American Samoa Sea Turtles

Climate Change Vulnerability Assessment Summary

An Important Note About this Document: *This document represents an initial evaluation of vulnerability for sea turtles based on workshop input and existing information. The aim of this document is to expand understanding of species vulnerability to changing climate conditions, and to provide a foundation for developing appropriate adaptation responses.*

Species Description

Sea turtles in American Samoa, also called Laumei[1], include the endangered Hawksbill sea turtle (*Eretmochelys imbricata*) and the threatened Green sea turtle (*Chelonia mydas)*.[2] They are generally found throughout the Pacific but Hawksbills usually nest on isolated Tutuila beaches while Greens primarily nest at Rose Atoll.[3] Sea turtles are not very common in the region with possibly only 120 breeding females, with the majority sighted around Tutuila.[4]

Species Vulnerability

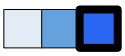
Moderate Vulnerability

Mod Confidence

Overall sea turtle vulnerability was rated as moderate by workshop participants due to moderate sensitivity to climate and non-climate stressors, moderate exposure to projected future climate changes, and low to moderate adaptive capacity. Sea turtles are vulnerable to loss of habitat due to sea level rise and coastal erosion.[5] Increased air and sea temperatures also impact nest sex composition and nesting preference.[6] Sea turtle habitat is also threatened by coastal development including coastal armoring, water quality, and light pollution.[5] Other non-climatic threats to sea turtles include incidental fisheries catch and possible predation and poaching of eggs.

Sensitivity

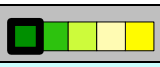
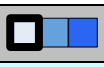
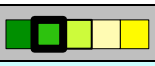
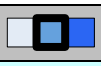
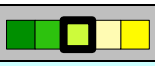
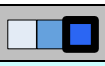
Moderate Sensitivity



High Confidence

Sea turtles are moderately sensitive to sea level rise, coastal erosion, and air temperature. Sea level rise and coastal erosion affect sea turtle nesting habitats and nesting success due to flooding of nests during times of high tide and storms, and increased air temperature impacts hatchling sex ratios to more females in each nest.[5,6] Disturbance regimes such as disease, extreme storms, and tsunamis can contribute to sea turtle mortality from direct impacts to nest

and adult sea turtles. Non-climate stressors have contributed to increased threats to sea turtles, and will be exacerbated by climate impacts by further impacting nesting beaches and hatchling success.

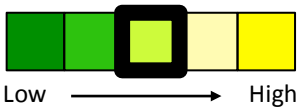
SENSITIVITY FACTORS AND IMPACTS*	
CLIMATE STRESSORS	Moderate sensitivity  Moderate confidence 
FACTOR	**IMPACT**
Sea level rise/Coastal erosion	• Impacting nesting beaches. • Decreased nesting success due to lass of habitat.[5] • Increased nest wash out.[6]
Warmer air temperature	• Increased air temperature will impacting nest sex rations and growth rates, resulting in mostly female hatchlings.[6] • Possible short-term advantage of increased female ratios increasing reproductive success.
DISTURBANCE REGIMES	Low sensitivity  Low confidence 
FACTOR	**IMPACT**
Disease/ Tsunami	• Deadly disease such as fibropapillomatosis due to poor water quality and nutrient loading could have a major impact if expanded to the region.[7] • Tsunami may cause physical stress as well as habitat loss
DEPENDENCIES	Low-moderate sensitivity  Moderate confidence 
FACTOR	**IMPACT**
Habitat Prey/forage dependency Generalist or specialist	• Moderate to high dependence on coral reefs, sea grass, and sandy beach habitats. • Sea turtles have low to moderate prey and forage dependency. • Species is somewhat of a specialist and is dependent on beaches for nesting.
NON-CLIMATE STRESSORS	Moderate sensitivity  High confidence 
FACTOR	**IMPACT**
Land use change	• Development of coastlines threatens nesting beaches and reproductive success.[5] • Coastal lighting impacts sea turtle nesting and disorient hatchling
Harvest/ Bycatch	• Possible death or injury through fisheries by bycatch
Roads/ armoring	• Beach armoring and roads can degrade sea turtle nesting habitat and prevent turtles from having a successful nest.

* Factors presented are those ranked highest by workshop experts.

SENSITIVITY FACTORS AND IMPACTS*	
Pollution & poisons	• Derelict gear and marine debris can trap or cause serious health to sea turtles when injected

Exposure†

Moderate Exposure



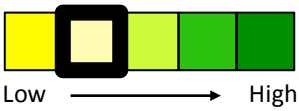
Mod Confidence

Under future conditions in the next 20 years, sea turtles likely will be exposed to warmer air and sea temperatures, sea level rise and coastal erosion, and more intense tropical storms. These factors will influence turtle nesting and hatching success as well as adult survivability during tropical storms.

PROJECTED CLIMATE AND CLIMATE-DRIVEN CHANGES	
CLIMATE STRESSORS	**PROJECTED CHANGES**
Warmer air and sea temperature	Extreme heat days will become more frequent and intense during the 21st century • Annual surface air temperature compared to 1971-2000 will increase by 1.1-1.3°F (+0.61-0.72°C) by 2030 • Sea surface temperatures compared to 1990 will increase +1.1-1.7°F (+0.61-0.94°C) by 2030.
Sea level rise/ Coastal erosion	• Region will experience roughly same mean average sea level rise as global trends between 0.5 m- 2.0 m along with increased frequency of extreme sea level events (linked with high tide events) • Increased storms and sea level will increase coastal erosion and runoff causing pollution and eutrophication threatening important sea turtle foraging habitat.
Tropical storms	Potential reduction in cyclone activity in American Samoa as storm tracks shift toward the Central North Pacific, but potential increases in storm intensity over the next 70 years.

Adaptive Capacity

Low-Moderate Adaptive Capacity



Mod Confidence

Hawksbill sea turtles are listed endangered and Green sea turtles are listed as threatened under the Endangered Species Act. Since they are highly migratory and transboundary species, they

† Relevant references for regional climate projections can be found in the Climate Impacts Summary Table.

can be impacted by different stressors in different regions. In American Samoa there are only approximately 120 nesting females, which have low to moderate adaptive capacity.[4]

ADAPTIVE CAPACITY FACTORS AND CHARACTERISTICS‡	
FACTOR	**SPECIES CHARACTERISTICS**
Extent, status, & dispersal ability Moderate adaptive capacity  Moderate confidence 	• Transboundary species • Threatened and endangered populations • Moderate dispersal ability
Intraspecific/life history diversity Low-moderate adaptive capacity  Moderate confidence 	• Life history diversity can vary, nest periodicity locked into next habitat • Threatened and endangered populations, limited abundance • Have high fidelity for foraging, nesting and breeding • Respond to climate queues for breeding
Resistance Low adaptive capacity  High confidence 	• Low degree of species resistance to impacts of stressor
Management potential Moderate-high adaptive capacity  Moderate confidence 	• Marine debris reduction programs • Protection of nesting beaches and living shorelines • Light management during nesting and hatching periods • Possible nesting beach shading programs

‡ Please note that the color scheme for adaptive capacity has been inverted, as those factors receiving a rank of "High" enhance adaptive capacity while those factors receiving a rank of "Low" undermine adaptive capacity.

Literature Cited

[1] Department of Marine and Wildlife Resources. 2006. A comprehensive strategy for wildlife conservation in American Samoa (RCB Utzurrum, JO Seamon, & K Schletz Saili, authors). DMWR, Pago Pago.

[2] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries. 2012. Fagatele Bay National Marine Sanctuary final management plan/final environmental impact statement. Silver Spring, MD. Available from http://sanctuaries.noaa.gov/management/mpr/mpr-nmsam-2012.pdf.

[3] Craig, P. Editor. Natural History Guide to American Samoa. 3rd Edition. 2009. National Park of American Samoa, Department Marine and Wildlife Resources and American Samoa Community College.

[4] Tuato'o-Bartley, N, TE Morrell & P Craig. 1993. Status of sea turtles in American Samoa in 1991. Pacific Science 47(3): 215-221.

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[7] Aguirre, A.A., Lutz, P.L., 2004. Marine turtles as sentinels of ecosystem health: is fibropapillomatosis an indicator? EcoHealth 1, 275–283.