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WATERSHED MANAGEMENT AND POLICY IN HAWAII: COMING FULL CIRCLE[1]

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ABSTRACT: Changes in watershed management and policy in Hawaii are an instructive case study on the evolution of resource management from a traditional vertically integrated system, to a segmented central government-based system, and now towards a community and watershed focus. The rise of European social and economic influences coupled with the precipitous decline in the Hawaiian population in the years following European contact led to the destruction of traditional management structures. Subsequently, the dominance of outside interests in Hawaii society and politics, culminating with the sugar industry, facilitated the unrestricted use and privatization of land and water resources. The post-World War II era ushered in fundamental changes in Hawaii society and politics including renewed appreciation of traditional management practices. Government policies, increased community interest in resource management, and a renaissance in Hawaiian culture have converged in recent years to facilitate the development of new management structures that draw on both traditional and contemporary management. These structures hold great promise for improving Hawaiian watershed management. Our observations suggest that other jurisdictions may find it productive to examine traditional management and policy structures and try to relate them to contemporary community-based resource management policies and activities.

(KEY TERMS: water resources; watershed management; water policy/regulation/decision making; water resources history; water resources planning.)

INTRODUCTION

Aldo Leopold, one of the pioneers in thinking about man's place in nature, observed in 1949 that "...there is as yet no ethic dealing with man's relationship to land and to the animals and plants which grow upon it. ... The land-relation is still strictly economic, entailing privileges but not obligations... Obligations have no meaning without conscience, and the problem we face is the extension of the social conscience from people to land" (Leopold, 1949:201, 209). These observations continue to hold true today. Many people, especially those in urban and suburban areas, are both physically and mentally detached from the land and water resources on which their lives depend. Streams that were formerly places to fish and play often go unnoticed except as places to dispose of household trash and yard wastes. In addition, both official and informal authority and responsibility are fragmented between government agencies, landowners, community groups, and interested individuals. These groups often have very different visions of how resources should be managed. Recently, there has been an increasing awareness of and interest in learning about the thousands of years of indigenous knowledge and experience held by native Hawaiians and the resource management systems based on this knowledge. These management systems may provide a valuable base of common values upon which to build appropriate watershed management strategies.

In this paper, we summarize how policies and practices related to water rights, land and water use, and resource management have changed over the past 200 years in Hawaii. We will discuss the major factors underlying and facilitating these changes. We will then discuss how the rediscovery of traditional management systems and ideas, coupled with shifts in public policy at both the national and state levels, is bringing Hawaii watershed management full circle. The paper will conclude with a brief exploration of some of the implications of these changes for current and future management activities both in Hawaii and elsewhere.

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PHYSIOGRAPHY AND WATER REGIMES OF THE HAWAIIAN ISLANDS

The Hawaiian archipelago (Figure 1a) consists of 132 islands, islets, cays, and reefs extending for 2,574 km from northwest to southeast in the Pacific Ocean between about 19 and 22°N latitude (Figure 1). The eight major islands have a total land area of approximately 17,000 square kilometers (Juvik and Juvik, 1998). The climate is subtropical with temperatures ranging from below freezing on the tops of the higher volcanoes to 36°C at sea level on the leeward (south and west) coasts. The dominant rainfall pattern is established by the trade winds that release their moisture as they reach the steep volcanic mountains. As a result, the greatest rainfall occurs on the windward (east and north) sides of the islands. The winds become warmer and drier and rainfall lessens as one

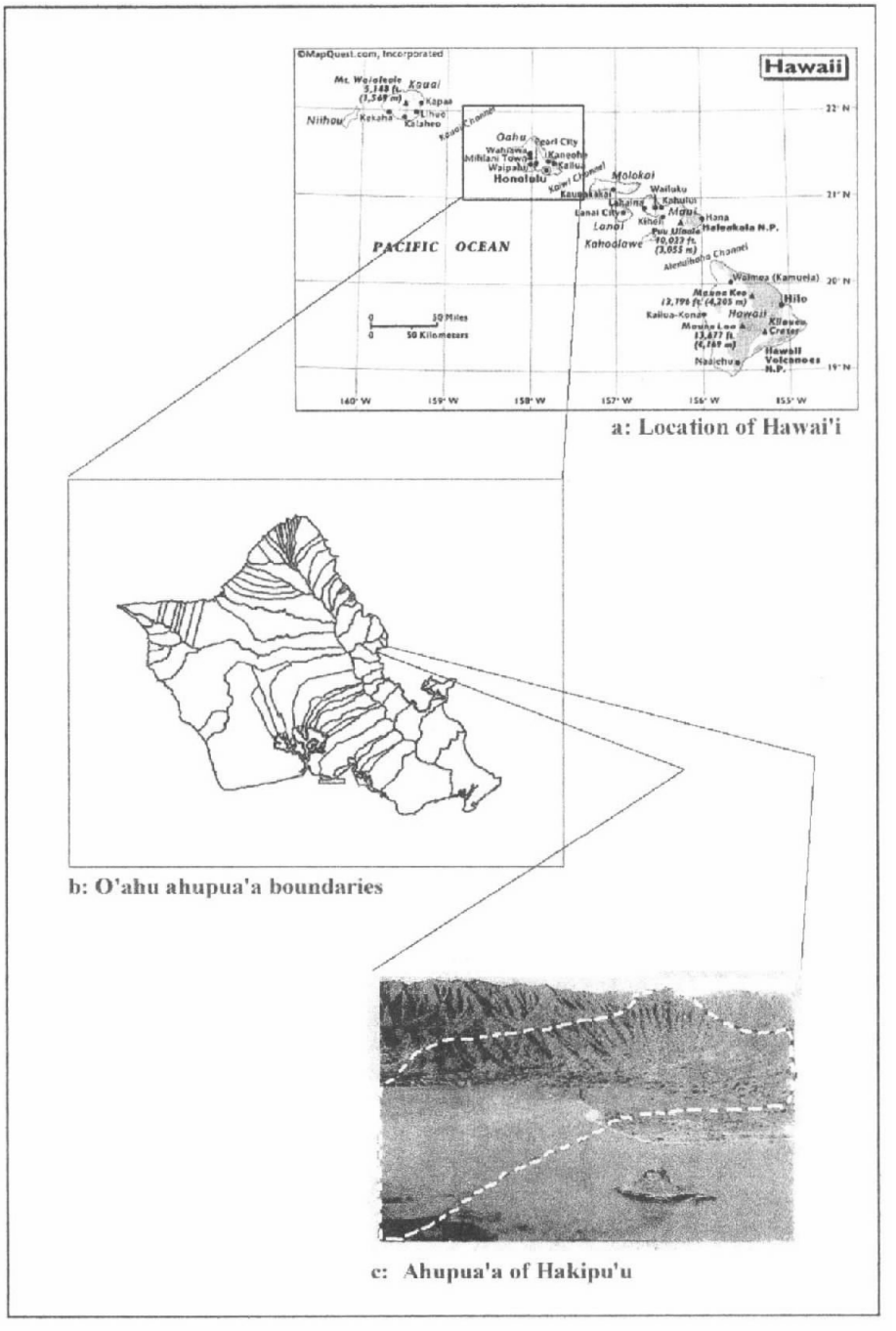

Figure 1. Hawaii and the Ahupuaa.

proceeds down the mountains and onto the plains on the leeward sides of the islands producing a semi-arid climate in many areas. The interaction between topography and wind patterns also produces large variations in rainfall over relatively short distances and elevation gradients from as low as 250 mm annually on the leeward coasts to as high as 11,300 mm annually in windward mountain areas (Giambelluca and Schroeder, 1998).

Since the islands are mountainous and small, most watersheds are small (10s of square kilometers), and streams tend to be short and flashy. Nearly all streams are rainfed, originate in steep terrain in the mountains, and flow quickly to the sea. Perennial streams and small rivers partially fed by seepage from perched ground water resources exist on the older islands of Kauai and Oahu. However there are very few perennial streams on the younger islands of Maui and Hawaii and on the smaller islands of Molokai, Lanai, Kahoolawe and Niihau. Perennial streams are also rare on the leeward sides of all islands (Franco, 1995).

TRADITIONAL HAWAIIAN MANAGEMENT

Watershed management in Hawaii began with the original settlement of the islands. Many scholars believe that the first inhabitants arrived in Hawaii from the Marquesas Islands between 300 and 600 AD, although Hawaiian oral tradition indicates it may have been as early as the 1st century AD. Archeological evidence suggests that the early migrants settled along the coasts near freshwater resources, primarily in the windward valleys, and practiced a mixture of shifting cultivation agriculture and subsistence fishing (Kirch, 1985).

By 1100 AD, and perhaps earlier, a distinctive Hawaiian culture had evolved, characterized by village-based settlements in the windward valleys of all islands. There is also some evidence of at least sporadic use of leeward areas (Kirch, 1985). During this time, social organization and resource management were dominated by extended family groups (*'ohana*) who lived and worked cooperatively under the leadership of respected elders (*haku*). The community made resource management decisions, including water management. These communities were probably relatively self-sufficient with some bartering of goods with other family groups as necessary. As populations continued to increase, members of a given family group dispersed across the landscape from the coast up into the upland areas while maintaining family ties and resource sharing relationships. This system eventually led to the development of land units called *ahupua'a* (Hitch, 1992).

Ahupua'a were the basic land units in Hawaii. Morgan (1948:17) defines the ahupua'a as "a complete estate, running from the sea to the mountains and hence providing a share of all the different products of the soil and sea; fish from the seashore; taro, yams, sugarcane, breadfruit, and bananas in the fertile area of the lowlands; and further up in the forest belt, firewood, poles for houses, logs for canoes, bark for tapa cloth, olona and other plant fibers for cords and rope, and feathers" (Figure 1c). The term *ahupua'a* comes from the altar (*ahu*) marking the seaward boundary of the area on which the sculptured head of a pig (*pua'a*) was placed at the time of the collection of tribute to the god Lono and his earthly representative the high chief (*ali'i nui*) during the Makahiki or annual harvest festival (Kamehameha Schools, 1994). In practice, all *ahupua'a* did not fit the idealized model described by Morgan (1948). For example, some of the *ahupua'a* on the island of Oahu (Figure 1b) extended beyond the bounds of a single mountain range and included the leeward valleys, both sides of the Waianae mountains and a strip of land extending east across the middle of the island to the top of the Koolau mountains. Many ahupua'a were also probably not completely self-sufficient and traded with each other for items not available or common locally (Gon, 1996).

The *ahupua'a* was governed by a group called the *`aha* council. The council consisted of acknowledged experts in the various skills associated with community survival and success including agricultural activities, water management, fishing, and cultural skills like chanting and hula. Council members were chosen by their communities. Governance and decision making were based on group consensus. Large "public works" projects on several islands, including the extensive stone-walled fish ponds on the south coast of Molokai, provide evidence of the long-term ability of this system to effectively manage resources and maintain social harmony (John Ka'imikaua, June 20, 2000, personal communication, Honolulu, Hawaii). Over 50 coastal fish ponds have been identified along the southern coast of Molokai and efforts are underway to restore some of them, such as the `Ualapue Fishpond, as community development initiatives supported by grant funding.

The *`aha* council system existed for several hundred years; however a shift to a highly structure society governed by an hereditary elite (the *ali'i*) occurred around 1100 to 1200 AD. Hawaiian chants and legends speak of the arrival of a group of immigrants from Raiatea in the Society Islands around this time. Some believe that these immigrants conquered the original inhabitants and imposed a hierarchical

system with themselves as the *ali'i* class (Lindo and Mower, 1980). Others suggest that increasing population densities led to the indigenous development of social stratification as resources became more scarce and competition for these resources intensified (Kirch, 1985). Whatever triggered the change in social structure, it introduced what is termed the *ali'i* period and a highly organized form of the *ahupua'a* management system.

During the *ali'i* period that culminated with the unification of the islands in 1795 under King Kamehameha I, management authority in the *ahupua'a* shifted from the community-based *`aha* council to a *konohiki* (headman) appointed by the island or district *ali'i*. The *konohiki* managed all aspects of land and natural resource use in the *ahupua'a* assisted by *kahuna* (members of the professional and priestly class) who were experts in different specialties such as irrigation and water management, farming, and fishing (Kamehameha Schools, 1994). Within the *ahupua'a*, Hawaiians maintained an integrated system of diverse agricultural enterprises that could include flooded fields for taro cultivation (*lo'i*), irrigated fields for other crops (*kula*) and rainfed areas (Handy and Handy, 1972). Water was diverted from natural streams for domestic and agricultural use by means of artificial ditches called *`auwai* (Handy and Handy, 1972; Costa-Pierce, 1987). The *`auwai* connected with the streams became permanent features of the localities where they were constructed. There is ample historic and archeological evidence of the wide extent of these systems in precontact Hawaii, including remains of at least four distinct types of irrigation systems (Kirch, 1985).

Hawaiians were careful observers of nature, choosing to adapt their land use practices to local conditions rather than making drastic changes in the landscape or hydrologic conditions to fit preconceived farm types. This is well illustrated in the development of agricultural irrigation systems in Hawaii. Present day irrigation complexes, such as those found in Hanalei, Kauai, have a series of irrigation/drainage canals that allow a high degree of control over water reaching individual plots. It is likely, as proposed by Kirch (1985), these elaborate systems are the culmination in the progression of systems from simple check dams that expanded natural wetlands along streams to increasing degrees of water control through the use of individual, paired, or series of irrigation ditches. Along the diversity of stream systems, riparian wetlands, floodplains, natural springs, and seeps were adapted into a wide variety of irrigated field types. Overlain with these irrigated cropping systems, were a variety of fish ponds and combined fish and crop fields (Costa-Pierce, 1987). The increasing complexity of these systems must have derived from increasingly complex social systems.

Resource use and the management of land and water in the *ahupua'a* was based on an extensive set of cultural norms and religious beliefs. Water in particular plays a central role in Hawaiian culture and religion as evidenced by extensive references to water in prayers, chants, legends, and myths (Franco, 1995). Water (*wai*) and land (*'aina*) were believed to be gifts from the gods. As such, proper stewardship of these resources was more than good resource management practice; it was an ethical responsibility. This ethical and social responsibility was formalized in Hawaii through the system of *kapu* (taboo). *Kapu* literally means forbidden in Hawaiian. *Kapu* on specific activities (such as catching fish, cutting trees, or harvesting other natural products) were set by the *`aha* council and later by the *ali'i*. Breaking of the *kapu* could result in severe punishment including exile or death (Morgan, 1948). Some manifestation of the *ahupua'a* management system existed for well over 1000 years. However, the arrival in 1778 of the British ship Endeavor, captained by James Cook, started a string of events that would result in the nearly complete destruction of the *ahupua'a* management system before the end of the 19th century, and its replacement by a management system focused largely on the private ownership and control of land and water resources.

UNRESTRICTED USE OF RESOURCES

After Cook's "discovery" of Hawaii, the islands quickly became a major supply port and way station for fur trading ships bound for China and for whaling ships operating in the Pacific. These developments resulted in fundamental changes in Hawaiian culture and society that led to the collapse of the *ahupua'a* management system and the degradation of much of the resource base through overuse and mismanagement. These changes can be summarized as three interrelated factors: (1) the precipitous decline in the Hawaiian population after European contact; (2) the marginalization of Hawaiian culture and religion as Hawaiians adopted "western" practices and beliefs; and (3) the incorporation of Hawaii into the cash-based world economy.

Most estimates of the population of Hawaii at the time of Cook's arrival range from 250,000 to 300,000. However, some contemporary Hawaiian scholars suggest that the population may have been as high as 700,000 to 1,000,000. By 1831 when Christian missionaries took their first census, the population stood at about 130,000. The first Hawaii government census

in 1850 showed a population of 84,000 and the 1876 census showed a population of only 54,000. Some of the decrease may be attributed to local famines and battlefield deaths associated with Kamehameha's unification of the islands in the late 18th century and to emigration of young men to serve as crew on whaling and trading ships. However, the bulk of the decrease was due to mortality from introduced diseases including syphilis (resulting in sterility), cholera, and smallpox (Schmitt, 1998).

The marginalization of Hawaiian religion and culture and fundamental changes in values are closely related to the precipitous decline in the population. The first Christian missionaries arrived in Hawaii in 1820 and found a population in steep decline and a culture and belief system in disarray. Many people were dying from unfamiliar diseases and others were unable to have children. Liholiho (Kamehameha II) had lifted the *kapu* system after ascending to the throne in 1819 on the urging of Ka'ahumanu and other powerful women in the royal house. These rapidly changing circumstances left many Hawaiians receptive to the new belief system presented by the missionaries. Queen Ka'ahumanu, who ruled as regent after Liholiho's death in 1824 until her death in 1832, converted to Christianity in 1825 and the missionaries exercised considerable influence in her government. Although some were sympathetic to and interested in Hawaiian culture and belief systems, most missionaries spoke out strongly against the traditional religious and cultural practices and urged that they be discontinued (Dougherty, 1992).

At this same time, Hawaii was becoming part of the cash-based world economy. Interactions with foreign seaman provided Hawaiians with exposure to unfamiliar and exotic foreign goods. Instead of exclusively working to produce the goods and services needed for subsistence, commoners could now provide products or services to visitors in exchange for cash or goods. A market for Hawaiian products also developed, first for sandalwood (discussed in more detail below) and later for goods like water, fruit, vegetables and meat, and services required by the whaling ships that began to frequent Hawaiian harbors on their way to and from Pacific whaling grounds (Morgan, 1948).

Taken together, these three factors had a disastrous effect on the traditional *ahupua'a* management system. There was a significant population decline in rural areas as a result of mortality, coupled with migration to coastal towns where employment was available. Even those commoners who did not leave the rural areas spent increasing amounts of their time producing goods for sale or trade rather than cultivating food crops. This population decline left *ahupua'a* managers (*konohiki*) without the labor necessary to manage the lands and to maintain the elaborate water management structures necessary for taro cultivation. It also resulted in a severe reduction in staple food production in the kingdom.

Two specific activities had severe negative impacts on land and water resources: the sandalwood trade and the introduction of grazing livestock. Sandalwood (*Santalum spp.*) is a small tree or shrub that grew in the dry and semi-dry forest areas on all the major islands. The wood of these trees is aromatic and was in demand in China for use as incense and in ornamental carving and cabinetwork (Degener, 1930). Fur traders on their way from Alaska and the Pacific Northwest to China started taking on sandalwood in Hawaii and an extensive trade had developed by the early 1800s. Until the death of Kamehameha I in 1819, the sandalwood trade was a monopoly of the king who decreed that only mature trees be harvested in order to ensure continued availability of the resource (Cox, 1992). However, under Liholiho (Kamehameha II) the trade opened to other chiefs, and in 1826 even commoners could privately cut and sell wood. The opening of the sandalwood trade and the growing desire of Hawaiians for foreign goods led to the near total destruction of sandalwood forests by 1845 and the corresponding degradation of watersheds where they were found (Degener, 1930; Hitch, 1992).

Even more extensive and ongoing resource degradation was caused by the goats, cattle, pigs, and sheep introduced into Hawaii by visiting sea captains before the end of the 18th century. Initially, harvest of these animals was forbidden by King Kamehameha I. As a result animal populations increased quickly, and both feral and semi-feral ungulates caused significant damage to native forests and grasslands. The end of the *kapu* system in 1819 allowed harvest of these animals, and the arrival of whaling ships increased the demand for cattle as provisions. However, livestock damage to native forests and to watersheds through overgrazing and erosion of steep slopes was recognized as a severe problem throughout the 19th century (Cox, 1992) and remains a problem today.

PRIVATIZATION

Operating in parallel with the unrestricted use of forest resources was a shift in the status of water and land resources. Under the Hawaiian belief system, water and land were resources that could only be used, not owned. However, over the course of the 19th century, their status shifted initially to property of the government and subsequently to resources that could be privately owned and controlled.

From their initial arrival in Hawaii, outsiders had urged the Hawaiian government to allow for private land holdings. For most Europeans of that time, communal land holdings and management structures, like the *ahupua'a* management system, were seen as an impediment to the progress and modernization of the kingdom. In addition, some foreigners saw privatization as a necessary first step that would allow them to acquire property as a way to obtain wealth and power. Evidence for the growing acceptance of privatization is found in the 1839 Bill of Rights that affirmed the right to private property that could not be confiscated by the government, and in the 1840 Constitution, which declared that land was no longer the property of the king, but belonged to the chiefs and people in common (Hitch, 1992). The trend toward private property culminated in the *Mahele* (division) of 1848 when Kamehameha III and his chiefs agreed to divide the land between them. This was followed in 1850 by instructions from the King's Privy Council and the Kingdom Legislature to the Board of Commissioners to Quiet Land Titles telling them to grant fee-simple titles to natives for the parcels they cultivated (Hitch, 1992).

While the *Mahele* provided commoners (*maka'ainana*) with a chance to obtain title to their land (referred to as *kuleana*), there were several factors that severely disadvantaged them in the process. First, although they obtained title to individual parcels of agricultural land, commoners lost use rights to common lands including access to areas for fishing, hunting, pasture, and collection of forest products. Second, many parcels were too small to support a family if it was unable to obtain resources from the common lands. Third, the cost for surveying and processing the title ($6 to $12), although small by present standards, represented a significant sum of money at the time when compared to prevailing wages and the market value of the land. Lastly, many commoners were unwilling to oppose local elites if conflicting claims were presented (Morgan, 1948). When land distribution was completed in 1855, only an estimated 30 percent of eligible males had actually received titles (*kuleanas*) (Dougherty, 1992) and the total acreage distributed amounted to less than 1 percent of the total available land (Morgan, 1948).

The framers of the *Mahele* were not unaware of the problems associated with commoners losing access to products from community lands including water use rights. Traditionally, the water flowing through the irrigation (*'auwai*) system in an *ahupua'a* was attached to the irrigated tract. This evolved into the legal concept of "appurtenant rights," during the land reform period of the 1840s and was explicitly validated in the *Kuleana* Act of 1851 which stated that *kuleana* holders "have the right of way; and might obtain water, thatch, house timber, *ti* leaves and the like, provided they did not sell such supplies" (Morgan, 1948:133). Appurtenant water rights in Hawaii have also been referred to as taro water rights.

The philosophy of privatization was quickly extended to water resources. The first steps toward privatization came in 1859 with the passage in the Hawaiian Kingdom legislature of "An Act to Authorize the Minister of the Interior to Take Possession of Whatever Land and Water may be Required for use of the Honolulu Water Works." This Act, coming in response to a looming water crisis in urban Honolulu, marked the first time the government asserted ownership and direct responsibility over the management of water resources (Cox, 1992). The distribution of water resources was becoming an issue throughout the Kingdom as evidenced by the establishment by Royal decree of local water rights commissions on all islands in 1860. These commissions, made up of local elites, were charged with resolving disputes over water use and water allocation. The function and make-up of these locally-controlled commissions marked a return to a system similar to the *`aha* council but with more limited jurisdiction. The water commissions existed until 1907 when, under the territorial government, they were abolished and their functions transferred to circuit court judges (Wilcox, 1996).

The final impetus for privatization of water and the first instances of diverting water out of its original *ahupua'a* came with the rise of the sugar industry in Hawaii. Although sugar had been cultivated by native Hawaiians since ancient times and efforts to commercially cultivate sugar in the islands had started as early as 1835, the industry did not take off until the passage of the Reciprocity Treaty between the United States and the Kingdom of Hawaii in 1876 (Morgan, 1948). The Reciprocity Treaty allowed Hawaiian sugar to be imported into the United States duty free and effectively opened the market to Hawaii producers. Sugar requires large amounts of both water and sunlight for optimum production. Unfortunately, these are usually not found in the same place in Hawaii. Water is abundant in cloudy windward areas and is less available in sunny leeward areas. So, sugar planters sought permission to construct irrigation works, locally known as ditches, to divert water from windward sources to prime cane lands in leeward areas. This process was facilitated by the passage in the Kingdom legislature of "An Act to Aid in the Development of the Resources of the Kingdom" in 1876. This Act empowered the government to issue licenses to individuals and companies for the capture and use of resources, including water, for the "public good". In addition, the legislature passed "An Act to Regulate the Passage of Water over the Lands not Benefited Thereby" that allowed an individual or

company to petition for right-of-way to move water over another's land. Later in this same year, the first license to capture and divert water for irrigation was issued to Alexander and Baldwin for the construction of the East Maui Irrigation Ditch (Wilcox, 1996). Wilcox (1996) aptly summarized the changes in water management from the *ahupua'a* system of precontact Hawaii to the sugar dominated decades of the late 19th and early 20th centuries in her book *Sugar Water*. "Water moved with the times in Hawaii, from taro to sugar, from the *konohiki* to the court, from the village to the city, from the windward to the leeward and from the public to the private" (Wilcox, 1996:32-33).

WATERSHED RESTORATION AND PROTECTION

Although moving water from its sources on the windward sides of islands to sugar lands on the central and leeward plains was the major focus of water management in the sugar plantation era, watershed protection and restoration became increasingly important in the later decades of the 19th century. There were extensive private and later public efforts to restore and revegetate upland areas that had formerly been covered by native forests. Two principal causes of native forest destruction were the sandalwood trade and grazing livestock management discussed earlier. Another factor that contributed to forest destruction, particularly in the later part of the 19th century was the harvest of wood for fuel on sugar plantations. However, most plantations had switched to coal and cane residue by the 1880s, so wood cutting ceased to be a major problem after that time (Cox, 1992).

In 1860, concern over the fresh water supply for the growing city of Honolulu sparked the first public expression of awareness of forest degradation and its negative impacts on water supply. In that year, the Kingdom legislature passed an act that protected all government lands at the sources of streams on the south side of Oahu from degradation by imposing strict fines on the owners of animals trespassing in these areas (Wilcox, 1996). This was followed in 1876 by the passage of "An Act for the Protection and Preservation of Woods and Forests" that authorized the Minister of the Interior to set aside and protect woods and forest lands that were valuable either as watersheds or sources of timber. It also authorized the appointment of a superintendent to administer the resulting areas (Cox, 1992).

The need for sugar irrigation water was the driving force behind most subsequent watershed management activities. By the late 19th century, the major sources of irrigation water had been identified and had either been exploited or plans had been made for their development. As a consequence, concern shifted from the identification of new resources to the preservation of existing ones through watershed protection (Cox, 1992). A number of planters on several islands took direct actions in the early 1880s to preserve or restore forest lands, and the first major government tree planting effort occurred in 1882 with the planting of over 50,000 seedlings on the hills above Honolulu (Cox, 1992).

Progress was also made on the policy front in the Hawaiian Kingdom government with the appointment in 1887 of "forest keepers" for the island of Maui (and perhaps other islands as well), followed in 1893 by the passage of legislation creating a Bureau of Agriculture and Forestry and the hiring of a commissioner to head it (Cox, 1992). The first commissioner, Joseph Marsden, quickly developed and generated support for a fencing program on the islands of Hawaii and Maui to protect forest areas from livestock. The Board of Agriculture and Forestry also commissioned a survey of forest lands in 1899 to identify areas where fencing and other actions were needed. Other private interests, including several plantations and the Bishop Estate, set aside large tracts of land for watershed protection. The Hawaiian Sugar Planters Association (HSPA), founded in 1895, was also active in conservation issues and pushed for stronger conservation legislation in order to ensure a steady supply of abundant water for its member plantations. Partially in response to sugar industry lobbying, in 1903 the territorial legislature passed Act 44 that complemented the Forestry Act of 1876 and facilitated the development of forest reserves (Cox, 1992). By 1914, when Ralph Hosmer, the first territorial forester of Hawaii, returned to the continental U.S., nearly one-quarter of the land area in Hawaii was officially in forest reserves, including most areas of highly sloping land and most major water recharge areas (Cox, 1992). These areas on the upper slopes of the mountains came to be commonly referred to as "the watershed," both in professional publications (e.g., Lyon, 1929; McEldowney, 1930) and in common parlance. Work on expanding and reforesting these areas continued throughout the early decades of the 20th century initially under the direction of Charles Judd, who succeeded Hosmer as territorial forester, and with the expertise and labor provided by the HSPA (Lyon, 1929; McEldowney, 1930).

POST-WAR CHANGES

The plantations and associated water companies continued to construct and maintain irrigation structures, and the territorial government continued its watershed protection efforts largely focused on managing the forest reserve lands throughout the first half of the 20th century. However, the 1950s ushered in a new political era for Hawaii. In the post-World War II years, the political climate was fundamentally altered with the return of change-oriented local soldiers, many of them Japanese-Americans, from military service. Their return and the rise of union organizations led to the decline in the power of established interests. Until World War II, economic and political power in Hawaii was dominated by the "Big Five" (C. Brewer and Company, Theo H. Davies and Co., American Factors (AMFAC), Castle and Cooke, and Alexander and Baldwin). These large inter-linked agribusiness companies represented Hawaii's landed aristocracy. They effectively dominated Hawaii's economy, politics, and courts through a network of business and family relationships and consequently controlled decision making over land and water. In the 1950s, Hawaii's Democratic party, made up primarily of Hawaii's working class, rose to power to displace the paternalistic control of the large plantation companies and their associates in business (Cooper and Daws, 1985; Kent, 1983). The post-war years, as elsewhere throughout the U.S., also saw an increased demand for housing and land for nonagricultural uses. In addition, Hawaii was being recognized as a vacation spot. In coming decades these factors would serve to transform the economy and resource allocation decisions.

Planning has traditionally been delegated by the states to local governments. However, in the decade following statehood in Hawaii (1959), the government, including planning activities, remained highly centralized. Only two levels of government were established – the state and county. The State performs many functions that are usually handled by local governments including health, welfare, education, and housing. The counties also rely heavily on the State and Federal governments for financing public works projects. In addition, the State, as a major landowner, controls over 35 percent of all lands in the state, including offshore submerged lands.

The 1957 Territorial legislature laid the foundation for land management planning in Hawaii by passing three major pieces of legislation. The first established a Land Study Bureau to describe all lands as a basis for determining their best uses. The second established Forest and Water Reserve zones regulated and administered by the Territory. The third established the Territorial Planning Office (later the State Office of Planning) to prepare a long-range comprehensive plan to guide physical and economic development. Hawaii's first General Plan was presented to the Governor in 1961 and adopted in the Legislature by resolution. The major emphasis of that first General Plan was to foster economic growth and expanded opportunity, especially on the neighbor islands, through government actions that would encourage wise use of land. The General Plan was to be reviewed every five years to integrate new information and policy directions. Hawaii's subsequent body of land use law was designed primarily to protect agricultural industries from the threat of urbanization, rising land taxes, and speculation. The law recognized the problem associated with the shift of prime agricultural land into "...non-revenue producing residential uses" and directed that "...the greatest possible protection shall be given to those lands with a high capacity for intensive cultivation" (Hawaii Revised Statutes, 2000, Section 205-2).

The changes in Hawaii society and politics that started in the 1950s also led to changes in the composition and philosophy of the Territorial and later State Supreme Court. As George Cooper noted in his 1978 paper on the history of water rights in Hawaii: "The Supreme Court in its approximately 50 water rights decisions ... has a rather perfect record of developing the law in ways conducive to sugar's needs" (cited in Wilcox, 1996:33-34). However, the court's interpretation of land and water rights started to change in 1968 with the case of *Palama v. Steehan* in which the justices ruled that the right-of-way provisions of the *Kuleana* Act of 1851 still applied in present day disputes over land access (Egan, 2000). This reinterpretation of Kingdom law continued with the court's 1973 decision in the case of *McBryde Sugar Co. v. Robinson*. In their opinion in this dispute between two landowners on Kauai over diversion of water from the *Hanapepe* watershed, the court declared that under Hawaiian Kingdom law (principally the *Kuleana* Act of 1851), landowners were not granted private ownership of water running over their property. Therefore, neither party could claim the waters in dispute since they were under the ownership of the State as the successor to the Kingdom. Furthermore, the decision reaffirmed the historical principal of appurtenant (taro) water rights that held that any parcel adjacent to a watercourse had usufructory rights to the water including the undiminished natural flow of running streams. In addition, they held that diversion of running water from one *ahupua'a* to another was not consistent with these rights (Egan, 2000). Subsequent court opinions have sought to further define the scope and extent of traditional use rights to water and other

natural resources including forest and near-shore marine products.

Meanwhile, national level concerns over water conservation and water quantity began to take into account issues of water quality. Rachel Carson's series of articles in the New Yorker and her book, *Silent Spring* (1962) revealed to the nation the dangers of pesticide use and disposal. Incidences such as the Cuyahoga River catching fire in Cleveland because it was choked with oil and other pollutants, along with other water quality problems nationwide led to the passage of the Clean Water Act in 1972. The increasing environmental and natural resource problems and public awareness of these problems led to the passage of no less than 16 major environmental laws within a span of a few years starting in the late 1960s (Wilder, 1998). Laws passed in this period, including the Coastal Zone Management Act, Endangered Species Act, and National Environmental Protection Act, placed layers of regulatory controls and multiple agency jurisdictions on the use of land and water resources.

THE RISE OF REGULATION (1970S AND 1980S)

In the 1970s, more emphasis was placed on developing policies to guide state actions. The intent was to create a "...unified policy framework under which State development goals are defined, priorities established, and programs kept in balance" (Hawaii State Department of Planning and Economic Development, 1971). Perhaps the most important change in public philosophy was that land and water were being viewed as fundamental resources rather than commodities. These resources have value to society beyond their market price, and any decisions on the development of land and water resources must uphold the public interest.

Increasing urbanization of Hawaii, accompanied by water development, reallocation, and economic growth, solved some previous problems while creating others. Up to this time, irrigation for agriculture had been the predominant water use. Irrigation usage was focused on preserving physical environmental conditions, the traditional crops cultivated, the rural lifestyle associated with some types of agriculture (i.e., ranching), local self-sufficiency, import substitution, and export promotion. In the 1970s, a series of public decisions began to withdraw water from agricultural use to provide inexpensive water to urban residents and the increasing number of tourists visiting the state. This was deemed preferable to developing more costly ground water sources, exchanging treated sewage effluent for potable water in agricultural use, or desalinating brackish water.

In 1977, then Governor George Ariyoshi, appointed a commission to assess water supplies and needs throughout the islands, especially on Oahu. In his announcement, the Governor said that his administration's growth policy "...must be largely structured in accordance with water availability..." (*Robinson v. Ariyoshi*, 441 F. Supp. 559 D. Hawaii 1977). In 1978, a new emphasis in public policy legislation focused on increasing responsibility of State government to plan and manage growth in Hawaii. The Hawaii State Plan, presented to the State Legislature during the 1978 legislative session, was intended to be a long-range guide to influence the direction, rate, and timing of growth in the State. This was the birth of a "growth management" ethic in Hawaii's public policy. The State began to play an active role in the shaping of its environmental, social, and economic future. The State obligated itself to not only see that natural resources were developed for the most beneficial social uses but also to conserve those resources for use by future generations (Hawaii State Department of Budget and Finance, 1977).

By the late 1970s, Hawaii statutes provided for the creation of county boards of water supply and described their powers and duties. The four county charters listed the specific powers granted to these boards. Generally, these boards were charged with the task of providing current and prospective domestic water supply needs. However, many agricultural and industrial water consumers with private wells, including military bases, did not fall under the immediate jurisdiction of the boards. Therefore, these boards had limited ability to oversee, manage, and control the total amount of surface and ground water being used or withdrawn.

The Honolulu Board of Water Supply (BWS) and its counterparts on the neighbor islands were basically responsible for their county's supply of domestic water, but they also supplied water for commercial, industrial, and some agricultural uses. Therefore, their perspective on water issues was conditioned by the developing needs of their clientele. The basic mandate of county water boards was to "deliver the goods" and should they fail, they could expect to be immediately confronted by their – primarily urban – constituents. During the 1970s, the practice of the Honolulu BWS, and to a lesser extent the neighbor island boards, was to transport municipal water from developed ground water areas where water was plentiful to areas where water was scarce. Ground water transfers allowed the BWS to guarantee water supplies to new development projects by drawing from the basins of others, thereby elevating urban development over agricultural and alternative uses. One

could argue that this practice by the BWS had the effect of unilaterally making economic policy with respect to land use and State development. This practice tended to work against any meaningful growth management strategies (Hawaii State Department of Budget and Finance, 1979).

The Groundwater Use Act of 1961 (Hawaii State Legislature, 2000, Chapter 177) had given the State Board of Land and Natural Resources (BLNR) broad powers and responsibilities to oversee, manage, and control all ground water uses statewide, including the authority "to regulate the use of ground water in areas designated by the board as being endangered or likely to become endangered by excessive or improper use." The objective was achievement of the "most beneficial use" of the ground water resource. However, through 1978 (roughly 17 years later), rules and regulations necessary to implement the provisions of the law were still being drafted and debated.

The State's role in managing and protecting natural resources was reiterated and reinforced in 1978 by the Hawaii State Constitutional Convention (Con-Con). Amendments from the Con-Con defined new constitutional obligations and responsibilities in managing and planning growth and development. One of these amendments mandated the legislature to create a new water resources agency (the State Water Commission) whose role was to protect, manage, and regulate water resources. The Con-Con also passed landmark amendments that constitutionally reaffirmed native Hawaiian traditional and customary practices. These amendments required legislation that specifically codified native Hawaiian rights to resources upon which those practices depended, particularly access to land and water. Under this new framework, decisions on resource use and allocation were to be made on a broader basis than economic efficiency. The impact analysis had to consider all impacts to society. During this time period there was recognition that prices in the marketplace were not always a good proxy for societal values. Questions like "who experiences the impacts?" and "who benefits and who pays?" needed to be answered in order to ensure the best possible allocation decisions. Federal legislation provided the direction to formalize such a decision-making framework with the passage of several environmental disclosure and regulatory requirements (e.g., NEPA, Clean Water Act). Hawaii soon followed suit by passing its own version of NEPA that required environmental impact reviews (Hawaii State Legislature, 2000, Chapter 343).

As was the case at the national level, water quality became more of an issue in Hawaii during the 1970s and 80s. The State's regulatory system to control point sources of water pollution was established in the Department of Health (DOH). Nevertheless, water quantity issues described above and water quality issues were addressed by separate State and county agencies, with few interagency cooperative arrangements to coordinate water management decisions among these agencies. Numerous narrowly focused national, state, and county regulations were passed dealing with water management issues. Different agencies managed forested areas, endangered species habitat, agricultural lands, urban areas, wetlands, streams, coastal lands, and the shoreline.

By the 1980s, Hawaii's environmental and natural resources management systems were characterized as overly regulated, but under managed. While government decisions were still largely centralized at the State level, jurisdiction over water use and water quality was fragmented among federal, state, and county agencies. State government, large landowners, developers, plantations, and the military were the major decision makers of this period. Watershed management in Hawaii heading into the 1990s was a puzzle of overlapping authorities with limited coordination, dividing up the watershed horizontally. Water running from the mountains to the sea passed through multiple authorities regulating aspects of its use and quality. A vastly different management regime with various agencies managing different parts of the watershed (horizontal orientation) was now in place compared to the vertical orientation of the traditional *ahupua'a* system where water was managed as it flowed – from the mountains to the sea.

INTEGRATED RESOURCE MANAGEMENT (1990S)

During the last decade of the 20th century, the focus of water quality issues, both at the federal and state levels, turned from point sources to nonpoint sources of pollution. Section 319 was added to the Clean Water Act in 1987 and Section 6217 to the Coastal Zone Management Act in 1990 to address nonpoint sources of pollution. These statutes led to the development of the Polluted Runoff Control Program in Hawaii's DOH and a Coastal Nonpoint Pollution Control program in Hawaii`s Coastal Zone Management Program (Hawaii State Office of Planning, 1996 and 2000).

As the State developed these programs, the problem of overlapping jurisdictions and multiple agencies addressing only specific portions of nonpoint pollution problems became very apparent. In addition, it was clear that authorities regulating water quantity were not well integrated with those regulating water quality. These unresolved jurisdictional issues, coupled with continued economic growth and urban

expansion, led to a decrease in the number of water bodies that met water quality standards.

New approaches were developed and adopted to address natural resource management issues like water use. Several agencies adopted ecosystem management whereby whole ecosystems instead of individual species became the target of management efforts. Furthermore, it became clear that many of the problems related to water quantity and water quality were in turn related to people's behaviors and values. Some agencies increased the involvement of resource users and stakeholders in management decisions. In some parts of the State, community-based management projects were developed. Agreements among federal, state, and county agencies, private landowners, resource user groups, and nongovernment organizations multiplied during this time period. For watershed management alone, no less than 13 watershed-based partnerships have been established in Hawaii (Hawaii State Office of Planning, 2000).

The movement towards ecosystem integrity, community-based management, and the establishment of partnerships and cooperative agreements to manage resources has been proposed as a solution to what Garret Hardin termed "the tragedy of the commons" (Feeney *et. al.,* 1990; Hardin, 1968). Numerous case studies worldwide have documented efforts where government, landowners, communities, and resource users have established cooperative agreements to jointly manage resources (Berkes, 1989; Ostrom, 1990; Pomeroy, 1995). These and other case studies describe the trend towards integrated natural resources management, incorporation of traditional management systems, and increased community and local level participation in coastal management (Christie and White, 1997). These same trends are evident in Hawaii.

REDISCOVERY OF THE *AHUPUA'A*

Although the *ahupua'a* were not strictly equivalent to watersheds, the vertical, integrated nature of this management system has led authors to compare it to contemporary ideas of watershed-based management structures (e.g., Smith and Pai, 1992). In recent years, an expanding group of local scholars and teachers, community workers, and activists have built on this premise along with a growing understanding and appreciation for Hawaiian culture and ethics, a better understanding of Hawaiian ecosystem dynamics, and ideas from community-based management, to develop and refine what is now referred to as the *ahupua'a* concept. This concept goes beyond the hydrologic and physical ideas of *ahupua'a* as watersheds to integrate indigenous economics, governance, social structure, food systems, spirituality, and ethics.

In its present form, the *ahupua`a* concept stresses: (1) forming appropriate values that allow people to make informed decisions for themselves and for society; (2) promoting community-based efforts involving *ahupua`a* tenants, people with localized knowledge, and those with a personal stake in the decision-making process; (3) creating partnerships and commitment of stakeholders to reexamine existing governmental and legal structures and incorporating *ahupua`a* principles within them; and (4) perpetuating *ahupua`a* principles and practices from generation to generation (Blane and Chung, 2000).

This vision has struck a chord with an increasing number of Hawaii residents and resource managers. As a result, many efforts are currently underway in Hawaii to holistically approach resource management issues using the concepts and principles of the *ahupua`a*. In *Hanalei* on the island of Kauai, the *Hanalei* Heritage River Initiative is applying *ahupua`a* concepts as a model for ecologists seeking improved resource management strategies that transcend western ecological, scientific, and social science discipline boundaries in favor of culturally-based decision making. In the North *Kona* district on the island of Hawaii, the *Pu`uwa`awa`a Ahupua`a* Project is a groundbreaking partnership of community and major stakeholders including State agencies, the County of Hawaii, ranchers, conservationists, hunters, native Hawaiian groups, and the Nature Conservancy of Hawaii. These groups are collaborating to craft an *ahupua`a*-based system of management allowing for compatible uses in a multi-use plan aimed at protecting vanishing Hawaiian dryland forests. Most importantly this effort will establish new levels of resource management coordination and responsibility across levels of government and between the public and private sectors (for-profit and non-profit). Yet another project is the *Ha`ena Ahupua`a* Project on the island of Kauai, that is developing a marine resources management plan revolving around community-based stewardship. The goal is to establish an underwater habitat preserve using the *ahupua`a* concept in developing a culturally powered integrated coastal management system. The final example is the on-going efforts of the Ala Wai Watershed Project in one of Oahu's most densely populated urban *ahupua`a*. Here the participants are applying the culturally based concepts of the *ahupua`a* to involve neighborhood communities and experts from government and the University of Hawaii to undertake restoration and nonpoint source prevention activities to clean up a polluted urban waterway.

These are just a few examples where the *ahupua`a* concept is being used to bring together disparate

groups to address complex issues that cross political, economic, jurisdictional, and cultural boundaries. In most of these cases the primary strength of the *ahupua'a* concept has been to provide a common base upon which to build or expand community-based activities. There are also other advantages to using the *ahupua'a* as a basic management unit. Unlike a physiographically defined watershed, *ahupua'a* are historically and culturally defined areas. Maps are available showing historical *ahupua'a* boundaries for all islands. Since *ahupua'a* are an older land division, there seems to be relatively less resistance to potentially readopting *ahupua'a* boundaries that cross contemporary ones like neighborhoods. This process is also easier in Hawaii since existing neighborhood institutions do not control resource management decision making and all *ahupua'a* are fully contained in one county. In addition, nearly all *ahupua'a* have a set of legends and stories about how they were established, famous residents, and activities of the gods in the area. This cultural history seems to provide many residents, especially children, a sense of the *ahupua'a* as a storied and integrated place.

However, adoption of the *ahupua'a* concept as the basis for water and resource management in Hawaii has some disadvantages. First, there is far more movement of people, goods, and services between *ahupua'a* now than was true in ancient times. So, it is unclear how much control a given *ahupua'a* could realistically have over some of its resource management decisions, like controlling potential sources of pollution. Cross-boundary issues also potentially impact the identification of stakeholders in the ahupua'a management process. Since the definition and involvement of stakeholders is a key component of successful management, a completely place-based system where only residents' voices are heard could potentially leave out important groups who impact *ahupua'a* resources, such as people who work but do not live in the area. At the other extreme, since Waikiki is arguably the economic engine that drives the Oahu economy, it could be argued that all Oahu residents are legitimate stakeholders in the Ala Wai *ahupua'a* that includes Waikiki. If stakeholders are defined this broadly, this may dilute the *ahupua'a* management ideas so much as to make them no different than present day management structures.

A second potential disadvantage of complete reliance on the *ahupua'a* concept as the basis for watershed management lies in local Hawaii politics and the reemerging legal rights of native Hawaiians. Many in Hawaii take pride in the State as a multicultural place. For some, the reassertion of native Hawaiian cultural beliefs, including the *ahupua'a* management system, is seen as a threat because it puts native Hawaiian beliefs in a position of primacy over other traditions. There are also potential concerns about management authority under an *ahupua'a*-based system and how it would be reconciled with contemporary democratic ideals. The *ahupua'a* system that existed at the time of European contact was, at least on its face, extremely autocratic with decision-making concentrated in an all-powerful manager (the *konohiki*) supported by the hereditary elite. This model is in sharp conflict with ideas of community empowerment for resource management decisions and community-based decision making. The rediscovery of the *`aha* council model provides an alternative management framework that seems more compatible with local democracy; however, issues related to the potential tradeoffs between popularity and expertise when selecting council members remain.

Although there are potential problems and disadvantages to the widespread adoption of *ahupua'a*-based management structures, the potential advantages and existing success stories indicate that the framework has great potential. The ultimate challenge will be to redefine jurisdictional and political boundaries that make sense within an *ahupua`a* integrated resource management concept by communities rather than by government agencies or courts. Hawaii's government agencies and courts have been generally interested in and, to varying degrees, in favor of these *ahupua`a*-based management concepts. However, much of the *ahupua'a*-based activity has taken place in the middle of the watershed between the forest reserve lands on the hills, administered by the Department of Land and Natural Resources, and the coastal areas and beaches, administered by individual county governments and the State Coastal Zone Management Program. Agencies are reluctant to give up power and influence. In addition, control over resource management also includes responsibility and accountability for the quality of the resource. Significant questions remain on issues like how the State would show compliance with federal statutes, such as the Clean Water Act, and who would be responsible for ensuring this compliance. In addition to the long and involved process of redefining institutional structures, perhaps the most difficult task confronting us is truly involving all stakeholders in the process. Efforts in this area are underway by organizations working together to weave a network of partners and stakeholders: the *Ahupua`a* Action Alliance, Malama Hawaii, the Hawaii State Office of Planning, the Hawaii State Office of Environmental Quality Control, and other public and private groups and individuals are actively involved.

Overcoming the barriers mentioned above would be facilitated by some changes in policy. Already there has been an acceptance of the *ahupua'a* as a potential

management framework by several state and federal agencies, at least on a theoretical level. However, these changes on paper have yet to be accompanied by the devolution of decision-making authority over state-controlled resources, like forest lands in the upper watersheds and coastal areas, to local communities. There have been preliminary discussions with several groups on possibly developing joint management agreements for forest areas and streams; however, these have yet to be finalized. Further efforts are necessary. State and county governments could also refocus ongoing community efforts and future activities around *ahupua'a* boundaries instead of or in addition to established neighborhoods. They could also provide financial support for signage, maps, and other information designed to increase public awareness of the *ahupua'a* concepts.

CONCLUSIONS

The concept and principles of the *ahupua`a* revolve around water in all of its manifestations: as ground and surface water, as airborne mist and rain, and as the great reservoir represented by the ocean. The *ahupua`a* is a comprehensive approach incorporating land, air, and water resources. In addition, the *ahupua`a* maintains a sense of place through its place names, legends, and features making it easier for people to relate personally to their geography. Although the jury is still out, early evidence indicates that projects using *ahupua'a*-based approaches have been and continue to be successful. These early successes suggest that Hawaii's resource managers may be able to build on these efforts. This could eventually lead to the creation of island-wide integrated resource management systems based on *ahupua`a* principles. Such systems have the potential to generate increased public support, yield better environmental results, and save time and money.

Native peoples throughout North America and the Pacific successfully and sustainably managed water and land resources for thousands of years. However, knowledge and appreciation of these management activities has often been lost. Our experience in Hawaii suggests that by building on both the ideas of the past and the present, and working together as communities, we can develop and implement a vision of resource management that will ensure the maintenance and enhancement of our unique island environments on into the future. The power of this localized vision to mobilize people and resources toward integrated land and water management activities suggests that other communities may find it productive to investigate and build upon traditional local management approaches.

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