ANALYSIS

Governing snowmobilers in multiple-use landscapes: Swedish and Maine (USA) cases

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Received 4 November 2002; received in revised form 20 October 2003; accepted 20 October 2003

Abstract

Snowmobiling growth in North America and Sweden creates challenges in “governing the commons.” Snowmobiling contributes to the economy of distressed rural regions and enhances residents’ quality of life; but quasi-open access to winter landscapes also breeds conflicts: among snowmobilers, with landowners, with other recreationists, and with environmentalists and ecosystem health. Common pool resource and impure public goods theories are used to interpret these conflicts and strategic interactions. Case studies in Sweden and Maine yield insights about conditions for sustainable management of multiple-use landscapes when property rights are complex and stakeholders diverse. The case studies utilize key informant interviews, tourist surveys, and a contingent valuation exercise to illustrate how innovative governance institutions, complemented by infrastructure investments, can mitigate conflicts, re-align incentives, and internalize costs. Local self-governance has evolved with state facilitation, but without changes in fundamental property law. Three keys are trail agreements between snowmobile clubs and landowners, clubs’ norm formation and rule enforcement, and public–private investment in quality trails. These arrangements are strained by hot spot congestion, free riding, and unresolved conflicts with other recreationists.

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Keywords: Multiple-use landscape; Snowmobile; Common pool resource; Impure public good; Free riding; Governance regime

1. Introduction: snowmobiles’ contradictory roles in rural life and landscapes

The central problem explored here is governing recreational access to multiple-use landscapes in an era of growing motorized off-road recreation. The ecosystems under study combine private and state land ownership, but with important common property features regarding public recreational access. Limited compatibility among land uses and limited possibilities for excluding motorized users have bred conflicts among stakeholders and with ecosystem health. Although this narrative centers on snowmobiling, analogous tales could be told about the impacts of all-terrain vehicles (ATVs), personal water craft (jet skis), and even floatplanes (aircraft), whose sounds, sights, and emissions increasingly pervade industrial nations’ backcountry landscapes (Havlick, 2002; Vail, 2001). We investigate how stakeholders...
in Sweden’s western mountains and Maine’s northern forest have responded to emergent snowmobiling conflicts, reshaping governance institutions and building infrastructure, but not changing core property laws.

Snowmobiling has complex and contradictory effects on rural lifestyles, economies, and ecosystems. It has unquestionably improved the quality of winter life for many rural residents, replacing isolated “cabin fever” with group-centered outdoor adventure. “Snow scooter driving is part of our identity up here in northern Sweden. It sits deeply in our soul that this is freedom” (Lindgren, 2003). Snowmobiling has buoyed economically distressed regions, suffering from chronic winter unemployment and “mature” agriculture, forestry, and mining sectors (Vail and Heldt, 2000). Snowmobiling also manifests cultural contradictions. It perpetuates machine-centered, nature-dominating rural traditions, but has also evolved into a family-, club-, and community-oriented activity, featuring ice fishing contests, barbeques, charities, and outdoor religious services (Anttila, 2001; Genthner, 2002).

A few statistics convey snowmobiling’s scope, growth, and economic importance in the study regions. Swedes registered 224,000 snowmobiles in 2001, up 47% from 1990. This is roughly one snowmobile per 25 adults, with the ratio nearly one-per-two adults in northern counties. Maine’s 1.2 million residents registered 80,000 snowmobiles: a one-per-fifteen residents ratio said to be the highest of any US state (Rubin et al., 2001; SCB, 2000). In 2002, snowmobilers’ spent over US$300 million in Maine, a 500% increase from 1988. “Sledding” now equals alpine skiing as Maine’s top source of winter tourism revenue. It generates 2300 full-time equivalent jobs (BPR, 1988; Reiling, 1998; Mazzone, 2001). Not surprisingly, Maine’s Office of Tourism and local chambers of commerce hope to attract still more snowmobilers. Swedish policy, with regional exceptions, has been less encouraging. Snowmobilers’ economic contribution is less appreciated and, as we shall explain, they are implicated in more intense land use conflicts.

In contrast to snowmobiling’s contributions to rural economics and welfare, it is implicated in several distinct conflicts, entailing what Manning (1999) terms “goal interference attributed to others” (p. 203). Knopp and Tyger (1973) began to document such snowmobiling conflicts three decades ago. Lindberg et al. (2001) and Havlick (2002) explain that these conflicts are typically asymmetrical, with motorized recreationists who impose costs, such as property damage and habitat disruption, often unaware of their interference with others’ goals. Fig. 1 introduces four principal conflicts uncovered by this study (one-way arrows indicate predominantly directional impacts; two-way arrows indicate reciprocal impacts.)

Snowmobiling can also confer benefits on other actors. For instance, most Swedish backcountry skiers view snowmobilers as an emergency lifeline, and Maine’s forest owners rely on snowmobile clubs to help police ATV trespassing (Gamble; Lindberg et al., 2001). Given this mix of detrimental and beneficial externalities, Marcouiller and Green’s (2000) identification of three degrees of compatibility—mutual exclusivity, competitive coexistence, and complementarity—is useful.

The paper is organized as follows. First, the study areas are briefly described. Section 2 then draws on two theoretical traditions to explain snowmobiling conflicts and conflict resolution. One approach weaves together common pool and impure public goods theories, emphasizing complementarity among three types of capital: natural (winter landscapes), human-made (trail infrastructure), and social (governance institutions). The second approach combines institutional economics and governance theories to show how innovative governance arrangements re-shape snowmobilers’ incentives, behavior, and norms. Section 3 describes field research methods. Sections 4 and 5 present the Sweden and Maine case studies. Finally, Section 6 summarizes findings, stressing the evolutionary adaptation of governance regimes to changing constraints.

Type 1. Snowmobilers ↔ Snowmobilers:
Type 2. Snowmobilers → Landowners:
Type 3. Snowmobilers ↔ Other Recreationists
Type 4. Snowmobilers → Conservationists

Fig. 1. Patterns of conflict.
1.1. Sweden’s western mountains and Maine’s northern forest

The study areas have core similarities, but also differences that make for fruitful comparison. Both are predominantly rural, with extensive mountain ranges, major watersheds, and hundreds of lakes and ponds. The land is over 90% forested. In Sweden’s Dalarna County, three-fourths is privately owned; the Maine figure is 94%. Both have long outdoor recreation traditions. Storyteller Hans Christian Andersen lauded Dalarna’s rustic charms following an 1849 visit. H.D. Thoreau shaped Maine’s wilderness mystique with his contemporaneous Maine Woods essays. In recent decades, regional economies have become increasingly tourism-dependent. Tourism accounts for 4% of Dalarna’s employment, versus 2% for all Sweden; and 10% of Maine jobs, compared to 5% for the US economy (Vail and Heldt, 2000).
Sweden’s centuries-old right of common access, allemansrätten, ensures public access to undeveloped landscapes. Not codified in law, it is rather a set of customary rules and judicial interpretations regarding activities, such as camping, berry picking, and cross-country (XC) skiing, where the state accepts no obligation to defend landowner claims. Under allemansrätten, XC skiing became a widespread pastime, with the Society for Promotion of Ski Touring founded in 1892. Today, one-fourth of Swedes, compared to just 3% of Americans, participate (McIntyre, 1999). In 1975, following heated debate about allemansrätten’s applicability to recreational vehicles, Parliament passed the Terrain Driving Law, granting snowmobiles access to nearly all snow-covered land. (Twelve fragile alpine regions were excepted.) Today’s snowmobile conflicts stem largely from this statute, which, de facto, curtailed landowners’ and self-propelled recreationists’ rights and opened the door to environmental degradation.

Maine’s 4-million-hectare northern forest is nearly all commercial timberland, long held by a handful of owners bearing names like International Paper. Legally, landowners could prohibit public access, yet most allowed recreational use of lands not involved in logging operations. Over many decades, “Mainers”
came to view recreational access as an entitlement. In the 1970s and 1980s, with construction of a 40,000-km logging road network, access was—sometimes grudgingly—extended to snowmobilers. As a practical matter, the transaction costs of excluding them or collecting fees would have been prohibitive, since sledders could drive nearly anywhere in the vast winter landscape. In the mid-1970s, Maine’s “snowmobile problem,” unlike Sweden’s, centered on lawless riders and high policing costs.

2. Conceptual lenses

2.1. Outdoor recreation and common pool resource (CPR) theory

Textbook discussions of CPRs emphasize homogeneous natural capital stocks such as trees, fish, and aquifers (Tietenberg, 2003, p. 70). With open access, individuals’ incentives to intensify exploitation are misaligned with the collective interest in restraining exploitation, to enhance economic rents and conserve stocks. Open access causes reciprocal externalities, whereby each user’s harvest subtracts from the remaining pool and may also raise others’ extraction costs. Rational individual exploitation dissipates short-term income (scarcity rent) and may exceed maximum sustainable yield.

As the following case studies convey, recreational landscapes do not meet a literal definition of open access, where there is no vested ownership, no limitation on use, and no user responsibility (Hanna et al., 1996). Most snowmobile trails cross private land; Swedes are indoctrinated that allemansrätten rests on a conservation ethic and respect for landowners’ interests; and Maine recreation brochures stress that the public’s backcountry adventures depend on landowners’ goodwill.

CPR theory has recently been applied to recreational land use conflicts (Bosselman et al., 1999; Marcouiller, 1998; Anttila, 1999). With snowmobiling, it applies most clearly to type 1 conflicts among snowmobilers. The key reciprocal externality involves hot spot congestion at peak times on prime trails, for instance, Easter Weekend on Sweden’s Grönlitt massif. “Congestion” is shorthand for a nexus of amenity-reducing and cost-raising effects, including increased physical crowding, exhaust fumes, trail deterioration, accidents, and hostile encounters. It also includes what Manning (1999) terms “displacement costs,” when sledders react to congestion by traveling farther afield or riding less attractive trails. Hot spots are intensified by the broad social trend toward concentration of leisure into weekend bursts, redoubling pressure on trails within a few hours’ drive of population centers.

Although snow-covered landscapes are quite resilient, unrestricted access nonetheless contributes to three depletion effects: soil and plant degradation when snow cover recedes, wear-and-tear on infrastructure (bridges, culverts, etc.), and trail mileage cutbacks when landowners gate their property in response to heavy traffic.

Open access also entails a free rider problem. Quality trails require in-season grooming as well as investments in land clearing, culverts, bridges, and signage. With open access, individuals have minimal incentive to contribute to these investments, resulting in sub-optimal trail quality. This, in turn, weakens the incentive to ride on designated trails. Three basic approaches to CPR governance are privatization and markets, state ownership and regulation, and community norms and reciprocity. Whichever regime is crafted to govern snowmobiling, some free riding incentive persists due to high exclusion and fee collection costs.

2.2. Ecosystem services, multiple use landscapes, and impure public goods

The forest, lake, and alpine ecosystems of western Sweden and northern Maine generate service flows—timber, natural beauty, stream flows, songbirds, wild game, etc.—that support both commodity production (forestry, farming, reindeer herding) and many forms of recreation. The mix and levels of these flows determine sustainable carrying capacity for any particular activity and shape conflicts and complementar-

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1 User fees are increasingly collected for backcountry recreation, like hunting and camping, but not snowmobiling (Vail and Hultkrantz, 2000).
2 Permissive access was also motivated by forest owners’ search for political allies against conservationist efforts to regulate clearcutting, pesticide spraying and other industrial forestry practices.
ities among activities. Recreational carrying capacity is a controversial notion, used here heuristically, not literally. Capacity is rarely a fixed bio-physical limit. Typically, it is influenced by the resource management regime and by various actors’ “sensitivity to conflict” and “coping behaviors” (Manning, 1999, pp. 202–203). Although higher use levels commonly raise incremental costs, there is seldom a “bright line” beyond which growth causes irreversible damages or a system collapse. This is particularly true when users adjust their expectations or shift to less-congested sites and times (Manning, 1999; Prato, 2001; Seidl and Tisdell, 1999).

Landscape scale is important both for carrying capacity and conflict management. Locally, XC skiing and snowmobiling may be mutually exclusive, while at a large landscape scale, they are compatible or even complementary. Thus, snowmobile tracks in remote areas facilitate skiing in deep snow and provide a rescue lifeline. In the study areas, the overarching land use complementarity is between snowmobiling and commercial forestry, where unused logging roads are integral to trail networks.

The landscapes under study are best considered impure public goods, in contrast to pure public goods where exclusion is not feasible and no-one’s use subtracts from others’ welfare (Vail and Hultkrantz, 2000). Snowmobiling can certainly have detrimental third-party effects and disrupt ecosystem services. Symmetrically, other land uses may adversely affect snowmobilers. A distinctive feature of snowmobiling is the strong complementarity between two impure public goods: natural landscapes and trail infrastructure. Well-groomed, well-sited trails mitigate third party effects by inducing most sledders to steer clear of logging operations, XC ski tracks, and wildlife breeding areas.

2.3. Managing multiple use landscapes with vested ownership but common property features

Williamson (2000) defines resource governance as, “an effort to craft order, thereby to mitigate conflict and realize mutual gains” (p. 599). Designing snowmobile governance to reduce, if not eliminate, the four types of conflict faces impediments. First, it is not politically feasible to rewrite fundamental property laws. Second, there are cultural obstacles to modifying snowmobilers’ behavior and norms. Third, incentives to shirk make enforcement of laws, contracts, or informal rules costly. Finally, governance is complicated by trail networks crossing multiple ownerships and political jurisdictions.

Focusing on strategic interactions between snowmobilers and landowners in western Sweden, Anttila (2001) models the evolution of local contracting arrangements. A “lose–lose” prisoners’ dilemma game has been replaced by a repeated cooperative game. In the pre-contract setting, landowners posted land against trespassers and threatened to prosecute violators: the worst case for snowmobilers. Enforcement, however, imposed heavy monitoring costs on the owners. Contracts for well-defined trails, with self-policing by snowmobile clubs, improved both parties’ payoffs. Snowmobiles avoided prosecution and collective trail investment brought higher quality riding. Landowners could limit sledding to specified areas and cut enforcement costs. Two conditions strengthened the players’ incentives to make and abide by such “win–win” (Pareto-improving) contracts. First, quality trails induced most snowmobilers to ride in designated corridors. Second, asymmetric information—snowmobilers’ knowledge of peer behavior—made self-policing more cost-effective than third-party enforcement. A key to evolutionary success was the clubs’ discouragement of “rogue sledding” through a mix of moral suasion and informing state rangers of violators.

The vast literature on commons governance reveals no universal truths: “the devil is in the details.” In our case, organizing snowmobilers and landowners, mediating contract negotiations, sanctioning shirkers, and financing trail infrastructure all pose challenges. Social scientists have surveyed dozens of case studies and experiments in commons governance (Grafton, 2000; Ostrom, 2000; Agrawal, 2002). Synthesizing insights from diverse contexts, Agrawal (2002, pp. 62–63) identifies over 30 features of resource systems, stakeholder groups, institutional arrangements, and “external environments” that influence the effec-

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3 Maine’s forest managers claim most sledders keep to designated trails; the main exception and concern is sledding on plowed logging roads (Gamble; Medina). The Funäsdalen case described in Section 4 also supports this conclusion (Alexandersson, 2001).
tiveness and resilience of governance regimes. Given such complexity and context specificity, a deterministic theory of commons governance is not likely to emerge. Nonetheless, Grafton (2000) identifies facilitating conditions—not definitive causes—relevant to the snowmobile context:

- “Rules of access [to the resource]...accepted by the community”
- Manageably small numbers of participants
- Strong “mutual obligations and ties among members”
- “Participation of most resource users [or representatives] in changes to collective rules” and in regime management and monitoring
- Easy detection of violators and “technology to exclude non-members”
- “Enforcement of rules with graduated sanctions against transgressors” (pp. 506, 512).

The literature suggests that state intervention is often necessary. In Grafton’s (2000) words, “The institutional costs to overcome the free rider problem can often be very high, requiring some form of coordination across resource owners, users, and beneficiaries” (p. 513). A core insight is that often states can most effectively mitigate conflicts and promote mutual gains with a facilitative strategy, rather than public resource ownership or regulation. Given deeply embedded cultural norms of private property and public recreational access in Sweden and Maine, a facilitative strategy is intuitively plausible.

Ostrom (2000) observes that, “In all known self-organized governance regimes that have survived for multiple generations, participants invest resources in monitoring and sanctioning the actions of each other to reduce the probability of free riding” (p. 138) Appealing to evolutionary game theory, Ostrom interprets players’ interactions in terms of distinct personality types and strategies. Rational egoists, the amoral utility maximizers familiar from neoclassical economics, seek to optimize short-term payoffs. They readily flout rules and free ride on others’ investments. Should they predominate, the game may degenerate to a prisoner’s dilemma. Narrow, myopic self-interest may be countered, however, by the strategies of two other types of player: conditional cooperators and willing sanctioners. Not altruists, they attempt to secure their multi-period interests by improving collective payoffs. Cooperators follow cooperative strategies so long as enough others do so, while sanctioners accept short term costs in order to enforce cooperative game rules. Such a mix of personalities and strategies seems to be present among snowmobilers, helping to explain how governance has evolved.

Social norms evolve along with governance structures and can be their “glue,” reinforcing external incentives and sanctions. Following Ostrom (2000), norms are “shared understandings about actions that are obligatory, permitted, or forbidden” (p. 143). Williamson (2000) stresses that while incentives and regulations can change behavior relatively quickly, norms evolve on a longer time scale. Indeed, America’s experience in managing motorized recreation indicates that rational egoism is tenacious (Havlick, 2002). Nonetheless, our case studies suggest that, with three decades of behavior modification, a new snowmobiling ethic is spreading, reflected in a greater sense of responsibility toward landowners, other recreationists, and nature conservation.

3. Field research methods

The Swedish cases build on a foundation of tourist survey research in mountain regions, including skier–snowmobiler and landowner–snowmobiler relationships (Fredman and Heberlein, 2003; Hultkrantz and Mortazavi, 1999; Lindberg et al., 2001). Attitudinal surveys and contingent valuation experiments in Dalarna County are used to assess the extent and severity of skier–sledder conflicts and the value placed on trail separation (Heldt, 2000; Heldt and Nerhagen, 2001). This analysis is supplemented by a semi-structured key informant interview with a regional recreation official (Magnusson) and written communications from the chair of a working group on snowmobile traffic (Martinsson). Assessment of Funäsdalen’s trail management innovations relies on a project consultant interview (Alexandersson) and reports of the project’s initial year (Alexandersson, 2001; Björkén, 2001).

The Maine section centers on a case study of the Rangeley Lakes region. It utilizes eight semi-structured key informant interviews plus meeting minutes
and consultant reports from a 2-year outdoor recreation planning process for the Rangeley region. The process, called “Conservation Works!”, was initiated by the Maine Audubon Society (EPO, 2000; Irland Group, 2001; Jones, 2002). State-level informants include the Maine Snowmobile Program’s director of landowner relations (Peppard) and the Maine Snowmobile Association (MSA)’s executive director (Myers). Rangeley interviewees include presidents of the snowmobile and cross-country ski clubs (Ellis; Foltz), forest managers for large landowners (Gamble; Medina), and “Conservation Works!” principal consultants (Giffen; Irland).4

Field research findings are presented in a narrative and primarily qualitative form.

4. Mitigating snowmobile conflicts in Sweden’s southwestern mountains

A century ago, the Swedish Tourism Association was built around a network of mountain hiking and skiing huts. Skiers, primarily well-educated urbanites, viewed the mountains as rightfully their place for exercise and contemplation. The 1975 Terrain Driving Law dramatically curtailed rights to solitude in nature, previously guaranteed by allemansrätten. Snowmobiling’s rapid growth and skiers’ high “sensitivity to conflict” have made the law controversial ever since. Mountain tourism areas also experience conflicts among snowmobilers and with landowners and environmentalists.

High latitude and severe climate make Sweden’s alpine ecosystems fragile. Above tree line landscapes are open, making snowmobiles visible and audible over long distances and leading many skiers to view sledding and skiing as incompatible. Fifty-six percent of skiers surveyed in Sälen municipality claim that snowmobiles interfere with skiing. This understates the extent of conflict sensitivity, since “displaced” skiers who sought solitude elsewhere were not interviewed (Heldt and Nerhagen, 2001).

This section uses two studies in mountain tourism areas and one in a working landscape to compare the effectiveness of alternative local governance mechanisms in mitigating conflicts. In Sälen, governance efforts initially stressed norms of courtesy and reciprocity to reduce snowmobiler–skier conflict. Ultimately, the state used zoning to separate trails. In Funäsdalen, stakeholders responded to types 1, 2, and 3 conflicts with multi-party contracting and a stakeholder-owned corporation. In both areas, motorized and self-propelled recreation are generally considered incompatible at a micro-scale, but potentially compatible at landscape scale. The third example briefly revisits Antilla’s analysis of snowmobile club–landowner contracting.

The governance regimes sketched here focus on conflicts among people, but snowmobiling also degrades alpine ecosystems. Indeed, it was signs of environmental damage, publicized by the Swedish Environmental Protection Agency (EPA) and Society for Nature Conservation, that prompted official investigations of air and water pollution, fish stock depletion (via ice fishing), destruction of fragile tundra, and disruption of wildlife reproduction (SOU, 1993, 1995). Although the governance arrangements described here have reduced those impacts, continuing EPA criticism is one reason Swedish policy makers do not aggressively promote snowmobiling as a rural development engine (Martinsson).

4.1. Conflict resolution in Sälenfjällen: from failed voluntarism to state zoning

Sälenfjällen, Sweden’s top winter tourist destination, illustrates the limitations of voluntary compliance with social norms to govern snowmobiling, particularly when sledders are heterogeneous and monitoring costs are high. Most land around Sälen is owned by alpine ski resorts. However, most XC skiing and snowmobile trails are public, managed by the municipality and county. Three distinct types of snowmobile actors compete with skiers for access: local club members, snowmobile rental and “safari” businesses, and tourist sledders. The first two can be thought of as multi-period players. Their repeated interactions and reciprocal ties strengthen incentives to make long-term agreements. Tourist sledders, in contrast, are “one-shot” players, in theory less easily influenced by other players and needing tangible incentives or sanctions to comply with game rules (Ostrom, 2000).
For most of the 1990s, community organizations (including public agencies, the mountain rescue service, snowmobile club, police department, large landowners, and tourism businesses) jointly implemented the norm-based regime. It emphasized mutual respect between snowmobilers and skiers and appeals to use only designated trails. Specific measures included print media, trailhead signs, and trail separation, with snowmobiles nominally banned from ski tracks (Magnusson). Skiing conditions improved somewhat, but skiers still suffered amenity losses, due both to norm-violating sledders and to snowmobiling’s sheer growth in southwestern Sweden, which is within a day’s drive of Scandinavia’s four largest cities.5 

Lobbying by angry skiers and conservationists led Parliament to add Sälénfjällen to Sweden’s system of Regulation Zones in 1997, prohibiting snowmobiling except for one trail monitored by county rangers. This proved to be a “win–lose” approach. Two-thirds of skiers perceived conditions to be improved with zoning, but two-thirds of snowmobilers claimed that their situation was worse. Indeed, the combination of zoning restrictions and Sälén’s hot spot location has intensified type 1 congestion conflicts (Heldt and Nerhagen, 2001).

Grafton’s criteria for effective self-governance, cited above, cast light on Sälén’s inability to resolve the sledder–skier conflict. The increase in one-time tourist sledders from outside the community makes it difficult to achieve voluntary compliance based on “mutual obligations and ties among members.” In retrospect, it would have been more effective to reinforce “moral suasion” with greater investment in high-quality trails, strengthening snowmobilers’ incentive to ride them. However, fund raising is difficult when tourist sledders can free ride and lack any long-term stake.

As Ostrom (2000) observes, “without some form of coordination to enable all individuals to agree upon, monitor and sanction contributions to the provision of a public good, the good is underprovided” (p. 138). In 2001, Sälén’s six snowmobile rental and safari businesses overcame the problem through joint investment in trail expansion. The municipality agreed to share costs and manage grooming. Acting as joint monopolists, they eliminated tourist sledders’ free riding by raising rental fees and putting the added revenue into trails. Under this private–public partnership, Sälén’s trails are improving, to the benefit of sledders and skiers alike. Yet, since snowmobile owners can still free ride, trail quality will remain less than optimal.

4.2. “Northern Europe’s finest snowmobile area”: a governance success in the making

Funäsdalen illustrates innovative local governance to attack types 1, 2, and 3 conflicts simultaneously. It joins several interest groups and combines land use contracts, a stakeholder-owned corporation, trail user fees, and zoning. This is Europe’s first trail system where grooming is fully funded by user fees (Alexandersson, 2001; Björkén, 2001). The actors and conflict patterns are similar to Sälén’s, but Funäsdalen’s greater economic reliance on XC skiing has made resolution of snowmobiler–skier conflicts a top priority.

The Funäsdalen project is an exception to Sweden’s tendency not to promote snowmobile tourism. It aims to strengthen the economy by expanding snowmobiling and skiing compatibly. Its perceived importance is reflected in US$750,000 of seed capital for 450 km of trails, jointly financed by Sweden’s EPA and the European Union’s fund for distressed rural regions. Notwithstanding this state backing, planning, and management are grounded in the community. Local stakeholders have laid out ski and sled trails and formulated access rules, using long-term contracts with landowners. To formalize commitments, the various constituencies chartered a for-profit corporation to manage trail maintenance, fee collection, and monitoring. It is 51% owned by the landowners’ association, with area tourism businesses and the snowmobile club as minority owners. Alexandersson (2001) believes a side benefit has been to strengthen local democracy by increasing participants’ mutual responsibility and legitimating new forms of collective action.

To ensure high-quality skiing and snowmobiling within one landscape, trails are carefully separated and the state has created snowmobile prohibition zones. As in Sälén, zoning is particularly important.

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5 Between 1985 and 2000, the fraction of adult Swedes who had snowmobiled in the mountains increased from 9.4% to 16.1% (Fredman and Heberlein, 2003).
to control tourist snowmobilers, who lack solidarity with other players. Snowmobilers caught violating the rules are fined US$60 (four times the daily fee), however, monitoring costs are high, so some free riding and nuisance effects are inevitable. To encourage cooperation, trail fees are kept low: US$15/day, US$45/week, and US$105/season (at 8 SEK/1 US$). By comparison, Sweden’s cheapest alpine skiing pass costs US$30/day. The fee is too low to deter peak congestion.

Funa¨sdalen’s blend of infrastructure investment, user fees, landowner contracts, and zoning has significantly reduced free riding and conflicts with skiers and private landowners. Reduced riding off-trail and in ecological protection zones also mitigates environmental damages. The state facilitates these arrangements in four ways: underwriting trail investment, establishing prohibition zones, policing with county rangers, and rendering a judicial ruling that open access under the 1975 law does not hold for developed trails.

4.3. Resolving a commons dilemma via contracting

Outside tourist areas, the central snowmobile conflict pits snowmobilers against farm and forest operators. Open access under the 1975 law results in externalities such as logging road obstruction, tree seedling destruction, and soil compaction. These depress landowners’ economic returns, although estimates of income losses are small: roughly US$1.5 million/year nationally for farmers and US$0.15–0.25 million for woodlot owners. Nonetheless, costs and emotional stress can be significant for individual farmers and woodlot owners (SOU, 1994). Skier conflicts and environmental damage are not severe in these working landscapes because skiing is less common, noise is buffered by forest, and ecosystems are more resilient.

For a decade, snowmobile clubs have contracted with landowner associations. The potential for Pareto-improving outcomes hinges on the credibility of clubs’ commitment to confine snowmobiling to designated trails. In turn, sledders’ incentive to stay on trails depends on trail quality. Trail infrastructure is largely maintained through club dues and volunteer labor, unlike Sälen and Funäsdalen where trails are considered a quasi-public good and receive supplemental support from government and tourism businesses. The clubs also promote responsible riding norms through member education and trail signs. In 2001, the state strengthened clubs’ ability to recruit members and spread norms by giving them responsibility for preparing drivers for Sweden’s mandatory snowmobile license exam.

Although present arrangements improve on the pre-contract situation, they perpetuate under-investment in trails and therefore incomplete compliance with responsible sledding norms, particularly by non-club members. This is confirmed by Anttila’s (2000) survey of Swedish Farmers Federation officials, 85% of whom acknowledge that contracts reduced farmers’ frustrations and property damage. But over 60% report continuing snowmobile problems. Given the 1975 law’s open access guarantee, the central challenge is to strengthen incentives to ride on designated trails. That requires more investment than current arrangements can mobilize.

5. Taming Maine’s snowmobilers: clubs, contracts, and renewed conflicts

Maine’s government has had a longer and more extensive role than Sweden’s in managing and also promoting snowmobiling. Department of Conservation (DOC) intervention in the 1970s was prompted by a simmering type 2 conflict: landowners frustrated by “rogue sledders” threatened to gate their land. The state’s prime objective was to preserve traditional public access to private wildlands, without burdening the state’s budget or entangling government in micro-management. State promotion of snowmobiling for its rural economic contribution came later.

The DOC approached its task strategically, creating incentives for snowmobilers to organize and landowners to negotiate trail licenses. For snowmobilers the prime incentive was an integrated, high-quality trail network, funded largely from snowmobile fees fuel, and taxes. Landowners’ received no monetary rents, but gained control over trail location, exemption from legal liability, and low enforcement costs. Under scores of local licensing arrangements, the trail network has reached 20,000 km, including 4000 km of the Interconnected Trail System (ITS), snowmobilers’ “superhighway,” connecting Maine
with neighboring New Hampshire and Canada. Laying out the ITS necessitated state brokering of landowner-club negotiations, but on-going management is largely decentralized.

The MSA has evolved into Maine’s largest sporting organization and a political force, with 280 local clubs and 15,000 dues payers (32,000 family members). The state’s landowner relations director observes, “Snowmobilers...learned at the very beginning that to have a trail system, they needed the support of the landowner. The clubs organize the landowner appreciation program and have been strong lobbyists for landowners in the Legislature” (Peppard). MSA’s public image has also been enhanced by the civic and charitable works, previously noted.

These arrangements meet several of Grafton’s criteria for effective commons governance, notably “mutual obligations and ties among members” and participation by resource owners’ and users’ in rule making and monitoring. However, other supportive conditions, particularly “a manageably small number of participants” and easy apprehension of rule violators, are not fulfilled and contribute to unresolved conflicts.

The incentive “glue” binding the arrangement is the state’s Trail Grant program, which rebates most sled registration revenues and 0.62% of state gasoline taxes to clubs. The clubs contribute volunteer labor and member dues. Between 1986 and 2000, Trail Grants increased sixfold, from US$286,000/year to US$1,787,000/year and the state’s share of trail infrastructure outlays grew from 54% to 67% (BPL, 2000). Recent Trail Grant initiatives seek to boost the rural economy by attracting more sledders, particularly non-residents who pay higher registration fees, take longer average trips, and spend more per day (Irland Group, 2001). Initiatives include supplementary trail grants to town governments and grants for bridges to upgrade the ITS and link trails to tourist towns.

### 5.1. Growing congestion and persistent free riding

Maine’s post-1990 snowmobiling boom challenges the sustainability of current institutional and financial arrangements. Rapid growth has resulted from promotional campaigns, infrastructure development (trails, parking, sled rental operations), and changes outside the northern forest (sprawl and low-snow winters to the south have attracted more non-resident snowmobilers). Non-resident registrations tripled to 15,000 in the 1990s. From 1971 to 1991, registrations grew by just 15%, while trail mileage doubled. By contrast, registrations surged 50% in the 1990s, with very little trail expansion.

More sledders means good economic news for towns like Rangeley, located at a junction of two ITS trails. Whereas many tourist businesses formerly closed and unemployment soared in the winter, snowmobilers now inject US$5–7 million of spending and support 75 jobs (Irland Group, 2001). Rangeley’s development goal is to re-double “sledding days.” Local snowmobilers, however, are ambivalent. Many feel crowded off their own trails on weekends and harassed by reckless drivers. Trail grooming costs are outstripping the budget from Trail Grants, club dues, and business contributions. Club members, whose thousands of hours of volunteer labor maintain the trails, are burning out and growing resentful of free riders (Ellis; Giffen). In Ostrom’s terms, they are “conditional cooperators” rethinking their strategy. Registration fees and gasoline taxes prevent pure free riding, but just one-third of snowmobile owners pay club dues and even fewer share in volunteer labor. Resident sledders arguably have a latent property right and should pay less than outsiders, yet, club members actually pay more through their dues and “sweat equity.”

### 5.2. New conflicts in landowner relations

Maine’s trail network, 95% on private land, is a notable achievement in multiple-use landscape management. As in Swedish non-tourist areas, it functions like a repeated cooperative game. Licensing arrangements are sustained by the players’ reputations (trust) and low enforcement costs. However, new problems have arisen with changes in land ownership and owners’ objectives, combined with growing third-party effects. Trail expansion, sought by clubs and tourist towns, is threatened by emergent conflicts, both with large landowners who license most of the

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6 The club and local businesses urge non-resident sledders to buy US$10 booster stickers, but most do not (Ellis).
ITS corridor and with residential owners along trails linking the ITS to tourism communities.⁷

Rangeley’s 250 km of trails traverse three large forest ownerships. The owners’ longstanding relationship with the Rangeley Snowmobile Club is now threatened by a third party: all-terrain vehicle drivers, who trespass on snowmobile trails and logging roads in all seasons. ATVs undercut both recreational and industrial land uses, tearing up trails and causing timber stand damage, soil erosion, and vandalism.⁸ One forest products corporation has passed ATV exclusion costs onto the snowmobile club, obliging it to install gates that are locked except in winter. Another owner is considering closing some trails to all recreation, a practice already common in more populous Maine regions. Neither owner is inclined to license a new expedition trail that the town and club want to relieve congestion and boost the economy (Ellis; Gamble; Medina; Myers).

The state has responded with increased mediation efforts and enforcement of ATV speeding and drunk driving laws. Its strategy is to tame ATVers, as it did snowmobilers in the 1970s, by offering trail grants, safety education, and other services as incentives for club formation and self-policing. Recruitment has been limited, however: trail grants are a weak incentive for “rational egoist” ATVers who can trespass on- or off-trail with a low probability of apprehension (Fleming, 2003; Myers; Peppard).

A second emerging conflict centers on trails connecting the ITS with tourist towns. Trails near overnight destinations like Rangeley cross numerous leisure home lots, requiring complex right-of-way negotiations. Transaction costs for contracting and yearly trail relocation are rising, a situation exacerbated by ownership turnover and real estate development, as industrial landowners “cash out” recreationally valuable lands. Rangeley’s problem crystallized with condominium construction along a link trail. Many owners are “urban refugees,” intolerant of noisy, smelly snowmobiles and their sometimes rowdy owners. This parcelization and sprawling development near gateway towns threatens to make long-compatible land uses mutually exclusive (Ellis; Vail and Hultkrantz, 2000).

5.3. Snowmobilers, skiers, and environmentalists

In contrast to Sweden’s intense sledder–skier conflicts, Maine’s principal type 3 conflict has snowmobilers on the receiving end of detrimental externalities caused by ATVers. Indeed, the media often remark on the lack of friction between snowmobilers and XC skiers, snowshoers, hikers, or dog sledders (Wonsavage, 2002). In Rangeley, key informant interviews and “Conservation Works!” stakeholder meeting minutes failed to uncover serious conflicts (Ellis; Foltz; Giffen; Peppard). Skiers’ low “sensitivity to conflict” is probably linked to their sport’s comparatively recent arrival and limited spread. In much of Maine, snowmobilers “were there first,” and skiers do not claim prior rights. Further, few skiers participate in multi-day expeditions (Maine currently lacks a hut-to-hut trail). Most take day outings to public lands or commercial ski tour centers, where groomed tracks are separated from snowmobile trails and engine noise is muffled by forests.

Rangeley’s experience is instructive. Its ski club began as a branch of the snowmobile club, which lent it grooming equipment. Together with landowners, the clubs jointly planned 75 km of ski tracks to minimize conflicts. Safety gates are placed at trail intersections. However, both clubs have expansion plans, so future conflicts are anticipated. (Ellis; Foltz) Regional recreation planners are attempting to fashion a new multi-stakeholder compact building on the two clubs’ norms of trust and conflict resolution. The goal is, “to develop a more permanent system of trails for all types of activities, including hiking, skiing, horseback riding, snowmobiling, cycling and ATVs” (Jones, 2002). This process will test whether simultaneous expansion of motorized and self-propelled recreation is feasible at a large landscape scale.

Snowmobiling’s environmental impacts, widely investigated and publicized in Sweden, have received little study in Maine. Major conservation organizations have not raised environmental objections to snowmobiling, although they lobby vigorously for expansion of motorless tracts on public land. Indeed, the Maine Audubon Society has been a prime mover in Rangeley’s multiple-use landscape planning. Climatic and
ecological differences from Sweden partially explain this complacency: There is no fragile tundra and little spring season sledding to threaten wildlife reproduction. The most noted impact is local air and noise pollution, although there is a suspicion that snowmobile access to remote ponds contributes to illegal ice fishing and game fish depletion (Giffen; Peppard).

5.4. Policy responses to emergent governance challenges

For a quarter century, state-supported local governance arrangements kept types 1 and 2 conflicts in check. Conflicts with other recreationists and environmentalists were minimal. However, this institutional model appears increasingly maladapted to challenges inherent in snowmobiling’s growing popularity: hot spot congestion, free riding, and inadequate trail infrastructure. The model’s resilience is also being tested by two exogenous forces: the ATV boom and changing land ownership. The Maine Legislature has offered symptomatic relief by increasing state allocations to trail grants, policing, and safety programs (but notably not to environmental impact analysis). Some key informants doubt that money alone can sustain present governance arrangements. They argue for more direct state financing, management, maintenance, and policing of the trail network (Ellis; Irland).

6. Findings and discussion: evolutionary adaptation of governance regimes

The Sweden and Maine case studies underscore the usefulness of conceptualizing rural landscapes as impure public goods with certain common pool characteristics. In the snowmobiling case, natural capital—the undeveloped landscape—is complementary with human-made capital—trail infrastructure. Rivalness among landscape uses, combined with legal and practical limits to excluding snowmobiles, leads to four principal types of conflict. Type 1 conflicts among snowmobilers center on reciprocal congestion externalities and free riding on trail infrastructure. Type 2 conflicts between sledders and landowners involve property damages and nuisance effects. Type 3 conflicts pit snowmobilers against other recreationists, particularly cross-country skiers in Sweden and ATV riders in Maine. And type 4 conflicts involve tensions between snowmobilers and environmentalists over detrimental effects on air and water quality, fragile terrain, and wildlife habitat. Lesser conflicts involve snowmobilers and tourist community residents and snowmobiling demands on the limited resources of Sweden’s ranger patrol and Maine’s warden service.

This conflict typology sheds light on more general controversies surrounding motorized recreation in “the commons.” Thus, types 3 and 4 conflicts are at the heart of Sweden’s national debate over snowmobiling in the region surrounding the nation’s highest peak, Kebnekaise, as well as the Bush administration’s decisions to reduce roadless areas on US federal lands and permit snowmobiling in Yellowstone and Grand Teton National Parks.

With snowmobiling, managing the commons centers on governance regimes and infrastructure investments to improve compatibility with competing land uses and values, particularly commodity production (crops, timber, reindeer), self-propelled recreation, and ecosystem health. The case studies trace the evolution of local institutional arrangements, backed by crucial state assistance but a limited state management role.

Following passage of Sweden’s 1975 Terrain Driving Law, mountain tourism areas like Sälen tried several methods to “tame” snowmobilers. Moral suasion, trail separation, and selective zoning mitigated sledder–skier conflicts and ecosystem damage. However, the limited extent and quality of trails, combined with the growing popularity of snowmobiling, intensified congestion and strengthened incentives to shirk rules and norms. In contrast, the governance model being developed in Funäsdalen appears well designed to reduce all four types of conflict while enhancing snowmobiling’s local economic contribution. The model, institutionalized in a multi-stakeholder corporation, involves land-use planning to separate ski and snowmobile trails, zoning to protect fragile ecosystems, investment in high-quality trails, and trail fees to prevent free riding and finance grooming. The Swedish state offers crucial support in

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9 Legislators are also considering doubling the allocation of gas taxes to trails. Trail grants currently receive just half of sledders’ US$2 million/year gas taxes. (Rubin et al., 2001) A backlog of road maintenance and a powerful highway lobby make this an uphill battle.
the form of trail financing, zoning restrictions, ranger patrols, and a court ruling permitting fees on developed trails. Funäsdalen’s model is catching on, with two neighboring counties now seeking EU funds for their own experiments (Lindgren, 2003).

For a quarter century, Maine’s snowmobile governance arrangements were tolerably effective. They centered on snowmobile club—landowner contracting and local, volunteer-based trail maintenance, with the state offering financial incentives and organizational assistance. With the rapid growth of snowmobiling since 1990, however, type 1 hot spot congestion and free riding problems have intensified. Types 2 and 3 conflicts have also worsened, as a result of changing land ownership and the explosive growth of all-terrain vehicle use.

The Rangeley Lakes study indicates that the “old regime” is increasingly maladapted to evolving conditions. More Trail Grant funding, more wardens patrolling the trails, and tighter ATV regulation offer symptomatic relief. However, the core arrangements—local club contracting and volunteer trail labor—have become increasingly problematic with more congested trails, increased maintenance requirements, and more complicated and contentious annual licensing negotiations.

It is tempting to conclude that Maine should adopt the Funäsdalen model, but a sustainable Maine snowmobiling regime requires more extensive and directive state intervention, for two reasons. First, Maine’s policy makers, more than Sweden’s, promote snowmobiling for its rural economic development contribution. Second, Maine’s snowmobile economy depends on a more complex, larger-scale public good, the 20,000 km statewide trail network that crosses hundreds of private ownerships. In reality, Maine’s political culture is not well-adapted to extensive state management of recreation on private lands. The DOC bureaucracy, landowners, and the Snowmobilers’ Association would probably oppose such an intrusive role (Gamble; Myers; Peppard). Nonetheless, meeting the challenges of expanding the ITS, securing connector trails, and establishing trail user fees is not likely under the present institutional arrangements.

Several institutional and technical innovations might mitigate remaining conflicts in both settings. For instance, sharply differentiated trail fees might encourage more mid-week riding and less weekend and holiday traffic. Discounted state registration fees might induce more snowmobilers to join local clubs. Zonal trail licenses might cut free riding without excessive transaction costs (Hultkrantz and Mortazavi, 1999). Differentiated registration fees could accelerate the replacement of noisy, polluting two-stroke engines with four-stroke snowmobiles. Also, on-board transponders (e.g., embedded in license plates) combined with a network of field sensors could facilitate more complete, lower cost monitoring of driving violations.

The studies reported here contribute to a growing literature on institutional arrangements for “governing the commons.” They suggest the significant potential of local institutions, with state support, to mitigate four types of conflict linked to motorized off-road recreation. Maine’s Rangeley case reveals a need for new governance and investment approaches in the face of rapid snowmobiling growth and changing land ownership, while Sweden’s Funäsdalen experiment shows the potential of multi-stakeholder cooperation and multiple-use landscape management to improve snowmobiling’s compatibility with landowners’ and skiers’ interests, as well as ecosystem health.

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