Illegal Marijuana Cultivation on Public Lands: Management Perspectives

A technical report that documents and communicates the management challenges of preventing, mitigating, and responding to illegal marijuana cultivation on public lands

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Illegal Marijuana Cultivation on Public Lands: Management Perspectives

A Technical Report

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Executive summary

One of the most pressing threats to our natural resources is illegal and rampant marijuana cultivation (*Cannabis sativa*) that occurs on U.S. public lands, such as national forests, national parks, and special recreation management areas. Such cultivation results in enormous impacts to environmental, social, and economic resources on and associated with these lands. These impacts conflict directly with the basic sustainability principles that managers follow in order to protect current environmental, social, and economic resources while enhancing these resources for future generations. However, preventing, mitigating, and responding to marijuana cultivation is a significant challenge for land management agencies. This research aimed to understand this issue from managers’ perspectives and was guided by the following goals:

1) To understand managers’ challenges, successes, ideas, and experiences regarding marijuana cultivation
2) To highlight specific drivers that prohibit, assist, and influence the prevention, mitigation, and response to marijuana cultivation on public lands
3) To compare and contrast challenges across different land management agencies and positions

To accomplish these goals, the investigators conducted, recorded, and are disseminating the results of 29 on-site and telephone semi-structured confidential interviews with a variety of key informants involved in addressing marijuana cultivation on public lands. The investigators interviewed administrators, law enforcement officials, ecologists, and public relations specialists, all of whom confront illegal marijuana regularly.

Participant responses were grouped into non-distinct themes, where overlap and interdependencies between themes are common. Results suggest that six main themes exist: *Collaboration, grows and growers, challenges of interdiction, ecological impacts, complexity, and future concerns*. Each of these themes is briefly defined and discussed, with representative and supporting quotes. Each of these themes has some level of overlap but is distinguishable by its own characterization. Also, each theme has some congruence across agencies and sometimes between positions. The themes and subthemes are not intended to provide an exhaustive representation of the management implications of illegal marijuana on public lands, but to highlight the salient issues that respondents consistently indicated, across professional domain, expertise, and agency.

The interconnectedness between themes is important and suggests that collaboration, good investigation, and removal of infrastructure contribute to eradication success but are performed inconsistently across and within agencies. Secondly, ecological impacts and safety also influence the efficacy of eradication but are not well-understood and under-researched. All of the above appear to be influenced by limited financial, human, and physical resources, which according to respondents consistently plague eradication efforts and subsequent success of addressing the issue. Finally, tactics and policies are influenced by inadequate resources, are inconsistent across and within agencies, and are not well-understood. Ultimately, the agglomeration of the elements noted above, and their interrelationships, result in a complex problem requiring intensive resources, research, training, formal education, and substantial public outreach.

Results also indicated a substantial need within and across land management agencies for further research, including an extensive quantitative population assessment of managers’ engagement with illegal marijuana cultivation, as well as research into growers’ perspectives.
## Investigators (in alphabetical order)

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<th>Name</th>
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kelly.bricker@health.utah.edu | Dr. Kelly Bricker has worked and studied nature-based tourism for over 25 years. She has managed over 35 projects specific to nature-based recreation management, coordinating teams of scientists, NGOs, educators, and the private sector. She has worked for and closely with land-based natural resource management agencies on sustainable recreation and issues relative to visitor management. Kelly has been awarded grants to explore sustainable tourism and recreation on public lands, certification programs in the United States, quality of life in rural communities in the Fijian Islands, and incentive travel participants to Africa. |
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matthew.brownlee@hsc.utah.edu | Dr. Brownlee specializes in researching complex issues on public lands. Specifically, he concentrates on linking stakeholders’ perspectives about resource issues, conditions, and settings with management applications. His research involves work with multiple land management agencies, including the National Park Service, the U.S. Forest Service, the Bureau of Land Management, the Army Corps of Engineers, and private organizations. Dr. Brownlee has presented at numerous international and regional conferences on natural resource topics related to protected areas. His research generally incorporates student learning and addresses a pertinent management need in addition to unanswered academic questions. |
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jerose@davidson.edu | Dr. Rose studies nature-society relations and their interaction with public spaces. He uses qualitative and ethnographic research techniques to better understand individuals’ experiences and perceptions of natural spaces in public urban, rural, and unbuilt settings. His examinations of social productions of nature enable and support research and teaching that embeds political economic factors within material ecological conditions. His social science research critically confronts the intersections of social and environmental justice, particularly as they are enacted or inhibited in applied settings. |
Introduction

The western United States (U.S.) is geographically dominated by federally managed lands that serve a variety of purposes, including resource extraction, biodiversity protection, general conservation, and outdoor recreation. These lands experience continual impacts and threats borne from complex interplays between social and environmental processes (Miller, 2012). One of the most pressing threats to these lands is illegal and rampant marijuana cultivation (Cannabis sativa). Although this issue is not new, in 2012 the United States Attorney’s Office (USAO) stated that illegal drug production on public lands “pose[s] a safety threat to the public and an environmental threat to the land and to wildlife [and that] the problem is severe.” This statement and associated releases are partially attributed to the substantial increases in marijuana cultivation on public lands in the last two decades. For example, marijuana plants seized annually on public lands increased from fewer than one million in 2004 to 2.6 million in 2009. In California alone, land management agencies witnessed a 300% increase from 2006 to 2010 in identified grow sites (U.S. Office of National Drug Control Policy [NDC], 2012).

As a result of these increases, recent eradication efforts have resulted in more than $1.45 billion in marijuana seizures on public lands across seven western states (USAO, 2012). During the summer of 2012, approximately 67% of all marijuana plants captured in the west occurred on public lands (USAO, 2012). Within a three year period, 49,105 metric tons of marijuana were confiscated on California’s public lands alone (Miller, 2012). However, successful seizures represent as little as 15% of estimated production efforts on public lands (NDC, 2012). These data reveal the enormity of the issue that often under-resourced land management agencies must constantly confront. Consequently, marijuana cultivation on public lands continues to cause grave environmental, social, and economic impacts. These impacts conflict directly with basic sustainability principles that managers follow in order to protect current environmental, social, and economic resources while enhancing these resources for future generations (Bricker et al., 2010). Land management agencies are also charged with public safety and visitor enjoyment (Manning, 2012), and marijuana production on public lands directly conflicts with this permanent mandate as well.

Impacts

An example of the direct conflict between an agency’s responsibility to sustainability and marijuana cultivation is the serious environmental damage that results from illegal drug production (Cohen, Sanyal, & Reed, 2007). Specifically, to increase production capacity, marijuana growers often expose sunlight and clear arable land by removing endemic flora that land managers aim to protect. Furthermore, individuals involved in marijuana cultivation divert streams from traditional paths to irrigate their crops and frequently introduce harmful rodenticides and insecticides indiscriminately. As a result, these toxic products contaminate local watersheds by polluting streams and damaging sensitive riparian habitat (Murphy, 2001; National Drug Intelligence Center, 2005). Additionally, cultivation teams reside at grow sites for extended periods of time and irresponsibly dispose of household litter, human waste, irrigation lines, and large stores of federally banned fertilizers (USAO, 2012). Restoration teams remark that “…the wildlife is killed, plain, and simple. Traps are set, deer, bear, and grey squirrels are poached, and mice are poisoned. Based on the tools that have been collected and the carcasses that have been identified, the growers are engaged in a war with the natural world for the resources they require to continue their production of marijuana” (Miller, 2012, p. 102)

Beyond impacts to the nonhuman environment, cultivation activities pose serious threats to social/cultural resources, including visitors to protected areas (Chavez & Tynon, 2000; Peters, 2003). Specifically, these illegal operations are often associated with organized crime syndicates, and as a result, the potential for violent confrontations is high for land managers, law enforcement officials, and visitors alike (Beckley, 2010). Beyond the violence often associated with illicit drug production, there are also significant

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negative human health effects associated with this problem (Cohen, Sanyal, & Reed, 2007). Exposure to chemical byproducts represents a significant problem. Disposing of wastes generated from the production of illegal drugs on public lands is a violation of the Resource Conservation and Recovery Act of 1976, and is subject to more stringent penalties under federal sentencing guidelines (Hazardous Waste, 2003). In recent marijuana eradication efforts, litter, irrigation lines, and fertilizer and pesticides were removed from grow sites on public lands (USAO, 2012). Furthermore, there are often heavily armed individuals securing grow sites, and armed drug traffickers transport the marijuana after cultivation, which poses additional threats to residents in near park communities.

Economically, these near park communities often have high reliance on well-managed public lands (Eagles & McCool, 2002), and this reliance can be jeopardized by marijuana cultivation. For example, some recreational users or commercial operators may be discouraged from using a specific protected area or nearby community due to the presence and perceived danger of illegal activity. This risk perception may result in the loss of tourist expenditures on supplies, food, lodging, entertainment, and other associated services. The economic impacts stretch well beyond near park communities, as cultivation activities may place an unforeseen burden on the budget of many agencies. For example, the National Park Service estimates that for every acre of marijuana cultivation, approximately 10 acres are damaged with an estimated restoration cost of $11,000 per acre (National Drug Intelligence Center, 2005).

**Problems for land management agencies**

Addressing these impacts is central to ‘sustainable natural resource management’ that aims to protect and enhance environmental, social, and economic resources and processes. However, preventing, mitigating, and responding to marijuana cultivation is a significant challenge for land management agencies. Most agencies find few incentives and many barriers to aggressively pursue illegal activities on public lands (Cohen, Sanyal, & Reed, 2007).

First, cultivating marijuana on public lands is much more difficult for law enforcement officials to detect than in an urban environment (Solomon, 2001). “Federal officials believe that aggressive prosecution in big cities has driven dealers to rural communities that have fewer law enforcement officers with adequate resources to handle these cases” (U.S. House of Representatives, 2005, p. 2). As a result, land management professionals may need additional training in the detection and response to marijuana cultivation in remote settings.

Second, law enforcement specialists at federal land management agencies report a shortage of staff and high concern for employee safety (Chavez & Tynon, 2007). These concerns are amplified by the associated crime that often follows illegal drug trafficking (Cohen, Sanyal, & Reed, 2007). However, budget and safety concerns are not limited to law enforcement. Resource management divisions, who are responsible for assessing and restoring grow sites, are also likely constrained by budget shortfalls and burdensome policies.

Finally, the prevention of marijuana cultivation on public lands requires successfully facilitating complex relationships between land management agencies, local law enforcement, the U.S. Drug Enforcement Agency (DEA), the U.S. Department of Homeland Security, and state-level initiatives (e.g., Becker, 2012). However, few land management professionals may receive robust training in managing these complex inter-agency relationships as they directly relate to marijuana cultivation. As a result, inefficiencies may develop in regards to inter-agency communication, resource allocation, and response strategies.
Rationale for research

Empirical research that documents these specific problems from a multiple agency/multiple position perspective was nonexistent until this project. Managers currently had no integrated and comprehensive outlet to explain and communicate their challenges and successes regarding marijuana cultivation. Consequently, policy officials and related stakeholders may not understand the unique challenges and needs associated with preventing, mitigating, and responding to marijuana cultivation on public lands. This may result in the misappropriation of resources away from cultivation and its associated issues. This research began to fill this gap and was guided by the following goals:

1) To understand managers’ challenges, successes, ideas, and experiences regarding marijuana cultivation
2) To highlight specific drivers that prohibit, assist, and influence the prevention, mitigation, and response to marijuana cultivation on public lands
3) To compare and contrast challenges across different land management agencies and positions

Previous research on illegal activity on public lands has used “less than systematic data sources” (Cohen, Sanyal, & Reed, 2007, p. 262), despite marijuana cultivation on public lands increasing in prevalence (Mallery, 2011). Furthermore, the National Research Council’s drug policy (NRC, 2001) has focused largely on enforcement and substance prevalence rather than effectively understanding the extent of harm (Reuter, 2002) or adopting a formal, risk-based approach to managing law enforcement resources on federal lands (U.S. Government Accountability Office, 2010). Additionally, most of the research has tracked the frequency and amount of seizures, estimated street value, and indictments, as opposed to managers’ perspectives. In short, such research was “necessary and overdue” (Tynon & Chavez, 2006, p. 154).

General research approach

To address these objectives, the research team conducted and audio recorded 29 semi-structured confidential interviews with a variety of key informants involved in addressing marijuana cultivation on public lands. Qualitative methods, such as interviewing, provided a greater depth of insight into experiences than quantitative approaches and were particularly useful because little was known about the potential views expressed by respondents (Glaspell et. al, 2003; Hallo, Manning, & Stokowski, 2009).

Since marijuana production likely occurs on federally managed lands regardless of agency oversight, the researchers selected key informants from a variety of agencies, including but not limited to the Bureau of Indian Affairs (BIA), the Bureau of Land Management (BLM), the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Forest Service (USFS). In addition, some research participants from High Intensity Drug Trafficking Areas (HIDTA) were interviewed. The research team intentionally selected key informants from different types and levels of divisions, including but not limited to law enforcement, resource management, and administration. These informants were selected using a purposive and snowball sampling approach where key informants recommended other potential study participants (Marshall & Rossman, 2012). Ultimately, key informants were selected based on their potential diversity of opinions and ability to provide robust insight into the issue. Researchers also aimed to spatially diversify respondents to increase geographic representation that matched media reports regarding illegal production on public lands (see Figure 1 for location of respondents and media reports), although our research and media reports both suggest that illegal marijuana cultivation on public lands is of particular concern in the U.S. west, and further concentrated in California. This purposive sampling ensured that a diversity of opinions, influenced by different ecosystems, cultures, institutions, and social dynamics, were incorporated. A greater number of participants were not sought after the data received...
reached saturation, where responses, insights, and overall themes provided no substantially novel insights. Researchers adhered to strict research protocols aimed at protecting respondents’ anonymity and specific names or identifying professional positions are not reported in this or other documents.

Figure 1. Interview participants’ primary location of professional position and media reports regarding illegal marijuana production on public lands

Multiple investigators were present for each interview, recorded notes, and documented their insight through an iterative discussion process. Interviews, primarily taking place on the telephone, with the participants were digitally recorded, and stored in encrypted files. The investigators conducted a content analysis of these interviews using coding procedures described by Patton (2002), and Miles and Huberman (1994). This coding allowed investigators to group similarly patterned responses into simpler, more generalized categories (Coffey & Atkinson, 1996). As a result of systematically examining categories and related text, the investigators identified the range of views expressed and perceptions held by respondents.

Informed consent

Informed consent is one of the most basic and vital principles in the protection of human subjects in research. Each study participant was given a basic written statement concerning the aims and scope of this research, as well as notification of the risks associated with participating in this study. Study participants were made aware that the interviews had virtually no risk of any psychological or political harm to them, and they were told and assured that all responses, in addition to their identity, would remain strictly anonymous. Further, study participants were made aware that their participation was voluntary, that they have the right to stop participating at any time during the study, and that their interview information and consent could be withdrawn at any point. Each research participant was given the contact information for
Drs. Bricker, Brownlee, and Rose, where participants could contact the research team. Verbal consent was obtained from each participant.

*Interview structure and general questions*

The investigators used a modified Seidman Approach (Seidman, 2013, p. 20) to structure the interview process. This approach involved three sequential categories that contain questions that allow respondents to communicate their 1) focused history with the issue, 2) perceptions, insights, and experiences with the issue, and 3) reflection and meanings regarding the issue. The same basic set of questions guided the interviews, but the semi-structured format permitted the investigators to ask clarifying or exploratory questions (Patton, 2002). Each potential respondent provided their consent to participate prior to answering the interview questions.

Initial questions
1. Did you have a chance to read the consent form that we emailed you?
2. Do you mind if we record this interview?

Focused history
1. Please start by telling us about your current position and your responsibilities.
2. How long have you been in this position?
3. How long have you been with the agency and in what capacities?
4. Please summarize your history with preventing, mitigating, and responding to marijuana cultivation on public lands?
5. Has your experience with marijuana cultivation on public lands evolved over the years? How? Why?

Perceptions, insights, and experiences
1. Documentation indicates that marijuana cultivation on public lands is a substantial issue. Do you agree with this? Why or why not?
2. Marijuana cultivation on public lands seems very complex. In your opinion, what contributes to its complexity?
3. What are the key challenges that you have experienced when dealing with marijuana cultivation? What contributes to these challenges?
4. What are the primary successes that you have experienced when dealing with marijuana cultivation (in short, what do you, your colleagues, and your agency do well)? What contributes to these successes?
5. What are the primary resource needs (e.g., money, training, time) that would help you effectively (or continue to effectively) prevent, mitigate, and respond to marijuana cultivation on public lands? What are your ideas about how to best secure these resources?

Reflection and meaning
1. What do you think will happen in the future regarding this issue? Will it increase, decrease, become less or more important? Why?
2. How has your interaction with marijuana cultivation changed your perception of your work, or of your agency’s mission?
3. What else is important for us to hear from you today?
4. How would you summarize your thoughts on marijuana cultivation on public lands?
5. We are interested in speaking with other professionals who hold diverse experiences and opinions about this issue. Who else do you recommend we contact? Why?
The investigators conducted a content analysis of these interviews using standard coding procedures (Saldana, 2013). Multiple coders \((n = 3)\) reviewed all of the data, followed by a collaborative reading and synthesis of the codes to generate themes that were developed across agencies, positions, and geographic locations of the participants. This coding allowed investigators to group similarly patterned responses into simpler, more generalized categories (Saldana, 2013). As a result of systematically examining categories and related text, the investigators identified the range of views expressed and perceptions held by respondents. Data from the interviews were then thematically coded to highlight salient issues that the respondents addressed concerning illegal marijuana grows on U.S. federal lands. Further, an iterative multi-level coding process enabled initial codes to be further synthesized into even broader themes, while ensuring that these broader themes retained the core discursive messages of the participants’ statements and meanings (Saldana, 2013). Trustworthiness of the research was increased through processes of member checking, peer examination, consistent interview technique, and varying our field experiences (Krefting, 1991).

**Results**

The purpose of this project was

1) To understand managers’ challenges, successes, ideas, and experiences regarding marijuana cultivation  
2) To highlight specific drivers that prohibit, assist, and influence the prevention, mitigation, and response to marijuana cultivation on public lands  
3) To compare and contrast challenges across different land management agencies and positions  

Addressing the overall question of the management challenges and successes in interacting with illegal marijuana grows, as well as the drivers that supported or inhibited management practices, participant responses were developed by the researchers into non-distinct themes, where overlap and interdependencies between themes are common. Results suggest that six main themes assist in addressing these objectives. The six themes are: collaboration, grows and growers, challenges of interdiction, ecological impacts, complexity, and future concerns. Each of these themes is briefly defined and discussed, with representative and supporting quotes from participants in Table 1. Each of these themes has some level of overlap but is distinguishable by its own characterization. Also, each theme has some congruence across agencies and sometimes between positions.

**Collaboration**

Issues of “collaboration” were consistent points of reference for many of the respondents interviewed. Collaboration was often cited as a point of success in past interdiction efforts, while simultaneously there was widespread acknowledgement that more collaboration would result in greater successes. Multiple interviewees recognized that strong interdiction methods on their lands were often successful, but also likely led to increased illegal grows on adjacent lands, both public and private; respondents felt they were effectively pushing the problem elsewhere. Collaboration is needed at multiple spatial and bureaucratic scales, as respondents identified the necessity of collaboration within their agency, between multiple land management agencies, and between land management agencies and other organizations (e.g., Foster et al. 2009). Outside agencies included a variety of obvious and less-than-obvious support. For instance, collaborating with local law enforcement agencies (e.g., police, sheriffs) or federal law enforcement agencies (DEA) supported interdiction efforts, but respondents also acknowledged that visitor informants provided useful tips on grow sites, non-profit environmental agencies were often vital sources of grow site restoration efforts, and local civic organizations were effective communication avenues for informing the public.

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Grows and growers
The illegal marijuana grows themselves and the individuals associated with the grows were another important theme from the interviews. Participants reported an increasing size, complexity, flexibility, and sophistication of grow sites and associated techniques. Grow sites and techniques were far from monolithic, and interviewees suggested that growers were very responsive to past interdictions, such that growers change conditions, locations, sizes, methods, and other techniques regularly, making detection and intervention more difficult. Further, respondents suggested a seeming futility with engaging with the grows on the local scale, whereas a more effective law enforcement intervention would address higher organizational levels in the marijuana production scheme.

Challenges of interdiction
Subsequently, the challenges of interdicting these growers and grow sites was constantly discussed by participants. In addition to the perceived need for greater investigative sophistication, participants highlighted that interdiction brought significant challenges to existing financial and material resources. Managers emphasized that human safety in and around these sites is increasingly problematic, as land management employees are often exposed to automatic and semi-automatic weapons (c.f., Beckley, 2010; Pendleton, 1996; Tynon & Chavez, 2006; Wing & Tynon, 2006) and booby traps (Batiste, 2013), as well as the various harmful chemicals that are used as fertilizers, pesticides, herbicides, and rodenticides. Respondents lamented that serious direct physical conflicts between growers and visitors is inevitable. Finally, in this theme we understood the repeated emphasis on dismantling infrastructure at grow sites, ranging from sleeping platforms and kitchens to the significant amount of hoses, irrigation, and litter that remained after interdiction.

Ecological impacts
Administrators, land managers, and ecologists alike voiced significant concerns about the ecological impacts associated with illegal marijuana grows. While impacts to water quality and surrounding ecosystems are beginning to be understood, there has been significant research examining the bioaccumulation of associated toxins in mesocarnivores, particularly in fishers (c.f., Gabriel et al., 2012; Gabriel et al., 2013; Thompson et al., 2013). Respondents reported a number of associated areas of ecological impacts that have yet to be addressed, including issues pertaining directly to human health. For example, respondents acknowledged that the rodenticides and fertilizers used in illegal marijuana production may eventually enter municipal water sources or agricultural areas with unknown impacts to human communities. Intensification of drought conditions for downstream communities was another recurrent concern for managers. In addition to the needed ecological research, interviewees also discussed the importance of clearly and effectively communicating these results to interested parties, including local and regional political entities and to the visiting public.

Complexity
The complexity of illegal marijuana growth on public lands was regularly cited as one of the many difficulties faced by participants. Organizationally, there remain frustrations in organizing land management agencies in ways that effectively address this growing concern. For instance, respondents acknowledged that illegal marijuana growth is not only an issue for law enforcement or ecologists, but for both of these parties in an integrated, systematic manner. While many identified circumstances where land management agencies are increasingly responding to illegal marijuana grows in such ways, they also revealed that it has taken time and suffered setbacks along the way. Administrators found difficulties in directing these multiple structures to work together in an integrated fashion, while simultaneously supporting and being supported by external land management agencies and other non-land management agency entities. Further, while respondents identified a few examples of interagency organization to convene and address best practices and shared challenges (i.e., NPS, n.d.), they also identified a perceived lack of a national, interagency dialogue concerning this issue, in part because of the multitudinous complexities involved. Respondents also suggested that there were complexities associated with laws
governing ways in which illegal grows were accessed across federal lands, in grow sites adjacent to federal lands and the associated downstream impacts, and in using other rights (i.e., mining law) to squat on federal lands for illegal purposes.

**Future concerns**

A final theme that was developed across respondents was a lack of clarity around the future of illegal marijuana cultivation on public land. Not only did interviewees state that they do not have a clear and consistent assessment of how well various intervention efforts have been and will be in the future, but there was also ambiguity associated with the uncertainty of the current and future legality of marijuana. While many responses indicated an objective sense that the unpermitted growing of anything on public lands is illegal, many also indicated that the seemingly dynamic legal status of marijuana in many states gives them pause as to how vehemently illegal marijuana growth is addressed. Current and future conflicts between state and federal laws were cited as confounding issues for land managers. Others even addressed potential collaborative solutions between land management agencies and marijuana growers, where marijuana cultivation is permitted and regulated similarly to grazing or timber harvesting on appropriate federal lands.

Table 1. *Themes, subthemes, and direct quotes of illegal marijuana growth on U.S. federal lands.*

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<thead>
<tr>
<th>Themes and subthemes</th>
<th>Direct participant quotes</th>
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<tr>
<td><strong>Collaboration</strong></td>
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<tr>
<td>Interagency</td>
<td>“Different federal agencies don’t talk. Within this region there are XX DEA offices, YY forest districts, ZZ divisions, and not each division will take the same stance on marijuana. Here we make it the feather in our cap, but ___ says they don’t care and then someone else can run the show [responding to marijuana cultivation on public lands]… Just not aggressively pursuing it with the same tenacity, even within one agency, much less with a lot of agencies working together.”</td>
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<td>“You’re dealing with multiple jurisdictions, multiple experience levels, some people are talking to each other, working together”</td>
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<td>“Whenever you get into this you’re dealing with egos and people try to do it themselves, alone, take the glory for the bust, make the front page, it makes a good article a good story but they’re probably missing a lot of grows too. It is too much for one agency.”</td>
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<tr>
<td>Intra-agency</td>
<td>“We’ve got to have the resource people talking to the law enforcement folks. And then we try to communicate our operations to other folks in the Forest Service, because they’re dealing with these same issues… It really requires all of us being on the same page.”</td>
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### Beyond agency

“We need to join the federal land management people with the university people. People are truly engaged but are 3,000 miles away in many cases, and out of the field, and don’t even know who is working on this. Having research to support taking it to the Hill, real research documents to say this is really what’s going on out there and why…”

“We collaborate locally and regionally—we have worked with state partners, local partners, utilized state assets, aviation assets, very strong in deterring activity...can be an effective tool in reducing demand.”

“Taskforce is the model that should be pushed; you are not really going to combat the entire organization without this approach…”

### Grows and Growers

**Dynamic production tactics**

“These grows are no longer Mom and Pop operations… 20 years ago, it was small cultivation operations. Parks that historically had no connections to local (drug) areas have experienced marijuana growth on a scale of not 5 or 10 plants, but hundreds of thousands of plants… The nature of it has changed to a sizeable operation, greater sophistication than one can do on their own [sic].”

“Now they get two sometimes three harvests, when they used to get one. We used to look in drainages, water sources you know but they will pipe water now over into dry drainages and even grow in shade. They know where we look and try to get in where we don’t.”

“When the growers change tactics and locations, we can’t just jump on the plane and helicopter and go because in my agency we have to follow the aviation protocol and we can’t keep up.”

**Law enforcement investigations**

“There has been a bigger emphasis placed on the investigation side. We’re trying to tie it all together…getting people camping at the grows, means nothing.”

“If you arrest the people, the growers, it does not matter. We learned that you need to prosecute the management of the growers.”

### Challenges of Interdiction

**Safety**

“Visitor safety is our number one priority, but I worry about our rangers also…99 percent of the grows I go into I find weapons.”

**Challenges to resources**

“We need a new model, we are public land managers, not international drug cartel enforcement officers…these are complex and different from what we are trained to do.”

“You have to pick and choose—you can only do so much with so much out there.”

“Complex cases can be expensive.”

“At the end of the day, it’s the people at the top who will decide if they want to fund these efforts or not.”
**Removal of infrastructures**

“One of the market disruptions we look at is we have to remove the infrastructure. If we don’t, many of the growers will come back within the same grows the following year and use the facilities that have been left behind. That is why for reclamation we now remove everything in the grow site, trash, piping. If we leave that stuff, it takes minimal effort to get the grow site up and running again.”

**Ecological Impacts**

**Known**

“One of the challenges is the support from the public and support from the Hill as to what the environmental impacts actually are, and the biggest challenge is being able to educate everybody…that it’s a huge impact related to public lands. What we need to do better and what a lot of people don’t know is the environmental impacts.”

**Unknown**

“We really don’t know, I mean, we don’t know about water quality… some of the wildlife issues, clear cutting issues. It’s a big deal…”

**Complexity**

**Resource degradation**

“There was a complete disconnect of management with law enforcement—they were flabbergasted that this was occurring [toxins in the environment] – completely unaware of [ecological impacts], of magnitude of what is going on out there…”

**Interagency involvement**

“You’re dealing with multiple jurisdictions, multiple experience levels, some people are talking to each other, working together…”

**Encroachment and access**

“We’ve had people build houses on FS system lands to house their illegal grow workers; …squatters use mining law in order to evade another law; …access issues where people are crossing FS lands to access illegal grows, including building a road adjacent to a creek…”

**Future Concerns**

**Ambivalence and ambiguity of legality**

“Whatever happens [with legalization], we’ve got a job to do. So legalization isn’t a question for us. You’re not allowed to grow corn or potatoes in national parks, so we would go after those grows too.”

“There will still be a market for it, because there’s always a black market for something. It’s not real clear how it [legalization] will impact public lands.”

“If they decriminalized it to one or two plants, you may not see it like you see it now.”

**Uncertainty of success**

“Not sure we’ve made any headway…”

“We’ve certainly made gains…”

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The themes and subthemes are not intended to provide an exhaustive representation of the management implications of illegal marijuana on public lands, but to highlight the salient issues that respondents consistently indicated, across professional domain of expertise and across agencies.

The diagram below displays the interconnected nature of the major themes derived from this project related to the project’s objectives. First, this figure suggests that collaboration, good investigation, and removal of infrastructure contribute to eradication success but are performed inconsistently across and within agencies. Second, ecological impacts and safety also influence the efficacy of eradication but are not well-understood and under-researched. These two primary elements of the figure are influenced by limited financial, human, and physical resources, which according to respondents consistently plague eradication efforts and subsequent success of addressing the issue. Finally the figure displays that tactics and policies are influenced by inadequate resources, are inconsistent across and within agencies, and are not well-understood. Ultimately, as displayed at the bottom of the figure, the agglomeration of the elements noted above, and their interrelationships, result in a complex problem requiring intensive resources, research, training, formal education, and substantial public outreach.

Figure 2. Diagram of interconnected themes from the research
Conclusions

A primary purpose of this research was to document and effectively represent perspectives of a variety of land managers who engage with the dynamic issue of marijuana cultivation on U.S. federal lands. Interview respondents indicated that this is a significant and complex problem across the entire country, and especially in specific areas in the U.S. west, including the intermountain region, the Pacific Northwest, and much of California. Perhaps because of the sample population interviewed, respondents indicated that this was a growing problem, and one that would steadily intensify without significant and ongoing contributions of financial, human, and political resources.

Returning to the initial goals of this research, the challenges, success, ideas, and experiences regarding illegal marijuana production were identified through the six major themes developed from the semi-structured interviews: Collaborations, grows and growers, challenges of interdiction, ecological impacts, complexity, and future concerns. The specific drivers that prohibit, assist, and influence the prevention, mitigation, and response to marijuana cultivation on public lands were more difficult to identify, but are found within the various themes presented earlier. Respondents indicated that political and financial commitments remain a necessity, while collaborating across and within agencies has supported many successful interdiction efforts. Prevention of marijuana growth remains unclear, but there was near universal agreement that removing various infrastructures associated with past grow sites (user trails, irrigation structures, primitive living accommodations, etc.) was vital to ensuring that future growers not return to those same sites. Finally, our results indicate that different land management agencies respond to marijuana cultivation dissimilarly. For instance, many NPS units claim to have effectively eliminated production on their lands, but have done so through significant funding of a targeted grant. Restoration ecologists also had more success in NPS and USFS lands, largely due to the expensive nature of remediating areas used for marijuana (approximately $11,000 per acre, according to numerous respondents). Conversely, BLM offices indicated that personnel budgets were stretched so thin that they relied almost exclusively on the external support of local sheriffs and other non-land management agencies. Successes in addressing illegal marijuana grows often occurred when land management agencies partnered and collaborated with other agencies, local officials, and tribal authorities.

Future research

As the issue of illegal marijuana production and cultivation on public lands is relatively unexplored, there are numerous avenues for future research (National Research Council 2001). Ecological research in and around marijuana grow sites is in its initial stages, and themes from our research point to a growing demand from managers, public relations specialists, politicians, and a variety of ecologists to have more informed, empirically focused studies that detail the impacts to water, wildlife, soil, and other ecological systems. The international community seems to agree:

Government, academic, and private scientific research institutions and foundations should be encouraged systematically to monitor environmentally affected areas through remote sensing, aerial surveys and other resource evaluation technologies. Research on and assessments of forest resource loss and ecosystem contamination by dangerous products and wastes that have environmental and health implications should be advanced on an urgent basis. (UNODC 2014)

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Beyond ecological studies, themes from our research imply that there are significant economic discrepancies that are felt in local communities due to illegal marijuana grows. Potential decreased visitation and tourism can further stress land management agencies’ budgets and lead to decreasing political support. Our research provides a small entry into the complex land management concerns associated with illegal marijuana grows. In-depth case studies might provide more detailed analysis and context of specific sites, while a more expansive quantitative population assessment might provide greater insight into the depth and scope of illegal marijuana grows. Finally, another important actor in this complex system is the actual growers and the (often transnational) networks (Batiste, 2013; Martin, 2012) that support and facilitate their involvement in the grow sites. Tracing this lineage complicates the system even further, implicating drug cartels, national law enforcement policies, and the international political economy, among others.

In addition to lessons from previous efforts at interagency and intra-agency collaboration concerning illegal marijuana (Foster et al., 2009), this research contributes to a growing body of popular media by providing a more systematized understanding of the multiple ecological, managerial, and administrative concerns that land managers face with illegal marijuana production on federal lands. As the demand for marijuana and the amount of energy required to produce marijuana at indoor facilities increases (Mills, 2012), the urge to grow marijuana on public lands may intensify.

Finally, almost all respondents indicated that a national symposium that provides interaction among researchers, managers, law enforcement professionals, policy makers, and associated stakeholders would substantial improve cross-agency collaboration and assist in formulating best practices. Presentation and workshops at such a symposium would contribute to addressing this growing problem. Most respondents indicated that a symposium was overdue, critical, and should be inter-disciplinary as well as multi-agency.
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References


