

## Common Pool Resources, Buffer Zones, and Jointly Owned Territories: Hunter-Gatherer Land and Resource Tenure in Fort Irwin, Southeastern California

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*Anthropologists have described, but seldom explained, the existence and persistence of common pool resource systems among hunting and gathering populations. Land tenure practices in the Fort Irwin area of the Mojave desert, California are explored. Ecological, ethnographic, archeological, and ethnohistoric information suggests that this area was jointly owned and intermittently used by several distinct ethnic groups. Although the region was important as a buffer against resource shortfall during certain seasons, sporadic use and meager and variable resource yield may have made exclusive ownership difficult and costly. A jointly managed region with common pool resources better served surrounding groups, while simultaneously creating a spatial buffer to diffuse social tensions. Following presentation of the Fort Irwin case, the paper considers the formation of such land tenure practices among hunting and gathering populations.*

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**KEY WORDS:** common pool resources; territoriality; hunter-gatherer; Mojave desert.

### INTRODUCTION

A long history of ethnographic research has shown that hunter-gatherers practice a wide variety of land and property ownership strategies. Not only are there differences between hunter-gatherer groups, but practices may vary within a group from region to region, season to season, and even

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resource to resource (Dyson-Hudson & Smith, 1978; Kelly, 1996; Smith, 1988; Thomas, 1981). Scholars generally recognize a continuum of property rights, ranging from exclusive individual ownership of land and resources (i.e., private) to open range and unowned resources, with jointly owned commons and common pool resources lying between these extremes (Berkes, *et al.*, 1998; Bromley & Cernea, 1989; Hayden, 1981; Ostrom, 1990; Smith, 1988; Wade, 1987). I focus on this latter category.

Ostrom (1990, p. 30) defines a common-pool resource (CPR) as “a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use.” CPRs are finite in size but may be renewable, and resources appropriated or used are no longer available to others; that is, appropriation must detract from the overall value of the resource pool. Because exclusion is difficult, resources within CPR systems are often owned and used by multiple people. CPRs can be held at various social scales, ranging from partnerships between individuals or families to land and resources held in common by nation-states.

This paper examines inter-tribal CPR systems, that is, land and resources jointly used by distinct ethnic and/or linguistic groups. This type of land tenure is distinct from reciprocal access arrangements (Smith, 1988) that have been the topic of several discussions of hunter-gatherer land use patterns (e.g., Barnard, 1986; Cashdan, 1983; Dyson-Hudson & Smith, 1978; Ichikawa, 1986; Lee, 1972; Myers, 1982; Peterson, 1979; Silberbauer, 1981; Williams, 1982). Within reciprocal systems, groups exclusively own well-defined territories, but with permission allow others to harvest resources on their land, with the understanding that reciprocal access will be granted in the future. Although it is almost always granted, asking permission is integral to these systems, for it allows owners to keep track of which resources have been harvested where and by whom. On the other hand, within inter-tribal CPR systems groups may harvest resources without gaining prior permission or making any type of repayment, though they must follow mutually agreed upon rules (by all joint users) of the system. Both systems serve to efficiently monitor, manage, and map groups of people onto available resources, although in different manners and under different circumstances.

Beyond describing them, hunter-gatherer studies have had little to say about why CPR systems might develop (however, see Smith, 1988, p. 246, and Steffian, 1991). Research in economics and anthropology among pastoral, agricultural, and industrial societies has provided a broader theoretical base on which to understand this type of land ownership and use (e.g., Berkes, 1989; Berkes *et al.*, 1998; Low & Heinen, 1993; Ostrom, 1990; Ostrom *et al.*, 1994). Two types of CPR systems are often contrasted,

those in which resources are actively managed, or more like true commons systems, versus those that are unmanaged, or more like open range systems. Each strategy is best suited to particular social and ecological conditions, and should be favored under different circumstances.

In what follows, these ideas are applied to the Fort Irwin region of southeastern California, which appears to have been jointly owned but relatively unmanaged by multiple ethnic groups under a CPR system. Ethnographic, archeological, ethnohistoric, and ecological data are presented to support this position, with the goal of broadening our understanding of land tenure systems used by North American hunter-gatherers. Following this, discussion centers on how intertribal CPR systems might develop and be maintained in spite of the importance of such land and resources to the subsistence pursuits of individual groups.

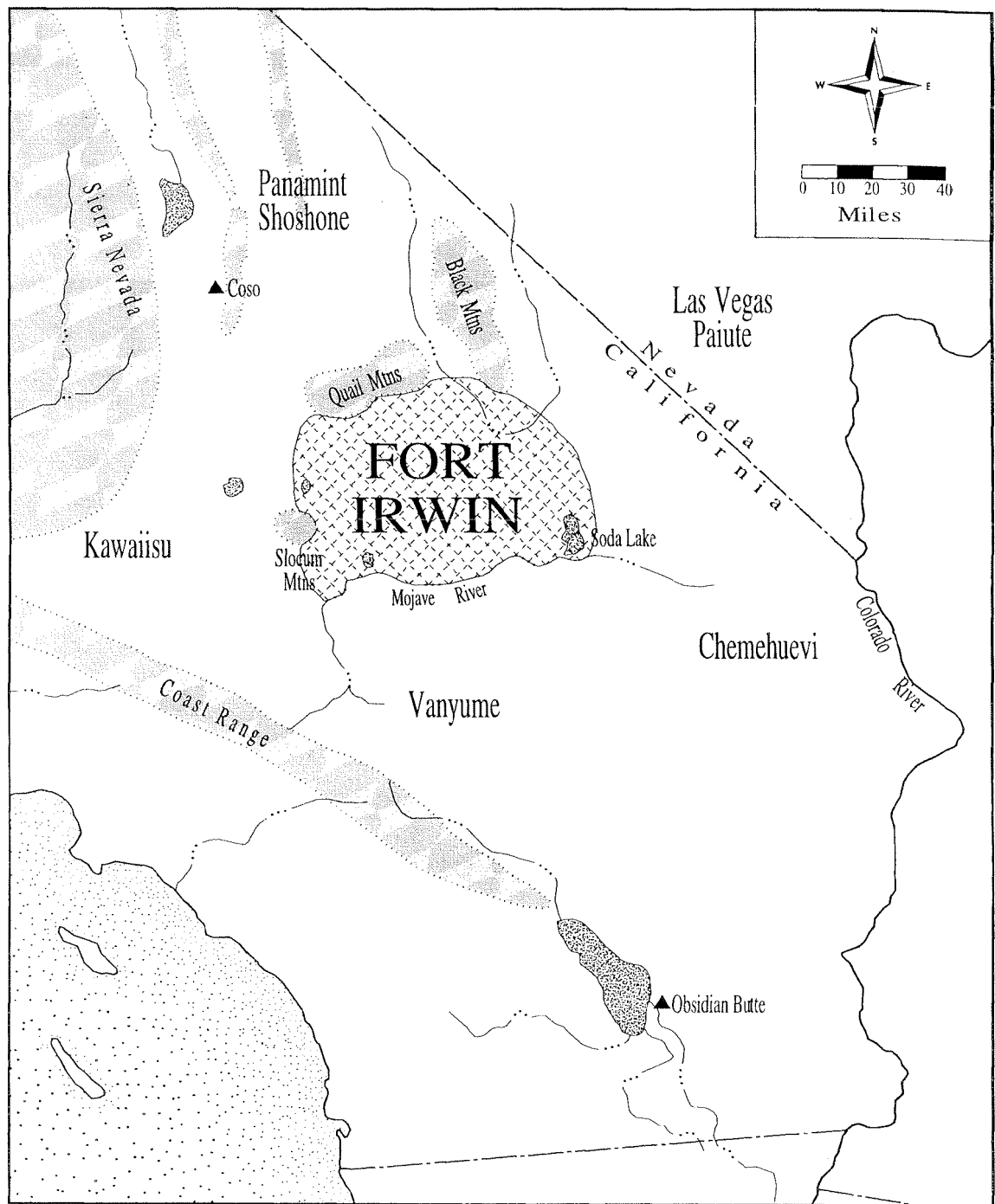
## FORT IRWIN, SOUTHEASTERN CALIFORNIA

### Environment of Fort Irwin

Although Fort Irwin is more properly a modern military base that prehistoric Native Americans had no connection to, "Fort Irwin" is defined here as that region of the Mojave desert stretching from approximately Slocum Mountain in the west to Soda Lake in the east, and the Quail Mountains in the north to the Mojave river in the south (Fig. 1). This area, approximately  $150 \times 100$  kilometers, is centered roughly on the boundaries of modern Fort Irwin, and has been the focus of much archeological investigation. As used here, Fort Irwin (or the Fort Irwin region or area), is simply convenient nomenclature for the geographic area under investigation, and should not be interpreted as strictly following boundaries of the military base.

Geographically, the area is a desert and consists of low lying mountains, most less than 1500 meters (a.s.l.), separating dry lake basins at elevations between 500 and 800 meters. Precipitation is winter-dominant and averages between 5 and 10 cm per year, with high interannual variability. In some years enough water falls to temporarily fill basin lakes, whereas, in others there is no measurable precipitation. Only three major springs and no perennial rivers exist within the area. Temperatures are also extreme. Daily summer maximums typically exceed  $40^{\circ}\text{C}$ , and temperatures of  $50^{\circ}\text{C}$  are not uncommon; daily minimums during winter are often below freezing.

Few plants thrive under these extreme conditions. Creosote (*Larrea divaricata*) and white bursage (*Ambrosia dumosa*) dominate much of the landscape, particularly areas below 1000 m, while Joshua tree (*Yucca brevi-*



**Fig. 1.** Map of the study area, showing Fort Irwin, places mentioned in the text, and traditional home ranges for surrounding Native groups.

*folia*) and blackbush (*Coleogyne ramosissima*) are found in higher elevations. Other plants occurring in localized patches are occasionally associated with these species including various grasses, cacti, and other small shrubs. Garlic Spring, Bitter Spring, and No Name Spring, the major permanent sources of water in the area, support stands of mesquite (*Prosopis* sp.),

willow (*Salix* sp.), and cottonwood (*Populus fremontii*), and stand out against the normal background of vegetation. Likewise, animals are scarce, but include deer, mountain sheep, coyote, rabbit, tortoise, chuckwalla, as well as various rodent, reptile, and migratory bird species. Upland locations support slightly higher densities of fauna, including economically important larger species such as deer and mountain sheep, whereas lowland locations are more sparse, but still offer opportunities to hunt and gather smaller game such as rabbit, tortoise, and small rodents.

### The Problem in Fort Irwin

Ethnographic research among Native Californian groups has been patchy in both spatial coverage and detail. The majority of academic work was undertaken during the early 1900s, after native lifeways were significantly altered through direct (e.g., missionization and sedentarization) and indirect (e.g., disease and disruption of trade patterns) influences of European immigrants (Heizer, 1978; see also Preston, 1996). Indeed, much research was based on salvage and memory ethnography, where tribal elders were asked to inform anthropologists about how it was in the old days before the arrival of whites. Work was focused in areas where Europeans were interacting with native people. Less is known of regions more sparsely populated and infrequently visited by early settlers, such as the Mojave desert. As a result, the reconstruction of aboriginal patterns in these latter areas has relied on other sources of information, such as archeology, analogy with similar groups, and theoretical arguments, rather than first-hand ethnographic data.

Different ethnographers have attributed Fort Irwin to a minimum of four different Native American groups: the Kawaiisu, Chemehuevi, Las Vegas Paiute, and Vanyume. For example, while Julian Steward (1937, Fig. 1; 1938, p. 76) ascribes the area to the Kawaiisu, and Zigmund (1938, 1981) includes it within their range of seasonal trips, Kroeber (1925, p. 593) believes the region to be a westward extension of Chemehuevi territory, and Kelly (1934) locates the Las Vegas Paiute on the eastern side, with logistical hunting in and south of the study area. Other information indicates that the Vanyume may have owned and used the area, although little is known of this group (Bean & Smith, 1978; Euler, 1966, p. 105). The proximity and high residential mobility of Shoshone groups living in Panamint and Death valleys (Bettinger, 1982; Coville, 1892; Steward, 1938) makes it possible that they, too, made use of the area.

Anthropologists have spent some time discounting one another as to which group owned the area, each partial to the claims made by the group

he or she studied. Why the disagreement? Did a single group exclusively own and use the region? Or is the disagreement somehow a reflection of actual land tenure practices? Below, I draw evidence from several sources to make the case for the latter.

### **Ethnographic Patterns**

Unfortunately, ethnographic work was not carried out directly in Fort Irwin. By the time ethnologists were making their surveys of Californian groups in the late 1800s to mid-1900s, people were no longer using the area other than as a conduit for trade. The majority of ethnographic references to this area include statements to the effect that people remember having visited it on occasion for various trading, hunting, and gathering activities.

Although differences exist between the groups purported to have occupied Fort Irwin, they are similar in many aspects of settlement and subsistence that are relative to the discussion below (Kroeber, 1925; Steward, 1938). Groups appear to have maintained a flexible settlement pattern, following food resources as they became available in different locations. Gathering information about the state and harvest potential of resources was integral to this system. Information could be gathered directly through monitoring rainfall and plant growth, or indirectly through communication with other groups (Bettinger, 1982; Steward, 1938; Thomas, 1972, 1981). Owing to the sparse and variable nature of food resources, people maintained relatively low population densities (Eggan, 1980, p. 177; Euler, 1966, p. 51; Kroeber, 1925; Zigmond, 1938, p. 638). Exact figures are difficult to determine due to Euroamerican disruption (i.e., disease and displacement), high mobility, flexible social boundaries, and inaccurate census data (King & Casebier, 1981, p. 195; Preston, 1996). However, as a rough gauge for two groups that may have used the area, Steward (1938) estimated Las Vegas Valley densities at .04 and Death Valley at .03 people per square mile.

A generalized seasonal round for groups such as the Kawaiisu, Southern Paiute (Las Vegas and Chemehuevi groups), and Western Shoshone (Panamint and Death Valley groups) includes a late fall/winter aggregation, followed by a spring/summer dispersal. People were highly mobile and movements of over 80 kilometers per year were not uncommon (Steward, 1938). In general, people would begin the year (January) in aggregated winter villages, usually in upland areas, eating stored resources. Villages would break up when food stores were low, during late spring in good years and early spring in poor ones. At this point nuclear families would disperse and begin a cycle of successive short-term occupations at temporary camps (Bettinger, 1982). Subsistence activities would have focused on low-

bulk and patchy resources, such as greens, grass seeds, insects, and small game (Thomas *et al.*, 1986). Springtime settlement would typically focus on warmer low elevation areas, where plants would bloom and ripen first. In summer, as various seeds, berries, and roots would ripen, first on the valley floor and then into upland areas, groups would follow the availability of resources into higher elevations. Fall was typically a time of plenty as bulk staple resources such as piñon, acorn, and mesquite became harvestable. There was much travel between valley lowlands, where communal hunting of rabbit and antelope would take place, and uplands, where gathering activities were focused, and between different villages, which would hold their annual *fandangos* or feasts (Kelly & Fowler, 1986). Following these events in the late autumn, extended families would reconvene at villages to begin preparation for the winter, including construction of lodges and caching and storing of overwintering food resources.

## RECONSTRUCTING A PROTOHISTORIC COMMONS

Ecological, anthropological, archeological, and ethnohistoric information support the notion that Fort Irwin was exploited under a CPR system. In turn, such land tenure helps to explain the conflicting accounts of land ownership described ethnographically. This information can be subsumed into three main topics: seasonality studies, the distribution of artifacts, and comparison with land tenure strategies in other parts of the Great Basin.

### Seasonality

Several congruent lines of evidence suggest Fort Irwin was occupied primarily during spring and may have been devoid of people at other seasons. First, the majority of plants known to be economically important to the Kawaiisu (Zigmond, 1981) and Panamint Shoshone (Coville, 1892), *and* native to the area, grow and seed during a narrow window in spring and early summer. Thus, economically useful plants were available for harvest precisely when groups were fissioning following the breakup of winter camps. Given the low elevation and warmer temperatures of Fort Irwin, these plants ripen slightly earlier than in surrounding areas. As a result, the area may have been particularly attractive in years when winter stores ran out early and fresh early-ripening greens and seeds were needed.

Second, seasonality data from late prehistoric archeological sites (i.e., post 650 B.P.) are comprised of items available mainly in spring and early summer. This evidence includes faunal remains such as migratory birds,

chuckwalla, and tortoise (Basgall, 1991, p. 438; Basgall *et al.*, 1988, F7; Rector *et al.*, 1983, p. 134; Warren, 1991), and plant macrofossils identified in flotation studies, such as indian ricegrass, boxthorn, blazing star, tansy mustard, and wild heliotrope (Basgall, 1991, p. 439–441; Basgall *et al.*, 1988, G2; McGuire & Hall, 1988, G2). These are species that Kawaiisu and Panamint Shoshone informants consistently cited as important food resources (Zigmond, 1981; Coville, 1892). Although absence of indicators from other seasons does not preclude use of the region during those times, seasonality data are consistent with springtime occupation.

Third, late prehistoric sites in the area appear to exclusively represent short-term occupations by small groups (Basgall, 1991; Basgall *et al.*, 1988; McGuire & Hall, 1988; Jenkins, 1986), especially when compared with known winter village locations in other areas. Despite extensive work, no features or structures indicative of longer term occupation, such as house floors or dwellings, have been recorded or excavated, and no sites have been interpreted as fall or winter villages.

Finally, ethnohistoric documents examined by Robert Euler (1966, pp. 72–74) indicate that contacts with Native Americans by nineteenth-century Euroamericans moving through the region were limited to spring and were with small groups or lone individuals. Although the number of documents is few and the distribution of seasons when these travelers were in the vicinity is unknown (i.e., it is likely that fewer traveled through the region during summer, thereby diminishing the potential for contacts with native people during this season), this observation supports the notion that the area was only occupied during spring. Unfortunately tribal affiliation was not recorded.

In sum, although it is possible that permanent groups lived in the area, they are not known, they have not been described ethnographically, archeologists have not been able to document their existence, and they were not reported by early travelers. From the evidence at hand, it appears that the region was occupied mainly during spring and was something of a no-man's-land during late summer through winter.

### Distribution of Artifacts

The distribution and sources of several classes of artifacts suggests that people using the area came from several directions. For example, archeological research has generated a large collection of ceramic artifacts with multiple traditions represented, some in Southwestern styles, some in lower Colorado River styles, and others in Great Basin styles (Gilreath, *et al.*, 1987; Jenkins, 1986; Lyneis, 1988). Ceramics may have been made locally



or carried in from the outside, but the different styles likely reflect people with distinct traditions making use of and moving through the region. Systematic sourcing of pot shards and clays would go far in addressing this topic, but such studies have not been undertaken in the area (see, however, Eerkens *et al.*, 1998, n.d.).

Other artifact categories, such as obsidian and shell, suggest a similar pattern. For example, obsidian artifacts with small hydration rinds (suggesting late prehistoric occupation) have been sourced to at least five known and several additional unknown sources (Gilreath *et al.*, 1987). Of those with rinds less than 4.0 microns, approximately half are derived from the Coso locality, over 100 km to the northwest. Other specimens come from sources within Fort Irwin (Goldstone), from the north (Mt. Hicks), and from the southwest (Obsidian Butte, California). Similarly, shell artifacts have been found representing species that inhabit both the Pacific Ocean and the Gulf of California (Gilreath *et al.*, 1987; McGuire & Hall, 1988). Although these items are commonly interpreted as evidence of trade (Hughes, 1994; Hughes & Bennyhoff, 1986), they may also be interpreted as items procured and deposited by those who moved through the area. Thus, obsidian and shell artifacts from western, northern, and southern sources may represent use of Fort Irwin by groups that came from and lived in those directions.

Unfortunately, the nature of archeological data does not allow us to confidently state that the area was used simultaneously or within a relatively short period by peoples coming from these different directions, a position necessary to label the resources as common pool and the land as jointly owned. Dates for late prehistoric pottery styles, obsidian artifacts, and shell beads span the last 1400 years, with most dating to the last 500 years (Gilreath *et al.*, 1987). Although 500 years is relatively short in archeological terms, it is a large block of time in ethnographic terms. It is possible that land ownership shifted between groups with each depositing their sources and styles of pottery, obsidian, and shell, during a period their group owned and used Fort Irwin. In sum, the area appears as would be expected under a CPR system, though proving this conclusively from archaeological evidence alone is difficult.

### Joint-Use Land Tenure

Unfortunately, ethnographic work was not carried out in the Fort Irwin area. However, work with groups nearby shows that joint ownership of land was not uncommon (e.g., Euler, 1966, p. 108; Kelly, 1934, p. 555; Kelly & Fowler, 1986; Manners, 1974, p. 196; Palmer, 1933, p. 91; Steward,

1938). For example, the Black Mountains just north of Fort Irwin were held jointly by the Death Valley Shoshone and Las Vegas Paiute and were useful "as a source of mountain sheep and certain edible seeds" (Kelly, 1934, p. 555). Kelly and Fowler (1986, Fig. 1) also indicate that Las Vegas Paiute hunted deer within and south of Fort Irwin, and shared land on their eastern border. Similarly, Zigmond (1938, p. 635; 1986, p. 400) records that small groups of Kawaiisu went east into the desert as far as Fort Irwin to collect plant and animal resources. His informants often had a striking familiarity with Mojave desert plants, which do not grow in the Kawaiisu core area in the Southern Sierra Nevada (Zigmond, 1981).

In none of these cases did ethnographers suggest that informants had to seek permission from the owners of Fort Irwin to procure resources. Yet, permission-seeking was commonly observed among Great Basin groups when gathering outside their home territory (Downs, 1966; Kelly, 1934; Palmer, 1929, p. 35; Steward, 1938, p. 183). Thus, use of Fort Irwin seems to have been on an as-needed basis without requiring permission, perhaps when resources within the home territory were in short supply. In this manner, Fort Irwin may have seen most intensive occupation during difficult years when winter food stores ran out early and could not support the entire population.

In short, sporadic use of the region by small and ethnically diverse groups as they dispersed from their winter villages in spring best accounts for the ethnographic, ethnohistoric, and archaeological information. Multi-ethnic use may help explain why different ethnographers attributed the area to different people. That is, informants from different groups may have indicated that Fort Irwin was within their territorial boundaries because, at some point, *each had* used the area in question. Indeed, as commonly held land that could be used without permission, in some sense it *did* belong to each group. Early anthropologists may have projected their own notions of land tenure, where all land had to be accounted for and owned by a single group, onto native patterns. Thus, when a group claimed that they made use of an area, anthropologists may have equated this with exclusive ownership.

## DISCUSSION

How and why do CPR systems develop among small scale societies? This question is particularly interesting from the point of view of sharing. Anthropological studies of sharing often focus on within-group behavior, with less attention on between-group practices. At this social scale, encompassing large webs of unrelated individuals, explanations must move beyond

kin or genetic-based (i.e., inclusive fitness) arguments, a topic not explored here. Theories on why joint land use areas develop and persist among more traditional societies can be divided into three main, although not necessarily mutually exclusive, types of arguments: defendability or cost-benefit, environmental risk buffering, and social conflict buffering.

The first suggests that CPR systems develop because areas are not worth claiming and defending as private by any one group. Such systems develop especially in areas containing extremely sparse and variable resources (Smith, 1988) or when extraction technology is inefficient (Low, 1996; Low & Heinen, 1993; Ostrom *et al.*, 1994). People generally have two mechanisms for defending a territory—perimeter defense and social boundary defense (Cashdan, 1983). Perimeter defense includes actively patrolling territory boundaries with the ability to level sanctions (especially physical harm) against intruders. Social boundary defense includes controlling access to the social group, such as withholding information that would increase foraging efficiency, refusal to engage in exchange relations, or cutting off access to potential mating partners to groups discovered intruding upon the territory. The need or desire for these social privileges may prevent outsiders from intruding and/or taking resources without permission. When these defense systems cannot provide and maintain exclusive access to resources, users may favor a CPR system. For example, meager distributions of resources may spread populations so thin over the landscape that active perimeter defense to detect unauthorized intrusion is too costly. In fact, densities of resources may be so low or variable that the region is unable to support a viable reproducing population (Wobst, 1974). For example, Myers (1982, p. 190) reports that groups occasionally abandon tracts of land in the deserts of Australia. Open lands are also reported in the Kalahari (Cashdan, 1983, p. 53) and the Great Basin (Kelly, 1934, p. 553; Palmer, 1933, p. 91) and may have been abandoned for lack of resources. Under such conditions, a managed and jointly owned CPR system may provide greater benefits to all than an attempt by any single group to secure private and exclusive ownership.

The second argument emphasizes the importance of CPRs in buffering environmental risk. For example, although a particular region may have an average yield able to support 100 people, high variability may force a group of 100 to include a larger and more diverse territory. Certain areas may not be needed every year, but occasional access may be necessary. If territories and resources can be pooled and jointly owned, groups have unimpeded access to a larger and more diverse range. Coordinating harvesting activities from a pooled territory is effective in mapping groups onto the landscape and prevents overlap between foraging groups. Similarly, pooling information and past experience about the behavior, location, and

quality of resource patches helps people to more efficiently harvest resources. Additionally, a larger pool of individuals can monitor the region, protecting it against intrusion and/or illegal harvest. Management of CPRs safeguards against overexploitation (i.e., preventing a "tragedy of the commons," see Hardin, 1968) and prevents multiple groups from harvesting the same limited resource base. Jointly owned grazing lands are often found among pastoralist societies, particularly those living in more marginal regions (e.g., Fratkin, 1994; Gilles & Jamtgaard, 1982; McCabe, 1990; Mearns, 1993; Ostrom, 1990). Because private ownership is expensive and impedes access to a diversity of pasture types, communal ownership and CPR systems are preferred.

The third argument suggests that joint-use lands serve as social buffers between groups. For example, although two adjoining groups may enjoy exclusive access to their respective core areas, space between the groups may serve as a buffer against social friction. Such no-man's-lands have been described by several ethnographers among North American foragers (e.g., Downs, 1966; Hickerson, 1962) and band and tribal societies elsewhere (e.g., Heinz, 1972; Chagnon, 1968, 1996). Chagnon (1996) has argued that buffer zones may develop depending on social relations and relative military power between groups. If social relations deteriorate or if villages grow in size and power, surrounding villages may elect to keep open space between themselves and this village to minimize interaction and/or chance of attack. Open areas also give villages a place to flee when attacked. Steffian (1991) has argued that maintaining such buffer zones also provides secondary ecological benefits, as these areas preserve a supply of game that helps to restock nearby hunting territories. For these reasons, jointly owned lands with CPRs may be actively and consciously maintained devoid of permanent populations.

### **Fort Irwin Resolved**

Why did such a system of land tenure develop in the Fort Irwin area? Given the fact that the area was consistently used, as is clear by the density of archeological sites, why did no group claim the region outright as its own? This is especially interesting with regard to the arguments made by Cashdan (1983), who suggested that social boundary defense provided no upper limit on territory size. To differing degrees, all three positions discussed above are important in answering this question, the sum of which made the region more valuable and manageable under a jointly-owned CPR system than a privately owned area.

First, the Mojave environment is harsh. Although it may be possible

for individuals to live in the region year round and claim it outright (i.e., water is available in certain areas, and food can be stored), over the long run the benefits may not have outweighed the costs. As in other arid regions, one of the main problems to surmount is temporal and spatial variability in the availability of food and water. Temporal variability is often overcome using systems such as flexibility in diet breadth and multi-year storage (Halstead & O'Shea, 1989; Jochim, 1981; Rowly-Conwy & Zvelebil, 1989). However, archeological and ethnographic data indicate that diet breadths were already extremely wide, encompassing nearly all available resources, and high mobility and simple technology made storage spanning multiple years unattainable. Thus, groups may not have been able to consistently and reliably resolve the problems associated with high temporal variability. Similarly, solutions to buffer spatial variability, such as expanding the foraging territory to cross more diverse environments or establishing reciprocal access to resources (Cashdan, 1983; Dyson-Hudson & Smith, 1978), may not have been possible. Surrounding lands appear to have been taken, precluding expansion of the foraging range, and Fort Irwin populations may not have had much to offer in exchange that could not have more easily been taken. Because population densities would have been low and sparsely distributed, patrolling the region would have been expensive and time consuming, and the risk of outsiders getting caught during unauthorized foraging, particularly short forays focused on seasonal resources, would have been low. Thus, outsiders may have been able to refuse reciprocal foraging access to Fort Irwin groups without losing the ability to hunt and gather within Fort Irwin (see Cashdan, 1983, p. 50; Smith, 1988, p. 250). This would have made it extremely difficult for Fort Irwin groups to survive periods of drought and reduced food availability. Moreover, given the marginality of the area it may have been difficult for individuals within Fort Irwin to attract mates from outside groups. Given low internal population numbers, Fort Irwin peoples may not have been able to maintain a viable and reproducing population (e.g., Wobst, 1974).

In addition, extreme summer temperatures in Fort Irwin makes outdoor work strenuous. One solution found among other Great Basin groups is to move into higher and cooler elevations. However, the Fort Irwin area does not encompass large mountains, which has the further effect of restricting ecological diversity. People may have been forced to seek refuge elsewhere, in territories belonging to other groups, leaving the area empty and the owners less informed about the status of resources within their territory. This result would have minimized the effectiveness of social boundary defense, because outsiders would have little incentive to seek access to the Fort Irwin social group and the limited information they would have possessed. For these reasons, Fort Irwin may not have been

worth claiming outright and guarding as private, that is, the benefits may not have outweighed the costs.

Second, spring was a time of dispersal and high mobility among Great Basin groups (Steward, 1938). Ranges expanded and larger territories were needed. As plants ripen earlier in Fort Irwin, groups may have been pulled into this region first, especially in years when outside stored resources failed to provide through winter and spring. In other words, the area may have been highly valued as an emergency buffer against resource shortfall and environmental risk. The value of Fort Irwin resources in such years would have been inflated (i.e., in the face of starvation) making exclusive ownership and territorial defense even more difficult. For this reason, Fort Irwin may have been valuable to outside groups by providing access to a different ecological niche. However, the frequency with which the area was needed may not have been high, making joint ownership under a CPR system most beneficial and efficient.

Finally, unoccupied, the region may have conveniently provided a social buffer between ethnic groups, reducing potential conflict and/or warfare. Although trade and exchange of information, goods, and marriage partners was still possible, the presence of a buffer zone would have minimized competition for resources between groups. This factor may have reinforced the advantages of joint ownership, and any group attempting to claim the region may have been forced out by the collective action of other groups who made use of the area.

In short, no group may have been able to exclusively own the Fort Irwin region, even using a system such as social boundary defense. The conditions given by Cashdan (1983; see also Smith, 1988, p. 250) that make social boundary defense practical, including that residents possess more information about local conditions than visitors and that trespassers are likely to be caught, were probably not met. Rather than try to claim Fort Irwin and make a living within it, it may have been more attractive for individuals or family groups to join surrounding tribes, where the environment was more favorable and stable populations existed. In sum, the area better served western Great Basin people as a jointly owned area with CPRs, where groups could forage unimpeded when their local environment failed to provide sufficient resources to make it through winter and spring.

### **Land Use Management**

Given that Fort Irwin was jointly owned and used, an important question remains; were the resources and appropriation activities managed like a commons or were they more akin to an open access system? Smith

(1981, 1988) has considered this question by investigating the evolutionary advantages of information sharing and managed foraging (see also Ostrom, 1990; Ostrom *et al.*, 1994). This work suggests that uncoordinated land use is not only inefficient, but can be life threatening if a group unknowingly enters a region already harvested by another group. For example, if the distance between water holes or food patches is far enough and others have depleted local resources, a group may die of dehydration or starvation before reaching an alternative area. The risk of this danger depends on the frequency of use by different groups and the regenerative capacity of the resources. If Fort Irwin were only occasionally exploited for plant resources by groups with ecologically uncorrelated home ranges, the risk of arriving too late (i.e., after other people) to a particular resource patch would be low. Under such conditions, management and information sharing may not have been necessary and an open access system of land tenure may have developed. Alternatively, with more frequent use, particularly resources slower to recuperate from exploitation, such as game (e.g., mountain sheep, deer, or rabbits), people may have opted for a managed system.

Many economists and environmental scientists have argued that true open access systems are unstable (e.g., Bromley & Cernea, 1989; Hardin, 1991; Runge, 1986; Wade, 1987). Without sanctions, there are no incentives for individuals to limit harvest quantities. Although all who use the region share the costs of overexploitation, individuals using the area gain all the benefits. As a result, open access CPRs are often overexploited and destroyed (see Hardin, 1968). Runge (1986) has suggested that what may appear to be open access often involves tacit cooperation by users and follows the rules inherent to managed systems. Thus, true open access systems are rare.

In light of these observations it seems likely that Fort Irwin was jointly owned and managed by nearby ethnic groups. Although the degree of co-management was probably low due to sporadic use, groups would have been aware of who was in the region, where exactly they had been, when they were there, and what they were procuring, and would have planned their own harvesting activities with this information in mind to prevent overlap. Whether coordination and management was through direct (i.e., verbal communication) or indirect (i.e., with symbols) means is unknown. However, work by Ostrom *et al.* (1994, p. 149) suggests that face-to-face discussion is far more effective in managing CPR resources than other modes of communication. It is likely that rules for appropriation were established mutually between users, although they were probably subject to change depending on local conditions, and that a system of graduated sanctions was in place to punish violators (see Ostrom, 1990, p. 90).

Other areas in the western Great Basin may also have been owned

and managed in this manner. For example, Singer (1984) found conflicting ethnographic reports as to which group owned the Chuckwalla Valley southeast of Fort Irwin, and concluded the area may have been neutral territory. Similarly, Steward (1938) stated that no permanent groups lived in Eureka Valley, 150 km north of Fort Irwin, where little permanent water may have made a CPR system more beneficial. Unfortunately, little archeological research has been carried out in the valley to test this hypothesis (Norwood *et al.*, 1980).

### **The Development of CPR Systems Among Hunters and Gatherers**

Under what circumstances would we expect to see a land use pattern as has been described for Fort Irwin? Based on an analysis of over a dozen enduring and self-governing CPR systems in quite different social and environmental settings, Ostrom (1990) found several cross-cutting similarities that she felt were important to the development of such systems. First, populations had been stable for a relatively long period of time. She felt this gave individuals time to develop a mutual trust that the rules for appropriation would be followed, and that individuals would gain a reasonable expectation that their children and grandchildren would inherit use rights. Stability reinforced conformance to the rules of the CPR system by promoting long-term self interests over the short-term benefits of over-exploitation. Subsequent experimental work (Ostrom *et al.*, 1994) has shown that communication and information gathering (i.e., monitoring) are critical to the stability of these systems. Monitoring allows individuals to gain valuable information about the state of resources for their own appropriation activities, and at the same time allows individuals to see that others are not breaking the rules, thereby increasing commitment and faith in the system. In short, stability in the home ranges of nearby groups must obtain for CPR systems to develop.

Second, norms defining proper behavior are clearly outlined and known by all, including clear definition of the region, and a reputation for honest dealings is highly valued. This necessitates at least occasional contact between joint appropriators, with systems tending towards open access requiring less frequent contact. Thus, joint appropriators must live within reasonable proximity and the region must not be so large as to hinder contact.

Third, appropriators of CPRs must have similar extraction technologies. Cases where technologies are significantly different, that is, where one group is able to harvest resources more efficiently or faster than another, can lead to differential value placed on resources. In turn,



groups more dependent on these resources may attempt to claim exclusive ownership, or more likely, may end up overharvesting (taking more than their share and violating the CPR rules) because they pay only a marginal share of the management costs, causing a collapse in the resource system (a tragedy of the commons). Ostrom also suggests that appropriators should have similar leadership and social organization structures. Groups with unequal structures may have difficulty entering into binding agreements over harvesting rules and may have alternative goals for extracting resources (i.e., to support different types of institutions). More organized groups may be able to influence decision making, and may be motivated to take more than their fair share, again causing destruction of the natural resource system.

Finally, the physical environment also plays a role. Ostrom found that CPR strategies tended to develop in uncertain, variable, and complex environments. Several additional conditions are offered here that should contribute to the development of a relatively open intertribal CPR system, as has been described for Fort Irwin. First, the region should have a low average yield of resources over a fairly large area, particularly relative to surrounding areas. Second, resources should be spatially variable within the region and surrounding areas, such that sharing and buffering are a necessary part of survival. Third, resources should also be temporally variable, enough so that permanent residence in the region is difficult. Finally, despite low overall yield, the region should offer different resources or resources at different times of the year than the surrounding area. Under such conditions, foragers would intermittently use the area to buffer resource shortfall, but use would not be too regular or predictable. That is, the region would be valuable to foragers, but only on an infrequent basis. The low relative yield within an area of higher density, the large patrolling area, and the ease of undetected intrusion would make exclusive claims on the area expensive. However, a CPR system with multiple users and monitors may make co-ownership and co-management worthwhile by guaranteeing continued access to the region, while at the same time providing expanded man-power for patrolling and information gathering activities. Once such a joint use area has been established tradition and the benefit of a social buffer may uphold, strengthen, and perpetuate its existence.

## CONCLUSIONS

Hunter-gatherers employ a diversity of land use practices. However, most research on land tenure and territoriality has focused on exclusive

ownership and reciprocal access types of systems, with little effort devoted to understanding commons and open access systems. Hopefully this paper will stimulate anthropologists and especially archeologists to begin investigating joint land use and CPR systems.

It is suggested that Fort Irwin was just such a place, where several nearby Native American groups used the area on a sporadic as-needed basis. The region is arid, hot, and unreliable. However, owing to its geographic location, it occasionally presented resources at times when other areas were lacking. For this reason, the region may have been valued as an emergency buffer to resource shortfall. Use would have been by small and mobile groups as they dispersed from their winter villages during early spring, particularly during years when stored foods did not last through spring. Groups likely coordinated their foraging schedules to avoid overlap with others. However, use was not frequent enough to make exclusive ownership worthwhile. A joint-use intertribal CPR system best accounts for the existing ethnographic, archeological, and ethnohistoric information. Of course, land use strategies change with social and environmental conditions, and the system described here need not have been in place throughout prehistory. People may have taken up more permanent residence and ownership under more favorable environmental conditions.

Finally, it is worth considering the implications of this study for future land ownership practices. In the past, the lack of an exclusive ownership system similar to Western notions of land tenure, and the mobility of some hunting and gathering groups, have been used as justification for European immigrants to lay claim to and take away tracts of land from indigenous people. Although no single group exclusively owned and used the Fort Irwin region, this does not mean groups had or have no claim to the land. That is, this research should not be used to deny land claims to native people in the area. Through collective use, all groups owned the area in question. In terms of modern ideas about land ownership, where one agency is usually responsible for exclusively using and managing a region, this research should pose interesting problems if the land is ever returned to Native groups.

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