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Cannabis Impacts on Native Lands: On the Need for Inclusion of Native Perspectives in Extension Work

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Cover Page Footnote

1 This research was supported by a Department of Cannabis Control Academic Research Award. We are grateful for DCC's interest and investment in understanding cannabis impacts on Native lands. 2 Here the "Handbook of North American Indians Volume 8" ethnolinguistic map is employed to broadly represent Ancestral Tribal Territories. While not a representation of current reservation land or of current boundaries of individual Tribes, this map represents the extent of California land as Indigenous Land, an important component of understanding that all land in California has cultural significance to Tribes and requires protection under AB 52.

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Cannabis Impacts on Native Lands: On the Need for Inclusion of Native Perspectives in Extension Work

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Abstract.This article highlights the need for Cooperative Extension to increase awareness of Tribal concerns around activities that impact land, natural resources, and water. A research team at UC Berkeley worked with a Tribal Advisory Committee to conduct a survey of Tribal representatives' perceptions of cannabis impacts on Native lands and cultural resources. The results show that there is widespread concern among Native communities about the environmental impacts of cannabis cultivation, especially to water quality, access, and availability. These concerns underscore the need to include Native communities in Extension's agricultural and natural resource activities across all regions and sectors.

INTRODUCTION

The U.S. Cooperative Extension system was founded through the expropriation, distribution, and sale of Native lands (Joseph Myers Center, 2020; Lee & Ahtone, 2020). Yet apart from several successful long-term Tribal-University partnerships (e.g. Sowerwine et al., 2019; Martenson et al., 2011), Extension services do not adequately reach Tribal communities. A lack of knowledge and funding limits relevant Extension programming for Tribal communities (Emm & Breazeale, 2008). For example, existing programs—such as the USDA-funded Federally Recognized Tribes Extension Programs (formerly the Extension Indian Reservation Program), the 1994 Tribal Colleges Extension Program, and early Tribal Extension programs—reach only 10% of Native populations on reservations (Hiller, 2005). Moreover, reservation lands are not the only areas of concern to Native American and American Indian (Native) communities. Many contemporary Native communities sustain connections with traditional sacred and historic sites, including village and gravesites, ceremonial sites, gathering and hunting sites, and other landscape features woven into Native identity and practice (Baldy, 2013). Hence, Native communities have a vested interest in areas used for agriculture and forestry, including areas outside of Native ownership and control.

The connection between Native communities and sites of cultural practice and identity recently entered the legal lexicon as "Tribal Cultural Resources" (TCRs) in California Assembly Bill 52 (AB 52) . As defined in AB 52, TCRs are "sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a tribe" that are either listed or eligible for listing in local, state, and national registers of historical resources (§21074). Importantly, TCRs are not only objects of historical interest to archeologists; they are also areas and landscape features of contemporary use and significance to Tribes. The prevalence of TCRs throughout rural areas underscores how Native communities are indirectly affected by Extension services and why they need to be included as partners in our work. The inclusion of Native perspectives in Extension initiatives and programming should be a priority across land-grant institutions.

This article highlights the need for Cooperative Extension to strengthen partnerships with Tribes and include Native perspectives in Extension work while paying special attention to agriculture and natural resources. In personal communications, two authors of this study—both Cooperative Extension specialists at UC Berkeley—learned that Tribes were concerned about the impacts of cannabis cultivation on TCRs. After cannabis production became legalized with the passage of California Proposition 64 in

2016, a Tribal colleague raised concerns about additional potential for adverse impacts on Native communities and the general issue of Tribal sovereignty over the permitting process of non-Tribal cannabis grows on ancestral lands (L. Hillman, personal communication, 2018). Another study author heard about the co-location of cannabis grows within TCRs and ancestral territories in Northern California. These conversations led the authors to inquire whether other Tribes might be facing similar concerns, what other concerns Tribes have, and whether and how those concerns are being addressed by county and state agencies. Further inquiry demonstrated that rural counties in California are experiencing extensive development in cannabis facilities and infrastructure in areas that are home to a high proportion of Tribal nations in California. Tribal concerns about unregulated cannabis production on cultural and environmental resources also appeared in local news outlets (Kemp, 2018, 2022). These factors led the study's authors to propose a project to document the threats of cannabis to TCRs—threats that may be new following the legalization of cannabis—and what we can learn from this emergent industry about how to better protect TCRs.

In Summer 2022, a collaboration between UC Berkeley researchers and a Tribal Advisory Committee, funded by the California Department of Cannabis Control, surveyed Tribal representatives about their perceptions of cannabis impacts on Tribal territories, Native ancestral homelands, and cultural resources. The survey examined concerns about different cannabis-related activities and perceptions of their social, environmental, and economic impacts. Survey responses varied significantly, suggesting different priorities for the cultivation and adult use of cannabis across Tribal governments and geographic regions and highlighting the importance of local-level engagement in Extension work. The survey found that Tribal governments are generally in favor of the transition from the unregulated to the regulated cannabis market with potential opportunities to either participate in or help regulate, via the consultation process, cannabis production on Tribal ancestral lands. The survey also found that among the different social, environmental, and economic impacts of cannabis cultivation, Tribal governments perceive the strongest impacts to be those related to the environment, especially in terms of water quality, access, and availability. Respondents' concern about the impact of cannabis production on the environment and on other cultural resources underscores Extension's work to address Native concerns across all agricultural and natural resource sectors. Including Native perspectives in land use and management is essential for protecting Tribal Cultural Resources, including the natural environment.

SPATIAL ANALYSIS OF CANNABIS IMPACTS

All of California is Native ancestral land, not just the areas within reservation boundaries. Here we provide a visual representation of the extent of legal cannabis cultivation in California and the potential for adverse impacts to Tribal ancestral territories.

Figure 1 spatially represents Department of Cannabis Control (DCC) permit data for legal cannabis grows in the state. In Northern California, these grows are concentrated in Humboldt, Trinity, and Mendocino counties (also known as the "Emerald Triangle"), which is recognized as the historic center of illicit and medical cannabis production (Polson, 2021). Figure 2 shows the same parcel layers, coded for density, from the 1978 "Handbook of North American Indians, Vol. 8." TCRs in these territories are disproportionately impacted by cannabis cultivation. To access remote regions, cannabis cultivators have relied on the historic corridors of California Indian trails, many of which are culturally significant to Tribes. Additionally, the same factors that make an area ideal for cannabis cultivation—such as elevation, slope, aspect, and the presence of a natural water source—also make it suitable for cultural use, indicating that cannabis cultivators have actively selected for TCRs (S. Lazar, personal communication, 2022; J. Eidsness, personal communication, 2022). A geospatial analysis of DCC parcel data juxtaposed on Native ancestral land reveals that 27 of

Figure 1. Department of cannabis control parcel layers.

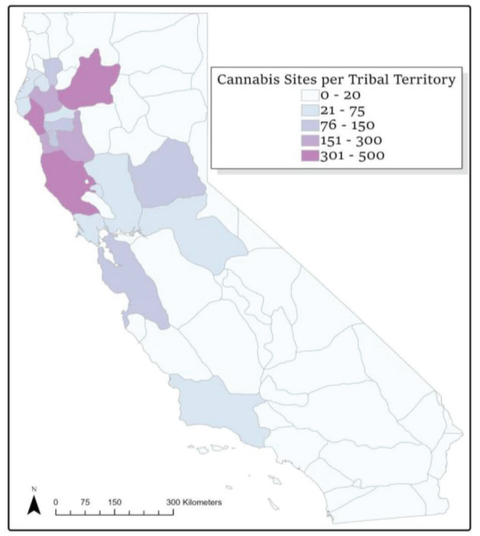

Figure 2. Density of legal grows on ethnolinguistic map.

72 distinct ethnolinguistic territories (37.5%) contain at least one permitted cannabis agricultural site, with some territories containing several hundred sites.

Figure 3 displays the outline of Bear River's ancestral territory (7288km^2), used with permission from the Bear River Band of the Rohnerville Rancheria, a federally recognized Tribe in Northern California. The red pin and inset map mark the location of Bear River's reservation land, totaling 0.74km^2 or the equivalent to 0.0001% of their ancestral territory. The other red pins on the map are Trinidad Rancheria, Blue Lake Rancheria, and Table Bluff Reservation.

This map demonstrates the extent of ancestral territory beyond reservation lands and the potential for adverse impacts from cannabis cultivation. Of the 2,670 cannabis cultivation permits issued in California, 919 permitted cannabis sites (34%) fall within Bear River's ancestral territory, not including any in-process provisional permits or illegal grows.

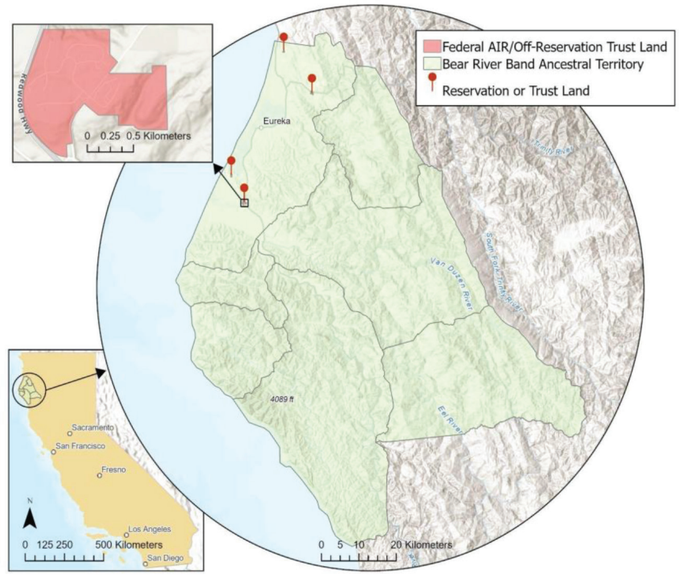

Figure 3. Aboriginal territory of Bear River band.

METHODOLOGY

SURVEY DESIGN

Using participatory action research (Adelman, 1997) and Indigenous methodologies (Kovach, 2021), the University of California researchers (UC) convened a Tribal Advisory Committee (AC) to co-develop key questions through an iterative series of conversations. The UC team consisted of two Extension specialists, one non-Extension faculty person, one post-doc, and one doctoral student. The seven members of the AC included Tribal Historic Preservation Officers (THPOs), a cultural resource specialist, and a Tribal Chair, all of whom have direct experience with the impacts of cannabis on Native lands and cultural resources. Through an iterative series of conversations, UC asked the AC to identify their concerns about cannabis cultivation and related cannabis activities. UC aggregated these concerns and used them to develop specific survey questions, which they refined and expanded through further discussion with the AC.

The survey asked respondents to report on the prevalence and types of cannabis grows on trust lands (including reservations) and in culturally affiliated areas. We also asked respondents to state whether their Tribe has an official policy on cannabis cultivation. Then, using questions with Likert-scale response options, we asked respondents to rate their level of concern regarding different cannabis-related activities, including legal grows, illegal grows, the permitting process, and the ability of Tribes to grow, process, and sell cannabis in the State-regulated market. Finally, we asked respondents to evaluate cannabis impacts to cultural and natural resources—such as water quality, water availability and access, and ecosystems and wildlife—as well as impacts to economic opportunities, housing and cost of living, and community health.

The AC helped to distribute the survey and made sure that the survey distribution strategy was politically appropriate; for example, they directed UC to get authorization from Tribal Chairs to collect data. Subsequently, UC shared their findings with the AC and invited them to give feedback on analysis and contributions to presentation materials and publications.

SURVEY DISTRIBUTION

The UC team obtained approval from UC Berkeley's Institutional Review Board (Protocol #2021–11–14791) to conduct research with human subjects and from the California Regional Indian Health Board (CRIHB, Protocol #2020–003), as requested by UCB's Office for the Protection of Human Subjects. This additional level of review helps to ensure that the research will promote the health and social goals of Native communities in California. After developing the survey, the research team (UC and AC) piloted the survey with members of the AC. The surveys were available online through the Qualtrics survey platform in July 2022.

The research team disseminated the survey in two ways. First, we procured the Native American Heritage Commission (NAHC) Tribal contact list, which includes California Native American Tribes (both federally recognized and federally unacknowledged). Using this list, we reached out to Tribal Historic Preservation Officers (THPOs), cultural resource specialists, and Tribal Chairs. The THPOs, Tribal Chairs, and other Tribal officials we contacted are well qualified and have the experience to speak to concerns about cannabis impacts since they are responsible parties for the political, cultural, and economic life of their Tribes and are the first point of contact for public agencies, including planning offices. Moreover, these Tribal officers are typically authorized to interact and speak on behalf of the Tribe on official matters such as land use issues. Some Tribal research protocols require permission from the Tribal Chair to involve Tribal members in a research study, so we copied Tribal Chairs when contact information was available so they could be aware of our request. Through follow-up emails, we targeted Tribes in regions that have a high density of cannabis cultivation, such as those in the Emerald Triangle and in Coastal California between the San Francisco Bay area and Los Angeles.

Second, we distributed an anonymous survey link through our networks, which included UC's collaborators from previous projects and the AC's professional networks. Since the NAHC list is incomplete and out-of-date, it is often necessary to rely on personal contacts to reach the appropriate audience.

Using the first, individualized dissemination strategy, we sent the survey (and several reminders) to 244 distinct email addresses and received a total of 37 usable responses (a 7% response rate). We do not know how many emails were sent out using the second, snowball method, but we received nine additional survey responses.

RESULTS

Overall, we received 46 surveys sufficiently complete for analysis; we eliminated 9 surveys for insufficient data. Since responses to individual questions were optional and some surveys were only partially completed, the number of responses varies between questions.

TRIBAL IDENTITY, FEDERAL RECOGNITION, AND WORK AFFILIATION

Thirty-five out of 46 respondents (76%) identified as Native American, and 39 out of 46 respondents (84%) work for a Native American Tribe in California. Of the 39 respondents who work for a Tribe, 31 (79%) work for a Tribe that is federally recognized and eight (21%) work for a Tribe that is not federally acknowledged (Figure 4). Twenty-five work in Tribal government, 25 as Tribal staff, six as volunteers, and three as consultants; many of the respondents work in multiple roles. Several respondents declined to answer (Figure 5).

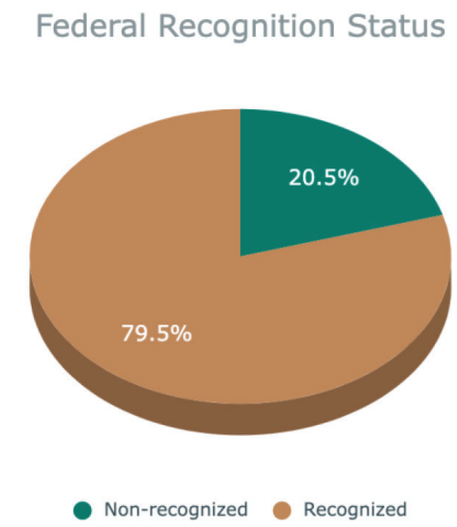

Figure 4. Federal recognition status of survey respondents' tribes.

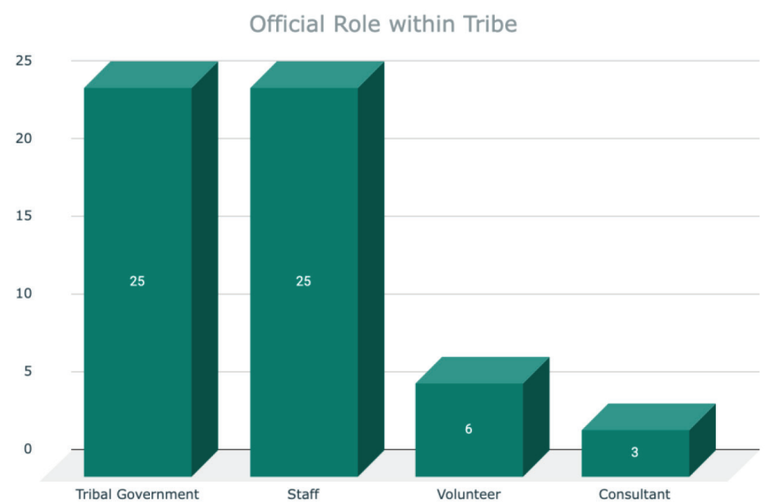

Figure 5. Respondents' official roles within tribe.

Survey respondents who indicated they were enrolled citizens of a Tribe may have worked for their own Tribe or another Tribe. We asked respondents who are both enrolled citizens and who work for a Tribe to answer the remaining survey questions from the perspective of their official role working for a Tribe. Two participants who did not identify as Native American and do not actively work with a Tribe were routed to the end of the survey. Hence, the following responses come from a maximum of 44 respondents, nine of which were coded as non-federally recognized based on the Tribe for which they offered a response. Response rates to specific questions vary.

LEGAL STATUS OF CANNABIS GROWS ON NATIVE LANDS

The first set of questions asked about the legal status of cannabis grows *within* the Tribe's trust or reservation lands, *outside* the exterior boundaries of any trust lands, and whether the Tribe has an official policy on cannabis cultivation.

Legal Status of Grows on Trust Lands

Out of 43 respondents reporting on the permitting status of cannabis grows within the boundaries of the Tribe's trust or reservation lands, seven (16%) reported that the Tribe has no lands in federal reservation or trust status. This leaves 36 respondents who answered in the context of having federal trust lands. Of those, 21 (58%) reported that there are no cannabis grows on the Tribe's federal trust lands, three (8%) reported permitted grows only, five (14%) reported

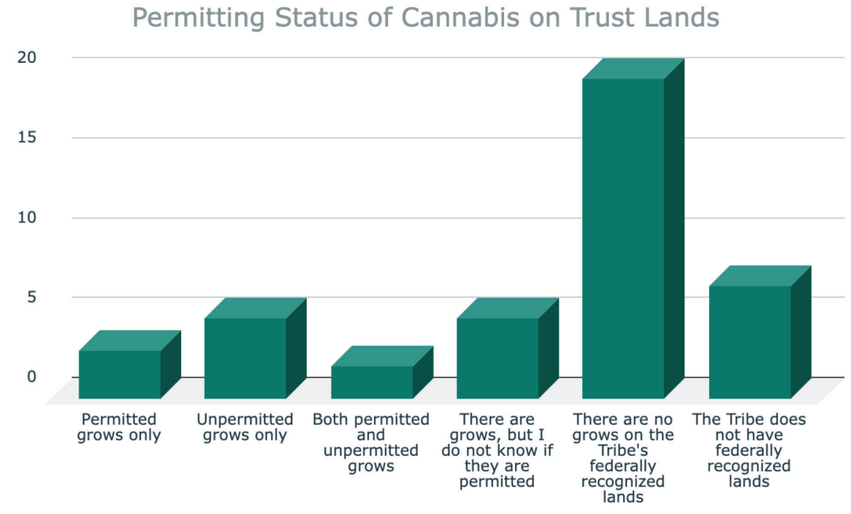

Figure 6. Permitting status of cannabis on Trust Lands. Most Trust lands have no cannabis grows.

unpermitted grows only, and two (6%) reported a mix of permitted and unpermitted grows. An additional five respondents (14%) were aware of grows but unsure of their status (Figure 6). This question assumes that non-federally recognized Tribes do not have trust or reservation lands.

Legal Status of Grows Outside of Trust Lands

Out of 44 respondents reporting on the permitting status of cannabis grows on culturally affiliated lands outside the boundaries of any trust lands, 19 (43%) reported a mix of permitted and unpermitted grows, 14 (32%) were unaware of any grows, five (11%) reported permitted grows only, three (7%) reported unpermitted grows only, and three (7%) were aware of grows but unsure of their status (Figure 7). Of the nine non-federally recognized respondents, five were unaware of any grows, two were aware of both permitted and unpermitted grows, one was aware of permitted grows only, and one was aware of unpermitted grows only.

Tribes with Official Policy on Cannabis Cultivation

The 43 respondents reporting on whether the Tribe has an official policy on cannabis cultivation on Tribal lands indicated that only 10 Tribes (23%) have an official policy on cannabis cultivation: five allow it and five prohibit it. Seventeen (40%) do not have an official policy on cannabis cultivation. Seven respondents (16%) were unsure whether the Tribe had a policy and an additional nine (21%) declined to answer (Figure 8). Of the eight non-federally recognized respondents, three declined to answer, two had an official policy prohibiting cannabis cultivation, two did not have an official policy on cannabis cultivation, and one was unsure whether the Tribe had a policy.

CONCERNS ABOUT CANNABIS-RELATED ACTIVITIES ON TRIBAL LANDS

The next set of questions asked respondents to evaluate their level of concern regarding different cannabis-related activities on Tribal lands, including illegal cultivation, legal cultivation, cannabis permitting, and the ability of the Tribe to grow, process, and sell cannabis (Figure 9).

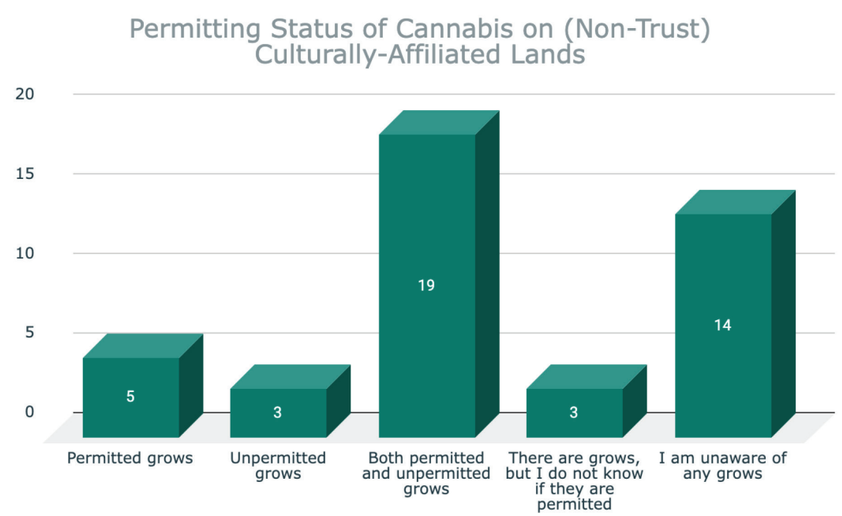

Figure 7. Permitting status on non-trust, culturally affiliated lands.

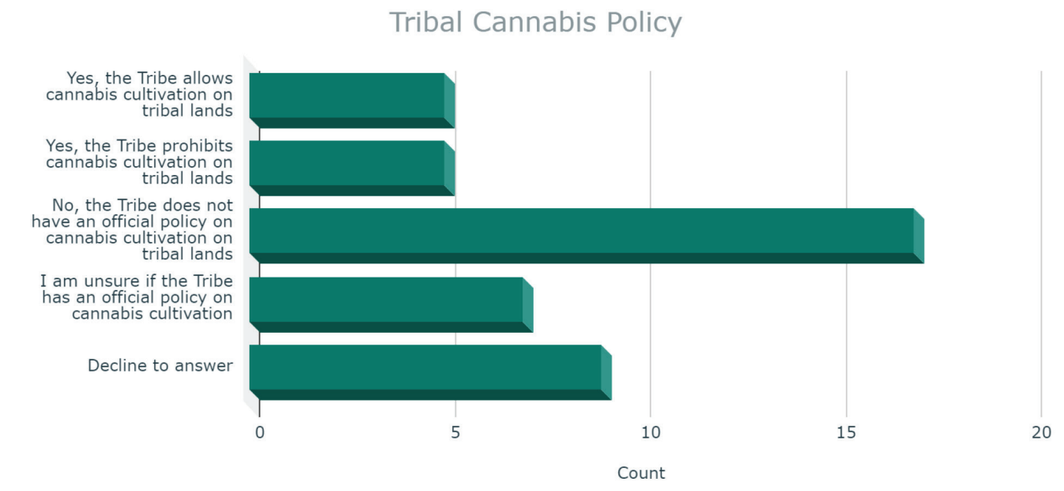

Figure 8. Tribal cannabis policies..

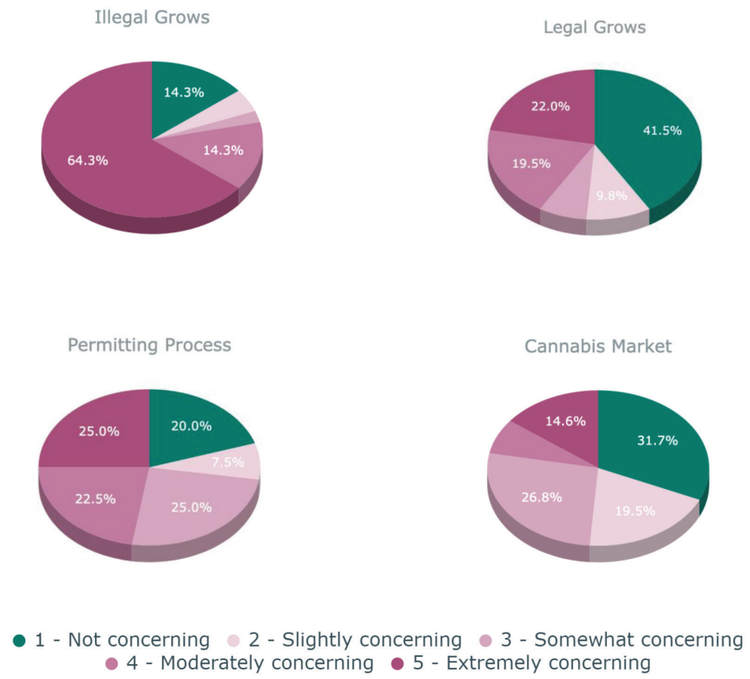

Figure 9. Concerns about different cannabis-related activities. Higher levels of extreme concern regarding illegal cannabis indicates that Tribes are in favor of the transition to the legal market. However, the permitting process and the cannabis market were also of high concern to Tribes

Concerns about Illegal Grows

Forty-three respondents reported their level of concern regarding illegal grows. Thirty-six (84%) were concerned about illegal cultivation on Tribal lands; 27 (63%) were "extremely concerned." Only seven (16%) reported no concern. Respondents from non-federally recognized Tribes reported similar levels of concern: seven of eight were "extremely concerned" while the remaining respondent reported no concern.

Concerns about Legal Grows

Forty-two respondents reported their level of concern with regard to legal grows. Twenty-four (57%) were concerned about legal cultivation on Tribal lands: nine (21%) were "extremely concerned," eight were (19%) "moderately concerned," three (7%) were somewhat concerned, and four (10%) were only "slightly concerned." Eighteen (43%) respondents reported no concern. A higher percentage of non-federally recognized respondents reported concern with legal grows: two of eight were "extremely concerned," three were "moderately concerned," and only two reported no concern.

Concerns about the Cannabis Permitting Process

41 respondents reported their level of concern about the cannabis permitting process. Thirty-two (78%) were concerned: 10 (24%) were "extremely concerned," nine (22%) were "moderately concerned," 10 (24%) were "somewhat concerned," and three (7%) were only "slightly concerned." Nine (22%) respondents reported no concern. Non-federally

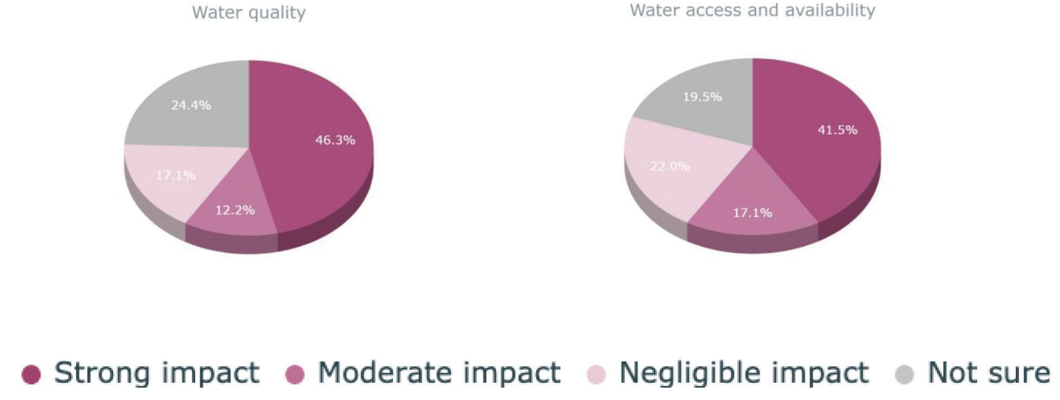

Figure 10. Perceived impacts to water quality, access, and availability.

recognized respondents reported similar levels of concern: three of eight were "extremely concerned," two were "moderately concerned, and two reported no concern.

Concerns about the Tribe's Ability to Grow, Process, and Sell Cannabis

Forty-two respondents reported their level of concern regarding their Tribes' ability to grow, process, and sell cannabis. Twenty-eight (66%) were concerned: six (14%) were "extremely concerned," three (7%) were "moderately concerned," 11 (26%) were "somewhat concerned," and eight (19%) were only "slightly concerned; 14 (33%) reported no concern. Non-federally recognized respondents reported similar levels of concern, with four of seven concerned to some degree and three of seven reporting no concern.

Short-Answer Descriptions of Concerns

Ten respondents wrote in short answers to further explain their concerns, citing water use and water-related concerns (40%), Tribes' ability to own and operate a marijuana business (20%), the permitting process (10%), illegal grow removal (10%), and drug abuse (10%).

CANNABIS IMPACTS

The next set of questions asked respondents to evaluate the impact of cannabis on different areas of concern, including water access and availability, water quality, ecosystems and wildlife, TCRs, economic opportunities, community health, and housing/cost of living (Figures 10, 11, 12).

Impacts to Water Quality

Forty-one respondents reported their perceived impacts on water quality. Twenty-four (59%) reported some level of impact: 19 (46%) reported a "strong impact," five (12%) reported a "moderate impact," and seven (17%) reported a "negligible impact." An additional ten (24%) were unsure of the impact of cannabis cultivation on water quality. Non-federally recognized respondents reported similar levels of impact: four of eight reported a "strong impact," one reported a "moderate impact," one reported a "negligible impact," and two were unsure of the impact.

Impacts to Water Access and Availability

Forty-one respondents reported on impacts to water access and availability. Twenty-four (59%) reported some level of impact: 17 (41%) reported a "strong impact," seven (17%) reported a "moderate impact," and nine (22%) reported a "negligible impact." An additional eight (20%) were unsure of the impact of cannabis cultivation on water access and availability. Non-federally recognized respondents reported similar levels of impact, with five of eight reporting a "strong impact" and only one reporting a "negligible impact."

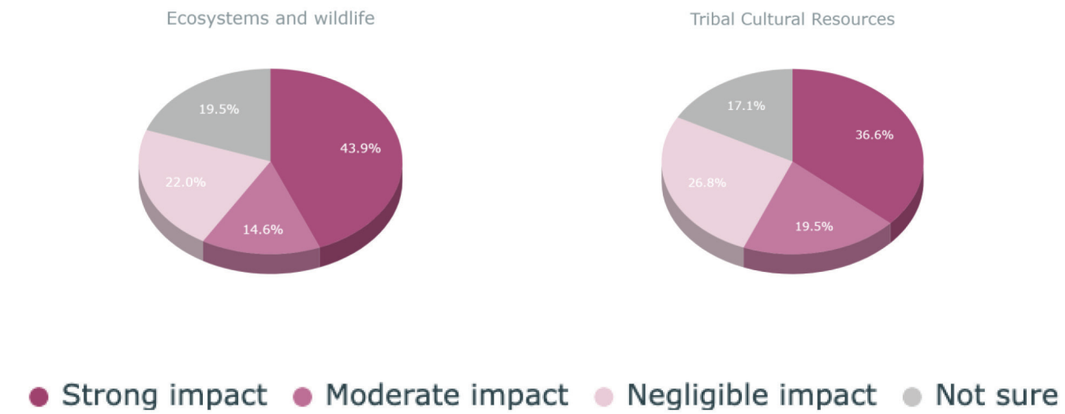

Figure 11. Perceived impacts to ecosystems, wildlife, and tribal cultural resources.

Impacts to Ecosystems and Wildlife

Forty-one respondents reported on impacts to ecosystems and wildlife. Twenty-four (59%) reported some level of impact: 18 (44%) reported a "strong impact," six (15%) reported a "moderate impact," and nine (22%) reported a "negligible impact." An additional eight (20%) were unsure of the impact of cannabis cultivation on water access and availability. Non-federally recognized respondents reported similar levels of impact: five of eight reported a "strong impact," one reported a "moderate impact," one report a "negligible impact," and one was unsure of the impact.

Impacts to Tribal Cultural Resources

Forty-one respondents reported on impacts to TCRs. Twenty-three (56%) reported some level of impact: 15 (37%) reported a "strong impact," eight (20%) reported a "moderate impact," and 11 (27%) reported a "negligible impact." An additional seven (17%) were unsure of the impact of cannabis cultivation on Tribal Cultural Resources. A higher percentage of non-federally recognized respondents reported impacts to TCRs: four of eight reported a "strong impact," two reported a "moderate impact," and only one reported a "negligible impact." The remaining respondent was unsure about impact.

Impacts to Economic Opportunities

Forty respondents reported on impacts to economic opportunities. Twenty-two (55%) reported that cannabis was impacting economic opportunities: 11 (28%) reported a "strong impact," 11 (28%) reported a "moderate impact," and six (15%) reported a "negligible impact." An additional 12 (30%) were unsure of the impact of cannabis cultivation on economic opportunities. A lower percentage of non-federally recognized respondents reported impacts to economic opportunities, with only one of eight reporting a "strong impact," three reporting a "moderate impact," and two reporting a "negligible impact." Two of the eight were unsure about economic impact.

Impacts to Community Health

Forty-one respondents reported on impacts to community health. Twenty-two (54%) reported that cannabis was impacting community health: 11 (27%) reported a "strong impact," 11 (27%) reported a "moderate impact," and eight (20%) reported a "negligible impact." An additional 11 (27%) were unsure of the impact of cannabis cultivation on community health. A higher percentage of non-federally recognized respondents reported impacts to community health, with four of eight reporting a "strong impact," one reporting a "moderate impact," one reporting a "negligible impact," and two unsure about impact.

Impacts to Housing and Cost of Living

Forty respondents reported on impacts to housing and cost of living. Fifteen respondents (38%) reported that cannabis was

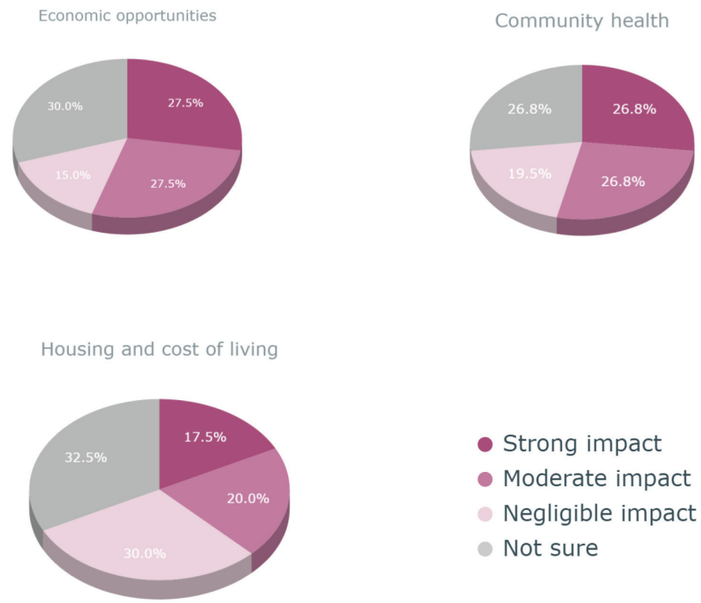

Figure 12. Perceived impacts to economic opportunities, community health, and housing and cost of living.

impacting housing and cost of living, with 7 (18%) reporting a "strong impact," 8 (20%) reporting a "moderate impact," and 12 (30%) reporting a "negligible impact." An additional 13 (33%) were unsure of the impact of cannabis cultivation on housing and cost of living. Non-federally recognized respondents reported similar levels of impact, with one of seven reporting a "strong impact," one of seven reporting a "moderate impact," two reporting a "negligible impact," and three unsure of the impact.

Short-Answer Descriptions of Impacts

Of the nine respondents who wrote in short answers explaining the impacts above, five (56%) focused on impacts to water quality. For example, one respondent wrote: "The [river] which runs through the reservation began experiencing cyanotoxins in the flow and it is related to permitted grows and fertilizers. This is a danger to drinking water and swimming." Another respondent wrote: "The areas affiliated with the Tribe have illegal grows that are damaging to water supply and utilize water in drought-ridden areas. They have a negative impact on wildlife and plant habitat, especially the illegal grows on forestry land." Two respondents were concerned about fish habitats in particular: "The Environmental and Natural Resources Department has concerns regarding impacts on fish habitat as well as habitat of other organisms," wrote one. Another answered:

> We are working to return Chinook to rivers above the [dam] and to make sure Chinook have good cold water all the way to the ocean. Current dumping of pesticides in the rivers and the illegal dumping of agricultural pesticides.

These responses demonstrate that Tribes are concerned about permitted and unpermitted grows, reservation and off-reservation lands, and human and non-human outcomes. Three respondents (33%) cited impacts from illegal grows specifically, with one reporting that "the response to remove these illegal operations can be physically more damaging than the creation of the operation." Finally, one respondent noted a possible positive impact of legal cannabis, which is that it could create jobs; another respondent reported that Tribal cannabis operations "meet or exceed California [environmental] regulations."

DISCUSSION

Over 50% of survey respondents reported that cannabis is impacting water quality, water access and availability, ecosystems and wildlife, TCRs, economic opportunities, and community health. These impacts were rated strongest regarding natural and cultural resources, with respondents reporting "strong" impacts to water quality (46%), ecosystems and wildlife (44%), water access and availability (41%), and TCRs (37%). Fewer respondents reported strong impacts regarding social and economic indicators, although the higher rate of respondents who were unsure for these indicators (27–33%) suggests that this is because these impacts are more diffuse and harder to measure. However, reports of "strong" impacts to economic opportunities (28%), community health (27%), and housing and cost of living (18%) are significant.

Since not all Tribes are actively measuring cannabis impacts in quantitative terms, we believe that reports on impacts may also be indicative of overall community concern. A final point worth noting is that, as one respondent wrote, some Tribes do not hold a distinction between natural and cultural resources. Hence, for some Tribes, TCRs encompass water, ecosystems, and wildlife. We view this as a limitation of our survey results.

A significant number of respondents (40%) indicated that their Tribe does not have an official policy on cannabis cultivation. As the data above show, however, not having a cannabis policy does not necessarily mean that a Tribe lacks interest in cannabis. With many Tribal lands held in trust by the federal government and cannabis federally classified as a Schedule 1 illicit substance, the 21% of respondents who declined to answer this question (three of eight, or 38% among federally non-recognized Tribes) may indicate a general reluctance to take a public position on cannabis. The ten respondents who reported having an official policy on cannabis cultivation, meanwhile, were split 50–50 about whether their policy allows or prohibits cultivation. This split demonstrates that Tribal governments have different perspectives on the cultivation, use, and sale of cannabis based on distinct historical experiences with and future aspirations for the crop.

Understanding where Tribal representatives see the strongest cannabis impacts helps to explain their levels of concern regarding different cannabis-related activities, including legal cultivation, illegal cultivation, the permitting process, and the state cannabis market. Eighty-four percent of respondents reported some level of concern about illegal cultivation, with 63% "extremely concerned." By comparison, 57% reported some level of concern about legal cultivation, with 21% "extremely concerned." The data suggest that many Tribal representatives view cannabis cultivation as a significant problem independent of its legal status. Higher levels of concern regarding illegal cultivation, however, indicate that Tribal representatives are generally in favor of transitioning cannabis cultivation to the legal market, possibly because the impacts of legal cannabis can be more easily regulated. Some illicit cultivators target trust lands for cultivation, since Tribal sovereign status can mean that there is less enforcement in these areas (P. Rabano, personal communication, 2022). We note further that the cannabis regulatory system is itself a concern to Tribal representatives. Seventy-eight percent of survey respondents reported some level of concern about the cannabis permitting process, with 24% "extremely concerned," and 66% of respondents reported some level of concern with the ability of Tribes to grow, process, and sell cannabis—which they are currently prevented from doing on lands held in trust because of state and federal regulations.

Additionally, there is ambiguity in terms of what specifically survey respondents are concerned about. Concerns about legal cultivation may relate to or overlap with concerns about Tribal consultation (or lack thereof) in the cannabis permitting process, Tribal participation in the cannabis market, or something else. The ten respondents who wrote in short answers to further explain their concerns cited water use and water-related impacts (40%) and Tribal cannabis businesses (20%).

We want to highlight that concerns about cannabis impacts and regulatory means to mitigate those impacts are not constrained to reservation and fee lands. Of the 36 respondents with lands held in trust, 21 (or 58%) reported that there is no cannabis cultivation on those lands. Meanwhile, 30 of 44 (or 68%) reported cannabis cultivation of some kind on culturally affiliated lands outside of the exterior boundaries of trust lands. This finding helps to contextualize reports on concerns and impacts by showing that Tribes are likely tracking the presence of cannabis and its impacts on culturally affiliated lands even when those lands are off-reservation. This alone demonstrates the presence and cultural importance of TCRs outside of Tribal ownership and control, and therefore the real presence of Tribal interests in cannabis cultivation and other agricultural and commercial development throughout California.

Our findings indicate that Tribal representatives are primarily concerned about impacts to water systems, ecosystems and wildlife, TCRs, and community health. This may explain why they tend to be in favor of transitions to the legal market—where cannabis cultivation is subject to regulatory control—despite concerns about regulation itself, specifically with regard to the cannabis permitting process and Tribes' ability to participate in the regulated market. Of special significance to Cooperative Extension, concerns about cannabis and perceptions of its impacts by Tribal representatives is not limited to what happens on lands held in trust: only 15 of 36 survey respondents (41%) were aware of cannabis cultivation on trust lands, as compared to 30 of 44 (68%) when it comes to culturally-affiliated lands outside of trust lands. The data on impacts and other concerns more strongly relate to non-reservation ancestral lands.

CONCLUSION

Native communities in California, many of which are in rural areas, express concern about the impacts of cannabis cultivation on social and economic well-being; the highest level of concern is reserved for impacts to the environment, which many Tribes view as intrinsically related to TCRs (e.g. lands, waters, wildlife). This high level of concern about the environmental impacts on TCRs, whether on or outside of reservation lands, suggests that Tribes have a real interest in all land use activities across the agricultural and natural resource sectors. Thus, the role of Cooperative Extension in understanding and addressing these concerns is paramount.

Extension should increase investment in partnerships with local Native communities to ensure that Tribal concerns and priorities around agricultural and natural resource activities within Tribal ancestral lands (on and beyond reservation lands) are adequately addressed. This is particularly important given the moral imperative for land-grant institutions to address their historical origins: their very founding on expropriated Indigenous lands. These partnerships could include steps such as:

- Establishing Tribal advisory boards that oversee Extension activities,
- increasing transparency and accountability to Native communities through Tribal IRB and data sovereignty processes,
- ensuring appropriate policies and guidelines are in place for consultation with Tribes when engaging in new agriculture and natural resource projects that may impact TCRs, and
- earmarking funding and creating programming for Extension work in Native communities.

Extension can also benefit from these partnerships by learning culturally appropriate ways to steward farmland and ecosystems, methods rooted in Traditional Ecological Knowledge that affirm Tribal sovereignty and contribute to agroecological resilience. Eco-cultural revitalization efforts within Native communities have led to a resurgence of cultural burns, dry farming, and other traditional land-tending practices and forms of regenerative agriculture that may be key to transitioning agriculture and natural resource sectors to low-emissions and low-impact farming and management while enhancing Tribal food security and food sovereignty (Mucioki et al., 2021). Our study reveals that Native communities sustain connections with their ancestral lands beyond their reservation boundaries and maintain local knowledge about those environments. Including Native perspectives in Extension work can help alleviate the risks associated with all types of land use activity on TCRs and affirm Tribal sovereignty over their ancestral lands and resources.

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