

Heritage Resources

Chapter 2: Heritage Resources



Honokahua burial site.

M*ai's archaeological landscapes, ethnic diversity, historic structures, and rare ecosystems collectively define the island and make it unique. The combination of royal fishponds, burial sites, historic sugar mills, churches, vibrant rainforests, endemic species, and spectacular views tell the tale of a mix of cultures and their relationship with the surrounding natural environment. A tenet of environmental stewardship is sustainability, which refers to the ability of mankind to “meet the needs of the present without compromising the ability of future generations to meet their own needs,” according to a widely accepted definition. Human interactions with the natural elements provide challenges and opportunities for further natural-resource protection.*

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CULTURAL, HISTORIC, AND ARCHAEOLOGICAL RESOURCES

Maui is an island rich in history, culture, and traditions. Beginning with the arrival of voyaging Polynesians, and progressing through time to modern day, Maui has developed into a diverse community. The island's archaeological artifacts, folklore, historic buildings, landscapes, people, traditions, languages, and lifestyles are all a part of its history. Cultural, historic, and archaeological resources provide us with a connection to the past and a sense of identity and place. They inform us of our history and provide us with an understanding of Maui's people, past and present.



Wo Hing Society Hall, Lahaina.

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Background Information

Beginning with the early Hawaiians, Maui has become home to people from across the globe. Each group has made its mark on the island. The early Hawaiians arrived more than a thousand years ago by voyaging canoes from Central Polynesia. They brought with them their language, traditions, and lifestyles. Maui's culture today is rooted in things Hawaiian – the Aloha Spirit, the Hawaiian language, hula, surfing, and the beauty and spirit of the land.



Maui's Cultural Resources Provide a Sense of Identity

Kepaniwai Park, I'ao Valley.

Western explorers arrived in Hawai'i using modern tools of navigation and sailing. They arrived to Hawai'i as sandalwood traders, whalers, and in 1820 as missionaries. Around these economic activities, small towns developed to provide goods and services. American and European institutions, traditions, and culture became rooted in Hawai'i during the rapidly changing period of the 19th century.

With massive growth of the plantation industry, the need for labor also grew, resulting in the importation of workers from Asia, Europe, South and Central America, and the South Pacific Islands, which created incredible ethnic and cultural diversity within the County.

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Pu`unēnē.

As a result of Maui’s Native Hawaiian history spanning more than a thousand years, and its more recent multi-ethnic history, the island is rich in archaeological and historic sites. The preservation of archaeological sites is important to present-day Native Hawaiians and encourages the perpetuation of traditional practices. Historic and archaeological resources are also important to Maui’s economy. Hawaiian archaeological sites and post-contact historic places provide a visitor experience found nowhere else.

The Countywide Policy Plan, at page 49, establishes the following goal: “Maui County will foster a spirit of pono and protect, perpetuate, and reinvigorate its residents’ multi-cultural values and traditions to ensure that current and future generations will enjoy the benefits of their rich island heritage. “

Each part of Maui has a mix of cultural resources. Table 2-1 summarizes Maui’s resources in the context of the four regions.

Table 2 - 1: Maui’s Cultural, Historic, and Archaeological Resources by Community Plan Area

Community Plan Area	Cultural, Historic, and Archaeological Resources
Hana	The Hana Community Plan Area is characterized by its vast natural areas, wealth of Hawaiian history, agricultural lands, and rural communities. Hawaiian history and folklore are central to the identity of this area. Many Hawaiian royalty and ali`i originated from this area, including Queen Ka`ahumanu. Hawaiian cultural resources, including lo`i kalo, heiau, burial sites, battle grounds, and ancient trails, are abundant in this area.

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Community Plan Area	Cultural, Historic, and Archaeological Resources
Wailuku-Kahului	Cultural resources of the Wailuku-Kahului Community Plan Area are dominated by the sugarcane industry, though this area is also rich with Hawaiian cultural resources. This area was home to many of Maui's ali'i, including Kahekili, Maui's most powerful chief. `Iao Valley is the site of one of the most famous battles in Hawaiian history where King Kamehameha I defeated the Maui army in an effort to unite the Hawaiian Islands. The Wailuku Historic District's landmarks, civic center, and commercial buildings along High, Main, Market, Church, and Vineyard Streets stand as unique reminders of the island's cultural identity and history.
Makawao-Pukalani-Kula	The history of the Hawaiian cowboy, or paniolo, is prominent in places such as Haleakalā Ranch and `Ulupalakua Ranch. Remnants of Chinese history can also be found in this area at the Ket Hing Society.
Kihei -Makena	The cultural resources of this area are closely tied to its coastal resources. Fishing villages were prominent in this region and several fishponds still remain along the coast. Within the southwestern end of the Kihei-Makena Community Plan Area is a mix of archaeological resources, including Hawaiian burial sites, fishing shrines, heiau, and shelters. Also within this portion of the region is Keone`ō`io, where the French explorer, Francois de Galaup, Comte de la Perouse, first mapped Maui's South shore and recorded his observations of Hawaiian culture. South Maui also played an important role in the cattle ranching community during the 1800s and first half of the 1900s.
Pa`ia-Ha`iku	This area's importance in Hawaiian oral history is indicated by the numerous references to landings, battles, and visits conducted here by various ali`i nui. This area was also the location of numerous heiau, reflecting the presence of both locally and regionally powerful chiefs, as well as a sizable population to provide labor for the building of the structures. During much of the 19 th and 20 th centuries, vibrant plantation towns existed in this area. The sugar and plantation industries and their employees utilized a railroad line that originated in Ha`iku. Remnants of the old railroad track remain in Pa`ia Town, which was once the island's commercial hub.
West Maui	As the former capital of Hawai`i, Lahaina was the residence of Hawaiian kings and the location where many key Hawaiian governmental decisions were made during the 19 th century. Lahaina's identity as a major seaport made it central to the whaling industry in the Pacific. Lahaina was also home to many influential missionaries who had a profound effect on the culture of the island. The Lahaina Historic Districts I and II and the Lahaina National Historic Landmark District signify the importance of this area's rich cultural history. The southern end of the West Maui Community Plan Area, including Launiupoko, Olowalu, and Ukumehame, contains significant remnants of pre-contact Hawai`i such as heiau, agricultural terraces, and petroglyphs. North of Lahaina, toward the wetter end of the area, streams were extensively used for irrigated kalo cultivation by Hawaiians. The sugarcane industry and the pineapple industry also have had a strong presence in this area. Pu`ukoli`i, once the largest sugar camp in West Maui, was located mauka of Kā`anapali, and several Japanese and Filipino graveyards still exist in the area.

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CHALLENGES AND OPPORTUNITIES

Perpetuation of Cultural Practices and the Hawaiian Language

While State and County programs exist to perpetuate the island’s cultural practices and traditions, additional support is needed to make them more effective. Maui’s physical beauty, architecture, food outlets, clothing, music and customs make the island special and define its “sense of place.” By maintaining Maui’s unique features, we can maintain the health of the visitor industry and economy. In recent years, the development of shopping malls, fast food chain stores, and tract housing have given Maui the visual appearance of many mainland communities. Maui has also lost several locally owned retail stores and restaurants that catered to the needs of island residents.

The Countywide Policy Plan, at page 50, establishes the following objective:

“Perpetuate the Hawaiian culture as a vital force in the lives of residents.”

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Lo'i kalo.

Cultural programs, education, and the local arts need to be widely available to perpetuate the island's unique sense of identity. Educating residents about the value of cultural resources is essential to the preservation of these resources for future generations. Public schools and private organizations, such as the Maui Arts and Cultural Center, provide important venues for such education.

The legal protection of historic and archaeological resources is limited outside of the officially designated historic districts (in Lahaina and Wailuku), formally dedicated historic sites, and the Special Management Area. T many significant sites that exist outside of these areas and should be afforded stronger protection.

Protection of Cultural, Archaeological, and Historic Resources

The National Park Service accepts "Thematic Cultural Resource" nominations for inclusion on the National Register of Historic Places. Cultural resources can be grouped by ethnicity or other themes and publicized through "thematic cultural resource guides." As a valuable resource for the visitor industry, thematic cultural areas and accompanying guides could produce a source of funding for restoration and maintenance of historic sites.

Many cultural areas are made up of a mix of historical sites, archaeological complexes, and natural resources. These elements carry their full cultural significance when linked, protected, and interpreted together as a cultural landscape.

Kalo Kanu o Ka `Āina: A Cultural Landscape Study of Ke`anae and Wailuanui, Island of Maui (1996) makes recommendations for methods to preserve the cultural landscape in portions of the Hana Community Plan Area based on cultural resource inventories, land use management decisions, and actions that protect the community's rural lifestyles and vital natural resources.

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Hale Ki'i, Wailuku.

The National Park Service administers the National Heritage Area (NHA) program. NHA-designation encourages local residents, government agencies, nonprofit groups and private partners to collaboratively plan and implement programs and projects that “recognize, preserve, and celebrate” the applicable area’s physical and cultural landscape. There are currently 49 NHAs; none are in Hawai`i.

The Statewide Historic Preservation Plan for the State of Hawaii (2001) and the Cultural Resources Management Plan for Maui County (1984) provide numerous recommendations that, if implemented, would strengthen cultural resource management.

Geographic Information System technology provides tools to efficiently map the location of cultural sites. The Historic Resources Inventory and Mapping (2006) is one documented inventory of cultural resources. Interviews with knowledgeable cultural practitioners and kupuna across the island are also necessary.

Identifying and protecting historic and archaeological sites on private property can be especially challenging because of the need for support and cooperation from private landowners. Challenges include identifying unknown archaeological sites, encouraging owners to list sites on the State or National Register of Historic Places, and maintaining a database of listed sites.

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Ke`anae.

Island-wide Inventory of Historical Resources

Predictive maps could be developed from a comprehensive resource inventory to forecast undiscovered archaeological sites. In other communities, predictive maps have been used successfully to forecast the location of important archaeological and historic resource sites, thus allowing more effective resource preservation.

The development of incentive programs to encourage landowners to register, maintain, and improve historic and archaeological sites on their property would make voluntary preservation more attractive. Low-interest loans and tax incentives would provide incentives for restoring historic structures.

Maui County has established historic districts within Lahaina and Wailuku (Chapter 19.50, Maui County Code) to provide recognition and protection for historically significant structures. Similarly, establishing archaeological districts could protect areas with strong archaeological significance.

The Countywide Policy Plan, at page 51, establishes the following objective:

“Preserve and restore significant historic architecture, structures, cultural sites, cultural districts, and cultural landscapes.”

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Ke`anae.

SUMMARY OF CULTURAL, HISTORIC, AND ARCHAEOLOGICAL RESOURCES ISSUES

While some State and County programs exist to perpetuate island culture and protect historic and archaeological resources, additional support is needed to enable these programs to be effective. The following are a few of the many requirements to meet cultural-resource challenges.

- Preserve cultural practices and the Hawaiian language
- Strengthen management programs to better protect archaeological and historic resources
- Develop island-wide inventories of historic and archaeological resources

GOAL, OBJECTIVES, AND POLICIES

Note: see matrix

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Mā`alaea Bay.

SHORELINE, REEFS, AND NEARSHORE WATERS

Maui's shoreline is a complex system of wetlands, gullies, dunes, beaches, lava fields, and hardpan substrate. Maui's coast serves as habitat for indigenous plants and animals. The health of the shoreline and beach areas is a key factor in sustaining sand resources, coral reefs, and marine wildlife. These areas serve as ecological, social, and economic resources. Various Federal, State, and County laws exist to conserve coastal resources while balancing development demands. Even with the existing regulatory framework, further management is necessary to balance rapid growth with shoreline protection.

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A bodyboarder at D.T. Fleming Beach Park, Honokahua.

Access to shoreline and beach areas is essential for a range of recreational activities; surfing, swimming, fishing, diving, and canoeing are part of Maui's lifestyle. Many of Maui's most spectacular views are along the island's coastline. Coastal-land preservation protects cultural and historical resources, including traditional fishponds, heiau, and burial sites. A comprehensive network of State and County laws exist to preserve and enhance shoreline and coastal waters. While there are many layers of regulations, the jurisdictional boundaries and inherently complex nature of the hydrologic cycle present a challenge to effective coastal-resource protection. The Countywide Policy Plan, at page 47, establishes the following policy: "Protect and restore nearshore reef environments and water quality." The corresponding implementing action is: "Develop regulations to minimize runoff of pollutants into nearshore waters and reduce nonpoint and point source pollution."

CHALLENGES AND OPPORTUNITIES

Lack of an Integrated Coastal Zone Management Program

Maui's beaches, nearshore waters, and reef ecosystems cannot be managed or regulated independently of one another. Integrated Coastal Zone Management (ICZM) provides a more holistic approach to beach management. ICZM requires a broader effort that crosses political and geographic boundaries in an effort to achieve sustainability.

ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area and to take actions towards meeting these objectives. ICZM seeks over the long term to balance environmental, economic, social, cultural, and recreational objectives, all within the limits set by natural dynamics. Integration of all relevant policy areas and levels of administration is required.

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Deteriorating Reef Health and Fish Stock; Compromised Ecosystems

The Beach Management Plan for Maui (2006), prepared by the University of Hawai'i Sea Grant Extension Service, sets forth detailed objectives and recommendations to promote preservation and sustainable development of the coastline. Many of the plan's recommendations may be implemented through changes to land use policies, rules and regulations and the establishment of new programs and partnerships.

Reef decline on Maui ranks among the fastest in the world. Several sites, both protected and developed, have seen coral communities and reliant organisms nearly disappear in approximately 20 years.¹

A majority of the human population lives and plays along the shoreline. Additional tourism and a growing resident population have increased development along the shoreline, which is a contributing factor in nearshore water quality. Coral ecosystems have not evolved to allow reef communities to recover from the types of disturbance caused by such development.

Two stressors that can be addressed immediately are: (1) overfishing, which reduces the ability of the wider reef ecosystem to oppose replacement of coral and other reef building species by algae; and (2) deteriorating water quality caused by increased inorganic nutrients. These problems can be attributed to coastal urbanization from an ever-increasing population of residents and tourists and from the groundwater influxes of nutrients into Maui's nearshore waters.

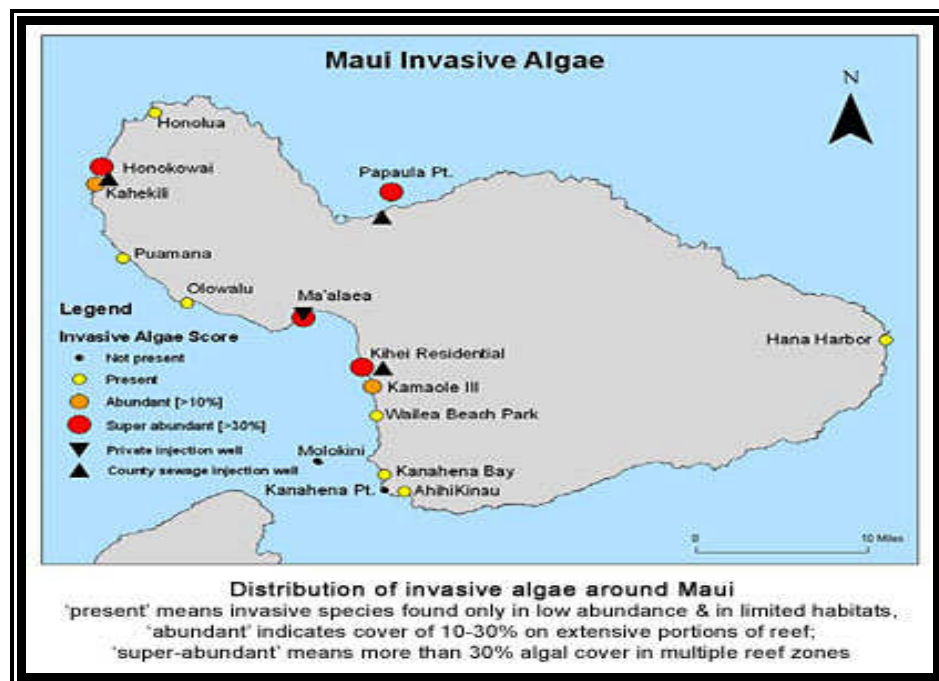
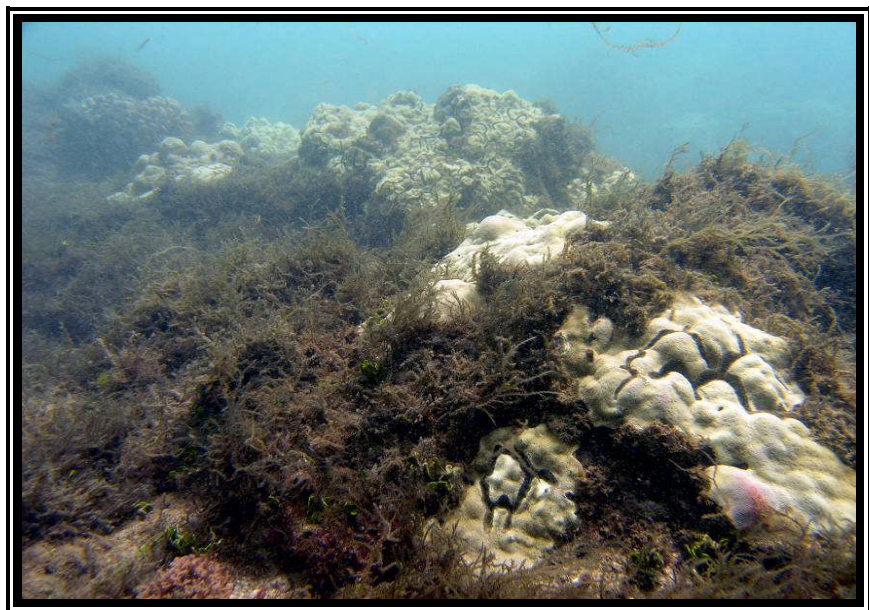


Figure 2 -1. Distribution of invasive algae.

¹ Vermeij, M.J.A. (2008). *Coral Reefs of Maui* (University of Hawai'i Press, Honolulu).

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Scientists have been studying the various types and locations of algal blooms. Large-scale macroalgal blooms have been documented on the island for several decades. The most common blooms are associated with the more heavily populated areas of Kīhei, Lahaina, and Kahului. The input of nitrogen and phosphorus from land-based sources such as agricultural fertilizers, sewage, and stream runoff may accelerate algal growth rates. Sewage-injection wells, defunct septic tanks, and channelized stream runoff may also contribute to the algal problem. Not only does this smother coral and destroy delicate ecosystems, but it can result in a detrimental affect on the local tourist economy; blooms in North Kīhei have been shown to cost the County more than \$20 million per year as a result of lost revenue and in the costs associated with removing algae from the beaches.



Macroalgae smothering Mā`alaea reef.

Once the decline starts, there is little that can be done to stop it. Prevention, rather than restoration, will be a more prudent management option.

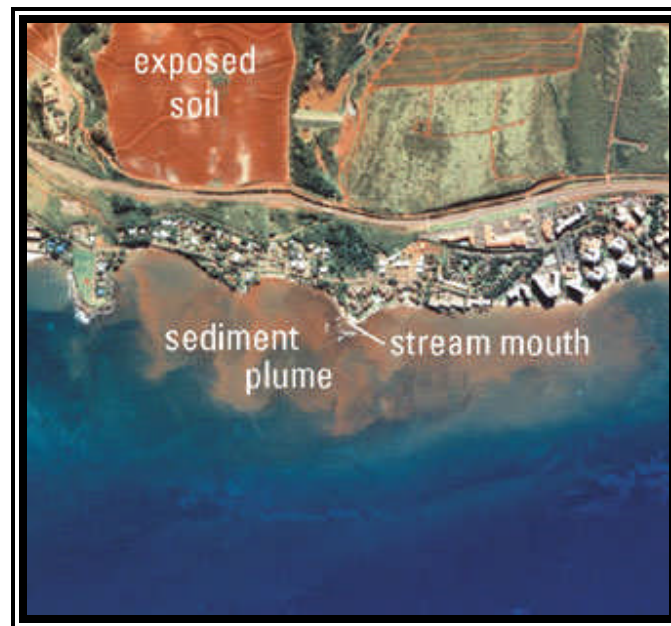
Potentially, there could be success in the utility of small-scale kapu management programs. One consideration would be an experimental limitation on the take of herbivores (large urchins, the majority of surgeonfish, parrotfish, and chub). The Division of Aquatic Resources, of the State Department of Land and Natural Resources, is experimentally introducing such programs to limit invasive algae, recover the reefs, and replenish the fish stocks. Another implementation measure may come in the form of a “resting” period for certain reefs where tour-boat mooring and snorkeling is popular. There may also be noticeable success in increasing the number Marine Managed Areas (MMA) on Maui. For instance, the Honolulu-Mokulē`ia Marine Life Conservation District has been protected since 1978, and recent surveys have shown success in the form of higher fish biomass, more large-sized fishes, and a greater number of species.

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MMA can be accomplished in a variety of ways with different definitions of what is allowable. Each coastal community should be managed and protected with respect to its specific needs.

Poor Water Quality Because of Upland Activities

Nonpoint source pollution is a major threat to Maui's nearshore coastal ecosystems. Urban development, agriculture, and degraded watersheds are significant contributors to such pollution. Urban development changes the natural hydrology of an area through site clearing, grading, impervious surfaces, and unnatural landscapes. Such activities decrease the ability of water to infiltrate the soil surface, which increases runoff volumes. Increased runoff produces erosion, which, in association with urban activities, results in the discharge of sediment and pollutant loadings to surface and coastal waters.



Agricultural runoff in West Maui.

Agricultural activities also generate a tremendous amount of nonpoint source pollution. Active agriculture requires regular disturbances to the land and the use of fertilizers and pesticides to cultivate crops. Likewise, golf courses and landscape planting, especially along the developed shoreline, generate nonpoint source pollution source from the application of fertilizers and pesticides.

The State of Hawai'i's Coastal Nonpoint Pollution Control Program Management Plan (1996) and Implementation Plan for Polluted Runoff Control (2000) (cumulatively, the Nonpoint Pollution Plans) provide a comprehensive statewide strategy to prevent and reduce polluted runoff in agriculture, forestry, urbanization, marinas, recreational boating, hydromodifications, and wetlands and riparian areas.

Heritage Resources

The goal of the Nonpoint Pollution Plans is to protect coastal waters from polluted runoff. The County of Maui will be a key partner and advocate with the State in effectuating these plans.

The Nonpoint Pollution Plans recommend the required reduction of post development loadings of pollutants known as total suspended solids (TSS) to levels similar to predevelopment levels. This can be achieved through the incorporation of various structural and non-structural enhancements. Reduction of TSS to predevelopment levels should be required of all new subdivisions to protect nearshore water quality.



Sandbags and seawalls, West Maui.

The County's grading ordinance (Chapter 20.08, Maui County Code) generally requires an erosion control plan, specifying best management practices (BMP), when a parcel exceeding one acre (43,560 square feet) is proposed for grading. The Nonpoint Pollution Plans recommend that an erosion control plan be required when the area of grading exceeds 5,000 square feet. Establishing such a requirement could significantly reduce the impact of grading activities on coastal water quality. In addition, monitoring of an erosion control plan and stiff penalties for non-compliance are necessary to ensure that BMPs are properly implemented.

As humans have settled their houses on the shoreline, they have had to adapt to natural environmental processes that may alter or damage their structures. Alterations to the shoreline, such as hardening and excessive extraction of sand from nearby dunes, can pose a threat to those very beaches and dunes. When natural sand-transport processes are interrupted through human actions, such as the construction of seawalls and revetments, it can deprive adjacent beaches of the sand necessary to compensate for erosion arising from storm surge, sea-level rise, and wave action.

Coastal erosion is a natural process, whereby the width of the beach is maintained by sand resources held in dunes, but coastal land is lost. In contrast, beach erosion is the loss of beach width arising from erosion and the impoundment of sand behind seawalls. While shoreline hardening is appropriate in some circumstances, the loss of Maui's beaches is often accelerated when private landowners attempt to protect their oceanfront property by armoring the shoreline.

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Decreased sand and beach, Kā`anapali

The Hawai`i Coastal Hazard Mitigation Guidebook (2005) serves as a precautionary tool for coastal development and planning throughout the State. Recognizing that policies for coastal-hazard assessment and shoreline setbacks are not uniform, the guidebook fills in critical gaps related to hazard zones, erosion trends, storm events, and safety-buffer design. The guidebook recommends erosion-rate shoreline setbacks based on the size, type, and lifespan of structures. In contrast to Maui's use of a 50-year multiplier for construction setbacks based on annual erosion rates, the guidebook recommends multipliers of 70 and 100 years, dependent on structure specifics.

Maui's pristine beaches and clear, clean waters are key elements in tourism and the public's recreational opportunities. Therefore, the regulation of shoreline development, including severe restrictions on shoreline hardening, is of critical economic, environmental, and social importance.

Limited Public Beach Access and Facilities



Recreational public access point, Puamana Beach Park.

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With Maui's growing population of visitors and residents, there is an increasing demand to develop along the shoreline. Many privately owned, undeveloped shoreline parcels that have traditionally been utilized by the public for recreational purposes and cultural practices are now being developed. Development of these parcels restricts the public's opportunity to utilize these coastal lands.

This Plan provides numerous policy recommendations for implementing more effective beach management practices.



Hāna Bay.

SUMMARY OF SHORELINE, REEFS, AND NEARSHORE WATERS ISSUES

Maui's comprehensive coastal zone management and regulatory framework is designed to protect the shoreline and abutting waters; however, human activities such as nonpoint source pollution, shoreline hardening, increasing development, and lack of beach access are among the major threats that have the potential to destroy the integrity of and the public's use of the island's beaches and coastal waters. With the dynamic nature of Maui's coastal areas, the County will continually face challenges in its resource management programs. A few shoreline protection issues include:

- Lack of an ICZM program
- Deteriorating reef health and fish stocks and compromised marine ecosystems
- Poor water quality arising from upland activities
- Limited public beach access and facilities

GOAL, OBJECTIVES, AND POLICIES

Note: see matrix

Heritage Resources

WATERSHEDS, STREAMS, AND WETLANDS

Traditional Hawaiian management models recognized the key importance of fresh water and the opportunities to manage water resources in a basin-wide context called the ahupua`a.

Beginning at the top of the mountains, the ahupua`a follows down the ridgeline, enclosing valleys and its resources, and extends out to the nearshore coral reefs and sea. This is what we typically refer to as a watershed. Within the



ahupua`a, traditional conservation and management practices were based on indigenous knowledge, with a respect for the land and water.

One of the many waterfalls in East Maui.

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Maui's Critical Watersheds and Streams

Maui consists of two large-scale watersheds: West Maui and East Maui. One portion of the East Maui watershed is one of the wettest areas in the State, receiving up to 400 inches of rainfall per year. Maui's watersheds are a mix of streams, gulches, and rivers varying in size, flow, and connectivity. Maui's watersheds and corresponding major streams are outlined in Table 2-2.

East Maui Watershed	West Maui Watershed
<ul style="list-style-type: none"> • Waikamoi Stream • Kailua Stream • Hanawā Stream • `Ohe`o Gulch • Makapipi Stream • Palikea Stream 	<ul style="list-style-type: none"> • `Īao Stream • Waiehu Stream • Waihe`e River • Waikapū Stream • Honokōhau Stream

CHALLENGES AND OPPORTUNITIES

Integrated Watershed Management

Maui's nearshore waters and marine life are dependent on functioning watersheds. Without healthy watersheds as a buffer, soils and sediment can erode and flow into nearshore reefs and ocean waters, smothering coral reef colonies. Such runoff can also cause the temperature of the water column to rise, in turn degrading the habitat and marine-life spawning areas.

The East Maui Watershed Partnership, West Maui Mountains Partnership, and the Leeward Haleakalā Watershed Restoration Partnership are existing watershed-based partnerships that coordinate the efforts of various government agencies, private businesses, and conservation organizations. These partnerships develop long-term resource inventories and management plans for their respective watersheds. The County of Maui, as a member of these partnerships, should continue to support their efforts and utilize the valuable inventories and plans they develop.

Polluted runoff from urban and agricultural activities, commonly referred to as nonpoint source pollution, degrades water quality. Such pollution and erosion impacts plants, animals, and human users of a watershed from upper elevations down to coastal lands and nearshore waters.

Point and Non-point Source Pollution

To mitigate nonpoint source pollution from agricultural operations, the County should actively partner with the State to implement the Department of Health's Pollution Prevention Plan, which provides incentives to farmers who prepare plans to address such issues as erosion control, nutrient and pesticide management, runoff from confined animal facilities, grazing management, and irrigation.

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Aquatic habitats ecologically link together most of the terrestrial habitats. The flow of water from mountaintops transports nutrients, organic matter (energy), and water down through the various forested habitats into estuaries and wetlands at low elevations and then finally into the sea. This organic energy from dead plants and animals fertilizes the growth of plants and animals in lower-elevation habitats; the streams and groundwater flow provide water for plants and animals throughout the ecosystem. Many native freshwater aquatic animals migrate between the ocean, estuaries, and upper reaches of streams as part of their life cycle, as noted in Hawai'i's Comprehensive Wildlife Conservation Strategy (2005) (Wildlife study).



Ginger-dominated forest, Waikamoi Preserve.

Loss of Riparian Biodiversity

Land conversion of Upcountry forested lots for residential uses removes trees and vegetation, which increases erosion and stormwater runoff. Mature trees are often removed to enhance vistas from a parcel and to make grading and utility installation easier. Yet, when trees are removed, erosion is increased, and sediment and stones flow into headland streams. The reduction or increase of vegetation at higher elevations can significantly impact the amount of available fresh groundwater. When fog is able to condense on trees and other vegetation, it can increase total annual precipitation by as much as 30 percent.⁸

Invasive species threaten the health of Maui's watersheds. Non-native species may out-compete native species or may directly harm native species through predation or infection. *Miconia*, a fast-growing, weedy tree from South and Central America, has caused serious damage on Maui by destabilizing watersheds and inducing landslides.

⁸ Meher-Homji, V.M. (1991). *Climatic Change; Probable Impact of Deforestation on Hydrological Processes* (Stanford University).

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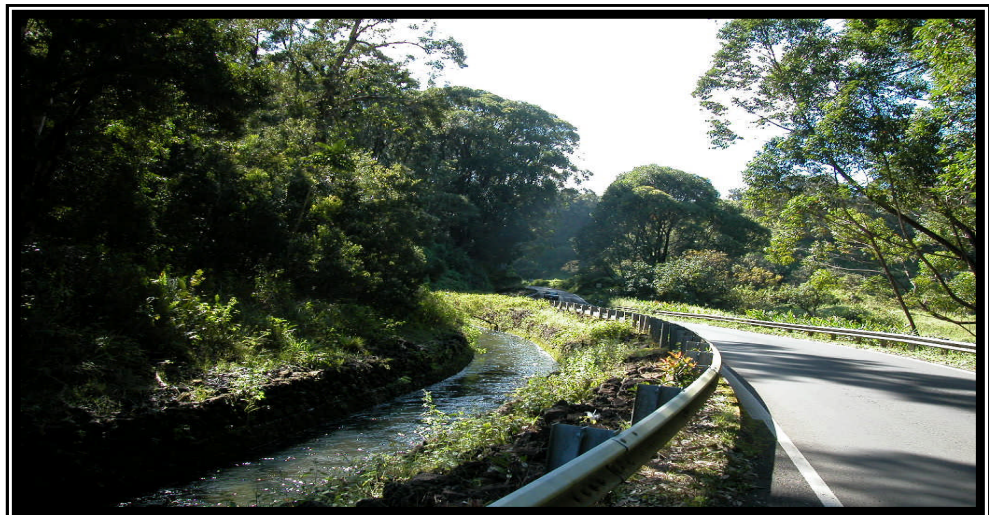
Wild boars, axis deer, and goats, which are known as feral ungulates, can drastically alter watersheds by eating understory plants down to their roots, leaving barren land susceptible to erosion.

Inappropriate Development

Maui's watersheds are threatened by unregulated land conversion. These key threats are negatively impacting the health of the island's watersheds. The incidence of increased population and subsequent demand for residential land will necessitate long-range planning and vigilant management to ensure the health of watersheds and streams for future generations.

The implementation of an island-wide directed-growth strategy that channels growth to areas suitable for urban development provides one mechanism to protect the natural integrity of Maui's critical watersheds. Overall, development within Maui's critical watersheds will be discouraged. When development or subdivision of land does occur on agricultural lands or within the State Conservation District, the County or State should require documentation that development of areas susceptible to high erosion and sediment loss will be avoided.

To further protect the resource, conservation subdivision design (CSD) plans and the incorporation of low-impact development (LID) techniques should be considered. This could be accomplished through the establishment of an overlay district applied to Maui's critical watershed areas. CSD plans and LID techniques include the following: clustering development; utilizing innovative stormwater- and wastewater-management techniques such as rain gardens, vegetated swales, and neighborhood-scale wastewater-disposal systems; avoiding sensitive environmental features; buffering streams from development; limiting impervious surfaces; reducing driveway and roadway widths; and minimizing lawn coverage and tree removal.



East Maui Irrigation Company ditch next to Hāna Highway.

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Diversion and Damming

A stream's natural flow can be altered through diversion and damming, affecting the overall watershed by compromising the vitality of its flora and fauna. Many of Maui's streams are diverted for agricultural irrigation and domestic use. According to the Comprehensive Wildlife Conservation Strategy (2005) (the Wildlife study),⁹ Maui has the highest number of diverted streams in the State. Diversion results in reduced stream flow and a rise in water temperature, thus negatively affecting many aquatic species.

With the high number of diverted streams on Maui, it is necessary to take proactive steps to protect endemic aquatic species and their spawning grounds. The County should work with State agencies to "protect baseline stream flows for perennial streams, and support policies that ensure adequate stream flow to support Native Hawaiian aquatic species, traditional kalo cultivation, and self-sustaining ahupua`a," consistent with the policy established at page 46 of the Countywide Policy Plan.

SUMMARY OF WATERSHED, STREAMS, AND WETLANDS ISSUES

Many of Maui's streams and watersheds are privately controlled, while water resources are held in public trust for the people. Some of the major watershed, stream, and wetland issues facing Maui include:

- Absence of a comprehensive and integrated approach to watershed management
- Watershed pollution from point and nonpoint sources
- Loss of riparian biodiversity
- Inappropriate development near and around sensitive habitats that support native, endangered, and endemic species habitat
- Stream diversion, damming, and alteration resulting in a disruption of the hydrologic cycle

GOAL, OBJECTIVES, AND POLICIES

Note: see matrix

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WILDLIFE AND NATURAL AREAS



Waterfall in Kīpahulu.

Many of Maui's natural areas and wildlife are in designated State and National Parks, nature preserves, forest reserves, natural area reserves, and private lands. These lands contribute to the quality of life on Maui, attract visitors, provide habitat for native species, and are closely tied to the Hawaiian culture. Maui's natural areas and wildlife are key components of the island's identity. As the island experiences an increase in population

and subsequent demand for development, Maui's natural areas and wildlife will experience increased challenges requiring strong management and protection.

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‘Ōhi’a forest, Waikamoi Preserve.

CHALLENGES AND OPPORTUNITIES

Lack of Integrated Environmental Resource Planning and Management

Maui’s natural areas and undeveloped open space provide wildlife plant and animal habitat for many of Hawai‘i’s native and endangered species. Furthermore, these areas are resources for the island’s residents and visitors. Many wildlife and natural areas contain rainforests and other disappearing Hawaiian ecosystems that are critical for the survival of many native species.

Native wildlife is important to residents. According to the Wildlife Values in the West (2005) survey,¹⁰ a large majority of Hawai‘i’s residents (71.4 percent) strongly agree that it is important to take steps to prevent the extinction of endangered species.¹ Wildlife-viewing opportunities are worth hundreds of millions of dollars to the State’s tourism industry, according to the United States Department of Interior.

The Countywide Policy Plan, at page 46, establishes the following policies:

“Preserve and reestablish indigenous and endemic species’ habitats and their connectivity.”

“Expand coordination with the State and nonprofit agencies and their volunteers to reduce invasive species, replant indigenous species, and identify critical habitat.”

¹⁰ This survey was a project of the Western Association of Fish and Wildlife Agencies Human Dimensions Committee in cooperation with Colorado State University.

Heritage Resources

Loss of Natural Areas and Wildlife Habitat

A strong foundation of programs and partnerships to protect endangered species is in place. The Federal government and State of Hawai`i have the primary responsibility for managing endangered species; however, the County should continue to play a key supportive role through its land use planning and regulatory responsibilities.

With Maui's continually growing population, previously undeveloped areas are experiencing increased development pressure, particularly in the State Agricultural District. Many agriculturally designated lands are home to threatened and



endangered species that could be harmed by

Cyanea mceldowneyi, endemic to East Maui.

development. The County can ensure greater protection of flora and fauna resources by requiring assessments for development in areas with medium, high, and very high concentrations of threatened and endangered species.

The Natural Area Partnership Program (NAPP) was created within the Division of Forestry and Wildlife, Department of Land and Natural Resources, to protect privately owned lands with intact Native Hawaiian ecosystems and essential habitat for endangered species. The program provides private landowners with assistance to protect land in perpetuity through transfer of fee title or a conservation easement to the State or a cooperating entity.

Programs such as NAPP are vital to the preservation of natural areas; however, they rely on private landowners to voluntarily initiate the partnership. An inventory and evaluation of NAPP-eligible lands could be conducted to identify lands that add to contiguous native ecosystems and provide vital habitat for native species. For lands identified as possessing these characteristics, proactive steps could be taken to encourage property owners to protect the land.

To fund the acquisition of important natural areas, the County may apply for grants from the Land Conservation Fund, pursuant to Section 173A-5, Hawai`i Revised Statutes, to obtain funding for the acquisition of land and easements for watershed protection, parks, coastal areas, scenic resources, and other natural areas.

Heritage Resources



Greensword found only in the West Maui Mountains.

Maui is biologically diverse and characterized by high levels of endemism (i.e., species unique to the island) in animals and plants, with more than 10,000 species found nowhere else on earth. As reported in the Wildlife study, rates of endemism are typically 99 percent to 100 percent for terrestrial insects, spiders, and land snails; 90 percent for plants; more than 80 percent for

breeding birds; and 15 percent to 20 percent for aquatic fauna.

The longevity of a species is directly related to the health of its habitat. In addition to the individual species, the native habitats can be considered endangered because of habitat fragmentation. Vast expanses of Maui's native habitats have already been lost; therefore, preservation of remaining habitat is vital to the survival of many species.

Historically, activities such as logging, agriculture, grazing, military use, fire, and urban, rural, and residential development have claimed more than half of Hawai'i's native habitats. At low elevations, where development pressures are highest, less than 10 percent of native vegetation remains, according to the Wildlife study. Native flora is in need of conservation; more than 250 species are federally listed as threatened or endangered.



'Ama'u fern.

Heritage Resources



Horizon across from Keālia Pond.

The upper elevations of West Maui and Haleakalā provide vital habitat for endangered and endemic plants and animals. With the threat of habitat destruction and invasive species in the lower elevations of the island, many native species have been forced to adapt to higher elevation. East Maui, in particular, has been identified as containing some of the last remaining intact Native Hawaiian ecosystems in the State. The Waikamoi Preserve, within East Maui, protects hundreds of native species. The koa-`ōhi`a forest within the preserve provides a sanctuary for many endangered plants and animals. State and Federal lands, such as State Forest Reserves and Haleakalā National Park, also provide habitat for many endangered species and protect sensitive habitat.

Kanahā Pond Waterbird Sanctuary in Kahului provides vital habitat for native waterbirds. Keālia Pond National Wildlife Refuge, on Maui's south shore, provides critical habitat for many endangered bird species. The refuge protects some of the last remaining native wetland habitat in the State.

Hawai`i presents both an opportunity and challenge for conservation. While the threats to Hawai`i's native species persist, recent years have seen greater awareness of the need to take action to conserve biodiversity, more assertive political will to take steps to address the problems, and wider community involvement in projects.

Maui's native species and their habitats are also important cultural resources for Native Hawaiians. Historically, feathers from forest birds were used to make elaborate capes, lei, and helmets for the ali`i (royalty). In present-day Hawai`i, the link between Native Hawaiian culture and native species has not been lost, as seen in the continuation of traditional practices such as gathering of native plants for hula, medicinal uses, carving, weaving, and ceremonies.

Introduction of Invasive Species

The greatest threat to native and endemic species of Hawai`i is invasive species. Because of their evolutionary history, Hawai`i's native plants and animals are particularly susceptible to the threats posed by the introduction and spread of invasive species and pathogens. The introduction of invasive species causes environmental and economic harm. Non-native species may out-compete native species or may directly harm native species through predation or infection. Non-native species may also threaten native species through interbreeding and hybridization, leading to the loss of

Heritage Resources

the native species as a unique species. The Wildlife study estimated that more than 6,000 introduced terrestrial and aquatic species were established and that approximately 26 percent to 30 percent of species in Hawai`i are non-native. While many introductions do not pose a threat to native habitats, approximately 10 percent of the established non-native species are highly invasive or pose significant threats to Hawai`i ecosystems.

No other state has experienced a similar invasion of non-native competitors, predators, habitat-modifiers, vectors of infectious disease, and pathogens, according to the Wildlife study. Over a nine-month period, the State Department of Agriculture discovered more than 100 alien species entering via air cargo, as reported in the Kahului Airport Pest Risk Assessment (2002).

Feral ungulates (hooved animals), such as cattle, pigs, goats, deer, and mouflon sheep, pose a major threat to native plants by consuming and trampling native understory plants. In turn, this has created conditions favoring non-native plant infestation and establishment, preventing the establishment of ground-rooting native plants, and disrupting soil-nutrient cycling.

Actions that will assist conservation efforts include the protection of existing native habitats from feral animals, invasive plant control and eradication, monitoring of populations, and additional research on methods to address the role of invertebrates and disease. Furthermore, education and outreach efforts will teach residents and visitors about invasive species, how to avoid introduction, and how to eradicate those that are already a nuisance.

SUMMARY OF WILDLIFE AND NATURAL AREA RESOURCES ISSUES

Maui's wildlife and natural area resources are key components of the island's identity. Interconnected natural landscapes that provide habitat for native and endangered species can be affected and degraded by a few activities that reduce their habitat value. Major issues affecting Maui's wildlife and natural areas include:

- Lack of integrated environmental resource planning and management
- Loss of natural areas and wildlife habitat
- Introduction of invasive species

GOAL, OBJECTIVES, & POLICIES

Note: see matrix

Heritage Resources



A West Maui sunset.

SCENIC RESOURCES

Maui's shoreline, tropical rainforests, rugged valleys, vast open spaces, historic towns, pastoral landscapes, and panoramic Pacific Ocean views are all a part of the island's scenic resources. In the past few decades, the island has experienced rapid growth of the visitor industry, as well as an increase in population, which has dramatically impacted the island's scenic corridors and view planes. The current network of laws established to protect scenic resources is focused on coastal lands. Areas outside of coastal lands also possess significant scenic resources that could benefit from regulatory controls and preservation strategies.

Heritage Resources

Scenic views are public resources; they contribute to residents' everyday quality of life. The island's dramatic viewsheds and scenic horizon are part of what makes Maui a desirable place to live. There are many kinds of scenic resources and various ways to appreciate them on a daily basis.



View from Kīhei looking south to the Island of Kahoʻolawe.

There are some views that possess notably higher significant scenic-resource value than others. State and County roadways, such as Haleakalā Highway, Honoapiʻilani Highway, Hāna Highway, Kula Highway, and Kahekili Highway, provide ocean, mountain, agricultural, and island-wide views. Roadways on Haleakalā, especially at upper elevations, offer expansive views of Central and West Maui, the islands of Molokaʻi, Lānaʻi, and Kahoʻolawe, and the peaks of Mauna Loa and Mauna Kea on the Island of Hawaiʻi. Coastal roadways also provide significant views of neighboring islands, slopes of Haleakalā, and rugged valleys of the West Maui Mountains. The East Maui portion of the Hāna Highway is famous for its legendary cliff, ocean, rainforest, waterfall, and valley views.

CHALLENGES AND OPPORTUNITIES

Degradation of Scenic Resources

Scenic views are closely tied to residents' quality of life and the island's sense of place. Maui possesses unique, rare, and significant views, many of which have no equal. Many views and landscapes are closely tied to Hawaiian culture, folklore, and history.

Maui's spectacular views are a driving force behind the island's thriving visitor industry. Thus, scenic-resource preservation is an important part of protecting the health of Maui's economy.

Within highly urbanized corridors, there are exceptional and important views. These views are especially important because they provide visual relief and enhance the quality of the built environment, thereby making urban areas more livable.

Heritage Resources

The Scenic Resources Inventory and Mapping Project (2006)¹⁷ identifies and maps the island's scenic-resource corridors. Each roadway corridor is rated exceptional, high, medium, or low based on its overall resource value. Roadway corridors with exceptional or high scenic-resource values typically contain dramatic and diverse resource values throughout the corridor. These corridors are typically in a natural condition and remain undeveloped.



Limited Access to Scenic Resources

Kekaulike Highway.

While roadways offer vast opportunities for residents and visitors to enjoy Maui's beautiful views, other areas also contribute significantly to the island's scenic resources. Areas such as beaches and trails provide access to scenic views, some of which may not be visible from roadways.

Lands rich in scenic-resource value are often the same lands that are in high demand for recreational, resort, and residential uses. Over the past two decades, growth and development has caused some visual clutter along State and County roadways, obstructed ocean views, and produced urban and rural sprawl conditions on agricultural lands that once separated distinct country town communities. While the visual impact of some developments may seem minimal, the cumulative impact is significant. Inappropriate architectural, site, and landscape design, as well as the massing of many coastal structures, can dramatically hamper scenic resources. Furthermore, utility poles can diminish the quality of views from many State and County roadways and create visual clutter.

Inappropriate Building and Landscape Design

Subdivision and development of Maui's agricultural and rural lands has resulted in landscapes marked by the proliferation of dwelling units that threaten visual resources.

The establishment of a Scenic Roadway Corridor Overlay District would establish special controls along scenic roadway corridors to prevent or mitigate the impact of development on scenic resources. An important component of the overlay district would be the establishment of design guidelines and a view-corridor management plan. Techniques such as development clustering, greenbelts and open-space buffers, site-plan configuration to protect view planes, building design and height limitations, setbacks from public roadways, landscaping, and other means would be incorporated into the guidelines. Any new subdivision or construction of a building that exceeds a specified height threshold and is within a Scenic Roadway Corridor

¹⁷ Cited at page 12 of the Countywide Policy Plan.

Heritage Resources

viewshed would be subject to an assessment of the project's visual impact and compliance with the design guidelines.

The management plan would identify right-of-way improvements, utility controls, roadside maintenance activities, signage, potential new vehicular turn-offs, and land-acquisition opportunities that would protect the integrity of scenic resources.

The County could use the management plan and design guidelines to review site designs, development applications, and Capital Improvement Programs to ensure that Maui's scenic roadways and resources are protected.



Pi'ilani Highway.

Loss of Agricultural and Open Lands to Development

In recent years, thousands of acres of former sugar land in the Pa'ia-Ha'iku Community Plan Area and the West Maui Community Plan Area have been impacted by development.

The Countywide Policy Plan, at page 74, establishes the following objective: "Improve land use management and implement a directed-growth strategy." An island-wide directed-growth strategy can help protect Maui's scenic resources. A directed-growth strategy can utilize principles such as open-space preservation, agricultural land protection, green belts, and a compact settlement form that will help to minimize the encroachment of urban development into rural areas.

SUMMARY OF SCENIC RESOURCES ISSUES

- Loss or degradation of scenic resources that are a part of the island's shared quality of life
- Access to scenic resources
- Inappropriate building massing, architecture, siting, and landscape design
- Loss of agricultural and open lands to development

GOAL, OBJECTIVES, AND POLICIES

Note: see matrix
