Mapping Subsistence Agriculture in the National Park of American Samoa

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http://www.nps.gov/gis/mapbook/tech/30.html

The National Park of American Samoa (NPSA) is unique in that the land is not owned by the federal government, but is leased from several villages for a period of 50 years. The National Park of American Samoa was authorized by Congress in 1988 "to preserve and protect the tropical forest and archeological and cultural resources of American Samoa.. Traditional Samoan customs are to be maintained within the national park." The desire of Samoans to protect the integrity of their rainforest and their traditional way of life, called fa'asamoa, is compatible with the establishment of the park. The National Park Service is authorized to manage the lands and reefs within the park, but participating villages have reserved traditional subsistence rights to these areas. The matai system of lawful, chiefly authority is one of the most important components of fa'asamoa. For centuries, the matai system has acted to enforce fa'asamoa over the lands and waters now placed within the national park. The objectives of the national park and fa'asamoa reinforce each other.

The purpose of this project was to delineate and classify land use zones in the park, with a particular emphasis on mapping and defining subsistence agricultural use and protected forest zones. Under the Park lease provisions, native American Samoans can continue to carry out subsistence activities with traditional tools and methods on currently active and managed lands leased to the Park, while clearing and cultivation is prohibited in primary and mature secondary forest. Subsistence agriculture typically includes maintaining small plots of land for the cultivation of traditional Polynesian crops such as bananas, taro, breadfruit and coconuts. Managed lands are defined as areas that were farmed or fallowed within the last fifteen years. Additionally, some fallowed lands are currently slated for active (managed reforestation) or passive (natural reforestation) restoration and were delineated as such. The remaining terrestrial areas within the park are classified as "Protected Forest."

Maps are a useful tool for cross-cultural communication. GIS methodology was utilized to compile data to address the challenges of protecting America's southernmost rainforest while preserving the rights of subsistence farmers. Through this project, the National Park of American Samoa identified 232 acres of land used for subsistence agriculture out of a total of 9,355 acres (5,260 marine acres not included.)

ArcGIS software was employed extensively in delineating land use categories which included: Protected Forest, Subsistence Agriculture (Active 0-3 Years), Subsistence Agriculture (Fallow 4-15 years), Current Restoration and Passive Restoration. The methodology for determining these delineations involved a combination of image interpretation, GPS and field sketches. The imagery utilized for this project included 2001 IKONOS imagery (Panchromatic and Multispectral) and aerial photographs from
1990, 1994 and 2002. Rockwell's Precise Lightweight GPS Receivers (PLGR) were utilized extensively. Field observations were conducted by botanists and Samoan subsistence farmers employed by NPSA and contractors through the Pacific Cooperative Studies Unit (PCSU) at the University of Hawaii (UH).

GIS was used to integrate remotely sensed imagery, GPS data and ground observations to delineate agricultural fields. In the early stages of the project, an initial set of field maps was created with georeferenced imagery and overlays of preliminary information about the location of managed land. This initial data set was compiled solely from image interpretation in 1993 and was found to be lacking in sufficient detail to produce a meaningful product. The need to combine the expertise of ground observation and image interpretation became apparent and a funding request that addressed the need to map subsistence resources in more detail was submitted to and received from the Natural Resource Preservation Program - Disturbed Lands Restoration funding source for FY01. NPSA contracted with the Pacific Cooperative Studies Unit (PCSU) at the University of Hawaii (UH) to initiate the field work in FY02.

Several areas were prioritized for field surveys. These included the areas identified in 1993, as well as areas along road corridors and trail systems. In addition, potential agricultural areas identified on the imagery were surveyed. After field assessment, many of the areas that were initially identified as agricultural land actually turned out to be landslides.

Determining the age of actively managed fields was easily accomplished through ground truthing while determining the age of fallow subsistence fields was more difficult. The methodology for determining the age of fallow fields included referencing the older aerial photographs (1990 and 1994) and measuring the diameter of indicator tree species such as Rhus taitensis (tavai) and Hibiscus tiliaceus (fau) which flourish in the sunny fallow fields rather than the dense canopy of the mature primary forest.

Attribute information was compiled including a unique identifier for each field, crop types, status (active or fallow), landowner, farmer, phone number and digital photographs. Field crews were encouraged to note this information on data sheets while recording locational information such as photo points and field boundaries with GPS. Field maps including imagery with GIS overlays were employed extensively and often used as the basis for sketching field measurements.

Challenges were faced in compiling the data. These included cloud cover in recent imagery, the rough terrain of the National Park which is cloaked in dense tropical rainforest (making it difficult to capture GPS data) and the need for cultural sensitively in conducting work in an area where land is communally owned. These challenges were met by referencing multiple image sources; employing GPS techniques which included offset mapping, the use of external antennas on extension poles and GPS mission planning software; supplemental GIS data including Digital Elevation Models (DE Ms), contours, streams, culverts, trail heads and permanent transects were also utilized extensively. Field crews were instructed to take measurements and draft sketches on the
field maps and data sheets as a back up to GPS data. Several recommendations have resulted from the effort to promote the notion of protected forest and areas of permitted subsistence cultivation. GIS generated maps should play a role in cross cultural communication as these recommendations are implemented. The recommendations include (1) the need to hire a subsistence specialist to communicate with village leaders about acceptable land use practices (2) development of a bilingual brochure and interpretative signs (3) a workshop for landowners and farmers (4) the need for a park land use plan (5) support the practice of agriculture in disturbed areas on the island of Ta'u while re-enforcing the notion of protecting pristine areas.

The goal of this project was to conduct research to determine contemporary subsistence uses of park resources. The data and maps compiled for this effort should be used to develop long-range sustainable strategies in conjunction with village councils. This project was documented under PMIS project #43784 in FY01. The work was accomplished by a partnership that included NPS staff (Terrestrial Ecologist, GIS Specialist, feral pig control crew and a student intern through the Student Temporary Employment Program (STEP)), a botanist and a technician from the PCSU at UH, and two interns provided by MASSIP (Micronesian And Samoan Student Internship Program).

References Cited


