

# Reversing the Decline of the East Pacific Leatherback

A 10-year plan to stabilize the East Pacific Leatherback Regional Management Unit and reverse the current population trend to a recovery trajectory



March 2013

To develop this Business Plan, a workshop (with support from National Fish and Wildlife Foundation) was conducted with more than a dozen key leatherback experts from the region, as well as other participants with expertise or interest in sea turtle conservation. The Business Plan establishes realistic but ambitious population goals, defines key activities to address major threats to East Pacific (EP) leatherbacks, and outlines specific actions, metrics, timelines and financial needs to ensure success<sup>1</sup>.

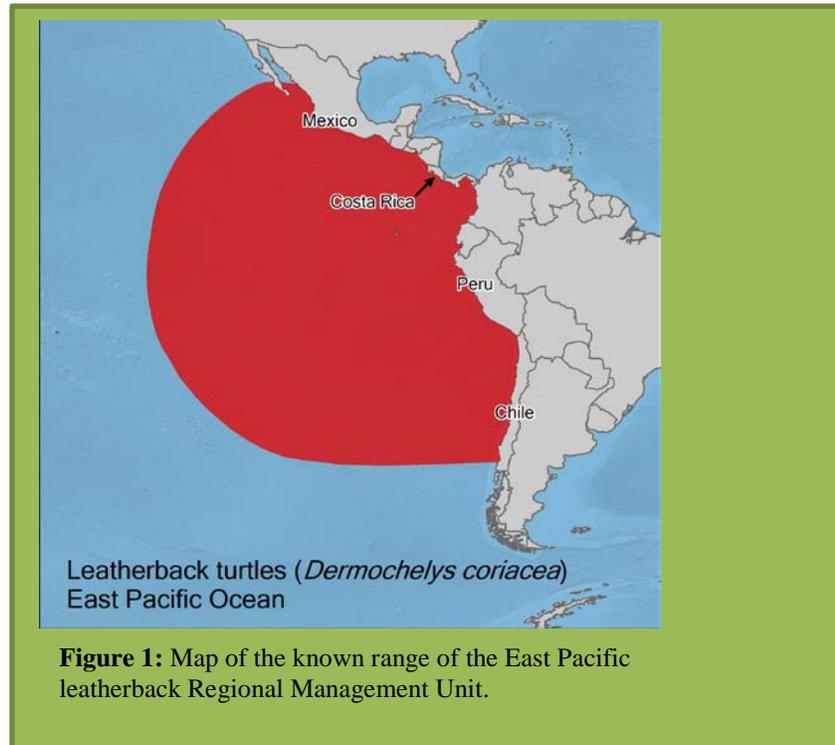
## CONSERVATION VALUE

The East Pacific (EP) leatherback Regional Management Unit (RMU) (see Figure 1.) nests along the coast of Mexico, Central, and South America, and its area of occupancy extends from Baja California Sur, Mexico, to central Chile, and westward to 130°W (see map). Primary nesting sites are found in the states of Michoacán, Guerrero, and Oaxaca, in México, and in the province of Guanacaste, Costa Rica. EP leatherback feeding areas have been documented off Panama, Colombia, Ecuador, Peru, and Chile (Shillinger et al. 2008; 2011).

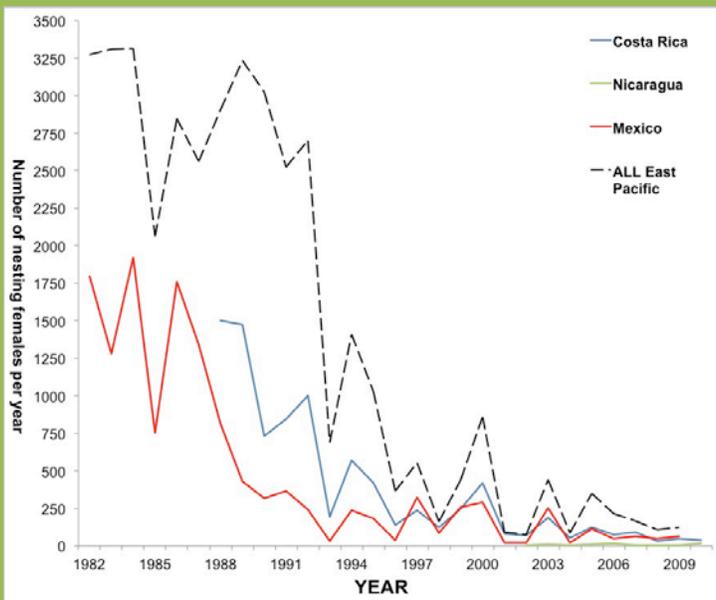
Every year roughly one-third to half of the reproductively mature females (approximately 15 years or older) of the population lay 5-12 nests (60-100 eggs/nest) from October through February. Leatherbacks are the largest (typically over 500

lbs), deepest diving (to more than a half a mile), and widest ranging (from the tropics to high latitudes) of all sea turtle species. Adaptations in carapace and flipper structure also makes the leatherback the most efficient swimmer of all turtles as they pursue their prey – jellyfish. Leatherbacks can travel nearly 10,000 miles per year, making them one of the most migratory species on Earth.

The precipitous decline in the EP leatherback RMU during the past two decades has been extensively documented (e.g. Santidrián Tomillo et al. 2007; Sarti Martínez et al. 2007), and was recently identified as one of the most endangered sea turtle RMUs in the world (Wallace et al. 2011). Comprehensive reviews of long-term nesting abundance in Mexico (Sarti Martínez et al. 2007) and Costa Rica (Santidrián Tomillo et al. 2007)—which together comprise nearly 75% of *all* EP leatherback nesting—concluded that nesting numbers had **declined more than 90% since the 1980s** (see Figure 2. below), from thousands of nesting females per year to no more than 1,000 adult females in the entire population. Based on estimates of total annual abundance at the regional scale, this population now averages roughly 100-200 females per year (observed values up to 150 females per year).



<sup>1</sup> The EP leatherback Business Plan was developed to fit within the major goals of the Bellagio Blueprint for Pacific sea turtle conservation.



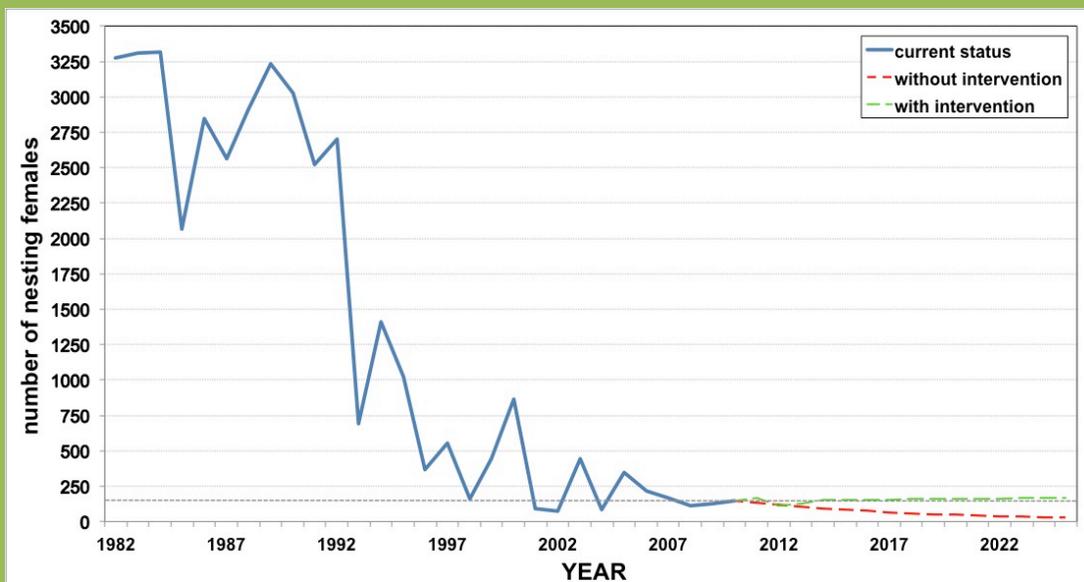
**Figure 2:** Nesting trends for the primary and secondary nesting beaches of the EP leatherback RMU show a dramatic decline across all beaches.

Long-term monitoring and conservation programs at the most significant nesting beaches in Mexico and Costa Rica have essentially eliminated threats from human consumption of eggs and nesting females, and ongoing efforts through NFWF support at important sites in Nicaragua are increasing in effectiveness (Urteaga et al., 2012). However, in spite of these major advances in leatherback conservation, the abundance of this RMU remains perilously low, and continues to decrease slowly toward regional extinction (see Figure 2.).

For these reasons, NFWF supported a leatherback Expert Working Group (EWG) to rethink existing approaches to leatherback conservation in the region, and to identify priority actions to reverse the decline and to promote long-term recovery of leatherbacks in the eastern Pacific.

## DEFINING OUR CONSERVATION GOALS AND OBJECTIVES

The EP Leatherback Business Plan provides a 10-year investment strategy of nearly \$3 million to reverse the steep decline trajectory for the population and have a stabilized population trend of 150-200 annual nesting females by 2023. This would equate to roughly 1,000 nesting females for the population and would secure a strong growth trajectory from which to recover the population.



**Figure 3.** Projected annual population growth trajectories over the next decade, which is the monitoring duration that [SWOT's Minimum Data Standards for Nesting Beach Monitoring](#) requires for detection of a 5% trend in a leatherback population.

**To achieve these population stabilization goals, NFWF has selected three overarching strategies from those identified by the EWG<sup>2</sup>:**

- 1) **Reduce mortality from fisheries bycatch:** reduce bycatch in 7 known hotspots and assess and reduce fishery interactions in other high use areas for leatherbacks at different life stages.
- 2) **Increase Productivity of Nesting Beaches:** conduct aerial surveys and convene regional experts to determine the importance of secondary beach monitoring and protection to meeting stabilization goals and implement action to maintain productivity on priority beaches.
- 3) **Promote and strengthen implementation at the regional scale:** support collection, integration, and analysis of information on leatherback bycatch and population status to assist management at the regional scale.

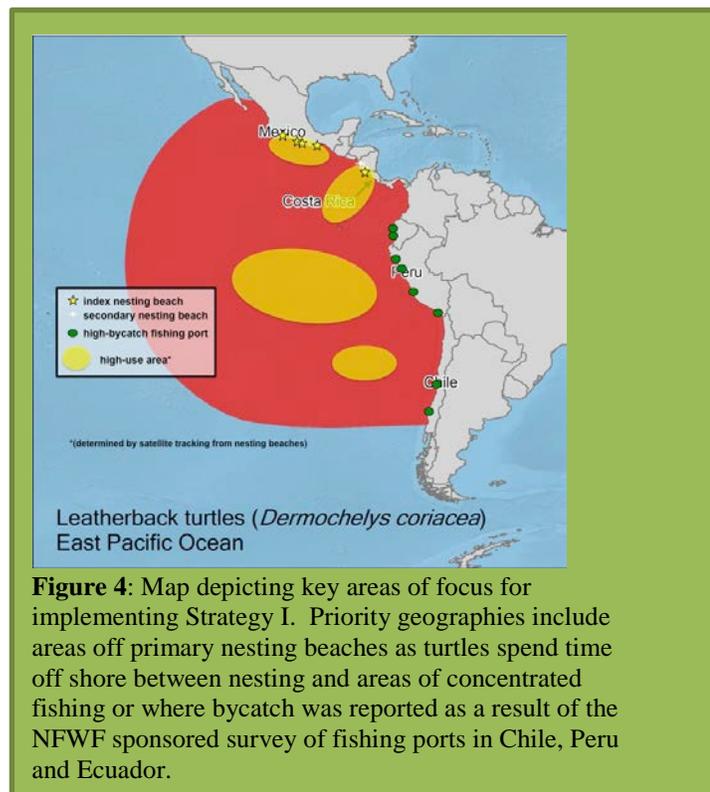
## PROPOSED INVESTMENT STRATEGIES

The Foundation proposes the following investment strategies for reducing mortality during the in-water life stages of EP leatherback turtles while securing management and protection of new recruits to the population on the nesting beaches.

### ***Strategy 1: Reduce mortality from bycatch***

Bycatch is still considered the major obstacle to population recovery. The latent impacts of high mortality in swordfish driftnets off Chile in the 1990s are likely further hindering recovery, as possibly thousands of adult leatherbacks were killed annually (Frazier and Montero, 1990; Eckert and Sarti, 1997), which eliminated a significant portion of the breeding population and, therefore, their future offspring as well. In addition, ongoing leatherback bycatch in small-scale fisheries in South America (Alfaro-Shigueto et al. 2007; 2011; 2012) continues to impact adults and subadults, the two life stages with the largest per-individual impacts on marine turtle population dynamics (Wallace et al. 2008).

Leatherback bycatch has not been quantified at the regional scale, thus preventing robust estimation of the level of reduction necessary to stabilize and eventually increase population abundance. However, some information about leatherback bycatch is available for some ports and fishing gears (hook and line gear and gillnets) in South America. In particular NFWF supported a recent tri-national project to assess sea turtle bycatch in net fishing gear using port-based surveys in Ecuador, Peru, and Chile which provides the only available baseline of leatherback bycatch in the region and highlighted high-bycatch ports. This project found that between 1,000-2,000 leatherbacks are caught in nets and



<sup>2</sup> The EWG identified numerous activities under each of the three strategies: 1) bycatch reduction, 2) regional networks and 3) nesting beach protection to increase hatchling production. The NFWF business plan highlights those activities that must be implemented as soon as possible to ensure stabilization of the EP leatherback population and were evaluated as the highest priority recommended activities under each strategy.

longlines annually, of which roughly 30%-50% die as a result of these interactions; therefore, bycatch mortality is likely between 300-600 but could be as high as 1,000 leatherbacks annually. Significant reductions in bycatch mortality will be critical to stabilizing the EP leatherback population trend because saving subadults and adults represents direct increases in survivorship of the very life stages NFWF will use to quantify population trends. Based on the information currently available, **the interim goal for this strategy is to reduce annual bycatch mortality by one-third in this region over the next ten years, or by approximately 150 turtles (RRV of 80 nesting females) per year by year three of the business plan, in Ecuador, Peru, and Chile combined**<sup>3</sup>.

### *1.1. Reduce bycatch in areas already identified as high-bycatch*

NFWF-funded port-based surveys have identified 7 ports as priority for further assessment and mitigation (Ecuador: Manta and Santa Rosa; Peru: Salaverry, Pisco, San Jose, and Ilo; Chile: Coquimbo) and will be prioritized for the following activities to reduce bycatch.

- Conduct quantitative assessments of suspected bycatch hotspot ports (based EWG assessment of existing information; e.g., published bycatch mortality rates and bycatch estimates from surveys) to establish baselines and follow-up assessments to evaluate progress after mitigation activities.
- Establish three new bases (Manta, Ecuador, San Jose, Peru, and Valparaiso, Chile) for the radio communication program between conservation groups and fishermen to enhance reporting, safe handling and release of leatherbacks caught in fishing gear, and avoidance of leatherback bycatch when possible by 2016. Additional bases may be added in later years of the plan based on the success of this strategy and the assessment of other bycatch hotspots.
- Provide training and equipment for releasing leatherbacks from fishing gear (e.g., line cutters, dehookers) to at least 30% of artisanal fishermen in key ports in Ecuador, Peru, and Chile, and to 10% of on-board observers in Chilean longline fleet.
- Test gear configurations in gillnets and trammel nets in Ecuador and Peru; test gear configurations in longlines in Peru and Chile to meet reduction goals in these ports by 2018.
- Pilot study to assess the magnitude of the impact as well as the motivations for consumption at fishing ports in Peru to inform development of approaches that might reduce this practice.



**Figure 5:** Continued support and expansion of previously supported efforts by NFWF like the Radio Program and line-cutter programs depicted here from grantee Pro Delphinus are called for in Strategy II.

### *1.2. Identify other areas of high-bycatch and important to leatherbacks*

Assessments similar to those in the south are needed for other countries in the region where leatherbacks are known to frequent to further refine quantification of leatherback bycatch. Virtually nothing is known about long-term habitat use patterns in the region during the 3-4 year period that females are away from nesting beaches, not to mention the complete lack of data on adult males and subadults. While the actions below are needed throughout the region, priority will be given to high-use waters adjacent to nesting beaches and potential feeding areas in the region.

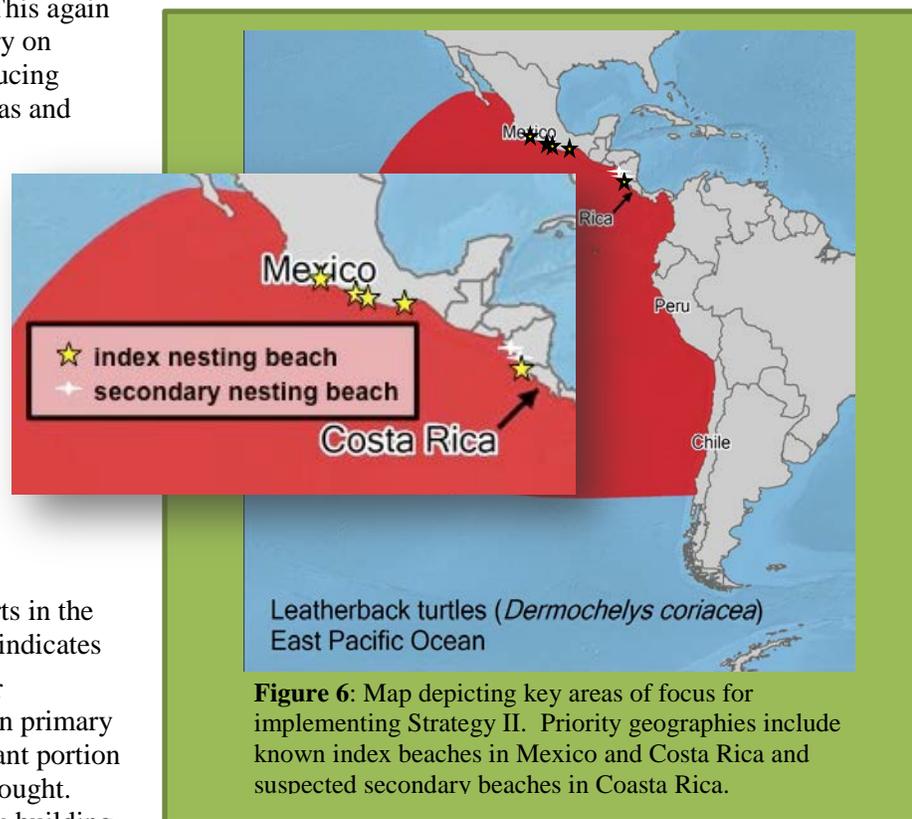
<sup>3</sup> The population targets to be saved by each strategy in the context of what numbers are necessary to ensure population stabilization and eventual recovery should be considered initial estimates. Strategy 3 of the business plan calls for the development of more robust targets after additional assessments have been completed.

- Expand port-based bycatch surveys conducted in Ecuador, Peru, and Chile to all countries throughout the region, particularly those known to host leatherback nesting (Mexico, Nicaragua, Costa Rica) and possible feeding areas (Panama, Colombia) targeting at least 3 ports per country and 10% of vessels per port. Hotspot areas identified through this assessment will later become priorities for activities in section 1.1.
- Deploy satellite transmitters on juvenile and adult leatherbacks bycaught in Peru (and possibly Ecuador and Chile) during both El Nino and La Nina years to identify important feeding areas and migration routes back to nesting beaches, and to estimate post-release mortality rates, which is a critical piece of information that is essentially unknown for all fishing gears.

### **Strategy 2: Increase Productivity of Nesting Beaches**

In contrast to many other sea turtle populations, threats to EP leatherbacks on nesting beaches—namely human consumption of eggs and nesting females—have been significantly reduced compared to historic trends at major nesting sites in Mexico and Costa Rica. However, egg harvest remains an issue where protection efforts are insufficient or non-existent. Enhanced protection of nesting beaches and increases in hatchling production are efforts that have delayed impacts on population trends because of delayed maturity typical of sea turtles, including leatherbacks, which means 15-30 years between hatchling and adult stages. Thus, results of increased hatchling production should not be expected to be observable for at least 15 years, and still depend on survivorship of juvenile and adult life stages. This again puts the highest priority for population recovery on increasing survival of older life stages, i.e. reducing mortality from fisheries bycatch in feeding areas and migratory routes. Nonetheless, without beach protection and increased hatchling production, the reproductive cycle of leatherbacks will be incomplete and would prevent recovery. Therefore, efforts to maintain or enhance protection of nesting turtles, their eggs, and hatchlings must be supported at the same time as bycatch reduction efforts.

A complete regional assessment of EP leatherback nesting beaches has not been conducted. Primary (or index) nesting beaches in Mexico and Costa Rica were established for monitoring and protection efforts in the 1980s, but since that time, anecdotal evidence indicates that secondary beaches, while lower in number (supporting fewer than 20 nesting females) than primary beaches, collectively may host a more significant portion of the remaining population than previously thought. NFWF has supported assessments and capacity-building of secondary beaches in Mexico, and the development of programs for secondary beaches in Nicaragua that have brought poaching from 100% of nests laid in 2002 to less than 10% of nests laid (keystone goal) today. While the primary beaches have been afforded some protection and management planning they are still woefully underfunded and therefore have not had the means to implement many of the beach stabilization and quality measures that are called for to increase nesting productivity. These strongholds need to be secured to maintain the capacity for increasing numbers in the population. Based on the information currently available, **the interim goal for this strategy is to increase annual hatchling production on primary and secondary nesting**



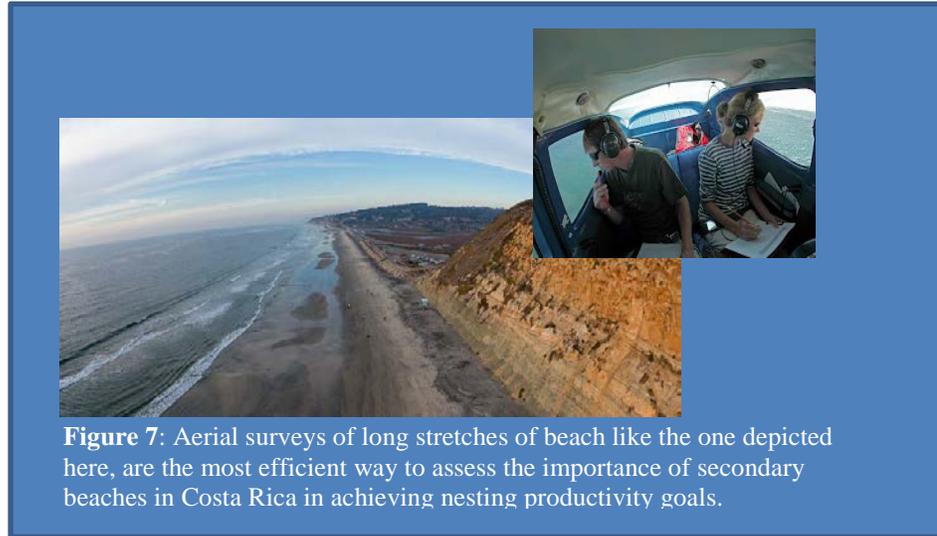
**Figure 6:** Map depicting key areas of focus for implementing Strategy II. Priority geographies include known index beaches in Mexico and Costa Rica and suspected secondary beaches in Costa Rica.

**beaches by 50%, which would correspond to approximately 10,000 additional hatchlings (RRV of 40 nesting females) per year by year three of the business plan<sup>4</sup>.**

### *2.1. Abundance and prioritization mapping of secondary beaches*

In contrast to many other sea turtle populations, threats to EP leatherbacks on major nesting beaches have been significantly reduced compared to historic trends. On lesser beaches (supporting < 20 females) where protection efforts are insufficient or non-existent, egg harvest remains an issue. In the initial stages of conservation, these small but numerous beaches were passed over to secure beaches with higher numbers. Now that those beaches are secure, these smaller beaches need to be assessed for their overall potential productivity contribution to the population to aid in recovery.

- Assess current status and needs for known secondary beaches in Mexico and Nicaragua.
- Identify secondary beaches and priorities for monitoring in Costa Rica and Panama through workshops and aerial surveys. Beaches and monitoring strategies will become later priorities under 2.2 by year 5.



**Figure 7:** Aerial surveys of long stretches of beach like the one depicted here, are the most efficient way to assess the importance of secondary beaches in Costa Rica in achieving nesting productivity goals.

### *2.2. Increase productivity on significant beaches*

The nesting strongholds for the EP leatherback population—4 index beaches in Mexico and 1 complex of beaches in Costa Rica—have been known for some time and are under adequate protection. While most of these key sites benefit from a management plan to promote sustainable development, budgets are often limited to monitoring and enforcement activities. Productivity of these beaches can be increased through targeted maintenance (i.e. beach restoration), reducing threats from development (i.e. shielding light pollution), implementing measures to maintain nest temperatures at levels that favor higher hatching success (e.g., shade structures, irrigation systems), and otherwise implementing actions that have been called for in these plans but have gone unfunded. NFWF will evaluate and update plans at these primary nesting sites (i.e. index beaches) and provide modest support to address the greatest threats to productivity. Actions may include:

- A regional campaign to reduce turtle egg consumption.
- Update or implement zoning plans to minimize impacts from development, including maintenance of invasive species, lighting or beach set-backs to reduce the impacts of current development as identified in management plans.
- Establish shade areas through construction or planting or other mitigate measures to address sand temperatures for optimal hatchling production and to adapt to climate change.

### ***Strategy 3: Strengthen regional coordination to maintain population-level priorities***

In many cases, sufficient information is available for specific actions to be taken at specific locations. However, to effectively implement and the threat reduction strategies called for in the plan and evaluate

---

<sup>4</sup> The population targets to be saved by each strategy are in the context of what numbers are necessary to ensure population stabilization and eventual recovery should be considered initial estimates. Strategy 3 of the business plan calls for the development of more robust targets after additional assessments have been completed.

the impacts to the overall RMU, a regional and coordinated approach is needed to keep sight of priorities and progress at the level of the EP leatherback population. NFWF has learned the value of population/regional level networks (i.e. ICAPO and WIDECASST) for strengthening regional capacity, collaboration and analyses for improved management and evaluation. Fortunately, there is a group of scientists and managers that have already begun to discuss some of these issues for Pacific leatherback populations, and NFWF was able to support a sub-set of this group to work collectively on the development of this plan. The following activities seek to build on this initial foundation toward a coordinated conservation effort for the EP leatherback population.

### *3.1. Establish EP Leatherback Regional Network*

NFWF will work to support a network to facilitate standardization, integration, and coordinated reporting of data collection for bycatch assessments and nesting beach monitoring in a common database. Some of the products include but are not limited to:

- Generate a catalog of primary (> 20 nesting females per year<sup>5</sup>) and secondary beaches (between 5-20 nesting females per year), including annual abundance and degree of protection.
- Create regional monitoring system of hatching success and influential environmental factors (e.g., beach and nest temperatures, beach dynamics, etc.) for all primary beaches and five secondary beaches.



**Figure 8:** Expert working group that was convened to develop the Action Plan upon which this plan was developed. This core group will be the foundation for coordination and expansion called for in Strategy III. Member's names and affiliation can be found in the Acknowledgements section.

### *3.2. Regional Coordination of Targets and Evaluation*

NFWF will also support coordinated goals setting, recovery planning and evaluation for the population to increase the effectiveness of its investments. Two initial products include:

- Develop population model to refine quantified targets necessary for population stabilization and recovery as available data is improved and increased.
- Conduct and synthesize regional assessment of fisheries that interact with leatherbacks using rapid bycatch assessments, and working through existing regional instruments.

---

<sup>5</sup> Index sites can have 50 nesting females or more in a season, but not every year, and it is becoming less frequent – Bryan Wallace, Personal Communication.

While the majority of implementation of activities will take place in the first 5 years, assessments may lead to further bycatch reduction efforts in later years and monitoring of implementation progress will be conducted throughout the 10-year period of the initiative.

## Initiative Budget

	<b><u>5-Year</u></b> <b><u>Estimate</u></b>	<b><u>10-Year</u></b> <b><u>Estimate</u></b>
<b>Strategy 1: Reduce mortality from bycatch</b>		
<i>Reduce bycatch in areas already identified as high-bycatch</i>	\$650,000	\$900,000
<i>Identify other areas of high-bycatch and important to leatherbacks</i>	\$400,000	\$400,000
<b>Strategy 2: Increase Productivity of Nesting Beaches</b>		
<i>Abundance and prioritization mapping of secondary beaches</i>	\$175,000	\$175,000
<i>Increase productivity on significant beaches</i>	\$200,000	\$500,000
<b>Strategy 3: Strengthen regional coordination to maintain population-level priorities</b>		
<i>Establish EP Leatherback Regional Network</i>	\$80,000	\$130,000
<i>Regional Coordination of Targets and Evaluation</i>	\$30,000	\$70,000
<b>Monitoring and Evaluation</b>		
<i>Strategy I bycatch reduction assessment (1 years + year 5, 8 at 5 sites)</i>	\$200,000	\$300,000
<i>Strategy II beach maintenance for productivity (1, 3, 5, 8 at 3 sites)</i>	\$50,000	\$125,000
<i>Strategy III network (years 2, 5, 8 of mitigation across 7 countries)</i>	\$20,000	\$30,000
<b>Total</b>	<b>\$1,805,000</b>	<b>\$2,630,000</b>

## Monitoring and Evaluation

Determining whether the conservation plan described here is successful is predicated on NFWF's commitment to assessing both the performance of individual projects as well as the contribution of those projects and strategies towards the initiative outcomes. Accordingly, standardized metrics have been identified to measure achievement of priority activities and outcomes (see below). Outcomes will be measured by the number of recruits to the population in a standardized reproductive equivalent (RRV) of nesting females – which are among the highest valued individuals in the population and the unit that many scientists consider the standard for monitoring population recovery. By standardizing this unit of measure, NFWF is able to compare the potential benefit of a project to protect turtle nests on the beach vs. a project to reduce bycatch at sea.

The majority of the implementation activities will take place in years 2-6; however, monitoring of implementation progress, threat reduction, and valuation of sea turtle mitigation will be conducted throughout the ten-year period of the initiative. At the project level, individual grantees will monitor and provide an update on key activity and outcome metrics in annual and final reports. Further monitoring of sea turtle outcomes by third parties will also be employed where appropriate, including tapping into ongoing research and monitoring programs already active at priority sites.

At the level of the overall recovery strategy, NFWF's in-house evaluator will conduct an internal assessment in year 3 which will examine the latest progress on reduction of key threats and the estimated number of nesting female reproductive equivalents saved. Findings from this interim assessment will be used to inform future decision-making to ensure success. Towards the end of this strategy's life cycle, a more comprehensive third-party evaluation will be conducted as part of the IUCN Red List assessment process by hawksbill experts to see if the future trajectory of the population has changed as projected.

Strategy	Activity	Metric	Scale	10-yr Goal	Notes
<b>Habitat Restoration</b>	Beach habitat quality improvements	Miles restored	Project	4	Miles identified in current management plans for highest density beaches. Additional miles may be added after these plans have been refined.
<b>Species-specific Strategies</b>	Reduction in by-catch	# of individuals saved through use of safer gear or practices	Project / Initiative	150	Relevant to NFWF hotspot investment geographies as specifically listed in the business plan.
<b>Capacity, Outreach, Incentives</b>	Building institutional capacity	# of organizations contributing to the initiative's conservation goals	Initiative	30	Seeks to measure the success of the networks and filling capacity gaps for conservation in ETP. Seek to have at least one govt and non-govt party for each country in the network.
	Outreach/ Education/ Technical Assistance	# individuals reached by outreach, training, or technical assistance activities	Project	1000	Fishermen engaged in BMP education to reduce turtle bycatch.
		# individuals demonstrating a minimum threshold of behavior change	Project	400	Fishermen that are using turtle safe gear in order to meet our target of 150 turtles saved annually.
<b>Planning, Research, Monitoring</b>	Research	# research studies completed	Initiative	8	Focused on targeted assessments of priority nesting and foraging grounds and rapid and quantifying assessments of bycatch (quantitative assessment in priority ports, additional port surveys, 2nd round of quantitative assessments, secondary nesting beach assessments, tagging study, 3 capacity pieces)
	BMP development	# BMP recommendations developed	Initiative	3	Focused on pilot projects to reach mitigation targets for bycatch and nesting beach threats (new gear solutions for nets, long-line and retention issues)
	Monitoring	# monitoring programs established or underway	Project / Initiative	3	Monitoring of implementation progress for all three BP strategies.

## Acknowledgements

Several individuals provided input to the Eastern Pacific Leatherback Business Plan and we would like to thank them for their expertise and input in developing this investment strategy. Specifically we would like to thank Bryan Wallace from the Ocean Society who drafted the first version of the business plan and for additional insights and coordinating the Expert Working Group assistance.

The Expert Working Group participants who contributed to this report were: Bryan Wallace – Oceanic Society, USA, Joanna Alfaro-Shigueto and Jeffrey Mangel – ProDelphinus, Laura Sarti and Ana Barragán – CONANP, Mexico, Veronica Caceres – Inter-American Convention for the Protection and Conservation of Sea Turtles, Diego Amoroch, Sandra Andraka, Alvaro Segura – WWF, Raquel Briseño-Dueñas – UNAM-Mazatlan, Jorge Azocar – IFOP, Chile, Miguel Donoso – Pacifico Laud, Chile, Paula Salinas – Universidad Arturo Prat, Chile, Andres Baquero – Equilibrio Azul, Ecuador, Jose Urteaga and Perla Torres – Fauna and Flora International, Nicaragua, Pilar Santidrián Tomillo – The Leatherback Trust, Costa Rica, Rotney Piedra – MINAE, Costa Rica, Javier Quiñones and Evelyn Paredes – IMARPE, Peru, Shaleyla Kelez – ecOceanica, Peru, Francesca Vannini – Oaxacan Wetland Network, Mexico, Jacinto Rodriguez – Fundación Agua y Tierra, Panama, Hector Guzman – STRI, Panama, Vincent Saba – NOAA – Northeast Fisheries Science Center-NOAA, USA, George Shillinger – Stanford University, USA, Jeffrey Seminoff and Peter Dutton – Southwest Fisheries Science Center-NOAA, USA.