Institute) greatly enhanced the volunteers' experience.

We thank the Earthwatch Institute, and particularly Dana Salomon and Stan Rullman, for their exceptional project support, understanding, and willingness to go extra mile for the success of this project.

Literature Cited

Minkova, T.V., L.M. Kuehne, D.C. Donato. 2020. Using Passive Acoustic Monitoring to evaluate sustainability of forest management. Study Plan. Washington State Department of Natural Resources, Forest Resources Division, Olympia, WA.

Anything Else?

Taking the calculated risk to travel across the country (Figure 2) during the COVID pandemic and following the safety protocols of multiple organizations was a highly appreciated effort and an impressive level of motivation. Thank you all.

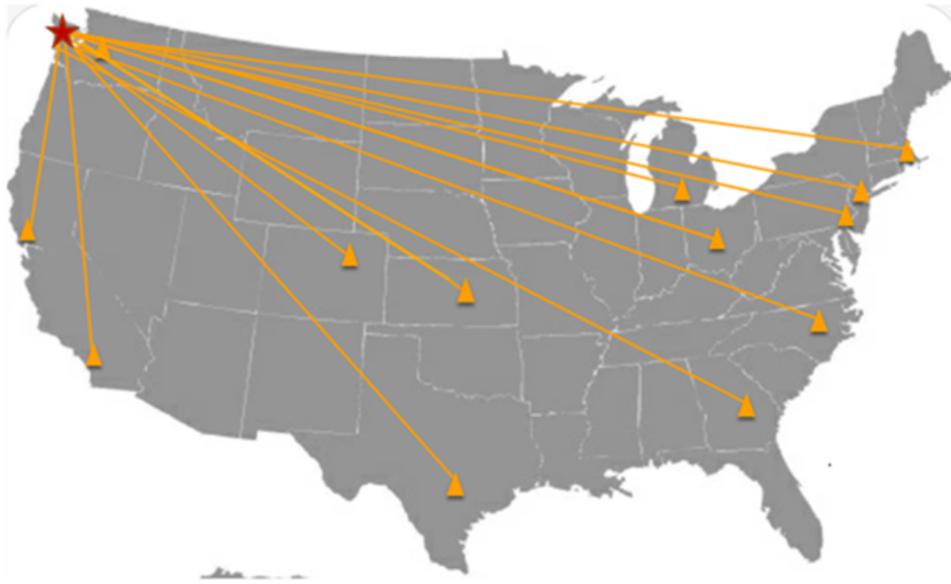


Figure 2. The points of origin of the volunteers working on the Olympic Peninsula, WA in 2021