2013

Conserving Fish and Forests: Community Involvement and Its Limits in Resource Management On the Island of Hawai'i

Amber W. Datta
Pomona College

CONSERVING FISH AND FORESTS: COMMUNITY INVOLVEMENT AND ITS LIMITS IN RESOURCE MANAGEMENT ON THE ISLAND OF HAWAI'I

Amber Datta

In partial fulfillment of a Bachelor of Arts Degree in Environmental Analysis, 2012-2013 academic year, Pomona College, Claremont, California

Readers:

Professor Char Miller

Professor Diane Thomson

TABLE OF CONTENTS

Introduction……..……...……..…… 2

Hawaii: A Biodiversity Hotspot…….…… 4

Community Involvement in Resource Management…….. 7

The Case Studies…….. 11

The Historical Relationship…….. 12

A Community and Its Fish…….. 34

A Community and Its Forests…….. 59

The Promotion and Limits of CBRM…….. 70

Drawing Conclusions……..…….. 75

Literature Cited…….. 80

Appendices……..…….. 85

Appendix A: Map of the Nine FRAs…….. 85

Appendix B…….. 86

Appendix C…….. 87

Acknowledgements

Thank you so very much to my primary reader, Professor Char Miller, whose office I would often enter feeling like the world was on my shoulders, and yet leave feeling as though it was at my feet. Thank you also to Professor Diane Thomson, whose comments and conversations were an invaluable addition to the process of conceptualizing and writing this thesis. Thank you to David Tarnas (former N. Kona and S. Kohala District Representative), Dr. William Walsh (Division of Aquatic Resources), Marilyn Herkes (West Hawaii Fisheries Council), and Tina Owens (West Hawaii Fisheriec Council) for their willingness to help and the resources they provided me with. Thank you to my family, for their encouragement, interest and constant stream of relevant news articles. Thank you to my friend Will Keith, whose conversations and moral support saw me through every step of the way. Thank you to my peers for talking, writing, and struggling through every aspect of this process with me.

Introduction

Four hundred and thirty thousand years ago the Island of Hawaii broke the surface of the Pacific Ocean,[1] isolated from the nearest landmass by more than two thousand miles of open water. Today, over 21,000 species and more than 185 thousand people live on its slopes, with an additional million people visiting as tourists each year.[2] World famous as a vacation "paradise," residents and visitors to Hawaii alike share an appreciation for Hawaiian nature and all that it has to offer. For some, Hawaiian nature is a morning trip to a beautiful white sand beach, for some it is an exhilarating hunting trip high on the mountain slopes, and for still others it is a hike in the forest, a fishing trip, a SCUBA adventure or a bird watching extravaganza. Nature is a major reason people come to Hawaii, and a major reason that many choose to stay. Regardless of class, culture, or ethnicity— of which there are many in Hawaii— people are constantly interacting with the environment. The islands are indeed an ecological treasure and a people's paradise, but striking the balance between these two identities is a process far less peaceful than this tropical scene suggests.

Over everything from the green and golden coral heads that host parties of butterfly fish dressed in stripes and speckles, and of tangs in highlighter yellow, to the misty cloud forests that conceal ruby red honeycreepers and sharp-eyed Hawaiian hawks, lies an invisible framework of rules and regulations that attempts to mediate human interactions with this nature. Without these, the everyday life described above would not

---

[1] Fleischer, Robert C., Carl E. McIntosh, and Cheryl L. Tarr. 2002. Evolution on a volcanic conveyor belt: using phylogeographic reconstructions and K-Ar-based ages of

[2] "Historical Visitor Statistics." *Hawaii Tourism Authority*. Hawaii Tourism Authority, n.d. Web. 9 Nov 2012 <http://www.hawaiitourismauthority.org/research/reports/historical-visitor-statistics/>.

be possible. Without limits on fishermen, snorkelers would see fewer fish; without management of wild game, hunters would come back empty-handed. From the beaches and the tourists to the fish and the fishermen to the game mammals and their hunters, the people and nature of Hawaii survive in the context of one another, and thus it is necessary to carefully manage these interactions in order to provide the lifestyle that is so often taken for granted by the island's residents. Although the word "framework" may suggest a stiff set of rules, management strategies through Hawaii's history have been as dynamic as the human-environment interactions themselves.

In recent decades resource management in Hawaii has become increasingly flexible; following a global trend, strategies to involve local communities in order to conserve biological diversity and ecosystem function have begun to evolve in Hawaii's resource management system. Community involvement is the newest approach for resolving interest group conflicts in a number of fields; for conservation it is being developed as a method of achieving conservation goals by allowing multiple people groups, each with different interests in resource use, to collaborate in forming effective management policies. The diversity of interest groups dependent on natural resources has made management efforts in Hawaii, as elsewhere, a complicated and often tense endeavor. Conflicts of marine and hunting game resource use in Hawaii are especially high; in each case several groups of people have different goals for the same resource. The first goal of this study is to examine how community involvement has been implemented in Hawaii as an attempt to achieve conservation goals by collaborating with these interest groups. Two case studies have been chosen from the Big Island, where this form of management has been noticeably active in recent years. The first case study is the

West Hawaii Fisheries Management Area, where a group of community stakeholders provides management recommendations that are then implemented by the state. The second case study is the Ka'u forest reserve, where community involvement is invited into the management decision-making process but is also limited in its ultimate political power by the state. These case studies will demonstrate the use and limits of community involvement in resource management.

This paper is structured as follows. First, the importance of conservation in Hawaii and its corresponding resource management goals are described. Next, a more detailed discussion of the meaning of community involvement is given. The case studies are placed in the context of the history of resource management in Hawaii then discussed individually in terms of what conservation goals they accomplish and how this is done using community involvement. This is followed by a discussion of the limits of community involvement and what this implies for how community should be involved in resource management in Hawaii and elsewhere.

Hawaii: A Biodiversity Hotspot

Hawaii has been named a "biodiversity hotspot"[3] and an "exceptional natural laboratory."[4] With more than 1000 species of flowering plants, 2000 non-flowering plants, 7000-8000 insects, 1000 land snails, 1500 marine mollusks, 100 birds, 680 fish, 8000 marine algae and plants, three sea turtles, one bat, and one seal, Hawaii has more than caught the attention of ecologists and evolutionary biologists.[5] Rooted in these two

[3] Wilson, E. O. "The Creation of Biodiversity." Page 23.
[4] Simon, Chris. 1987. "Hawaii evolutionary biology: an introduction." Page 175.
[5] Ibid. Page 175.

disciplines, conservation biology exists to explore and protect biodiversity like that of Hawaii. The definition of this field displays this goal plainly: "an integrative approach to the protection and management of biodiversity that uses principles and experiences from [a wide range of academic disciplines]."[6] From the perspective of a conservation biologist, Hawaii is valuable as more than a tourist attraction or an ideal home; it is a place to unlock the mysteries of evolution and study the many, potentially useful, non-human species that call it home.

Conservation biology has led to the recognition of the value of biodiversity at a global scale, and to a corresponding increasing concern over its rapid decline; species extinction rate today is estimated to be 100 to 1000 times what it was before human populations skyrocketed and technology advanced to the point that this one species now dominates the earth.[7] The value of this quickly-disappearing biodiversity has been simply summarized into four main points: 1) as humans we have an ethical responsibility as the dominant species on Earth to steward other species, 2) biodiversity is aesthetically pleasing, which can be valued at the personal level but also economically in the form of ecotourism or in the making of nature films, 3) humans have obtained food, industrial, and medicinal products from biodiversity, which has the potential to provide much more as it is further explored, and 4) plants, animals, and microorganisms contribute to a range of free ecosystem services, such as filtering water and maintaining soils, that humans

---

[6] Meffe, Gary K. "Conservation biology and the preservation of biodiversity: an assessment." Page 256.
[7] Vitousek, Peter M., Harold A. Mooney, Jane Lubchenco, Jerry M. Melillo. 1997. "Human Domination of Earth's Ecosystems." Page 498.

depend on.[8] These values as a whole have made the conservation of biodiversity a priority among environmental nongovernmental organizations (NGOs) and have led to international meetings like the Convention on Biological Diversity and the Global Biodiversity Forum. Hawaii is an important contribution to global biodiversity and especially to national biodiversity; this state makes up only 0.2% of American land area, yet it is home to approximately a third of the nation's plants and animals listed as endangered or being considered for this list.[9] Despite the importance of Hawaiian biodiversity to the United States, extinction rates of native species due to invasive species and other factors are severe: 63% of known extinct plants and 72% of known extinct birds in the United States were endemic to Hawaii.[10]

Conservation goals in Hawaii are focused on slowing this loss of biodiversity and ecosystem function in order to uphold the biological integrity of these unique islands and thus support the people who depend on them. If biodiversity is lost, ecosystems and their functions degrade,[11] and vice-versa. In other words, in order to sustain biodiversity, resource management efforts must focus on entire ecosystems in addition to the individual species of which they are composed.[12] This paper

---

[8] Ehrlich, P. R., and A. H. Ehrlich. 1992. "The value of biodiversity." *Ambio: A Journal of the Human Environment.* 21.3: 219-226. Page 219.
[9] Vitousek, P. M., L. L. Loope, C. P. Stone. 1987. "Introduced species in Hawaii. Biological effects and opportunities for ecological research." Page 224.
[10] Stone, Charles P. and Stephen J. Anderson. 1988. "Introduced animals in Hawaii's natural areas." Page 134.
[11] Chavas, Jean-Paul. 2008. "On the productive value of biodiversity." *Environmental and Resource Economics.* 42.1: 109-131. Page 109.
[12] Brosius, Peter J., Anna Lowenhaupt Tsing, and Charles Zerner. 1998. "Representing Communities: Histories and Politics of Community-Based Natural Resource Management." Page 163; International Union for the Conservation of Nature (IUCN) – The World Conservation Union. October 1999. Report of the Eleventh Global

focuses on the management of marine and forest ecosystems, whose functions provide fish (for both visual and edible use) and clean water, respectively, to Hawaii communities. These communities themselves have become involved in this management in an attempt to improve conservation of their resources.

Community Involvement in Resource Management

The idea to involve community in resource management is most easily understood by considering a recently developed model: the Community-based Resource Management (CBRM) model. This model seeks to involve community in the previously top-down governmental process of resource management. It is based on the idea that local populations are better able to manage resources than state or distant corporate managers because they are more aware of intricate local ecological processes, have a vested personal interest in using resources sustainably, and have local or "traditional" institutions for access that are more effective than top-down strategies.[13] This approach avoids the "clumsy" nature of top-down, "one-size-fits-all, command-and-control" systems that lack the social and ecological details needed to manage resources effectively at the local scale.[14] Conservationists and environmentalists see CBRM as a way to "involve local people in transnational conservation and resource management goals as a

---

Biodiversity Forum: Exploring Synergy Between the UN Framework Convention on Climate Change and the Convention on Biological Diversity. Page 11.

[13] Brosius, Peter J., Anna Lowenhaupt Tsing, and Charles Zerner. Page 158; Nickelsburg, Stephen M. 1998. "Mere volunteers? The promise and limits of community-based environmental protection." Page 1372; Agrawal, Arun and Clark C. Gibson. 1999. "Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation." Page 631.

[14] Nickelsburg, Stephen M. 1998. Page 1374.

means of protecting biological diversity and habitat integrity."[15] In other words, CBRM harnesses the ability of communities to manage their resources to effectively achieve conservation goals. In recent decades, this model of resource management has grown from a few small-scale projects to a transnational movement.[16]

The CBRM approach has been successful to some degree in the United States and across the world. An example of CBRM in the U.S. is the Applegate partnership in southern Oregon, a community-based effort that has improved the watershed in its area and created an information base for those interested in watershed related issues.[17] Another example is the Malpai Borderlands Group, which works along the southern Arizona-New Mexico border and has managed to ease some of the famously tense ranching land use issues in the area by creating a forum for discussions between ranchers and conservationists. These discussions have led to the creation of a grass banking system; this system allows ranchers to graze their cattle on the sustainably managed Gray Ranch while letting their own ranch recover, which allows grasslands to restore while helping out the ranchers.[18] Community-based management of forests in Ghana has successfully enhanced forest cover where land-owning farmers are dominant.[19] Over 100 CBRM projects related to coastal management in the Philippines have been implemented, leading to increased job satisfaction among fishermen and overall improvements in coral reef

---

[15] Brosius, Peter J., Anna Lowenhaupt Tsing, and Charles Zerner. Page 158.
[16] Ibid. Page 158.
[17] Nickelsburg , Stephen M. 1998. Page 1396-1398.
[18] Ibid. Page 1404.
[19] Leach, Melissa, Robin Mearns, and Ian Scoones. 1999. "Environmental entitlements: dynamics and institutions in community-based natural resource management" Page 227.

management, although this varied by project and method.[20] These are a few of a wide variety of examples of CBRM implementation, which give an overall sense that this new management system has been a success.

However, while CBRM has potential, it has also had some noticeable failures. The Applegate Partnership succeeded in improving its watershed, but could not come up with a plan for forest product use that was accepted by industry, government and environmental groups. The fate of the forest was ultimately placed in government hands, which made the forest an "adaptive management area" (AMA) and forbid environmental groups from challenging timber sales under the 1995 Salvage Rider[21] provision.[22] The community-based Applegate partnership became "one of several participants in an agency-coordinated negotiation process," as it could not spearhead management efforts involving the diametrically opposed loggers and environmentalists.[23] Out West, The Malpai Borderlands Group created the grass banking system, but did not get all 35 ranchers in its area involved, and in fact has been directly opposed by some of those ranchers because of its perceived alliance with conservation goals.[24] In Ghana, forests are sustainably used where landowners live, but not where recent immigrants who only have land tenancy arrangements exist.[25] The 100 coastal resource management projects in the

---

[20] Pomeroy, Robert S., Richard B. Pollnac, Brenda M. Katon, and Canesio D. Predo. 1997. "Evaluating factors contributing to the success of community-based coastal resource management: the Central Visayas Regional Project-1, Philippines." Page 97-99 &112.

[21] The Salvage Rider allowed timber companies to expedite logging by suspending the environmental restrictions that would have held them back (Elderkin 1996).

[22] Nickelsburg, Stephen M. 1998. Page 1401-1402; Elderkin, Susan. 1996. "What a difference a year makes." Page 1.

[23] Nickelsburg, Stephen M. 1998. Page 1402.

[24] Ibid. Page 1405.

[25] Leach, Melissa, Robin Mearns, and Ian Scoones. 1999. Page 227.

Philippines have shown an overall success, but individual projects like constructing artificial reefs failed.[26] In summary, the CBRM approach has high ideals but a hit-and-miss success rate. Despite these failures, CBRM is being promoted both within the United States and elsewhere in the world. There are some, however, who criticize such widespread approval of the model.

Critics of those who promote CBRM do not oppose the concept of CBRM directly, but rather point out weaknesses in the foundation of CBRM thinking, with the hope that the CBRM approach can be improved. One critic wrote of CBRM: "[the model's] oversimplification and flawed basic assumptions mean [it] serve[s] as [a] poor and misleading guide for translation into operational strategies and programs."[27] In other words, there are flaws in the basic assumption that communities desire conservation of natural resources and are capable of accomplishing it. Critics note that these flaws are rooted in a basic assumption that the CBRM model makes about community: community is thought of as "a small spatial unit, as a homogenous social structure, and as shared norms[28]." The model considers community to be a unified, cooperative unit. In contrast, critics define community as having "multiple interests and actors within [it]," and thus in understanding community the focus should be on "how these actors influence decision-making."[29] Critics expand on this approach, writing, "to be more accurate in our efforts to depict communities and their relationship with their natural resources— and thus to be more relevant to policy-making— we argue that greater attention be focused on…the

---

[26] Pomeroy, Robert S., *et al*. 1997. Page 112.
[27] Leach, Melissa, Robin Mearns, and Ian Scoones. 1999. "Environmental entitlements: dynamics and institutions in community-based natural resource management." Page 229.
[28] Agrawal, Arun and Clark C. Gibson. Page 630.
[29] Ibid. Page 630.

multiple actors with multiple interests that make up communities…and…the institutional arrangements that structure their interactions."[30] Another critic adds: "Only through the explication of specific histories and political dynamics can we begin to address the problems and prospects of [CBRM]."[31] In other words, in order to use CBRM effectively the different interest groups that compose a community must be recognized.

This more critical perspective shapes how I examine community involvement in resource management on the Big Island of Hawaii. In this study I examine how community has been involved in West Hawaii fisheries and Ka'u forest management to achieve conservation goals. I specifically consider three things: 1) the composition of the community in each case 2) the extent to which conservation goals were achieved due to decisions that were the result of interest groups' collaborative desire to conserve, and 3) what these results suggest about the limits of using community involvement to achieve conservation goals and what this implies about where and when to promote CBRM.

The Case Studies

The ideal of the CBRM model says that conservation goals will be met most fully if community is given power and can collaborate in making decisions about resource management. On the Big Island, community has been involved to varying extents in forestry and marine management. The first case study, the marine management area along the island's west coast, is an example of where community has demanded and been given a significant amount of power in making management recommendations, which are generally adopted by the state once consensus is reached. As will be seen, this is an

[30] Agrawal, Arun and Clark C. Gibson. Page 636.
[31] Brosius *et al*. Page 160.

example of where the CBRM model is working relatively well to achieve conservation of the reefs. The second case study, the Ka'u forest reserve, is an area where community is demanding more decision-making power, but is currently only involved to a limited extent. It will be shown that conservation goals are nonetheless starting to be met in the area using the current approach, and that promoting the CBRM model here may not be best for the continued achievement of conservation goals. To give a better understanding of the management issues at hand, these two case studies will first be placed in the context of the history of resource management in Hawaii.

The Historical Relationship of Hawaiian Nature with Hawaii's People

The history of resource management in Hawaii illustrates the dynamic nature of the relationship between the islands and the people who populate them. It follows that the history of this relationship can be broken down first according to the order in which two general people groups arrived in Hawaii: the Polynesians and then the Westerners. This recounting will cover briefly the development of resource management by the Hawaiians, but will focus primarily on the environmental and political changes brought about by the Westerners. It should be noted that many such changes occurred, but here I will focus specifically on those that inform the current struggles with marine and forest management. The rise of conservation in resource policy will also be discussed. Focusing on these topics will provide the specific historical context needed to understand the current struggles to manage fisheries and native forests on the Big Island.

The Island-Islander Relationship Begins

Forest dominated the slopes of the main Hawaiian Islands in the time before the first men landed on its shores. Dense lowland rainforests grew along the wet windward coasts and up the mountainsides until they merged with montane rainforests that stretched up to the tree line at 8,000 feet. On the drier leeward side of the islands the forests were sparser along the coast and graded up to dryland then montane tropical forests at higher elevations.

The Polynesians of the South Seas, specifically those from the Marquesas, arrived around 700 A.D, beginning the islands' first dynamic relationship with humankind.[32] In time the newcomers brought the entirety of their culture to the islands, eagerly entering what was truly a virgin landscape. As the Polynesians introduced their various subsistence strategies to these new landscapes they were forced to adapt to new types of terrain, transforming both the land and their culture in the process. They initially found fish but few other sources of food; over time they planted seeds and cuttings of taro, banana, coconut, and other plants now often mistaken for "native."[33] As the Hawaiian population grew, fishponds and irrigation systems were invented, and the land was divided up into ahupua'a.

Ahupua'a were wedges of land that divided each island almost like a pie, so that each piece included a central river, starting at the headwaters and descending all the way down to the sea. This allowed the inhabitants of each Ahupua'a to utilize the variety of resources offered by each ecological zone, from the fish of the shallows to the valuable

---

[32] Tabrah, Ruth. 1980. *Hawaii: A Bicentennial History*. 1st ed. New York: W. W. Norton & Company, Inc. Page 12.

[33] "A Natural history of the Hawaiian Islands: selected readings II." Ed. Alison Kay. Honolulu: University of Hawaii Press, 1994. Page 399..

Koa wood and bird feathers of the upland forests. The Ahupua'a were based on natural boundaries but primarily served as a tax unit in the political system. The majority of the population within each land division devoted themselves to some aspect of cultivation, fishing or craft. These people are commonly referred to as the "Maka'aina," meaning "eyes of the land," and are roughly equivalent to the commoners of old European feudalism.[34]

To give a brief outline of the socio-political structure, the "Konohiki," were the lesser warrior chiefs, supervising agents, and dependents of the high chiefs, who collectively governed the Maka'aina; the high chiefs, to whom the Konohiki were subject, were called the "Ali'i". At the highest level were the "Mo'i," or supreme chiefs, who were unified by Kamehameha I in 1810.[35] Taxes were transferred from the Maka'aina up through the system to the Moi'i. Management of resources and construction of things like new irrigation systems were taken very seriously. For example, things like water rights were given to individuals according to how much work they had put into building the system; on the other end, if anyone had the misfortune of breaking a dam, shareholders killed him and crammed his body into the break.[36] In addition to the ahupua'a system, the king could use a management method called the "kapu," a decree that restricted the use of resources at certain places and times. The

[34] Unlike European society, there were no serfs, meaning that even members of the lowest level of Hawaiian society were free to leave their land at all times (E.S. Handy & E. Handy 323)
[35] Handy, Craighill, and Elizabeth Handy. *Native Planters in old Hawaii: their life, lore and environment*. Page 59.
[36] Ibid. Page 59.

punishment for breaking the kapu was often also death.[37] It is interesting to note that although there was a turnover in the upper levels of society as the Mo'i succeeded one another, the Maka'aina were almost always allowed to stay with their land, allowing for a sense of permanence despite a lack of ownership.[38] In summary, the old Hawaiian system worked similarly to feudalism, using a severely enforced top-down system of management; the people were ruled by several levels of royalty and worked directly with the land to sustain themselves and their communities.

It is worth noting that this system promoted sustainability but should not be idolized; the king managed resources at a detailed level but the methods of agriculture and forestry still had some serious impacts on the islands' ecosystems. As the population of natives increased, so did their demands on the land. Although much care was put into the organization and management of the ahupua'a, the natural terrain was still severely altered and eroded, and some endemic species, especially birds with desirable feathers, were pushed to extinction.[39] There is little information available on the state of fisheries under the ahupua'a system, but it is suspected that they were susceptible to overexploitation. A kapu was placed on certain species or reef areas when their populations dwindled; fishponds, which are still intact today, may have been created to consistently provide fish during such bans. These kapu rules on fisheries may also have led to an increased dependence on terrestrial resources.[40] Further up the mountain slopes,

---

[37] Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, T. A. Wilhelm. 2011. "Marine resource management in the Hawaiian archipelago: the traditional Hawaiian system in relation to the Western approach." Page 3.
[38] Ibid. Page 41-42.
[39] Kirch, Patrick. "The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem." *A Natural History of Hawaii*. Ed. Alison Kay. Page 426.
[40] Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, T. A. Wilhelm. Page 4.

areas that were once forested were cleared for agriculture, leading to today's dry and grassy slopes, characteristic of places like the Ka'u coast of the Big Island (except for the forest that remains in the reserve area).[41] When Captain Cook arrived in 1778, an estimated 25% of the original forests, especially those of the lowlands, had been transformed by agriculture and introduced animals for over 1,000 years into an "anthropogenic grassland fire regime."[42]

It is seen here that the Hawaiians had set up a complex, top-down system of resource management based essentially on the watershed structure of the islands, given that each ahupua'a was centered on a river. This system supported communities but also had a significant impact on the previously "pristine" natural systems of the islands. Western arrival brought further degradation to these systems and gradually replaced the Hawaiian monarchy with American federal government, which replaced the ahupua'a system with a government department that manages resources using several divisions. Although this system differed somewhat in its structure, it is notably similar to the old monarchy in that it manages resources primarily from the top-down, with the state imposing its rules on the people. The details of the coming of the Westerners and the environmental and political changes they brought are given in the next sections.

---

[41] Cox, Thomas R. 1992. "The Birth of Hawaiian Forestry: The Web of Influences."; Handy, Craighill, and Elizabeth Handy. *Native Planters in old Hawaii: their life, lore and environment*.

[42] Ahue, Keith W. State of Hawaii. Division of Forestry and Wildlife. *Hawaii Tropical Forest Recovery Action Plan*. Page 6. ; Cox, Thomas R. 1992. "The Birth of Hawaiian Forestry: The Web of Influences." Page 170.

Environmental Changes

After the arrival of Captain Cook, the European influence increased in Hawaii and human impacts on the islands accelerated.[43] The lowland and even the higher elevation forests began to be affected by the growing presence of human beings. Through the 1700's and 1800's both Eastern and Western men came to Hawaii, bringing ranching and plantation agricultural practices with them. With the rise of plantations, agriculture was intensified, and harvests were more severe.[44] In fishing, new technologies were introduced, including the use of explosives, which were banned by Queen Liliuokalani in 1892.[45] Although the ahupua'a system was by no means perfect, this new approach to resource use and the introduction of new species was more destructive. The impacts of Western practices were many and varied, ranging from intensive logging of native sandalwood to clearing the land for cattle ranching. These impacts are important for understanding the current state of Hawaii's ecosystems as a whole, but for the purpose of this research only those which led to the current struggles in forest resource management will be discussed in detail. The impact most relevant to today's struggles is the introduction of invasive ungulate species. The following section discusses the first introductions of these species and the impacts they had on Hawaiian landscapes.

[43] Cox, Thomas R. Page 170.
[44] Ibid. Page 1.
[45] Walker, Ronald L. 1978. "A history of the division of fish and game," Page 1.

Hoofprints on the Land

Introduced ungulates—animals with hooves—are now recognized for their destructive influence on Hawaiian forests, but they were initially introduced for subsistence and purposefully allowed to spread. The Hawaiians were responsible for the introduction of the pig, but Westerners brought the sheep, goats, horses, cattle, and a new species of pig.[46] In 1778 Captain Cook left goats and additional pigs with the Hawaiians as a gift. In the 1790s the British imported sheep but found that they were not economically viable; they were allowed to escape and spread into the forests, where they multiplied without hindrance.[47]

Captain George Vancouver brought the first cattle to Kealakekua, a famous bay on the Big Island, from California in 1793, as a gift to King Kamehameha I.[48] From seven females and three males an entire population of wild cattle was permitted to grow under a kapu on killing them placed by the king. The first pair of horses was gifted to Kamehameha I in 1803, as the cattle population was growing; this was the beginning of ranching in Hawaii. King Kamehameha III lifted the kapu on cattle in 1830, but by 1846 the population of free-roaming cattle had increased to 25,000, and semi-domesticated cattle numbered around 10,000.[49] Cattle weigh between 1,200 and 1,500 pounds apiece and have a horn spread of up to six feet; they became a danger to people directly as well as through consumption of crops and the thatching on houses. It is thus not surprising that the hunting of cattle was encouraged after the kapu was lifted. To provide food for

---

[46] "History of Agriculture in Hawaii." *Division of Land and Natural Resources*. Web.
[47] Ahue, Keith W. State of Hawaii. Division of Forestry and Wildlife. *Hawaii Tropical Forest Recovery Action Plan*. Page 6; Cox, Thomas R. 1992. "The Birth of Hawaiian Forestry: The Web of Influences." Page 170.
[48] "History of Agriculture in Hawaii." *Division of Land and Natural Resources*. Web.
[49] "Introduction of Cattle." *HawaiiHistory.org*

domestic cattle, the cattle industry introduced fountain grass, mullein, and kiawe; all of which have become invasive, competing with and overcoming native plant species across the Big Island.[50] These introductions of ungulates have dramatically reshaped Hawaii's cultural and natural landscapes.

Feral ungulates, especially sheep, goats, and pigs, destroy forest habitats in a myriad of ways. Pigs dig up forest ground cover, while sheep and goats forage on plants to such an extent that they often cannot regrow. These activities result in barren landscapes, soil erosion, local extinction of rare plants, and degradation and elimination of habitats that support rare birds and invertebrates. Additionally, once habitats have been destroyed, space becomes available for invasive alien fire-adapted grasses to replace native species.[51] Although these ungulates wreak havoc on native ecosystems, they make for good hunting and thus have reshaped Hawaiian culture by becoming an important source of sustenance and form of recreation.[52] Hunting culture developed alongside plantation agriculture, forestry, and fisheries— as the populations of foreign species, human and nonhuman, increased, so did the need for effective management systems.

Political Changes

King Kamehameha II (1797- 1824) and Queen Ka'ahamanu abolished the traditional kapu system in 1819.[53] Hawaii became a constitutional monarchy by 1840, and in 1848 the Hawaiian land was divided between the government and King Kamehameha

[50] Stone, Charles P. and Stephen J. Anderson. 1988. "Introduced animals in Hawaii's natural areas." Page 134; "Introduction of Cattle." *HawaiiHistory.org*.
[51] Stone, Charles P. and Stephen J. Anderson. Page 137.
[52] DLNR. *Environmental Assessment.* Page 67.
[53] Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, T. A. Wilhelm. Page 4.

III's private "Crown" lands, which was a considerably smaller portion.[54] In 1850 the Kuleana Act was passed, establishing fee simple ownership and thus allowing land to be sold to private parties with no interest in sustaining the ahupua'a system. This is what allowed for the creation of the plantations and the importation of workers, which diluted the Hawaiian ethnic population.[55] With the disappearance of the monarchal ahupua'a system, a new structure for resource management was developed.

Institutions to Manage Nature

The establishment of today's resource management system began in earnest when the Hawaiian kingdom was overthrown and Hawaii was annexed into the Unites States in 1898; at this point management of both fisheries and terrestrial resources was handed over entirely to the government, which continued to create new institutions.[56] The story of the development of the current management system reflects a change in priorities over time; what started as an attempt by the government to create an environment that pleased its citizens is now an attempt to conserve both Hawaii's original natural resources and its past and present cultural resources in an attempt to maintain resources for these citizens. It will be seen in the first case study that this final goal is confounded by the development of hunting culture within native culture, which has complicated today's forest reserve management process. The creation of the divisions of government that manage resources and the shifts in the priorities will now be described to provide a foundation for today's situation.

---

[54] La Croix, Sumner J., and James Roumasset. 1990. "The evolution of private property in nineteenth-century Hawaii." Page 839.
[55] Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, T. A. Wilhelm. Page 4.
[56] Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, T. A. Wilhelm. Page 4.

The government began by dividing responsibilities among several different divisions. In 1892 a Bureau of Agriculture and Forestry was established to manage animals related to agriculture.[57] In 1903, the Legislature of Hawaii passed a bill that established the Division of Forestry. The Division of Forestry created thirty-seven forest reserves, a total of nearly 800,000 acres, between 1904 and 1913, notably with a primary management goal of excluding livestock from the native forests.[58] This eradication program was expanded in 1907 to include a hunting license system that required a $5.00 tax payable to Hawaii counties. This eradication was, ironically, the precursor to today's game management system, which seeks to maintain ungulate species.[59] This shift from the eradication to the maintenance of wild game is contrary to current conservation goals, but it occurred alongside the development of these goals. It is important to note that these two developments are contrary to each other, but that their histories are intertwined; they will therefore be described in concert with one another.

Management Dichotomy: Game Management and Conservation

In 1908, Governor Frear, appointed in 1907, called for a "Territorial Conservation Commission of Hawaii" to investigate the natural resources of the then Territory of Hawaii and recommend wise development and use. This was the beginning of a conservation program for Hawaii. This scientific investigation provided the information used to start the current system of wildlife sanctuaries and refuges under the Division of

[57] Walker, Ronald L. 1978. "A history of the division of fish and game." Page 2.
[58] Ahue, Keith W. State of Hawaii. Page 7.
[59] Walker, Ronald L. 1978. "A history of the division of fish and game," Page 1; Conry, Paul J. State of Hawaii. Division of Forestry and Wildlife. *Game Management Program FY01-FY05*. Page 1.

Forestry; this system began with the protection of bird, animal and plant life on islands off Molokai and Oahu in 1917.[60]

In 1919 a "Fish and Game Commission" was created under the Board of Agriculture and Forestry to focus on animal species management. At this point in time hunting and fishing laws were all but non-existent; there were no bag limits, hunting seasons or other related restrictions. Forest reserve areas remained focused on "wild-animal" eradication programs; the Board of Agriculture and Forestry soon began involving the public in massive goat drives to further this effort. From 1921 to 1922 these goat drives led to the eradication of 7,000 goats from Puuanahula and Puuwaawaa areas on the south side of the Big Island.[61] The Division of Forestry expanded the eradication program to include the general public more consistently during the Great Depression through a system of issuing special hunting permits. The economic struggles of the time demanded this change because of the greatly increased demand for meat; the public killed approximately 30,000 pigs, sheep, goats, horses, cows, donkeys and deer annually during this ten-year period.[62] These ungulates, which were at the time considered a pest, were now becoming important sources of food for Hawaii's people. This shift in use was not, however, immediately recognized in management policies.

The goats continued to be eradicated, but other ungulates, Axis deer, were simultaneously being introduced for sport hunting. In the early 1930s deer were introduced to Maui from Molokai to spread their availability for hunters. The first game warden was hired in the 1920s to assist in law enforcement. During this period the first

[60] Ahue, Keith W. State of Hawaii. Page 7.
[61] Walker, Ronald L. 1978. "A history of the division of fish and game," Page 1
[62] Ibid. Page 2.

bounty, $1.00, was placed on feral goats on the island of Oahu. Fees from hunting and fishing licenses were used to support the game farm established at the Mokapu Peninsula on Oahu in 1921 and were managed by the Hawaii Fish and Game Commission.[63]

This game farm began after July 1927, when the Territorial legislature abolished the Fish and Game Commission, replacing it with the Division of Fish and Game under the Board of Agriculture and Forestry. Part of its mission was to "develop the game farm to increase game bird distribution…at the Mokapu facility."[64] The Mokapu game farm was part of an effort by the Territory of Hawaii to raise introduced game birds and release them into the forests for hunting interests, although this interest was only minor at this time.[65] The farm was funded by the donations of four different counties, in addition to the revenue generated by hunting licenses.[66] It was approximately 350 acres, 12 of which were fenced. Birds were imported from the continental U.S., Japan, Australia, the East Indies, and Africa, to be raised and released. The only native bird raised on the game farm was the Nene, due to concerns about its dwindling population in the wild; this was one of the first species conservation efforts in Hawaii, but it was unfortunately unsuccessful as all but one of the 42 birds raised died after being released into the wild.[67] In 1930 more than 1,500 ring-necked pheasants were released on Oahu, Kauai, Molokai, Maui, and Hawaii. It was common for an individual hunter to bag 30 to 40 cocks in a year. By around 1938 over 40,000 game birds were being released throughout the state each year. The Mokapu facility, and the game farm approach in general, came to an

[63] Walker, Ronald L. Page 1; Devaney, Dennis M., Marion Kelly, Polly Jae Lee, and Lee S. Motteler. *Kane'ohe: A History of Change*. Page 95.
[64] Ibid. Page 1.
[65] Devaney, Dennis M., Marion Kelly, Polly Jae Lee, and Lee S. Motteler. Page 95.
[66] Walker, "A history of the division of fish and game." Page 2.
[67] Devaney, Dennis M., Marion Kelly, Polly Jae Lee, and Lee S. Motteler. Page 97.

abrupt end on December 7th, 1941, when Japanese planes destroyed the farm during the bombing of Pearl Harbor.[68]

Although the game farm was destroyed, the hunting interest it fed had now grown substantially. By providing increasing numbers of game birds the government was promoting hunting interests and thus facilitating the integration of hunting into the culture even as it was continuing to eradicate ungulate hunting game elsewhere. The increase in hunting interests was restricted for a time during World War II, but this did not prevent the demand for public hunting from continuing to increase later on.

The ungulate eradication program that had begun to flourish during the Depression was severely curtailed by the reduction in the number of firearms possessed by the public during the war. In 1941 public fishing and hunting were prohibited. As the war progressed, some restrictions on hunting and fishing were lifted for eradication purposes only; from 1943 and 1944, just over 4,000 sheep, pigs and goats were removed throughout the state, a significant decrease from previous years.[69] When the war ended in 1945 hunting and fishing restrictions were restored to what they were before the war. The demise of the game farm at the beginning of the war and the grants for wildlife introductions and habitat maintenance made available by the Federal Aid in Wildlife Restoration Act,[70] passed in 1939, encouraged a new, science-based approach to game management in Hawaii.[71] This new approach prompted the final shift from the game "eradication" goal to a game "harvesting" goal.

---

[68] Walker, "A history of the division of fish and game." Page 2.
[69] Ibid. Page 2.
[70] "Digest of Federal Resource Laws of Interest to the U. S. Fish and Wildlife Service." *Fish and Wildlife Service*.
[71] Walker, "A history of the division of fish and game." Page 2.

In an effort to begin a science-based approach to managing game in the wild, the Division of Fish and Game hired wildlife biologists to study game birds in Hawaii and recommend management practices based on their findings.[72] Upon completion of the study in 1947, the Division of Fish and Game began to "improve" habitats by placing water units in key hunting areas and by establishing new game management areas. Despite this promotion of some species of hunting game by this Division, game mammal hunting was still under the Division of Forestry and the eradication of mammals continued under its authority. The establishment of hunter camps, one of which was at Pohakuloa on the Big Island, facilitated this process. In 1946 game wardens were authorized to sell hunting licenses. Soon afterwards new laws and regulations were created by the state to regulate the harvest of game birds. These two Divisions were clearly conflicted in their goals for hunting game management; while the Division of Fish and Game set about creating new habitats for introduced species, the Division of Forestry was continuing their eradication, with the exception of game birds. As hunting interests increased, and the Division of Fish and Game grew, the management goals for ungulates began to reflect those for game birds.

The Division of Fish and Game expanded significantly during the 1950s. Cooperation with private landowners and management changes on State lands led to the establishment of new hunting areas throughout the islands. A total of 25,832 acres divided into three areas were under Division control for public hunting in 1950; by 1959 there were twenty-two such areas covering a total of 294,000 acres considered to be game

[72] Ibid. Page 3.

management area open to public hunting.[73] During this time, attempts to introduce new game species continued. While most of these species consisted of quail, francolins, and other game birds, the Division of Fish and Game also began to experiment with European bighorn (mouflon) sheep. These sheep were released onto Kauai and Lanai, and in 1957 experiments to hybridize them with the feral sheep on the Big Island were conducted. In the meantime habitat "improvement" efforts continued through the clearing of brushlands and establishment of water units and food plots for game birds. Studies were conducted on Axis deer and seasons were set by the state, with the first controlled hunting season occurring in 1954. The possibility of transferring Axis deer to the Big Island was considered, and in 1959 the deer were successfully transplanted from Molokai to the nearby island of Maui.[74] Although all these institutions, laws, and regulations were being formed to mediate the interaction of Hawaii's communities with nature, the communities themselves were not involved their creation or implementation. As game management continued to develop, the state remained in complete control of all management decisions.

The government now recognized and supported the increased hunting of both birds and ungulates for sport and subsistence throughout the islands, with the exception of a few areas. Through the early 1950s the Division of Fish and Game supervised game bird hunting on game management areas while the Division of Forestry continued its hunting "eradication" of mammals in forest reserves. Finally, however, these eradication efforts were abandoned as the Division of Forestry also began to recognize the importance of feral mammals for recreation and subsistence. The Division then closed

[73] Ibid. Page 3.
[74] Ibid. Page 3.

some forest reserve areas to hunting to allow the mammals to increase. This significant change in the approach to game mammal management is reflected in the new language used in the 1959 reports by the Division of Forestry; what was once referred to as "eradication" was now called "wild animal harvest."[75] The management of public hunting on some forest reserves like Mauna Kea was subsequently transferred to the Division of Fish and Game.[76] Although the switch from eradication to sustaining hunting game occurred for the public's benefit, decisions on how to accomplish this were still being made by the government, not the public itself, using the findings of hired wildlife biologists. During the following decade, the government redistributed management of forests, hunting game, and fisheries into the framework it has today.

These changes were prompted by new personnel and federal funding that were infused into Hawaii's resource management practice in the 1960s, after Hawaii's transformation from a territory to a state in 1959.[77] In 1961 the state government was reorganized, leading to the creation of the current Department of Land and Natural Resources (DLNR). The DLNR operates under the following mission statement: "[To] enhance, protect, conserve and manage Hawaii's unique and limited natural, cultural and historic resources held in public trust for current and future generations of visitors and the people of Hawaii nei in partnership with others from the public and private sectors".[78] After the creation of the DLNR, the Division of Fish and Game, Division of Forestry, and Division of Parks were transferred to this department, along with the Division of Land

[75] Ibid. Page 4.
[76] Ibid. Page 4.
[77] Ibid. Page 4.
[78] Mission Statement." Division of Land and Natural Resources. Web.

Management, Division of Conveyances, and Division of Water and Land Development.[79] In July of 1964 all State Forest Reserves were declared as public hunting areas, increasing total acreage open to public hunting from 522,000 to 950,000 acres. For the first time the Division of Fish and Game was given the responsibility of managing public hunting for *all* public lands.[80]

Although responsibilities had been shifted, management practices remained more or less the same. Game birds and mammals continued to be introduced to the islands. Several species of game birds were released on Kauai along with blacktail deer, while pronghorn antelope and mouflon sheep were imported to Lanai. Studies of Axis deer on Lanai and Molokai were completed and research on the feral pig began in order to develop management plans for these species.[81] Yet as these actions were being taken, conservation interest was growing across the nation and soon began reinforce what few conservation efforts had been taken in Hawaii. Today's management of forest reserves and other public lands continues to maintain game populations but must simultaneously comply to conservation laws created at the state and national levels, which are discussed in the next section.

National Conservation Comes to Stay in Hawaii

Non-game management and endangered species projects began to take form in 1965, when such efforts were recognized as important responsibilities of the Division of Fish and Game. Up until this point the only conservation-related program was for

[79] Walker, "A history of the division of fish and game." Page 5.
[80] Ibid. Page 5.
[81] Ibid. Page 5.

restoration of the native Nene goose mentioned earlier, and later of the Koloa, another native bird.[82] Attempts like these to protect native species intensified after the passing of the Endangered Species Act (ESA) at the national level in 1973. The ESA recognizes the human-caused extinction of many species, and hopes to slow this species loss. The purpose of the act is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved."[83]

Hawaii revised its endangered species laws in 1975 to match with the ESA, necessarily incorporating it into Hawaii resource management efforts, but the process was by no means clear-cut. Priorities on conserving endangered species amplified the conflicting management efforts to promote both invasive hunting game and native species. Because hunting had now become so much a part of Hawaii's culture, the DLNR could not simply switch its goals from promoting game back to eradicating it without angering the public. The current game management plan highlights this issue, stating, "One of the major Hawaiian natural resource management issues that has generated debate is the protection of native ecosystems versus public hunting."[84] This issue was further complicated when the State Program, Planning, and Budgeting System (PPBS) placed the Division of Fish and Game under three major, but separate programs in the 1970s: Culture and Outdoor Recreation, Environmental Protection (includes the meeting of ESA requirements), and Economic Development (for commercial fisheries). Attempts

[82] Smith, Donald J. 1952. "The Hawaiian goose (Nene) restoration program." Page 1-9; and, Walker, "A history of the division of fish and game." Page 5.
[83] "Endangered Species Program." *U. S. Fish & Wildlife Service.*
[84] Conry, Paul J. State of Hawaii. Division of Forestry and Wildlife. *Game Management Program FY01-FY05*. Page 1.

to carry out the conflicting interests of these programs resulted in a jumble of conflicting actions.

New areas for hunting and fishing recreation continued to be added to the system, and new game species and fish species were still being introduced to Hawaii's native ecosystems. Even as these actions were being performed, the provisions of the ESA were accelerating the release of the endangered Nene and Koloa and studies on Hawaii, Maui, and Kauai of other forest birds, including the Alala and Palila, were being conducted.[85] The U. S. Fish and Wildlife Service (USFWS) cooperated with the state to form "endangered species recovery teams," whose job it was to draw up plans for restoring various endangered forest bird species. Conservation actions taken on land were mirrored in marine management, where surveys to assess potential conservation areas were being conducted. These surveys resulted in the creation of 3 new Marine Life Conservation Districts, one of which was located at Kealakekua Bay on Hawaii Island.

In 1978 former administrator Ronald Walker of the Division of Fish and Wildlife (the renamed Division of Fish and Game) expected that the future of the Division would "probably see increased emphasis on aquaculture, endangered species and intensely managed fishing and hunting recreation."[86] He was quite right. As global conservation began to focus on biodiversity, Hawaii was soon recognized as a diversity hotspot. With thousands of unique marine and terrestrial species, resource management in Hawaii became a conservation priority, and by the time Ronald Walker made his prediction about fishing and hunting recreation, conservationists' community involvement approach was already being introduced to deal with these resource interests.

---

[85] Ibid. 6.
[86] Ibid. 7.

Institutionalizing Community Involvement

The Hawaii Environmental Policy Act (HEPA) of 1974 first required community involvement in Hawaii resource-related decisions by law. The HEPA was modeled directly off the National Environmental Policy Act (NEPA), signed by President Richard Nixon in 1974. A discussion of the NEPA will thus provide an understanding of the HEPA. The NEPA is often referred to as the "Magna Carta" of environmental laws in the United States because it was the first major environmental law, and laid the foundation for the nation's environmental policies. In response to recognition of human impact on nature, the NEPA states that it is the aim of the Federal Government to "use all practicable means…to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill all social, economic, and other requirements of present and future generations of Americans."[87] In an attempt to produce this "harmony" between man and nature, the Act invites the communities concerned about the environment into the management process.

In terms of what it does on the ground, the goal of NEPA is to require all government agencies in the executive branch to evaluate the environmental effects of any actions they intend to take, from managing public lands to building roads. The Council on Environmental Quality (CEQ) was established in the Executive Office of the President and is responsible for ensuring that Federal agencies comply with NEPA.[88] This environmental review process requires the involvement of the people in federal

[87] "The NEPA Statute." *National Environmental Policy Act.*
[88] United States. Council on Environmental Quality. *Citizen's guide to the NEPA: Having your voice heard*. 2007. Page 5.

environmental decisions, which is accomplished by presenting these assessments to the public and asking for feedback. This involvement of the public marks the passing of NEPA into law as a turning point in America's history of resource management. Rather than taking a top-down approach in which professionals make decisions that affect the whole of society, NEPA relies on the public because it believes "citizens often have valuable information about places and resources that they value and the potential environmental, social, and economic effects that proposed federal actions may have on those places and resources."[89] In other words, the government recognizes that the public can provide local level information that would otherwise be lacking and realizes that obtaining this information will improve the quality of the actions taken by government agencies in terms of mitigating the impacts they have on the environment.

To accomplish this goal of public involvement, the NEPA requires federal agencies to prepare an environmental assessment (EA) if environmental affects are uncertain, and an environmental impact statement (EIS) if environmental effects are likely to be significant.[90] Agencies also have a list of described actions called "categorical exclusions;" if an action is not expected to have a significant effect on the environment then the action is considered a "categorical exclusion" if it fits into the list of descriptions the agency has previously created.[91] An EA determines whether or not environmental effects are significant enough to warrant an EIS, and at the very least aids in the agency's compliance to NEPA if no EIS is needed. The level of public involvement in the EA is at the discretion of the agency, and ranges from completely open public comment periods to

[89] United States. Council on Environmental Quality. 2007. Page 1.
[90] Ibid. Page 8. See Appendix for flow chart of NEPA process.
[91] Ibid. Page 8.

only notifying interested members of the public. The EIS analyzes the ecological, aesthetic, historic, cultural, economic, social, and health effects of the proposed action. The EIS is reviewed by the Environmental Protection Agency (EPA), which then publishes a "Notice of Availability," signaling the start of a 45-day comment period for the public.[92] During this process agencies may hold public meetings or hearings to facilitate comments by the public. At the end of this period the agency must respond to these comments, then file a final ESI. A 30-day wait period ensues before the agency can make its final decision. If an action is found by the agency or by the EPA to be environmentally unacceptable, the issue is referred to the CEQ.

The NEPA applies only to federal agencies, but HEPA mirrors its concepts and applies them to Hawaiian state-level agencies. This reflection of NEPA in HEPA can be seen in its nearly identical purpose: "to establish a system of environmental review which will ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations".[93] Hawaii developed an Environmental Council (EC), analogous to the CEQ, as well as a process requiring EAs and EISs that are similar to those of the NEPA. The major difference between HEPA and NEPA is that while the NEPA review process is required for "major federal action significantly affecting the human environment," the HEPA review process is required when any of nine "triggers" are present.[94] These triggers are related to the type of action a state agency plans to take or what areas will be affected by the action. For example, one

[92] http://www.epa.gov/compliance/nepa/eisdata.html
[93] Hawaii State Government. *Hawaii Revised Statues Chapter 343: Environmental Impact Statement*. Page 2.
[94] State of Hawaii. Office of Environmental Quality Control. *Guide to the Implementation and Practice of the Hawaii Environmental Policy Act*. Page 1.

trigger applies when an action will use land classified as a conservation district by the state; another if an agency proposes to build a large wastewater treatment unit, waste-to-energy facility, landfill, oil refinery, or power-generating facility.[95] Although the details of when to apply HEPA and NEPA differ slightly, the overall implication for both is that the public must be involved in any government action that will affect natural resources.

Summary

The history provided here illustrates that the dual role of Hawaii's management in maintaining invasive game while preserving native species is the result of hunting culture and conservation concerns that developed simultaneously in Hawaii. To meet these multiple demands, the government centralized land management and repeatedly made the final political decisions on what actions to take. The implementation of NEPA and HEPA increased conservation pressure and thus reinforced the duality of the DLNR's management goals, but also introduced a new strategy for management by approaching community to receive input on how to manage resources at a local scale. On the Big Island of Hawaii, this idea to involve community has been taken one step further with Act 306, which established the West Hawaii Regional Fisheries Management Area.

A Community and Its Fish

The State of Hawaii House of Representatives nineteenth legislature passed a bill in 1998 that called for the establishment of the Kona coast of the Big Island as the "West Hawaii regional fishery management area," which fell under the jurisdiction of the

[95] Ibid. Page 6.

Division of Land and Natural Resources (DLNR).[96] One of the main purposes of this bill, called Act 306, was to achieve the following conservation goal: establish a system of Fishery Replenishment Areas (FRAs) along the West coast, and involve the public in this process. Five years later a report on the effectiveness of these FRAs stated that they have "proven to be biologically sound, enforceable, and conflict resolving."[97] The creation of Act 306 is a story of how a community-based management system developed from a grassroots movement that later became supported and enforced by the state government; this combination of community and government involvement is cited as the reason for the act's success in maintaining reefs and resolving conflicts between user groups.[98] This format for resource management is remarkably close to that set forth by the CBRM model, with the government relying on local knowledge and motivation to ensure the sustainability of reef resources. To accomplish this the state allowed community into the decision-making process, and while it retained its power to make the final decision that established the FRAs, it more or less directly accepted the community's recommendation. The story of this shift towards a sharing of power with the public begins with an activist movement in the Hawaii community to resolve conflicts over resources back in 1973.

---

[96] State of Hawaii. House of Representatives, Nineteenth Legislature. 1998. *Relating to the West Hawai'i Regional Fishery Management Area*. Page 3.
[97] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2005 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 8.
[98] Tissot, B. N. W. J. Walsh, and M. A. Hixon. 2009. Hawaiian Islands Marine Ecosystem Case Study: Ecosystem and Community-Based Management in West Hawaii. Coastal Management. Page 263.

Components of community

The community surrounding marine resources in Hawaii was and is still made up of several interest groups. To understand the motivation and type of actions first taken by the community in 1973, these groups and the reason for their concern must be introduced. The community of people involved in fisheries management on West coast of the Big Island of Hawaii (hereafter referred to as simply "Hawaii"), can be broken down into five prominent groups: fishermen, aquarium fish collectors, ocean tourism companies (especially SCUBA tour companies), the general community of Hawaii residents, and the Native Hawaiians. As might be suspected from this list, these groups approach the reef with differing intentions and values, which often s to escalating conflicts between them. These conflicting groups not only affect each other but also affect the reef they depend on. In a study of the history and current status of Hawaii's fisheries M. Kimberly Lowe goes so far as to say, "the "user conflicts" on the Kona coast are almost too numerous to mention."[99] The need to resolve these user conflicts and the negative effects these users can have on the reef were two major drivers for the creation of what eventually became Act 306. Understanding the root of these conflicts is key to recognizing what caused the community to push for this act; this will be accomplished through an examination of each group and the concerns they bring to the community table.

Fishermen bring one of the most obvious things to this table: the fish. Perhaps one of the most well known uses of a reef ecosystem, fishing plays out at both a commercial and recreational level along Hawaii's West coast. Although commercial fisheries focus

[99] Lowe, M. Kimberly. 2004. "The Status of Inshore Fisheries Ecosystems in the Main Hawaiian Islands at the Dawn of the Millennium: Cultural Impacts, Fisheries Trends and Management Challenges." Page 69.

80% of their attention on coastal pelagic fish, they also gather reef fish in large quantities; the average amount of coral reef fish landed annually is estimated to be 1,352,269 pounds.[100] Even this data on the impacts of fisheries on the reef is considered to be an underestimate because it is suspected that commercial fishers under-report their catch. Additionally, the state of Hawaii does not require non-commercial fishers to have a fishing license, meaning that the amount of fish caught for recreational and subsistence purposes is not recorded; this amount is however suspected to be at least equal to if not greater than commercial amounts.[101] The economic value of commercial fishing ranges in the millions: during the period from 1966 to 2001 a peak of $3.5 million was reached in 1977 and a low of just over $2 million was reached in 1985. Data recorded from this same period shows that the number of fishermen involved in this industry has increased from 200 in 1966 to a high of 1200 in 1996, although by 2001 this number had dropped to 800 fishermen.[102] Overall, it appears that the number of commercial fishermen has drastically increased in these past few decades, bringing concern about overfishing[103] to the table.

The problem of overfishing along Hawaii's coast is suspected to stem not only from commercial fishers who land fish for consumptive purposes but also from those

---

[100] DeMello, Joshua. "Commercial Marine Landings from Fisheries on the Coral Reef Ecosystem of the Hawaiian Archipelago." Page 157; Tissot, B. N. W. J. Walsh, and M. A. Hixon. 2009. "Hawaiian Islands Marine Ecosystem Case Study: Ecosystem and Community-Based Management in West Hawaii." Page 257.

[101] Friedlander, Alan. "The State of Hawai'i's Coastal Fisheries in the New Millenium." Page 3.

[102] DeMello, Joshua. "Commercial Marine Landings from Fisheries on the Coral Reef Ecosystem of the Hawaiian Archipelago." Page 158.

[103] One study suggests that the most heavily fished species groups show different trends, "making it difficult to conclude" that the coral reef fisheries are in decline and calling for more studies on the subject (DeMello, Page170). Public concern over this issue is nonetheless present.

who harvest reef fish to sell as aquarium collectibles.[104] Although the collection of fish for this purpose began on the island of O'ahu, by 2003 aquarium fishers relied heavily on the Big Island for 81% of their catch, most of which is taken from the West coast. Thus this coast of Hawaii now accounts for 70% of the total state value for aquarium fisheries.[105] The practice of aquarium collecting began at a small scale, where collectors would simply use breath-hold diving techniques and linen nets. As the industry grew, the techniques became larger scale and more efficient; now SCUBA and synthetic nets are used to collect fish more easily.[106] By 2009 the total annual value of this catch was $1,271,329, a 71% increase since the year 2000.[107]

The effects of aquarium collection on the reefs is most notable at a species level- species that look and survive best in a fish tank are targeted and are in turn affected the most severely. Over 90% of the aquarium collection focuses on only seven species of fish, with 72% of this amount comprising of solely *Zebrasoma flavescens*, the popular yellow tang.[108] The yellow tang is one of the most abundant and flashy fish in West

---

[104] Tissot, Brian N., and Leon E. Hallacher. 2003. "Effects of Aquarium Collectors on Coral Reef Fishes in Kona, Hawaii." Page 1767.
[105] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2005 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 4.
[106] Walsh, William J., Stephen S. P. Cotton, Jan Dierking, and Ivor D. Williams. "The Commerical Marine Aquarium Fishery in Hawai'i 1976-2003." Page 129-130.
[107] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 2.
[108] Tissot, Brian. 1999. "Adaptive Management of Aquarium Fish Collecting in Hawaii." Page 16.

Hawaii, which is frequently referred to as the "Gold Coast."[109] It is not surprising to find that the apparently visible lack of yellow tangs in certain areas has encouraged the many claims made by the public that aquarium fishing is severely impacting the reefs, although very few actual scientific studies have been conducted on the topic.[110] One such study reported that eight of ten surveyed species frequently taken by collectors showed a significant decrease in abundance over a two-year period relative to areas under protection.[111] However, another study conducted by the same scientist found results but concluded that although their findings are troubling, they "warrant further investigation," suggesting that more research be done before solid conclusions are drawn about the actual effects of the aquarium industry on these reef ecosystems.[112] Despite this, the concentrated presence of collectors of these well-known fish species along the popular West coast has caught the attention of many community members, helping to make aquarium collecting one of the greatest sources of controversy in West Hawaii fisheries management.[113]

The popularity of this coast is due in part to the seemingly unrelated aspect of weather, which lures many other groups of people into the waters where aquarium

---

109 Tissot, Brian N. 2005. "Integral Marine Ecology: Community-Based Fishery Management in Hawai'i." Page 81.
110 Talbot, Ret. "Extremists Call for Ban on All Aquarium Livestock Collection in Hawaii." Page 1.
111 Tissot, Brian. 1999. "Adaptive Management of Aquarium Fish Collecting in Hawaii." Page 17.
112 Tissot, Brian N., and Leon E. Hallacher. 2003. "Effects of Aquarium Collectors on Coral Reef Fishes in Kona, Hawaii." Page 1767.
113 Tissot, Brian. 1999. "Adaptive Management of Aquarium Fish Collecting in Hawaii." Page 17; State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 6.

collectors do their hunting. The West coast happens to be the sunny and dry coast of Hawaii, which causes high concentrations of the island's tourists, and the residents themselves, to congregate in these areas.[114] Dive tour companies are quick to take advantage of this coast's appeal, bringing large numbers of tourists out to the very places where aquarium collectors score their best catches.[115] Tourism is the main industry in the state of Hawaii and in 2004 it generated $11.4 billion; more than 80% of these tourists participate in marine recreation, supporting the more than 1,000 ocean tourism companies in the state.[116] In 2001 tourists in the state took an estimated 13,900,000 snorkel or diving trips, the majority of which were taken with these companies, whose profit is around 67 million dollars.[117] Thus the fish of Hawaii's reefs are not only valued as food and aquarium pets but also as an extraordinary sight to see in their natural habitat.

This somewhat more passive economic use of the reefs is nonetheless suspected of causing damage via anchor dropping and physical contact between divers and the reef. Once again, there have been few studies done in the area to confirm this, but one such study done at Kealakekua Bay on the Kona coast concludes, "…there is no statistical support for the premise that divers at Kealakekua Bay are causing damage to the reef. However, in all cases the decline in coral cover and the incidence of bleached and broken

---

[114] Lowe, M. Kimberly. 2004. "The Status of Inshore Fisheries Ecosystems in the Main Hawaiian Islands at the Dawn of the Millennium: Cultural Impacts, Fisheries Trends and Management Challenges." Page 69.
[115] Walsh, William J. "Community-Based Management of a Hawai'i Aquarium Fishery." *Marine Ornamentals '99: Collection, Culture, Conservation*. 16-19 Nov 1999. Page 84.
[116] Tissot, B. N. W. J. Walsh, and M. A. Hixon. 2009. "Hawaiian Islands Marine Ecosystem Case Study: Ecosystem and Community-Based Management in West Hawaii." Page 4.
[117] Cesar, H. S. J., and Pieter van Beukering. 2004. "Economic valuation of the coral reefs of Hawai'i." Page 235-236.

coral was higher at the impact [site] relative to the control site".[118] The study also mentions that a longer study period may be necessary to show the effects of divers on the reef more clearly; it seems safe to assume that although more research is needed, even the dive tour companies cannot be excluded from a consideration of the strains on the West coast reefs.

The interest in the West coast reefs is not solely a matter of economics and sustenance. The residents of Hawaii also value these reefs, in this case for recreational use and for their beauty. In a recent news report related to Hawaii's marine resources, the reporter states, "…for the people of West Hawaii, the reef fish are more than just a "resource": they're a part of the coast's personality, beautiful and engaging, one of the reasons for living here".[119] Although it may not be the subject of many studies, it seems likely that the qualities of Hawaii that bring in the tourists also cause the residents to stay. Between 1950 and 2000, the population of island of Hawaii increased from 68,350 to 148,677.[120] The number of snorkeling and dive trips taken by residents in 2001 is estimated at 1,240,000 and 370,000 trips, respectively.[121] Although this was significantly less than the amounts estimated for tourists (13,400,000 snorkeling and 500,000 diving trips), it is likely that problems with individuals kicking corals (which kills them) and dropping anchors onto reefs are just as relevant to residents as they are to the tourism industry. Many Hawaii residents who participate in these activities and others (ie: surfing, fishing, etc), are well aware of the problems facing the reefs and are not shy about

---

[118] Tissot, Brian N., and Leon E. Hallacher. 2000. "Diver Impacts on coral reefs at Kealakekua Bay, Hawai'i." Page 9.
[119] McNarie, Alan D. "Reef Madness."
[120] Lowe, M. Kimberly. Page 17.
[121] Cesar, H. S. J., and Pieter van Beukering. Page 235.

stepping up to do something about it. In a news article about a recent resolution regarding aquarium fishing, which will be discussed as a case study later on, one resident states that aquarium fishing was once viewed by the legislature as an argument between dive operators and aquarium collectors, but that "they forgot that there was another huge group, which was the people of Hawaii…and I think they were surprised to find out how much we cared about it".[122] Members of Hawaii's community today are not, however, the first residents to value the reefs so deeply.

In addition to the dive tours, the fishermen, the aquarium collectors and the residents of modern Hawaii, the Native Hawaiians of old Hawaii are still involved in the fisheries of the West coast. Fishing and ocean recreation have been a part of Native Hawaiian lifestyle for centuries, beginning well before the commercialization of these islands.[123] The history of how the colonization and commercialization of Hawaii has affected the native peoples is well beyond the scope of this paper, but the attitudes it has produced in today's culture is very much relevant. To summarize these attitudes here does not do the culture justice and it is likely a gross generalization, but for the purposes of demonstrating what Native Hawaiians add to the discussion of West Hawaii's fisheries management it must be done to some extent.

An excerpt from poem written by Haunani-Kay Trask provides some incite into a Hawaiian perspective on fisheries:

> "*all those 5 gallon*
> *toilets flushing*
> *away tourist waste*
> *into our waters*

---

[122] McNarie, Alan D. "Reef Madness."
[123] Lowe, M. Kimberly. Page 13.

Waikiki home
of ali'i
sewer center
of Hawai'i" [124]

The use of the word "our" describes a feeling of possession and a connection to the ocean that hints at the "conservation ethic" that prevailed in Hawaii culture before Western contact.[125] According to M. Kimberly Lowe, who works for the Division of Aquatic Resources, the Hawaiian culture's loss of dominance led to "less and less intact conservation practices" being handed down from generation to generation.[126] Lowe continues to write that "although the sense of responsibility to the places their ancestors... lived…is still alive amongst [Hawaiians] today, many factors inhibit their effectiveness in caring for natural resources, including restricted access to ancestral lands, diversion and pollution of streams and groundwater, urbanization and congestion of cultural sites, and lack of cooperation and respect from others".[127] In summary, the idea that Hawaiian culture very much values the ocean but has been restricted from helping conservation efforts comes across rather strongly in Lowe's paper. There are others who also push for a return to a system similar to the ancient Hawaiian management system, where resources were cared for at a very localized level.[128] In fact, the rise of ecosystem-based

[124] Ibid. Page 24.
[125] Ibid. Page 24.
[126] Ibid. Page 24.
[127] Ibid. Page 72.
[128] Specifically, resources were managed within *ahupu'a,* land divisions whose borders were determined according to the geographic locations of individual watersheds on each island (*Tissot et al.,* 2009).

management at a community level on the West coast of Hawaii was in a large part inspired by ancient Hawaiian management practices.[129]

From Native Hawaiians to dive tour operators to commercial fishermen it is clear that the West coast community consists of a wide variety of people brought together by the very resource that reveals their differences. What appears here is a mix of economic interests and preservationist ideals. As has been noted, aquarium collectors, fishermen, and dive tour operators make millions on Hawaiian reefs, with the Kona coast as a focal point for all three of these trades. Standing largely in opposition to the economic exploitation by aquarium collectors, are the dive tour operators who depend on the visible presence of these fish and the residents of Hawaii past and present, who seek to preserve the beauty and health of these reefs. In a testimony supporting a ban on the aquarium trade one resident is reported to have said, "We don't let people walk into a national forest and cut down a tree for any reason, much less sell it…How is this any different?"[130] This recently expressed concern is the same concern that began the development of West Hawaii fisheries management by the Hawaii community of 1973.

It should now be clear that the community was motivated to get involved in policy-making by the extreme amount of both sentimental and monetary value of the West coast reef for many different members of the island community. The development of fisheries management began specifically with the conflict of interest between aquarium collectors and dive tour operators, in what one scientist has called "a classic

---

[129] Tissot, B. N. W. J. Walsh, and M. A. Hixon. 2009. "Hawaiian Islands Marine Ecosystem Case Study: Ecosystem and Community-Based Management in West Hawaii." Page 6.
[130] Lauer, Nancy Cook. "Fish-collecting ban reso passes council."

clash of conservationists' versus preservationists' worldviews."[131] The story of the development of fisheries management towards the creation of Act 306 shows how this seemingly isolated conflict between two groups became a present solution that incorporates all of the major marine-related interest groups in the Kona community.

History of community involvement

In 1973 the "public," likely dive operators and some residents, raised concerns over a perceived decline in number of fish on the reefs, which was blamed on the aquarium collectors; in response, the DLNR decided to place a moratorium beginning on July 1, 1973. This, however, was rescinded two days before its proposed start date. Following this, university scientists called for the establishment of sanctuary areas where collecting was prohibited.[132] Unfortunately, there was little funding required for the needed to scientifically confirm the suspicions of the residents and dive tour operators, and so these sanctuaries were never actually established. The creation of a special catch report that aquarium collectors were expected to fill out each month was the only action taken; aside from that, the conflict was ignored for the next ten years.[133]

The shift of aquarium collectors' focus from Oahu to the Kona coast in the late 1980's caused the conflict within the Kona community, especially between the dive tour operators and the aquarium collectors, to escalate. These two groups met in 1987 and

---

131 Tissot, Brian N. 2005. "Integral Marine Ecology: Community-Based Fishery Management in Hawai'i." *World Futures*. 61: 79-95. Page 81.
132 Walsh, William J., Stephen S. P. Cotton, Jan Dierking, and Ivor D. Williams. "The Commerical Marine Aquarium Fishery in Hawai'i 1976-2003." Page 130.
133 Walsh, William J. 1999. "Community-Based Management of a Hawai'i Aquarium Fishery." Page 1.

were encouraged by Sea Grant[134] and the Division of Aquatic Resources[135] (DAR) to negotiate a "Gentleperson's Agreement" to resolve the conflict. The collectors agreed to avoid collecting in certain areas while dive tour operators agreed not to initiate legislation to restrict collecting and to cease harassment. This worked for a solid six months before the agreement expired. Meetings were held in 1988 to reinstate the agreement and to close the previously established areas permanently. This time the actions taken were successful, and the Gentleperson's Agreement areas were established formally as the Kona Coast Fisheries Management Area zones, which took effect in October 1991.[136] This can be viewed as a first solid step toward Act 306.

The establishment of these zones was a first step, but it was not enough to satisfy the parties involved. Controversy over aquarium collecting only continued to build as the number of collectors increased, and more resolutions and bills were brought to the table to address the issue. One such resolution, passed in 1996, called on DAR to develop a "comprehensive management plan to regulate the collection of aquarium fish".[137] DAR responded by creating the West Hawaii Reef Fish Working Group (WHRFWG), making an effort to include individuals representative of each "reef resource user group" as well as those who heard of the group and wanted to join; on the whole, at least 70 members of the West Hawaii community became involved. Together the WHRFWG identified places along the coast where conflicts were particularly intense and then completed relevant

---

134 The University of Hawai'i has a Sea Grant College Program that is part of a national network of programs designed to "promote better understanding, conservation, and use of coastal resources" (seagrant.soest.hawaii.edu)
135 Division within the DLNR
136 Walsh, William J. 1999. "Community-Based Management of a Hawai'i Aquarium Fishery." Page 2.
137 Ibid. Page 2.

management rules for their specific communities along this coast. It was at this point that DAR began the research to investigate the impacts of aquarium collecting that was called for way back in 1973. In the end however, opposition from aquarium collectors and a slow legislative process led only one WHRFWG recommendation to be passed—the establishment of licenses for aquarium exporters. The management rules for the more localized communities on the West coast did not make it out of the chute (Walsh, 1999).[138] Yet Hawaii was learning from its failures—though ineffective on its own, the model of official community involvement set forth by the WHRFWC became a cornerstone for the success of Act 306.

It took one final push for the community to achieve its goal of protecting the coral reefs. When the general ineffectiveness of the WHRFWG was recognized, several of the group's members combined with other citizens to form the Lost Fish Coalition (LFC). The chief goal of this group was to directly push for an outright ban on aquarium collecting in all of West Hawaii. After collecting 4000 signatures on a petition for this ban, Representative Paul Whalen (R-Kona, Ka'u) proposed a bill that would enact this ban. Almost simultaneously, Representative David Tarnas (D-N. Kona, S. Kohala) introduced a bill calling for the entire West coast to be established as a "West Hawaii Regional Fishery Management Area" (WHRFMA). In February 1998 the first bill was rejected. Multiple user groups, including the aquarium collectors, endorsed the second bill and on the 13th of July 1998 it took effect- this, at last, became Act 306.[139]

---

[138] Ibid. Page 2.

[139] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2005 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 6.

The Provisions of the Act

Act 306 not only created the WHRFMA but also established the areas multiple purposes and detailed the first steps of the management plan the act would carry out. The thoroughness of the management plan established through this act is of great interest and relevance to the Hawaii community, but for the sake of brevity only those of interest and relevance to this research will be mentioned here. The purpose of the WHRFMA is described by the act in the following manner: "…for effective management of fishery activities in this coastal area, to enhance nearshore resources and to minimize conflicts of use". The sub-purposes of the act called for the identification of high use areas, the establishment of mooring buoys in these areas, the carrying out of scientific research and monitoring of the area, and the closure of "fish replenishment areas" (FRAs) where "certain specified fish harvesting activities [aquarium collecting][140] are prohibited."[141] These are a few of environmental goals set forth, but the most interesting political purpose is the seventh, and last, placed on the list.

The seventh required purpose of the WHRFMA is to "provide for the substantive involvement of the community in resource management decisions for this area through facilitated dialogues with community residents and resource users."[142] In other words, for this act to be properly carried out by Hawaii's government, its people *have* to be heard. The effort the community put into the creation of this act and the eventual power it gave

---

[140] The part in brackets was added for clarity, it is actually detailed in a different part of the act. Fishing is another "fish harvesting activity" but was not the focus of these particular 9 FRAs.

[141] State of Hawaii. House of Representatives, Nineteenth Legislature. *Relating to the West Hawai'i Regional Fishery Management Area*. Page 4.

[142] State of Hawaii. House of Representatives, Nineteenth Legislature. Page 4.

them through its purposes is perhaps the most striking aspect of Act 306. The passing of Act 306 into law marks the transition from the grassroots development of resource management that began along this coast in 1973 to a form of shared co-management between the public and the government on the West coast of Hawaii. The Act's inclusion of the public in the resource management process hints at the kind of management suggested by the CBRM model. As will be seen, the method by which this provision was carried out in fact fits the ideals of CBRM model quite well.

The Act's call for community involvement is reminiscent of the HEPA, but this time involvement was to be "substantive." To accomplish this level of involvement, the state brought together the different fisheries stakeholders, providing a venue for discussions that led to community-generated recommendations for state management. Through Act 306, the DLNR instituted the same council method it had established with the creation of the WHRFWG,[143] but this time their efforts were more successful. The DAR within the DLNR combined forces with Sea Grant to create a council consisting of members who represented a wide range of both geographic areas and economic interests. This resulted in the inclusion of 24 voting community members and 6 non-voting representatives from DAR, DLNR's Division of Boating and Ocean Recreation (DOBOR), DLNR's Division of Conservation and Resources Enforcement (DOCARE), Sea Grant, and the Governor's Office.[144] The initial 24 voting members included four aquarium representatives, three commercial dive tour operators and one hotelier; the

---

[143] Recall the West Hawaii Reef Fish Working Group, which took the first steps towards fisheries management in the late 1990's.

[144] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2005 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 7.

remainder of the council consisted of "a variety of overlapping and not easily definable interests," including at least 10 commercial and recreational fishermen, along with shoreline gatherers, recreational divers, a LFC representative and several "community representatives." Of these members, 2 had degrees in fishery or marine science and forty percent were Native Hawaiians, including one member on the Board of the Office of Hawaiian Affairs. Twenty-three of these 30 members were previously on the WHRFWG.[145] These diverse groups of people were brought together under the title of the "West Hawaii Fisheries Council (WHFC)," which first convened on June 16th, 1998.[146]

Does the WHFC meet the assumptions of CBRM?

The work of the WHFC to create and manage the 9 FRAs required by Act 306 is a good example of CBRM management, with significant amounts of input and collaboration among the public leading to policy-making decisions at the state level. In evaluating this case study I refer back to the criteria set forth at the start of this paper: 1) To what extent are conservation goals achieved this case study? 2) What is the composition of the community and to what extent were these goals reached as a result of their collaborative desire to conserve? The successes of this model in these two areas will be discussed first, followed by a mention of where the model has fallen short of these CBRM ideals.

The WHFC successfully achieved the first conservation goal of Act 306, the establishment of 9 FRAs, entirely through the efforts of volunteers. A written evaluation of the effectiveness of the West Hawaii Regional Fishery Management Area stated, "the

[145] Ibid. Page 7.
[146] Ibid. Page 7.

creation and functioning of the WHFC is entirely attributable to the volunteer commitment of time, energy and resources of its members."[147] During the first ten years after the council was established 62 members of the community devoted nearly 5,000 hours of their time to sit on it (members could join and leave at their leisure). The amount of time required to reconcile multiple interest groups is considered a major cost, and therefore a potential reason for failure, by one CBRM critic, who writes, "community members may lack the time to devote to an exhausting, collaborative effort…the probability that citizens will undertake such long-term collective action varies widely from community to community, most likely in correlation with the economic prosperity of the inhabitants."[148] It is difficult to measure the economic prosperity present in the WHFC, but given that such a wide range of interest groups are involved, economic prosperity probably varied among them; it seems more likely that the motivation to stay involved in WHFC, and thus overcome this potential barrier to CBRM, came from the strong economic, cultural or ethical attachments of these interest groups. The success of these motivated volunteers in collaborating can be seen in the process by which they established the 9 FRAs mandated by Act 306.

[147] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 8.
[148] Nickelsburg, Stephen M. 1998. Page 1391.

The Act called for 30% of the coast to be designated as FRAs, where aquarium fish collection is prohibited.[149] The WHFC used a consensus-based approach[150] to accomplish this.[151] Members of the council were asked to canvass their respective communities and construct maps of proposed areas for FRAs based on their findings. Aquarium collectors were reluctant to do this, but the proposed FRAs on the few maps they did submit overlapped with the areas chosen by other communities. The council combined all of the collected maps to determine the groups' overall selection of FRAs; there were many areas of overlap on these maps, making agreement on most areas relatively easy. A public hearing proposing these areas to the public was held in April 1999. At least 860 people attended this hearing, and the plan received the support of 93.5% of the 876 submitted testimonies (Figure 1[152]).[153] In December of 1999 the nine FRAs[154] proposed by the consensus maps were signed into law by Governor Benjamin

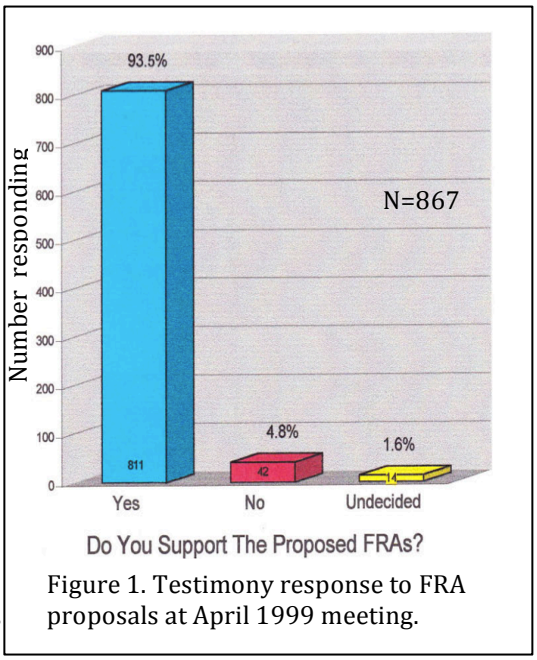


Figure 1. Testimony response to FRA proposals at April 1999 meeting.

[149] State of Hawaii. House of Representatives, Nineteenth Legislature. *Relating to the West Hawai'i Regional Fishery Management Area*. Page 4.
[150] A detailed chart of the legislative process for this council is included in Appendix B
[151] Tissot, Brian N. 2005. "Integral Marine Ecology: Community-Based Fishery Management in Hawai'i." Page 88.
[152] Pers. Comm. Dr. William Walsh.
[153] State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 6.
[154] A map of these 9 FRAs is included in Appendix A

Cayetano, closing a total of 35.2% of West Hawaii's coastline (previous reserves are included in this amount).[155]

The ability of the WHFC to involve the community in carrying out the requirements of Act 306 was more than evident in the creation of the FRAs, and this was only the beginning. Since then, the WHFC has greatly expanded its involvement in fisheries management, doing everything from resolving beach user conflicts (mostly between communities and aquarium collectors) to establishing harvest limits for sea urchins.[156] The 2010 evaluation of the effectiveness of FRAs states, "the WHFC has been, and continues to be, invaluable and instrumental in achieving the objectives of Act 306."[157] Thus, the WHFC inspired by Act 306 has met both the community involvement and conservation biology goals of CBRM. Because of this, the WHFC has been set forth as a successful example of CBRM, and is considered worthy of replication elsewhere in Hawaii.[158] However, there are some imperfections in the products of the WHFC that suggest that it did not fully reflect the CBRM ideal.

The WHFC appeared to reflect the CBRM ideal of a community unified in its desire to carry out conservation goals when it established the FRAs, but it will be seen

---

155 Capitini, Claudia A., Brian N. Tissot, Matthew S. Carroll, William J. Walsh, and Sara Peck. "Competing Perspectives in Resource Protection: The Case of Marine Protected Areas in West Hawai'i." Page 764; State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 6.

156 State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 7.

157 Ibid. Page 2.

158 Tissot, B. N. W. J. Walsh, and M. A. Hixon. 2009. "Hawaiian Islands Marine Ecosystem Case Study: Ecosystem and Community-Based Management in West Hawaii." Page 16.

that the public was not fully satisfied with this result. In the case of Act 306, it will be seen that its greatest strength, community involvement, is also its greatest weakness. Interest groups collaborated to come up with the FRA plan, but a closer look at the different interest groups involved shows that this plan was not the a result desired by all groups.

The need to hear everyone's opinion and to create a compromise when designing resource policies is both time consuming and reportedly frustrating. The discussions about designating the FRA locations were described as sometimes "contentious" and a considerable amount of frustration revolving around the aquarium collectors occurred. This played out both within the council and on the larger public scale. Within the council, aquarium collectors and other members continued to battle over whether or not collecting fish had serious impacts on the reefs. The collectors held the position that studies were skewed to show significant impacts on the ecosystems, while other community members argued that the effects were obvious regardless of "all the [DAR] charts and graphs."[159] During the process of turning in maps of potential FRA areas, collectors were reluctant to participate and in some cases did not turn in maps at all; one member even attempted a boycott of the council meetings, assuming that votes would not occur without his presence (he was incorrect).[160] At the very least, aquarium collectors disagreed with the other interest groups over whether or not no-collecting zones (FRAs) were needed to achieve conservation goals. At the most, this group may have been opposed to conservation goals altogether, which is what other groups accused them of. This puts the

---

[159] Capitini, Claudia A., Brian N. Tissot, Matthew S. Carroll, William J. Walsh, and Sara Peck. 2004. "Competing Perspectives in Resource Protection: The Case of Marine Protected Areas in West Hawai'i." Page 764.
[160] Ibid. Page 764.

assumption of CBRM that communities jointly desire conservation at stake, making it worthwhile to determine which of these two possibilities is true.

A look at more recent events on the fisheries front will help to demonstrate the position of the aquarium collectors. User conflicts were not altogether soothed by the formation of the WHFC; at the larger, island-wide scale beyond the West Hawaii coast, public controversy over aquarium fishing continues to make the news despite the creation of the FRAs.[161] On October 5th 2011, a resolution to ban the aquarium trade from the entire state of Hawaii was brought before the County Council on the island of Hawaii. Four hours of public testimony and a series of emails from those who could not make the meeting brought in a total of 117 testimonies, 101 of which supported the ban.[162] A conflict supposedly resolved by Act 306 has violently resurfaced, but the tables have been turned. This time around, the biologists have sided with the aquarium collectors, and the residents and Native Hawaiians have taken all the more offense at this move. The opposing sides of this conflict were well represented, and often directly stated, in the testimonies during the public meeting. A man from a Hawaiian fishing village on the island of Hawaii stated: "our way of life is being hampered every day by these collectors," and that the reefs have been "devastated" over the years by this trade.[163] In contrast, DLNR biologist William Walsh testified that this was not the case, and that in fact many key fish species have recovered immensely because of the FRAs. The problem, he noted, was that these increases were within the FRAs, but the remaining 65% of the coast was still experiencing decreases due to overfishing; in other words, people are

---

[161] Example headlines: "New aquarium fish rules draw criticism" (Nov 2012), "Public gets chance to chime in on fish collecting rules" (Nov 2012),
[162] Lauer, Nancy Cook. "Fish-collecting ban reso passes council." *West Hawaii Today*.
[163] Ibid.

seeing the opposite of what is actually happening at the biological level.[164] An aquarium collector stated, "…the fisherman has been regulated off of nearly all the Kona Coast to the dive charters' benefit and still they want to see us banned".[165] Council member Pete Hoffmann, who voted in support of the ban said, "It is clear…that this may not be a resource issue at all… I'm going to vote for [the resolution], because I don't think the DLNR is doing its job." The arguments go on and on, back and forth, but one thing has become clear: interest groups disagree about what conservation steps are needed.

Evident from these testimonies are a number of apparent misunderstandings between the groups. Although a Hawaii resident who flew over to testify from Maui described the aquarium collectors as "a handful of selfish people…taking as many fish as they want for an amusement industry far away," even this group has expressed an appreciation of the reef. A collector stated in her testimony against the bill, "I love the ocean and the beautiful fish and I have a personal interest to make sure [they] are here for years to come."[166] A perusal of the public discussions that ensue beneath online newspaper articles on the ban reveal responses to biologists' claims that go so far as to say that the biologists (who have dedicated many years of their lives to studying this reef) are being paid off by aquarium fishermen.[167] Assuming these opinions are honest, it appears that many of the groups at hand value the reef for the same reasons, but nonetheless continually misunderstand each other. In other words, aquarium collectors are not directly opposed to conservation, and neither are biologists for that matter, but they are opposed to the total-ban method being pushed for by the public.

---

[164] McNarie, Alan D. "Reef Madness." *Big Island Weekly*.
[165] Lauer, Nancy Cook. "Fish-collecting ban reso passes council."
[166] Ibid.
[167] Public post beneath Lauer 2011

This has some important implications for the CBRM model. First of all, if the interest groups involved in the FRA creation were at such odds with each other, how was the final decision made? Given that aquarium fish collectors were against the creation of these reserves, even though they do not seem directly opposed to conservation, it seems that their opinion was overpowered. Indeed, the SCUBA tourism industry and fishing industries are present in much greater numbers and thus likely dominated the decision to implement Act 306 (recall that Act 306 itself was based on the grassroots efforts of these groups). According to Dr. Brian Tissot, "revenues from dive tourism dwarf those of the aquarium industry, which may well explain why aquarium collectors were unable to develop the political support to oppose the establishment of FRAs in West Hawai'i."[168] This idea that some interest groups are more powerful than others is reinforced by the current struggle to carry out another component of Act 306, which was to create no-take fish reserves, where fishermen would not be allowed to fish.

After ten years, these no-take reserves have still not been created, due to "resistance from influential segments of the fishing community and government reluctance."[169] In response, the WHFC organized a Marine Reserve subcommittee responsible for completing this particular task. Tina Owens, Marine Reserve chair, confirms that a major challenge to this process has been that the fishing interest group is substantially larger than the aquarium interest group, and that this fishing interest group is directly opposed to the establishment of no-take reserves. She adds that many members

---

168 Tissot, Brian N. 2005. "Integral Marine Ecology: Community-Based Fishery Management in Hawai'i."Page 86.

169 State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." Page 3.

of this group claim to have a right to fisheries as part of their Hawaiian traditional gathering rights,[170] leading to political controversies that have greatly slowed the process of establishing marine reserves.[171] The details of this controversy will not be delved into here, but it is important to note what they imply: even when the CBRM assumption that communities desire conservation of their resources hold true, conflicts over what specific conservation goals are and how they should be implemented led not only to struggles in collaboration but also to some groups dominating over others when the final decision is made.

The example of the West Hawaii fisheries and the WHFC demonstrate that CBRM can produce valuable conservation results, but that this method is limited by the ability of interest groups to collaboratively work towards a common conservation goal. Dissonance in interest groups' opinions, combined with a disparity in their size and thus political power, can lead to results, or lack of results, that are not ideal for achieving conservation goals. Overall, the WHFC has begun to achieve conservation goals with the establishment of the FRAs, and is currently working to educate the fishing community and include them in conservation projects in hopes of garnering their support. I therefore am not suggesting that the CBRM approach has completely failed to reach conservation goals, or that the community should cease to be involved in the process. Rather, what I hope to invoke is a sense of caution when promoting the CBRM model in Hawaii and elsewhere. The example of the WHFC demonstrates that ability of CBRM to achieve conservation goals can be limited by the type and relative power of interest groups

---

[170] For details of these rights, see: http://www.capitol.hawaii.gov/hrscurrent/vol01_ch0001-0042f/05-Const/CONST_0012-0007.htm

[171] Pers. Comm. Tina Owens, Chair of Marine Reserve subcommittee, WHFC.

involved. Given this, there are some instances on the Big Island where the CBRM model is being pursued, but should not be implemented until the interest groups at play are evaluated in terms of their conservation goals and potential political power. The next case study presents a situation where CBRM of forests is being sought after by a community, but perhaps should not be implemented given the current situation.

A Community and Its Forest

After the passing of HEPA, the DLNR began to invite the public into the process of developing management plans for the natural areas under its responsibility. This process is currently playing out in Ka'u on the West coast of the Big Island. The DLNR has proposed a management plan for the 61,641-acre Ka'u forest reserve, which involves fencing off 12,000 acres of new management units that will effectively exclude the invasive ungulates that are known to damage forest ecosystems.[172] The management plan is intended to address the following needs to: 1) maintain and restore a key watershed, 2) preserve a unique ecosystem with critically endangered plants and animals, 3) perpetuate natural resources vital to Hawaiian culture and practices, 4) have a suitable site for the reintroduction of the 'Alala (native crow), and 5) provide for continued and expanded public use.[173] Following the provisions HEPA, the DLNR drafted an Environmental Assessment (EA) for this plan and made it available online for public comment. A revised draft of the EA states its intention to involve the public explicitly, "management actions are meant to be updated through the dynamic process of incorporating community

[172] See Appendix C for map of reserve and proposed area for fencing.
[173] Hawaii State Government. Department of Land and Natural Resources. *Final Environmental Assessment: Ka'u Forest Reserve Management Plan*. 2012. Page 6-7.

input and research results into resource protection and enhancement."[174] In addition to posting the written draft online, the DLNR held a public meeting to allow the Ka'u community to allow for a verbal discussion of the plan they put forth. The state's incorporation of community input essentially employs the CBRM approach to the extent that it can draw on local knowledge, although the final decisions are made by the state and are not nearly as influenced by community the decisions made up the coast with the West Hawaii fisheries. This case study provides an example of where community involvement has begun but the CBRM model is not fully employed, although some interest groups are pushing for this to happen in the future. The following analysis will demonstrate the importance of considering the limitations of the CBRM model illuminated by the fisheries case study before promoting it in new places.

I begin by asking the same questions that were addressed in the fisheries case study: 1) To what extent are conservation goals achieved and, 2) To what extent were these conservation goals achieved as the result of community involvement. It will be demonstrated first that the strategy of involving community, without giving it actual decision-making power, has allowed the DLNR to achieve its conservation goal of preserving the forest to some extent. The concerns of the community about the decisions that were made and their demands for increased CBRM will be considered. Following the interest-group oriented analysis suggested by critics of CBRM, this examination will first describe why the Ka'u forest is a conservation priority and then show its relationship with different interest groups in the area to provide a context for the current public response to

[174] Ibid. Page 1.

the EA. The case study will conclude with a discussion of what is likely to limit CBRM's potential to achieve conservation goals in this area.

Conservation of a native oasis

On an island filled with developing human communities and increasing numbers and ranges of invasive species, Ka'u Forest Reserve exists as an oasis of native habitat. A survey conducted by the Division of Fish and Wildlife (DOFAW) in 2001 found that the majority of the forest has suffered minimal disturbance and non-native plant presence is low, less than 10%, placing this area in the highest quality ecosystem vegetation classification level.[175] The forest reserve and surrounding area support 153 endemic plant species and 32 rare[176] plants. Fourteen of these rare plants are listed as endangered by the USFWS, which also considers the reserve to be Critical Habitat for three species of Hawaiian plants. The forest reserve also provides habitat for high densities of endemic birds, invertebrates, and the Hawaiian Hoary Bat. The Reserve is a wildlife conservation priority due to its status as one of the most diverse and intact forests on the island that not only currently supports many species but also has potential as a restoration site for endangered forest bird populations like the 'Alala, which has gone extinct in the wild.[177]

[175] Hawaii State Government. Department of Land and Natural Resources. *Final Environmental Assessment: Ka'u Forest Reserve Management Plan*. Page 23.
[176] A "rare" plant refers to a Threatened or Endangered or Candidate Species and Species of Concern for the federal or state endangered species lists
[177] Ibid. Page 30.

Figure 2. Aerial view of the Ka'u Forest Reserve from the final draft of the Environmental Assessment (DLNR).

In addition to providing a habitat for the biodiversity that makes Hawaii a "hotspot" for conservation, the Ka'u Forest Reserve encompasses a major watershed that provides the important ecosystem function of providing clean water to the area (Figure 2). Forested areas increase moisture by up to 20 percent,[178] and intact ecosystems within watersheds are known to keep water well filtered.[179] A forest that is healthy and that has undisturbed soils limits aquatic pollutants like nutrients and silt from covering the reefs via runoff.[180] The clean water and variety of plant and animal species present in the forest are an important resource for the nearby community.

Valuable as the forest is for providing these resources to the community, few steps to conserve the forest have been taken. Invasive ungulates like the feral cattle and

[178] Ibid. Page 50.
[179] Kremen, Claire. "Managing ecosystem services: what do we need to know about their ecology?" *Ecology Letters* 8.5: 468-479. Page 468.
[180] Hawaii State Government. Department of Land and Natural Resources. *Final Environmental Assessment: Ka'u Forest Reserve Management Plan*. Page 50.

pigs have caused a significant amount of damage to the understory of the Ka'u forest, putting endangered plants in the area at risk and threatening the ability of the watershed to provide potable water. Wild pigs have been particularly detrimental due to their foraging habits, which overturns the soil, making space for fast-growing invasive weeds where native plants, ferns, and tree seedlings might otherwise have existed.[181] This invasion of the Ka'u forest reserve is a specific example of the influence of Westerners on Hawaii's resources discussed at the start of this paper. The following section will describe the interest groups present in the current Ka'u community, with a few historic details given to explain the origin of these interest groups and the views they hold on how to manage the forest.

The people of the land

There are 8,451 residents in the Ka'u district as of 2010.[182] This may seem like a small number, but it is actually a great increase from past times as the result of a 35% growth rate per decade since 1980.[183] This fast growth rate is the result of people moving into the town Ocean View in Ka'u, attracted by inexpensive property in the area; thus the traditional community of Ka'u, who are generally more concerned with the forest, is proportionally smaller than in the past. Members of the community who spend time in the forest are hunters, plant gatherers, farmers and ranchers who value the water provided by the reserve, and the *kama'aina* (long-time residents) who had maintained water

[181] Ibid. Page 23.
[182] Ibid. Page 65.
[183] Ibid. Page 65.

infrastructure during the plantation days.[184] The aspect of the plan that caused the most disagreement between these groups was the proposal to put up fences that would exclude ungulates from the upper part of the reserve's watershed, an action taken to maintain the ecosystem function of water filtration that the forest performs if it is undisturbed by ungulates. While farmers, ranchers, plant gatherers and some *kama'aina* supported this conservation-oriented aspect of the plan, hunters were very much opposed to it. This is at first surprising, as hunters, gatherers, *kama'aina*, and perhaps some of the farmers and ranchers, tend to identify with Hawaiian culture and share, to some extent, its values. A look at the recent history of this community helps to define these groups and explain this divergence in their interests.

Before Western contact, the Ka'u forest was considered wilderness and thus the people would enter it but did not live within it. Unlike other parts of the island, the majority of this forest was not cleared for agricultural use, although there was some harvesting of wood. Aside from wood, the forest provided the vital resources of clean water and other supplies including, fiber, medicine, and materials for ceremonies. Thus the health of the forest had an immediate effect on Hawaiian society, which heavily depended on it for these resources. After Westerners arrived, this direct relationship between the population and the forest became more tangential.[185]

As Westerners began to dominate land tenure and the economy, the forest began to be exploited for sandalwood, timber, and hāpu'u pulu (native tree fern). Additionally, the wild cattle introduced by Captain Vancouver reached Ka'u and grazed it heavily. Sugar plantations later arose in the area and the Hawaiian population became diluted with

[184] Ibid. 67-68.
[185] Ibid. 67.

immigrant workers who had no historical connection to the forest.[186] These changes in the use of the land and the composition of the community led to environmental degradation of the forest and an increasingly distant connection between the forest and the people of the area. Members of the DOFAW team put in charge of developing the Ka'u Forest management plan found that today, the many hundreds of residents with whom they discussed the plan had spent little time, if any, in the Reserve.[187]

While the general public was becoming more distant, there was one interest group that could not ignore the forest. That the combined effects of invasive ungulates and the logging of valuable trees like sandalwood led to the degradation of the forest were recognized early on by the plantation owners. At the start of the 20th century plantation owners became aware of the forest's role in maintaining their water resource, and the detrimental effects of ungulates to that role, and so they built fences to keep the cattle out of the area and removed any cattle that remained. The amount of fencing was extensive; one company, the Hawaiian Agricultural company, completing 35 miles along the eastern half of the forest in 1896 and another, the Hutchinson Sugar Plantation Company, adding 17 miles along the western end of the forest until it connected with the first fence by 1904.[188] Plantation and other fences mostly protected the remaining open sides of the forest. This was the origin of the Ka'u Forest Reserve, which was officially established by on August 2nd, 1906 for the explicit purpose of maintaining the water supply for agricultural needs.[189]

---

[186] Ibid. Page 67.
[187] Ibid. Page 67.
[188] Ibid. Page 88.
[189] Ibid. Page 17 & 67.

Meanwhile, wild pigs were spreading into the forests across the island, and presumably into the Ka'u forest in areas where fences did not block their movements. These pigs were not the same species as those brought by ancient Hawaiians, but were rather a hybrid between those pigs and a new variety of pigs brought by Westerners. The pigs originally raised by the Hawaiians were domestic and were not hunted in the forest. The practice of hunting wild boar with knives and guns arose after Western contact, and became increasingly common as populations of these hybrid pigs increased in the forests. Over the past century the hunting of the pigs and other introduced ungulates became not only a popular sport but also a means of subsistence in Ka'u, as it did across the state. The development of this practice reconnected many of the Ka'u residents with the forest, a connection that remained after the plantations declined. The value of the water filtration function of the reserve presumably declined with the downfall of the plantations, but is still recognized by the remaining farmers in the area. While the value of water filtration became less central to community concerns over the forest, the hunting interests grew. The forest has now become highly valued as a place for hunting and, to a lesser extent, for plant gathering, as some residents still collect the variety of native plants growing in the reserve.[190]

This history explains why the hunting group stands apart from the other groups in the interest it has in the forest. While many of the groups involved identify as Hawaiian, their values diverge because the hunting interest is a relatively new cultural value while the other interests reflect more ancient cultural values. The HEPA process meeting and written public reviews of the EA reflect this intracultural conflict and the implications it

[190] Ibid. Page 67.

has for achieving conservation goals in the area. The meeting is described on a local news website as "a firestorm of controversy among hunters in the region."[191] The next section will provide a more detailed account of conflicted public responses to the EA plan, particularly the proposal for the 12,000-acre fenced area, with focus on illuminating the positions taken by different interest groups and what this implies for the potential of CBRM in the area.

The current conflict

The DOFAW has proposed fencing off 12,000 acres near the top of the reserve to help preserve the integrity of the watershed. To gather information about the cultural uses of this area the DOFAW met with kupuna (Hawaiian elders) from the community to gain an understanding of common public use in the area in the present and in recent history. Much of Hawaiian history is recorded in oral tradition; talking with the kupuna was culturally appropriate and provided a fair amount of useful information, which is recorded in the EA. The overall sentiment of the kupuna seemed to express an appreciation of the forest as source of fresh water, of plants used for tea and ceremonies, and of a cheap source of meat.[192] During public meetings, the most vocal opposition came from hunters who were concerned that fencing off the ungulates would decrease the available hunting grounds they depend on for subsistence. Ka'u district Hawaii County Councilwoman Brittany Smart writes in her EA comments, "…the DLNR Deputy Director, DOFAW staff, and its consultants were in "hostile territory" at the meeting…

---

[191] Corrigan, David. "EA for Ka'u Forest Reserve completed, published." *Big Island Video News.*
[192] Ibid. Pages 57-62.

the lack of trust for DLNR's ability to create workable game management plants and forest management plans was a common complaint." This distrust of both government and science was a common theme in what Smart referred to as a "storm of community and hunter resistance."[193]

The meetings often became quite heated, making the headlines in the local news. Hunters reportedly expressed feelings that the Ka'u reserve fence was "another attempt by the DLNR to limit access to the forest."[194] Big Island Video News posted footage of a meeting held on June 5th, 2012, where local hunting concerns were heard loud and clear, and often were expressed in the local pidgin language. One hunter challenged the DLNR's management of the area, stating, "you don't come to the district of Ka'u… and tell us what to do- ever."[195] Another demonstrated a severe mistrust of scientists, demanding: "Who sits on what committee to say what areas should be fenced off? Is it traditional people, is it hunters, is it gatherers, or is this about science? You know, science has been the biggest problem in Hawaii..."[196] When informed that kupuna were involved in the planning process, the man responded with a pointed and emotional speech:

> "Those kupunas don't hunt already, they don't use the forest, why not talk to the people that use it, the generation that use the forest… now you cannot tell me, that you come in Ka'u, and you entertain a few Hawaiian people, that give you the green light to go do this— this is public lands… so you should go to every island, and have hearings about this kinda programs, no just go down in the corner pocket, and play your goody stuff— that's what resorts do, that's what developers do, you state guys acting just like them, and yet I pay you!...And you guys go out, and give the all green lights to the science, and never to subsistence living, and

---

193 Ibid.
194 "VIDEO: Hunters speak out against plan to fence Ka'u Forest." *Big Island Video News.*
195 Ibid.
196 Ibid.

> never to traditional and gathering rights of daily people. These rights came with these lands, you cannot ignore those rights and that purpose of how we use the lands. And it's important that our children get to practice the same things that we do. Who else gonna perpetuate our culture… the science? They're ruining our culture."[197]

With that final, punctuated statement, the man thanked the audience for listening and sat down. While these are only the speeches of a few people, others that testified expressed a similar mistrust of science and of state control, and were concerned that the land was being taken away from them and therefore from their children and culture. The reasons for the sentiments felt and expressed by these people are varied and complex. There is deep-seeded resentment of the state among some Hawaiians as a result of the Western "invasion" of their culture, and there is a misunderstanding of the intent of science and of resource management. The details of historical reasons for these sentiments will not be discussed here, as the matter deserves a careful examination that would go beyond the scope of this discussion. There are however a few key points to recognize that are relevant to the discussion of public involvement at hand.

First, it is clear that there is a large gap in knowledge between those involved in policy-formation at the national level or even state level (ie: NEPA and HEPA), and the communities their policies impact at the local scale. This gap works in both directions; locals often seem to lack understanding of the state, national and global context of the events happening in their community, and governments lack understanding of how their policies will play out in the vast number of communities they affect. Second, although the environmental assessment report and a verbal presentation of the plan attempted involve the community and thus bridge this gap, it did not do so very well. In fact, it was rather

[197] "VIDEO: Hunters speak out agains plan to fence Ka'u Forest." *Big Island Video News*.

one way. The final draft of the EA, written after the DOFAW considered public input, contains a significant amount of detailed cultural and land use information that would have been next to impossible to obtain without consulting members of the community. The DOFAW depended on kupuna members of the community during the initial drafting process and continued to revise the plan based on public input, to a certain extent. The state included local information, but the locals did not seem to receive much information despite the availability of the EA. The NEPA and HEPA demand public involvement but do not work off a public vote, so what they propose can ultimately be pushed through regardless of the public's input.[198] The Ka'u Forest management plan will therefore be put into effect, achieving conservation goals, but doing so as the result of state desires not community collaboration. Tensions are still high in the local community and are likely to be perpetuated by the carrying out of this plan—the conflict with the hunter interest group was not resolved. This resistance will make enforcement more difficult, and is more or less opposite to the result a CBRM model would attempt to produce.

The Promotion and Limits of CBRM

The conflict between hunting and conservation interests demonstrated in Ka'u is a trend across the island and the state. Proponents of CBRM note that forcing a community to modify its behavior to follow top-down rules does not have a very successful historical track record;[199] the HEPA's provision to involve community but not let it make the ultimate decision on their local resource management would therefore not be expected to

[198] United States. Council on Environmental Quality. *Citizen's guide to the NEPA: Having your voice heard*. 2007. Page 7.
[199] Agrawal, Arun and Clark C. Gibson. "Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation." Page 632.

sit well with them. Indeed, tension has led to a proposition to create a game management advisory group, which appeared on the November 6th, 2012 election ballot as follows:

> "Hawai'i: Establishing a game management advisory commission: Shall the Hawai'i County Charter be amended to create a Game Management Advisory Commission that would advise County, State and Federal agencies on matters related to the preservation of subsistence hunting and fishing, protection of traditional and cultural gathering rights, and the taking and conservation of aquatic life and wildlife?"[200]

This proposition passed by a nearly 2 to 1 margin: 37,366 people voted in its favor, 19,751 voted against it, and 6,676 left it blank.[201] In other words, CBRM (in the form of an advisory commission) is being pushed for by the Hawaii public to address resource issues like those occurring in Ka'u, and these efforts have so far been successful.

The CBRM model, if created by the community itself as it was for the West Hawaii fisheries, could supposedly resolve tension and encourage adherence to the regulations that are set forth. Observations from living on the Big Island lend weight to the notion of CBRM supporters' in general that a lack of public agreement with the regulations will lead to a lack of the conservation regulations being respected. The disagreement between hunters and DOFAW management strategies has led

---

200 "County of Hawaii General Elections 2012: State Constitutional Amendments and Charter Amendments PROS and CONS." League of Women Voters of Hawaii County. Page 6.

201 "Voters issue a powerful mandate for hunting, fishing and gathering on Hawaii island." *Hawaii Free Press.*

members of the Big Island community to disobey the law before. Quite recently, a couple of individuals used a helicopter to introduce Axis deer to the Big Island and mouflon sheep for hunting purposes.[202] A proposal to introduce deer to this island was rejected by the state in the 1970s, on the grounds that such an introduction would "result in unacceptable levels of damage to natural resources, including economic damage to local farmers."[203] This anti-deer policy was thus continued and was affirmed by the state Legislature on June 21st, 2012.[204] The actions taken to introduce the deer were clearly in opposition to state regulations and conservation goals.

There seems to be a general sentiment in Hawaii that people will do what they believe they have the right to do. This is not to say there is a complete lack of respect for resource-related rules— in fact much of Hawaiian culture honors nature, indicated by the state's motto: "*ua mau ke ea o ka aina i ka pono"* ("the life of the land is perpetuated in righteousness"). In other words, proper behavior keeps nature from perishing by human hands. The trouble arises when the rules are perceived as contrary to the culture; a perception clearly expressed by hunters during the Ka'u public meetings. In the eyes of this group, "science" implied that managing resources meant destroying ungulates, which in turn meant destroying culture and was thus connected to the narrative of Westerners destroying native culture. The disapproving attitude of the hunters, a key interest group in the Ka'u area, suggests that conservation regulations set forth by the DOFAW are less likely

[202] "Maui helicopter pilot to be sentenced in deer case." *Hawaii News Now*
[203] State of Hawaii. Department of Land and Natural Resources. *Hunters Encouraged to Help Control Invasive Axis Deer on Big Island*.
[204] Ibid.

to be respected, as has occurred in other areas, than if the community implemented its own rules. It is therefore easy to see the logic that has led to the promotion of CBRM in Hawaii and the passing of the proposition to create a community-composed game management advisory group.

This promotion of CBRM as a method for achieving management goals is an increasingly common occurrence both within the state and across the nation and, for that matter, around the world.[205] Yet the analysis presented in this paper suggests that CBRM should be promoted more cautiously if conservation goals are to be achieved. Here I will compare the situation in Ka'u to that of the West Hawaii fisheries to demonstrate that the limits of CBRM may prevent it from accomplishing conservation goals for resource management.

The hunting interest group present in Ka'u is analogous to the fishing group present on the West Hawaii coast. There is no easy way to obtain an actual count of the hunters in Ka'u because there are no hunter check stations in the reserve. As of 2010 there were 139 licensed hunters in the area, but it is suspected that many more people hunt without a license, due to the inconvenience of obtaining a permit from the DOFAW office in a different town (Hilo), and to a prevalent sentiment that the community should not need to have permit to gather in its forests.[206] The hunting interest group, like the fishing interest group, is supposed to be quite large, and quite politically vocal given the proceedings of the DOFAW's public meeting to discuss the EA. Like the fishermen, the hunters also resist the DLNR's decisions on the premise that such decisions violate

---

[205] Swatuk, Larry A. 2005. "From "project" to "context": community based natural resource management in Botswana." Page 95.
[206] Hawaii State Government. Department of Land and Natural Resources. *Final Environmental Assessment: Ka'u Forest Reserve Management Plan*. Page 68.

traditional gathering rights, a sentiment reflected in the testimonies quoted above. Given these similarities, the creation of the game management advisory commission and the community's desire to have a more CBRM in general is comparable to the hypothetical creation of a group primarily made up of fishermen.

In the case of the West Hawaii fisheries, it was found that the WHFC was able to create FRAs but not no-take fish reserves, primarily because of the unbalanced amount of power each interest group held. Interest groups that were larger were able to dominate the decisions made by the WHFC. This demonstrated an important limit on the CBRM model: it is difficult for a collaborative community effort to accomplish conservation goals when interest groups have disproportionate amount of power, and particularly when those with the greatest amount of power are directly opposed to the conservation goal being set forth.

In Ka'u, hunting interests are directly opposed to the removal of invasive ungulates for the purpose of conserving the watershed and its function of providing clean water. Promoting a CBRM model to manage game in Hawaii is likely to lead to the sort of difficulties the WHFC currently faces while trying to establish no-take marine reserves. Given the current situation, empowering the hunting interest group using the CBRM model is likely to promote the continued presence of ungulates in Hawaii's native forests. If conservation goals are to be met using CBRM, analyses like this one must be used to first evaluate the main interest groups in each community, and then consider what the different groups' perspectives and amounts of power implies for the limits on the ability of CBRM to accomplish conservation goals.

Drawing Conclusions

Critics of the CBRM approach focus primarily on the assumptions that it makes. Foremost among these assumptions is the notion that community can be defined as a single entity, with shared values. The two case studies examined in this paper both demonstrate that in reality this is not exactly the case. The West Hawaii Fisheries Management Area is currently managed by the WHFC, which attempts to collaborate in order to make recommendations that are then adopted by the state. This CBRM approach has successfully created FRA's but has not yet been successful in creating no-take marine fish reserves due to resistance from fishermen interests. In the Ka'u forest area, which is being degraded by introduced ungulates, the state plans to build a fence to achieve the conservation goal of eradicating these ungulates from a certain area, but this is not the result of a community decision, and is in fact resisted by hunting interest groups in the area. The community in Ka'u and elsewhere on the island is pushing for a CBRM approach, but the limits of CBRM demonstrated by the struggles of the WHFC suggests this may not be best for achieving conservation goals.

The current Ka'u culture is a mix of ancient and more recent Hawaiian traditions, along with other interest groups. The introduction of game and sportsmen culture has been infused into the community's relationship with the forest, creating community opposition reminiscent of fishermen's opposition to conservation goals. Opposition from groups like fisheries and hunting interests demonstrates that the CBRM model is limited because its assumption that community will collaboratively strive to achieve conservation goals is not always met. The critical approach of recognizing communities not as a whole but as an assortment of different interest groups is key to recognizing whether or not

conservation goals will be achieved using the CBRM model. This analysis suggests that CBRM should only be promoted to achieve conservation goals when dominant interest groups in the community are in support of these goals, which is not always the case. This conclusion raises an important ethical dilemma for decision-makers involved resource management: is it acceptable to use a CBRM approach only where community interests will prioritize conservation goals?

A critic of CBRM writes that "participatory natural resource management programs such as CBNRM [CBRM] will be localized when and where they serve or do not threaten the dominant interests."[207] In saying this he was arguing that CBRM are likely to be twisted so that it is only implemented where it serves the powerful economic stakeholders in third world countries, but his conclusion can also be applied to the question posed above. If the "dominant interest" is considered to be that of conservationists, it becomes apparent that selectively implementing CBRM only in areas where conservation is supported inherently rejects the empowerment of communities that have different interests. In considering the acceptability of promoting CBRM in this manner, it is helpful to consider the consequences of not doing so. This would mean empowering communities everywhere regardless of their interests. I will use a hypothetical situation here to illustrate the potential consequences of taking this action.

If, in the case of Hawaii, hunting interests are empowered and given the responsibility of managing game, it seems likely that exclusion of invasive ungulates from forests will be very limited. In the case of Ka'u, it seems likely that the community would have abolished the fencing in of a 12,000-acre area, or at least diminished its size.

---

[207] Swatuk, Larry A. 2005. "From "project" to "context": community based natural resource management in Botswana." Page 119.

If this pattern of management continued, the watershed would degrade and eventually lose its ability to provide potable water. This would have the dual affect of polluting reefs during runoff and decreasing the amount of clean water available to the Ka'u community, which is especially important for agricultural groups. The distrust of science, which says ungulates degrade the forest's ability to provide clean water, would lead to mismanagement of forests to the extent that the community could end up harming its own water source. Again, this is a hypothetical situation that oversimplifies the potential chain of events quite a bit, but what I am getting at here is the general idea that if community fails to prioritize conservation, the ultimate result will be degradation of natural resources, which in turn will hurt the community. This would be detrimental enough at the local level, but consider its implications for the national and global scale.

The CBRM model has been set forth as the solution to environmental across the United States. In 2000, the Environmental Protection Agency (EPA) began to set CBRM goals in the form of Community-Based Environmental Protection (CBEP). CBEP takes the model of CBRM and promotes its development around the country. It cites the Malpai Borderlands Group as an ideal example of how the CBEP can succeed,[208] but fails to note that this group has not been entirely successful. Similarly, environmental NGOs have promoted CBRM internationally, encouraging it in places like Botswana,[209] the Philippines,[210] Ghana,[211] India,[212] and elsewhere. The

[208] Community-Based Environmental Protection: A Resource Book for Protecting Ecosystems and Communities, 1997, U.S. EPA (EPA 230-B-96-003), Washington, DC
[209] Swatuk, Larry A. 2005. "From "project" to "context": community based natural resource management in Botswana."
[210] Pomeroy, Robert S., Richard B. Pollnac, Brenda M. Katon, and Canesio D. Predo. 1997. "Evaluating factors contributing to the success of community-based coastal resource management: the Central Visayas Regional Project-1, Philippines."

CBRM has succeeded in some of these areas but has also had several drawbacks, including the project failures, lack of inclusion of all interest groups, and skewed empowerment mentioned in the section of this paper that introduced CBRM. A careful analysis of individual communities' historical, cultural, and political context could help to mitigate these conservation failures, but CBRM is nonetheless continuing to be promoted at both the national and global scales without such measures being taken.

The analysis I offer in this paper is meant to caution the widespread promotion of CBRM by environmental groups and others, with the hope that the limitations of CBRM will be considered before it is implemented. The model of CBRM has the potential to utilize the details of local knowledge and facilitate a collaborative approach to resource management that prioritizes biodiversity conservation, but there are steps that must be taken to ensure that this is what will actually happen when CBRM is applied. It is critical to analyze communities as entities made up of multiple interest groups with varying amounts of power in order to predict the ability of CBRM to accomplish conservation goals at different localities. It is in the best interest of local communities and the global community to prioritize the conservation of the species and ecosystem functions on which they depend when making management decisions. However, it is apparent from the struggles of both the West Hawaii fisheries and the Ka'u forest reserve that communities do not always accept this concept. In other words, the assumption that

---

[211] Leach, Melissa, Robin Mearns, and Ian Scoones. 1999. "Environmental entitlements: dynamics and institutions in community-based natural resource management."
[212] Ibid.

communities will do a better job of achieving conservation goals using CBRM than traditional government methods is not always met because the value of conservation goals is not well understood by the groups involved.

This trouble with the acceptance of conservation goals raises a new set of questions. Why do different interest groups disagree with these goals? In Ka'u and West Hawaii there was an apparent mistrust of science, as well as an intense economic dependence on resources that conservation strategies may limit access to. These and other factors may cause resistance to conservation both within the United States and in other countries. These factors must be identified at each locality where CBRM is proposed in order to uncover the unique challenges to conservation present in each community, which will inform strategies to lessen this resistance before CBRM is implemented. On the Big Island it may be helpful to involve communities in the conservation process, which has already started to happen in some areas. At other places the solutions may look different; finding them will take time and careful analysis, but it is worth the effort. If the limitations of CBRM are recognized, steps can be taken to avoid these limitations before the model is implemented. If this is done, communities can become better equipped to manage their resources to sustain ecosystems and thereby themselves at the local, national, and global scales.

Literature Cited

"A Natural history of the Hawaiian Islands: selected readings II." Ed. Alison Kay. Honolulu: University of Hawaii Press, 1994. Print.

Agrawal, Arun and Clark C. Gibson. 1999. "Enchantment and Disenchantment: The Role of Community in Natural Resource Conservation." *World Development* 27.4: 629-649.

Ahue, Keith W. State of Hawaii. Division of Forestry and Wildlife. *Hawaii Tropical Forest Recovery Action Plan*. Honolulu: 1994.

Brosius, Peter J., Anna Lowenhaupt Tsing, and Charles Zerner. 1998. "Representing Communities: Histories and Politics of Community-Based Natural Resource Management." *Society and Natural Resources* 11: 157-168.

Callicott, J. Baird. 1990. "Whither conservation ethics?" *Conservation Biology*. 4.1: 15-20.

Capitini, Claudia A., Brian N. Tissot, Matthew S. Carroll, William J. Walsh, and Sara Peck. 2004. "Competing Perspectives in Resource Protection: The Case of Marine Protected Areas in West Hawai'i." *Society and Natural Resources*. 17: 763-778.

Cesar, H. S. J., and Pieter van Beukering. 2004. "Economic valuation of the coral reefs of Hawai'i." *Pacific Science* 58.2: 231-242.

Chavas, Jean-Paul. 2008. "On the productive value of biodiversity." *Environmental and Resource Economics*. 42.1: 109-131.

Community-Based Environmental Protection: A Resource Book for Protecting Ecosystems and Communities, 1997, U.S. EPA (EPA 230-B-96-003), Washington, DC.

Conry, Paul J. State of Hawaii. Division of Forestry and Wildlife. *Game Management Program FY01-FY05*. 2005.

Corrigan, David. "EA for Ka'u Forest Reserve completed, published." *Big Island Video News* 24 Oct 2012, n. pag. Web. 5 Dec. 2012. <file:///Users/Amber/Desktop/College stuff/Semester 7/EA 191/Sources/Ka'u/EA for Ka'u Forest Reserve completed, published.html>.

"County of Hawaii General Elections 2012: State Constitutional Amendments and Charter Amendments PROS and CONS." League of Women Voters of Hawaii County. Vote411.org. Hilo, 2012.

Cox, Thomas R. 1992. "The Birth of Hawaiian Forestry: The Web of Influences." *Pacific Historical Review*. 61.2: 169-192.

Devaney, Dennis M., Marion Kelly, Polly Jae Lee, and Lee S. Motteler. *Kane'ohe: A History of Change*. Honolulu: The Bess Press, 1982. 95-103. Web. <http://www.librarieshawaii.org/kaneohepl/kaneohehistory/kaneohe_history_of_change_ocr_pt5_pp95_110.pdf>.

"Digest of Federal Resource Laws of Interest to the U. S. Fish and Wildlife Service." *Fish and Wildlife Service*. Accessed 3 Nov. 2012. http://www.fws.gov/laws/lawsdigest/FAWILD.HTML.

Ehrlich, P. R., and A. H. Ehrlich. 1992. "The value of biodiversity." *Ambio: A Journal of the Human Environment.* 21.3: 219-226.

Elderkin, Susan. 1996. "What a difference a year makes." *High Country News*. Sept 02, 1996 issue. <http://www.hcn.org/issues/89/2748>.

Emerson, Ralph Waldo. 1836. "Nature." Web. http://oregonstate.edu/instruct/phl302/texts/emerson/nature-emerson-a.html#Chapter I.

"Endangered Species Program." *U. S. Fish & Wildlife Service*. USA.gov, 28 2012. Web. 4 Dec 2012. <http://www.fws.gov/endangered/laws-policies/section-2.html>.

Fleischer, Robert C., Carl E. McIntosh, and Cheryl L. Tarr. 2002. Evolution on a volcanic conveyor belt: using phylogeographic reconstructions and K-Ar-based ages of the Hawaiian Islands to estimate molecular evolution rates. *Molecular Ecology* 7.4: 533-545.

Handy, Craighill, and Elizabeth Handy. *Native Planters in old Hawaii: their life, lore and environment*. Honolulu: Bishop Museum Press, 1972. Print.

Hawaii State Government. Department of Land and Natural Resources. *Final Environmental Assessment: Ka'u Forest Reserve Management Plan*. 2012. Web. <http://oeqc.doh.hawaii.gov/SharedDocuments/EA_and_EIS_Online_Library/Hawaii/2010s/2012-10-23-FEA-Kau-Forest-Reserve-Management-Plan-5B.pdf>.

Hawaii State Government. *Hawaii Revised Statues Chapter 343: Environmental Impact Statement*. 2008. Web. <http://luc.state.hi.us/docs/hrs_343.pdf>.

"Historical Visitor Statistics." *Hawaii Tourism Authority*. Hawaii Tourism Authority, n.d. Web. 9 Nov 2012. <http://www.hawaiitourismauthority.org/research/reports/historical-visitor-statistics/>.

"History of Agriculture in Hawaii." *Division of Land and Natural Resources*. N.p., 28 1999. Web. 30 Oct 2012. <http://hawaii.gov/hdoa/ag-resources/history>.

"Introduction of Cattle." *HawaiiHistory.org*. Info Grafik Inc., n.d. Web. 30 Oct 2012. http://www.hawaiihistory.org/index.cfm?fuseaction=ig.page&CategoryID=254.

International Union for the Conservation of Nature (IUCN) – The World Conservation Union. October 1999. Report of the Eleventh Global Biodiversity Forum: Exploring Synergy Between the UN Framework Convention on Climate Change and the Convention on Biological Diversity. IUCN, Gland, Switzerland and Cambridge, UK

Jokiel, P. L., K. S. Rodgers, W. J. Walsh, D. A. Polhemus, T. A. Wilhelm. 2011. "Marine resource management in the Hawaiian archipelago: the traditional Hawaiian system

in relation to the Western approach." *Journal of Marine Biology* 2011:16 pages. http://www.hindawi.com/journals/jmb/2011/151682/abs/.

Kirch, Patrick. *Feathered Gods and Fishhooks*. Honolulu: University of Hawaii Press, 1985. Print.

Kirch, Patrick. "The Impact of the Prehistoric Polynesians on the Hawaiian Ecosystem." *A Natural History of Hawaii*. Ed. Alison Kay. Honolulu: University of Hawaii Press, 1994. Print.

Kremen, Claire. "Managing ecosystem services: what do we need to know about their ecology?" *Ecology Letters* 8.5: 468-479.

La Croix, Sumner J., and James Roumasset. 1990. "The evolution of private property in nineteenth-century Hawaii." *The Journal of Economic History* 50.4: 829-852.

Lauer, Nancy Cook. "Fish-collecting ban reso passes council." *West Hawaii Today* [Kona] 05 10 2011, n. pag. Print.

Leach, Melissa, Robin Mearns, and Ian Scoones. 1999. "Environmental entitlements: dynamics and institutions in community-based natural resource management." *World Development* 27.2: 225-247.

Lowe, M. Kimberly. 2004. "The Status of Inshore Fisheries Ecosystems in the Main Hawaiian Islands at the Dawn of the Millennium: Cultural Impacts, Fisheries Trends and Management Challenges." *Status of Hawaii's Coastal Fisheries in the New Millenium, revised*. Ed. Alan M. Friedlander. Honolulu, Hawaii: Hawaii Audubon Society.

"Maui helicopter pilot to be sentenced in deer case." *Hawaii News Now* [Honolulu] 13 Sept 2012, n. pag. Web. 7 Dec. 2012. <http://www.hawaiinewsnow.com/story/19534315/maui-helicopter-pilot-to-be-sentenced-in-deer-case>.

McNarie, Alan D. "Reef Madness." *Big Island Weekly* [Kona] 09 11 2011, n. pag. Web. 6 Dec. 2011. <http://bigislandweekly.com/news/reef-madness.html>.

Meffe, Gary K. "Conservation biology and the preservation of biodiversity: an assessment." *Nature and Human Society: The Quest for a Sustainable World*. Ed. Peter H. Raven and Tania Williams. Washington, D. C.: National Academy Press, 1997. 255-263.

"Mission Statement." Division of Land and Natural Resources. Web. Accessed 6 Dec 2012. http://hawaii.gov/dlnr/divisions/dcre/mission-statement.

"The NEPA Statute." *National Environmental Policy Act*. N.p., n.d. Web. 4 Dec 2012. <http://ceq.hss.doe.gov/laws_and_executive_orders/the_nepa_statute.html>.

Nickelsburg, Stephen M. 1998. "Mere volunteers? The promise and limits of community-based environmental protection." *Virginia Law Review* 84.7: 1371-1409.

Pomeroy, Robert S., Richard B. Pollnac, Brenda M. Katon, and Canesio D. Predo. 1997. "Evaluating factors contributing to the success of community-based coastal resource management: the Central Visayas Regional Project-1, Philippines." *Ocean & Coastal Management* 36.1-3: 97-120.

Reiger, John. F. *American Sportsmen and the Origins of Conservation*. 3rd. Corvallis: Oregon State University Press, 2001. 1-44. Print.

Simon, Chris. 1987. "Hawaii evolutionary biology: an introduction." *Trends in ecology & evolution.* 2: 175-178.

Smith, Donald J. 1952. "The Hawaiian goose (Nene) restoration program." *The Journal of Wildlife Management*. 16.1: 1-9.

State of Hawaii. Department of Land and Natural Resources. *Hunters Encouraged to Help Control Invasive Axis Deer on Big Island*. Honolulu: , 2012. Web.

State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2005 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." December 2004.

State of Hawaii. Division of Aquatic Resources. Report to the Twenty-third Legislature Regular Session of 2010 on "A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fishery Management Area." January 2010.

State of Hawaii. House of Representatives, Nineteenth Legislature. *Relating to the West Hawai'i Regional Fishery Management Area*. Honolulu: Hawaii, 1998. Print.

State of Hawaii. Office of Environmental Quality Control. *Guide to the Implementation and Practice of the Hawaii Environmental Policy Act*. 2012. http://oeqc.doh.hawaii.gov/Shared%20Documents/Misc_Documents/Guide%20to%20the%20Implementation%20and%20Practice%20of%20the%20HEPA.pdf.

Stone, Charles P. and Stephen J. Anderson. 1988. "Introduced animals in Hawaii's natural areas." *Proceedings of the Thirteenth Vertebrate Pest Conference*. 134-140.

Swatuk, Larry A. 2005. "From "project" to "context": community based natural resource management in Botswana." *Global Environmental Politics* 5.3: 95-124.

Tabrah, Ruth. 1980. *Hawaii: A Bicentennial History*. 1st ed. New York: W. W. Norton & Company, Inc.

Tissot, Brian. 1999. "Adaptive Management of Aquarium Fish Collecting in Hawaii." *SPC Live Reef Fish Information Bulletin*. Ed. Tom Graham. Secretariat of the Pacific Community and The Nature Conservancy.

Tissot, Brian N. 2005. "Integral Marine Ecology: Community-Based Fishery Management in Hawai'i." *World Futures*. 61: 79-95.

Tissot, Brian N., and Leon E. Hallacher. 2000. "Diver Impacts on coral reefs at Kealakekua Bay, Hawai'i." Hawai'i's State of the Reefs Report. University of Hawaii Sea Grant College Program. Honolulu, HI. Pp. 59-72.

Tissot, Brian N., and Leon E. Hallacher. 2003. "Effects of Aquarium Collectors on Coral Reef Fishes in Kona, Hawaii." *Conservation Biology*. 17.6: 1759-1768.

Tissot, B. N. W. J. Walsh, and M. A. Hixon. 2009. "Hawaiian Islands Marine Ecosystem Case Study: Ecosystem and Community-Based Management in West Hawaii." Coastal Management 37: 255-273.

United States. Council on Environmental Quality. *Citizen's guide to the NEPA: Having your voice heard*. 2007. Print. <http://ceq.hss.doe.gov/nepa/Citizens_Guide_Dec07.pdf>.

"VIDEO: Hunters speak out against plan to fence Ka'u Forest." *Big Island Video News* 5 Jun 2012, n. pag. Web. 5 Dec. 2012. <http://www.bigislandvideonews.com/2012/06/05/video-hunters-speak-out-against-plan-to-fence-kau-forest/>.

Vitousek, Peter M., Harold A. Mooney, Jane Lubchenco, Jerry M. Melillo. 1997. "Human Domination of Earth's Ecosystems." *Science* 277: 494-499.

Vitousek, P. M., L. L. Loope, C. P. Stone. 1987. "Introduced species in Hawaii. Biological effects and opportunities for ecological research." *Trends in Ecologys & Evolution* 2.7: 224-227.

"Voters issue a powerful mandate for hunting, fishing and gathering on Hawaii island." *Hawaii Free Press.* 16 Nov 2012, n. pag. Web. 5 Dec. 2012. http://www.hawaiifreepress.com/ArticlesMain/tabid/56/articleType/ArticleView/articleId/8236/categoryId/41/Voters-issue-a-powerful-mandate-for-hunting-fishing-and-gathering-on-Hawaii-island.asp&xgt;.

Walker, Ronald L. 1978. "A history of the division of fish and game." *Division of Land and Natural Resources.* Web. 30 Oct 2012. http://www.state.hi.us/dlnr/dofaw/pubs/Walker%20DOFAW%20History.pdf.

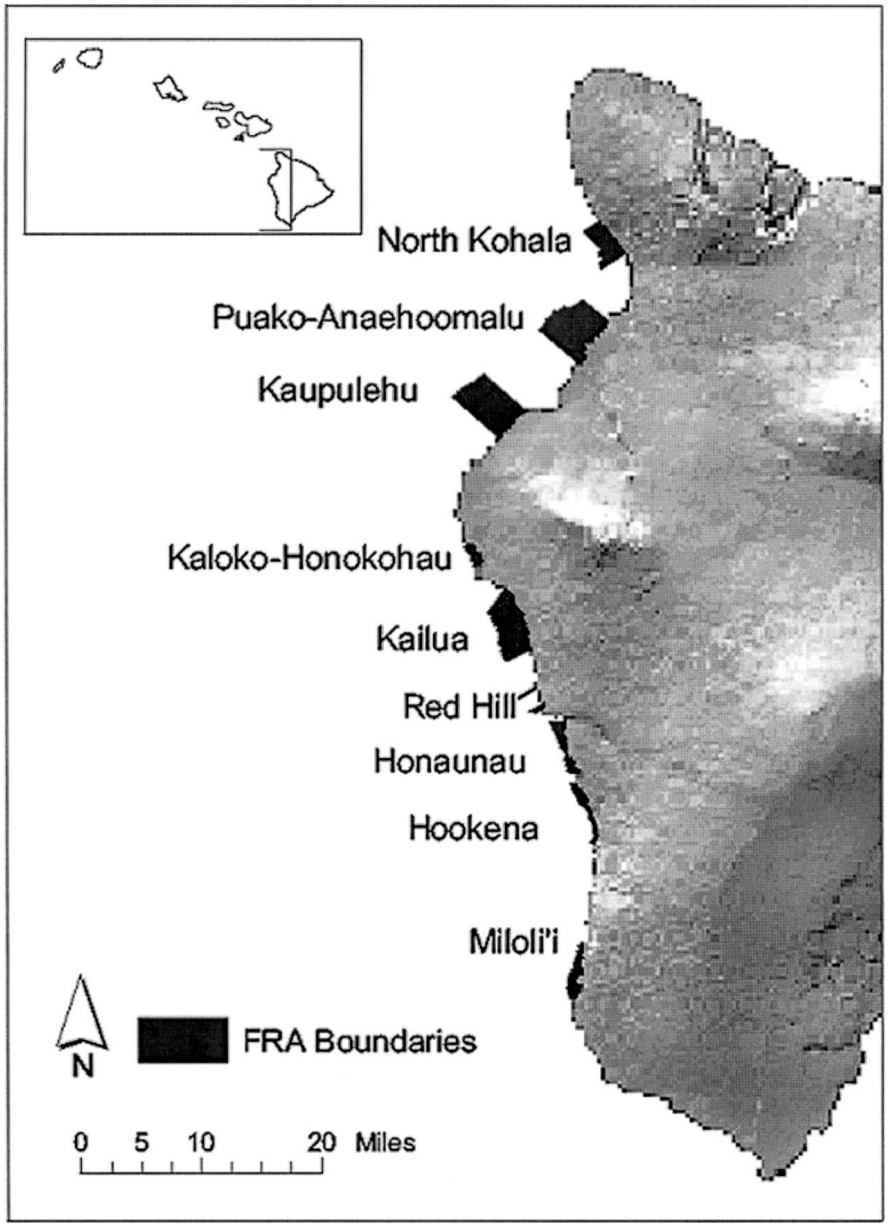
Walsh, William J. 1999. "Community-Based Management of a Hawai'i Aquarium Fishery." *Marine Ornamentals '99: Collection, Culture, Conservation*. 16-19 Nov. Hawaii Sea Grant College Program. 83-88.

Walsh, William J., Stephen S. P. Cotton, Jan Dierking, and Ivor D. Williams. "The Commerical Marine Aquarium Fishery in Hawai'i 1976-2003." *Status of Hawaii's Coastal Fisheries in the New Millenium, revised*. Ed. Alan M. Friedlander. Honolulu, Hawaii: Hawaii Audubon Society.

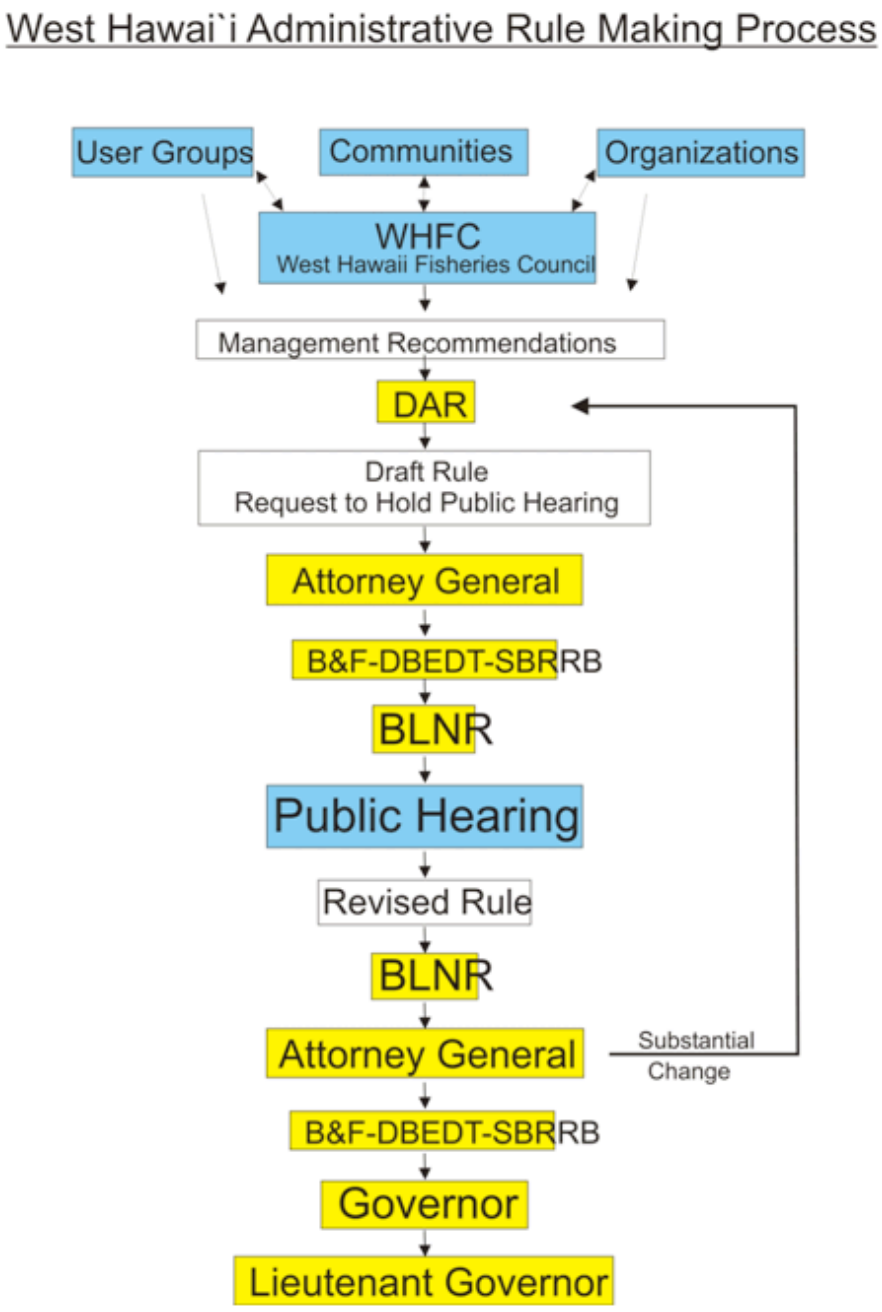
Wilson, E. O. "The Creation of Biodiversity." *Nature and Human Society: The Quest for a Sustainable World*. Ed. Peter H. Raven and Tania Williams. Washington, D. C.: National Academy Press, 1997. 277: 22-29.

Appendices

Appendix A- Map of the 9 FRAs

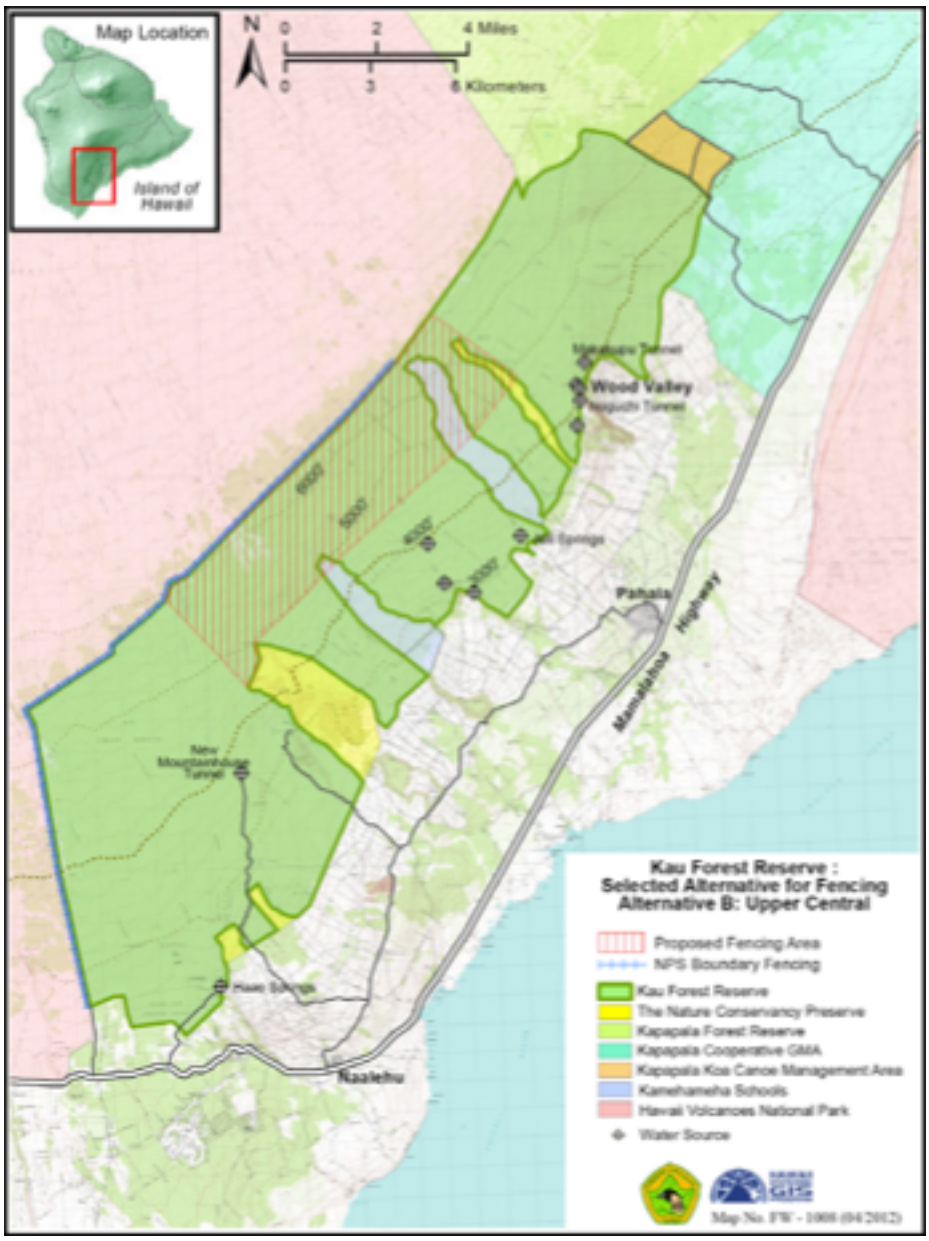


Appendix B- WHFC process



© http://www.ecotippingpoints.org/our-stories/indepth/usa-hawaii-fisheries-council-community-participation.html

Appendix C- Map of the Ka'u Forest Reserve with chosen location for fenced area[213]



[213] Hawaii State Government. Department of Land and Natural Resources. *Final Environmental Assessment: Ka'u Forest Reserve Management Plan*. Page 19.