

Table of Contents

Conservation Policy in Time and Space: Lessons from Divergent Approaches to Salvage Logging on Public Lands

<u>ABSTRACT</u>	0
<u>INTRODUCTION: SCIENCE AND CONSERVATION POLICY</u>	1
<u>THE STORM AND ITS AFTERMATH</u>	2
<u>HISTORY OF LAND USE AND CONSERVATION IN THE ADIRONDACKS</u>	3
<u>LARGE-SCALE DISTURBANCES AND THE ADIRONDACK PARK</u>	4
<u>ASSESSING THE POTENTIAL FOR ADIRONDACK WILDFIRES</u>	5
<u>LEGALITY OF TREE REMOVAL IN THE STATE FOREST PRESERVE</u>	6
<u>THE SOCIAL AND ECONOMIC CLIMATE OF THE 1995 BLOWDOWN</u>	6
<u>FIRE MANAGEMENT IN THE ADIRONDACK PARK</u>	8
<u>EVOLUTION OF SCIENCE, PUBLIC OPINION, AND POLICY</u>	9
<u>CONTRASTING NEW YORK AND NORTHWESTERN STATES SALVAGE LOGGING POLICY</u>	10
<u>CONCLUSIONS</u>	12
<u>RESPONSES TO THIS ARTICLE</u>	13
<u>Acknowledgments:</u>	13
<u>LITERATURE CITED</u>	14
<u>APPENDICES</u>	19

Conservation Policy in Time and Space: Lessons from Divergent Approaches to Salvage Logging on Public Lands

[George Robinson](#) and [Jeffrey Zappieri](#)

SUNY Albany

- [Abstract](#)
 - [Introduction: Science and Conservation Policy](#)
 - [The Storm and its Aftermath](#)
 - [History of Land Use and Conservation in the Adirondacks](#)
 - [Large-Scale Disturbances and the Adirondack Park](#)
 - [Assessing the Potential for Adirondack Wildfires](#)
 - [Legality of Tree Removal in the State Forest Preserve](#)
 - [The Social and Economic Climate of the 1995 Blowdown](#)
 - [Fire Management in the Adirondack Park](#)
 - [Evolution of Science, Public Opinion, and Policy](#)
 - [Contrasting New York and Northwestern States Salvage Logging Policy](#)
 - [Conclusions](#)
 - [Responses to This Article](#)
 - [Acknowledgments](#)
 - [Literature Cited](#)
 - [Erratum](#)(Added March 9, 1999)
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ABSTRACT

A 50-yr precedent was reversed in 1995 when, following a powerful windstorm, salvage logging was disallowed in the protected Adirondack Park State Forest Preserve of New York, United States. Damage from a similar windstorm in 1950 had provoked massive salvage operations, approved by the New York State legislature on the grounds of fire prevention and resource conservation. Following the 1995 storm, state conservation officers and consulting ecologists were prepared with up-to-date assessment tools and a theoretical framework that treated large disturbances as normal ecosystem processes; the executive branch acted in accord with their recommendations to forgo salvage. Prior to these events in New York State, federal forest preserves in western states had recently been opened to salvage sales, following a widespread series of fires and insect outbreaks. In this latter case, under the rubric of "forest health," legislative amendments were added to unrelated bills and passed without open debate. This lack of public exposure may have denied opportunities for an ecological basis to a key policy decision that carries substantial ecological implications. On the one hand, Adirondack Park salvage policies have evolved to address large-scale forest disturbances as natural events rather than catastrophes that demand intervention. On the other hand, federal salvage policies have arisen in a different political and economic background, and have so far largely escaped scientific scrutiny.

INTRODUCTION: SCIENCE AND CONSERVATION POLICY

In biological conservation, a key role for science in the policy process is providing timely information (Lubchenco 1995, 1998). Opportunities for ecologists can be especially significant following natural disasters, when the press and general public are likely to misjudge the resilience and resistance of natural systems. For example, during the 1998 Yellowstone fires, [See [erratum](#).] when nearly one-fifth of the 9000-km² park was burning, the event was treated as a national catastrophe (Knight and Wallace 1989, Schullery 1989). However, evidence from dendrochronology suggests that severe droughts, accompanied by large wildfires, have previously occurred at intervals on the order of every 200 years (Romme and Despain 1989). One of the key difficulties for ecologists is getting this kind of information into the proper venues for influencing policy (Brunner 1995).

Current ecological theory stresses that natural systems are subject to stochastic, non-equilibrial processes (Boyce 1991, Pimm 1991, Sprugel 1991, Pickett et al. 1992, Shinneman and Baker 1997). Aligned with these changing viewpoints is the awareness that the areal extents of natural disturbances can be large enough to overwhelm whole communities and ecosystems, at scales larger than the sizes of many remnant natural areas (Rejmánek 1984, Baker 1992, Esseen 1994). The implications for biological conservation are strong, particularly with respect to the design and management of nature preserves (Laurance et al. 1997, Meffe and Carroll 1997). Powerful windstorms provide instructive examples of highly influential, large-scale natural disturbances that have both ecological and social dimensions (Turner et al. 1997). As with wildfires, they often call for rapid responses, but management options are usually limited to cleanup operations following the event. However, cleanup decisions drawn from an ecological perspective might emphasize that major disturbances contribute to natural ecosystem properties, leading to a policy of passive accommodation, rather than postdisturbance intervention (Peters et al. 1996).

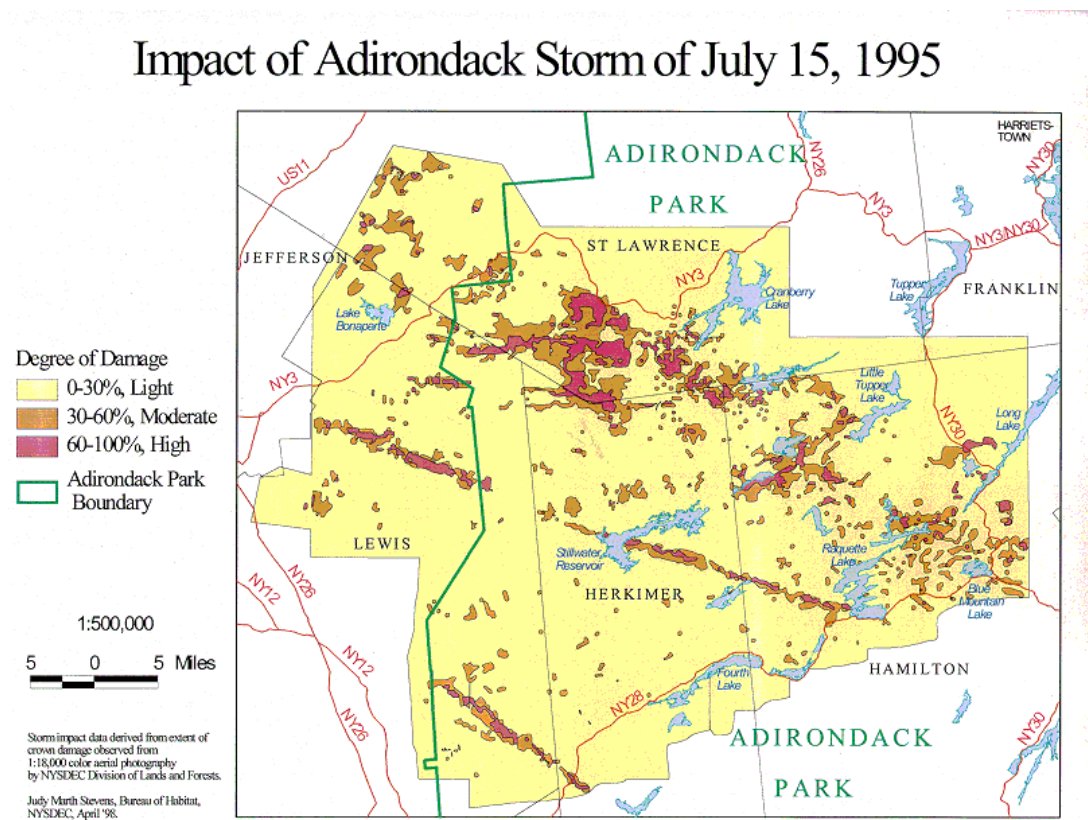
In this paper, we search for connections between ecological science and public policy with respect to salvage logging on public lands. We examine how conservation policy was formulated in response to a massive 1995 windstorm in the Adirondack Park of New York State, an event that received little national attention, but gave rise to an ecologically informed precedent for addressing natural disturbances on protected public lands. The relatively large size of the Adirondack Park, its conservation status, and the extensive forest damage caused by massive windstorms in 1950 and 1995 combine to offer an instructive example of relationships between conservation goals and the scales of natural processes. The State's ultimate decision to forgo salvage logging in 1995 stood in stark contrast to contemporaneous national policies opening federal lands to salvage-related timber harvest.

We begin with a description of the storm event and the controversy that ensued. This is followed by a brief history of Adirondack Park management, including the significance of large-scale disturbances. We then explore the role of ecological theory and scientific information in the formulation of the policy response to the 1995 blowdown, which reversed a 50-yr standing precedent that had permitted salvage logging of highly protected Forest Preserve lands of New York State. We follow with a contrast between current New York State and federal salvage policies, drawing from recent debates over federal forest management for forest health in the Pacific Northwest.

THE STORM AND ITS AFTERMATH

In the early morning hours of Saturday, 15 July 1995, a fast-moving thunderstorm of near-record proportions traveled through the Adirondack Mountains of northern New York State. Moving from northwest to southeast, the storm, labeled a "derecho" by meteorologists, took a linear path with extensive lines of high-velocity microbursts (Fig. 1). Strong winds caused extensive damage, hitting hardest in northwestern counties of the Adirondack Park; approximately 4000 km² of publicly- and privately-owned forest land were affected (Jenkins 1995, DEC EAT 1996). The storm leveled trees, threatened lives and property, and raised the specter of catastrophic fires to follow. It was an event of major proportions that opened a floodgate of local opinion, although it received little attention from national media.

Fig. 1. Thematic map of forest tree damage assessment in the Adirondack Park, New York State, following the July 1995 windstorm.



Adirondack residents were acutely aware of the storm and deeply worried about fire hazards during an unusually dry summer season. Spokespersons for wood products companies requested a prompt decision from the Governor allowing suspension of the State Constitution and permitting the authorization of salvage logging operations. In immediate response, environmental organizations protested salvage proposals on the grounds of state constitutional protections for the Park, fearing invocation of the salvage precedent that was set following a massive windstorm in the 1950s.

Numerous editorials and opinion pieces were published in the region's newspapers (Appendix 1). A common

early theme was that fire danger was severe and the park was a "tinderbox ready to burn." Parallels were drawn to concurrent intense wildfires in the pine barrens of Long Island, New York. Adding to public fears was debate over the effectiveness of fire detection systems. Beginning in the 1980s, the New York State Department of Environmental Conservation (NYS DEC) had retired its lookout towers, relying instead on commercial and private pilots to report fire outbreaks. Some Park residents felt vulnerable and expressed support for salvage logging throughout the Park, to remove potentially hazardous fuel.

Conservation groups countered that damage from logging operations would be too severe to warrant salvage attempts. Some noted that the most heavily affected section of the park, the Five Ponds Wilderness Area, was nearly fireproof, dominated by water bodies and low-lying wetlands. Another theme was that, by opening dense forest canopies, large storms contribute to the Park's natural mosaic of habitats. Prominent among salvage opponents were the Adirondack Council, the Association for the Protection of the Adirondacks, New York's chapter of the National Audubon Society, the Natural Resources Defense Council, and the Wilderness Society (Jenkins 1995; see [Appendix 1](#)).

The NYS DEC assembled a comprehensive document that included reports from an advisory committee of consulting ecologists (DEC EAT 1996). Based on scientists' recommendations and its own assessment of the consequences of storm damage, the agency concluded that salvage logging on protected lands could not be ecologically or economically justified. The Governor accepted the agency's recommendation, and a no-salvage decision was adopted, supporting the constitutionally guaranteed "forever wild" character of the Forest Preserve. New York conservation groups were quick to praise the decision, while parties that had pressed for salvage allowed the issue to die. In a few short months, a once-flaring debate had sputtered. It is worthwhile examining previous disputes over Adirondack lands and resources, in order to evaluate the response to the 1995 windstorm.

HISTORY OF LAND USE AND CONSERVATION IN THE ADIRONDACKS

The Adirondack Park, encompassing 24,280 km² of land within a designated protection zone (the "Blue Line"), is larger than the combined areas of Yellowstone, Glacier, and Olympic National Parks. Slightly over half of the park is privately owned, with the remainder belonging to New York State (Widmann and Drake 1997). Most of the public portion is designated as State Forest Preserve, a land use category accorded the highest degree of protection. The Forest Preserve is administered by NYS DEC, rather than by the Department of Parks and Recreation. The DEC's jurisdiction emerged from a lengthy debate over whether to emphasize the Park's recreational or environmental values (Graham 1978).

By 1825, 300 years after the explorer Champlain had laid plans for expeditions to settle the Adirondack region, New York was a populous, bustling state, while the Adirondacks remained inaccessible. Native Americans had created few, if any, permanent Adirondack settlements, and agriculture was limited to small, marginal operations. Land ownership had already passed among several nations, and land speculators had laid claim to substantial sections, even though the area was crudely mapped and poorly surveyed (Donaldson 1921, Graham 1978, Keller 1980, Pilcher 1987, McMartin 1994).

Like many of the remaining large natural areas, the Adirondacks had escaped human intrusion by default. In the meantime, nature conservation in New York State had become a public issue well before the founding of the Adirondack Park. New York's farmers had begun to notice a "rural decline," expressing concern over water pollution due to erosion and contamination by livestock, whereas trappers worried about the demise of beaver in northeastern North America (Whipple 1935, Graham 1978, Keller 1980). However, organized lobbying for protection of the Adirondack region first came from recreationists, whose numbers swelled following the publication of a popular travelogue (Murray 1869). These summer travelers were often greeted by the unpleasant landscapes that follow heavy logging, as timber operations expanded to feed a new and growing pulp market.

George Perkins Marsh, one of the first advocates of an American wilderness ethic, lamented the environmental degradation caused by unregulated logging (Marsh 1864).

The major public policy issue that led to legal protection of Adirondack forests, however, was water quality. The 1885 Forest Preserve Law, which set the stage for founding the Adirondack Park in 1892, was aimed at protecting supplies of Adirondack fresh water, in part to maintain navigable flows in rivers and canals to the south. Other than the provision of a "Blue Line" boundary that encompassed some 1,130,000 ha of wildlands, there was little agreement on how to regulate and manage activities within the new Park. Indeed, at that time, only about 240,000 ha of the Park belonged to New York State. Eventually, forfeitures from tax delinquencies more than doubled these holdings (McMartin 1994). Most of the state-owned properties received a wilderness entitlement during the 1894 New York State Constitutional Convention. Article VII(7), which remains one of the strongest conservation documents in U.S. history, asserts: "The lands of the State, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be removed or destroyed" (NY State Constitutional Convention 1894, Vol. V: 766, cited in Forsyth 1970). A Fisheries, Game and Forestry Commission was created to protect the area within the Blue Line by enforcing laws on public lands, and monitoring logging on private lands. (A glossary of acronyms and terms relevant to conservation of the Adirondack Park is presented in [Appendix 2](#)).

In subsequent years, attempts to reinstate commercial logging in the Forest Preserve were met by a concerted wilderness preservation lobby (Whipple 1935, Graham 1978). By 1935, on the 50th anniversary of the Forest Preserve, most state lands had been protected from extraction. Today, although much of the Preserve forest cover is second growth, the aging stands now include many large trees and incorporate ecosystem dynamics and wildlife populations characteristic of old-growth forests (Cogbill 1996, Dunwiddie et al. 1996). Recreational use grew rapidly after the Second World War, and sentiment for logging public lands had further diminished until the occurrence of a massive hurricane in 1950.

LARGE-SCALE DISTURBANCES AND THE ADIRONDACK PARK

Hurricanes and other windstorms are among the most influential natural disturbances in forests of northeastern North America (e.g., Foster and Boose 1992, Foster et al. 1997). Now that post-agricultural regrowth has produced maturing forests with old-growth characteristics, evidence is mounting that the classic "gap" dynamic associated with single treefalls in temperate forests (Runkle 1981, Peet and Christensen 1987, Shugart 1987) is embedded in a broad and variable matrix of large-scale blowdowns, whose influence can extend over entire watersheds (Bormann and Likens 1979).

The western region of the Adirondacks appears to be prone to powerful windstorms, including tornadoes, hurricanes, and the lengthy chains of "microbursts" that descended in July 1995 (DEC EAT 1996). Windstorms are such a common occurrence that streets and towns in the region are occasionally named after them. The Great Blowdown of 25 November 1950 apparently caused more damage than any other storm in the history of New York State (Graham 1978, McMartin 1994, DEC EAT 1996). Accompanied by heavy rain, winds > 100 mph (45 m/s) rose from the southeast, beginning in New York Harbor and moving to the northwest. Tree root systems throughout the Adirondacks grow asymmetrically, against the force of prevailing westerlies, and blowdown was exceptionally widespread and devastating in the Park (Keller 1980, McMartin 1994). The dimensions of the total area of forest damaged by the storm were largely inferred from accounts of the volume of salvage timber removed. Some may have been poached opportunistically, whereas additional legitimate salvage may have been created by a later (1954) hurricane (McMartin 1994). The equivalent of 125 x 10⁶ board feet (295,000 m³) of hardwood timber and nearly two billion board feet (4.7 x 10⁶ m³) of softwoods was reportedly knocked to the ground. Aerial reconnaissance was limited, but a rough map of the damage indicates that 1600 – 1700 km² (7%

of the current Park area) were "heavily affected," with 25 –100% of trees fallen or snapped (Graham 1978, DEC EAT 1996). Spruce (primarily red spruce, *Picea rubens*) was the most sought-after lumber tree and was also among the most heavily damaged (McMartin 1994).

At the time, warnings arose over the potential for catastrophic fires, due to the massive increase in fuel load. Foresters also feared that dead trees would invite disease and destructive insects of all kinds, arguing that insect species that attack dead or injured trees would also harm living ones (Graham 1978, McMartin 1994). Controversy ensued, with one contingent favoring immediate removal of the timber to prevent further timber losses, and another calling for a hands-off policy. Ultimately, emergency powers were invoked to suspend the State Constitution, permitting removal and sale of a large volume of timber (Graham 1978). During the 5-yr salvage operation, approximately one million dollars accrued from the sale of public timber, with 10% of the proceeds being used to purchase additional Forest Preserve land (McMartin 1994).

ASSESSING THE POTENTIAL FOR ADIRONDACK WILDFIRES

In their current extent and successional stages, Adirondack forests are unlikely to sustain large fires (Jenkins 1995). This is due to a moist summer climate and a landscape mosaic of frequent natural fire breaks, such as lakes, swamps, and rock outcrops. According to pre-settlement surveys taken in 12 townships in the western and northwestern Adirondacks during the period 1796 – 1825, fire was a rare event, of far less ecological importance than windstorms. Even in the more flammable sand plains and oak/spruce hills of the central and eastern Adirondacks, most historic fires are believed to have been of human origin, often fueled by logging debris. Throughout the Park, fire scars and charcoal are rare in old trees (Pyne 1984). A given conifer forest in the Adirondacks may burn naturally at intervals of 300 – 500 yr, whereas hardwood forest may burn at intervals of 1000 – 2000 yr (Bromley 1935, Henry and Swan 1974, DEC EAT 1996).

In the early days of the Park, fires fueled by logging debris were frequent and extensive. Legal provisions for fire control included a system of wardens, empowered to set penalties for deliberate burning on state property and to regulate railroad rights-of-way in the Preserve. In addition to ignition from railroad locomotives, it is believed that many fires were started in order to provide employment for temporary firefighters (Graham 1978). However, by the 1950s, forests had recovered sufficiently to regain much of their historic fire-retardant properties (McMartin 1994) and, in contrast to some expectations, the six years following the 1950 blowdown witnessed a total of 45 small fires, which in sum burned only 230 ha. Prolonged droughts were absent during this period, which was also a time of advances in early fire detection, including the use of aircraft, and improvements in fire suppression, with well-organized rapid-response teams (McMartin 1994). As a further precaution, fire-prone sites had been closed to campers and hikers, who remain, to this day, the major sources of ignition (DEC EAT 1996).

The post-1950 salvage, which required suspension of the State Constitution, now seems unjustified on the basis of fire suppression. In fairness, we note that wildfire was still greatly feared at the time, and that tools for predicting fire potential were considerably weaker than those for fire suppression. At the same time, we can find no evidence of strong scientific opposition to the decision permitting salvage in the Forest Preserve. The legal profession, on the other hand, was well represented, as this unparalleled event quickly led to a renewal of historic debates over the meaning of "forever wild."

LEGALITY OF TREE REMOVAL IN THE STATE FOREST PRESERVE

During the Constitutional Convention of 1915, the majority report of the Conservation Committee recommended the removal of dead trees to promote afforestation and fire protection, and to garner revenues. However, the "forever wild" clause has passed through two subsequent constitutional conventions (1933 and 1967) without substantial revision. Legal decisions affecting public forests in the Adirondack Park, primarily judicial dicta and Opinions of the Attorney General, have generally maintained a high level of protection for trees inside the Preserve. Early Attorney General rulings interpreted the "forever wild" clause literally and without exception. Appeals from wood products companies for access to dead and damaged Preserve trees were disallowed. Turn-of-the-century fires were blamed on lumbering practices, and public opinion had turned against commercial foresters. On the other hand, perceived fire threats led to decisions such as a 1933 Opinion that roads built for use in fire suppression did not violate constitutional protections. Fire, in fact, had become a touchstone in defining the legal meaning of "protection."

A landmark Attorney General's Opinion, which led to a suspension of the State Constitution, followed the hurricane of 1950 and established a precedent that was repeatedly invoked during debate over the appropriate response to a 1995 windstorm. On the grounds that the debris left by the storm constituted a fire hazard and, therefore, a threat to the Forest Preserve, the Attorney General ruled that cleanup was a legal and appropriate response to the perceived emergency. His Opinion also argued that fallen timber resources would help in the Korean War effort. A Constitutional amendment soon followed, and in a 5-yr progress report, the Attorney General's ruling was reaffirmed (Anonymous 1956). The 1950 Opinion stood as precedent for a large-scale salvage operation in the aftermath of the windstorm of 1995. The rush to salvage timber from Forest Preserve lands left bitter memories among conservation advocates, and later fueled efforts to convert the Adirondack Park to a National Park (Anonymous 1967, Graham 1978).

THE SOCIAL AND ECONOMIC CLIMATE OF THE 1995 BLOWDOWN

The wood products industry has historically been an important part of the Adirondack region's economy, today constituting 7% of the area's total revenues and about 10% of total economic activity (ESPFA 1995b). The current 2.4×10^6 ha Adirondack Park contains 1.4×10^6 ha of private lands, with ownership apportioned as: 26% large pulp and paper companies; 4% private clubs that manage and harvest their own forests; 28% small firms (including recreation and resource extraction industries); and 40% individual families (Widmann and Drake 1997). State Forests, in contrast to State Preserve lands, are also managed for timber production. [Table 1](#) summarizes NYS DEC's general estimates of the extent of blowdown effects on forest resources, characterizing storm damage as the percentage of trees damaged on different categories of forest land.

Table 1. Estimated land area affected by the 1995 Adirondack blowdown, categorized by jurisdiction and extent of wind damage. Data are from aerial photograph interpretation and market value estimation conducted by NYS DEC (DEC EAT 1996).

Area of damage (ha)

Degree of damage	Forest Preserve	State Forests	Private lands	Total
Low (0–30%)	138,900	1250	194,500	334,650
Medium (30–60%)	25,300	850	15,900	42,050
High (60–100%)	9700	600	5000	15,300
Total	173,900	2700	215,400	392,000
Estimated value (\$US in millions)	\$116.7	\$3.0	\$77.6	\$197.3

Within the Forest Preserve, the forest types most affected consisted of mixed hardwood/conifer stands managed as wilderness. NYS DEC estimated that only about 25% of the estimated salvage value (\$29 million) could be recovered from the Preserve, due to impaired access, wood deterioration, and depressed timber markets. For privately owned lands, the Empire State Forest Products Association (ESFPA) predicted that 75% (6000 ha) of heavily damaged lands would be accessible (ESPFA 1995*b*). Assuming a net dollar loss before salvage of \$2,700,000, it was incumbent on private landowners to concentrate on recovering the value of their own fallen trees. The ESFPA sought guidance from the APA in clarifying regulatory ambiguities and requested that the Agency help landowners in their efforts to clean up the storm's aftermath. In response, the APA developed a general permit that clarified a landowner's legal obligations and allowed for an expedited review process, but still sought to maintain high environmental standards (DEC EAT 1996).

Salvage logging is generally an inefficient form of timber recovery. Experience from other regions where heavy storms have damaged forest lands (e.g., South Carolina after Hurricane Hugo; Pennsylvania after several recent tornadoes) shows that wood volume harvested accounts for 15 – 40% of the total available (Sheffield and Thompson 1992, ESPFA 1995*a,b*). The tangled stems and downed tops, often bent under extreme tension, promote hazardous working conditions. In addition, quality of the downed material is significantly reduced by breakage or shattering, insect damage, and fungal decay. In the Adirondacks, valuable species like white pine (*Pinus strobus*) and sugar maple (*Acer saccharum*) are susceptible to rapid degradation from fungal staining, and

can lose commercial value within a few warm months (ESPFA 1995c).

In the economics of salvage logging, road building is probably the single greatest cost, and in blowdown areas, clearing exiting roadways and skidways increases the expense. In even the best of circumstances, new roads > 3 km in length are not cost effective (ESPFA 1995c). Logging roads also threaten the wilderness character of the Adirondack Park, and permits are difficult to obtain. In cooperation with NYS DEC, the Adirondack Park Agency (APA) has developed guidelines designed to minimize environmental impacts (McMartin 1989), and all of these practices add substantially to the costs of accessing downed timber in the park.

The economic climate for the Adirondack wood products industry differed substantially in 1950. The post–War American economy demanded abundant wood supplies, primarily to fuel a national housing boom, but also to fill increased demands of the paper industry (Sedjo and Radcliffe 1980). Although Adirondack forests were used largely for pulp production, the generally higher wood prices resulting from an economic boom encouraged salvage operations (Amigo and Neuffer 1980). In contrast, following the 1995 blowdown, a complex of economic factors combined to rule out a unified response from wood products industry advocates. With a glut of pulp wood and a weak market for new housing, demand was low for the damaged softwoods, and economical salvage operations would have been largely limited to hardwoods. However, because so much of the Park's private hardwood stands are relatively small parcels, a brief oversupply could have led to hardships for local landowners, who rely on a stable market, although thriving timber markets in Canada and Pennsylvania might have buffered price declines (ESPFA 1995c, DEC EAT 1996). As for loggers themselves, most independent operators are family businesses (K. Roy, *personal communication*), and they may have been sufficiently occupied with normal rotation harvests and salvage operations on private lands.

Despite a long–lasting animosity between Adirondack residents and State regulatory agencies (Graham 1978), no grassroots lobbying effort arose to promote salvage on Forest Preserve lands in 1995–1996. Furthermore, press accounts and letters to newspapers generally did not treat the blowdown as an unheard–of catastrophic event. Most opinion pieces in favor of salvage were the work of village administrators drawing attention to local fire hazards, and wood products industry advocates ([Appendix 1](#)). Issues of forest health that had followed the 1950 hurricane were not raised, with the exception of one industry report (ESPFA 1995c). At the same time, state policy was formulated with a contemporary ecological perspective on the role of natural disturbance in forested ecosystems (DEC EAT 1996).

Ultimately, cleanup operations planned for the Park's wilderness areas were restricted to clearing woody debris from roads, trails, and campground facilities. Prompting this apparent change in policy was the argument that adding large amounts of recovered timber to a locally weak market would inevitably shift volume and value recovery away from private timberlands, thus reducing private–sector market opportunities. The prevailing counter–argument was the same one offered in 1950: that prohibiting public salvage operations would greatly enhance the hazard of forest fires. In scientific and management terms, the official policy for the Forest Preserve following the 1995 storm represented a near–complete reversal of the salvage precedent set after the 1950 hurricane. In addition to a changing socioeconomic climate, the 1995 event was distinguished from that in 1950 by the level of scientific effort directed at assessing wildfire potential.

FIRE MANAGEMENT IN THE ADIRONDACK PARK

Salvage logging after the 1950 blowdown was advocated by the Attorney General, on the grounds of fire prevention, and downed trees were treated as hazards to be removed. Memories of the 1903 and 1908 conflagrations were invoked (Graham 1978, McMartin 1994), and full–scale commercial access to Forest Preserve lands was permitted. By the time of the 1995 blowdown, however, the capacity to anticipate and respond to wildfires had improved. Assessment tools for fire potential were also much more advanced and accessible following the 1995 windstorm. NYS DEC had computer models at hand incorporating climate, topography, estimates of fuel loading, and variation in fuel moisture levels, as well as potential threats posed to

dwellings and other structures (DEC EAT 1996). Advising in the use of these models were ecologists and environmental scientists from academic institutions and nongovernmental organizations. Decades of field study had demonstrated that most of the storm area was consistently humid, regularly supplied by moist air currents from the Great Lakes. The blowdown, however, did leave a high volume of elevated debris, which, upon drying, could act as potent fuel.

The "BEHAVE" model used in the 1995 assessment ranks fire potential numerically, based on fuel properties, with larger numbers indicating greater fire threat (DEC EAT 1996). Field sampling indicated that the fuel load had increased from an average of 19 Mg/ha (19 tons/ha) on unaffected sites to 70 – 350 Mg/ha on old-growth blowdown sites, with fuel reaching depths of > 12 feet (3.7m). Given this information, the fuel load portions of the model changed from classes 8–10 (characteristic of slow-burning surface fires of standing timber) to classes 11–13 (typical of quickly spreading, active-logging slash fires). Computer simulations using these classifications, along with matching slope gradients and a range of climate conditions, indicated that a wind-driven surface fire could enter an uncontrollable stage. For example, given wind speeds of 15 miles per hour (24 km/h) and a fuel moisture level of 12% over a variety of slopes, the model predicted that fire behavior would exceed mechanical suppression efforts (DEC EAT 1996). However, judging from NYS DEC maps ([Fig. 1](#)) and APA satellite images (K. Roy, *personal communication*), much of the blowdown was very patchy and subdivided by numerous fire breaks.

Fire probability assessments of the 1995 storm undoubtedly benefited from a longer historical database, which included a period of more careful logging practices, improved regulation of recreational use, and the absence of steam locomotives from the Park. Between 1990 and 1995, 106 wildfires had been reported in the Five Ponds area, the region hardest hit by the 1995 windstorm. Those fires burned a total of 95 ha. Most originated with debris burning (32%), campfires (13%), and arson (20%) (DEC EAT 1996). Because fires are more likely and more costly in areas of concentrated human activity, the more populous areas were designated by NYS DEC as focal points for fire prevention. The strategy proposed for these high-risk zones was to remove, reduce, or convert fuel types in order to lower fire hazards. Fire detection, suppression, and rescue capabilities were also stepped up in these locations, including the installation of new lightning detectors. In more remote areas of the Preserve, removal of downed trees was deemed unjustified, although flammable material was felled on some trails and campgrounds to promote decay (DEC EAT 1996).

EVOLUTION OF SCIENCE, PUBLIC OPINION, AND POLICY

Technological advances and improved understanding of ecological processes over the past half century have led to greater opportunities for including science in the natural resources policy. Rapid and comprehensive ecological assessments were key to the early formulation of a science-based response to the 1995 Adirondack blowdown (DEC EAT 1996). Shortly after the windstorm's occurrence, NYS DEC officials were able to obtain maps detailing the status of forest damage in various regions of the Park, products of modern remote sensing and geographic information systems (GIS) technology that were unavailable in 1950. These analytical tools, in combination with knowledge extracted from large-scale surveys of key areas and long-term monitoring projects in the Park, provided decision makers and conservation organizations with a sophisticated and reliable information base.

Advancements in technology probably played other roles as well, including progress in fire hazard assessment and fire suppression capabilities since 1950, which also may have influenced policy choices. With a more accurate picture of the wind damage and better fire prediction and control tools, there was less incentive in 1995 than in 1950 for decision makers to focus management alternatives exclusively on wildfire potential. Ancillary social factors also may have played a part in reducing the fear of fire. Memories of the devastation caused by Adirondack forest fires in the early part of the century still existed in 1950, but had dimmed by 1995.

Changes in the sociopolitical realm between 1950 and 1995 have also been substantial. Throughout the 20th

century, two schools of thought had dominated the American conservation policy field: resource conservation and environmental preservation (Callicott 1990). Proponents of resource conservation, or so-called "wise use," advocated efficient management of natural resources (Hays 1985). This view dominated public and political thinking until the 1960s (although it occupied a somewhat weaker position during the New Deal period of the 1930s), and experienced a resurgence in the 1980s. During the 1940s and 1950s, national emphasis was on the necessity for resource development at the cost of preservation, in order to achieve both prosperity (a reaction to the scarcity economics of the post-Depression era) and national security (a consequence of World War II and the subsequent rise of Cold War hostilities). Increased material abundance, enhanced by wartime technological advances, became the foundation for public policy decisions. Even liberal politicians, formerly strong supporters of New Deal concern over environmental preservation, stressed the practical and material benefits of developmental progress, afraid to appear "soft, naive, or utopian" in the new Cold War age (Koppes 1985). In 1944, Secretary of the Interior Chapman noted that conservation meant development of resources, not sequestering them from public and private use (Koppes 1985). Production for consumption, as opposed to the redistributive politics of the 1930s, was the theme of the Truman administration's Fair Deal program.

The late 1950s and 1960s witnessed a change in public values and demands, spurred on, in part, by increasing awareness of the consequences of environmental abuse (Costain and Lester 1995). Public values were also influenced by socioeconomic shifts in American society, as a majority of Americans began to look at natural areas more as sources of recreation than as sources of employment. The field of environmental issues at this time included concerns with open space, wildlands, and outdoor recreation (Dunlap 1995). These began to shape policy debate and constituted the initial political thrust for environmental preservation, culminating in the establishment of the National Outdoor Recreation Review Commission in 1958 (Hays 1985). The 1960s eventually saw the rise of environmentalism as a major social and political force. Nongovernmental environmental organizations (NGOs), which heretofore had limited impact on national politics, exhibited exponential growth. By the time of the 1995 blowdown, several NGOs, with local, state, and national memberships, were well-represented in the press and influential in the official NYS DEC assessment of the storm effects (Jenkins 1995, DEC EAT 1996, [Appendix 1](#)). Recent years have shown a return to more conservative politics and an upsurge in "wise-use" conservation policies on a national scale. Voters in environmentally progressive states, like New York, have displayed fewer of these tendencies, and with a contentious national election less than a year away, advocating salvage logging on public lands may have represented a political risk unacceptable to leading New York State officials.

Conservation biologists would like to believe that, despite the importance of political and economic factors, science has a significant role to play in public policy development. However, the political decision-making process is rarely dominated by ecological thought (e.g., Repetto 1993, Franklin 1995, Gunderson et al. 1995, Meffe and Carroll 1997). Policy is determined from an integrative analysis of all relevant factors, including, but certainly not limited to, rational assessment and scientific information (Brewer and DeLeon 1983). In order to clarify a role for science in this larger arena, a comparison of the 1995 Adirondack blowdown with comparable disturbance events elsewhere may be instructive.

CONTRASTING NEW YORK AND NORTHWESTERN STATES SALVAGE LOGGING POLICY

Significant turns in environmental public policy can follow a dramatic, highly publicized "focusing" event, such as the grounding of the Exxon Valdez in Prince William Sound, Alaska (Birkland 1998) or the Yellowstone wildfires of 1988 (Schullery 1989, Knight 1991). The Adirondack blowdown of 1995 received little media coverage outside northeastern New York, and it lacked the drama of blazing wildfires or oil-soaked wildlife. Although some local media reports were cast in rather sensational phrasing ([Appendix 1](#)), statewide attention was drawn to other natural resource issues, including wildfires in the Long Island Pine Barrens. In contrast, in northwestern states, the extensive wildfires of 1994 gave a sense of urgency to the salvage debate in federal

forests. Perhaps the single most publicized event was the tragic deaths of firefighters during the Storm King Mountain fire (Joint Oversight Hearing 1995, Sampson et al. 1995). Combined with growing concerns about the cumulative damage of multiple pest outbreaks, fire-damaged trees were said to represent threats to "forest health." Large volumes of public lumber were opened for sale under the Emergency Salvage Timber Sale Program amendment to Public Law HR 104-19 (Section 2001, known as the "salvage rider").

Although the affected forests were disjunct units, and a comprehensive scientific assessment of damage was not conducted, salvage-based solutions were aimed at what some considered to be a general decline in northwestern forest health (Anonymous 1994, Blatner et al. 1994, Kolb et al. 1994, 1995, Morelan et al. 1994, Sampson et al. 1994, 1995, DellaSala et al. 1995, DellaSala and Olson 1996). Congressional scrutiny was increasingly focused on fire management policy in northwest forests, in part because of growing concern over forest health issues, as well as threats posed by wildfires in expanding suburban zones (Joint Oversight Hearing 1995). Federal salvage legislation addressing forest health rested on what appeared to be a single-use directive for public lands, in that future wood production was emphasized. Such utilitarian definitions of forest health may be satisfactory when a national forest is restricted to one or a few uses (high-yield production forest, or wilderness), but may break down in a multiple-use framework (O'Laughlin et al. 1994, Kolb et al. 1995, Peters et al. 1996). Therefore, despite its appeal, the concept of forest health remains ambiguous within the context of multiple, potentially conflicting, agency goals (O'Laughlin et al. 1994, Vogt et al. 1997).

Forest health assessments themselves may need better scientific grounding, including more comprehensive monitoring programs (O'Laughlin et al. 1994). Old-growth or otherwise unmanaged stands, for example, may require thinning to reduce fuel loads. In some cases, fire suppression has led to gradual changes in species composition in long-needled pine forests, leading to calls for combinations of fire management and salvage (Mutch 1992, 1994). However, unmanaged, aging stands can provide valuable wildlife habitat (e.g., Everett et al. 1994, Henjum et al. 1994, Torgersen and Bull 1995), and dead wood contributes to forest soil nutrient retention (Marton and Haire 1990). In the case of pest outbreaks, it can be debated whether a given infestation is an unusual, disruptive event or simply part of the natural disturbance regime of wild forests (Swetnam and Lynch 1989, Schowalter 1991, 1994, Wickman 1992). Amid these uncertainties, salvage logging on public lands was promoted without clear management goals or sound scientific bases (Peters et al. 1996). The politically polarized debate over salvage-based exemptions to federal environmental regulations may have slowed progress toward resolving these uncertainties (Blatner et al. 1994, Sampson et al. 1995, Peters et al. 1996).

The mixture of heavily forested public and private lands in both the Adirondack Park and the Pacific Northwest has led to some parallel resource management problems (FEMAT 1993, Blatner et al. 1994, Vogt et al. 1997). Indeed, the forest products industry briefly raised the issue of forest health following the 1995 Adirondack blowdown (ESPFA 1995*b*). Politically and economically, however, there are significant differences between the two regions that bear directly on forest management policy decisions. First, although the logging industry plays a prominent role in the Adirondack economy, there is no established industry presence in Preserve forests, because of the constitutional protection for the Forest Preserve. On the other hand, federal forests, which represent some of the largest properties in western states, began as extractive reserves.

Second, the state and federal resource agencies involved have missions and objectives that differ. NYS DEC is required to protect and balance the use of forest resources. The U.S. Forest Service and the Bureau of Land Management, in addition to comparable demands, are mandated to assure commercial production of forest products. As a means of encouraging forest harvest, these federal agencies subsidize the access costs of logging (Anonymous 1987). In the Adirondacks, industry pays for access. The strong timber lobby in the western states has been described as a "policy monopoly" (Berry 1989, Baumgartner and Jones 1993) because it is able to directly influence regulatory policy decisions. The condition is enhanced and strengthened, in this case, by the distributive nature of federal forest policy, in which tax moneys collected from the general public are spent on behalf of a small interest group. Distributive policies generally provide incentive for special interests to organize, and often encourage policy monopolization (Wilson 1973).

Third, budgetary constraints and agency jurisdiction are also important in solidifying the Forest Service's stance on salvage logging operations. A considerable portion of the Service's annual budget is devoted to expenses

connected with conducting timber sales, including salvage operations (Rosenbaum 1995). For any Forest Service District, loss of salvage revenues could lead to decreased budget allowances and reduced stature and influence. Salvage sales are particularly desirable for financial reasons, because proceeds from salvage sales remain within the district, and cost accounting is less rigorous for salvage sales than for sales of standard rotation timber lots (Shields 1994). Non-salvage revenues revert to the agency's General Fund. A further incentive is found in a dedicated revolving fund, maintained by the Forest Service, from which districts may draw to cover costs of advertising and contract bidding. The fund's value increased 1,040% from 1987 to 1993 (Shields 1994). Salvage sales therefore contribute to a Forest Service District's stature and influence.

In the Adirondack Park, not only do state government agencies lack incentives to offer salvage sales, but also there is no large demand for public timber. The ESFPA represents a mixture of small and large industries that own timber lands, or are otherwise invested in long-term resource management. For many operators, salvage logging on State Forest Preserve property would have required abandoning ongoing operations, some of which had already expanded to include recovery of downed timber within private holdings. Furthermore, had demand for logs been higher, any political influence wielded by ESFPA might have been matched by a well-organized environmental advocacy coalition.

Fourth, although the Adirondack Park is a single, largely contiguous management unit, regulated by environmental protection agencies, the forests targeted in Federal salvage legislation represent a broad mix of ecosystems with a wide range of management needs, including the need to define each unit's "multiple-use" mission within its respective agency (Cubbage et al. 1993). Adirondack Park administrators have had a century to struggle with definitions of multiple use, and the Park's current blend of public and private land use policy has evolved in response to changing public needs and attitudes. Many aspects of ecosystem management, such as adaptive management and hierarchical scaling (Jensen et al. 1996, Vogt et al. 1997), can be found in Adirondack Park directives (e.g., APA 1985, APA and NYS DEC 1985).

Finally, although the salvage decision in New York State was open to direct public scrutiny, legislation authorizing salvage on federal lands escaped public debate. The two federal salvage initiatives that passed were both amendments to public laws that were themselves unrelated to forest management policy (HR 104-19 in 1994 and HR 1158 in 1995). The single openly debated bill on the issue (S-391 in 1995) was never passed. Furthermore, the role of the chief executive was very different at each government level. In New York, taking the 1950 Adirondack blowdown response as precedent, no legislation to declare a constitutional emergency would have been introduced without an executive recommendation. Governor Pataki was identified as the primary decision maker, and lobbying was directed at the executive branch. At the federal level, President Clinton was handed legislation whose primary contents were popular and politically prominent programs (e.g., funding for emergency flood relief in California, in the case of HR 1158). At that stage, his only opportunity to act on the salvage amendments was a full veto. Furthermore, much of the lobbying directed against the salvage amendments began after their passage, whereas legislators sponsoring the amendments had previously received substantial election campaign contributions from wood products industries (Daly 1994).

CONCLUSIONS

A comparison of events surrounding the 1950 and 1995 Adirondack windstorms shows evident changes in public attitudes, applicable technology, ecological theory, and the role of science in public policy formulation. At the time of the 1995 storm, ecologists possessed an improved understanding of natural disturbance dynamics, and were also better positioned to inform policy decisions in New York State. Available new technologies (remote sensing, GIS, and fire assessment models) enhanced scientists' ability to convey necessary blowdown information to policy makers. An improved public understanding of ecological principles may have been instrumental in encouraging public and political acceptance of the necessity of maintaining natural disturbance regimes for forest ecosystems. It is likely that these factors, in combination, contributed to a societal climate conducive to greater scientific input in the policy process. However, under different socioeconomic and political circumstances,

ecological science might have been given a smaller role, such as in the case of federal salvage logging in northwestern states. As general conclusions, we offer the following:

1) The Adirondack Park management system appears capable of accommodating large-scale natural disturbance as part of the forest fabric, without the need for intervention. To a large extent, this is unwritten policy, not explicit in the State Constitution and not sheltered from the winds of socioeconomic change. However, the decision to forgo potential resource benefits and to assume a moderate fire hazard risk, in exchange for allowing natural post-1995-blowdown recovery, has a firm basis in modern ecological theory.

2) Federal salvage policy in western states has largely escaped ecological scrutiny. We echo many others in noting that the wide range of ecosystems and the multiple management objectives of these various forests ought to produce a variety of salvage-related policy goals. Under current legislative mandates, however, a science-based salvage policy has not been effectively developed. Western forest ecologists may be poised to contribute significantly, but their expertise has been excluded from the decision-making process.

3) We stress that our treatment of western states' forest ecology and management has been superficial, and that the comparisons and contrasts we have drawn ignore innumerable details, ecological, political, and otherwise. However, we believe that fundamental differences in management have led to very different levels of public and scientific scrutiny, with consequences for the long-term protection of native forests.

RESPONSES TO THIS ARTICLE

Responses to this article are invited. If accepted for publication, your response will be hyperlinked to the article. To submit a comment, follow [this link](#). To read comments already accepted, follow [this link](#).

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APPENDICES

Appendix 1. Chronology of selected newspaper and newsletter articles.

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Appendix 2. Glossary of terms and acronyms.

The **Adirondack Park** consists of all land, state-owned and private, inside the Blue Line. The Park became a legal entity on 20 May 20 1892 by Chapter 707 of the laws of that year, stating that it was "... to be forever reserved, maintained, and cared for as a ground open for the free use of all the people for their health or pleasure, and as forest lands necessary to the preservation of the headwaters of the chief rivers of the state and a future timber supply." This law described the original Park boundaries, provided for the sale and exchange of land outside the Park, the expenditure of the proceeds for new purchases within the Park lines, and the leasing of campsites within the Park.

The **Blue Line** is the administrative boundary of the Adirondack Park. Its name is derived from the fact that the State Comptroller in 1884 issued a map of the proposed park with the boundaries outlined in blue.

The **Forest Preserve** is a designation indicating the highest form of conservation in New York State, as described in the "forever wild" constitutional amendment adopted in 1894 (Vol. V, p. 766), which declares: "The lands of the State, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be removed or destroyed." State lands in this classification are found in 12 Adirondack and four Catskill counties.

State Forests are public lands used as experimental or demonstration forests. They represent a small fraction of public Park lands, and are subject to commercial logging to generate revenues.

The **Adirondack Park Agency (APA)** is the independent New York State agency supervised by a board of commissioners, mandated to include Park residents. The agency, which has an advisory staff of scientists, planners, and lawyers, regulates land use practices within the Blue Line, mainly by issuing or denying permits.

The **Empire State Forest Products Association (ESFPA)** represents a consortium of private timber landholders in New York State. This group acts as a watchdog and participant in regulatory decisions affecting the Adirondack Park. Members include private land owners, paper companies, lumber companies, furniture manufacturers, and saw mills.

The **New York State Department of Environmental Conservation (NYS DEC)** is the agency charged with management of the Adirondack Park. This agency also regulates and monitors environmental quality, including air, waters, forests, fisheries, and wildlife, throughout the state.

Address of Correspondent:

George Robinson
Department of Biological Sciences
Biology 126
State University of New York at Albany
Albany, NY 12222 USA
Phone: (518) 442-4302
Fax: (518) 442-4767
grobins@csc.albany.edu

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