Society and Natural Resources, 25:700–715

ISSN: 0894-1920 print/1521-0723 online
DOI: 10.1080/08941920.2011.633596

Routledge
Taylor & Francis Group

Access to Natural Resources on Private Property: Factors Beyond Right of Entry

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Discussions of access to natural resources on private lands in the United States often focus on property rights and ownership. In Maine, changing ownership of private forestland has been associated with increased posting against trespass. This raises concerns about the terms of physical entry to land for resource use. While the right of entry is an important component of access to natural resources, other factors also affect access. Building on a theory proposed by Ribot and Peluso (2003), this study of nontimber forest product gatherers and forest landowners/managers in northern Maine examines social and biophysical factors that affect access to natural resources. We consider who is affected by these factors, and suggest ways forward to promote more equitable access to nontimber forest products, especially for Native Americans in the region.

Keywords access to natural resources, Maine, Native Americans, natural resource management, non-timber forest products, private property

Access to natural resources is a fundamental concern in the field of resource management. Discussions of access to natural resources on private lands in the United States

Received 28 October 2009; accepted 19 June 2011.

We gratefully acknowledge the Northeastern States Research Cooperative's support in funding this project, and all of the plant gatherers and land managers who shared their time and expertise with us.

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often focus on property rights, ownership, and the terms of physical entry to land. While ownership status and regulations that set the conditions for physical entry to land are important components of access to natural resources, other factors also affect access. Ribot and Peluso (2003) argue for an understanding of access that extends well beyond property rights. They explored rights-based, structural, and relational mechanisms that influence access. In the study of non-timber forest product (NTFP) gathering reported on here, we find their mechanisms relevant. However, we also found that biophysical factors, that is, environmental conditions and spatial proximity, influence access. A conceptualization of access that includes consideration of the mechanisms identified by Ribot and Peluso and the additions we propose is relevant for an array of resource users. For example, changes in environmental conditions can alter access to resources for any user who is interested in specific sites, fauna, and/or flora. These changes might include shifts in habitat composition or alterations in access routes, such as logging roads, due to new management regimes. Thus, while our research focused on access to NTFPs in particular, our findings support a proposition for natural resources more generally: a fuller conceptualization of access that includes biophysical factors illuminates some of the challenges faced by resource users in the United States today and provides a broader foundation for developing management responses.

NTFP gatherers are one group whose access is affected by multiple factors. NTFPs (wild plants and fungi) are collected and used by people from varied socioeconomic and ethnic backgrounds across the rural to urban gradient (Robbins et al. 2008). Gathered for food, medicine, craft, spiritual, and aesthetic purposes, NTFPs contribute to food security and nutrition, economic livelihoods, cultural identity, and subsistence lifestyles (Emery 2001; Emery and Pierce 2005; Hurley et al. 2008; Kuhnlein and Chan 2000; Norgaard 2004). Gatherers have developed systems of formal and informal access to resources on private and public property that they do not own (Ballard and Huntsinger 2006; Emery et al. 2003; Laird et al. 2010).

NTFP gathering in the state of Maine provides a good opportunity to ask questions about access to natural resources in the eastern United States. Maine, which is 90% forested, has seen substantial changes in forest landownership and land use (Hagen et al. 2005). In 1994, the forest industry comprised 59% of large tract (>5000 acres) ownership. By 2005, this percentage had declined to 15.5%, as the number of large tracts owned by investors (real estate investment trusts and timber investment management organizations) grew from 3% to 33%, and other types of landowners, including nonprofit organizations, became forest landowners. Hagan et al. (2005, 3) also note "a trend toward more forest owners with smaller parcel sizes." Three of Maine's watersheds (Lower Penobscot, Androscoggin, and Kennebec) are projected to experience 20 to 40% rates of increase in housing density on private forestlands by 2030 (Stein et al. 2005). These changes are prominent in the southern two thirds of the state (Stein et al. 2005), where they have been accompanied by increased posting of land against trespass (Acheson 2006). As a result, Maine's tradition of public access to private lands for recreation has begun to erode.

Northern Maine had experienced less change in landownership patterns as of 2005 (Hagan et al. 2005, 11). The intent of our study was to gather baseline information about what factors might affect access to NTFPs before substantial changes

occur in the area. In addition to documenting culturally and economically important uses of plants and fungi (Baumflek et al. 2010), we asked the question: What key factors affect access to NTFPs in northern Maine? Our results indicate that gatherers are experiencing changes in access and that this trend is likely to continue. They also provide evidence to expand the theory of access proposed by Ribot and Peluso (2003) to consider biophysical factors.

Property Rights and Access

Because concerns about access to natural resources in Maine have arisen in the context of changing property ownership patterns, it is useful to consider how property rights are linked to access. The ''bundle of sticks'' has been an important property rights metaphor in the United States for more than a century (Goldstein 1997). Each stick represents a separable right, such as rights of use, exclusion, and alienability. Multiple parties may hold the separable rights associated with a parcel of land. However, legal scholars, judges, and legislators often consider one component of the bundle, the right to exclude, to be a defining characteristic of property ownership (Balganesh 2008). Accordingly, American property laws ''recognize a landowner's right to exclude as a core, perhaps primary component of landownership'' (Kahr 2009, 77).[1]

The right to exclude has been limited by rules that provide public access to private land, usually for recreational activities. Kahr (2009) notes that many state laws allow recreational entry to undeveloped land provided it is not posted with signs. In Maine, although a criminal statute prohibits trespassing on posted lands, the state encourages the ''open land tradition'' through liability laws that protect landowners if someone injures him- or herself while recreating, regardless of whether permission was granted to use the land (Acheson 2006). Also, the Great Pond Law, which dates to colonial times, provides access to large inland bodies of water meeting criteria defined in Maine law (Me. Rev. Stat. Ann. 38 §436-A).

Scholars have noted that property rights involve social processes that change to reflect the needs and values of the society that creates and enforces them (Duncan 2002; Vandergeest 1997). In addition, landowners may exercise multiple definitions of property rights (Hurley et al. 2002; Jackson-Smith et al. 2005). In their study of hunter access to posted land in Minnesota, Snyder et al. (2009) found that ''posting is used as a means to control access rather than to prevent it entirely'' (260–261). Changes in landownership can bring new ideas about the rights and responsibilities of property owners, and have implications for access. For example, Yung and Belsky (2007) found that although Montana ranchers had strong beliefs in individual property rights, ranchers nevertheless felt responsible for providing community and livelihood goods, such as access for hunting. In contrast, newly arrived owners of ranchland valued personal privacy. They restricted access to land for hunting and cattle paths, generating tension between new landowners and long-time residents.

In Maine, actions and attitudes of landowners about access to private land are shifting. A survey conducted by Acheson (2006) revealed an increase in posting of land among small forest landowners in the state. However, Acheson's study also shows that landowners believe in Maine's open land tradition. He found that his respondents ''think that landowners have the right to keep the public off their land, but they also feel that landowners should not exercise these rights unless forced to by very irresponsible behavior'' (Acheson 2006, 24).

Defining Access Broadly

Property rights and landowner decisions to regulate access to their land play critical roles in access to natural resources, but they are neither absolute nor static. In addition, property rights and landowner regulations are not the only factors affecting access. In their argument to broaden the definition of access, Ribot and Peluso (2003) differentiate between property (the *right* to benefit from things) and access (the *ability* to benefit from things). Their theory includes property and rights-based access as one component of a framework that emphasizes structural and relational factors. They consider an array of mechanisms that constitute "the means, processes, and relations by which actors are enabled to gain, control, and maintain access to resources" (Ribot and Peluso 2003, 159–160). Specifically, they discuss law, technology, capital, markets, labor, knowledge, authority, identities, and social relations, while noting that these are heuristic categories that are neither fully distinct nor exhaustive (Ribot and Peluso 2003).

Ribot and Peluso's framework has provided the theoretical foundation for studies that examine access in natural resource settings. Jepson et al. (2010) highlight institutional arrangements that affect access and land use, and consider the implications for land change in the Brazilian Cerrado. McDermott (2009) documents the link between access to resources and access to decisionmaking processes and power in community-based forestry projects. Laird et al. (2010) brought together case studies to examine issues related to wild product governance. These studies describe conditions of access primarily through the lens of land tenure systems and associated informal, customary, and formal rights-based agreements and laws. In this collection, Dyke and Emery (2010) and Richards and Saastanoinen (2010) discuss a broader array of political–economic factors that affect gatherers' ability to benefit from resources.

Several mechanisms outlined by Ribot and Peluso help us understand access to NTFPs in northern Maine. Rights-based access mechanisms include permits and licenses in addition to property ownership (Ribot and Peluso 2003, 162). Relatedly, among structural and relational access mechanisms, "Access to capital is clearly a factor shaping who is able to benefit from resources" (165), including the purchase of rights through land ownership. In addition, through labor opportunities, a gatherer may establish relationships that provide access to resources that are owned by their employer (167). This access may be directly related to the job (being hired to gather NTFPs) or it may be negotiated as a side benefit. Ribot and Peluso (2003, 170–171) also note that social identity can influence "the distribution of benefits from things," both conferring and eliminating rights of access. They highlight the process of establishing indigenous identity and how this can affect access to resources for hunting, fishing, and gathering (171). Finally, the ability to negotiate varied social relationships (e.g., economically based ties; identity-based ties; and relationships at local, regional, and national scales) can affect access to resources, particularly where new values and structures are emerging (172).

We agree with Ribot and Peluso's argument to expand conceptualizations of access beyond rights-based approaches to consider "a larger array of institutions, social and political-economic relations and discursive strategies that shape benefit flows" (157). However, their theory assumes the a priori existence of a resource. Missing from this approach is consideration of biophysical factors that affect the material presence and quality of resources and so influence users' access. We believe

that combining Ribot and Peluso's approach with explicit attention to biophysical factors of environmental conditions and spatial proximity can provide a stronger foundation for management recommendations. Other scholars have examined how management actions change environmental conditions and thereby affect the availability and quality of natural resources such as berries (Carvalho et al. 2005), acorns (Norgaard 2004), and sweetgrass (Hurley et al. 2008). Scholars have also considered the effects of spatial proximity on access to resources and services, such as supermarkets with adequate fresh produce, dairy, and protein (Morton and Blanchard 2007) and regular health care (Arcury et al. 2005). These studies, along with Ribot and Peluso's theory, provide a basis for understanding the range of factors that influence access to NTFPs in northern Maine. The remainder of this article describes our study area, methods, results, ways forward, and conclusions.

Study Area

The St. John River watershed drains 21,230 square miles in northern Maine in the United States and in the Canadian provinces of New Brunswick and Quebec. Thirty-six percent (4,891,392 acres) of it is located in Maine. Vast swaths of spruce–fir forestland, accessible only by a system of logging roads, occupy the western portion of the watershed. The eastern part of the watershed is a patchwork of woodlots and fields that support crops including potatoes and broccoli. The region is populated by groups with varied cultural backgrounds including Maliseet, Mi'kmaq, French-Acadian, Swedish, and Scotch-Irish. People in the area have traditionally earned a living through resource-based activities such as logging and farming. They also have a history of using NTFPs for food, medicine, craft, spiritual, and aesthetic purposes.

Many of the larger landowners (>1000 acres) in the watershed are commercial forestry operations. Management techniques include precommercial thinning, shelterwood cuts, overstory removal, and application of herbicides to promote conifer growth. Although land in the western portion of the watershed remains primarily in forest production, parcels commonly change hands between industrial owners. New types of landowners, including nonprofit organizations and timber investment management organizations, have assumed ownership and management of several hundred thousand acres of forestland in the watershed. For example, The Nature Conservancy owns 180,000 acres of land in the region, managed in part to demonstrate sustainable forestry practices, and in part as an ecological reserve. In addition, the Maine Bureau of Parks and Lands holds approximately 200,000 acres of land in the region, managing them for recreation, wildlife, and forest products. Smaller landholdings (<1000 acres) are managed as agricultural lands, woodlots, and residential areas.

With landowner shifts in the region at a potentially earlier stage than in the southern part of the state, it is a useful time to gather data from people in northern Maine who are just beginning to experience the impact of changes.

Methods

We conducted qualitative research in Maine's St. John River watershed from fall 2007 through spring 2009. Ethnographic methods, including interviews and

participant observation, were employed to obtain data about use of and access to NTFPs (Patton 2002).

We interviewed 42 people: 28 gatherers and 14 landowners/managers. Gatherers were identified through key informants and outreach material and selected through purposive sampling (Patton 2002) to ensure representation of varied genders, age classes, and cultural groups. In total, we spoke with 19 women and 9 men who gather NTFPs. They were 31 to 85 years of age. They came from the main cultural groups of the area identified by the U.S. Census (11 with a mixed and/or general family heritage from England and Europe, 6 French-Acadian Americans, 2 Swedish Americans, and 1 Scotch-Irish American), and from Native American tribes that are a smaller part of the population but culturally important relative to gathering (5 Mi'kmaqs and 3 Maliseets). We oversampled Native American gatherers because while access to resources is important to many users, it is important to consider the impact of changes in access on potentially marginalized groups. In 2000, the poverty rate for Native Americans living in northern Maine was 36%, double that of all other area residents, and more than triple the national average (U.S. Census 2009).

We identified landowners or managers from public records available through the Maine Forest Service, selecting interviewees through purposive sampling to include varied ownership types (public, private, and nonprofit). The landowners or managers we interviewed are responsible for properties of 1,000 acres or more, with the exception of one individual who owns just over 400 acres but is known to allow gathering by members of local tribes. As a group, these landowners/managers control access to over 3,801,170 acres of land, or 77.7% of our study area.

We developed two interview guides, one for gatherers and one for landowners/managers, because we were interested in different, but complementary, information from each group. Interviews ranged from 20 minutes to 3 hours, with most lasting 1 hour. We asked gatherers where they collect NTFPs (habitat and landownership) and whether they obtain permission or incur costs (e.g., fees) to harvest. Gatherers were also asked about changes in their ability to find and gain access to species of interest, as well as concerns about gathering. We asked landowners and managers about management purposes and practices, gathering on their land, and their interactions with gatherers, including whether they imposed regulations on the harvest of NTFPs. We also asked whether they had concerns about such activities.

Interviews were audiorecorded, transcribed, and entered into NVIVO software for coding and analysis, under the terms of informed consent forms approved by the University of Vermont Institutional Review Board. We employed thematic analysis (Boyatzis 1998) because it is useful for examining both theory- and data-driven material. Following two readings of all transcripts, a coding scheme was developed to capture topics identified at the outset of the study and issues that emerged from the data. The coding scheme was applied to a selection of interview excerpts by two researchers to test for reliability. It was then applied to all interview transcripts. Participant observation data were gathered by accompanying people on gathering outings, attending workshops about NTFPs in the region conducted by a gatherer, and participating in a festival and ceremonies in which NTFPs were celebrated or used. Field notes from these activities provided information about gatherer practices and concerns expressed outside of recorded interviews.

Results

Gatherers collected over 120 species of plants and fungi for medicine (58 species), food (55 species), crafts (32 species), spiritual (7), and aesthetic (5) purposes.[2] Examining where people collect these NTFPs reveals differences between European American and Native American gatherers. In our sample, 65% of European American gatherers (13 of 20) collect primarily or exclusively on their land or the land of people in their social networks. Many of these gatherers own more than 75 acres. The three European American gatherers who gathered primarily on land owned by people outside their social networks were collecting plant material for commercial use. The three oldest European American interviewees, all in their 80s, described decades of collecting on their own land and land within their communities. In contrast, all the Native American gatherers we interviewed collect primarily or exclusively on land owned by others who are not in their social networks. Because they collect NTFPs on the land of others, Native American gatherers in our sample were most affected by the barriers to access described in the following sections.

Our data highlight four factors that affect access to NTFPs in northern Maine: (1) landowner regulations, (2) social relations, (3) environmental conditions, and (4) spatial proximity. While we have categorized our findings in this way to facilitate reporting, we recognize that the factors are interrelated and take note of these relationships as they are relevant.

Landowner Regulations

Landowner decisions to regulate use through fees, permits, lease systems, and posting affect access to NTFPs. These decisions are meant to control access through rights-based mechanisms (Ribot and Peluso 2003). They require that gatherers approach the landowner/manager to gain or maintain access.

Large Forest Landowner Regulations. The industrial timberland and other large forest landowners we interviewed reported that they allow unregulated gathering of NTFPs for personal use, as long as it does not interfere with forest management. However, a group of public and private landowners manage recreational access to 2.3 million of the 4.9 million acres in our study area under the umbrella of the nonprofit North Maine Woods. Access to this area requires a daily use fee. Large landowners/managers commonly used permit, fee, and lease systems for commercial species (balsam fir, sugar maple). Management goals affect their decisions about commercial leasing. For example, one landowner rejected a proposal to lease land to an industrial maple sugar operation because it was not consistent with management goals to create forest gaps and retain snags.

Small Landowners, Changing Practices, and Posting. Many gatherers we interviewed noted an increase in posting of land against trespass in the St. John River watershed among smaller landowners. Native American gatherers, in particular those who harvest ash trees (*Fraxinus nigra*) for basketry material, reported the greatest decline in access to resources. In their view, this shift in access is due to changing practices for posting and attitudes about protecting land among landowners who own farms and woodlots up to several hundred acres in size. Some gatherers

are afraid to cross property boundaries that were once open, citing the fact that people from "away" were moving in:

> People from out of state are coming in and buying 40–100 acres of land, and think they are land barons. The first thing they do is post the land, no hunting, no fishing.

One ash gatherer felt that access was becoming more difficult because smaller landowners are increasingly concerned about allowing extraction-based activities on their land:

> People are a little more into their land and how it's going to be treated, not wanting anything to be cut, wanting to preserve that, which is understandable. But it's hard because we're trying to preserve a way of life too.

Like the large landowner systems regulating commercial harvest, increased posting of land falls into the category of rights-based access. However, posting may restrict access more definitively than a permit system if some gatherers understand it as nonnegotiable. Others may be unwilling or unable to attempt to negotiate access for various reasons, including experience of discrimination based on social identity. Thus, the impact of landowner regulations on access is linked to social relations and identity.

Social Relations Beyond Landowner Regulation

A lack of positive social relations between gatherers and landowners/managers generates obstacles for access to NTFPs. This lack of positive social relations is particularly relevant to Native American gatherers, who are far more likely than other gatherers in our sample to obtain NTFPs on land owned by people not in their immediate social networks. Several examples from our data highlight barriers to access that arise from changing or absent social relations.

Changing Social Relations with Farmers. One example of how access to NTFPs has decreased due to changes in social relations came from an ash collector. He explained the importance of the work relationships that Native Americans had with farmers prior to the mechanization of potato harvests in the 1960s. Native Americans were often employed to harvest potato crops and were allowed to cut ash to make work baskets in which to collect the crop. These work relationships provided access to a culturally important resource, ash for basket making. Shifts in modes of production substantially decreased the need for manual labor as well as for ash baskets. Today, potato farmers do not benefit in a material sense from allowing basketmakers to cut ash trees on the farmers' land. Many of the old relationships have fallen into disuse, relationships with the new generation of farmers have not been as well developed, and access to ash has decreased as a result. In Ribot and Peluso's (2003, 167) framework, this is an example of a change in labor and social relations that previously had enabled access to resources.

Social Relations and Forest Certification. An example of social relations that have been difficult to establish in spite of institutional incentives arises from the process of forest certification. Much of the forestland in the watershed is managed under

operations certified through the Forest Stewardship Council (FSC) and/or the Sustainable Forestry Initiative (SFI) (Maine Forest Service 2008). A requirement of FSC Certification Principle Three is that relationships with local indigenous groups be developed (FSC 2002). Although large forest landowners/managers we spoke with expressed willingness to allow Native Americans access to harvest NTFPs, they were unsure how to work with the tribes. Some had tried to comply with FSC certification, but felt their attempts were unsuccessful and did not know what else to do:

> In our green certification, one recommendation was to have more involvement with Native Americans. Well, they know we [allow ash harvesting], but I guess we can be more aggressive to some degree, but, it [ash] is readily available to them. I'm not sure what else we could do.

The environmental planner for one band explained that the tribe would be interested in developing relationships with landowners for harvesting plants, but interactions have been very limited. In 15 years working for the tribe, the planner had been contacted by one large private forest landowner and one federal agency about developing relationships for harvesting ash trees. In an outcome that demonstrates how factors of access (social relations and spatial proximity) overlap, both were located too far away to be beneficial. The planner recalled another landowner who initiated a conversation about managing culturally important archaeological sites but was not receptive to ash harvesting.

Social Relations and Communication. Some gatherers we spoke with identified a need for better communication about land management to prevent waste of NTFPs. One gatherer described her dismay at finding a stand of ash had been damaged by skidders during a timber harvesting operation. Black ash is often considered an unimportant tree as timber or firewood, and the skidder injuries also rendered the trees unsuitable for basketmaking:

> To see those new growths coming up and cut into like that, it was heartbreaking. We could have used that, and they cut into those areas that were pretty sacred to us. We won't be able to use it. It's too bad. What can we do to find out ahead of time before they cut? At least then we could harvest what's there, so that it could be used instead of not having any use to them at all.

The preceding issues raised by our interviewees largely coincide with the mechanisms of access that Ribot and Peluso (2003, 172) describe, demonstrating that the lack of positive social relations can be a significant barrier to access to NTFPs. Beyond Ribot and Peluso, our results also illustrate the significance that the biophysical factors of environmental conditions and spatial proximity have for access.

Environmental Conditions

Land management decisions and ecological processes create environmental conditions that influence access to NTFPs. Gatherers reported several environmental conditions that affect their ability to derive benefits from NTFPs.

Pollution or Toxicity. Even when gatherers have permission to collect on private or public property, apprehension about exposure to toxins limits the places they feel comfortable harvesting. This theme arose more among gatherers who use plants for edible, medicinal, and spiritual reasons as compared to materials for craft purposes. Many gatherers we interviewed expressed deep concern about harvesting plants where herbicides or pesticides had been or might have been applied:

> For berries and things like that . . . we did have a problem that changed things a lot. They sprayed. Once they sprayed, we wouldn't dare to pick anything.

Gatherers reported avoiding locations in industrial forests that were treated to suppress broadleaf trees, and along power lines and railroad tracks where chemicals are sometimes applied to control vegetation. As a result, several gatherers we interviewed confine their harvesting activities to their own property, or the land of friends who do not apply chemicals to their land. Others expressed concern that herbicides applied by landowners may be transported by wind or water, affecting neighboring areas.

Changing Habitat. The forests and fields of northern Maine are working landscapes where changes in management practices affect NTFP habitat. Shifts away from even-aged timber harvests that create large openings in the forest canopy limit habitat for raspberries and other sun-loving NTFPs. Decommissioning of logging roads can cause loss of edge habitat where many NTFPs thrive, and can eliminate access routes to previously reachable locations. As farm fields go out of production, habitat is created for early successional species, such as chokecherries and red-osier dogwood. Some of these changes result from new understandings of best practices to reduce human impacts on the environment. At the same time, they can disturb sociocultural practices associated with natural resource use. Geomorphic processes can play a part in availability as well. For example, one interviewee recalled a population of beach plums on an island in the St. John River that was destroyed by early spring ice scouring.

Loss of Habitat and Changing Land Use. As land in the St. John River watershed is developed, habitat for some NTFP species is destroyed. Perhaps the most dramatic example in our data is the loss of a Maliseet medicinal plant collection site when a wetland was filled for the construction of a Walmart parking lot. Other gatherers reported the loss of blueberry and sweetgrass harvesting sites due to construction of homes and erosion of riverbanks caused by dams.

Spatial Proximity

Even where entry to property for gathering is permitted or encouraged, distances can be prohibitive. Some industrial forestland in northern Maine that is open to NTFP harvesting is in areas that can be reached only by long travel on logging roads. For some individuals, the distances are too great for gathering to be worthwhile unless combined with other activities such as fishing or canoeing. The words of one land manager echo a sentiment expressed by several people we interviewed:

> People have traditionally eaten all of that stuff (fiddleheads, mushrooms, berries), yes. Do they drive three hours from Fort Kent to get it? No. If

> they're canoeing the St. John, sure, they'll pick it on the way by, if it's ready.

Similarly, an employee of the Maine Department of Parks and Lands explained that he thinks distance keeps people from taking advantage of free permits to harvest ash on state lands:

> They're focused more on private land, because it's right in their backyard. They try to stay as close to home as possible, which makes sense.

In the case of ash, distance from a road also affects gatherers ability to harvest. Ash logs can be heavy and cumbersome; some gatherers we spoke with are elderly or have health conditions that make hauling logs a long distance prohibitive.

Compared to other gatherers, Native Americans reported traveling the greatest distances from their homes, up to 30 to 150 miles, to harvest NTFPs. This is partly due to the fact that, compared to other gatherers, Native American collectors sought access to plant species, such as muskrat root (*Acorus calamus*), that are found in specialized habitats in limited locations. In addition, with increases in posting of land, the geographic distances that must be traveled to gain access to NTFPs are increasing for gatherers who do not own land on which to gather. In this context, changes in rights-based access described by Ribot and Peluso (2003) have implications for the spatial proximity of and access to resources.

Ways Forward

A shift away from Maine's open land tradition may be starting in the northern region of the state. If this shift intensifies, it would parallel changes that have raised substantial concerns in the southern two-thirds of the state and exacerbate existing constraints on access to NTFPs and other natural resources. Increased posting would be an obvious impediment to access but our findings indicate additional factors already have substantial influence on access. Ribot and Peluso (2003, 173–174) suggest that access analysis can "serve as a tool for identifying the larger range of policy mechanisms—beyond property and other forms of rights—that can affect changes in resource management and use." Following their lead, we identified management options to respond to barriers to access to NTFPs in northern Maine. Adding biophysical factors to Ribot and Peluso's framework expanded the array of options we identified. Where possible, we suggest organizations that could help implement these options.

Landownership. Land acquisition for NTFP management would be an obvious way to secure rights of entry for gathering, but it is financially prohibitive for the majority of individuals. Some tribal governments may have the wherewithal to acquire land for use by their members. However, even where funding is available, locating suitable habitats and willing sellers is a significant challenge.

Entry Arrangements. Another option is to develop entry arrangements with landowners, including permit fees and harvesting regulations. The success of such an approach could be enhanced if gatherers and landowners/managers exchange ideas and address concerns of both parties prior to or as part of the process of crafting regulations. The University of Maine Cooperative Extension, which already

publishes a series of bulletins about NTFPs, as well as land management, could facilitate such exchanges.

Social Relations. Conflicts do exist between some landowner goals and gathering, but some constraints to access likely are inadvertent. In either case, strengthening relationships between landowners/managers and gatherers could aid in identifying solutions to access challenges. Efforts to enhance social relations might be initiated by the landowners/managers during their planning processes. Alternatively, model management plans for NTFPs could be generated by tribes and other groups interested in partnerships for NTFP harvesting. Plans could consider ecological and social factors, highlight issues of access to NTFPs, and identify opportunities and actions to address these issues. Collaboration between NTFP harvesters and land managers could provide a basis for developing management plans that are sensitive to NTFPs and might help to reduce conflicts in goals, outcomes, and harvesting regulations.

Work with gatherers could help landowners/managers to obtain or maintain forest certification. It would contribute to meeting goals under FSC Principle 5 (Benefits from the forest) (FSC 2002) and SFI Objective 5, Performance Measure 5.4 (''support and promote recreational opportunities for the public'') and Objective 6, Performance Measure 6.1 (''identify special sites and manage them in a manner appropriate for their unique features'') (SFI 2010). Certification offers incentives for collaboration between tribes and landowners/managers under the terms of FSC Principle 3 (Indigenous people's rights) and SFI Objective 18, Performance Measure 18.2 (''confer with affected indigenous peoples''), although the latter applies only to actions taken on public lands. For example, where landowners have a professional forester cruise and mark timber prior to harvesting, it may be possible to work with members of the Native American tribes to identify basket-quality ash and provide access to these resources for indigenous people.

Environmental Conditions. Contamination of NTFPs by pesticides, herbicides, and other pollutants was a common concern among the gatherers we interviewed. In addition to known sites of chemical application, gatherers sometimes limit their activities because of uncertainty about whether chemicals have been sprayed in an area, preferring to err on the side of caution. The Maine Board of Pesticides Control requires advance public notice for some types of pesticide spraying (Maine Board of Pesticides Control 2009). Outreach to make gatherers aware of this system could inform their decisions about whether to harvest on a given piece of land. Increased use of alternatives such as integrated pest management may reduce the problem. Another strategy would involve land managers working with gatherers to identify important collection sites where treatment can be limited. Gatherers might also monitor for insects and diseases, allowing targeted applications only where these are deemed necessary.

As gatherers face the loss of plants due to changing habitat and land use, a management response may be available through regulatory frameworks that require mitigation. For example, as wetlands that contain NTFP collection sites are filled in for development, remediation or restoration projects could incorporate NTFP species into their design. Consultants, developers, and public agencies responsible for land and wetlands regulations (e.g., the Maine Land Use Regulation Commission and the U.S. Environmental Protection Agency Wetlands Program) could work with researchers and gatherers to develop information about economically and culturally

important NTFP species, including guidance on how to incorporate their conservation into remediation and restoration designs.

Spatial Proximity. In some cases, spatially proximate populations of plants and fungi may exist but are not used because they are unknown or access is prohibited. Efforts to establish or improve relationships between gatherers and landowners may help to make such resources available. In addition, establishing NTFP populations in readily accessible areas could help to create 'wild pantries' near communities, similar to community gardens. Where travel distances to NTFPs remain long, gatherers could develop networks to share transportation and labor.

Conclusions

As Ribot and Peluso (2003) predict, rights-based access through property ownership is just one component in a suite of interacting structural and relational processes. Capital and land ownership, shifting institutional arrangements to market forest products through ''green'' certification, changing labor opportunities in the agricultural sector, the capacity to negotiate access agreements, and social identity all play a role in access to NTFPs in our study area. In addition to these mechanisms, our findings illustrate the value of assessing biophysical factors that affect access to resources. In our case, forest management practices and land use change are linked to biophysical factors of environmental conditions and spatial proximity that affect access to NTFPS. Environmental conditions include the presence of toxins, changes in the distribution and types of habitat, elimination of gathering sites, and the distribution of logging roads. These conditions affect resource users interested in specific fauna and flora in the region as well as those who have used the logging roads for access. In addition, the spatial proximity of resources affects access. In our case, distances to NTFPs can be substantial and, in some instances, become a barrier to gathering.

Our findings demonstrate that access is more complex than a focus on rights of entry would suggest. While our study centered on gathering of NTFPs and so cannot be extended in its specifics to other resources, the results are indicative of the complexity one might find in other settings. The factors that affect access for gathering may be relevant for activities such as hunting, fishing, hiking, off-road vehicle use, snowmobiling, and cross-country skiing. However, the properties of resources such as wildlife and fish, water, trails, minerals, and timber differ dramatically, so access analysis and associated proposals for management must be adapted to the circumstances of individual settings. This said, our study supports a general definition of access that extends beyond rights of entry to include the wider array of social and biophysical factors that affect people's ability to derive benefits from resources. This approach to defining access can help generate a similarly wider array of possible management strategies.

Management strategies that emphasize property rights rely upon a legal framework. Strategies for collaboration between landowners and resource users highlight the social relations that accompany the bundle of legal rights. Those that address the material presence and condition of resources can take account of biophysical factors that affect access. The biophysical factors in our study (environmental conditions and spatial proximity) substantially affect gatherers' ability to benefit from NTFPs in the St. John River watershed. Thus our findings provide empirical evidence to

support the consideration of biophysical factors in addition to Ribot and Peluso's (2003) already expansive framework. Doing so provides a fuller understanding of access and can be useful in explaining and identifying potential responses to resource management issues.

Notes

1. We do not focus on usufructory rights here because we saw no indication of NTFP gatherers claiming such rights in northern Maine. In other settings, usufructory rights are central to understanding access (McCay and Acheson 1996).
2. Does not total 120 because several species have multiple uses.

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