Project Period	07/01/2012 - 07/30/2013
Award Amount	$60,000.00
Matching Contributions	$68,000.00
Project Location Description (from Proposal)	Makeahua Stream on the Pelekane Bay watershed. South Kohala district, Hawaii Island, State of Hawaii.

Project Summary (from Proposal)

Reduce sediment inputs into Pelekane Bay coral reef system by reducing land-based run-off. Project will engage volunteers to capture overland flow of sediment with erosion-control structures, and will restore stream banks in key drainages.

Summary of Accomplishments

We have reduced the amount of sediment moving downhill into Pelekane Bay, by constructing or rebuilding sediment check dams. We maintained the perimeter fence to keep the watershed goat-free. The outcomes were dramatic: bare ground was reduced from more than 500 acres to just 170 acres. 135 acres of mostly barren land are now mitigated by sediment dams within key drainages. 25,000 native plants that were planted are thriving in the fenced restoration corridor, and natural regeneration is filling in more than 150 acres in the enclosed area. Parker Ranch cattle herds have been reduced and are regularly rotated out of the watershed to allow the land to heal.

Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project's methods, monitoring, or results. How could other conservation organizations adapt similar strategies to build upon some of these key lessons about what worked best and what did not?

Reflecting upon this last year of work on the Pelekane Bay watershed, it is clear that the practices that were fine-tuned from the initial proposal to NFWF, through conversations and discussions, did indeed become the core of our work, and the most effective use of our time. Keeping the goat fence intact, and putting in the extra effort to completely remove the last of the goats is the key to large-scale improvement in vegetation cover. The dramatic differences we can see already in the watershed, compared to the goat-infested neighboring property, are incredible. It has certainly allowed us to use this example to influence the conversation all along the Kohala coast, to prod apathetic land owners to systematically control feral goat populations to protect marine habitats downslope.

The fence breach in the spring of this year was also a huge lesson learned. We need to be vigilant, and if goats do get through the fence, we need to immediately deal with the problem, bringing together partners and neighbors to reduce the population back to zero. All it takes is one nanny and one billy, and the population will return to the same as it was before.

Conservation Activities	Fence lines checked monthly (miles)
Progress Measures	Other (Miles of intact goat fencing maintained)
Value at Grant Completion	18
Conservation Activities	Watershed fenced and maintained as free of feral goats
Progress Measures	Acres where BMPs have been applied on land

Value at Grant Completion	6600
Conservation Activities	Restoration corridor-native plants irrigated and naturally regenerating
Progress Measures	Acres where BMPs have been applied on land
Value at Grant Completion	250
Conservation Activities	Erosion mitigation on bare ground
Progress Measures	% of bare soils in the watershed
Value at Grant Completion	1%
Conservation Activities	Fenced restoration corridor free of all ungulates
Progress Measures	Acres where BMPs have been applied on land
Value at Grant Completion	400
Conservation Activities	Rotational/pulse grazing to reduce fire fuel loads
Progress Measures	Acres where BMPs have been applied on land
Value at Grant Completion	6600

Conservation Outcome(s)	Reduce bare soil area on watershed
Conservation Indicator Metric(s)	Other (Acres of bare soil)
Baseline Metric Value	575
Metric Value at Grant Completion	172
Long-term Goal Metric Value	50
Year in which Long Term Metric Value is Anticipated	2030
Conservation Outcome(s)	Sequester sediment in check dams
Conservation Indicator Metric(s)	Other (Tons of sediment per storm event)
Baseline Metric Value	0
Metric Value at Grant Completion	5280
Long-term Goal Metric Value	20000
Year in which Long Term Metric Value is Anticipated	2030
Conservation Outcome(s)	Critical erosion areas addressed with sediment dams
Conservation Indicator Metric(s)	Other (Acres of drainages with sediment dams in place)
Baseline Metric Value	320
Metric Value at Grant Completion	455
Long-term Goal Metric Value	860
Year in which Long Term Metric Value is Anticipated	2020

Final Programmatic Report Narrative

Instructions: Save this document on your computer and complete the narrative in the format provided. The final narrative should not exceed ten (10) pages; do not delete the text provided below. Once complete, upload this document into the on-line final programmatic report task as instructed.

1. Summary of Accomplishments

In four to five sentences, provide a brief summary of the project's key accomplishments and outcomes that were observed or measured.

We have reduced the amount of sediment moving downhill into Pelekane Bay, by constructing or rebuilding sediment check dams. We maintained the perimeter fence to keep the watershed goat-free. The outcomes were dramatic: bare ground was reduced from more than 500 acres to just 170 acres. 135 acres of mostly barren land are now mitigated by sediment dams within key drainages. 25,000 native plants that were planted are thriving in the fenced restoration corridor, and natural regeneration is filling in more than 150 acres in the enclosed area. Parker Ranch cattle herds have been reduced and are regularly rotated out of the watershed to allow the land to heal.

2. Project Activities & Outcomes

Activities

- Describe the primary activities conducted during this grant and explain any discrepancies between the activities conducted from those that were proposed.

Goat Fence - On a monthly basis, we checked the integrity of our perimeter goat fence. Breaches were infrequent, but one incident had huge consequences. At that time, we had controlled the goats into a few last family groups totaling no more than 20 animals, but in February 2013, after a small rain that increased the vegetation cover on our side of the fence, the goats dug a hole under the fence, and a total of about 40 goats got in. We used a helicopter-assisted ground hunt, and removed about 30 animals. Following that, we continued with ground hunts, but due to the increased vegetation, the goats are roaming a wider area than before. We have received two new grants that will fund work on the watershed that will allow us to implement the "final answer" to the goats, by allowing us to use radio collars on animals along with helicopter assistance, to finally eradicate the last goats.

Sediment Dams - To address the amount of sediment that moves off the watershed during flash floods, we constructed or rebuilt 10 sediment check dams. The photo to the left shows the last step in the process. The crew is wrapping the rock wall with woven wire and ground cloth, which will act like a sieve when surface flow washes into this gully. Depending on the slope and area of the drainage basin, we construct one or more dams like this, adjusting the size of the dam to fit the amount of sediment it will need to hold.

Because these dams fill with sediment after a rain storm, we need to either empty the dam of sediment and/or build the dam higher to collect more sediment. The photo to the left shows a dam location that has had both treatments over the past two years. At the top of the photo is the berm that was created to hold the "unloaded" sediment. The dam that the crew member is standing on has two layers visible. The top layer is made of rocks and sediment that are held in place by wire and cloth. The lower layer is an extension of the first dam built here. This "rebuild" has allowed the original dam to stay in place, keeps most of the collected sediment in place as well, and doubles the original volume of sediment that the dam can hold. Not only does this allow the physical capacity of the dam to increase, but keeping the sediment on site means that the top soil, leaf litter, and seeds that come with the sediment are also held in place, creating a biological barrier in addition to the physical barrier (see outcomes, below).

Native plantings - Our plantings within the riparian corridor are surviving and growing. A total of about 25,000 plants of more than a dozen native species were watered through our irrigation system. During the driest times, they are watered twice a month, and when there has been at least 1/2 inch of rain, we hold off on the irrigation. In the lower section of the 400-acre riparian restoration area, about 150 acres of native shrubs and trees are regenerating now that they have no disturbance from feral or domestic animals.

Grazing management - Parker Ranch has reduced its herd from 600 to 350 head of cattle on the Pelekane Bay watershed. They have also changed their rotation so that they have rested the lowest, driest, three paddocks for nearly three years, and rotate the cattle completely off the watershed during extremely dry months (approx. 5 months in the past year). Parker Ranch cowboys have also recently been given permission to shoot goats that they encounter in their work.

Outcomes

- Describe progress towards achieving the project outcomes as proposed. and briefly explain any discrepancies between your results compared to what was anticipated.
- Provide any further information (such as unexpected outcomes) important for understanding project activities and outcome results.

Increased Vegetation Cover - The impact of so greatly reducing the goat population can be seen in the photo to the left, which shows the lack of vegetation cover where there are still uncontrolled goat populations (left side of photo) and the fenced, managed Pelekane Bay watershed where goats populations have been severely reduced (right side of photo). Even in these extremely dry periods, the amount of vegetation is noticeably different. (Photo from July 2013).

Reduction in Bare Ground - Analysis of satellite imagery from 2010, 2011, 2012 and 2013 reveals a steady trend in decrease of bare ground.

Year	Bare (1) pixels	Bare(2) pixels	Vegetated pixels	Total pixels	Bare(1) acres	Bare(2) acres	Vegetated acres	Total acres	Bare (1) percent	Bare (2) percent
2010	2624	985	60410	64019	583.6	219.1	13434.9	14237.5	4.10%	1.63%
2011	2368	631	61020	64019	526.6	140.3	13570.5	14237.5	3.70%	1.03%
2012	1897	513	61609	64019	421.9	114.1	13701.5	14237.5	2.96%	0.83%
2013	775	70	63174	64019	172.4	15.6	14049.6	14237.5	1.21%	0.11%

We used the same analysis method for calculating amount of bare ground as our last report. Two different satellite images from the summer season each year were analyzed. Using an automated system, the number of pixels in each satellite image classified as "bare" was calculated, listed above as Bare (1) pixels for the first image and Bare (2) pixels from the second image for the same year. Comparing the images each year, we can see that the amount of bare ground on the watershed has been significantly reduced, from an average of 401acres of bare ground in 2010, to an average of 94 acres of bare ground in 2013. This is much better than expected, probably due to consistent though light rains throughout the spring of 2013.

There hasn't been enough rain to change the fire fuel load significantly, so the impact of no cattle grazing has allowed for an unprecedented decrease in bare ground, without the grass becoming a fire threat. This change in grazing management has come about due to the ranch working closely with KWP and with the local NRCS office to better analyze the amount of feed available and subsequent carrying capacity of the land for domestic cattle.

Sediment dams - As the drought continued, we had very little rain during the time of this grant, but our sediment dams have proven themselves to be better at trapping sediment than we had anticipated.They also show the impact of improved vegetation cover on the watershed.

The dams themselves not only trapped sediment during the few small rain storms, but also topsoil, leaf litter, seeds, and composted cattle manure. This resulted in a vegetated gully behind every sediment dam that saw precipitation, as shown in the photo to the left. These green spots on the landscape showed the ability of the dams to trap and hold moisture along with sediment. The vegetation in the gully slows the flow of water, and helps it to soak into the soil, rather than run down the gully as a raging torrent. Although the surrounding land is still bare here, the sediment dam is reducing erosion.

Although at this time we have no monitoring data to show the absolute changes in amount of sediment being produced by the watershed, anecdotal evidence from the KWP crew's observations point to relative changes in the amount of sediment that is being trapped by the sediment dams during a rain fall. For example, one event dropped about 3/4 inch of rain on the north side of the watershed. Due to it being a large and poorly vegetated drainage basin at this one location, we had built three dams in sequence in one gully. Because of the reduction in goat population, light rains that had fallen over the previous month, and better grazing management, there was less sediment collected in the dams. This 3/4-inch rain that would previously have filled the first dam and most of the second dam with sediment, only filled the first dam about 1/3 of the way, and the second dam had no sediment collected even though the water clearly topped the dam. We attribute this to healing of the watershed. The same amount of rain produced less than 20% of the expected amount of sediment. Fewer goats means more vegetation, which means less erosion, which means less sediment on the reef. Success!

Native plantings - The 25,000 native plants that have survived through the first years of outplanting in the riparian restoration corridor are continuing to grow. In the picture to the left, the foreground has a native bunch grass called pili that is outcompeting the non-native grasses that surround it. In the background are native shrubs and trees. These planted and irrigated areas continue to amaze us, in the resilience of native Hawaiian plants, and their ability to use small amounts of rainfall. Many of the grasses and shrubs are blooming and seeding!

3. Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project's methods, monitoring, or results. How could other conservation organizations adapt similar strategies to build upon some of these key lessons about what worked best and what did not?

Reflecting upon this last year of work on the Pelekane Bay watershed, it is clear that the practices that were fine-tuned from the initial proposal to NFWF, through conversations and discussions, did indeed become the core of our work, and the most effective use of our time. Keeping the goat fence intact, and putting in the extra effort to completely remove the last of the goats is the key to large-scale improvement in vegetation cover. The dramatic differences we can see already in the watershed, compared to the goat-infested neighboring property, are incredible. It has certainly allowed us to use this example to influence the conversation all along the Kohala coast, to prod apathetic land owners to systematically control feral goat populations to protect marine habitats downslope.

The fence breach in the spring of this year was also a huge lesson learned. We need to be vigilant, and if goats do get through the fence, we need to immediately deal with the problem, bringing together partners and neighbors to reduce the population back to zero. All it takes is one nanny and one billy, and our population will return to the same as it was before, which is unthinkable.

The most important lesson learned is just HOW effective the sediment dams are! We knew that they could hold back tons of sediment from the watershed, but didn't expect that their effective could increase over time as they became vegetated. The bright green spots on the landscape are symbols to us of the ability of the land to heal itself, given the right conditions.

4. Dissemination

Briefly identify any dissemination of project results and/or lessons learned to external audiences, such as the public or other conservation organizations. Specifically outline any management uptake and/or actions resulting from the project and describe the direct impacts of any capacity building activities.

We presented our work at three key venues during this project period. In November 2012, the KWP coordinator was invited to the island of Maui to present the Pelekane Bay watershed project to two conservation groups there: the Maui Nui Marine Resources Council and the Maui Conservation Alliance. Both groups are working with partners to consider similar watershed restoration projects to protect coral reef ecosystems. (Powerpoint slide show included in uploads). We also had a poster and information table at the Nahehele Dryland Forest Symposium in February 2013.

Our corps of community volunteers were involved with planting in the upper watershed during the year, and at least 5 school groups organized environmental service trips to the Koaia Tree Sanctuary. We organized our first "dam day" for volunteers, and the story was written up in the local paper. (Story attached as an upload.)

5. Project Documents

Include in your final programmatic report, via the Uploads section of this task, the following:

- 2-10 representative photos from the project. Photos need to have a minimum resolution of 300 dpi;
- Report publications, Power Point (or other) presentations, GIS data, brochures, videos, outreach tools, press releases, media coverage;
- Any project deliverables per the terms of your grant agreement.

POSTING OF FINAL REPORT: *This report and attached project documents may be shared by the Foundation and any Funding Source for the Project via their respective websites. In the event that the Recipient intends to claim that its final report or project documents contains material that does not have to be posted on such websites because it is protected from disclosure by statutory or regulatory provisions, the Recipient shall clearly mark all such potentially protected materials as "PROTECTED" and provide an explanation and complete citation to the statutory or regulatory source for such protection.*