Wilderness Fire Stewardship on the Kenai National Wildlife Refuge, Alaska

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Introduction

The policies of all four federal agencies responsible for managing wilderness in the United States recognize the importance of fire as a natural ecological process and the desirability of restoring the historic role of fire to wilderness ecosystems (Parsons and Landres 1998). In 1995 the Departments of the Interior and Agriculture issued *Federal Wildland Fire Management: Policy and Program Review,* which provided policy direction for all federal wildland fire activities. A guiding principle of this new policy is that the role of wildland fire as an essential ecological process will be incorporated into the planning process. This new policy allows naturally ignited fires to be managed for resource benefits wherever an approved fire management plan is in place (Parsons et al. 2003).

John M. Morton. Photo from U.S. Fish and Wildlife Service.

However, despite the increased emphasis on managing wilderness fire for resource benefits—Wildland Fire Use (WFU)—no agency has a fully successful wilderness fire management program (Parsons 2000). In addition to the policy and administrative constraints that have limited the use of natural fire, even on the larger units, there are other reasons why natural fire can never be expected to be allowed to burn in some wilderness units.

In this article, we review the 2005 fire season on the Kenai National Wildlife Refuge (KENWR), especially the five lightning starts in wilderness. The decision process for suppressing these fires, or not, clarifies some of the major obstacles to allowing wildland fires in wilderness.

Kenai National Wildlife Refuge

The 2-million-acre (800,000-ha) KENWR is in south-central Alaska on the Kenai Peninsula, which is formed by the Cook Inlet and Prince William Sound. KENWR shares boundaries with Chugach National Forest and Kenai Fjords National Park. KENWR was established in 1941 as the Kenai National Moose Range but was renamed under the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. ANILCA also gave KENWR its mandates, of which the primary purpose is to conserve fish and wildlife populations and habitats in their natural diversity.

Biodiversity is unusually high for this latitude because of the juxtaposition of two biomes on the peninsula: the northern fringe of the Sitka spruce-dominated (*Picea sitchensis*) coastal rainforest on the eastern flank of the Kenai Mountains, and the western-most reach of boreal forest in North America on the western side of the Kenai Mountains. Forests on KENWR are dominated by white (*P. glauca*) and black spruce (*P. mariana*) with an admixture of aspen (*Populus tremuloides*) and birch (*Betula neoalaskana*). Extensive peatlands are interspersed among spruce in the Kenai Lowlands. Lichen-dominated tundra replaces mountain hemlock (*Tsuga mertensiana*) and subalpine shrub above treeline in the Kenai Mountains and Caribou Hills.

Unlike the other 15 refuges in Alaska, KENWR has a fairly substantial urban interface with issues more typical of the lower 48 states, such as high recreational use and expanding adjacent resident population, but also with oil and gas activities, contaminants, and commercial fisheries. More than 50,000 people live on the Kenai Peninsula, and as one of only two Alaskan Refuges on the road system, KENWR is a recreational destination for many Anchorage residents and tourists.

Wildfire and spruce bark beetles (*Dendroctonus rufipennis*) are the dominant disturbance processes on KENWR. There are two distinct fire cycles: black spruce has a mean fire return interval of 79 years (De Volder 1999), whereas white spruce burns much less frequently, averaging once in 400 to 600 years

(Berg and Anderson, in press). The two largest fires in the last century were in 1947 (310,000 acres; 125,506 ha) and 1969 (86,000 acres; 34,818 ha).

Fire Management

In 1980 Congress designated 1.35 million acres (550,000 ha) or about 69% of KENWR as wilderness in three separate geographic units. Wilderness on KENWR is managed in accordance with the Wilderness Act, ANILCA, National Wildlife Refuge System Administration Act, Federal regulations (50 CFR), and U.S. Fish and Wildlife Service (USFWS) policy. The 1985 Comprehensive Conservation Plan (CCP) established the current directives for managing fire and wilderness on KENWR. Specifically, WFU is allowed on 97% of KENWR, prescribed fire is *not* allowed in wilderness, and wildfires not contributing to management goals are suppressed using the "minimum appropriate tool." WFU is naturally ignited wildland fire whereas prescribed fire is management-ignited fire; both are managed to achieve specific, planned resource objectives in approved land and fire management plans.

The 1998 Alaska Interagency Wildland Fire Management Plan further defines how fire is managed on KENWR. This plan defines four Fire Management Options that can be applied by KENWR to help define suppression priorities and the default response to wildland fires in different areas. The options range from Critical, where human life or inhabited property is at stake, to Full where uninhabited property or cultural/historic sites are at risk, and to Limited where there are few anthropocentric resources. Under the Modified option, fire is managed as Full until a conversion date changes the option to Limited. Only in Limited is the default response (i.e., initial attack) to allow a fire to burn, whereas suppression is the default for the other three options. This classification, which is unique to Alaska and applies only to naturally ignited fires (all human-caused fires are suppressed), was first applied to KENWR in 1984. In 2004, Fire Management Options on KENWR were adjusted to increase the likelihood of natural wildfire being managed for resource benefit. The Limited option area was increased from 780,000 acres (316,000 ha) to 1,283,000 acres (520,000 ha), effectively placing 97% of wilderness under the Limited option. This change helped set the stage for the relative success of fire management activities in 2005.

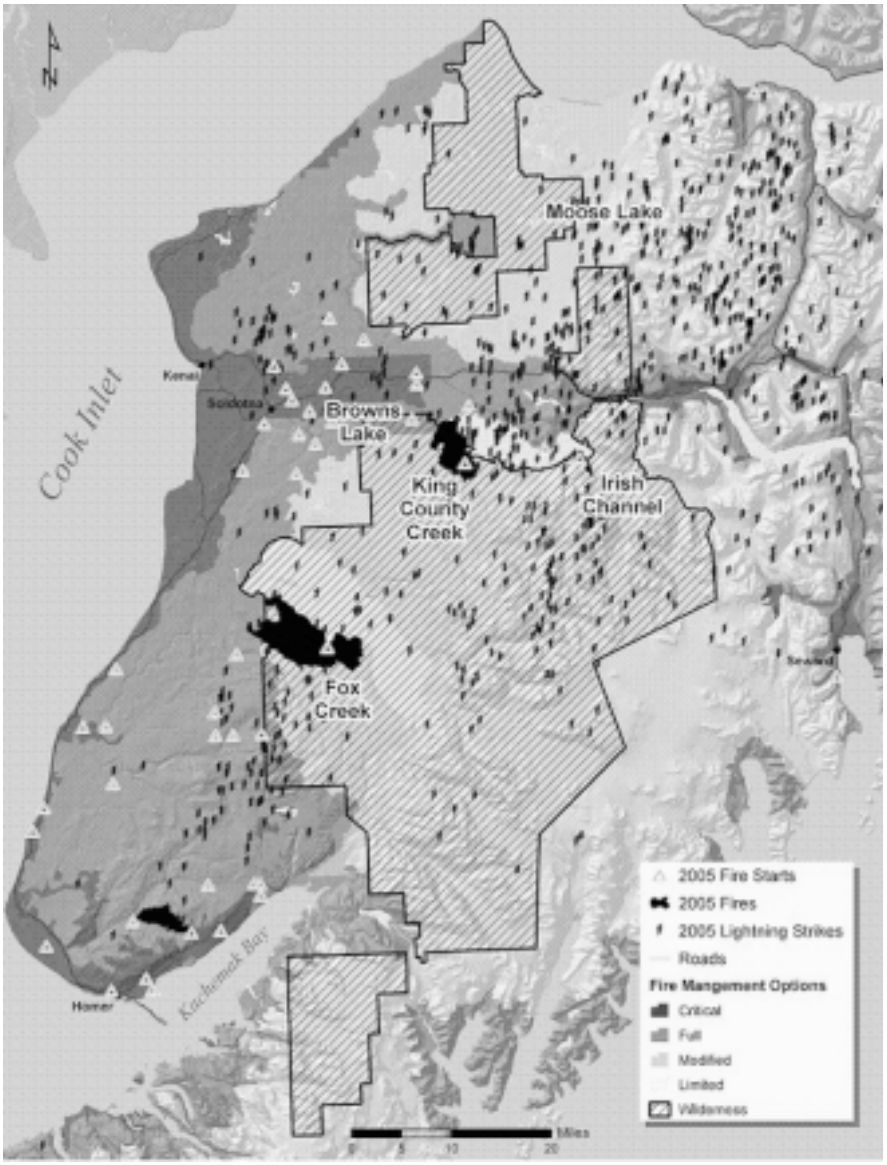

Figure 1—Lightning strikes, fire starts and Fire Management Options on the Kenai Peninsula in 2005, with specific reference to five wildfires in wilderness. Map courtesy of U.S. Fish and Wildlife Service.

In 2005, there were 54 fire starts on the Kenai Peninsula, of which 30 were anthropogenic, 22 were lightning strikes, and two were from unknown sources (see figure 1). Of the 22 lightning-ignited fires, 15 were on KENWR. All but two of the 15 wildfires were suppressed, despite the fact that six occurred in Limited and five were in wilderness.

The Brown's Lake Fire was a lightning start in black spruce in a Full option area. It was immediately suppressed due to its proximity to several subdivisions and the community of Funny River, at a cost of $5,000. Similarly, the Moose Lake

Fire was a lightning start in black spruce, but it occurred in a Limited option area. Although the default response should have been to allow it to burn, it was suppressed for three reasons: (1) there were several other concurrent fire starts on KENWR, (2) the fire was showing extreme behavior, and (3) there was concern that personnel at a nearby research facility could not be evacuated safely. This fire was small (13.5 acres, 5.4 ha), but suppression costs were $114,000.

The King County Creek Fire was a lightning start in black spruce, initially in a Limited option area. However, the fire spread rapidly to the northwest toward areas designated as Full surrounding the town of Sterling. This is one of the few areas on KENWR where Wilderness is designated as Full rather than Limited management option due to the values at risk. The Incident Management Team contained the fire within natural barriers using aerial ignition to burn out unburned fuels in advance of the wildfire. The firing operation consumed an area almost as large as the wildfire footprint, with suppression costs estimated at $3 million for a fire that totaled 10,100 acres (4,100 ha).

The Fox Creek Fire was a lightning strike in beetle-killed white spruce in a Limited option area. It was designated for WFU (i.e., allowed to burn) because it was flanked to the north by Tustumena Lake, and to the east and west by wildfire scars from 1994 and 1996, respectively, with no nearby human habitation or structures to the south. However, the fire advanced westward into the remnant fuels left by the 1996 fire, threatening private cabins outside both wilderness and refuge boundaries. The fire also spread toward a historical cabin on the Tustumena Lake shoreline. Consequently, firefighters used aerial and hand ignition methods to both flank the fire in the west and to defend the cabin, both of which proved to be successful actions. The fire ultimately burned 26,300 acres (10,650 ha), with suppression costs estimated at $1 million.

The Irish Channel Fire was a lightning strike in mountain hemlock in a Limited option area. It was designated for WFU fairly soon after detection because it was flanked on the east by a previous fire in 2003, to the north and west by Skilak Lake, and to the south by tundra and glacier. This fire slowly consumed 925 acres (375 ha); management costs were negligible, essentially restricted to surveillance.

These five wildfires in wilderness demonstrate some of the vagaries of wilderness fire stewardship on KENWR. All five fires were lightning strikes in wilderness, four of which were in Limited. Three were suppressed in varying degrees, and two were allowed to burn as managed wildfires. The 27,225 acres (11,025 ha) burned by these latter two fires were the only WFU acreages reported by the USFWS in 2005. The 37,325 acres (15,111 ha) burned by all fires approximates the total acreage (41,350 acres/16,740 ha) that had previously been burned by anthropogenic and natural wildfire during 1985–2004 on KENWR.

Discussion

We recognize that managed wildfire must be used more effectively on KENWR. Several factors constrain WFU on KENWR, the most significant of which is the proximity of the urban interface to wilderness boundaries. Furthermore, because Wilderness on KENWR is fragmented into three units, the wilderness boundary (470 miles/760 km) exceeds the refuge boundary (409 miles/660 km), even though the former is within the latter. This geometric artifact increases the risk of wildfire to human safety, property, and structures.

The threat of personal liability to the refuge manager may be a substantive hindrance to WFU. Frankly, few managers would approve the Maximum Manageable Area of 128,400 acres (52,000 ha) that was defined for the Fox Creek Fire. A fire of this magnitude raises public and political ire both locally and in Anchorage. Air quality degradation associated with fire elicits complaints and sometimes financial penalties from the Alaska Department of Environmental Conservation. Fortunately, most peninsula residents were supportive of the decision to not suppress the Irish Channel and Fox Creek Fires. Both fires were remote, and local educational outreach about the need for fire appeared to be successful; most complaints originated from Anchorage, not the peninsula.

Logistics played a role in the decision to suppress the Moose Lake Fire, even though it was in Limited Management Option in wilderness. This fire was detected shortly after a severe June lightning storm and several fires elsewhere on the peninsula were already being managed or suppressed. Fire management resources on the peninsula and elsewhere in Alaska are limited and may have been inadequate for controlling multiple, concurrent large fires with extreme fire behavior.

Prescribed fire has been the land management tool most advocated for mimicking or restoring natural fire regimes in wilderness. In the lower 48, the USFWS has relied almost entirely on prescribed fire to accomplish wilderness management objectives, including the reduction of hazardous fuels, range improvement, wildlife habitat enhancement, and restoration of natural fire regimes (Parsons 2000). However, there continues to be considerable opposition both within and outside the USFWS and other agencies to prescribed fire in wilderness. Prescribed fire is viewed by many as inappropriate intervention that detracts from the wild or untrammeled nature of wilderness, and that its use conflicts

with the primary purposes of wilderness. Perhaps of greatest concern is that the use of prescribed fire could become an accepted alternative to natural ignitions and as such would soon become the dominant wilderness fire management strategy (Parsons 2000).

During a recent USFWS workshop, five situations were identified in which prescribed fire might be an appropriate tool in Alaskan wilderness: (1) to restore or enhance habitats of federally listed threatened and endangered species; (2) to control or eradicate invasive flora; (3) to increase the likelihood of naturally ignited fire to burn unimpeded (by reducing hazardous fuel loads around structures and the urban interface); (4) to restore a natural fire regime that has been temporarily altered (e.g., extreme fuel loads due to blowdown from a hurricane); and (5) to mimic a natural fire regime that has been altered and is not expected to be restored due to constraints on wildfire management.

Currently, situations 1, 2, 4, and 5 do not apply to KENWR. KENWR does not have listed species, invasive flora have not yet been identified that require fire treatment, and the fire regime at a landscape scale does not appear to be altered, temporarily or otherwise. However, situation 3 is a need that has been identified on KENWR. Aerial ignitions were used during the 2005 season to both contain wildfire (King Country Creek) and protect structures (Fox Creek). The use of prescribed fire to remove fuels or convert forest types would have presumably been safer and less expensive than managed wildfires. In this context, using prescribed fire to reduce fire risk at the wildland-urban interface, around structures, and along administrative boundaries may be an important approach to increasing the likelihood of WFU in wilderness.

The use of prescribed fire within wilderness has been proposed in the draft revised CCP for KENWR. Despite high suppression rates, there is concern that the natural fire regime is gradually being accelerated by increasing ignition rates, a 10-year outbreak of spruce bark beetles of unprecedented magnitude and size (Berg et al., in press), and a resident human population growing at 2.2% per year

Prescribed fire in wilderness is not without its concerns. Collateral damage associated with fire management activities may include exotic plant introduction, physical impacts associated with mechanical treatments, use of constructed fire lines for legal and illegal access by snowmachines and other off-road vehicles. Translating landscape-level estimates of the natural fire regime into when and which acre gets burned is also highly problematic; most fire behavior models are not spatially and temporally explicit at this resolution.

We are also concerned that historic fire regimes may be changing in response to global climate change. For example, long-term colonization of peatlands by black spruce will provide continuity of fuels across previously wet muskegs that served as firebreaks in fires such as the 1947 fire (Klein et al. 2005). This expanded fuel bed, coupled with longer, drier summers may be conducive to larger and more severe fires in the lowland black spruce forests, as well as putting more fire on the flanks of upland white spruce stands. As yet, we are not aware of any policy that articulates how historic fire regimes should be viewed (i.e., is it "natural"?) as global climate change becomes more apparent. **IJW**

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