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RESEARCH ARTICLE

Centring care as part of Indigenous environmental stewardship: Collective learning through cultural plants

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Abstract

1. Stewardship is broadly defined as 'universal responsibility of humanity to care for the planet, to ensure that it can continue to provide the essential natural resources for life'. Stewardship practices shape ecosystems, create diverse bio-cultural landscapes, and can enhance the productivity, availability and health of plants used by Indigenous Peoples for traditional foods, fibres and medicines.
2. In this paper, we argue that care is one key component that differentiates Indigenous stewardship from other forms of resource management and has the potential to cross cultural and institutional boundaries. We consider how care, which includes many of the principles, motivations and intentions behind Indigenous stewardship, is applied in cultural plant-rich ecosystems maintained by Indigenous communities in Southwest Alaska, Northern California and Coastal Maine.
3. This work emerged from collaborations among allied researchers, Indigenous gatherers, and Indigenous scholars, spanning three cultural plant-focused projects. Collectively, we conducted 109 interviews with Indigenous plant stewards, many out on the landscape. We use qualitative coding analysis and discussion to identify key elements of care in Indigenous environmental stewardship.
4. Our results highlight the many, sometimes subtle and nuanced, ways in which aspects of care motivate and shape stewardship. We group these components of care into themes that are part of our proposed conceptualization of care as a central tenet of Indigenous plant stewardship. We focus on responsibility and relationship as key elements of care; these are precursors to the privilege of harvesting cultural plants. Plants are cared for as family members, and there are

transferable elements of care among human and plant kin. Care transcends time, being received from ancestors and carried out for those yet to come. In some places where colonization has interrupted care practices, Indigenous caretaking today is part of healing and reconciliation.
5. Our conceptualization of care as one part of Indigenous environmental stewardship has the potential to shift collaborative work, community dynamics and societal worldviews related to environmental stewardship.

KEYWORDS
Alaska, California, care, cultural plants, Indigenous stewardship, Karuk, Maine, Wabanaki, Yup'ik

1 | INTRODUCTION

Indigenous environmental stewardship can shape ecosystem diversity, form, function and structure (Anderson, 2005; Deur & Turner, 2005; Quaempts et al., 2018). It is informed by millennia of multi-generational Indigenous relationships with the environment and guided by Indigenous knowledge, teachings and cosmologies (Armstrong et al., 2024; Artelle et al., 2018; Nadasdy, 2003). These practices enable access to food for humans and animals, support ecosystem health and resilience, maintain terrestrial and aquatic habitats and provide a range of ecosystem services (Baumflek et al., 2021; Mucioki et al., 2021; Sowerwine et al., 2023).

Care is both a noun and a verb, encompassing ethical principles and the actions those principles inspire. Fisher and Tronto's (1990, p. 40) definition of care highlights how care actions are motivated by care ethics: '[Care work is] a specific activity that includes everything that we do to maintain, continue, and repair our 'world' so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment'. While care is conceptualized as the ethics, values, principles, motivations and intentions behind actions (Enqvist et al., 2018; West et al., 2018), in many Indigenous worldviews, stewardship is the action of care that connects people to the land (e.g. caretaking, caring for country; Larson et al., 2023). Indigenous concepts of care include relationality, morality, humility, relationships and responsibility, reciprocity, Indigenous knowledge and skills, and Elder wisdom (Lin & Robin, 2025; Whyte & Cuomo, 2016). Indigenous stewardship, as motivated by an ethic of care, embodies relational values through human connection with all living and nonliving things (West et al., 2018). Virtanen et al. (2024) emphasize the essential role of caretaking between Indigenous people and plants, noting that these relational processes remain underexamined relative to those involving animals. Care ethics aim to restore relationships and responsibilities damaged by injustice. They prioritize Indigenous sovereignty over land, environmental stewardship and the maintenance of environmental health, which are essential to Indigenous social-cultural-ecological nourishment (Menzies et al., 2024; Whyte & Cuomo, 2016). Furthermore, applying a care ethics lens to environmental stewardship can offer a more inclusive conceptualization that illuminates the often-underrecognized roles of Indigenous women in stewardship, particularly related to plants. Care ethics, including feminist environmental care ethics, have been discussed as integral to stewardship, shaping actions and interactions with the land (Whyte & Cuomo, 2016). Although, feminist care ethics or practices have not always been adequately attributed to Indigenous ontologies (Doucet et al., 2024).

In this paper, we build on these foundations by developing a conceptualization of care as an integral component of Indigenous environmental stewardship, central to relational connections among social, ecological and cultural systems. We centre the care of cultural plants by Karuk, Wabanaki and Yup'ik plant stewards and gatherers to illustrate how care ethics and environmental stewardship are embedded in how Indigenous people relate to cultural plants and their ecosystems, but also how care is fluid and instructional among human and non-human kin. We ask: How is care part of and central to Indigenous environmental stewardship? This question emerged from conversations among three research teams co-led with Tribal partners focused on cultural plants and stewardship in California, Maine and Alaska. In application, the conceptualization of care presented in this paper, informed by Indigenous stewards, has the potential to shift collaborative work, community dynamics and societal worldviews related to environmental stewardship.

2 | COMMUNITIES

The Bristol Bay Region of Alaska is home to thirty-one Alaska Native Tribes. Yup'ik People are dominant to this region with Dillingham being the homelands of the Curyung Tribe and the regional hub (Figure 1). Dillingham is also the headquarters of the Bristol Bay Native Association (BBNA), which provides services to all Tribes in the Bristol Bay Region. The sub-arctic tundra climate dictates seasons. The landscape comprises rivers, lakes, mountains and lowlands with discontinuous permafrost. In this paper, we focus on arctic berries. Salmonberries (*Rubus chamaemorus*), lowbush cranberries (*Vaccinium vitis-idaea*), blackberries (*Empetrum nigrum*) and bog blueberries (*Vaccinium uliginosum*) grow in the tundra interspersed with forest patches of white spruce (*Picea glauca*) and balsam poplar

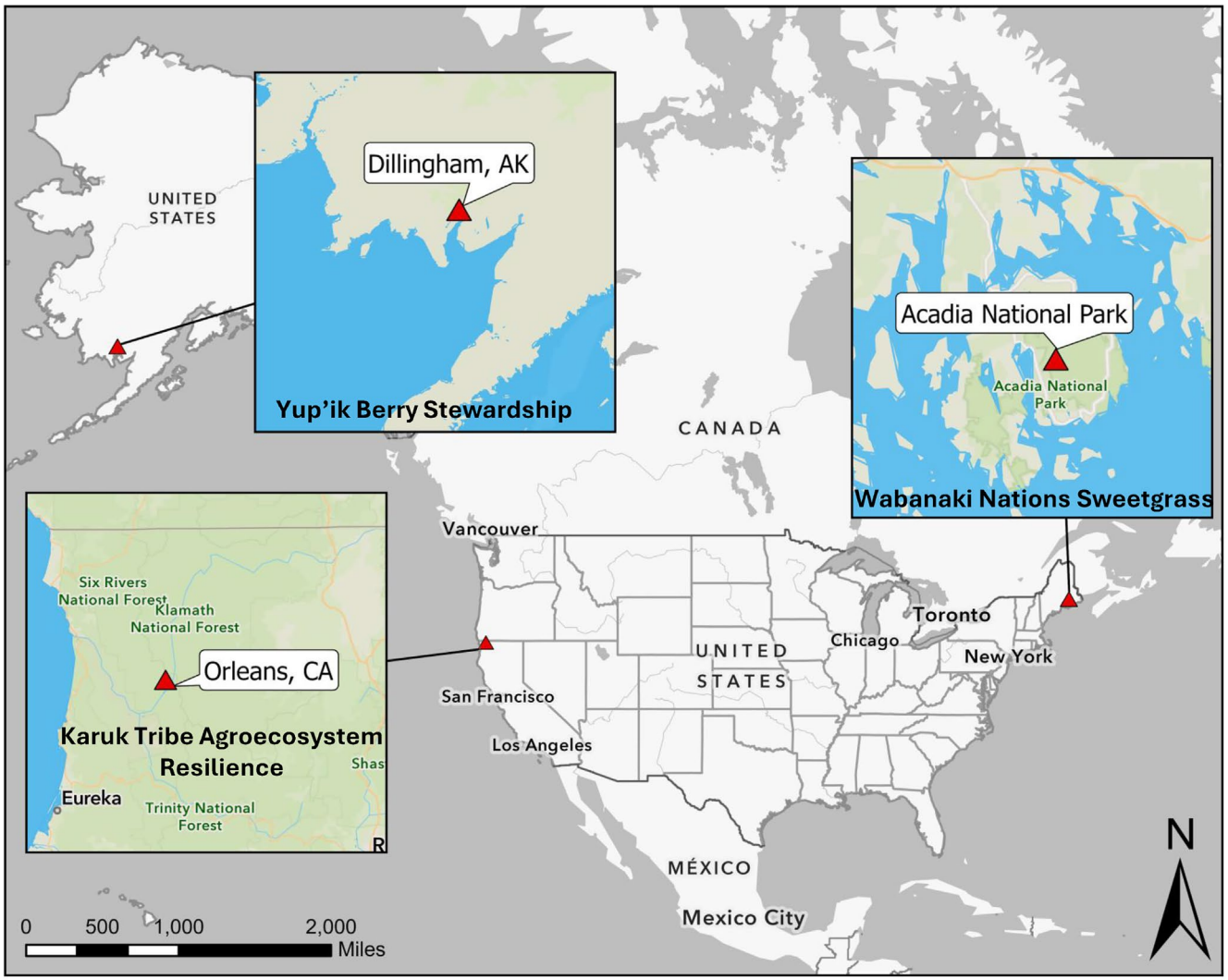

FIGURE 1 Locations of the three focal communities and environments, with the Karuk Tribe in Orleans, California, the Curyung Tribe in Dillingham, Alaska and the Wabanaki Nations in coastal Maine, within the jurisdiction of Acadia National Park.

(*Populus balsamifera*), where black currants (*Ribes* spp.), highbush cranberry (*Viburnum edule*) and huckleberries (*Vaccinium ovalifolium*) grow (Viereck, 1992). Annually, community members pick and store many gallons of berries (Mucioki, 2024).

The Wabanaki Confederacy, the People of the Dawnland, includes Maliseet, Mi'kmaq, Passamaquoddy, Penobscot and Abenaki Nations. Their traditional homelands, known as Waponahkik, span what are now referred to as the Canadian Maritime Provinces, Quebec, Maine and New Hampshire. Waponahkik is located within the Wabanaki-Acadian ecoregion, a transitional zone between northern hardwood forests and boreal forests, characterized by numerous wetlands, including bogs, rivers and coastal marshes. These water-based systems feature prominently in Wabanaki lifeways and cosmology. Here, we focus on Wabanaki care for sweetgrass (wəlí-mskihkəwal in Penobscot, welimahaskil or suwitokolasol in Passamaquoddy-Maliseet, and weljemajgewe'l in Mi'kmaq; *Anthoxanthum nitens*) within the jurisdiction of what is now Acadia National Park (Figure 1). The National Park is located on Wabanaki homelands (Mount Desert Island), and Wabanaki place names exist throughout the park landscape (Neptune, 2015).

Karuk Aboriginal Territory (KAT) is a 1.038-million-acre landscape located in the middle of the Klamath River Basin in northern California and southern Oregon. This region includes low-elevation river corridors and high-elevation mountain areas in the Klamath-Siskiyou Mountain Range. It includes Mediterranean California Mixed Evergreen Forests and ecological complexity, with meadow openings that are increasingly sparse due to many years of fire exclusion (Eitzel et al., 2024; Mucioki et al., 2022). In this paper, we draw on a project that engaged 35 culturally significant places and 20 cultural plant species (collectively referred to as cultural agroecosystems) that the Karuk Tribe prioritized for monitoring and restoration in and around Orleans, California (Karuk Tribe – UC Berkeley Collaborative, 2023; Figure 1). Across the KAT, jurisdictions range from places owned by the Karuk Tribe to public lands concurrently claimed by the US Forest Service. The Karuk Tribe is actively working with Tribal, private and public land managers to

TABLE 1 Descriptions of plant-related projects with Karuk stewards and gatherers, Wabanaki sweetgrass harvesters and Yup'ik berry pickers that contributed to our findings and conceptualization of care.

Cultural plant-focused projects that contributed to concepts of care	Overview of projects
Karuk Agroecosystem Resilience and Cultural Foods and Fibres Revitalization Initiative: xúus nu'éethti—we are caring for it Affiliated authors: Mucioki, McCovey, Lake, Sowerwine, Sarna-Wojcicki	• Collaborative project by The Karuk Tribe-University of California Berkeley Collaborative governed by co-developed principals of working together and research protocols of the Karuk Department of Natural Resources and the Karuk Tribe (2019–2022) • Assessed the condition of cultural agroecosystems and component cultural plants in Karuk Aboriginal Territory • Co-developed methodologies to support Karuk decision making • Supported capacity building of the Karuk Department of Natural Resources in long-term monitoring, restoration, data analysis, mapping and visualization techniques • Produced a co-authored report (Karuk Tribe – UC Berkeley Collaborative, 2023)
Restoring Wabanaki Sweetgrass gathering within Acadia National Park Affiliated authors: Baumflek and Greenlaw	• Collaborative project between Wabanaki sweetgrass gatherers and the National Park Service (NPS) (2015–2024) focused on addressing NPS Plant Gathering rule requirements • Guided by Wabanaki sweetgrass gatherers and Tribal Historic Preservation Officers • Employed Indigenous Research Methodology, Participatory Action Research, and CARE principles. • Respected Wabanaki people as active knowledge holders and decision makers within care of sweetgrass • Supported co-stewardship and promoted Wabanaki Peoples' roles within future management and restoration activities • Co-generated Wabanaki-led science to support environmental impact assessments • Co-developed a Cultural Protocol document and short film on Wabanaki Relations, Histories and Futures with sweetgrass
Berry harvesting and stewardship in the Arctic Affiliated authors: Mucioki, Aderman, Holen, Powell	• A component of the POLARIS project (2020–2025) that focused on cultural plant foods and the environment • Research focused on stewardship of berries and other cultural plants in conversation with Yup'ik berry pickers and stewards • Followed ethical protocols, approvals and guidance put forth by the Curyung Tribal Council and the Bristol Bay Native Association with many check points along the way • Spent time harvesting berries with local knowledge holders • Engaged in discussion with other researchers and knowledge holders that work with Arctic berries

steward the KAT following Karuk principles of stewardship, care and repair.

3 | METHODS

In this paper, we draw from three research projects focused on cultural plants and stewardship (see Table 1) and lived experiences of care, as Indigenous and non-Indigenous researchers, practitioners, plant stewards and gatherers. Among the authors of this paper, six are of Euro-American descent, one is a Karuk Tribal member, one is a Karuk descendant, one is a Maliseet citizen, and one is Yup'ik. The authors have collaborated for four to over 10 years. Groupings of authors engaged in three plant-focused projects (briefly explained in Table 1 with locations in Figure 1) that contributed to the ideas presented in this paper.

All projects were conducted with consent from the governing Tribal councils and adhered to local protocols and guiding principles (including CARE and community-based participatory methodologies; see Jennings et al., 2023) for ethical research with Indigenous communities. We followed research guidelines put forth by the Bristol Bay Native Association and Curyung Tribal Council, the Karuk Tribe's Practicing Pikyav process and the Wabanaki Tribal Historic Preservation Officers and Wabanaki research processes. All research was approved by the respective university institutional review boards or related federal processes. Prior-informed consent was obtained in all instances of qualitative data collection. Interviews were audio- or video-recorded, or documented through notetaking, with consent. Some participants are named in the paper while others are not. This is based on participants' preferences and the protocols of the three projects included in this paper. Quotes from qualitative data use a citation style agreed upon by the authors, denoting a short form for each project (KA: Karuk agroecosystem; WS: Wabanaki sweetgrass; YB: Yup'ik berry), participant initials, and the date of the conversation.

Results presented are based on qualitative data collected from the three separate projects through interviews and conversations on the landscape and authors' lived experiences. Each dataset is linked to a corresponding project (see Figure 1) that focuses on cultural plants. In Dillingham, Alaska, 46 interviews were conducted with individuals who picked, shared, processed and consumed berries and other plants; 27 respondents were Alaska Native, while other respondents had married into Alaska Native families and/or lived in the area for most of their lives. In Northern California, authors were involved in monitoring and caring for Karuk places and plants. Through this process, over 50 interviews were conducted on Karuk lands with ten different Karuk plant stewards. In Maine, a collaborative research effort unfolded over 7 years with 19 sweetgrass

FIGURE 2 A model of Indigenous environmental stewardship that centres care and actions of care to support the health and well-being of cultural plants and human and non-human kin. Figure designed and created by Shawn R. Pascuttini.

gatherers. This process included interviews with 13 gatherers and yearly workshops with 16 gatherers, Tribal Historic Preservation Officers from the Houlton Band of Maliseet Indians, Mi'kmaq Nation, Passamaquoddy Tribe, and Penobscot Nation, and National Park Service staff.

Qualitative data analysis was conducted for each stand-alone project, focusing on similar topics related to Indigenous plant stewardship and care. This was followed by collective author discussions of linking themes or codes identified in the analysis. Each project employed a hybrid approach combining inductive and deductive thematic development through qualitative analysis (Fereday & Muir-Cochrane, 2006). Authors associated with each project identified themes related to Indigenous stewardship and care, drawing on inductive themes emerging from their data and group discussions, as well as deductive themes from the existing literature. The authors carefully reviewed the transcripts multiple times and reflected on the overarching themes relevant to our research objectives. NVivo software versions 11–12 (Lumivero) were used to organize and analyse the data by respective project leaders. Further reflection was made on overarching philosophies, positionality, actions and language that Indigenous stewards in each case study use when considering the stewardship of lands and component plant species, as well as their broader implications for governance (Simonds & Christopher, 2013). After coding and considering each dataset, all authors of this paper participated in three large-group discussions and 15 small-group discussions throughout the writing and revisions to elucidate and develop ideas about care across the projects and to refine our language and shared or divergent understandings. Through these group discussions, additional inductive themes emerged, including gendered roles of care. We also considered overarching questions like: How are stewardship and care connected? What are actions of care? What is our individual or collective responsibility to care? Through these discussions, we identified the larger interconnecting themes, which structure the results sections and are represented in our Figure (Figure 2). Throughout further dialogue and revision, we refined and applied these themes to care and Indigenous environmental stewardship as well as study-specific

datasets to generate additional insights. The entire process was a reciprocal engagement among and within our three qualitative data sets, the authors' lived experiences, and their interactions and discussions.

4 | RESULTS AND DISCUSSION

Through our collective work, we have identified various elements of care and types of actions motivated by care ethics engaged by Indigenous plant stewards in our three focal communities. These different aspects of care are central to, and inseparable from, Indigenous environmental stewardship. As many Indigenous co-authors and participants in this paper discussed the connection between care and stewardship, the distinction between the two was not always evident. The connections and lines can be blurred, understood differently and open to interpretation. Indigenous environmental stewardship also includes many other elements, apart from care (Armstrong et al., 2024). Our results highlight that care ethics is one of the ways in which Indigenous stewardship differs from other types of stewardship and management.

We group the aspects of care (care ethics and actions motivated by them) in the following themes (Figure 2):

- *Care is grounded in responsibility and relationship*: Care, as expressed through Indigenous environmental stewardship, includes sustained relationships and the fulfilment of responsibility as means of mutual respect, consent and accountability with and from the plant.
- *Care includes ethics of mutual respect, agency and consent*: Consent is a process integral to mutual respect to and agency of plants and plant caretakers, who are very often women. This is a process connected to feminist care ethics.
- *Care maintains connection with family, community and non-human kin*: Care motivates and builds reciprocal connections with family, community and non-human kin, often through emotive or non-verbal actions. In the Indigenous context, care also centres the needs of non-human kin and not necessarily people.
- *Care is emotive*: Care is found in felt emotions connected to place, environment and plants, with particular generational and cultural ties that can drive and motivate actions of care and stewardship.
- *Care is embedded across the biophysical landscape*: Care can be seen in biophysical alterations to ecosystems and plants that promote relational health.
- *Care is reciprocal giving for the future*: Care motivates efforts in the present but often is received by past caretakers and shared for the good of the future.
- *Care is an act of resistance and healing*: Care is also the underlying motivation behind many Indigenous actions of healing and restoration in response to colonial systems and impacts.

These themes are highly interrelated. While we present them delineated for the purpose of communication and elucidation to readers, there is much entanglement, which is a reflection of practice. We intend that our work is positioned and applied through action; stewardship is the act of doing with the intention of care, not merely writing or defining. In a companion perspective piece, we apply Indigenous environmental stewardship and care to guide actors and collaboratives engaged in this work alongside land and plants (see Mucioki et al., in preparation).

4.1 | Care includes responsibility and relationship

Indigenous care ethics include responsibility, accountability and reciprocity with humans and non-human species, including plants (Tynan, 2021). These values motivate care actions with human–plant relationships and collective Tribal stewardship and governance practices (Reo, 2019). Knowledge of how to care is learned through being in relationship and present with plants. Frank Lake explains (Rossier, 2019, p. 166): 'I want my kids to have a sense of dependence in their relationship with the forest and knowing that they are part of that forest. (…) I think that's probably the biggest thing, we can encourage and promote that sense of responsibility, being a person of the forest. Then we're more likely to get involved (…). We're going to make a point to care for good huckleberry patches, not only for us, but for all the other wildlife that we see there'.

Similarly, sweetgrass gatherers expressed additional responsibility when sharing sweetgrass locations. Jennifer Neptune, a Penobscot sweetgrass gatherer, expressed, 'there is a very social aspect to it as well as a sense of protecting the grass and the places we love. We can be very secretive about the places we pick and only share locations with those we trust to go in a respectful way' (Neptune, 2024, p. 100). For some, being in 'good relations' and having upheld responsibility and relationship are considered prerequisites for use. Yup'ik berry pickers must be living their cultural relationship and responsibilities with all kin to be able to see berries. Otherwise, the berries will not give themselves to the picker (Aderman, 2024). In some cases, caring for plants is considered a precursor to the privilege of harvest and use. A harvester must first establish a relationship with the plant, grounded in respect and reciprocity (and understanding and knowledge, as referenced above). Following Yup'ik protocol, berry pickers must be invited by often more experienced pickers to take part in berry picking before they go out on the land. One Yup'ik berry steward said: 'You don't just get to go. People ask all the time, and it's a hell no. You don't get to go. And maybe that's part of the stewardship (…), you don't just give someone the keys (…), you have to earn that knowledge. You have to show your commitment' (Interview: YB-RC on 5/24/2023). In the case of berry picking in Alaska, people should demonstrate qualities of responsibility and relationship before they are invited to participate in accessing not only berry resources but also the knowledge, practices and stories that come with gathering in community. During the first harvest, the picker forms a relationship with the berry by introducing themselves and demonstrating their intention to treat the plants properly.

Caring for the plants transfers to the reciprocity and relationality of harvest activities as a provider within the community. Holen (2017) finds that reciprocity in human environmental relations is embodied in the praxis, the actual act of harvest, that creates a continuity of relationships over time between the gatherer and the plant. Armstrong et al. (2024) centre reciprocity with the environment as central to Indigenous stewardship and the Indigenous relationship with land and environment as a series of sustained reciprocal acts. Similarly, in California one respondent shared: 'You look at our mountains, our whole areas, we were going through, managing like it was one big giant garden. As long as we took care of it, it was taking care of us' (Interview: KA-JL on 7/24/2020). These lessons of reciprocity are fluid among humans and between humans and non-human kin.

4.2 | Mutual respect, agency and consent

In many Indigenous traditions, the well-documented practice of seeking consent before harvesting a plant or tending a landscape reflects a deep ethic of care and stewardship, affirming reciprocal responsibilities and ensuring that plant resources continue to offer themselves for harvest (e.g. Geniusz, 2015). For example, many Wabanaki harvesters describe harvesting only sweetgrass stems that willingly give themselves to the gatherer. One gatherer instructed her daughter, saying: 'Remember, if it doesn't yield to you, like this one (don't pick it) (…). I try to pick it, and it won't come up' (Interview: WS-TM on 8/27/2017). Consent from the plant to harvest and use it is an outcome of a sustained relationship in which the steward fulfils responsibilities of care. Seeking consent is a moral obligation and a practice that embodies mutual respect and accountability to plants, the environment and one another. It centres the personhood, agency and sentience of plants as beings with choice, requiring reciprocal love and care to be harvested (see also Baker, 2021).

Consent is integral to mutual respect and accountability within feminist care ethics, as caring is often associated with feminine qualities and women's labour (Whyte & Cuomo, 2016). Just as women play central roles in caring for people, they are also central to caring for plants and to facilitating care for current and future generations (Quaempts et al., 2018; Zank et al., 2021). This includes demonstrating values and actions that teach others how to care; many plant gatherers, in conversations across projects, mentioned their grandmothers, aunties, mothers and daughters. Yup'ik berry stewards shared comments with great admiration and respect like: 'And that's what my grandmother taught us' (Interview: YB-I on 5/22/2023). The speaker is accountable to these relatives and ancestors, who have passed on, through mutual caretaking. For example Helen Aderman (2024) remembers her late father's teachings: 'Respecting the lands and waters our *Ciurlaqs* (*ancestors*) walked on should always be practiced, because it is like when you go to church, you are honoring Our Creator, and treat it like it is the most sacred place that *Tlaam Yua* (*Creator*) dwells in, because when we're out doing our traditional activities, our *Ciurlaqs* are always with us'. Wabanaki gatherers noted that plants respond by growing more plentifully in places where people act respectfully: avoiding overharvesting, rotating collection sites or picking lightly.

In the communities included in this paper, women shared that caretaking responsibilities are highly regarded, prioritized and a source of pride. However, on the other hand, as one Yup'ik respondent stated, this can go unnoticed: 'ladies play many roles that we do not talk about. (…) Women do many things behind the scenes' (Interview: YB-HA on 9/26/24). The care and labour associated with wild food processing is women's responsibility in traditional Yup'ik society: men harvest salmon and other wild foods and transfer ownership and responsibility to women who then process, store and distribute the harvest throughout the year (Fall et al., 2010; Holen, 2009).

The feminine nature of care in no way means that those who are not women do not also engage in care work. Men, women, and two-spirited people[1] share similar and mutual care actions as well as accountability to each other. For example, Wabanaki sweetgrass gatherers receive similar teachings about caring for the plant, regardless of gender. Accountability for the health of a sweetgrass harvesting location is shared communally. A male berry picker in Alaska talked about harvesting as a process of gentle respect: 'Carefully pull the berries away from the plant and do not pull the roots out. That's killing them. So be careful with that. It reminds me of pulling somebody's hair or something. Yeah, like your kids' hair. You have to do it gently' (Interview: YB-MS on 5/27/2023). Another female, Yup'ik berry picker in Alaska, said: 'I cringe when I see the roots (of the berry)' (Interview: YB-D on 9/13/2022). Accountability and respect do not end after the harvest as one berry picker explained: 'We eat them (berries), and we share them, and we name them, and we talk about who picked them and where' (Interview: YB-RC on 5/24/2023).

4.3 | Care maintains connection with family, community and non-human kin

Being on the landscape, practicing care for plants, strengthens family and community networks and bonds, and is also part of the practice of caring for one another. The time spent together in the mutual practice of harvesting or processing plants, in reciprocal knowledge sharing or storytelling, in laughing and in learning are significant parts of care and stewardship. These practices maintain kinship with plants and with people who share mutual ancestry or community networks. People across communities often discussed practicing stewardship because they saw their grandmother doing so or because they were told to do so as children. As such, care and stewardship practices are shaped and guided by generational community and family units, extending to both other people and non-human kin. Karuk people continue to steward and care for plant assemblages across the landscape at the family level, as they have historically. Acorn trees have been managed and used for generations; great-grandmothers have been at the feet of the same trees harvested

[1]For more information, see Minnesota Indian Women's Sexual Assault Coalition (2014).

today, and their presence is still felt. Kathy McCovey described emotions that motivate care and stewardship, especially when seeing plant relatives in peril. She expressed feelings of worry and an obligation to respond to the needs of non-human kin: 'Whoa, that tree (black oak) is really stressed, I wish I could jump out [of this car] and free it' (Interview: KA-KM on 1/15/2019). This is a component of care that is emotive and oftentimes non-verbal.

Similarly, Yup'ik people usually visit berry patches that they care for as a family. Gatherers often discussed picking with their families and continuing to learn from older relatives as adults. Families frequently have ancestral berry-gathering grounds that other community members respect. Family and community generational connections shape how people care for and interact with the land, plants and other non-human kin:

> I was always taught by my Elders that you don't overpick one spot because it reduces the viability, or you're not leaving anything for the animals, you're not leaving anything for the plant to drop their berries and regrow (Interview: YB-CJ on 9/13/2022).

Indigenous care is strongest for people, family, relatives (including non-human kin) and places that are intimately known and thus cared for with the utmost respect (Whyte & Cuomo, 2016). Elder Wabanaki sweetgrass gatherers have been harvesting and caring for the same sweetgrass location for over 30 years. The care relationship extends outside of the saltmarsh and into the community. Sweetgrass is brought home and hung to dry where there is space. This may be in the kitchen or in a room dedicated to basket-making. Wabanaki sweetgrass harvesters' extended families experience sweetgrass through the grass's smell, which permeates the home during harvest season. For many Wabanaki people, the smell of sweetgrass evokes memories of a grandparent, an Elder or a particular time of their youth. This is connected to emotions for both people and the plant. Studies have found that people with generational connections to a place are better able to care for it in ways that are protective, sustainable and grounded in local and lived experiences of being there (Masterson et al., 2019). For example, Karuk respondents said things like: 'those were our homes. We lived there. We're supposed to take care of it'. (Interview: KA-JL on 7/24/2020) and 'I think a lot about our places' (Interview: KA-VP on 8/14/2020). Masterson et al. (2019) describe this as 'stewardship memory'.

4.4 | Care is embedded across the biophysical landscape

Care is sewn into the fabric of the landscape through acts of ecological stewardship that are visible through the presence of cultural plants, fire scars, new and young growth, plant growth forms, pruned berry bushes, picked berries, thriving sweetgrass or invisible but felt marks (treading lightly, giving thanks, asking permission and being present and in relationship with plants).

Environmental stewardship in the form of biophysical modifications to landscapes is a notable component of Karuk care. Kathy McCovey explained that Karuk landscapes consist of smaller areas of directed care and larger areas of expansive care. Karuk people care for stands of old-growth tanoak here, a huckleberry patch there, within the broader landscape. They tend these microclimates and spaces with an eye for the ecosystem and interconnections. The actions of care-motivated stewardship make food harvesting predictable and promote certain desirable qualities. For example, the act of picking up acorns keeps an area open. Burning acorn-gathering areas can deter infestations by filbert worm and filbert weevil, and the smoke cools the river during a time of year when it is hot for the salmon (Halpern et al., 2022; Karuk Tribe, 2019). Karuk ontology is embedded with cues for ecosystem management, and it is a system that is lived and carried out in partnership with the land and its multispecies inhabitants. Indicators of healthy plants and the ideal (desired) conditions of gathering places are taught as aspects of care and associated stewardship practices. Another example is pruning Yerba Buena tea by Karuk plant stewards, an act of biophysical care for the plant and future harvest: 'I went to almost every plant and cut off the tips. I left maybe 6 inches to probably 10 inches of vine. I am expecting that the ones that I pruned will have side sprouts coming off, which will eventually produce their own plants off the main stem' (Interview: KA-KM on 12/10/2019).

Comparatively, Yup'ik care for berries aims to leave little trace or evidence of disturbance to the land and plants. Several respondents said things like: 'You have to be very careful [when picking berries]' (Interview: YB-M&DN on 5/24/2023). Stewardship in the form of biophysical modification is not part of traditional practice among the Yup'ik People, reflecting the sensitivity and slow regenerative capacity of tundra and Arctic plants (see Mucioki et al., 2025). Similarly, Wabanaki sweetgrass gatherers observe the salt marsh to discern where people have already harvested and avoid those areas until the plants regrow. In this case, leaving some biophysical evidence of harvest communicates to others where to pick or avoid. People also practice rotational harvests for similar reasons.

Biophysical care of plants underscores the importance of Indigenous Knowledge of plant life history, disturbance requirements and responses, and essential knowledge for environmental stewardship (Baumflek et al., 2021). West et al. (2018, p. 2) suggest that centring care in stewardship shapes the 'kinds of knowledge considered relevant and the types of agency perceived as legitimate'. While they do not mention Indigenous actors or knowledge, our work makes it clear that care promotes the maintenance and generation of Indigenous knowledge and its essential contribution to global environmental challenges such as biodiversity conservation and environmental change (see, for example, Hankins, 2024).

4.5 | Care is reciprocal giving for the future

Caring for the land is a way of sharing with future generations of both human and non-human kin. Today, plant care is often central to biocultural restoration work in landscapes such as northern California, which

have been significantly altered by years of denial of Indigenous care and stewardship (Lake et al., 2018). Ultimately, at a time of very evident stress and decline of many plant species and ongoing consequences of fire suppression in Karuk territory, 'Anything that you don't do to it-- doing nothing is a decision' (Interview: KA-LMH on 10/10/2020)—a decision that will continue to perpetuate the amplifying stressors of climate change and mismanagement and constrain Indigenous governance in this region. Enacting care is a future-oriented decision that may not be fully realized in this generation but is instead transferred to and through subsequent generations. Consider care and stewardship as planning for the future desired condition. One Karuk participant noted: 'This isn't even gonna be for you guys' generation as far as the tanoaks go, if we restore those. That'll be for your kids this generation. So we're a ways off, but we have to start now' (Interview: KA-CH on 8/14/2020). Moreover, today's caretakers are receiving care from people before them who may no longer be present. In this sense, care can transcend time. This process of generational care for people and ecological spaces is also mentioned by Lin and Robin (2025). Caring in this way is a generational responsibility; it may ultimately teach people how to care in general (Kimmerer, 2022).

4.6 | Care as an act of resistance and healing

In our study, colonization and the resulting contemporary land and management jurisdictions and practices can curtail Indigenous Peoples' ability to care for land and plants. Caring can motivate political acts of resistance to counter the violence of colonization. Generational relationships through sustained stewardship and consumption of plants reaffirm Indigenous identity and sovereignty (Correia et al., 2025; Whyte & Cuomo, 2016). Care comes with fighting off modes of neglect in the forms of colonial policies of fire suppression or harmful development like dams on rivers or industrial resource extraction like mines or pipelines that can pollute and contaminate. Ongoing care in this manner is undertaken by protectors or guardians (see First Nations National Guardians Network, 2025; Reed et al., 2021). For example, Karuk and other Klamath River-based Tribes have spent more than 20 years advocating for dam removal to restore the health of salmon and waterways. In Dillingham, Alaska, care is demonstrated by advocacy against the Pebble Mine (Johansen 2023). Caring for something (and not just about it) can be all-consuming (Cusworth, 2023), and we particularly observe this in the ongoing efforts of many Indigenous stewards to revitalize care on Indigenous lands. The rematriation movement works to reclaim Indigenous lands and honour Indigenous practices and knowledge systems, thereby shifting power, centring healing and restoring balance (Hill et al., 2024). After centuries of colonial impacts on gender norms and relationships (Norgaard et al., 2018), uplifting and valuing feminine work of care affirms and centres vital everyday actions, respect of and accountability to women, and ways of doing, relating, and thinking that are essential to life (De la Bellacasa, 2010). Within Karuk territory, working with fire has become a very macho or masculine activity driven by wildland fire (suppression) crews and male dominated Forest Service personnel (Eriksen & Hankins, 2015). The Karuk Tribe is working to balance these roles by offering female-only fire-training opportunities led by Karuk practitioners (Oaster, 2022).

When relationships with plants and land are disrupted, and communities are unable to fulfil their responsibilities for care, plant health and harvests can suffer and decline. Karuk practitioners emphasized that if plants cease to be productive and provide, this indicates they are in need of care. Restoration through care is part of natural law (Hankins, 2024), identity, and responsibility to the earth for Karuk People: 'We're 'take care of the earth' people. So they come up here (sturgeon), we take care of them. We provide them with the habitat so they can grow and thrive. And that habitat that was here isn't here anymore. And it's our job as 'fix the earth people' to fix it' (Interview: KA-KM on 8/14/2020). Similarly, gatherers expressed that the health of sweetgrass in Acadia National Park had suffered due to a lack of Wabanaki care. A late Passamaquoddy Elder, MNP, noted that there would be more sweetgrass in the marsh if people had been picking it. Other gatherers shared that sweetgrass can 'choke itself out' if it is not harvested and that sweetgrass had disappeared entirely from some locations outside of the park in the absence of care. Several long-experienced gatherers emphasized that picking was a form of thinning, which was necessary for new grass to grow. People described the importance of harvesting larger sweetgrass culms to create space and light conditions for younger growth to develop and thrive. FF, a Passamaquoddy basketmaker who has been harvesting sweetgrass for over 40 years, explained, 'You see this taller grass that's in here beneath it, there's little guys, and they want their chance in the sun' (Interview: WS-FF on 7/23/2018). Her son, GF, noted that, 'if you take the stuff that's really well established, then it makes room [for smaller plants to grow]' (Interview: WS-GF on 7/27/2017). The Sweetgrass Cultural Protocol was developed in partnership with Wabanaki Nations and Acadia National Park staff to support the care of sweetgrass and sustained harvest (Anderson et al., 2023).

4.7 | Conceptualizing care as central to Indigenous environmental stewardship

Our paper focuses on the meanings and practices of care as integral to Indigenous environmental stewardship of land and plants. While Indigenous people have spoken about their caretaking responsibilities, this expression is often missing within stewardship literature. Additionally, in care literature, care is often presented metaphorically rather than as a method with suggested applications and actions. Our thoughtful examination of the intersections between care and stewardship has highlighted the many aspects of care evident in Indigenous plant stewardship. It has helped illuminate significant differences between what stewardship means for Indigenous communities and how it is operationalized in other contexts, including by state and federal institutions.

In Figure 2, we present a visual representation of the intertwined themes and elements of care identified in Indigenous plant stewardship practice. A collective land ethic for the governance of plants and environments, as illuminated in this research, centres on types of care, including Indigenous-led stewardship that spans generations within and among families and communities. This includes centring not only women as caretakers but also two-spirited people and men, sharing collective roles of caring that celebrate feminine labour and ethics. Care includes profound observation and listening in place with plants to understand their needs, to earn consent, and grow relationship and responsibility (Figure 2). It involves incorporating emotional bonds with cultural plants, valuing how plants support and sustain culture, and how Indigenous people, in turn, support and sustain the cultural plants (Figure 2). Harvesting with care is not merely taking, but rather a conversation with cultural plants, supported by generational knowledge of how to harvest as a form of care for the plant and the larger system (Figure 2). The care we see in plant stewardship is thinking, acting and reciprocal giving for the future of people and the environment, centred on the relational needs of non-human kin and humans alike, with no borders or boundaries among beings (Figure 2). Care spans generations, interconnecting family and community over time. Care is done with practices of mutual respect, agency and consent. Care requires relationships with the environment and people and is part of the responsibility to all interconnected beings and the Creator. Being a caretaker and the knowledge and experience gained from doing the hard work are often prerequisites for relationships with and access to non-human kin. Some places continue to exhibit decades of evidence of care through biophysical marks like slope terracing, trenching and mounding with-soil and rock formations, the shape (structure) of trees, fire scars, clustering of cultural species, managed patches of berries or disjunct plant populations (Armstrong et al., 2023; Keener & Kuhns, 1998). Reciprocity is an action and a value among Indigenous Peoples that connects them to the land and plants, to one another and to past and future generations (Nadasdy, 2003; Quaempts et al., 2018). Reciprocity is one of the most common threads across other works that also discuss elements of Indigenous environmental stewardship: like Armstrong et al. (2024) (reciprocity as central to Indigenous stewardship), Fisk et al. (2025) (reciprocity as means to decolonialize Natural Resource Management Institutions), Lin and Robin (2025) (reciprocity as an obligation or responsibility to the land), Locqueville et al. (2025) (reciprocity de-centres hierarchy of human needs) and David-Chavez et al. (2024) (reciprocity is part of doing relational science).

5 | CONCLUSION

In this paper, we conceptualize and demonstrate that care holds meaning and action in how Indigenous people in Maine, Alaska and California steward and relate to not only plants but also land, environment, one another and all beings. In doing so, we contribute to both the theory and application of environmental stewardship, Indigenous stewardship and care by:

1. Presenting a concurrently theoretical and action-oriented conceptualization of Indigenous environmental stewardship where care is integral and inherent to stewardship led by Indigenous People. Our conceptualization centres on care as one aspect of Indigenous environmental stewardship, a dimension that has been underrecognized in the literature. Indigenous co-authors expressed care in different ways: as inseparable from stewardship; as a spectrum of stewardship that aligns more closely with Indigenous worldviews and practices; and as a communal responsibility and way of life.
2. Showing that stewardship lives in many contexts and definitions that can be aligned or misaligned with Indigenous environmental stewardship. Although often used in Indigenous contexts of environmental relationships, the term stewardship (like management) is recognized as having colonial origins. Aligning care with stewardship requires reciprocity, relationship and responsibility in concert, something that stewardship alone does not require. Care-centred stewardship challenges Western paradigms of environmental management and governance by reframing co-stewardship not as institutional partnership alone, but as an ethical and relational process with other people, the land and plants and animals. It also pushes for Indigenous leadership in environmental stewardship. Indigenous environmental stewardship is guided by beliefs, values, identities, relationships and responsibilities that are not available to, or are not the same for, non-Indigenous People (e.g. Teixidor-Toneu et al., 2025).
3. Illustrating examples of care as part of Indigenous environmental stewardship of cultural plants like sweetgrass, acorns, berries and more underscores their biocultural significance. The theory is derived from the Indigenous relationship with plants and actions of stewardship lived and sustained by Indigenous plant gatherers and caretakers.
4. Guiding and challenging responsibility to care by many people who work in environmental spaces, with recognition that responsibilities and actions look different depending on Tribal affiliation (or not) and institutional and professional roles.

This paper brought together Euro-American, Karuk, Maliseet and Yup'ik researchers and practitioners across multiple institutions and sectors. Groups of authors had existing relationships within their respective projects, and new relationships were forged through our collaborative process. Our reflexive, cross-cultural, institutional and sector collaboration necessitated iterative oral discussion, both as a whole group and within smaller subgroups. Even with those discussions, documenting our work in English, preferential to Euro-American epistemologies and sub-conscious framing from western academic positionalities, can make it challenging to fully grasp Indigenous epistemologies of care that cannot be expressed through words, especially through the English language. Indigenous authors were intentional in emphasizing that care, expressed within this paper, is a concept and action owned by Indigenous people. In centring this, authors continuously navigated the intention of this paper, the audience we were writing to, as well as the benefit to Indigenous People. Each

of us was reflective of what we had to offer and knowledge we could share based on our research and lived experience and were careful not to wander too far outside of our present offerings to areas that we could not or should not speak to. Lastly, the nature of the paper did lean towards consensus rather than divergence, and each community holds unique elements of care that can be respectively dug into further beyond what we could communicate in this paper.

Care is an essential part of Indigenous well-being, stewardship practices, relations and responsibility towards plants, lands and other more-than-human kin. Expecting care as part of collaboration and stewardship pushes all collaborators to maintain a particular ethical and moral obligation of mutual respect, responsibility and reciprocity towards one another and the environment. It also promotes the application of Indigenous-centred stewardship and sovereignty, rather than stewardship applied for other purposes or contexts or colonial-imposed self-determination. Care has the potential to shape and shift ontological thought regarding how research and stewardship collaboratives approach challenges such as biodiversity conservation, restoration, responses to climate change and natural hazards. It also has the potential to prompt meaningful individual and collective action. Care thus becomes essential—not as an addition to stewardship, but as its foundation.

AUTHOR CONTRIBUTIONS

All authors conceived the ideas, designed the methodology and collected the data. Megan Mucioki, Michelle Baumflek, Suzanne Greenlaw, Jennifer Sowerwine, Daniel Sarna-Wojcicki and Bronwen Powell analysed the data. Megan Mucioki led the writing of the manuscript with significant contributions from all authors. Megan Mucioki, Michelle Baumflek, Suzanne Greenlaw, Frank Lake, Davin Holen, Kathy McCovey, Helen Aderman, and Bronwen Powell played significant roles in revising the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

No conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The interview data are not publicly available, guided by protocols for Tribal data sovereignty, Tribal and university ethics, and the protection of sensitive, sacred and identifiable information.

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