

The Emergence of Waterfowl Conservation Among Yup'ik Hunters in the Yukon-Kuskokwim Delta, Alaska

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This paper presents evidence of emerging waterfowl conservation practices and attitudes among certain groups of contemporary Yup'ik subsistence hunters in the Yukon-Kuskokwim Delta, a remote, wetlands dominated region of western Alaska crucial to several species of Pacific migratory birds. By examining what factors motivate hunters to follow restraint practices and evaluating how federal goose management policies impact these factors, I argue that recent policy has succeeded not by enforcement of regulations but by providing minimum necessary conditions for voluntary conservation to emerge as a cultural practice. This example of cooperative management may serve as a model for future, sustainable wildlife policies that involve indigenous resource users.

KEY WORDS: Alaska; indigenous conservation; cooperative management; waterfowl; Yup'ik.

INTRODUCTION

Game hunting and fishing are the principal subsistence strategies of subarctic and arctic foraging societies and an important activity to foragers throughout the world's tropical ecosystems. However, increased pressure on wildlife populations due to both indigenous and nonindigenous population growth and habitat alteration has generated the need for conservation and management policies that regulate the hunting practices of traditional foragers (Redford & Robinson, 1985). In an effort to find existing

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practices that satisfy this need, anthropologists in recent years have sought evidence for traditional, effective wildlife management and conservation among indigenous hunters (for example, Berkes, 1987; Hames & Vickers, 1983; Posey & Balee, 1989). Some such scholars have argued that nonhierarchical, voluntary reduction in resource exploitation is not feasible as an effective conservation strategy because selection favors the individual who violates the commons and takes as much as possible (Smith & Winterhalder, 1992). Based on this reasoning, or on the similar argument that rational choice based on the evaluation of individual gain would militate against voluntary reductions, cooperative, noncoercive wildlife conservation policies would not be viable alternatives to contemporary systems of game warden-enforced regulation. Other scholars of traditional, common-property resource management systems, however, suggest that social control mechanisms that effectively prevent violations of conservation principles can emerge and persist in essentially egalitarian societies (Berkes, 1987; Stocks, 1983). The examples they provide show that alternatives to coercive conservation systems are viable. A few such researchers in the neotropics and the subarctic have developed criteria to evaluate whether these indigenous systems satisfy strict, Western biological definitions of conservation, and have tried to identify conditions that must be present if conservation is to emerge, or to be adopted voluntarily, in a foraging society (Alvard, 1994; Brightman, 1987; Hames, 1991).

To date, little application has been made of such work on the "evolution" of conservation to the development of wildlife policies that might promote conservation's voluntary adoption and spread. Despite findings like those discussed above, coercive and suppressive strategies by governments to enforce conservation practices among traditional foragers continue to proliferate worldwide, often with the support or urging of international conservation groups (Peluso, 1993). These schemes have no hope of becoming self-perpetuating because they rely on continual inputs of funding to maintain costly enforcement efforts. Despite, and in part because of, their high costs, these schemes are also prone to failure among remote, scattered, and highly mobile traditional populations whose activities cannot be consistently monitored. Above all, such policies promote disregard for the needs and rights of traditional populations who choose to pursue subsistence lifestyles. The need for research on and dissemination of alternatives to coercive conservation policies for traditional foragers therefore seems particularly urgent.

Throughout this century, declining wildlife managers populations in Alaska and northern Canada have prompted wildlife to try to protect wildlife without depriving indigenous foragers of their subsistence. Early

wildlife protection efforts relied on enforcement and coercive means to force native hunting practices into accord with federal and state legislation. More recently, managers in the American subarctic and arctic have embraced more innovative and just approaches to motivating adherence to practices necessary for the conservation of scarce resources. Recent studies point to the effectiveness of cooperative and co-management systems that link a society of users with an external management agency in a joint effort to protect a resource (Osherenko, 1988a, 1988b; Singleton & Taylor, 1992). Beyond improving recognition of traditional peoples' rights, these systems may be more successful than coercive systems because even in the absence of comprehensive and perpetual enforcement, cooperative approaches foster self-motivated adherence to conservation rules (Osherenko, 1988a, 1988b).

One such cooperative policy, the Yukon-Kuskokwim Delta Goose Management Plan, has since the mid-1980s involved Yup'ik hunters in western Alaska in a program that appears to have successfully contributed to the recovery of four species of Pacific geese (Pamplin, 1986). The Delta effort provides an opportunity to explore general principles applicable to shaping policies that promote the voluntary adoption and spread of conservation attitudes and practices among traditional foragers. This study examines first how Yup'ik waterfowl hunters practice goose conservation today, and second, whether Yup'ik conservation practices predate or have changed in response to the new Goose Management Plan in the Delta. Using interview and participant-observation data, I argue against the assertion (Smith & Winterhalder, 1992) that hierarchical systems entailing enforcement or coercion are necessary today to protect scarce wildlife resources from overuse by indigenous users (Berkes, 1987; Hames, 1991; McCabe, 1990) and illustrate that with attention to certain criteria, cooperative resource management programs can make possible the emergence and adoption of self-sustaining conservation practices and attitudes.

Finally, to assess the applicability of anthropological conservation theory to resource policy formulation, I examine how the existing cooperative management scheme in the delta appears to be influencing Yup'ik conservation practices and attitudes in a manner consistent with discussions of the "evolution" of conservation by anthropologists Hames (1991), Redford (1990), Alvard (1994), and Brightman (1987, 1993). In defense of subsistence rights, indigenous spokespersons often feel pressure to prove their constituents to be traditional conservationists and to deny accounts that waste or excess harvests ever occurred routinely in their societies. The perceived importance of defending an image as traditional conservationists stems in part from a static view of traditional cultures as unchanging—by this narrow view, a group that did not conserve in the past will not conserve in the future and cannot be trusted to steward scarce resources. However,

culture responds constantly to changing conditions and decisions on the parts of its bearers. The absence of a conservation tradition may reflect simply the historical absence of a need for conservation, because low, mobile human populations and limited hunting technology checked human impact on game populations or because additional pressures on game populations such as habitat destruction did not exacerbate hunting's impacts. Even when game populations come to need conservation, certain conditions could render conservation against the best interests of traditional resource users (Brightman, 1987; Hames, 1991). For example, competition with a second group of foragers for the scarce resource would generate a commons dilemma (Hardin, 1968) in which conservation by one group would result not in resource recovery or increased availability to them, but only in extra returns to their competitors. What these examples illustrate is that past decisions not to conserve may reflect dynamic responses to prevailing conditions, not ignorance or inability. Past decisions should not be taken to indicate that, under new and appropriate conditions, a people would not make the decision to conserve. I will make the case, in this paper, that the new management scheme in the Yukon-Kuskokwim Delta provides conditions suggested by Brightman, Hames, Redford, and Alvard (*op. cit.*) necessary for conservation to be in the best interests of Yup'ik foragers and, therefore, necessary for them to choose to practice it.

THE DELTA AND ITS INHABITANTS

The 19.6-million acre Yukon-Kuskokwim Delta National Wildlife Refuge is inhabited by over 18,000 Yupiit who rely primarily on the harvest of fish and game for subsistence (Fig. 1) (Fienup-Riordan, 1994; Wentworth, 1994; U.S. Bureau of Census, 1990). The modest ethnographic record of the Yupiit begins at the turn of the century, with Edward William Nelson's (1899) detailed collection and catalogue of Yup'ik material culture. His records, along with the compiled journals of missionaries who first entered the Delta in the late eighteenth century (notably, Fienup-Riordan, 1991), comprise the most comprehensive published records of pre-contact Yup'ik culture. Fienup-Riordan (1983, 1990, 1991, 1994) has completed the bulk of more recent ethnographic work in the delta concerning Yup'ik culture, ritual structure, and social distribution. She suggests (1990) that pre-contact conservation, defined in Western terms, did not exist among the Yupiit. Neither the historical record nor the more recent ethnographic work of Fienup-Riordan, however, conclusively addresses the question of whether Yup'ik foragers practice conservation today.

The Yukon-Kuskokwim Delta also contains the breeding grounds for



Fig. 1. The Yukon-Kuskokwim Delta, Alaska. The villages of the central coast, including Scammon Bay, depend more on waterfowl than any other Delta region.

over 90% of the world's emperor geese (*Chen canagica*), 50% of the world's black brants (*Branta bernicla nigricans*), all cackling, or lesser, Canada geese (*Branta canadensis minima*), and the entire Pacific population of the white-fronted goose (*Anser albifrons frontalis*) (Bellrose, 1976; Dau & Hogan, 1985). In 1964, roughly 1 million members of these four species made the trip north to the Delta to nest and breed. Each of these four Pacific Flyway species winters in a different range—the emperor goose in the Aleutian Islands and on the Kamchatka Peninsula in Russia; the black brant in Baja California, Mexico, and the western U.S. coast; the cackling Canada goose primarily in California's Central Valley; and the white-

fronted goose in the western interior of Mexico and the United States (Bellrose, 1976). The convergence of the four species in their breeding areas has made the Delta a preferred place of study and monitoring, and a crucial location in their ranges for population recovery (Childress & Rothe, 1990).

It has also made the geese a key food source for the Yupiit (Wentworth, 1994). Life for Yup'ik foragers, even today, revolves around the coming and going of migratory species which provide virtually all of their food (Fienup-Riordan, 1994). Geese figure strongly in the subsistence culture that accompanies the annual foraging cycle, comprising up to a tenth of the diet in some areas on the coast (Alaska Geographic Society, 1979). The Yup'ik name for the month of April is *Tengmiirvik*, or "bird place," signifying the time each year when the people of the Delta turn to waterfowl arriving from the south for sustenance (Fienup-Riordan, 1994). Waterfowl have traditionally provided fresh meat in the spring as winter supplies dwindle. In years when prolonged or late ice break-up prevents travel and harvest of other game, migratory waterfowl were sometimes the only food available for a period of weeks (Oswalt, 1990). Traditional Yup'ik stories depict geese as alert and perceptive animals, the epitome of mobility and the object of difficult hunts (Nelson, 1900; Scammon Bay residents, personal communication). Yup'ik people speak of the taste of fresh goose meat in the spring with zest, and men look forward to their hunts. These themes bespeak a long and positive relationship between the people of the Delta and the geese that return to it each summer. However, spring harvest of geese in the Delta has technically violated federal law since 1916, when the Migratory Bird Treaty Act outlawed any spring or summer harvest of migratory birds (USFWS, 1994). A combination of active resistance on the part of the Yupiit, periodic, discretionary nonenforcement by federal game wardens, and geographical fortuitousness has protected the Yup'ik spring hunt throughout the century and preserved it through today (Morrow & Hensel, 1992; Robin West, USFWS, personal communication, 1995). In particular, whereas enforcement of the 1916 law affected indigenous hunting patterns in other parts of Alaska, the dispersed and difficult-to-reach nature of Yukon-Kuskokwim Delta villages protected their ability to hunt during periods when the government did attempt to enforce the spring ban.

Between the mid-1960s and 1986, all four populations of geese nesting in the delta dropped precipitously—from 23% for the black brant to an alarming 94% for cackling Canada geese (Chandler, 1986). The relative roles of sport hunting, Yup'ik harvests, habitat destruction, pollution, and myriad other factors in contributing to these declines remains unclear. Sport hunters in the continental United States and Mexico claimed large numbers of geese during the period of decline, harvesting, for example, over 63,000

white-fronted geese—over 20% of the total population—in the 1963–1964 season alone (Pamplin, 1986). This does not, however, help to explain concomitant declines in populations of the emperor goose, which winters far from the dense populations of sport hunters to the south. Subsistence hunting in the Delta almost certainly also contributed to the decline to some extent; by 1964, annual reported harvest of the four species by Yup'ik hunters was approximately 75,000 birds and several thousand eggs (Klein, 1966), or 1% to 6% of each species' population.

Moreover, the concentration of subsistence hunting in the delta in the spring, before egg-laying takes place and the year's survivors have an opportunity to increase their numbers, may increase its impact on goose mortality (Oswalt, 1990; Raveling, 1984). Fall and winter harvests of waterfowl include a large number of young of the year, which have an inherently low survival rate—many would die even if not harvested (J. S. Sedinger, personal communication, 1997). Consequently, mortality owing to fall and winter hunting tends to substitute for rather than add to other sources of mortality. Spring harvests, however, are primarily of breeding adults that have survived the high mortality risk of their first winter. These adults ordinarily have a high survival rate in the absence of harvest (Ward *et al.*, 1997), so spring hunting tends to contribute mortality that would not otherwise occur.

Until recently, these basic principles of population biology were thought to be the only ones governing the relative impacts of spring and fall harvests. These relative impacts do also depend, however, on a second difference: the size of spring subsistence harvests responds strongly to annual variation in goose population size, whereas fall and winter harvests tend not to be as sensitive to these fluctuations (C. Wentworth, unpublished data). Spring subsistence harvests therefore have more of an opportunity to act as stabilizing forces on goose populations; fall and winter harvests, in the absence of proper management, will be destabilizing. These destabilizing effects very likely increased the contribution of sport hunting to the massive goose population declines in the 1960s–1980s (J. S. Sedinger, personal communication, 1997).

As goose numbers declined into the 1980s, hunters in the continental Pacific coast states urged Yup'ik hunters to decrease their harvests and pushed for the creation of a new regulatory scheme to promote conservation of the dwindling populations. The end result of these efforts, in 1985, was the Yukon-Kuskokwim Delta Goose Management Plan (hereafter referred to as “the Management Plan”). It involved collaboration and input from Fish and Game agencies in the Pacific States, the Yup'ik Association of Village Council Presidents (AVCP), nongovernmental sport hunting groups, and the agency possessing ultimate responsibility for the birds and

the Wildlife Refuge; the U.S. Fish and Wildlife Service (hereafter “the Service”). The Management Plan, currently in effect, appears to have successfully helped populations of all four goose species, at least in small part through influencing Yup’ik hunting practices: harvest surveys conducted by the the Service in the Delta, which rely on self-reporting by hunters but nevertheless reflect overall trends, indicate that the annual Yup’ik take of species protected by the Management Plan dropped by approximately half from a 1980–1981 level of 31,731 (Copp & Smith, 1981) to a 1985–1993 average of 15,554 birds (Wentworth, 1994). More recently, as goose populations have rebounded, these harvests have been able to increase again to a 1997 level of 23,490 (USFWS, unpublished data). The means by which this overall reduction in harvest occurred is a central topic of Part II of this paper.

DEFINING CONSERVATION

Studies of conservation in indigenous societies have suffered from a lack of rigorous definitions of conservation itself (Alvard, 1994). In an effort to overcome the vague operational treatment of the term, Raymond Hames defined conservation, in the context of subsistence hunting and the case where prey populations are at risk of becoming too scarce, as “behavior that requires short-term restraint for long-term benefit” (1987, p. 93). This characterization focuses on actual practice rather than on religious or ideological themes that reflect a conservationist ethic. In fact, both Hames (1991) and Alvard (1994) caution against reliance on ideological data alone as evidence for the existence of conservation among indigenous foraging groups and emphasize that conservation must be manifest in actual practice. Hames puts the matter succinctly: “Conservation is matter of performance—not intent” (1991 p. 76). As Alvard writes, “. . . , no matter the veneration afforded a prey species, an animal on its way to the cook pot is no less dead” (1994, p. 129). Although expressions of respect or empathy for animals may reflect a long and close association with traditional prey, they do not in and of themselves constitute conservation.

According to some, restraint alone does not define conservation; conservationists must also recognize the connection between their practices and increased availability or abundance of prey (Brightman, 1987). This point is debated; Hames (1991) contends that conservation can be said to exist regardless of conscious intent on the part of its practitioners. However, he also points out that conservation must be an actual cultural adaptation for the group; it cannot be a “by-product” of another process with a different

purpose. For example, Hames would distinguish between a hunter who harvests fewer geese because he feels sorry for them, and one for whom a reduction in the amount of time he has to hunt forces him to harvest fewer geese. By definition, only the first could actually be termed “restraint,” and it qualifies as restraint even though it is not motivated by explicit conservation goals. The distinction between these two hunters may appear a fine one, but from the perspectives of conservation policy and of understanding when and why people choose to practice conservation, it is an important one. Cases in which “restraint” happens to occur as a by-product of some other goal or restriction are unlikely to deliver insights into what kinds of information and conditions foster voluntary, sustained conservation. One could argue that the second example of harvest reduction informs policy just as well as the first, by suggesting that one way to reduce harvests is to make hunters busier so that they cannot hunt as often. However, such manipulation tells little about how to impart choice and participation in the management process to resource users.

In sum, patterns of harvest reduction do not necessarily imply that conservation is occurring; they may merely reflect changes in people’s allocation of time and money, priorities, and desires. In order to establish that conservation exists, intentional restraint—the payment of short-term costs in terms of prey capture that yield long-term gains in prey availability—must be established, though it need not be motivated by the objective of conservation. The focus of this analysis of Yup’ik hunting was therefore to identify practices that involved intentional restraint, which subsets of a heterogeneous community of hunters followed them, why they chose to, and what accounted for differences among subsets of the hunting community.

FIELD SITE

I elected a case-study approach to illuminate the spectrum and distribution of attitudes and practices within a single community. I selected Scammon Bay, a village of approximately 350 people on the central coast of the Yukon-Kuskokwim Delta, because (1) of all the villages in the Delta, those on the central coast depend most on waterfowl as a regular source of food (Alaska Geographic Society, 1979; Wentworth, 1994); and (2) participation by Scammon Bay residents in other waterfowl studies, such as Service harvest surveys, has been relatively good, providing a complete data base to work from (Wentworth, 1994). The fieldwork for this study, consisting largely of participant-observation and interviews with the hunters of Scammon Bay and their families, took place over the summer of 1994.

FINDINGS

Ideology About Animals Hunted

In addition to detecting the presence or absence of Western-defined conservation at a single slice in time, no study of conservation would be complete without investigating what contextual factors arising out of traditional, indigenous thought may explain this presence or absence. Despite the influences of mainstream American culture on the villages of the Yukon-Kuskokwim Delta, elder generations of Yup'ik maintain certain strong beliefs about the animals they hunt. Although this is by no means an exhaustive account of traditional Yup'ik beliefs and attitudes about their prey, it introduces three basic concepts that guide behavior towards prey. It also provides an opportunity to assess whether common, traditional Yup'ik attitudes toward their prey might reflect or generate a rationale for traditionally practiced forms of restraint, and might either support or conflict with western concepts about conservation and the role of hunters in influencing prey populations.

“Animals, They Got Feelings. Every Living Thing Got a Feeling.”²

The unifying theme of Yup'ik thought about their prey is one of respect, expressed in a variety of ways, both for the living animals hunted and for the food and other necessities that they provide. The often profound expressions of respect that Yup'ik elders have for animals rise from the understanding that animals, like humans, have both souls, or spirits, and consciousness/personhood—*ella* or *yua*. Elder Paul John of Toksook Bay explains, for example, that if one failed to clean the bones of a goose properly and to eat all of the edible parts, the goose would be left “crying.” “We treat the animals the same way we'd like to be treated,” says a man in his 50s from the village of Akulurak. The older villager with whom I worked consistently chose human metaphors to explain how animals were affected by everything from biological research to sport hunters, expressing empathy for and closeness to the geese they harvest. “They're trying to live, like us, right? But we still kill them, which is sad,” says one Scammon Bay man. Older villagers lament that their younger counterparts under 40, whether or not they embrace the goals of external conservation, no longer express such personal ties to their prey.

Such empathy may actually motivate behavior that reduces impact on

²56-year old man, Scammon Bay.

game, as in the example of an elderly woman in Scammon Bay who explained the way parents teach their children to leave some eggs in each goose nest while harvesting them:

The mothers, not the fathers, tell the children, because the mom gives her babies, because she knows. It is not good to hunt eggs. The reason we hunt eggs is because we have to survive. It is very hard for some women, for me it's very hard to hunt eggs because I'm a mother. I [do] not take them all. If I was a goose and somebody come and get my [baby] geese, it [would be] just like somebody killing a child (translated in Scammon Bay).

Beyond being “like” humans, animals possess an actual relationship to humans that underscores their human-like awareness and power. Numerous stories about human individuals going to live with, communicate with, or become animals suggest that the Yupiit perceive a continuity between the human and animal worlds foreign to Western thought (Fienup-Riordan, 1991, 1994). The power of some humans to acquire information from animals has special significance in Yup'ik tradition, in part because coastal Yup'ik hunters live in a highly uncertain environment. Nearly every animal hunted on the coast—seal, belukha whale, salmon, herring, other fish, waterfowl, small land mammals, and occasionally caribou or moose—migrates, creating the possibility that it will not return the following year. Whereas animals possess this mobility, the Yupiit must, for the most part, wait out the year within the Delta, passing periods such as spring melt paralyzed by breaking ice and dependent on the animals that come to them. Felix Walker of Scammon Bay, in trying to explain the power of animal masks to the “magicians” who use them, relates a story of big men who use loon masks to harness the power to swim beneath the winter ice to the north or south to find out whether animals are on their way back to the Delta.

In addition, animals are said to possess human qualities that they may reveal to people in order to communicate with them. A story, told by Paul John of Tooksook Bay, illustrates this link:

In Distant Time, when people, certain people, had certain powers to do magical things, mystical things, it was very possible for a goose or some creature of mother earth to remove its muzzle or bill, and there would be a human face. And because they have a consciousness of their own, an awareness, they would be able to converse with you in your own language. That's one of the ways we attained knowledge—so much knowledge—about the waterfowl and other creatures that we depend on for life (translated in Bethel, Alaska).

These human-like creatures have sufficient awareness that humans must treat them with great care and respect to avoid angering or saddening them. Expressions of respect include avoidance of waste, proper use, and proper treatment in the house; for example, offering each killed goose a drink and a bit of food before preparing it. Some expressions of respect, such as

careful waste disposal and social treatment in the house, serve no direct function with respect to either conservation or efficiency of food use but act as supportive components of a larger system. Their practitioners may identify conservationist motives behind the practices—for example, animal bones are to be buried in the ground or thrown in a lake so that they can be “recycled” into new animals; improper disposal would prevent the animal’s future return. Other expressions, however, correspond directly to mitigated impacts upon animals and, if followed, could effectively guide endogenous conservation.

“We Don’t Waste Up Here.”

One such belief that remains more universal than any other across age groups today directs foragers to avoid wasting game. Seventeen out of the 25 hunters with whom I worked in Scammon Bay, ranging in age from 17 to 75, independently expressed that they did not waste game and condemned those, such as sport hunters and irresponsible neighbors, who did: “If the sport hunters going to catch and just stuff it and not eat the meat, it’s a waste. The heck with sport hunters.”

Avoidance of waste applies to the food derived from game in that every edible part of every prey item is eaten. “We don’t waste food up here,” says one young woman, “we eat what we catch.” Waste avoidance in this sense has the value of reducing the likelihood of hunger when food is scarce and minimizes the number of game animals necessary to meet dietary needs. The negative evaluation of waste also extends to the hunt itself and in this sense has a direct effect on game abundance:

. . . if you see a goose that is sick, . . . we’re supposed to try to take it. At least not leave it dying. . . . And we’re not supposed to shoot the goose or kill a goose and just leave it in the tundra. We’re supposed to take it home.

Even young hunters continue to put these “rules” into practice today. On an early fall hunt I observed near Scammon Bay, the lead hunter (a man in his mid-30s) brought down a white-fronted goose, which escaped across a large lake. Although other flocks passed overhead from which he could have replaced the lost bird, the hunter instead emerged from his blind, waded across the lake, and searched until he found the wounded bird. The same hunter both expressed substantial disbelief in the notion that hunters could affect game populations in the Western sense, and earned a substantial cash income that enabled him to purchase food for his family. Custom and a sense of respect rather than explicitly conservationist concerns or the need for food motivated his choice to avoid wasting the goose.

Closely tied to the ethic of waste avoidance in Yup’ik thought is the

directive that one should take only what one can eat. Hunters speak of “limiting” themselves, particularly in the spring before storing for the winter begins, to only as many birds as one’s household can eat within a few days. If a hunter finds that he has more game than he and his family can use immediately, he gives it away to extended family and village elders, and then to others if enough remains. “I try not to take so much; just enough” is typical of the comments made by over half of the hunters who participated in the study. Taking only what one needs has particular significance with respect to conservation because it specifically promotes the minimization of take, regardless of whether additional take generates no extra cost. A hunter waiting long hours in the cold to harvest waterfowl may go home as soon as he has enough to feed his household simply because the cost of staying out longer discourages him from doing so. This differs qualitatively from the case where a hunter has his shot at as many birds as he wants from a passing flock yet chooses to take only two or three. Even if it entails no well-defined, short-term costs (the hunter spends no extra time, energy, or equipment to meet his needs), the practice of taking only what one needs becomes significant when a hunter has game in his sights and chooses not to take it.

Other beliefs, however, may play a role in preventing the emergence or maintenance of conservation. Brightman (1987) introduced the hypothesis that a belief in the infinite renewability of animals, or in the maxim that more animals killed meant more to return in the future, would encourage indiscriminate hunting rather than conservation. Fienup-Riordan (1991) tentatively concludes that these very beliefs prevail among older Yup’ik informants, casting doubt according to her analysis on the possibility of pre-contact conservation. Fienup-Riordan’s evidence, however, is limited, and these beliefs stand in direct contradiction to the commonly expressed maxims of waste avoidance and minimization of take. The evidence for which kind of belief prevailed in the past is mixed. First, it is not entirely clear that waste avoidance predates contact with the West. Instances of waste recorded during the early contact period seem to contradict the strong anti-waste sentiments that most Yupiit express today. For example, the Moravian missionary John Kilbuck observed the selective harvest of only certain cuts of meat after a successful belukha whale drive at Hooper Bay in 1911 (Fienup-Riordan, 1990). Incidents of waste also occur in contemporary coastal villages, although on an individual rather than a community level. Some Scammon Bay residents commented negatively about neighbors who threw away uneaten, frozen meat at the end of a winter. Another man recounted having given a large quantity of fish to a fellow villager who then failed to process the fish rapidly enough and eventually threw it away. Today’s wasteful behavior by some individuals, roundly

condemned by others, may reflect culture change as subsistence traditions falter in the face of Western influence. Accounts of waste in historical times, however, suggest that proscriptions against waste in the past may have applied only to some species and not to others, that waste avoidance on the whole has strengthened and expanded since Kilbuck's time, that different regions within the delta may have contained different sets of practices, or that proscriptions against waste were simply applied inconsistently and according to the particulars of individual situations. Although the course of emergence of waste avoidance in the delta remains unclear, the expression of waste avoidance even by Yup'ik elders who know little or nothing about Western wildlife management activity indicates that waste avoidance is not simply a recent product of government agency interventions.

“We're Not Supposed to Ignore Them, and We're Supposed to Take.”

The Yup'ik concept that use of game in the present begets increased game in the future has become a popular example of the contradictions that exist between Western management and indigenous principles. In particular, wildlife managers in Bethel, the regional center of the Delta, say that the presence of this belief has compounded some attempts to prescribe hunting closures as a means to increasing game populations. Historical anecdotes suggest that such a belief may have existed earlier in contact history. For example, Kilbuck referred to the “time-honored custom that the more they kill, the more whales will return the following year” (Fienup-Riordan, 1991, p. 174). However, no delta resident encountered during this study expressed such a belief. A few older individuals express the converse belief that non-use could cause game to disappear, but this differs qualitatively from the belief that Kilbuck documented. Whereas Kilbuck suggests a belief that killing more animals results in more animals returning, my informants rather expressed the idea that respect towards animals includes wise use. According to informants, game make themselves available or are made available by a higher power for the purpose of harvest; consequently, failure to harvest game displays a lack of appreciation and results in the return of fewer game the following year. One man explained,

Think of something that you'll provide me. Then I'll accept it. Then later in years, I'll say no, I don't want to eat it no more. Would you still provide me? . . . If we're given something, to take care of, like birds, animals, [then] as long as we take care of them, God will provide them for us.

His reasoning implies that people should hunt game to avoid losing them, but it does not imply that killing excess game will result in future increases.

It is not clear, therefore, which of the two concepts prevailed historically over the other, whether one gave way to the other in the face of changing conditions, or whether the two co-exist through geographical and individual variation in interpretation and belief.

Two concepts, therefore, may or may not have existed in traditional Yup'ik thought that contradict the principles of Western conservation and might play or have played a role in preventing the emergence of conservation: the idea of infinite renewability and the concept that increased use begets increased availability. In addition, four of my informants expressed the idea that humans could not influence geese in any way and that "God" or "nature" took care of their return each spring. This kind of belief—that human actions have no effects on the availability or abundance of geese—also challenges conservation principles by removing any availability-related motivation to conserve, avoid waste, or show respect for game. The antiquity of this belief in the Delta is unclear, and seems at odds with the large complex of beliefs in the ability of humans to impact animal populations through respect. Of the four informants expressing this belief, three were devout Christians, one a church leader, and the others involved in evangelical organizations, suggesting that a subset of Delta residents may have adopted this type of belief as a product of recent religious influence.

In sum, although none of the three beliefs at odds with Western conservation concepts appears widespread, models of voluntary conservation suggest that individuals who have embraced these concepts will be unlikely to concurrently adopt the goals and methods of conservation. This does not imply that understanding the biological causes of prey decline will automatically lead to compliance with Western conservation efforts—there is nothing inevitable about the conclusion that particular rules, regulations, and conservation principles should be followed. Rather, in the absence of understanding that there is some cause-and-effect relationship between hunters' actions and prey availability, corresponding roughly to a negative correlation between harvest volume and prey availability, there is no reason for hunters to choose to adopt restraint on hunting, and conservation is much less likely to emerge without coercion or enforcement mechanisms. Consequently, even vigorous efforts to introduce voluntary conservation will most likely fail if this recognition, as well as other basic conditions to be identified below, is not present. The results of a test of this, and related, predictions follow.

Restraints Practiced by Waterfowl Hunters

Of the 25 Yup'ik hunters in Scammon Bay followed during this study, 16 (64%) followed one or more of the first eight distinct restraint practices

listed in Table I. One of these practices, the avoidance of molted birds (birds that are temporarily flightless because they have shed their feathers), has emerged gradually over recent decades (Hanna, 1922; Morrow, 1991) and has become a general rule for the entire village. Because molted birds are no longer harvested at all, the practices reported by one informant to have taken place in the past of releasing young or excess birds after molted bird drives do not apply to the present. Nine hunters, including 5 of the 16 practitioners of explicit restraint and four others, also adhered to a principle of taking only what geese were needed to meet their food requirements—the subsistence needs of their immediate families, and any obligations that they perceived to provide food to other community members. Twenty (80%) of the hunters participating in this study therefore engaged in some practice likely to decrease potential impacts on goose populations.

Although the principle of taking only what one needs/avoiding waste may aid in preventing overharvest, it is not treated in this analysis as a form of rigorously defined restraint. In terms of time, energy, and material costs, taking more than one needs is at best a neutral, and at worst a costly, proposition. Foregoing unneeded prey, if they truly are not needed, does not constitute a payment of short-term cost and may actually save waiting and search time as well as expensive equipment such as steel ammunition (the use of less costly lead shot has declined drastically in response to education about the health effects of lead on both wildlife and humans). In addition, definitions of “need” in Scammon Bay are less clear than one might expect because individual hunters do not have clear responsibilities

Table I. Restraint Practices Reported Among Scammon Bay Waterfowl Hunters^a

Practice	Number of practitioners
Actively practiced today	
No harvest of young snow geese	1 confirmed; others reported
Partial or total avoidance of a particular species of goose	7
No harvest of nesting birds	2
Avoidance of mated pairs	1
Partial or total avoidance of molted birds	1 confirmed; others reported
Restriction of hunting in July and August	25
No gathering of goose eggs	1
Gathering of only part of the eggs in each nest (take only 2–3 or leave 2–3)	7
Adherence to principle of “take only what I need”	9
Not active today	
Release of excess birds after bird drives	Reported by 1
Release of young during bird drives	Reported by 1

^aReported on a sample of 25 hunters.

as to whom they supply with waterfowl meat. Traditional Yup'ik society was marked by community-wide systems of reciprocity, in which a hunter with extra meat provided for families experiencing temporary shortages with the understanding that in later times of need that hunter could depend on the bounty of others (Oswalt, 1990). A decision about whether additional birds were "needed" would, in such circumstances, depend on knowledge of every other family's food supply. Today, reciprocity in Scammon Bay is both more limited and more variable. Some hunters provide for extended family members on a regular basis and may, once family needs have been met, share with friends; others provide solely for themselves and their immediate household members. Definitions of "need" are thus specific to individual hunters. Some consider only their own household needs, others take into account specific shortages of other households, and still others perceive "need" as relatively limitless because of endless opportunities to gift excess birds to relatives, friends, co-workers, and so on. The meaning of "taking only what one needs" therefore varies from hunter to hunter and does not always imply much limitation of take during a hunt. This practice is therefore discussed in separate terms from those that more clearly meet the criteria of restraint.

Two other practices merit careful discussion because, from a wildlife ecological perspective, they may not confer benefits to waterfowl populations. Although a Western biological interpretation should not necessarily obviate the possibility of accurate yet contradictory traditional knowledge, one must also consider the possibility that new conservation practices reflect misinterpretations of newly introduced biological literature in the context of conflicting, traditional perspectives.

First, the reported practice of avoiding mated pairs is puzzling in light of the accepted knowledge that geese form lifelong pair bonds and replace deceased mates immediately (Sedinger, personal communication, 1997). Adult geese find mates at maturity and will quickly replace deceased mates throughout their lifetimes; sightings of unmated birds therefore must be rare. Harvesting these rare, briefly unmated individuals has less impact on future population size than does taking one individual from a mated pair, because if a goose has already lost its mate then it will not breed that year, whereas the harvest of a mate may destroy a successful breeding effort in the current year. However, hunters cannot realistically await unmated adults if they occur with such irregularity. In saying that they avoid mated pairs, hunters may be referring not to the status of geese as mated or unmated but to whether they have nested in a particular year—in at least one of the four species, fewer than half of the adult females nest in any given year (Petersen, 1992). It is not clear, however, how hunters would know, without going directly to nests to hunt, whether any one female had or had not

nested that year. Moreover, when geese first arrive in the spring and subsistence hunting peaks, none of them have yet nested. The only other way that hunters could avoid mated pairs is by harvesting only juvenile geese, which in biological terms *does* make conservation sense, but which conflicts directly with another reported practice: the avoidance of young geese.

It is likely that the practice of avoiding young geese arises out of a desire to avoid removing the current year's production. From a wildlife ecological perspective, however, adults are more valuable to the population than yearling geese. The former have managed to survive to breeding age and can already enlarge the population with their young, whereas the latter have a good chance of dying before they reach reproductive maturity at age 2 to 4 (Sedinger, personal communication, 1997). The reverse practice of focusing harvest on young, unmated geese (and away from mated, adult pairs) would be a biologically effective means to conservation. This may explain how "avoidance of mated pairs" translates into an ecologically meaningful conservation practice. The reported practice of "avoiding mated pairs" is included in subsequent tabulations and discussions because of the persisting possibility that it reflects a more general effort to direct harvest away from breeding adults and towards juveniles more likely to suffer natural mortality before reproduction. The practice of avoiding young geese is included parenthetically, because no biological basis for its conservation value can be identified, but is included in discussion as an intentional form of restraint by hunters.

Origins of and Reasons For Restraint Practices

To investigate why Scammon Bay's hunters practice each of these forms of restraint, I interviewed each hunter as to his and other hunters' reasons for choosing particular forms of restraint. The sample size, although too small to draw general conclusions about the Delta, allowed an intensive look at each hunter's attitudes and motivations, yielding the most accurate picture of what guides their decisions about restraint. I also looked to informants and their family members to address the question of which practices predate Western influence, seeking references to history, novelty, regulatory influence, and connection to traditional beliefs. Limited historical literature added evidence to assess the historical depth of particular practices (Hanna, 1922; Klein, 1966; Morrow, 1991). Although self-reporting has the limitation that informants can misrepresent their actions and opinions—for instance, out of concern that illegal behavior might be reported to agency officials—it is the only feasible way to investigate intangible topics such as beliefs and motivations. Field observations of

hunting activity are no better; as long as the hunter is aware of an observer's presence, he may alter his actions. To minimize distortion, I cross-referenced information by asking at least two other hunters, in their respective interview sessions, about the practices and views of each of their fellow participants. I also made initial contacts with Scammon Bay through the Association of Village Council Presidents rather than U.S. or state agencies and avoided associating the project with agency regulation, emphasizing rather the question of how hunting has transformed over the course of the century, to avoid biasing responses.

The participants in this part of the study associated many of their restraint practices with recent changes in regulation and education. For example, one informant (age 56) discussed how people follow the practice of avoiding the capture of mated pairs not because they have to, for no regulation exists regarding this type of restraint, but because they understand and desire the positive effects of leaving mated pairs to produce young for future seasons. This informant linked the emergence of this practice to recent efforts by the Service to educate Yup'ik communities about goose ecology through the distribution of informational calendars and curricular materials. Because it is motivated expressly by a desire to preserve birds for later rather than by the need to avoid regulatory penalties or enforcement threats, it represents a voluntary, and therefore potentially self-perpetuating, conservation effort.

The avoidance of nesting birds appears to have a similar origin. Another informant reported that in the dense nesting areas of the Delta, "people just traditionally went out and picked as many [geese] as they could to subsist off in the spring . . ." (age 56). Another hunter said that he used to hunt birds on the nest "way back then" (age 28), before limits were placed on them. The comments of these two informants suggest that the avoidance of nesting birds emerged within the last 15 years, after the younger hunter had begun foraging independently. Although other hunters may recognize the conservation value of leaving nesting birds, neither of these men's comments indicate an explicit desire to increase future availability through this practice; one cited tradition and the other cited regulatory restrictions as motivation. What may distinguish this practice from that of avoiding mated pairs is that the Service will penalize hunters for harvesting nesting birds but not for taking mated pairs. The former occurs because the Service maintains for research purposes a comparatively strong presence in nesting areas near Scammon Bay and because harvesting birds off the nest is perceived by the Service as a more blatant violation of the technical closure on spring goose hunting. The onus of this regulation makes it difficult to determine whether hunters are simply following a rule or acting because they recognize the conservation benefits of their practice.

Another practice that has been effectively outlawed throughout much of the Delta because of its high visibility and coordination is the annual summer drive of molted geese. Most villagers over the age of 20 know about the large-scale bird drives in which whole communities used to engage, but few report taking any molted geese today, citing as their reasons both regulations and the desire to conserve for the future. In bird drives, villagers took advantage of their prey's temporary vulnerability by herding the flightless birds by boat into large nets, from which they were taken, killed, and distributed to the community. Hanna (1922) observed one such drive that yielded 14 boatloads of geese in a single day. Morrow (1991) participated in a 1979 bird drive involving 38 boats and hundreds of birds. Three Scammon Bay informants reported that the birds, once herded into a net, were all clubbed and distributed. One informant (age 56) reported that during bird drives in his childhood, herders released the young of the year and kept only 10 to 15 birds for each household, allowing the rest to escape. He recalled one such drive taking place in Scammon Bay in the late 1960s. However, his report of the release of excess and young birds contradicts both Hanna's (1922) report and the reports of several other informants, casting doubt on the possibility that this form of restraint was ever widespread, if practiced at all. The conflicting accounts might be reconciled by the possibility that restraint in bird drives appeared in the middle of this century in some areas, after the appearance of some government wildlife regulatory presence in the Delta (reported by villagers to have been in the early 1950s) but before stronger measures in the 1980s eliminated bird drives altogether. Further research would be necessary to resolve this question; however, it is clear that until very recently Yup'ik hunters did not avoid molted birds.

Like bird drives, goose-egg gathering played a regular part in the Yup'ik subsistence cycle until quite recently. Eight of the Scammon Bay informants, and their families, generally abstain from gathering goose eggs but report that they used to gather eggs on a regular basis. Three of these individuals specifically cite the new Service regulations as their reason for restricting goose egg harvests, but two clearly cite conservation goals as their motivation for this practice. One hunter (age 22), for example, says that he quite gathering eggs "at least to give them a little more chance because we're hunting them in the spring and the fall," and "so they have more." Klein (1966) reports that in 1964 a Scammon Bay household gathered an average of 100 waterfowl eggs of which goose eggs were favored most, confirming that Yup'ik foragers widely practiced egg gathering until recently. Klein also suggests that egg harvests decreased from the pre-contact era to 1964 because the concentration of people into villages after contact with missionaries and traders greatly reduced the area searched

for eggs, not because of emerging practices of avoidance. The practice of altogether avoiding goose eggs, like the practice of avoiding certain species of geese, must therefore have originated in the last two or three decades. The reasons that Yup'ik foragers give for avoiding eggs—regulation and the need to reverse recent declines—further indicate that the practice arose in response to Service influences and Management Plan regulations and education programs in the Delta during the last decade.

The declines in bird drives, egg gathering, and harvest of nesting geese, unavoidably activities that once took place in the summer because of the timing of molt, laying, and incubation, reduced July and August harvest of geese to low levels. The report by a single informant that hunters avoid geese in July and August to conserve them probably reflects the three new conservation practices, because pre-contact Yup'ik hunters most certainly did not avoid birds in the summer (Hanna, 1922; Fienup-Riordan, 1994). The origin of this category of restraint therefore is recent and coincident with the declines in specific summer waterfowl harvesting methods.

The origin of avoidance of young snow geese is not clear, although it appears recent because some parents now teach their children to avoid young members specifically of the species protected by the Management Plan and emphasized in Service literature. The single informant who discussed this practice at further length failed to give an explicit reason for following it but said of it, “that’s why they’re growing,” indicating a perception of future benefits incurred by this restraint practice.

The one form of restraint for which evidence strongly supports the hypothesis of pre-contact origins is the practice of leaving some eggs in each waterfowl nest rather than simply gathering all of the eggs in each nest. This form of restraint differs from the practice of simply avoiding eggs because the former may coexist with the practice of harvesting eggs and may therefore predate the decline in traditional egg harvesting. Because Delta geese are not known to lay eggs to replace those lost, and because they will not abandon a nest simply because it has been disturbed, the practice of leaving some in each nest can enhance population size by leaving irreplaceable eggs to hatch (Sedinger, 1990). Seven individuals in the participant group continue the tradition of harvesting eggs but follow a rule of leaving two or three eggs per nest or a rule of taking two or three eggs per nest, with up to 12 eggs typically available per nest (Bellrose, 1976). One hunter (age 46) explained that he took only a few eggs from each nest, leaving the rest “for young,” while another (age 56) said he followed this practice “to save some for next year.” These comments demonstrate the explicit conservationist purpose that motivates some of the foragers who follow this rule. Other comments indicate that the practice of leaving eggs has greater historical depth than other reported forms of restraint. Four

individuals discussed how they learned the practiced from their older relatives. Two men (ages 35 and 56) learned the practice from their grandmothers, who they report also followed it. In addition, a 75-year-old woman reported that her mother had taught her not to take all the eggs from a nest and that she “felt bad” for mother geese who lost all their children. Based on these reports, it is likely that the practice originated over 50 years ago, when the old woman was a young girl and the two men’s grandmothers were too young to have stopped foraging on their own. The old woman, in particular, has no knowledge of external game management, as indicated by her interviews and corroborated by her relatives. In addition, because no reports (by informants) of government wildlife agency influence on the Central Coast area predate 1945, it appears that the practice of leaving some available eggs, at least in this case, has other origins.

Table II summarizes the conclusions reached in this section about

Table II. Summary of Restraint Practices by Motive and Inferred Origin^a

Restraint practice	Is conservation expressed as motivation for practice?	Inferred origin	
		Predates service influence	Service-influenced
Partial or total avoidance of particular goose species	Yes		X
No harvest of nesting birds	No		Unclear; probably of recent origin
Partial or total avoidance of mated birds	Yes		X
No gathering of goose eggs	Some yes; others attribute to regulations		X
Gathering of only part of the eggs in each nest	For most yes; some attribute to tradition/teaching of relatives	X	
Release of excess birds during bird drives	Yes	Unclear whether existed	
Release of young during bird drives	Yes	Unclear whether existed	
Avoidance of mated pairs	Yes		X
No harvest of young snow geese	Yes	Unclear	Unclear

^a(1) Evidence that each practice is motivated by conservation goals and (2) origin of each practice. Only one practice clearly predates recent influence by external wildlife managers such as the U.S. Fish and Wildlife Service, which has pursued extensive conservation programs in the Delta since the inception of the Delta Goose Management Plan.

active restraint practices reported by Yup'ik hunters and their families. Although all but one of the specified practices can effectively enhance game abundance, only one—that of leaving some eggs in the nest during egg harvest—clearly predates recent influence by the Service, which has pursued extensive conservation and education programs in the Delta since the inception of the Management Plan. The practice of leaving eggs coexisted with another reported activity that predates outside influence: that of removing all the eggs from a nest and spitting into it to encourage the return of more eggs the following year. This tradition, recalled by only a few hunters and apparently believed and followed by only the oldest ones, cannot qualify as restraint because its practitioner, although concerned about enhancing the next year's availability of eggs, does not forego any items in pursuit of that goal. To this point, therefore, aside from a non-universal practice of leaving some eggs in each nest harvested, only scattered evidence exists of restraint practiced by Yup'ik waterfowl hunters before the arrival of outside conservation efforts and influences.

Just Following the Rules?

Unquestionably, many hunters practice restraint in contemporary Delta villages because they have learned about the effects of hunting on limited goose populations from the Service and they know which practices are considered worse than others. However, a clear distinction can be made between restraint motivated by fear of enforceable regulations that require it and restraint motivated by new knowledge about the influence of hunters on game populations. To informants, the distinction was often as clear as the difference between practicing restraint “because they are right, and we need to save geese” and practicing it “because we have to, even though they are wrong.” To some hunters motivated by the latter explanation, following Service guidelines will actually reduce goose availability by angering the geese about improper use by the hunters. This distinction is crucial from the perspective of policy design because the latter group of hunters, in the absence of an enforcement threat, would cease to practice restraint, while the former is more likely to continue practicing conservation regardless of the future of the Service's enforcement budgets and directives. To distinguish conservationists likely to continue on their own from individuals who would resume unrestrained hunting once perceived sanctions disappear requires further examination of who follows restraint out of a desire to conserve and who practices it for other reasons, such as a perceived need to adhere to the enforced portions of the Migratory Bird Treaty Act and the Management Plan.

On the whole, enforcement threats are not a primary concern of Scammon Bay hunters. Sixty percent of those interviewed clearly indicated that they are not worried about enforcement or that they can avoid enforcement just by avoiding certain areas and highly visible types of harvesting such as bird drives. Robin West, the Service Migratory Bird Coordinator in Alaska (personal communication, 1994), agrees with Yup'ik hunters' assessment of the enforcement threat: the difficulty of monitoring activities in the remote Delta, coupled with periods of discretionary nonenforcement of the Migratory Bird Treaty Act spring hunt ban by wildlife agencies throughout the last century, have left Yup'ik practices essentially up to them.

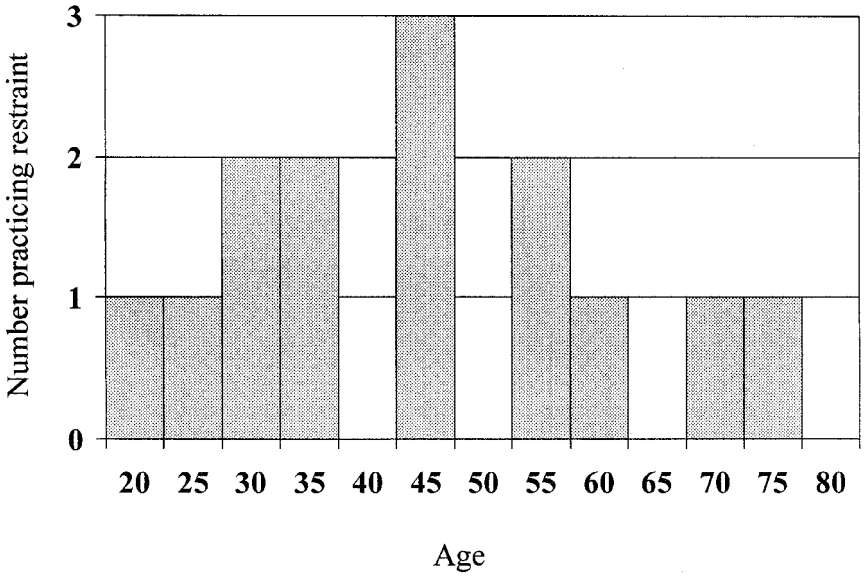
Hunters may support the goal of conservation even if a threat of enforcement does exist. Several informants expressed that they understand the Management Plan works and they only support it and its regulations because it works. If it did not, as one hunter commented, they would "ignore it." Another hunter suggested that if the Management Plan regulations went away, the people "would probably keep them as traditional, to conserve their waterfowl. They'd try to abide by the same principle, to conserve their geese." Even in the total absence of regulation, some hunters report, they would maintain the conservation practices they have learned. Several men in Scammon Bay practiced partial or total adherence to both a recently completed, multi-year closure on cackling Canada geese and a new closure on emperors by the Management Plan. Their reported reasons for adhering to the closures had more to do with concerns for their future than fear of reprisal or enforcement. Three of the four men (ages 28–58) who spoke at length about their motivations for following the closures specifically stressed concern for their children; for example:

I felt if I, one hunter, could take one instead of three of this, and another person does that, then maybe [we will] save the birds. I was thinking about the future, like [I] wanted my kids to see the birds that we used to hunt, things to be around. So I thought about the population decline, and I wanted it to come back up (age 28).

Still other hunters identify tradition or the lessons of their parents and grandparents, not rules, as their motivation for practicing restraint. In all, only 3 of the 25 hunters (12%) who participated in the study identified rules as their sole reason for practicing every form of restraint they adhered to. Three others identified rules as their reason for practicing one form of restraint but followed other restraint practices out of an explicit desire to conserve geese. For Scammon Bay hunters as a group, thus, restraint practices are largely practiced voluntarily, not in response to the threat of punishment.

For certain subsets of the Scammon Bay population, however, a desire or need to abide by these rules does predominate the set of motivating factors for practicing restraint. Figure 2 shows that people of all ages in

(a)



(b)



Fig. 2. Number of individuals who report (a) practicing restraint and (b) not practicing restraint. Individuals of all ages practice, and conversely do not practice, restraint in the Delta, without significant differences in the age composition of each group (Mann-Whitney U-test, $Z = 1.42$, $.20 > P > .10$).

Scammon Bay practice restraint and, conversely, that people of all ages choose *not* to practice restraint. Inspection of the reasons that people give for practicing restraint, however, shows a clear division between older (age 49+) and younger (age <49) subsets. Figure 3, which includes only those individuals who were able to give clear reasons for each form of restraint they practiced, shows that none of the eight hunters reporting conservation as their motivation for one or more restraint practices were over the age of 49. Five of the six hunters (83%) who identified rules and regulations as their motivation for one or more restraint practices were over 49 years of age. Despite the small sample size, the division between “abiders” (rule followers) and “conservationists” signifies a clear relationship between age and reason for practicing restraint (Mann-Whitney U-test, $Z = 2.58$; $P < .01$).

In addition, five foragers scattered between the two age categories reported practicing some form of restraint because parents or grandparents had taught it to them. Like the “conservationists,” this group practices restraint voluntarily in the sense that they do not perceive themselves as forced to do so. Unlike the motives of the “conservationists,” those of hunters following traditions of restraint are not doing so in response to recent policy-related changes and presumably would be following their parents’ lead regardless of whether or not the Management Plan had come about. The only hunters in Scammon Bay who appear to practice conservation because of principles adopted from Management Plan education and

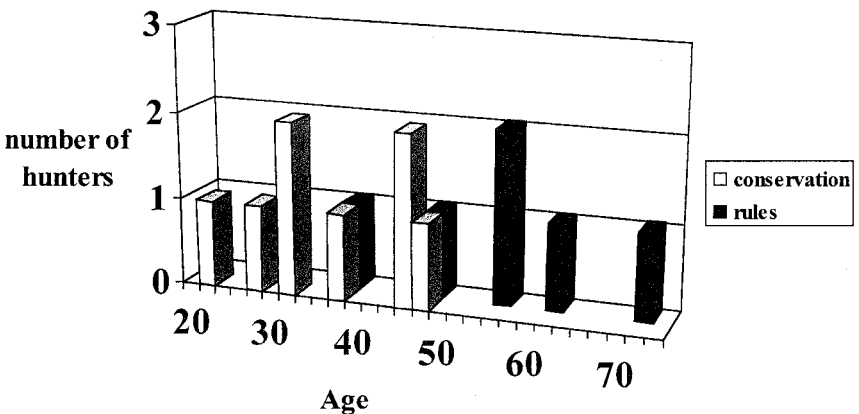


Fig. 3. The relationship between age and reasons reported for practicing restraint. While scattered individuals of all ages reported tradition (often as lessons from parents) as their reason for practicing some form of restraint, a significant age difference exists between the (younger) individuals who identify conservation motivations and the (older) rule-abiders (Mann-Whitney U-test, $Z = 2.58$; $P < .01$).

information efforts are, therefore, under the age of 50. Interestingly, this age group contains most of the highly active hunters in Scammon Bay — as villagers age past 50, they depend increasingly on their children and relatives to hunt for them.

What makes the (younger) “conservationists” different from the (older) “abiders”? Brightman (1987) asserts that in order for conservation to emerge (in the absence of coercion), hunters must be aware that they can influence future prey availability through present harvesting practices. That is, although such awareness can by no means be assumed to lead inevitably to conservation practices, it is one of a set of necessary prerequisites. I asked each hunter what things were responsible for the declines in goose populations over the last 30 years and found that those who named the role of Delta hunters in these declines were much more likely to practice restraint than those who did not recognize this connection (Spearman rank correlation coefficient, $r = 0.617$; $P < .005$). Of 14 hunters found to practice restraint, 11 (79%) specifically mentioned the role of Delta hunters in contemporary goose declines. One of the three who failed to mention this role was identified as an “abider,” whereas another simply described empathy for the geese as a motivation. Only one “conservationist” failed to cite the role of Delta hunters in declines.

In contrast, of nine individuals who do not practice restraint at all (hereafter referred to as “maximizers”), only two (22%) identified Delta hunters as having contributed to goose declines. One of these two was a 17-year-old hunter who actually talked about “limiting” himself but reported that village teenagers do not, in general, follow these rules. The other of these two exceptions was the poorest hunter in town. The latter case raises another necessary precursor to voluntary conservation identified by both Brightman (1987) and Redford (1990): resources must be sufficiently available that basic needs can be met through selective harvest rather than only through indiscriminate harvest of every available prey item. The improved efficiency of hunting technology in the Delta coupled with increased availability of manufactured food and cash income may be part of what enables Yup'ik hunters today to choose to conserve by ensuring that their immediate needs will be met. Poor hunters, however, cannot necessarily afford to pass over any opportunity for game procurement.

The correlation between recognition of human impact and restraint (due to any motivation) does not extend to age. Younger individuals are no more likely than older ones to recognize the human role in declines (Mann-Whitney U-test, $Z = 0.163$; $P > .50$), although many older individuals recognize only non-biological human roles in declines such as failure to show respect or, ironically, to hunt enough. In short,

an understanding of the human role in game population declines is closely correlated with the practice of restraint, but the proximate motivation may be either the perceived need to adhere to regulations (as is prevalent among older hunters) or the actual desire to conserve (as prevalent among younger hunters).

I found no significant relationship between age and attitude towards the Service, awareness of the Management Plan, experience outside of Delta villages, or attitudes about waste, so I turned to examining the comments the six "abiders" about ideology to investigate whether they expressed any beliefs potentially incompatible with principles of biological conservation, such as those explored earlier in this paper with respect to Brightman's (1987) assertion that certain beliefs would encourage indiscriminate hunting rather than conservation (see also Fienup-Riordan, 1990, 1991). Four of the six abiders (ages 49, 56, 56, and 62) expressed the belief that humans cannot influence animal populations in ways such as, "nature takes care of itself" and "animals come each year on their own." A fifth abider (age 71) expressed strong belief in the idea that human use of animals results in *increased* availability. Only one of the six — the youngest, at 37 — did not express any of the beliefs identified earlier as in conflict with conservation. That individual reported practicing other forms of restraint for explicitly conservationist reasons in addition to the one he practiced out of fear of enforcement. Examination of the entire group of 25 Scammon Bay hunters yielded the finding that all six of those who adhered to a belief incompatible with conservation were over 43 years of age. This group was significantly older than the group of 17 who, in discussions about their beliefs, mentioned no concepts at odds with conservation principles (Mann-Whitney U-test, $Z = 2.38$; $P < .02$).

In conclusion, the only factors that distinguished the young group of "conservationists" from the older group of "abiders" was the presence in the latter group of beliefs incompatible with conservation, which appeared to affect their reasons for practicing restraint. This finding, coupled with the finding that all but one (the leaving of some eggs in each nest) of the verifiable types of restraint identified by Delta hunters has recent origins and the findings of past scholars refuting hypotheses of pre-contact conservation in the Subarctic (Brightman, 1993; Fienup-Riordan, 1990), strongly suggests that waterfowl conservation practiced in the Delta today represents a nascent system whose emergence was facilitated by information and education efforts coupled with new conditions that enable and encourage voluntary conservation. It appears to be neither the exclusive by-product of adherence to externally enforced rules nor a remnant of traditional conservation that may have existed before contact with Westerners.

The Role of the Management Plan

Having concluded, based on available evidence, that existing conservation in the Yukon-Kuskokwim Delta for the most part has recent origins, the next salient question to address concerns why conservation has been able to emerge, or re-emerge, lately. The general answer might be that the Management Plan and the role of the Service in implementing it in the Delta have encouraged and to some extent required adherence to waterfowl hunting regulations. However, the fact that many younger Yup'ik hunters have gone from merely following the rules to supporting and voluntarily practicing conservation for the sake of future abundance deserves serious attention. Environmental and conservation policies on larger-than-local scales rarely achieve adherence through means other than active enforcement, provision of tangible incentives, or, on occasion in more traditional societies, social ostracism and sanctions for transgressors. Yet in this case it appears that Service efforts have succeeded in generating a partially self-enforced and perhaps even self-perpetuating culture of conservation among some Yup'ik hunters. Of six wildlife officials, both Yup'ik and non-Yup'ik, interviewed as part of this study in the Delta, none felt that hunting practices would revert to pre-contact patterns such as bird drives and large egg harvests even if enforcement efforts were ceased entirely. One Yup'ik Service officer responded that Yupiit would probably adopt some conservation measures "as tradition," as long as the Management Plan continued to serve as a source of information and communication among the different parts of the Flyway. His observation that conditions created by the Management Plan were conducive to maintaining conservation can be explained in the specific theory proposed by conservation anthropologists: the success of the Management Plan in fostering partially self-sustaining conservation reflects, in part, that the policy and its implementation provided necessary preconditions to voluntary conservation that previously were absent.

Hames argues that conservation requires (1) a social mechanism that maintains adherence within the practicing community or region; and (2) a social mechanism (such as territoriality) to prevent outsiders from cheating and taking the endangered game (1991, pp. 188–89) (Table III). In other words, he argues, there must be some form of internal (within the Delta) regulation and some sort of assurance that outsiders will not foil internal attempts to conserve the resource in question. The reasoning behind these requirements is that in their absence, one hunter's attempt to conserve is vulnerable to being undone by another hunter somewhere else, and a hunter with the power of decision will not decide to forego prey when no guarantee exists that his sacrifice will amount to any later reward. Brightman concurs that conservation requires "an organization of land tenure such that prac-

Table III. Minimum Preconditions for the Voluntary Adoption of Conservation

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1. (a) A social mechanism that maintains adherence within the practicing community or region
 (b) A social mechanism (such as territoriality) to prevent outsiders from cheating and taking the endangered resource (Hames, 1991; Brightman, 1987)
 2. (a) The perception by hunters that they can influence the availability of game
 (b) The ability of hunters to observe directly that their conservation efforts result in increased game availability during subsequent harvest periods (Brightman, 1987)
 3. Vested interest in the continued availability of the scarce resource
 4. The availability of sufficient overall resources to meet basic needs (Redford, 1990; Brightman, 1987)
-

tioners realize the benefits of selective predation" (1987, p. 130). Once again, he suggests that practitioners must be able to monitor all use of the resource they wish to conserve; otherwise, they would be unwise to forego the cost of conserving because its returns might go to someone else.

Territoriality alone will not remedy the problem of control over external hunters in the case of a highly migratory source such as Pacific Flyway geese. Prior to the mid-1980s, little communication existed between hunters in the continental Flyway states and the Yukon-Kuskokwim Delta. Each group knew of the other, but each followed a separate regulatory regime. Yup'ik hunters received no knowledge of the regime governing hunters in the continental states. In fact, a given village had no assurance that, even within the Delta itself, the actions of other hunters would support local conservation efforts. Until the mid-1980s, therefore, Hames's and Brightman's first preconditions for voluntary conservation were not met in the Delta.

The discussions that began in 1983 in Hooper Bay between continental sport hunters and Yup'ik subsistence hunters allowed the latter group to conclude that other hunters of the endangered geese were willing to cooperate with a plan to prevent cheating and promote more fair, evenly distributed conservation efforts throughout the Flyway. Yup'ik hunters can exert some control over sport hunters through their participation in annual revisions of Flyway-wide regulations and implementation plans. For example, Yup'ik representatives at a Management Plan meeting have the power to push for stiffer regulation of sport hunters in a given year if goose population data support the need for it (C. Simeon, personal communication, 1995). Yup'ik hunters can also monitor adherence of external hunters to these mechanisms by inspecting the annual harvest numbers from the continental states, which the Service now makes readily available.

The fairness with which conservation efforts and demands are distributed along the Flyway remains of paramount concern to subsistence hunters in Scammon Bay. The majority of hunters participating in this study made

negative comments about sport hunters in the continental states and specifically expressed concern that sport hunters might have higher bag limits, yet they had less reason to be hunting geese at all. Without the reassurance and knowledge that sport hunters of geese have to follow fully enforced rules similar to those in the Delta, it is clear that many fewer Yup'it would choose to practice conservation or even to follow the rules. The Management Plan, by implementing Flyway-wide regulatory schemes, ensuring that sport hunters and Yup'ik subsistence hunters communicate on at least an annual basis, and providing information to Delta hunters about harvests in the continental states, has in effect put the precondition of external regulation in place. In addition, the information about harvests and hunting on a village-by-village basis within the Delta now provided annually by the Service allows Yup'ik hunters throughout the Delta to monitor one another's adherence to conservation efforts. In this sense, the new policy has overcome the absence of internal enforcement mechanisms.

The second type of precondition to voluntary conservation that the Delta lacked prior to the Management Plan involves information about the effects of restraint practices. Brightman (1987) argues that hunters must be aware of their ability to influence the future availability of animals through their present harvesting practices. This awareness has two components: first, hunters must perceive that in a general sense, they can influence the availability of game; second, hunters must be able to observe directly that their restraint efforts bear fruit — that is, that restraint at some time (t) yield increased game at some later time ($t + 1$).

It is quite possible that until the declines of the mid-twentieth century, Yup'ik hunters had no need to practice waterfowl conservation. Lower impacts along the rest of the Flyway, coupled with less efficient harvesting technology and small human populations in the Delta, may have rendered the waterfowl resource functionally unlimited to Yup'ik hunters. Once a need for conservation did emerge, however, hunters may have lacked the specific kinds of information necessary to motivate conservation practice. Although traditional Yup'ik ideology about animals embodies the perception that hunters can influence game availability (Fienup-Riordan, 1990), this study confirms that some Yup'ik foragers, particularly the older men, do not acknowledge the power of local harvest practices to affect goose populations. The general understanding of hunters' roles in shaping game availability may not have been as prevalent before outside wildlife management influence as it is now. In addition, the highly mobile and fluctuating nature of goose populations (USFWS, 1996) may in the past have meant that there was no visible feedback from year to year about the influences of new hunting practices. The variability inherent in fixed-location observations of constantly shifting and mobile waterfowl populations may have

masked the effectiveness of changes in harvesting practices prior to the availability of information about annual goose populations. Indeed, although most of Scammon Bay's hunters said that they did perceive a drop in goose numbers over the years of decline, none were able to pinpoint particularly good or bad years.

Today, nearly everyone in Scammon Bay recognizes that goose declines occurred prior to the mid-1980s; however, only a minority recognize that hunters themselves can impact goose populations and are partly responsible for causing or halting the decline. The strong correlation (Spearman rank correlation coefficient, $r = 0.617$; $P < .005$) between understanding that hunters play such a role and actually practicing conservation among Scammon Bay hunters supports Brightman's argument that people must understand the biological causes of game population fluctuations if they are to voluntarily conserve. Much of this understanding, as well as the immediate feedback about conservation efforts provided by annual population count information, comes from the recently initiated program of supplying annual data to Delta villagers about harvests, populations, and the ways in which conservation efforts have allowed regulations to be relaxed over time. In particular, several hunters referred to an information-packed calendar provided annually to every Delta household and to curricular materials provided to Delta schools. In effect, the information and education programs of the Management Plan have provided Brightman's precondition of awareness to those hunters who have made use of the information provided each year.

A third type of precursor to the voluntary adoption of conservation practices is vested interest in, or at least genuine concern for, the continued availability of the scarce resource. In addition to the "older" (> 49 years) and "younger" (18–49 years) groups of hunters in Scammon Bay is a third group of hunters — teenagers, who could not for the most part be interviewed formally and individually but who were present at group and family interviews and with whom I interacted informally. As a group, these youngest hunters expressed and demonstrated that they do not follow Management Plan guidelines and regulations and that they do not practice restraint when hunting. Clearly, the pattern of conservation in Scammon Bay is not one of monotonically increasing concern for conservation with decreasing age; and the reasons for hunters in the 18–49 age group embracing conservation must extend beyond simple receptivity to outside ideas. Although other reasons for the rejection by adolescent hunters of conservation may exist, what appear most prominent are general, rebellious attitudes, and declining concern about whether or not prey are available in future decades. The process of changing attitudes toward prey and hunting practices in the Delta is embedded within a much larger process of cultural

change towards Western lifestyles. Increasingly, young Yupiit speak only English, adopt Western attitudes, dress, and ambitions, and specifically plan to leave the Delta for college or for life. Some say they do not want to pursue the subsistence lifestyle of their parents; others simply say that it will no longer be necessary in their adult lives as cash income and imported goods become more easily obtainable. Although hunters in the 18–49 age range are substantially committed to making or supplementing their living through subsistence and hope to see their children follow suit, their adolescent relatives and neighbors expect or want subsistence to disappear from their lives; the latter have no vested interest in the future availability of waterfowl, and without it they have no reason to adopt conservation measures.

A final precursor to voluntary adoption of conservation, the availability of sufficient resources to allow foragers the “luxury” to conserve (Brightman, 1987; Redford, 1990), had already existed in the Delta prior to the Management Plan for the majority of hunters because cash incomes allowed the spread of efficient hunting equipment and imported food. With community-wide reciprocity fading and cash income sometimes inadequate to support large families, however, households without strong familial or social ties can face chronic shortages. For those hunters who do not have sufficient resources to afford decisions based on restraint rather than short-term food procurement, conservation is not an option. In Scammon Bay, at least one household appeared unable to consider foregoing any prey because it was barely able to meet its needs even by maximizing harvests. In areas without sufficient resource availability, therefore, cooperative management policies must, in addition to communication, information, and education, promote sustainable development that generates sufficient abundance among the users of endangered resources to enable them to choose to conserve.

CONCLUSIONS

The case of the Management Plan supports the concept that sustainable, cooperative wildlife commons conservation policies become possible when they systematically remove barriers to the voluntary adoption of conservation measures and implement the necessary preconditions for such conservation identified by ecological anthropology. This is not to say that policymakers can manipulatively engineer specific, voluntary outcomes; no policy can — or should strive to — generate a particular cultural response, but some policies can make certain kinds of responses possible that previously were most unlikely. The most active group of Yup'ik hunters in the Delta, those between the ages of 18 and 50, not only practice restraint

in support of the Management Plan's regulations but also choose to do so in the absence of effective enforcement. They do so in large part because they have the desire to maintain prey availability in the future, the assurance that all users of the wildlife commons adhere equally to restraints on harvests, the information necessary to see the effects of their actions on goose populations, and the basic resources that they need in order to be able to choose to forego certain prey in the short term.

In this article, I argue that the behavior and attitudes of the hunters of Scammon Bay fulfill a rigorous definition of conservation, and that their emerging culture of conservation reflects the presence of key conditions as well as the specific suggestions, guidelines, regulations, and influences that inform how conservation in the Delta is taking shape. These hunters have begun to teach their newly acquired views and practices to their children, perhaps initiating a self-perpetuating cycle of cultural transmission and cementing the presence of new conservation in Yup'ik hunting culture. The youth of the Delta, however, are a group with increasingly heterogeneous goals. It remains to be seen whether many of them choose to adopt a subsistence lifestyle accompanied by new concepts of conservation rather than to pursue paid employment and independence of their traditional prey.

This case study provides an opportunity to view the emergence of conservation as it can occur in a foraging society subject to outside influences and changing conditions. Moreover, it demonstrates how effective commons management schemes can interact with resource users on a cultural level, creating over time a partially self-perpetuating system of attitudes and practices that promote sustainable resource use. Many resource management policies today do not include a goal of instilling self-sustaining systems of sound resource management over time so that costly enforcement measures can be scaled back. This study should provide an example for future resource management efforts of the ability of cultural institutions to respond dynamically to changing conditions and of the willingness of indigenous resource users to choose to conserve when they encounter the conditions necessary for that choice to make sense.

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